

THO CAM · FREE HANDBOOK

The CCTV Installer's Handbook

From site survey to handover. Cabling, networking, recording, safety and the faults you will meet most often.

Tho Cam is Vietnamese for "camera installer": *thợ* = skilled tradesperson, *cam* = camera.

Free for installers

Tho Cam · scan cameras, set IPs, write quotes and handover reports on your phone
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Foreword

This handbook is written for CCTV installers and network techs. It is not a thick textbook. It follows the order of a real day on the job site: survey, choosing cameras, cable routing, getting on the network, recording, handover, and then the faults you will meet most often.

How to use it. If you are new to the trade, read from the start. Experienced installers can jump straight to the chapter they need: chapter 13 is the quick fault-fixing guide, and chapters 7 and 8 cover finding cameras on the network, changing IPs and recovering passwords, which a lot of people get stuck on.

A few ground rules for this book

- The figures in this book are reference numbers, taken from manufacturer documents, from installers doing real jobs, or from simple calculations. The job site and the manufacturer's documentation for your exact model always have the final say. Where something is uncertain, the book says it is uncertain.
- The book does not print any manufacturer's default username or password. If you forget a password, go through the official manufacturer route (chapter 8). It is slower, but it leaves no problems behind for your customer.
- Working at height and working with 220V mains power (the standard in Vietnam) are genuinely dangerous. If a job is outside your experience, get an electrician or an experienced installer to work with you.
- The book is free, so share it with your colleagues. Please keep the Tho Cam credit in the footer intact.

About Tho Cam. The name is Vietnamese: "thợ" means a skilled tradesperson and "cam" is the everyday short form of "camera", so "Tho Cam" is simply "the camera installer", the nickname people use for the trade.

It is also the name of the app we are building for installers: find cameras on the network, change IPs, and make quotes and handover reports right on your phone. In some of the hands-on chapters there is a small box showing where the app can help, and there is an introduction page at the end of the book. The main content of the book is readable and usable without installing the app.

CHAPTER 1

Surveying before you install

Troubled jobs usually go wrong at the survey. Spending 20 minutes asking and measuring carefully will save you half a day of fixing things later.

Tools to bring

Missing one small item in the middle of a job means a whole trip to fetch it. The list below is a suggestion; add or remove items to suit the way you work.

Measuring and notes: a long tape measure (or a laser measure), a marker, a flashlight, paper and pen for sketching a diagram, and your phone for photos.

Drilling and fixing: a cordless drill, a hammer drill for brick or concrete walls, masonry bits, hole saws in 22 mm and 40 to 50 mm, screwdrivers, a hammer, wall plugs and screws in assorted sizes, and a sturdy ladder.

Cable routing: a fish tape (or cable rod), tape, cable ties, conduit clips (C-clips, pipe clamps), conduit, and junction boxes.

Network cable: an RJ45 crimping tool, a cable stripper, cutters, a **cable tester**, spare RJ45 connectors of the right type, and a few straight-through couplers.

Power: a multimeter, a voltage tester pen, a spare 12V power supply for bench-testing cameras, and an extension cord.

Network: a laptop with SADP or the manufacturer's tool, a **short patch cable (1 to 2 m)**, a small PoE switch or PoE injector to test cameras before mounting, and a PoE tester if you have one.

Waterproofing and accessories: silicone, rubber tape or waterproof tape, and a **camera junction box** (a plastic weatherproof box, 11×11 cm or 10×10 cm). Almost every job uses these, one per camera, so buy a few extra.

Safety: safety glasses, gloves, and a dust mask when drilling ceilings.

Paperwork: the diagram, the handover report template, and sticker labels.

> **TIP**
> Test the camera on the ground before you climb the ladder. Power it from a small switch right where you are standing, activate it, set the IP, check the picture, and only then carry it up to mount. Finding a dead camera after it is already hung up high costs you three times the effort.

> **TIP**
> Label the camera body as soon as you test it: the sequence number and the IP you set. When you get to the wall, you will know which unit goes where.

Questions to ask the customer before measuring

1. **What does the customer need?** Theft prevention, watching staff, watching children or elderly relatives. Each purpose calls for a different camera placement.
2. **How many days of recording?** This number decides the hard drive capacity (chapter 6).
3. **Remote viewing or not?** If yes, what internet connection does the customer have, who controls the modem, and who holds the account?
4. **Who keeps the passwords?** Ask early. The password should end up with the customer, not in the installer's notebook (chapters 9 and 10).
5. **Budget and deadline.** Talk about them openly, so you pick a setup that fits the budget instead of installing everything and then cutting back.

Walk the site, measure and photograph

- **The real height and distance of each mounting point.** Measure along the route the cable will actually take, not in a straight line. Remember to add the cable that loops around posts, beams and corners.

- **Obstructions.** You can see the branches that are there today, but it is easy to forget the tree that will grow over the next few months. Eaves, posts and signboards also block part of the view.
- **Lighting.** Backlight in the morning or afternoon, street lamps shining straight into the lens, dark zones at night. If you can, come back after dark and check.
- **Where the recorder goes.** A dry, ventilated spot with a power outlet, away from heat sources and hard for strangers to reach. Putting a recorder in a closed cabinet with no fan is asking for overheating.
- **The route to the internet.** Where is the modem, how far is it from the recorder, and is there a free network port?
- **Take photos** of every mounting point, every difficult cable run, and the recorder location. You will reuse these photos at the quote stage and at the acceptance test.

> **CAREFUL**
> Before drilling a wall or cutting into a ceiling, check both sides for electrical wires or water pipes. Look at the other side of the wall too. A nearby socket is a sign that wiring runs horizontally or vertically past that spot.

Draw a diagram on one sheet of paper

All you need: a rough floor plan, each camera's position with a number, the recorder position, the cable routes (solid lines, with the estimated length in meters), and the positions of the modem and power outlets. Take a photo of the sheet. A customer looking at this diagram understands and agrees faster than when you explain in words.

Survey form template (one page)

Copy this table onto paper or into your phone, one row per camera:

No.	Location	Purpose	Height (m)	Cable to recorder (m)	Obstructions, lighting	Notes
1						
2						
3						
4						

For the overall job, also write down: customer name and phone number; address; number of days of recording needed; whether remote viewing is needed; recorder location; modem location and the IP range the modem uses; the power outlet near the recorder; who keeps the passwords; and the scheduled date and time for the work.

Survey checklist

- [ ] Purpose and number of recording days agreed with the customer
- [ ] Cable length measured along the real route for each camera
- [ ] Obstructions and lighting checked (including at night if possible)
- [ ] Recorder location chosen, with a power outlet, ventilated, and secure
- [ ] Route to the modem identified
- [ ] Photos taken and diagram drawn
- [ ] You know who keeps the account and password

HOW THO CAM HELPS

Survey photos, notes and the camera list for each job are stored together in one place in the app. The app lets you place each camera on the floor plan and see its field of view (FOV) visually. Show it to the customer and you settle the positions very fast. The data can be reused when you make the quote and the acceptance handover report.

CHAPTER 2

Choosing cameras, lenses and mounting angles

Which camera for which job

Type	Suited for	Watch out for
PoE IP camera (bullet, dome)	Sites where network cable can be run; clear picture, easy to expand	Needs a PoE switch or a recorder with PoE ports; work out the power budget (chapter 5)
Analog camera, coax	Reusing existing coax cable, replacing old cameras	Needs signal and power cables; the signal standard must match the recorder
Wi-Fi camera (Ezviz, Imou, Tapo...)	Small homes, hard to run cable, customer uses it themselves	Depends on Wi-Fi signal, usually connects only on the 2.4 GHz band; needs its own power; viewed through an app
PTZ (pan-tilt-zoom) camera	Following activity across a wide area, large yards	Draws more power than a fixed camera; check the PoE power

A system does not have to use only one type. In Vietnamese townhouses, it is common to put PoE cameras on the gate and yard, and Wi-Fi cameras in the upstairs living room.

Resolution, infrared and backlight

- **The higher the resolution, the larger the recorded files.** An 8 MP picture is clearer than 2 MP, but it is much heavier on hard drive space and bandwidth (chapter 6). Choose what is enough; don't chase the number.
- **High resolution does not rescue a dark spot.** If the picture is dark, any resolution looks blurry. Fix the lighting first.

- **Infrared** gives a black-and-white picture at night and can see in the dark. **White light** (cameras with a lamp) gives a color picture at night, but the light has to be on, and it glares into the neighbors' windows if it points the wrong way.
- **Wide Dynamic Range (WDR) or similar backlight handling** helps when the camera faces a bright doorway. It does not fix everything, so change the direction if you can.

Lenses: the longer the focal length, the farther it sees and the narrower it gets

- **2.8 mm** is wide angle. Good for small rooms, hallways and short distances.
- **4 mm** is the middle ground, commonly used outdoors for yards and gates.
- **6 mm and up** sees farther but with a narrow angle. Use it when you need to identify at a long distance.

Choose the lens by what you need to see clearly, not by price. A wide-angle camera gives a feeling of "seeing everything", but detail in the distance, such as a face, shrinks to a few dots.

How far can it see clearly

The camera design standard (IEC 62676-4, often called DORI) uses the number of pixels per meter of the scene to say what a camera can do:

Goal	Pixels per meter
Detect that a person or object is present	about 25
Observe (see what a person is doing)	about 62.5
Recognize (recognize someone you know)	about 125
Identify (see the face clearly enough to serve as evidence)	about 250

Quick calculation: **pixels per meter = the camera's horizontal pixel count ÷ the scene width at that distance.** Scene width = 2 × distance × tan(half the horizontal field of view).

Example: a 4 MP camera is 2,560 pixels wide with a 90 degree horizontal field of view (tan 45 degrees = 1), so the scene width equals 2 times the distance. To identify a face (250 pixels per meter) the scene width must be no more than 2,560 ÷ 250 = 10.2 m, which means a maximum distance of about 5 m. A narrower lens reaches farther.

These numbers are theory under good lighting. At night, in backlight, dust or rain, the real distance at which you can see clearly will be shorter. Testing on site is still the best standard.

Where to mount

- **Avoid backlight.** Don't point straight at a large door or a window with harsh sun in early morning or late afternoon. If you have no choice, pick a camera with Wide Dynamic Range (WDR) and test it on site.
- **Don't mount behind glass.** At night the infrared light reflects off the glass and turns the picture white.
- **Plan for future obstructions.** The tree that is growing, the signboard about to be hung.
- **Leave a path for water to run off.** Mount outdoor cameras so rain does not run along the cable into the port (chapter 4).
- **Think about the person doing maintenance.** If the camera is too high or has no ladder access, cleaning the lens or replacing the camera later will be miserable.

HOW THO CAM HELPS

When choosing the angle, place the camera on the floor plan in the app and look at the simulated field of view (FOV) for the lens you chose. The customer sees how far the camera will see before you drill a single hole, so you settle the position fast and rarely have to move it.

CHAPTER 3

Cable routing and crimping RJ45

Most "flickering camera" faults come from the cable and the crimped ends. Do this step neatly and everything after it gets much easier.

Use conduit instead of stapling the cable

Running bare cable along a wall is fast, but it gets cut, yanked, and looks bad. Plastic conduit (the smallest size, about 20 mm, is enough for one cable) keeps the cable safe and tidy.

- **Fix the conduit with clips** (C-clips, pipe clamps). Drill into the **brick**, not into the mortar joint, because mortar cracks and loosens over time. Reference spacing: about one clip every 40 to 50 cm.
- **Put a conduit end box** where the cable enters the building.
- **Hole saws:** 22 mm for conduit entering the eave cavity, 40 to 50 mm at the camera mounting spot (a bigger hole is less cramped).
- **Tools worth having:** RJ45 crimping tool, cutters, tape, fish tape, hammer drill, cable tester.

Pulling cable through a small hole

- Use a **fish tape** (or cable rod). Tape the cable to the **tip** of the fish tape, not along its length, so it fits through a small hole. Wrap the tape just tight enough: too loose and it comes off while pulling, too much and it will not go through the hole.
- When the cable end snags at a conduit joint, bend the tip gently into a smooth point and push again.
- **Leave slack** at the camera end so you can re-crimp the connector. At the recorder end, leave an extra 1.5 to 2 m.

- **Label** both ends of the cable right when you pull it, before plugging into the recorder or switch. Ten minutes of labeling saves a whole session of tracing cables later.

Routing through ceilings, walls and metal roofs

- **Plasterboard and plastic ceilings:** use a fish tape and cable rods, follow the frame, and don't let slack cable lie on the ceiling panels. Leave an access point so the cable can be replaced later.
- **Metal roofs, steel pipes:** sharp edges cut cable jackets very easily. Wrap the pipe or line the edge with rubber where the cable passes, and secure the cable firmly so the wind cannot rub it against the edge.
- **Near power cables:** keep network cable well away from power cables and avoid running them side by side. If you must cross, cross at a right angle. Power cables running close can cause interference.
- **Underground cable:** run it inside conduit, the conduit must be sealed, and the ends plugged so water and insects stay out. Mark the route so that future digging does not cut the cable.
- **Joints in the middle of a run:** ideally, none. If unavoidable, use a straight-through coupler and keep it in a sealed box. Don't hand-twist and wrap with tape. Write down where the joint is.
- **Crimp the ends before pulling?** Practice differs: some installers cut the cable to length and crimp both ends first to save time, others pull first and crimp afterwards so the RJ45 does not snag in a small hole. If the cable has to go through narrow conduit or a tight hole, pull first and crimp after.

Choosing cable

- **Pure copper, not CCA.** CCA is aluminum core with a copper coating. Its resistance is higher than copper, so long-distance PoE power drops in voltage, and the camera reboots at night when the infrared turns on. It is cheaper, but not cheap once you count the cost of going back to fix it.

- **Visual check:** cut a piece and lightly scrape the plating at the end of the conductor. If you see silver instead of copper color, the cable has aluminum in it.
- **Outdoor cable:** choose one with a sun-resistant jacket.
- **Wire gauge (AWG)** matters as much as Cat5e versus Cat6. A thicker conductor has lower resistance.
- **The standard maximum length is 100 m for the whole channel,** made up of at most 90 m of fixed cable (inside walls, ceilings, conduit) plus at most 10 m of patch cords at the two ends. Pulling 100 m of fixed cable and then adding patch cords at both ends exceeds the standard. Poor-quality cable may manage much less.

Crimping RJ45

The standard color order. Hold the RJ45 connector with the copper contacts facing you and the cable entry at the bottom: pin 1 is the far **left**, counting to the right up to pin 8:

Pin	T568B (commonly used)	T568A
1	white-orange	white-green
2	orange	green
3	white-green	white-orange
4	blue	blue
5	white-blue	white-blue
6	green	orange
7	white-brown	white-brown
8	brown	brown



T568B and T568A wire color order

Both ends with the same standard make a straight-through cable. One end A and the other end B makes a crossover cable; these days switches detect this automatically, so you rarely need one.

Common crimping mistakes

- Stripping the outer jacket too far, exposing too much of the conductors.
- The wires not reaching the end of the RJ45 connector (the link light flickers, and a light tap makes it drop).

- Wrong color order.
- Using cheap RJ45 connectors.
- Using connectors made for stranded cable on solid copper cable, or Cat5 connectors on Cat6 cable (the cable is thicker, so the conductors can get cut during crimping). Solid copper cable needs connectors made for solid copper cable.
- **Not testing after crimping.** Always use a cable tester before plugging into equipment. A tester usually lights up the LEDs in sequence from 1 to 8 on both ends: a LED that does not light means that pin is broken or not crimped properly, and LEDs lighting in a swapped order mean the color order is wrong.

> **TIP**
> If you doubt a crimped end, cut off about 3 to 5 cm of cable at that end and crimp again. That is faster than guessing.

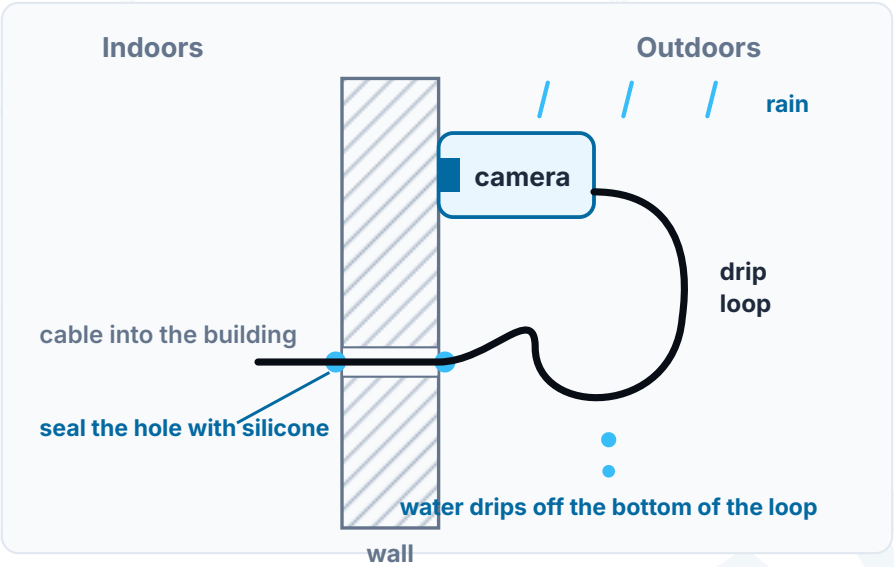
CHAPTER 4

Outdoors: water, lightning and power

Outdoor cameras fail mostly because of water, lightning, and careless power wiring. All three can be avoided.

Waterproofing

- **The camera housing is usually rated IP66 or IP67, but the cable and connectors are not.** An exposed network port or power cable is where water gets in and corrosion starts.
- Cameras come with waterproofing accessories: a cable gland nut, a waterproof ring, a waterproof cover, and an O-ring that fits on the network port and is locked by twisting. The power cable has a gasket between the two connectors. Don't throw these accessories away.
- **Slide the nut, rubber ring and cap onto the cable BEFORE crimping the RJ45.** If you remember only after crimping, the RJ45 will not pass through the cap and you have to cut and crimp again.
- RJ45 connector at the camera side: use a waterproof connector block with a rubber seal, and screw it down after plugging in. Tighten so the rubber seal presses against the cable, and don't let the cable get pinched or caught behind the camera.
- **Leave a drip loop.** Let the cable sag into a curve lower than the camera entry point (a drip loop). Rainwater running along the cable drips off at the bottom of the loop instead of flowing into the port.
- **Seal with silicone** around holes drilled through the wall to keep out water and insects.
- Fixed covers: tighten moderately. Overtightening warps the plastic cover.



Drip loop: leave the cable sagging lower than the camera entry point

Common outdoor faults

- **Water in the network port** because the connector is exposed or has no waterproofing accessories.
- **Cable left in the sun** for a long time turns brittle and the jacket cracks. Choose outdoor cable or run it in conduit.
- **Insects and geckos** get into the power box or camera housing through gaps. Seal the gaps with silicone.
- **Screws and covers overtightened** crack the plastic housing.
- **Cable pinched under the box lid.** It lets water in and also makes a short circuit likely.
- **No drip loop,** so rainwater runs along the cable straight into the port.

Check after heavy rain: go back, or ask the customer to tell you, if the picture goes blurry, there is condensation inside the lens, or the camera loses connection after rain. These signs usually mean water has gotten in, and dealing with it early limits the damage.

Junction boxes (11×11) and outdoor power boxes

Outdoors in Vietnam, most cameras are mounted on a **junction box** (a plastic weatherproof box, 11×11 cm or 10×10 cm) instead of straight onto the wall. The box hides the power supply, DC jack and network connector for a tidy look and shelters them from rain and sun. General rules:

- **Mount the camera on the box lid,** and bring the cable in through the **bottom of the box**. Rain runs from top to bottom, so the bottom is where the least water gets in. A hole facing up invites water in.
- **Handle moisture correctly.** Condensation sitting in a sealed box for a long time corrodes the jack and the power supply. Don't drill holes at random: hand-drilled holes ruin the box's water and dust sealing and become a path for insects and rainwater. If the box comes with drain holes, breather plugs or dedicated drain screws, use the right type, with a suitable protection rating. If the box is not designed that way, keep its sealed construction, mount it under a roof or cover, seal all the cable entries well, and follow the box manufacturer's instructions.
- **Cable enters the box through flexible conduit or ordinary conduit.** Where the cable passes through, use a waterproof cable gland or seal with silicone, so water and insects (including geckos) cannot get in.
- **After closing the lid, check that no cable is pinched in the gap,** and tighten all the screws. A gap that lets water in will ruin the power supply.
- **Keep the DC jack and RJ45 plug connections inside the box tidy:** not touching each other, and not lying against the bottom.
- **Stick the camera's serial number or QR code** somewhere easy to find, using clear tape. Finding the code later on a camera that is already mounted up high is miserable.

For a Wi-Fi camera plugged into mains power (220V in Vietnam) inside the box: the 220V power cable runs through flexible conduit or plastic conduit, with neat connections and fully insulated. A cable pinched under the lid, or a gap that lets water in, can lead to a short circuit or fire.

> **CAREFUL**
> Mains electricity (220V in Vietnam) is not something to experiment with. Wherever you connect to the customer's mains electricity, have an electrician do it or check it.

Lightning protection

Lightning does not have to hit the camera to damage it. Surge traveling through the cable is enough to kill a network port or burn out a power supply.

- **Single-point grounding:** all devices in the same system share one grounding point, so there is no potential difference between devices.
- **Do not connect devices to the building's lightning down conductor or lightning rod.** How to tie the camera grounding system to the building's grounding system is a job for the electrician. Don't drive your own rod and walk away; let a qualified person work it out for the building.
- The grounding wire should be **short and thick.** Ground resistance thresholds differ from place to place: some manufacturers state under 4 ohm for their equipment, while lightning protection installation documents in some places accept up to 10 ohm. Measure with an earth resistance meter and ask the electrician where you are installing.
- Metal-housing cameras: connect the housing to the ground wire through the ground screw, or mount it on a grounded metal pipe.
- **Surge protectors** for the network line and the power line, installed according to the design and grounded properly.
- **Shielded cable (STP) does not protect equipment from surge by itself.** The metal shield only works when it is grounded as designed; grounded wrongly, it can even create a potential difference between devices.

- **Underground cable** over long outdoor runs reduces direct exposure but does not remove the risk of surge traveling through the earth and through the cable.

Working at height

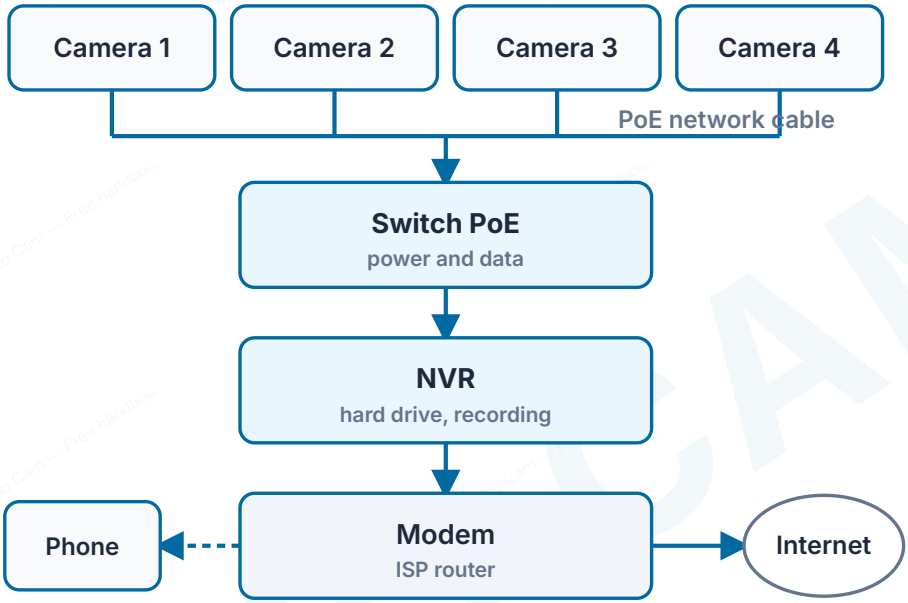
- A sturdy ladder at the right angle, with someone holding it when possible.
- Cut power to the area before touching electrical wires.
- Wear glasses when drilling wooden or concrete ceilings (dust flies into your eyes).
- Don't stretch for one more meter you can't reach. Climb down, move the ladder, and climb back up.

Sources for this chapter: Omada (TP-Link) waterproofing and lightning protection guides; Hik Guru, "HikVision CCTV Installation - Like A PRO". The full list and links are at the end of the book.

CHAPTER 5

Powering with PoE

A PoE camera gets both data and power over a single network cable. It is tidy, but if you get the power budget wrong, the faults are very hard to predict.



All devices share the modem's subnet. Cameras and NVR get static IPs.

Diagram of a typical PoE camera system

Calculating the power budget

1. Add up the maximum power draw of each camera. Infrared at night draws the most, so use the figure with the IR lights on, not the daytime figure.
2. Compare it with the **total PoE budget** of the switch or recorder, not the power of a single port.

3. **Leave about 20 to 30% headroom.** A switch running right at its limit is one of the reasons cameras reboot on their own when it gets dark.

Common PoE standards (per IEEE), power supplied at the source / power available to the device:

Standard	Name	Supplied (max)	Available to device
802.3af	PoE	15.4 W	12.95 W
802.3at	PoE+	30 W	25.5 W
802.3bt Type 3	PoE++	60 W	51 W
802.3bt Type 4	PoE++	90 W	71.3 W

PTZ (pan-tilt-zoom) cameras and cameras with a light or heater usually draw more than fixed cameras. Check the specs of the exact model.

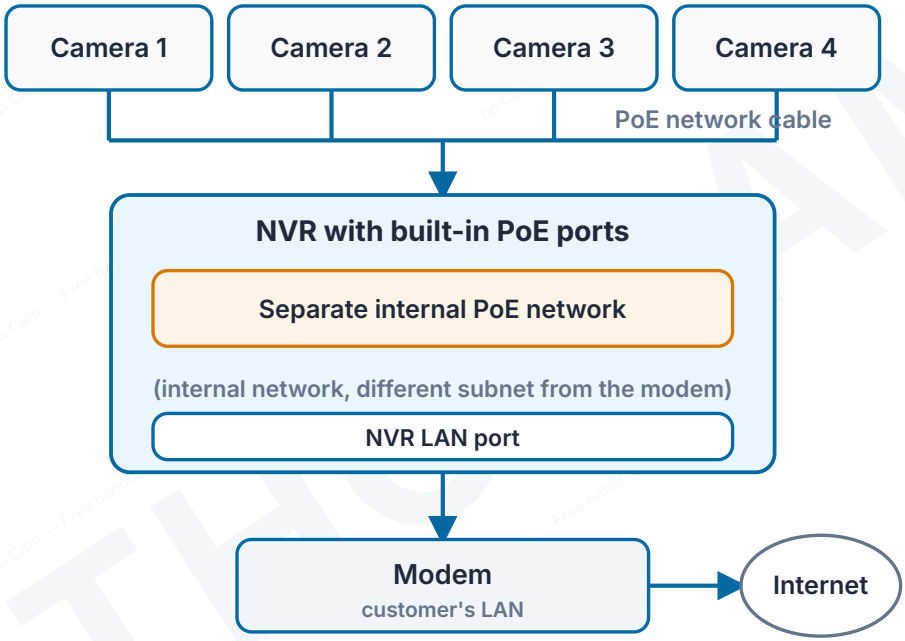
The power on a camera's spec sheet is the power received (PD), not the power the switch has to supply (PSE). The table above shows the loss the standard allows on the cable: with 802.3af, 15.4 W goes out and at most 12.95 W arrives, a loss of up to about 16%. The figure on a camera spec is usually the power consumed at the camera, so the switch has to supply a little more, especially on long runs. The 20 to 30% headroom above already covers this loss.

Worked example (assumed numbers). An 8-port PoE switch with a total budget of 120 W (this is the power the switch supplies, PSE). You install 6 fixed cameras, each drawing up to 7 W at the camera with IR on: 6 × 7 = 42 W. Add 2 PTZ cameras at 25 W each at the camera: 2 × 25 = 50 W. The total at the cameras is 92 W. Allow for cable loss at the standard's worst case (about 16%): 92 ÷ 0.84 ≈ 110 W that the switch has to supply. Add some margin for temperature and future load, and 120 W is only just enough. Pick a switch of 150 W or more, or reduce the load. Finally, check the **per-port limit** separately: a 25 W camera must go in a port that supports PoE+ (30 W).

Two ways to connect: an external PoE switch and the PoE ports on the recorder

There are two setups, and they set IP addresses differently (see chapter 7):

- **Setup A:** cameras connect to a **standalone PoE switch**, and the switch connects to the recorder and the modem. Cameras, recorder and modem are all on the same LAN (the diagram at the top of this chapter).
- **Setup B:** cameras plug straight into the **PoE ports built into the recorder.** The recorder creates its own internal network for the PoE ports, separate from the modem's LAN.



Setup B: cameras plugged into the recorder's PoE ports, on a separate internal network

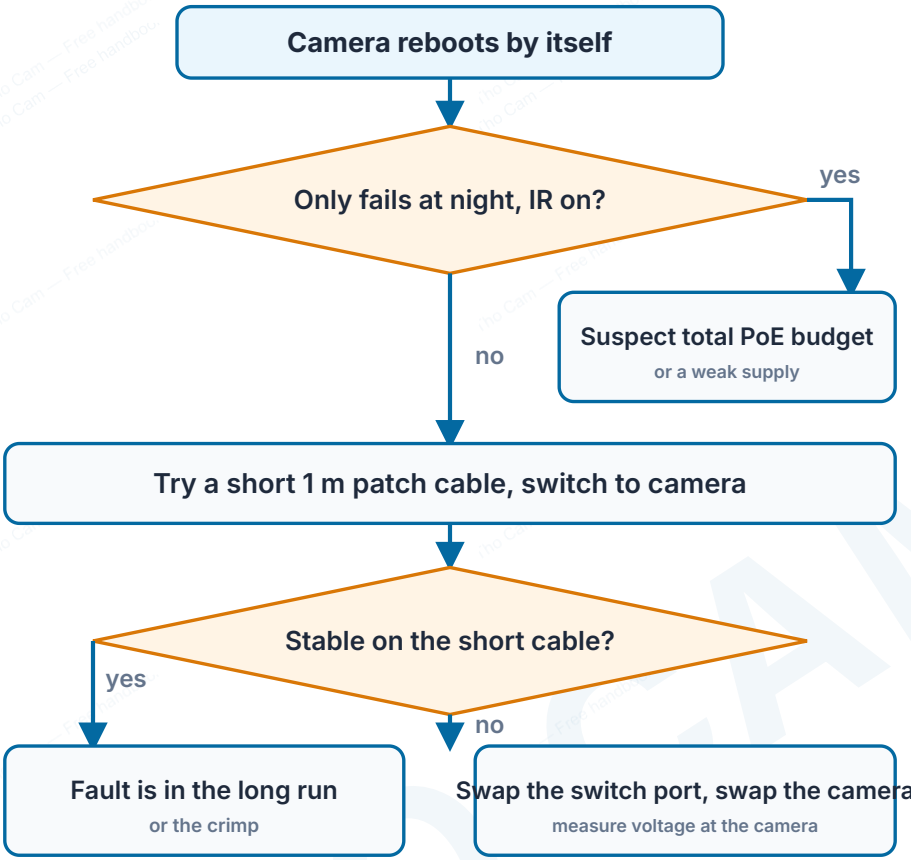
Watch out for mix-ups that damage equipment

- **Standard PoE is not "passive" PoE.** Plugging a passive PoE supply into a camera that only supports standard PoE can damage its PoE board.
- **Separate power supply voltage:** a 12V DC camera plugged into a 24V AC supply will burn out. Always read the label on the device and on the power supply before plugging in.
- **Weak adapters.** A recorder power supply that has been in use for years can degrade and no longer deliver enough for the mainboard and the hard drives. If the recorder sometimes sees the drive and sometimes does not, or the drive records erratically, suspect the power supply first.

Camera reboots or drops off the network, especially at night

When a PoE camera reboots on its own, do not guess. Isolate the fault in this order:

1. **Does it only fail when the IR is on (at night)?** Suspect that the switch's total budget is near its limit, or that the power supply is weak.
2. **Does it fail during the day too?** Suspect the crimped connector or the camera.
3. **Try a short temporary cable** (about one meter) straight from the switch to the camera. If it runs fine, the fault is in the long cable or the crimp, not the camera.
4. **Change the switch port.** Does the fault follow the camera or stay with the port?
5. **Power it from an external 12V supply** (if the camera supports it) to see whether PoE is the cause. External power usually takes priority over PoE.
6. **Measure the actual voltage at the camera** while it is running, not while the camera is unloaded.
7. **Re-crimp both ends of the cable** with the correct type of RJ45 connector.



Flowchart for isolating a camera that keeps rebooting

Try the math on Cat6 cable with 23AWG solid copper conductors: the round trip is about 6.7 ohms, so a 12 W camera (about 0.25 A) drops about 1.67 V, which the camera tolerates comfortably. That means a run of nearly 100 m on good copper cable is rarely the culprit. The two things that cause faults more often are CCA or poor-quality cable, and bad crimps.

PoE++ will not rescue a camera that only negotiates PoE+, because both use the same voltage level.

The Extend (CCTV Mode) switch on PoE switches

Many PoE switches sold for cameras today have an **Extend** (or **CCTV Mode**, often labeled 250 m) toggle. When it is on, the switch forces the PoE ports down to **10 Mbps** to push both power and signal further, to about 200 to 250 m on standard copper cable instead of 100 m. Very useful for factories, parking lots and long runs.

- 10 Mbps is enough for most 2 MP and 4 MP cameras at typical bitrates. For very high-resolution cameras or many streams, recalculate the bandwidth first.
- Only use long runs with **pure copper cable**. Running CCA this far is asking for trouble.
- The toggle usually applies to a group of ports or to individual ports depending on the model, so read the label on the switch.
- Each brand names it differently (Dahua calls it ePoE on its product lines), so check the documentation for the model you are using.

TIP
A small PoE tester (or a managed switch that shows the power on each port) saves a lot of time on jobs with unpredictable faults.

HOW THO CAM HELPS
The app has a built-in PoE power calculator: enter the number of cameras and the power of each type, and the app adds it up and tells you how much headroom is left against the switch. No need to remember formulas, and you can open it on your phone right at the job site.

Sources for this chapter: IEEE standards 802.3af, 802.3at, 802.3bt; the IPCamTalk forum (PoE+ on a Cat6 run of nearly 90 m); TIA/EIA-568 for cable channel length.

CHAPTER 6

Recorder hard drives

Calculating storage

A quick formula for one camera recording continuously:

> **Storage per day (GB) = bitrate (Mbps) × 86,400 ÷ 8 ÷ 1,000 = bitrate × 10.8**

Example: a 4 Mbps camera recording continuously uses about 43.2 GB per day. Eight cameras, kept for 15 days:

43.2 × 8 × 15 = 5,184 GB, or about 5.2 TB.

Ways to reduce storage: lower the bitrate or resolution for less important areas, use more efficient encoding if the equipment supports it, or record on motion. Motion recording saves disk space but can miss the footage you need, so tell the customer first.

When the drive is full, the recorder automatically deletes the oldest data to keep recording. The actual number of days kept depends on how you record and on the content of the picture.

Use a drive built for cameras, rated for 24/7 operation. Check the recorder manufacturer's list of compatible drives.

H.264, H.265 and H.265+ compression

For the same picture, H.265 needs less storage than H.264. Manufacturers also offer smart compression: **H.265+** (Hikvision calls it H.265+, Dahua calls it Smart H.265+, and some brands call it Ultra 265). It drops data in areas that change little, so it saves even more.

- **Turn on H.265+ on both the recorder and the camera** if the equipment supports it. With the same drive, the number of days kept goes up noticeably, nearly doubling in many scenes, at no extra cost for drives.
- How much you save depends on the scene. Static scenes (warehouses, corridors) save a lot, while scenes with lots of motion (streets) save less.
- The recorder, camera and viewing software must all support the standard. Older viewing devices may stutter or fail to play H.265. Test on the customer's phone before you finalize.
- Calculate storage for the customer using conservative numbers. If there is room to spare, the customer will be happy.

Storage by configuration (continuous recording, rounded figures)

Configuration	7 days	15 days	30 days
4 cameras, 2 Mbps each	0.6 TB	1.3 TB	2.6 TB
8 cameras, 2 Mbps each	1.2 TB	2.6 TB	5.2 TB
8 cameras, 4 Mbps each	2.4 TB	5.2 TB	10.4 TB
16 cameras, 2 Mbps each	2.4 TB	5.2 TB	10.4 TB
16 cameras, 4 Mbps each	4.8 TB	10.4 TB	20.7 TB

Before you quote the customer, check against the **number of drive bays and the maximum capacity per drive** of the exact recorder model, in the manufacturer's documentation. If the figure is beyond what the recorder can handle, you have to lower the bitrate, shorten the retention period, or choose a larger recorder.

HOW THO CAM HELPS

The app has a built-in hard drive calculator: choose the number of cameras, the resolution (based on common H.265 bitrates) and the number of days to keep, and the app gives you the drive capacity to buy. No formulas to memorize.

TIP

Hard drives running continuously for years wear out. The recorder has a drive status page in its storage menu. If it reports an error or anything unusual, replace the drive early, and do not wait until you need to review footage to find out the drive has failed.

Memory cards for Wi-Fi cameras

Wi-Fi cameras usually record to a memory card inside the camera. Days of retention for each card size, based on the camera's bitrate (continuous recording, rounded figures, with a small allowance because a card's real capacity is lower than the number printed on it):

Card	Recording at 1 Mbps	Recording at 2 Mbps
32 GB	about 2.5 to 3 days	about 1.5 days
64 GB	about 5.5 days	about 3 days
128 GB	about 11 days	about 5.5 days
256 GB	about 22 days	about 11 days

With motion recording, the number of days is much longer. When the camera runs out of space, it overwrites the oldest footage.

- **Choose genuine, high-endurance cards** made for surveillance cameras and recorders. Cheap cards and standard photo-camera cards that get overwritten constantly for a few months tend to burn out, or the camera reports "memory card not recognized".
- Do not choose a card larger than the maximum the camera supports. Check the model's specs.
- If the customer says "the camera isn't recording" and it is a Wi-Fi camera using a card, check the card first. Pull the card, clean the contacts, format it again in the app, and replace the card if the fault keeps coming back.

- The memory card is the most failure-prone part of a Wi-Fi camera, so tell the customer to check it regularly.

Installing the drive

- Power off and open the recorder's cover (usually a few screws on the back or the bottom).
- Plug the data cable and power cable into the drive. The connectors cannot be plugged in the wrong way round, so if one does not go in, do not force it.
- Fasten all **four screws** to hold the drive in place. A loose drive vibrates and fails early.
- Close the cover, power on, and wait for the recorder to finish booting.

First-time initialization (format)

A new drive, or a drive you have just replaced, must be initialized by **the recorder itself**. Recorders use their own format, not the one computers use. Do not format the drive on a computer and then put it back.

On a Hikvision recorder (menus may differ by firmware and model): **Configuration → Storage → Storage Management**, select the drive, press **Format**, and wait for the dialog to close.

A recorder that **beeps** after you fit a new drive usually means the drive has not been initialized, or the recorder does not recognize it.

> **CAREFUL**
> If an old drive reports an error but still holds data you need to keep, do not format it yet. Formatting wipes everything.

Setting the recording schedule

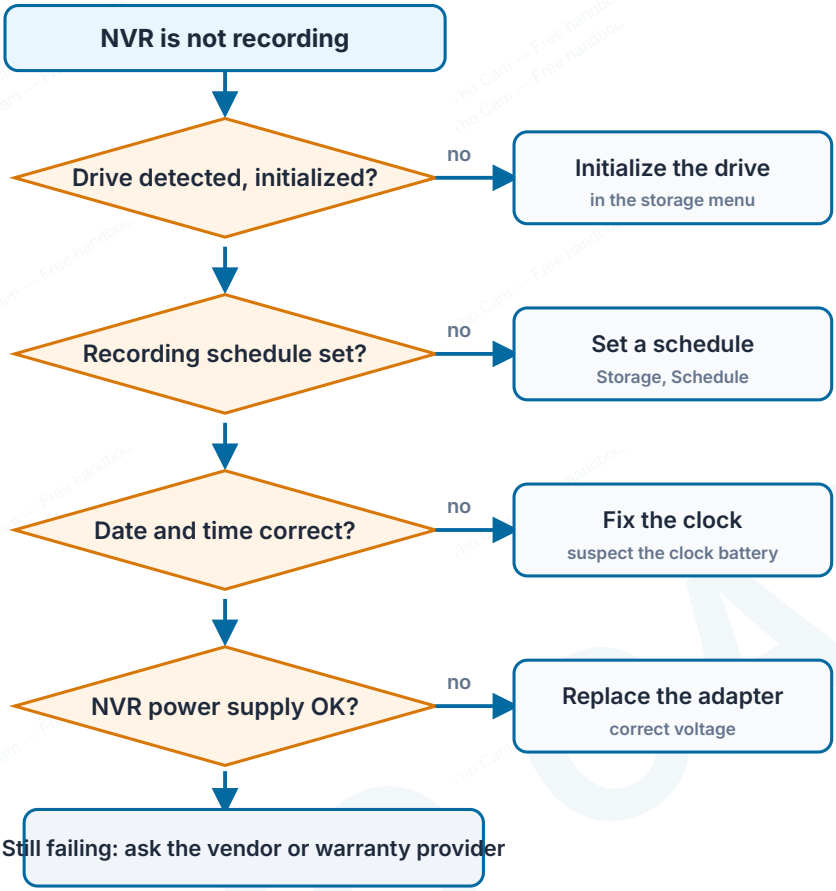
On Hikvision: **Configuration → Storage → Schedule Settings**, choose the recording mode for each channel. There are six modes: Event, Continuous, Motion | Alarm, Alarm, Motion, Motion & Alarm. If the time bar in the schedule has no blue color, there is no drive or the drive has not been initialized.

The camera has a mic but playback has no sound

A camera with a built-in mic connected to the recorder, where playback shows only picture and no sound, is a very common problem. The cause: the recorder records video only by default.

1. Go to the **Encoding settings** (Video/Audio) for that camera's channel.
2. Change the **Stream Type** from **Video** to **Video & Audio**.
3. Turn on **audio recording** (sound capture) if the menu has this option, and check that the camera has audio capture enabled.
4. Save, record a short clip, then **play it back** to listen.

Menu names differ by brand and firmware, but what you are looking for is the channel's encoding settings. Recording audio may raise privacy issues for people in the recorded area, so tell the customer first and see the privacy section in chapter 9.



Flowchart for checking when the recorder is not recording video

The recorder does not recognize the hard drive: what to do

Check in this order:

1. **Is the drive on the recorder's compatibility list?**
2. **The drive's data and power cables:** reseat them, swap the cables.

3. **Try a different drive.** If a new drive is not recognized either, the drive is not the culprit.
4. **The recorder's power supply.** Replace the adapter with a new one: **the voltage must match the label on the recorder exactly** (for example 12V DC), and only the current (A) may be equal or higher. Plugging in the wrong voltage will damage the board. A real case an installer ran into: a recorder installed years ago would not recognize even a new drive, and after switching to a new 12V 2A power supply it recognized the drive and recorded normally.
5. **Restart the recorder** and see whether it comes up normally.

Date and time reset to an old year after a power cut

After a power cut, a recorder that shows the year 1970 or 2014, with a red indicator light, and cannot play back footage by the real date, most often has a **dead clock battery on the mainboard**. Replace the battery with the right type (the type depends on the model, and is usually printed next to the battery holder or in the documentation), then set the date and time again. If the recorder is still under warranty, ask the seller before opening the case. Footage recorded while the date and time were wrong cannot be played back by the current date.

At handover, remember to **check the date and time** and consider turning on network time sync if the device supports it.

Source for this chapter: Hikvision Vietnam, "4 ways to fix a Hikvision camera that is not recording"; the storage formula is plain arithmetic.

CHAPTER 7

Getting on the network: activation, IP addresses, adding cameras

This is the part where fellow installers lose the most time. A new camera that has not been activated, a camera on a different subnet, two devices with the same IP.

Activating Hikvision cameras and recorders

A new Hikvision camera is in the **Inactive** state. **There is no default password.** Activation means creating the first admin password. A device that has not been activated cannot be logged in to or added to the app.

The factory default network address of an unconfigured device is: IP **192.0.0.64**, port **8000**, user name **admin**.

Method 1: SADP on a computer (the most common method)

1. The computer and camera are on **the same LAN** (plugged into the same switch).
2. Open SADP and the device list appears. Select the device with the **Inactive** status.
3. Enter and confirm a new password, then press **Activate**.
4. After activation you can change the IP right in SADP (manually or by enabling DHCP). Enter the password and press **Modify**.

Method 2: browser. Set the computer's IP in the same subnet as 192.0.0.64 (for example 192.0.0.x, subnet mask 255.255.255.0, with x different from 64), type 192.0.0.64 into the browser, create a password on the activation page,

then change the IP afterwards. A device that has been given an IP by DHCP or whose IP has been changed is not at 192.0.0.64, so find it with SADP.

Method 3: iVMS-4200 software (Device Management → Online Device, select the inactive device, press Activate).

Method 4: the Hik-Partner Pro app for installers, which has a bulk activation tool and can assign IPs when the phone is on the same network as the devices. You need an installer account.

Method 5: right on the recorder the first time you power it on, a setup wizard appears to create the admin password. Many versions also let you set a backup email or other password recovery options for later, depending on the firmware.

Activation password rules (per the manufacturer's documentation, which may differ slightly by firmware): at least 8 characters, and you should use at least three of the four types (uppercase, lowercase, digits, special characters). It must not contain the user name, "123", "admin" (case-insensitive), 4 consecutive ascending or descending digits, or 4 repeated characters in a row, and it must not contain "hik", "hkws" or "hikvision". SADP also rejects the string "nimda". The device has the final say: if it reports an error, change the password.

> **TIP**
> Set a **separate password for each customer**, stored somewhere the customer controls. One password used for every job is a risk for both the installer and the customer. When typing the password, remember to turn off the Vietnamese input method, or the password may pick up diacritics without you noticing.

Activating Dahua, KBVision and Imou cameras and recorders

In Vietnam, the Hikvision and Dahua ecosystems are about equally common, so you need to know both. Dahua and KBVision (brands in the same family) also require a new device to be **initialized**: you create the first admin password before you can use it.

- **Default address:** IP **192.168.1.108**, TCP port **37777**. This is different from Hikvision (192.0.0.64), so do not mix them up when searching.
- **Software:** Dahua's **ConfigTool**, used like Hikvision's SADP. Open ConfigTool and search for devices, and a device that has not been initialized shows an uninitialized status. Select the device, create a new password (and set a recovery email if there is a field for it), and press initialize.
- **Changing the IP:** also done in ConfigTool, like SADP: select the device, enter the new IP, subnet mask and gateway, and confirm with the password. Each device gets its own IP, in the same subnet as the modem.
- **The computer and device must be on the same LAN, plugged into the same switch,** for ConfigTool to find them.
- **Dahua and KBVision recorders:** the first time you power on, a wizard walks you through creating a password, similar to Hikvision recorders. A camera plugged into the recorder's PoE port is usually detected by the recorder automatically.
- **Imou cameras** usually go with the Imou Life app: add the device by scanning the QR code on the label (see the Wi-Fi cameras section below).
- **Remote viewing apps:** DMSS for Dahua and KBVision, Imou Life for Imou.

> **TIP**
> Install both SADP and ConfigTool on your laptop ahead of time. When you arrive at a job and do not know the brand beforehand, search with both, and each brand's devices will show up in that brand's tool.

Setting the IP for cameras and recorders

Short rules:

1. **Same subnet as the customer's modem** (for example, if the modem is 192.168.1.1, the cameras go on 192.168.1.x). This rule applies to setup A (cameras connected through a standalone PoE switch or on the LAN). Cameras plugged straight into the recorder's PoE ports (setup B) are on a separate internal network, see the section below.
2. **One IP per device.** No duplicates, none matching the recorder, none matching the modem.
3. **Set static IPs** on the recorder and cameras, and **turn off DHCP** on the recorder so it does not pick up a different IP by itself.
4. **Reserve a separate range** for cameras and the recorder, outside the range the modem hands out automatically (DHCP), so the modem does not assign a duplicate. Open the modem's configuration page to see what the DHCP range is.
5. After changing an IP, access the device again with the new IP.
6. If the customer changes the modem or the internet provider and the IP range changes with it, cameras with the old static IPs will lose their connection. Tell the customer to call you when they change the modem.

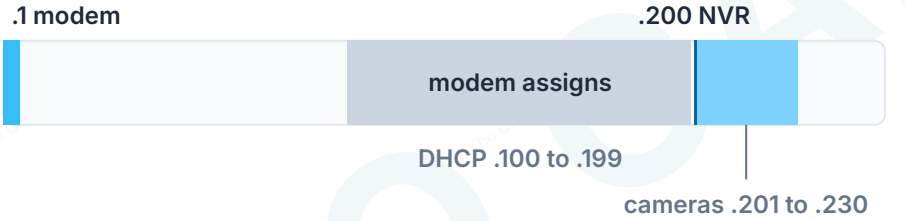
Recorders with built-in PoE ports: a separate internal network

A recorder with built-in PoE ports usually has an additional **internal network card** dedicated to those ports (Hikvision calls it Internal NIC in the network menu). A camera plugged into a PoE port is on this network range, not on the modem's range.

- The recorder usually assigns addresses to the cameras plugged into its PoE ports automatically. This range is different from the modem's range, so do not force it to match the modem's range.

- A camera plugged into the recorder's PoE port can usually only be reached through the recorder, not directly from a computer on the LAN. If you need to view or configure it, do it on the recorder or through the app where the recorder has been added.
- Check the internal network range in the recorder's network menu, and make sure of it before setting IPs for cameras connected externally.
- If a camera is far away and cannot be run back to the recorder's PoE port, connect it through an external PoE switch (setup A) and add it to the recorder by its LAN IP.
- The recorder's internal network range must not overlap with the modem's range. If it does, change one of them.

Which ways of assigning cameras the recorder allows depends on the brand and model. See the documentation for the model you are using.



Example of splitting up IP ranges: modem, automatic range, recorder and cameras

A common case: a camera taking the modem's IP

The customer complains that the home network is flaky, sometimes working and sometimes not. It turns out a camera was given a static IP identical to the internet provider modem's IP (usually .1). The camera and the modem fight

over one address and the whole network goes haywire. To catch it: scan the LAN or look at the ARP table, and an IP with two different MAC addresses is a duplicate. Move the camera's IP out of the modem's range and you are done.

A Hikvision IP camera kit from start to finish (eight steps)

This is a combined workflow based on how installers set up an IP camera kit with a recorder, so you have a shared picture of the whole job. The details of each step are in the earlier chapters.

1. **Prepare:** cameras, recorder, hard drive, PoE switch, network cable. Work out the cable length for each camera.
2. **Pull the cables, crimp the connectors, test the cables** for each run, and label them (chapter 3).
3. **Install the hard drive in the recorder**, fastening all the screws (chapter 6).
4. **Power and network:** cameras into the PoE switch (or the recorder's PoE ports), recorder and switch into the modem.
5. **Open SADP on a laptop** on the same network. The devices that have not been activated appear.
6. **Activate each device** with a new password, then change the IP: cameras in the same subnet as the modem, one IP per device.
7. **Configure the recorder:** open the web interface with the new IP, turn off DHCP and set a static IP, initialize the hard drive, use **Quick Add** to add the cameras, and enter each camera's password until the status shows **online**.
8. **Remote viewing app:** install the manufacturer's app, register an account (with a phone number for convenience), add the recorder by scanning the QR code on the recorder, and check live view and playback.

The configuration steps (5 to 7) take the most time, and are hardest for people who do not do this regularly. Do it once, carefully, and write the IPs you set into the diagram.

SADP does not find the camera: five common reasons

1. **The laptop and camera are not on the same LAN.** SADP only discovers devices on the same LAN. Going through a router or onto another VLAN, it will not see them.
2. **The Windows firewall or antivirus is blocking it.** Turn it off temporarily and scan again.
3. **The laptop has both Wi-Fi and a network cable active**, and SADP picks the wrong adapter. Turn off Wi-Fi.
4. **A managed switch with VLANs or blocked multicast.** Try plugging into a regular switch.
5. **The camera has no power:** the PoE switch is short on power, the cable is too long, or a crimped connector is loose. Look at the port lights on the switch first.

Adding cameras to the recorder

On a Hikvision recorder: go to the camera management settings and use **Quick Add**, and the recorder finds the cameras in the same subnet. The cameras start in a connecting state because they have no password yet: **edit them and enter the camera's password**, and the status changes to online. For systems with many cameras (16, 32), you can use intermediate PoE switches and chain them, instead of running every cable back to one spot.

A recorder from one brand and cameras from another. You can usually add them using the **ONVIF** protocol, with the account set on the camera. Some fellow installers have run into a case where a Hikvision camera added to a Dahua recorder reported "wrong account" after a power cut. The fix: delete the camera from the recorder, add it again, and check the account on the camera.

Wi-Fi cameras (Ezviz, Imou, Tapo…)

Wi-Fi cameras do not need network cable, but they have their own rules:

- **Connect to 2.4 GHz Wi-Fi.** Many cameras can only join the 2.4 GHz band. Your phone should also be on the home 2.4 GHz Wi-Fi during setup.
- **The classic fault with newer ISP modems (Viettel, FPT, VNPT) in Vietnam:** the modem has a feature that merges the 2.4 GHz and 5 GHz bands under one Wi-Fi name (Smart Connect, Band Steering). The phone jumps to 5 GHz on its own, so the camera setup fails with a network connection error. The fix: go into the modem's admin page and **split out a separate 2.4G Wi-Fi name** (for example, add a 2.4G suffix to the name), or **temporarily turn off 5 GHz during setup**. Turn it back on when setup is done, and the camera stays on 2.4 GHz.
- **Adding to the manufacturer's app:** open the app, tap the plus sign, and scan the QR code on the camera's label (on the back or the bottom). If it will not scan, enter the serial number and the verification code on the label.
- **Ezviz:** the verification code is 6 uppercase letters, printed on the label. You may be asked for it when adding or swapping devices.
- **Tapo:** the account in the app is a TP-Link ID account. The camera account is a separate account, used when connecting to a recorder or a third-party app.
- **Check the Wi-Fi signal at the mounting spot** with your phone before drilling. Far from the router or through several thick walls, the signal is weak and the picture stutters.
- **Tell the customer:** if they change the Wi-Fi name or password without telling you, the camera will lose its connection and have to be set up again.

The camera shows "offline" in the app

1. Is the network light on the recorder blinking? Is the network cable still good? Try swapping the cable.
2. In the device's network settings, in the **platform access** section (Hik-Connect): is it ticked on? If the device has video stream encryption turned on, you need the correct verification code. Apply, then wait for it to

change to Online.

3. Are the recorder and camera in the same subnet as the modem?

HOW THO CAM HELPS

It discovers cameras on the LAN (Hikvision, Dahua, ONVIF, Tapo and some other brands), changes the IP for the brands the app supports, and checks for an IP that clashes with the modem or with your own device, all on your phone.

Sources for this chapter: Hikvision activation documentation (SADP, browser, iVMS-4200), Ezviz (verification code), a video by Viễn thông Cường An.

CHAPTER 8

Forgotten passwords: go the official route

Everyone gets impatient when they forget a password. There are plenty of shortcuts online, but a shortcut can damage the device or leave a security hole for the customer. This chapter covers only the methods published by the manufacturers themselves.

> **NOTE**
> There are two different jobs here. **Recovering the password while keeping the configuration** has to go through the manufacturer's official route, and you have to prove you own the device (the device label, the account it is linked to, the email that was set). A **hard reset** with the button on the device needs no code and no manufacturer, but it wipes the entire configuration and returns the device to its initial state.

Hikvision

Depending on model and firmware, the "Forgot Password" screen will show which methods the device supports.

Through SADP: export an XML file or a QR code (installers, on the same LAN):

1. Install SADP on a computer on the same LAN as the device.
2. Select the device and press **Forgot Password**.
3. Depending on firmware, SADP lets you export an XML file, or shows a QR code (take a screenshot).
4. Send the XML file or the QR image, together with a **photo of the device label**, to Hikvision support. Wait for the reply.

5. Enter the returned code, or import the returned file, into SADP and set a new password.

Note: the returned code or file is valid for about 48 hours. From the moment you export until you finish entering it, **do not restart the device** and do not export again. If it fails, restart both the device and the computer and export again from the start.

Security code variant (older firmware): SADP shows a field for a security code. Copy the "Start Time" and the full serial number, send them with a photo of the label to the manufacturer, and the manufacturer returns several codes. Choose the one that matches the device's current time.

Through the Hik-Partner Pro app (installer account): open a password support request (Online Support Case), choose a device on the same LAN or another device, send the file or QR code and the label photo, and when the manufacturer replies, follow the instructions in the request details.

Self-recovery by the user: the backup email that was set earlier, or scanning the QR with the Hik-Connect or Hik-Partner Pro account currently linked to the device, then entering the verification code received. This only works if it was set up during installation.

Dahua (and KBVision)

- **IP cameras: ConfigTool + XML file.** Open ConfigTool, choose Password Reset, select a device that supports XML, click Reset, choose the XML File mode, save the ExportFile, **send it to Dahua support** (the guide page states plainly that this method cannot be completed without Dahua's support), receive the result file, open it in ConfigTool, and enter the new password.
- **Through the DMSS app** (recorder or camera): only works if a recovery email was set on the device from the time it was initialized.

- **The reset button on the camera** (on most models): returns the device to defaults and **loses the configuration**. How long to hold the button varies by model, so check that model's documentation and do not guess.
- For KBVision and Imou, follow the instructions for the exact model, since menu names may differ from Dahua. If you are stuck, ask the manufacturer or the distributor.

Ezviz

- **Account password:** in the Ezviz app choose "Forgot Password", enter the registered phone number or email, receive a 4-digit code, and set a new password.
- **Device verification code (6 uppercase letters):** on the device label. Some models also show it in the app (Settings, Device Information) or as a QR code on the cover of the manual. On some kits (doorbell, base station), it is stuck on the base station or the doorbell. If the code has been changed, the code on the label may no longer be correct.
- **Reset button:** hold for about 4 to 5 seconds until the indicator flashes blue or alternates red and blue, then wait 1 to 2 minutes. The device returns to defaults and the Wi-Fi must be set up again. The button location differs by model (on the back, under the memory card cover, or you may need to rotate the lens).

Imou

Imou goes with the Imou Life app. If you forget the account password, use the forgot password function on the app's login screen. To reset the device, **hold the reset button as instructed for the exact model**. The hold time is different for each model, so check the documentation that came with the unit. If you are still stuck, ask the distributor or the manufacturer.

TP-Link Tapo

- **The Tapo account password is the TP-Link ID password.** In the app: Log in, Forgot Password, enter the TP-Link ID email, open the email and click reset, enter a new password, and log in again.
- **The camera account** (used for RTSP, ONVIF, recorders and third-party apps) is separate from the TP-Link ID. Change or create it in the app: live view, gear icon, Advanced Settings, Camera Account. Changing it requires the current password. The official site does not describe how to recover a forgotten camera account. The practical method (which the manufacturer does not document as a procedure) is to **hard reset**, then add the camera to the account again and recreate the camera account.
- **Hard reset:** usually hold the Reset button for at least 5 seconds until the light flashes red. Some models need a different time (for example 10 seconds on some models). A PTZ camera needs the lens tilted up first, and an outdoor camera needs the rear cover opened.

Summary by brand

Brand	Forgotten device password	Hard reset	Notes
Hikvision	SADP, Forgot Password, export XML or QR and send to the manufacturer; or a support request through Hik-Partner Pro; or the backup email if one was set	Available depending on model, loses configuration	The returned code or file is valid for about 48 hours; do not restart in the middle
Dahua, KBVision	ConfigTool exports XML to send to Dahua; or DMSS if an email was set; or the reset button	Reset button on most models, loses configuration	Button hold time varies by model
Ezviz	Account password through the app; device verification code on the label	Hold the button for about 4 to 5 seconds	Set up Wi-Fi again after reset
Imou	Forgot password on the Imou Life app login screen	Reset button as instructed for the model	If stuck, ask the manufacturer or distributor
Tapo	TP-Link ID password by email; no separate recovery for the camera account yet	Hold the Reset button, usually 5 seconds, 10 seconds on some models	Add the camera again and recreate the camera account

TIP

Before a hard reset, ask the customer whether there is important data on the memory card or hard drive, and take a record of the old configuration (IPs, recording schedule). After the reset you will have to configure everything from scratch.

After you get back in

- Set a new password following the manufacturer's rules.

- Give the password to the customer to keep. Do not stick it on the handover report and do not leave it in the installer's notebook.
- Turn on a recovery option if the device supports it (backup email, security questions, account linking) so next time you do not have to ask the manufacturer.

Sources for this chapter: Hikvision (password reset), Dahua Wiki (Password Reset), Ezviz, TP-Link Tapo. The links are at the end of the book.

CHAPTER 9

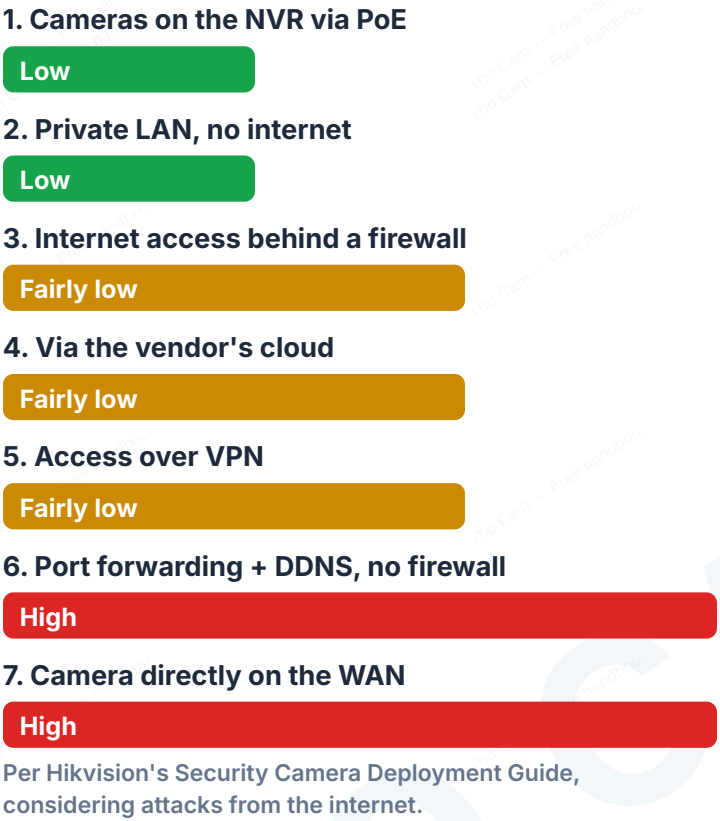
Security and remote viewing

If you can watch a camera remotely, so can a bad actor who tries to get in. A properly installed, secure system is different from one that is "done once the picture shows up". This chapter helps you pick the right approach for your customer.

Seven deployment types, from lowest to highest risk

According to Hikvision's "Security Camera Deployment Guide", these are the common deployment types and the risk of attack from the internet that the manufacturer assigns to each:

#	Deployment type	Risk level (per the manufacturer)
1	Cameras connected to the recorder over PoE, camera network separated from the outside network	Low
2	Private LAN, no internet access	Low
3	Internet access through a firewall, camera ports not exposed	Relatively low
4	Through the manufacturer's cloud service (for example Hik-Connect), camera ports not exposed to the internet	Relatively low
5	Access through a VPN	Relatively low
6	Port forwarding and DDNS, **no firewall**	**High**
7	Camera connected **directly** to the internet (WAN)	**High**



Seven deployment types by risk level

This guide only considers attacks from the internet. It assumes the internal network is properly segmented and the attacker has not got into it yet. If the internal network cannot be trusted, you need extra hardening and you should isolate the camera network from the other zones.

Bottom line for installers:

- **Do not use port forwarding or DDNS without a firewall.**
- **Do not plug a camera straight into the modem to reach the WAN** with ports left open.

- If the customer needs remote viewing, prefer the manufacturer's app or a VPN.
- Separate the camera network from the office network and the guest network where you can.

Cloud services (P2P) are not "absolutely safe" either

Hikvision rates Hik-Connect as "relatively low" risk, and that is the manufacturer's own assessment. In practice, the P2P services of several brands have had incidents. In late October 2026, Ukraine's cybersecurity agency (CERT-UA) warned that Dahua cameras and recorders were being hijacked through the Easy4IP service. Device serial numbers have a predictable structure, so attackers scan in bulk to find which devices are connected to the cloud. Then they get in with weak passwords or flaws in old firmware. The agency's point: "nobody knows the serial number" is not a reason to consider a device safe.

Signs of a break-in that the agency lists: unknown accounts, configuration changes of unknown origin, and logs showing logins through the manufacturer's proprietary protocol from the internal address 127.0.0.1. Recommendation: **turn off P2P if you do not need it, do not expose devices directly to the internet, and always keep firmware up to date.**

Firmware updates

In July 2026, Hikvision published 5 vulnerabilities in some cameras (CVE-2026-57599, 57600, 61390, 61391, 61392, with scores from 5.3 to 7.7). Some let an unauthenticated attacker obtain part of the sensitive data, some crash the device when it receives a specially crafted packet, and some give full control after an SSH login. The manufacturer has patched firmware, **depending on the model**. The list of affected models is on Hikvision's security advisory page, so do not guess it.

What you can do:

- Record the model and firmware version of every device at handover.
- Check the manufacturer's security advisory page before installing, and upgrade the firmware if a patch exists.
- Upgrade firmware in bulk with the manufacturer's official tool (Hikvision has Delivery Assistant).

The customer wants remote viewing: which way to go

What the customer needs	Suggestion	Avoid
Only view at home or in the shop	Private LAN, no internet access needed	Opening ports to the outside when it is not needed
View from a phone while away	The manufacturer's app, strong password set, latest firmware	Port forwarding and DDNS without a firewall
Several branches, many users	VPN, or a managed firewall	Plugging cameras straight into the WAN
Share with family members	The sharing feature in the app	Giving the admin password to several people

When you suspect a device has been compromised

Signs: unknown accounts in the list, configuration changing on its own, the recorder running unusually slowly, logs showing logins of unknown origin. What to do, in order:

1. **Cut the device's path to the internet** (unplug the cable to the modem, turn off P2P) to stop the risk right away.
2. **Change the admin password** and delete the unknown accounts.
3. **Update the firmware** to the manufacturer's latest version.

4. **Consider a hard reset** and reconfiguring from scratch if you are not sure it is clean (you will lose the configuration, so take screenshots of the old settings first).
5. **Tell the customer** clearly what happened and what you did. Walk the customer through changing the passwords of related accounts (for example the email used for the device).

Passwords

- **A separate password for each device** (or at least a separate password for each job site).
- Long, a mix of character types, not a birthday or a phone number.
- Change it at activation. Never leave a device running on a password "for convenience".
- The password goes to the customer, not onto the handover report.

Vietnamese regulations for internet-connected cameras

Circular 48/2026/TT-BCA, signed by Vietnam's Ministry of Public Security on 12 May 2026 (effective 1 July 2026), comes with the standard QCVN 11:2026/BCA on basic cybersecurity requirements for surveillance camera devices that use Internet protocols. This standard replaces the previous standard of the Ministry of Information and Communications (QCVN 135:2024/BTTTT). The requirements in the standard include unique password initialization, vulnerability management and updates, secure storage of sensitive parameters, secure communication channels, and protection of user data.

The standard references the international series ETSI EN 303 645 on cybersecurity for consumer IoT devices. Some news reports about the standard also say cameras must **allow users to configure** data storage within

Vietnam. This is a requirement about the device's configurability. It does not mean every camera must store all its footage in the country by default. Read the full text before you quote it.

The standard addresses manufacturers, traders and importers. The obligation to declare conformity and apply the CR mark (Vietnam's national conformity mark) depends on the product list issued by the Ministry of Public Security. For you as an installer, what to do is: when buying equipment, **ask the supplier about conformity declaration**, and apply the spirit of the standard on the job site (a separate password, firmware updates). The text may change, so check the official version before quoting it.

Privacy and personal data

Cameras record images and sound of people, so you should take responsibility for the data. An installer is not a lawyer, but you need to know a few things to advise your customers:

- **Position and recording area:** aim the camera at the area the customer needs to protect. Avoid pointing it at windows, the neighbor's yard, toilets, and changing rooms.
- **Audio recording:** turn it on only when really needed. The customer should know, and people in the recorded area should be notified.
- **Access rights:** whoever has the password can see everything. Create a separate account for each person who needs to view, and do not share the admin account.
- **Sharing:** use the app's sharing feature, and do not send passwords. Remind the customer not to post footage or clips showing people on social media without their consent.
- **Retention time:** keep footage only as long as needed. Keeping it too long increases the risk of a data leak.

- **Legal regulations:** processing personal data (images and voices of people) is governed by personal data protection law, for example Decree 13/2023/NĐ-CP in Vietnam. For a business job site or a public place, the customer should get legal advice.

Security checklist at handover

- [ ] A separate password is set, and the customer keeps it
- [ ] Port forwarding is turned off, no camera is opened straight to the WAN
- [ ] Whether P2P is on or off has been agreed with the customer
- [ ] Firmware is updated, or the version is recorded
- [ ] No unknown accounts on the devices
- [ ] Camera network separated from the guest network where possible

Sources for this chapter: Hikvision Security Camera Deployment Guide and advisory HSRC-202607-01; CERT-UA via The Hacker News (27/10/2026); Circular 48/2026/TT-BCA and QCVN 11:2026/BCA. Links are at the end of the book.

CHAPTER 10

Acceptance testing and handover

A good handover is when the customer signs and does not call you back a week later because "yesterday I couldn't play it back".

Check every camera

- **The right field of view**, matching what you drew in the plan.
- **Daytime and nighttime picture.** If you finished installing in daylight, arrange to come back or wait until dark to check again.
- **Sharp, no glare**, no new obstructions.
- **Resolution, frame rate, and bitrate** match the settings you agreed on.

Check recording, not just live view

A picture on the screen does not mean the drive is recording. Play it back:

- **Pick a clip that was just recorded** for each camera and play it back.
- **The date and time on the picture are correct** against real time.
- **The recording schedule** is set correctly and the hard drive is initialized.
- If you use motion recording: walk through the set zone and check that a clip was recorded.

Check remote viewing

- The manufacturer's app has added the device and it shows online.
- The customer tries live view and playback right on the customer's own phone.
- Notifications and sharing permissions (if the customer wants to share with family) are set up.

Paperwork and handover

- **Handover report** listing the devices, locations, installation date, test results, and the names of the person handing over and the person receiving. The customer signs.
- **Passwords: do not print them on the report.** Hand them over in person, or let the customer set them.
- **Warranty:** the term and scope written clearly. Model contracts for camera installation (in Vietnam) usually tie the final payment to the handover report, and the warranty period counts from the handover date.
- **Photos before and after** installation, saved for both sides.
- **Quick guide for the customer:** live view, playback, downloading clips, who to call when something breaks.
- **Serial number or QR code** of the device, stuck where it is easy to find.

Questions customers often ask

How long does the camera keep footage? It depends on the hard drive capacity, the bitrate, and the recording mode (continuous or motion). Give the customer the figure you calculated in chapter 6, and mention that it is an estimate.

Why is the picture black and white at night? The camera uses infrared lights, so the picture has no color. A camera with a white light shows color at night, but the light has to be on.

If the internet goes down, does the camera still record? The recorder records to the hard drive on site and does not need the internet. Without the internet, you just cannot view remotely.

What about a power cut? Recording stops. To keep recording through a short power cut, use an uninterruptible power supply (UPS) for the recorder, the switch, and the modem.

Who can see my cameras? Anyone with an account and password. Share with family through the sharing feature in the app, and do not hand out the admin password.

Who do I call if a camera breaks? Write down the phone number, the warranty period, and the warranty scope (see the handover report).

Do I need to clean the lens? Yes, periodically, with a soft cloth. Dust and cobwebs blur the picture and can cause glare at night.

Handover report template (what it should contain)

- Job site name, address, and handover date.
- Handing-over party (the installer or the contractor) and receiving party (the customer): full name and phone number.
- Equipment list: type, model, quantity, installation location.
- Test results: day and night picture, playback, date and time, remote viewing (pass or fail, with notes).
- Hard drive: capacity and estimated retention time.
- Passwords: write "handed to the customer", and **do not write the password**.
- Warranty: term, scope, and how to get in touch.
- Signatures of both parties and the signing date.

Talking to the customer at handover

- **Have the customer do it once on their own:** live view, play back a clip, download a clip. A customer who has done it once will call you ten times less.
- **Say clearly what is not included.** For example no audio recording, no viewing when the internet is down, and roughly how many days the drive keeps.

- **Warn them about a few things ahead of time:** tell you if they change the modem or the internet provider; do not change the password and then forget it; do not turn the camera by hand.
- **Leave a sheet of paper** with your phone number and the basic steps for when something goes wrong.

Handover checklist

- [ ] Every camera checked day and night
- [ ] Playback checked for each camera
- [ ] Date and time correct
- [ ] Remote viewing works on the customer's phone
- [ ] Passwords handed to the customer, not printed on paper
- [ ] Handover report signed by both parties
- [ ] Warranty and fault contact instructions given

HOW THO CAM HELPS

Checks the stream of every camera (resolution, FPS, bitrate), lets the customer sign right on the screen, and exports the handover report as a PDF. Camera passwords are not printed on the report.

CHAPTER 11

Quoting for customers

A clear quote earns the customer's trust and keeps you from being squeezed on price for no good reason. A sensible template includes:

1. **Materials:** cameras, recorder, hard drive, switch, network cable, conduit, accessories. Write the **specific model** so the customer can compare, not a generic "2MP camera".
2. **Labor:** separate from materials. List it by item (cable routing, camera installation, configuration) or as a lump sum, depending on how you work.
3. **Scope:** the things not included, for example drilling concrete walls, difficult cable runs through plasterboard ceilings, long-distance transport.
4. **Discount and VAT** if any, each on its own line.
5. **Combo packages** (for example 4 cameras, 8 cameras with a recorder) make it easy for the customer to compare.
6. **Terms:** how long the quote is valid, payment schedule, warranty, and installation time.
7. **Send it as a PDF** so the customer can save it and check against it, for example by email or a messaging app such as WhatsApp.

Sample quote layout (prices left blank)

No.	Item	Model	Quantity	Unit price	Amount
1	Outdoor IP camera	...	...	...	...
2	Indoor IP camera	...	...	...	...
3	Recorder, number of channels	...	...	...	...
4	Hard drive, capacity	...	...	...	...
5	PoE switch	...	...	...	...
6	Network cable, conduit, accessories (estimated quantity, paid by actual meters at acceptance)	...	...	...	...
7	Installation and configuration labor				...
	Discount				...
	VAT (if any)				...
	Total				...

On the line for network cable, conduit, and accessories, write clearly: "Cable and conduit quantities are estimated from the survey and paid by the actual meters at acceptance". It is hard to measure every meter exactly during a survey, so put this sentence in up front to avoid losing money or arguing with the customer.

At the end, write: the quote's validity period, payment schedule, warranty period, installation time, and the things not included.

A complete sample quote (assumed prices in Vietnamese dong, ₫ / VND, not market prices)

No.	Item	Quantity	Unit price (₫)	Amount (₫)
1	Outdoor IP camera 2 MP	4	750,000	3,000,000
2	4-channel recorder with PoE ports	1	2,200,000	2,200,000
3	2 TB surveillance hard drive	1	1,500,000	1,500,000
4	Pure copper network cable (estimated 60 m)	60 m	9,000	540,000
5	Conduit, clips (estimated 30 m)	30 m	8,000	240,000
6	Junction boxes, waterproof connectors, accessories	lump sum	300,000	300,000
7	Labor for cable routing, installation, configuration, acceptance	lump sum	1,800,000	1,800,000
	Subtotal			9,580,000
	Discount			-300,000
	Total (excluding VAT)			**9,280,000**

Notes at the bottom of the quote: cable and conduit are estimated from the survey and paid by the actual meters at acceptance. The quote is valid for 15 days. Payment is 50% at the start and 50% at acceptance. Equipment warranty follows the manufacturer, and workmanship warranty is 12 months (assumed figures, subject to agreement).

Tip for holding your price when pushed: split the quote clearly into materials and labor, and attach survey photos and the plan. When customers see each line item, they are less likely to haggle with a blanket "knock a bit off". If you want to lower the price, do it by changing the configuration (fewer cameras, a smaller drive), and do not cut the quality of the cable or the labor.

TIP

Attach the survey photos (chapter 1) to the quote. Customers who see exactly where the cameras will go ask fewer follow-up questions.

HOW THO CAM HELPS

Quotes are built from your own materials price list, with discount, VAT, and combo packages, exported as a PDF to send to the customer by email or a messaging app.

CHAPTER 12

A full day on the job: installing 4 cameras for a small shop

This chapter puts the earlier chapters together into one working session. This is a **hypothetical example for illustration**: a two-story townhouse shop, 4 PoE cameras, a recorder with 4 PoE ports placed on the mezzanine, and the modem on the ground floor. Further assumptions: each cable run is about 20 to 40 m, the brick walls are easy to drill, the cable path is straightforward, and there is no concrete to chisel. A harder job takes longer. The times are only a rough guide, and every job is different.

The evening before

- Check your tools against the list in chapter 1. Charge the drill battery, check the screws and wall plugs.
- **Test the four cameras on the floor:** power them, activate them, set the planned IPs, check the picture, and label them 1 to 4.
- Work out the hard drive: 4 cameras × 2 Mbps × 10.8 = 86.4 GB per day. A 2 TB drive holds about 23 days (2,000 ÷ 86.4). That covers the customer's 15-day requirement.
- Print or prepare the handover report template. Have a strong password ready, unique to this customer.

Hour 1: meet the customer and review the survey

- Walk through the plan with the customer and confirm the positions of the four cameras: storefront, cashier counter, storeroom, staircase.
- Check the walls and ceiling before drilling (chapter 1).
- Confirm the power outlet for the recorder and an open spot to place it.

Hours 2 to 4: cable routing

- Drill through the walls, run the conduit, and secure it with conduit clips drilled into the brick (chapter 3).
- Pull the four cable runs back to the recorder, leaving slack at both ends.
- Crimp the RJ45 connectors, **test every cable**, and label both ends (chapter 3).
- Outdoor cameras: thread on the waterproof fittings before crimping, and leave a drip loop (chapter 4).

Hour 5: mount the cameras

- Mount each camera at the agreed position and adjust the angle.
- Attach the waterproof connectors, tighten them properly, and do not let the cable get pinched behind the camera.
- Seal around the drilled holes with silicone.

Hour 6: recorder and network

- Install the drive, fasten all four screws, and power up (chapter 6).
- Activate the recorder with the new password, set a static IP, and turn off DHCP (chapter 7).
- Initialize the drive. Add the four cameras, enter the passwords, and wait for them to show online.
- Set the recording schedule and set the date and time.

Hour 7: testing and handover

- Check each camera's picture in daylight. Arrange to check the night picture again if it is not dark yet.
- **Play back the clip you just recorded** for each camera (chapter 10).

- Install the app, add the recorder, and try live view and playback on the customer's phone.
- Hand the password to the customer, sign the handover report, and go over the things to remember (chapter 10).

Checkpoints

When this is done	What to check before the next step
Cable routing	The cable tester shows all 8 conductors on every run; labels are on
Camera installation	No water getting in, no pinched cable, correct angle
Configuration	One IP per device, cameras online, drive recognized, recording schedule correct
Handover	Playback works, date and time correct, remote viewing works, handover report signed

CHAPTER 13

Quick troubleshooting guide

The table below is a shortcut for common symptoms. Each row gives the usual cause and what to try first. The details are in the chapter listed on the right.

Symptom	Usually caused by	Try first	See
SADP / ConfigTool does not find the camera	Different subnet, firewall blocking, wrong network adapter, switch blocking multicast, camera not powered	Turn off the laptop's Wi-Fi, plug into the same switch, look at the switch port light	7
Camera says "not activated"	New device with no password created yet	Activate with SADP or on the recorder	7
The customer's home network keeps dropping	Camera has the same IP as the modem	Scan the LAN, move the camera IP out of the modem's range	7
Camera restarts itself at night	Total PoE power close to the limit, poor cable or crimp	Try a short temporary cable, change the port, measure the voltage	5
Recorder does not recognize the hard drive	Incompatible drive, weak power, not formatted	Try another drive, replace the adapter, format on the recorder	6
Recorder beeps	Drive not initialized or not recognized	Initialize the drive in the storage menu	6
Not recording even though the picture shows	Recording schedule not set, drive not formatted, wrong date and time	Check the recording schedule and the drive status	6
Date and time jump back to 1970 or 2014	Commonly: the clock battery is dead	Ask about warranty if still valid, replace the battery, reset the date and time	6

Symptom	Usually caused by	Try first	See
Blurry or glaring picture	Dirty lens, backlight, placed behind glass	Clean the lens, change the direction, do not install behind glass	2
Black picture at night	IR lights faulty or underpowered	Check the power, check the IR lights	5
Camera shows "offline" in the app	Network cable, platform access not enabled, verification code	Change the cable, check the device's network configuration	7
A different-brand camera on the recorder shows a wrong-account error after a power cut	The ONVIF account on the camera	Remove it from the recorder, add it again, check the account	7
Forgot the password	Password was not saved	Follow the manufacturer's official procedure	8
Device has unknown accounts, configuration changed	Compromised through P2P or a weak password	Change the password, update the firmware, turn off P2P if not needed	9
Camera does not power up on PoE	Switch out of power budget, broken or badly crimped cable, port is not PoE	Try a short temporary cable, change the port, check the total power budget	5
Choppy or broken picture	Bitrate too high, weak Wi-Fi signal, poor cable	Lower the bitrate, check the cable and signal	5, 7
Live view works, playback does not	Not recorded, wrong recording schedule, drive fault	Check the recording schedule and the drive status	6
Hard drive fills up quickly	High bitrate, many channels recording continuously	Recalculate capacity, lower the bitrate or use a bigger drive	6

Symptom	Usually caused by	Try first	See
Cannot open the default IP (192.0.0.64 / 192.168.1.108)	Computer on a different subnet, device IP already changed	Set the computer's IP in the same subnet, or scan with SADP / ConfigTool	7
App says wrong password	Typo, Vietnamese input method turned on, password was changed	Retype it, turn off the Vietnamese input method	7
Wi-Fi camera keeps disconnecting	Weak signal, wrong band, customer changed the Wi-Fi	Check the signal, connect on the 2.4 GHz band, set it up again	7
Camera failed after rain or lightning	Water in the connector, lightning surge	Check the connectors, surge protection, and grounding	4
Camera has a mic but playback has no sound	Stream Type not switched to Video & Audio, audio recording not enabled	Go to the channel's Encoding settings, switch to Video & Audio, record a test and play it back	6
Wi-Fi camera says it does not recognize the memory card or does not record	Poor-quality card or format error	Format the card in the app, change to a genuine High Endurance card	6
The phone cannot set up the Wi-Fi camera at the network-pairing step	The ISP modem merges the 2.4G and 5G bands	Give the 2.4G Wi-Fi its own name, or temporarily turn off 5 GHz during setup	7
Water in the camera or the power box	Hole drilled in the wrong place, connector not sealed	Seal with silicone, rubber gaskets, drip loop	4

TIP

When the fault is unclear, isolate it in this order: camera → cable → switch port → power → recorder → network. Change one thing at a time and write down the result.

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Appendix: quick reference tables

Network cable color order

See the table in chapter 3 (T568B is the common one; T568A swaps the orange pair and the green pair).

Quick hard drive capacity

Bitrate per camera	GB per day (continuous recording)
1 Mbps	10.8
2 Mbps	21.6
4 Mbps	43.2
6 Mbps	64.8
8 Mbps	86.4

Number of cameras × GB per day × days of retention = the capacity you need (GB). Divide by 1,000 to get TB. Add a little extra as a margin.

PoE power by standard

Standard	Max power supplied	Power at the device
802.3af (PoE)	15.4 W	12.95 W
802.3at (PoE+)	30 W	25.5 W
802.3bt Type 3	60 W	51 W
802.3bt Type 4	90 W	71.3 W

Addresses commonly used when scanning for devices

Brand	Default IP	Port	Scan and initialization tool
Hikvision	192.0.0.64	8000	SADP
Dahua, KBVision	192.168.1.108	TCP 37777	ConfigTool

- Hikvision's initial admin username: admin. There is **no** preset password, and you create one yourself at activation or initialization.
- A device whose IP has been changed, or that got an IP from the modem, is no longer at the default address, so scan for it with SADP or ConfigTool.

RTSP stream syntax (advanced camera assignment)

When you need to add a camera to other software or another recorder over RTSP, copy the template and replace `IP` and `password`.

Hikvision

- Main stream: `rtsp://admin:password@IP:554/Streaming/Channels/101`
- Sub stream: `rtsp://admin:password@IP:554/Streaming/Channels/102`

Dahua, KBVision, Imou

- Main stream: `rtsp://admin:password@IP:554/cam/realmonitor?channel=1&subtype=0`
- Sub stream: `rtsp://admin:password@IP:554/cam/realmonitor?channel=1&subtype=1`

Notes:

- Hikvision: 101 is the main stream and 102 is the sub stream of channel 1. Channel 2 is 201 and 202, and so on following the same pattern.
- Dahua: `subtype=0` is the main stream and `subtype=1` is the sub stream. `channel` is the channel number.
- The RTSP port is usually 554 and changes with the device's configuration.

- The password sits right in the address, so **do not send this whole line to other people.** A password with special characters (for example @) has to be encoded in the address.

Glossary

- **NVR**: recorder for IP cameras. **DVR**: recorder for analog cameras.
- **PoE**: power delivered over the network cable together with data.
- **SADP**: Hikvision's software for scanning, activating, and changing device IPs on the LAN. **ConfigTool**: Dahua's similar software.
- **DHCP**: the modem automatically assigns IPs to devices. **Static IP**: you set a fixed IP on the device yourself.
- **Subnet**: a group of IP addresses on the same network, for example 192.168.1.x.
- **VLAN**: splits one switch into several separate networks.
- **ONVIF**: a common standard that lets cameras and recorders from different brands talk to each other.
- **RTSP**: a protocol for streaming video from a camera, used when viewing with other software.
- **P2P (the manufacturer's cloud)**: remote viewing through the manufacturer's servers, with no need to open ports.
- **DDNS**: a fixed domain name that points to the modem's changing IP.
- **Port forwarding**: opening a port on the modem so a device inside can be reached from the internet.
- **CCA**: copper-clad aluminum cable, with higher resistance than copper.
- **AWG**: conductor size, where a smaller number means a thicker conductor.
- **IP66, IP67**: the dust and water protection rating of a device's housing.
- **Infrared (IR)**: invisible light that lets the camera see in the dark.
- **Bitrate**: the amount of video data per second, which decides whether recordings are large or small.

Common network ports when scanning for devices

Port	Commonly used for
80, 443	The device's web interface
554	RTSP (video streaming)
8000	Hikvision's proprietary communication
37777	Dahua's proprietary communication
2020	ONVIF on some Tapo cameras
34567	Some budget recorders

Port numbers are only a hint for guessing the brand, and each device can be configured differently.

Reference sources

Websites accessed on: 01/11/2026. Specifications, menus, and firmware versions may change, so check the documentation for the exact model.

Hikvision

- Security Camera Deployment Guide (PDF, created 22/07/2026): **https://www.hikvision.com/content/dam/hikvision/en/cybersecurity/security-camera-deployment-guide.pdf**
- Security Advisory HSRC-202607-01 (CVE-2026-57599, 57600, 61390, 61391, 61392): **https://www.hikvision.com/en/support/cybersecurity/security-advisory/security-vulnerabilities-in-some-hikvision-cameras/**
- 4 ways to fix a Hikvision camera that is not recording (09/12/2020): **https://www.hikvision.com/vn/newsroom/tu-van/camera-hikvision-khong-ghi-hinh**
- Activating a device with SADP: **https://enpinfo.hikvision.com/hkwsen/unzip/20251224164304_81809_doc/GUID-E5BD58D7-364D-40DB-A6ED-4A176E9436CA.html**

- Activating with a browser (192.0.0.64): **https://enpinfo.hikvision.com/hkwsen/unzip/20251224164304_81809_doc/GUID-4ADA1B36-383A-4296-B421-47B3D85BBB43.html**
- Activating with iVMS-4200: **https://enpinfo.hikvision.com/hkwsen/unzip/20251224164304_81809_doc/GUID-734F0C74-FAC4-4304-9FA5-3068A2BC97E2.html**
- Resetting the password: **https://www.hikvision.com/ca-en/support/how-to/faq/how-to-reset-password/**

Dahua, Ezviz, Tapo

- Dahua Wiki, Password Reset: **https://dahuawiki.com/Password_Reset**
- Ezviz, how to reset the camera: **https://support.ezviz.com/faq/article/How-to-reset-the-EZVIZ-security-camera**
- Ezviz, device verification code: **http://support.ezviz.com/faq/article/Where-to-find-the-EZVIZ-device-verification-code**
- TP-Link Tapo, resetting the camera: **https://www.tapo.com/en/faqs/how-to-factory-reset-your-tapo-camera-two-methods**
- TP-Link Tapo, the camera account: **https://www.tapo.com/en/faqs/tapo-camera-account-how-to-create-change-or-delete-it**

Waterproofing, lightning protection, PoE

- Omada (TP-Link), waterproofing and lightning protection guide: **https://www.omadanetworks.com/vn/support/faq/4523/**
- Standards IEEE 802.3af, 802.3at, 802.3bt (PoE power); TIA/EIA-568 and ISO/IEC 11801 (the 100 m cable channel including 90 m of permanent link); IEC 62676-4 (DORI).
- IPCamTalk, "PoE+ power issues on ~90m Cat6 run" (09/2025): **https://ipcamtalk.com/threads/poe-power-issues-on-90m-cat6-run-%E2%80%94-need-advice.83292/**

Network security and regulations

- CERT-UA via The Hacker News, Dahua cameras hijacked through P2P (27/10/2026): **https://thehackernews.com/2026/10/attackers-hijack-dahua-ip-cameras-in.html**
- Circular 48/2026/TT-BCA (12/05/2026, effective 01/07/2026): **https://luatvietnam.vn/an-ninh-quoc-gia/thong-tu-48-2026-tt-bca-quy-chuan-ky-thuat-camera-giam-sat-internet-va-an-ninh-mang-434446-d1.html**
- QCVN 11:2026/BCA: **https://luatvietnam.vn/an-ninh-quoc-gia/qcvn-112026-bca-thiet-bi-camera-giam-sat-yeu-cau-an-ninh-mang-434447-d3.html**

Installation videos

- Hik Guru, "HikVision CCTV Installation - Like A PRO": **https://www.youtube.com/watch?v=OGbSpSo-XNg**
- Viễn thông Cường An, "Tự lắp camera, hướng dẫn 5 bước Hikvision" (Vietnamese): **https://www.youtube.com/watch?v=jy8ogsFTUW0**

About Tho Cam

Tho Cam: scan for cameras, change IPs, and make quotes and handover reports right on your phone.

Tho Cam is Vietnamese for "camera installer" ("thợ" = skilled tradesperson, "cam" = short for camera).

Tho Cam is an app for camera installers and network technicians:

- Scans for cameras on the LAN, changes IPs on the brands the app supports, and checks for duplicate IPs.
- Place camera positions on a floor plan and simulate the field of view (FOV) visually to settle positions with the customer.
- Live view, per-camera stream checks, and port ping tests.
- Quotes built from your own materials price list, exported as a PDF to send to the customer.
- Handover report: the customer signs right on the screen, exported as a PDF. Camera passwords are not printed on the report.
- T568 and PoE reference tables and a recorder hard drive calculator, which open without a network connection.
- No ads.

Install

- iPhone, iPad: search for "Tho Cam" on the App Store (the listing is titled "Thợ Cam - Công cụ camera IP"), or open **https://apps.apple.com/app/id6823687729**
- Android, Windows, Linux, Mac (trial version, PRO is unlocked for free during the trial period): **https://kaifuz.com/vi/thocam/beta.html**

Questions and feedback. Join the Discord server: **https://discord.gg/MWPVvuDyp** or the WhatsApp group: **https://chat.whatsapp.com/BNyE96XnaI22xVOWpOUrYu**

Good suggestions go into the next version. Here's to clean installs, fast handovers, and customers who sleep easy, fellow installers.



Tho Cam

Tho Cam (thợ cam) is Vietnamese for "camera installer".

Scan cameras, set IPs, write quotes and handover reports on your phone. All you need on site is your phone.

iPhone, iPad, Mac	apps.apple.com/app/id6823687729
Android, Windows, Linux (beta)	kaifuz.com/thocam/beta.html
Discord	discord.gg/MWPVvuDyp
WhatsApp	chat.whatsapp.com/BNyE96XnaI22xVOWpOUrYu

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A free handbook by Tho Cam. Share it freely and unchanged; please keep this page and do not resell it. The content is for guidance only: the manufacturer's specifications and the conditions on site always have the final word. Work on mains power and work at height call for an experienced person.