The Field Operations Manual

Commissioning, triage and the cost of a van

The marginal cost of a charging network is field dispatches. This is the manual for cutting them.

FOR Operations leads, field technicians and installers

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WHAT YOU GET

- A twenty-three point commissioning checklist that prevents a year of tickets
- The seven-rung triage ladder to run before booking a dispatch
- Which faults must never be cleared remotely
- What to stock at the depot rather than the warehouse

CHAPTER 01

Commissioning properly

Most of what a charging network will spend on field support over five years is determined in the twenty minutes after the installer says the unit is working. A charger that was commissioned properly generates a fraction of the tickets of one that was energised, briefly tested and signed off.

This is a checklist rather than a narrative, because that is what it needs to be at a site with an installer waiting.

Electrical

01 Earth resistance measured and the value recorded — not assumed from the drawing.

02 RCD type correct for the unit, and one RCD per charge point rather than a shared device.

03 RCD tested by pressing the test button, and the unit’s own reporting checked afterwards.

04 Surge protection fitted at the distribution board.

05 Cable size checked against the actual run length including vertical rises, and voltage drop at full load confirmed.

06 Torque applied to terminations, and recorded. Loose terminations are the slow-burning cause of later heat faults.

07 Board schedule updated and photographed, including which ways are spare.

Physical

- Enclosure gasket seats cleanly with the door closed, and is not pinched.
- Cable glands tightened, and conduit entering from below or the side, never from above.
- Drainage away from the plinth, checked with water rather than by eye.
- Bollards or equivalent protection in front of the unit. This is the item most often value-engineered out and most often regretted.
- Holster fitted and holding the connector clear of the ground.
- Signage and floor marking in place, so the bay is unambiguous.

Network

01 Signal strength measured at the mounting position with the door closed. Not at the entrance, not on a phone held at head height.

02 External antenna fitted where the reading is marginal, rather than noted for later.

03 Reconnection tested: pull the power, restore it, confirm the unit comes back without help.

04 Heartbeat interval confirmed and the unit visible on the platform.

THE SIGNAL CHECK WITH THE DOOR CLOSED

A steel enclosure attenuates signal considerably. A reading taken with the door open is a reading of a state the charger will never be in again, and it is how a site ends up with a unit that works during commissioning and drops out weekly for three years.

Protocol and platform

01 Boot notification received, with the expected identity, model and firmware version.

02 Connector count matches the hardware.

03 Configuration keys read and compared against your standard for that model.

04 Remote start, stop, unlock and reset each tested and confirmed.

05 Meter values arriving at the configured interval, with the expected measurands and units.

Functional and commercial

01 A full session with a real vehicle, from authorisation to receipt.

02 Meter reading cross-checked against the vehicle’s own display.

03 The correct tariff applied, and the receipt readable as a driver would read it.

04 QR code scanned from the sticker as fitted, leading to the right connector.

05 The station appears in the right station group, so field staff can see it.

Sign-off

A commissioning record with the measured values, the photographs and the name of whoever performed it. It costs a few minutes and it is the document that settles every later argument about whether something was ever right.

CHAPTER 02

The triage ladder

The ladder is a remote procedure, and its purpose in a field operations context is narrower than it sounds: it decides whether a van is dispatched, and if so, what the technician takes with them. This chapter is about that decision rather than about the diagnosis itself.

The rungs, briefly

01 Read the connector state. Unavailable usually means a person set it that way.

02 Read the fault code including the vendor field, and classify it.

03 Read the message log around the failure.

04 Check connectivity: heartbeats, and reconnection frequency over the past week.

05 Change availability — inoperative, then operative.

06 Soft reset.

07 Hard reset, last, because a unit that does not return has become a certain dispatch.

NEVER START AT RUNG SIX

Resetting first makes the charger work and teaches you nothing. The fault returns next week, the log has rolled, and nobody knows more than before. The two minutes spent on rungs two to four are what turn a recurring fault into a fixed one.

The dispatch decision

Dispatch when the ladder exits early for a reason that requires hands, or when it completes without recovery. Do not dispatch on a driver report alone, and do not dispatch on a fault that has already cleared.

LADDER OUTCOME	ACTION
Ground fault or RCD trip at rung 2	Dispatch immediately; do not reset
Physical damage reported	Dispatch; take the likely part
Silent at rung 4, whole site	Site connectivity or power — different job
Silent at rung 4, one unit	Dispatch with a router and antenna
Recovered at rung 5 or 6	No dispatch; watch for recurrence
Did not return from rung 7	Dispatch; it is now definitely offline
Recovered but recurring weekly	Schedule a visit rather than waiting for it to fail again

What the technician takes

The value of a completed ladder is that the visit is targeted. A technician leaving with the fault code, the message history and the reconnection count knows, in most cases, which part to carry — and a visit that ends in a second visit costs twice.

- Ground fault: insulation tester, and a connector assembly, because the cable is the most common cause.

- Repeated communication loss: router, SIM, external antenna.
- Contactor faults: the contactor for that model, if you stock it.
- No fault found remotely: the three most common parts for that model, and a plan to be there long enough to observe it.

Close the loop

Every visit closes with a cause and an outcome from a fixed list. Free text is how a year of dispatch data becomes four hundred unique descriptions of the same six problems, and the last chapter of this manual depends on that data being usable.

CHAPTER 03

Faults with special handling

Three classes exit the ladder early, each for a different reason, and each has caused avoidable harm where it was treated as ordinary.

Ground faults and RCD trips

Protection operated. Something caused leakage current and the device did what it exists to do. These exit at rung two and dispatch, and they are never cleared remotely — clearing re-energises equipment that tripped for a physical reason, in a public place, possibly with a vehicle attached.

At the site, work through the causes in order of likelihood rather than in order of interest.

01 Moisture in the connector or the enclosure. Most common, and strongly seasonal — these cluster after the first heavy rain.

02 A damaged cable, often from being driven over or dragged across a kerb.

03 A vehicle-side fault. If it trips only with one vehicle, it is not your charger.

04 The installation itself: a compromised earth, a damaged supply cable, water tracking along a conduit.

RECORD THE TRIP, NOT JUST THE FIX

A site with three ground faults in a year has a problem the fourth visit will not solve. The pattern is only visible if each one was logged with its cause rather than closed as "reset and tested".

Communication loss

Breaks the ladder because rungs five through seven all require reaching the charger. The diagnostic question is whether the charger or the link has failed, and it is usually answerable before leaving.

SIGNAL	POINTS AT
Whole site silent	Site connectivity, router or power
One unit silent, others fine	That unit's modem, antenna, SIM or PSU
Reconnection count rising for days	A marginal link that has finally failed
Silent right after a firmware update	The update, until proven otherwise
Silent only in heavy rain	Ingress affecting the modem or antenna

The third row is the useful one, because it is predictive. A unit reconnecting forty times a day is telling you a fortnight in advance that it is going to fail, and a scheduled visit is cheaper than an emergency one.

Missing or impossible meter values

The subtlest, because the charger reports itself as healthy. It is a billing incident before it is an operations incident, which is why it breaks a ladder designed for the latter.

- Readings stop mid-session: bill from the last good reading, flag the session, and check the unit.

- The register decreases: the meter reset. Do not bill, and investigate the unit rather than the session.
- A delta larger than the connector could physically have delivered: cap it, flag it, never bill it silently.
- Values that look like the wrong unit: check the unit field rather than assuming Wh, and verify against a vehicle.

Every one of these belongs on a queue that a person works. A session that cannot be billed correctly is a defect, and defects that live only in logs are defects nobody fixes.

CHAPTER 04

Measuring dispatches

Dispatches are the largest controllable cost in a charging network. Recording them as a cost line tells you what you spent; recording them properly tells you what to change.

Four tags per visit

01 Station and connector, not just the site.

02 Hardware model and firmware version at the time of the visit.

03 Cause, from a closed list.

04 Outcome: fixed on site, part replaced, no fault found, escalated to vendor, or deferred.

The closed list is what makes the data usable. Ten to fifteen causes is enough; more than that and technicians pick inconsistently.

The two numbers that matter

The share of faults resolved without a dispatch, and the share of dispatches that found no fault. The first is your triage working; the second is your triage failing.

NO FAULT FOUND IS A TRIAGE FINDING, NOT A HARDWARE ONE

It means a van was sent to something that had already cleared, or to a serviceability problem — a blocked bay, a stolen cable, a payment path down — that a technician cannot fix either. Both are addressed in the office, not the field.

Reading the distribution

PATTERN	MEANS	FIX
Concentrated on one model	A hardware problem	Procurement
Concentrated on one site	Installation or environment	Revisit commissioning
Concentrated on one firmware	A regression	Halt the rollout, tell the vendor
Evenly spread, mostly connectors	Normal wear	Stock the part at the depot
Rising in one season	Environmental	A calendar round, not more visits
Mostly no fault found	Triage	The ladder

The site-level finding

A connector replacement rate at one site three times the fleet average is almost never a hardware defect. It is a kerb the cable is dragged over, a bay layout that makes drivers stretch, or a missing holster. All three are cheap to fix once and expensive to keep replacing — and none of them are visible without per-station tagging.

Cost per dispatch

Compute it honestly: technician time including travel, vehicle cost, parts, and the revenue lost while the charger was down. Most operators are surprised by the total, and the surprise is what justifies spending on the things that prevent visits.

The monthly review

Fifteen minutes. Which model, site or firmware is over-represented; what share of visits were avoidable; what one change would have prevented the most. Make that change, and check next month whether it worked. Run consistently for a year, this does more for a network’s economics than any procurement decision.

CHAPTER 05

Spares and stocking

A technician drives ninety minutes, diagnoses a failed connector in four, and drives back because the replacement is in a warehouse in another city. That is the most expensive possible outcome of a correct diagnosis, and it is entirely a stocking decision.

What actually fails

Ranked by frequency across a mixed AC and DC fleet, and mostly mechanical rather than electronic.

PART	WHY IT FAILS	STOCK LEVEL
Type 2 cable and connector	Driven over, dropped, pulled	One per ten AC units
CCS2 cable assembly	The same, plus thermal cycling	One per fifteen DC units
Holster / retainer	Broken off by drivers	Generously — they are cheap
RFID reader module	Water and static	One per twenty units
Router / SIM module	Heat and power cycling	Two per depot, always
Contactor	Switching wear	One per DC model in service
Display or touch panel	Sun and vandalism	One per model
Door gasket	Perishes, gets pinched	A roll, not a part

Note what is absent. Power modules and control boards do fail, but rarely enough and expensively enough that stocking them is usually wrong unless you run a large single-model fleet.

The depot rule

A PART IN A CENTRAL WAREHOUSE IS NOT STOCKED

If a technician cannot carry the three most likely replacements when they leave in the morning — before knowing what the fault is — the stocking is wrong regardless of total inventory value. Spares belong where the day starts.

Track consumption, not just stock

Consumption per part per model is the number that says something. Triple the fleet average on one model is a procurement finding. The same rate concentrated at one site is a site finding. Both are invisible if replacements are booked against a cost centre rather than a station and a model.

The warranty question

Many of these are under warranty in the first year or two, which tempts operators into waiting for a vendor replacement. Fit from stock, then claim. The charger earns while the claim is processed, and the claim is easier to make with the failed part in hand and the session records showing exactly when it stopped working.

End of life

Hold a small stock of parts for models you are retiring, and know the date they become unobtainable. A fleet of twelve units of a discontinued model with no cable assemblies available is a fleet of twelve units awaiting a decision nobody has budgeted for.

CHAPTER 06

Firmware discipline

Every network eventually discovers it is running eleven firmware versions across four vendors and nobody knows which unit is on which. Firmware drift is not a hygiene problem — it is the reason two identical chargers behave differently, and it makes every other diagnosis harder.

Know the baseline

The minimum useful state is a list: every charger, its model, its current firmware, and when it was last updated. OCPP reports the version on boot, so this is a reporting job rather than an inventory one — but only if the platform stores what the charger reported rather than what someone typed at commissioning.

From that, define a baseline per model: the version you have tested and are willing to run. Below it is a planned upgrade. Above it is an unplanned one, which usually means a vendor pushed an update through their own channel — worth knowing about immediately.

Cohorts, in this order

01 One unit on a bench or a low-traffic site. A full session, meter values, fault reporting, remote commands.

02 One whole site. This catches interactions between units sharing a load-managed supply, which a single bench unit cannot show.

03 Ten to twenty percent of the fleet across site types. Hold a week; watch fault and failed-session rates against the untouched remainder.

04 The rest, in batches. Never all at once.

CORRIDOR SITES LAST

A highway charger that fails after an upgrade strands somebody. Put the least consequential sites at the front of the queue and the most consequential at the back — the opposite of the instinct to fix the important ones first.

Windows

An update takes a charger out of service for anywhere between two and forty minutes, and some units reboot more than once. Schedule against the site's own demand profile rather than a network-wide assumption about "overnight" — a residential society charges overnight and a corridor site does not.

Set the unit unavailable before starting, rather than letting a driver plug into a charger that is about to reboot.

The way back

Ask the vendor, before the first rollout, whether the previous version can be reinstalled and what it takes. For a surprising number of units the answer is "not remotely", which changes the risk calculation entirely — and is much better known before you have upgraded eight hundred chargers than after.

Where rollback is not possible, the cohort discipline is not a nice-to-have. It is the only protection you have.

Recording it

Per unit: version before, version after, when, who authorised it, and the outcome. When a fault rate moves three weeks later, that record is what turns a mystery into a rollback.

About this document

Written by the team building zevOS, the charge point management platform. We publish this kind of thing because operators who understand utilisation, demand charges and settlement make better decisions — including about us.

Corrections and disagreements are genuinely welcome. If something here is wrong, or true in most states but not yours, write to support@zevos.ai and we will fix it in the next revision.

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