EZRA ROBOTICS

# X30 Site Acceptance Test

The tests that hand an X30 patrol over to a substation: procedures, pass criteria, record sheets and sign-off

Version 1.0 • 2026-11-21

For the commissioning engineer and the substation's representatives who witness and sign the acceptance. Print it, fill it in on site, keep the signed copy.

# About this document

**For whom.** For the commissioning engineer and the substation's representatives who witness and sign the acceptance. Print it, fill it in on site, keep the signed copy.

Run it after the installation (X30 Installation Guide) and the tuning (X30 Tuning Guide), on the site's own routes, with the robot and the software versions that will be handed over.

## The X30 documents

| | |
|---|---|
| **Installation Guide** | Getting the stack, the handheld app and NETRA onto a robot and a computer, from nothing to the first patrol. |
| **User Manual** | Operating the robot: safety, the Skydroid H12, routes, patrols, inspections, the recorder and NETRA. |
| **Tuning Guide** | What every setting does, the models behind them and how to tune a robot for a site; the full parameter reference. |
| **Architecture** | How the stack is built: hosts, nodes, topics, frames, the safety pipeline, the protocols to the handheld and to NETRA. |
| **Site Acceptance Test** | The handover tests, with pass criteria and sign-off. |

All of them, and the same pages as a website with search: `https://darmawanrobotics.github.io/x30_ros/`.

## Revisions

| Version | Date | Changes |
|---|---|---|
| 1.0 | 2026-11-21 | First version, for x30_ros 0.19, X30Controller 1.0.2 |

# Contents


About this document . . . . . 2

1 Scope and conditions . . . . . 4
- 1.1 The system under test . . . . . 4
- 1.2 Conditions . . . . . 4
- 1.3 How to record . . . . . 4

2 Safety . . . . . 5

3 Start and localization . . . . . 6

4 Routes and patrols . . . . . 7

5 Inspection and recording . . . . . 8

6 NETRA . . . . . 9

7 Endurance . . . . . 10

8 Punch list and sign-off . . . . . 11
- 8.1 Punch list . . . . . 11
- 8.2 Decision . . . . . 11
- 8.3 Signatures . . . . . 12

CHAPTER 1

# Scope and conditions

## 1.1 The system under test

| Item | Record |
|---|---|
| Site (substation) | _____ |
| Date, weather, air temperature | _____ |
| Robot: Jueying X30 Pro, serial | _____ |
| x30_ros version (`CHANGELOG.md`) | _____ |
| X30Controller version (start screen) | _____ |
| NETRA version and license (**Settings › License**) | _____ |
| HIKMICRO and Hertzino firmware | _____ |
| Routes under test (names) | _____ |

## 1.2 Conditions

- The substation's permit for the test is in place; the routes avoid every bay under work.
- A person trained on the X30 User Manual operates the robot; one person stands by the hard emergency stop or Deep Robotics' handheld during every test with motion.
- The battery is charged; the robot starts on its dock; NETRA runs on its final computer.
- Equipment: a tape measure, a stopwatch, a box 0.5 m × 0.5 m × 0.5 m, a box 10 cm high, a contact thermometer or a calibrated handheld thermal camera, a heat source (a hot-water bottle), a phone for the alerts.

## 1.3 How to record

Tick ☐ Pass or ☐ Fail for each test and write what was measured on its line. A failed test goes to the punch list (Chapter 8) with its ID; the decision at the end says whether it blocks the acceptance.

CHAPTER 2

# Safety

**Before the first motion** Test the hard emergency stop first. No other test runs until S1 passed.

| ID | Procedure | Pass when | Result |
|---|---|---|---|
| **S1** | Robot standing. Press the hard emergency stop on the robot. | The joints go off at once; the robot rests on its body. | ☐ Pass ☐ Fail |
| **S2** | REMOTE, walk forward at about 0.5 m/s; press STOP (key B) on the H12. | The robot stops; the H12 shows **E-stop on**; NETRA shows the e-stop. Distance: _____ | ☐ Pass ☐ Fail |
| **S3** | With the e-stop on, hold the left stick forward and hold STOP to release; keep the stick forward. | The robot does not move until the stick was let go once. | ☐ Pass ☐ Fail |
| **S4** | AUTO patrol running; press **E-stop** in NETRA. | The robot stops within 1 s; the patrol pauses; release in NETRA and **Resume** continue it. | ☐ Pass ☐ Fail |
| **S5** | REMOTE, walk at about 0.5 m/s; close the app on the H12 (or switch the H12 off). | The robot stops within 1 s. Time: _____ | ☐ Pass ☐ Fail |
| **S6** | AUTO, a route straight toward the 0.5 m box across the whole walkway. | The robot stops without touching, at least 0.3 m before the box; **Blocked** after 10 s. Gap: _____ | ☐ Pass ☐ Fail |
| **S7** | REMOTE, full stick forward toward the box. | The robot slows and stops at least 0.1 m before it. Gap: _____ | ☐ Pass ☐ Fail |
| **S8** | AUTO, a person steps into the route 2 m ahead of the robot walking at cruise speed. | The robot slows and stops before the person; it goes on after the person left. | ☐ Pass ☐ Fail |
| **S9** | Robot standing; cover the LiDAR windows with a cloth (in REMOTE). | The field reports **No scan** or blind; AUTO does not start; REMOTE creeps at most 0.15 m/s. | ☐ Pass ☐ Fail |
| **S10** | In REMOTE, turn in place next to a wall (0.3 m from the body). | The turn slows and stops before the body touches. | ☐ Pass ☐ Fail |
| **S11** | Deep Robotics' handheld takes over during a patrol. | The stack's commands stop reaching the robot; after the handover back, the robot moves only after a new command. | ☐ Pass ☐ Fail |

CHAPTER 3

# Start and localization

| ID | Procedure | Pass when | Result |
|---|---|---|---|
| **B1** | The robot off on its dock. Switch it on and start the stopwatch. | Within 3 min: the H12 connects, the top bar shows **Start pose**, **Path clear**, no **Needs attention**. Time: _____ | ☐ Pass ☐ Fail |
| **B2** | `systemctl status x30-navigation x30-perception` on the hosts. | Both active; the journal without errors since the start. | ☐ Pass ☐ Fail |
| **B3** | NETRA's dashboard. | The robot online with its battery, mode and pose within 10 s of B1's end. | ☐ Pass ☐ Fail |
| **B4** | Stand the robot up; walk 5 m in REMOTE and back onto the dock mark. | The pose shows the robot within 0.2 m of the start. Off by: _____ | ☐ Pass ☐ Fail |
| **B5** | With a recorded tag in view, press **Localize** (H12). | **Tag** in the top bar; NETRA's pose jumps at most the drift. | ☐ Pass ☐ Fail |
| **B6** | Restart the navigation host's service with the robot standing elsewhere (no tag in view). | **No loc**; a patrol does not start until the robot is localized again. | ☐ Pass ☐ Fail |

CHAPTER 4

# Routes and patrols

| ID | Procedure | Pass when | Result |
|---|---|---|---|
| **P1** | Teach a route of at least 30 m with three stop points (H12: **Record**, **Point**, **Finish**). | **Route saved**; the route in NETRA (**Routes**) within a minute. | ☐ Pass ☐ Fail |
| **P2** | Start the route from the H12 (AUTO, **Start**). | The robot walks onto the route and follows it; at each stop point it stands and inspects; it ends at the route's end. | ☐ Pass ☐ Fail |
| **P3** | Measure the robot's position at each stop point against a mark made while teaching. | Within 0.15 m of the mark and 5° of the heading, at every stop. Worst: _____ | ☐ Pass ☐ Fail |
| **P4** | Watch the robot along the route. | It stays on the walkway taught: never more than 0.3 m off the taught line without an obstacle. | ☐ Pass ☐ Fail |
| **P5** | Place the 0.5 m box on the route, with room beside it. | The robot slides past it and back onto the route, without touching it and without leaving the walkway. | ☐ Pass ☐ Fail |
| **P6** | Place the box where the walkway leaves no room. | The robot stops before it, **Blocked** on the H12 and an alert in NETRA; after the box is removed it goes on by itself. | ☐ Pass ☐ Fail |
| **P7** | Place the 10 cm box on the route. | The robot treats it as an obstacle (stops or passes it) and never steps on it. | ☐ Pass ☐ Fail |
| **P8** | During a patrol: **Pause**, then **Resume**; then REMOTE, drive a little, AUTO, **Resume**. | The robot stands on pause; it resumes the route from where it is. | ☐ Pass ☐ Fail |
| **P9** | Start the same route from NETRA (**Patrols › Start a patrol now**). | The patrol runs as in P2; NETRA shows its timeline, stops and the laps. | ☐ Pass ☐ Fail |
| **P10** | A schedule in NETRA two minutes ahead. | The patrol starts on time without anyone. | ☐ Pass ☐ Fail |

CHAPTER 5

# Inspection and recording

> **Note** Teach the inspection points in NETRA first (**Substation › Inspection points**), on the stops of the route under test, and set the day's air temperature on the robot.

| ID | Procedure | Pass when | Result |
|---|---|---|---|
| **I1** | Run the route; at each stop, watch the camera on the H12. | The camera turns to every target; NETRA gets a result for every point, with the thermal and visible images. | ☐ Pass ☐ Fail |
| **I2** | Measure one target with the reference thermometer at the same time. | The robot's reading within ±2 °C or ±2 % of the reference. Robot _____, reference _____ | ☐ Pass ☐ Fail |
| **I3** | Put the heat source on a target of a point with three regions (phases), about 10 K above the others. | The finding is at least warning (similar criterion), the hot region marked. | ☐ Pass ☐ Fail |
| **I4** | A partial discharge point, with a source or a known corona. | The class and the severity in NETRA match the source (corona: attention). | ☐ Pass ☐ Fail |
| **I5** | **Inspect** on the H12 at a stop point. | The point is inspected where the robot stands; the result on the H12 and in NETRA. | ☐ Pass ☐ Fail |
| **I6** | During the patrol, the recorder. | **REC** on the H12 and in NETRA; a session folder on the perception host with video and thermal frames. | ☐ Pass ☐ Fail |
| **I7** | Recorder on and off from NETRA (**Live control**). | It starts and stops; the session is kept. | ☐ Pass ☐ Fail |

CHAPTER 6

# NETRA

| ID | Procedure | Pass when | Result |
|---|---|---|---|
| **N1** | Pause, resume and stop a patrol from NETRA. | The robot follows each command within 2 s; NETRA shows the new state. | ☐ Pass ☐ Fail |
| **N2** | During a patrol, switch NETRA's computer off the network for two stops, then back. | The robot goes on; after the reconnection every result of those stops arrives in NETRA (the spool). | ☐ Pass ☐ Fail |
| **N3** | An alert (P6) with Telegram configured. | The alert reaches the Telegram group within 1 min. | ☐ Pass ☐ Fail |
| **N4** | **Substation › Findings**, a point's trend, a patrol's PDF report. | The readings of the patrols under test, the images, the severities, the report opens. | ☐ Pass ☐ Fail |
| **N5** | `scripts/local.sh export` on NETRA's computer. | An export file with the database and the photos. | ☐ Pass ☐ Fail |

CHAPTER 7

# Endurance

| ID | Procedure | Pass when | Result |
|---|---|---|---|
| **E1** | A loop of patrols for at least one hour (a closed route with `loop_route`, or a schedule every lap), nobody intervening. | No intervention needed; every lap complete; every inspection in NETRA. Laps: _____, interventions: _____ | ☐ Pass ☐ Fail |
| **E2** | The battery during E1. | Below 20 % the robot finishes its lap and starts no new one; below 10 % it pauses. | ☐ Pass ☐ Fail |
| **E3** | After E1: free disk on both hosts, the health report. | At least 10 GB free on the perception host; no health errors. | ☐ Pass ☐ Fail |
| **E4** | Power the robot off and on during a patrol's dwell (simulated power loss). | The robot starts again; nothing on disk is broken (routes, reports, the spool); NETRA receives what was waiting. | ☐ Pass ☐ Fail |

CHAPTER 8

# Punch list and sign-off

## 8.1 Punch list

| Test | Defect | Blocks? | Fixed by (date) |
|---|---|---|---|
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## 8.2 Decision

- ☐ **Accepted**: every test passed.
- ☐ **Accepted with the punch list**: the open items do not block operation and are fixed by the dates above.
- ☐ **Not accepted**: the blocking items are fixed and the failed tests run again.

## 8.3 Signatures

| Role | Name | Signature | Date |
|---|---|---|---|
| Commissioning engineer, EZRA Robotics | | | |
| Substation representative | | | |
| Safety officer of the site | | | |
| Witness | | | |