Yarn Mesh TrapNode for AT520-AI AutoTrap

Deployment Guide

Extend connectivity up, down, over and beyond

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For Yarn Mesh Customers

1 Document Control

Definitions:

Term	Definition
802.15.4	IEEE 802.15.4 Wireless Mesh Network standard
IMS	Integrated Management System
LOS	Line of Sight
NFC	Near Field Communication
RCT	Radio Communications Tower (for Yarn Mesh Gateway)

Revision History

Version	Date Issued	Author	Authoriser	Description
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1.0	16/07/2024	Jonathan Clark		Release

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2 Introduction

2.1 Purpose of this Guide

This guide provides comprehensive instructions for the safe installation, setup, connection, and maintenance of the AT520-AI, Yarn Mesh, integration into IMS (FTP's Integrated Management System). This manual will serve as a field reference to help users fully understand the device, technology, and commissioning process, ensuring they are self-sufficient in troubleshooting and fixing any issues encountered during installation or commissioning.

2.2 Component Summary

- AT520-AI: An intelligent, AI-powered pest trap with integrated Yarn Mesh TrapNode designed for efficient and precise predator control.
- Yarn Mesh: A robust communication network ensuring extensive and reliable connectivity.
- IMS (Integrated Management System): A centralized platform for monitoring and managing all devices in the network.

2.3 AT520-AI Overview

The AT520-AI is a self-resetting automatic pest trap connected by Yarn Mesh with detection image classification and species selective arming powered by Yarn AI.

For further product details please see: https://nzautotraps.com/products/at520-ai

2.4 Yarn Mesh Overview

Yarn Mesh is a low-powered 802.15.4 sensor connected mesh, optimised for interconnecting devices and users over wide areas and difficult terrain, designed and delivered by the Team at FTP. Yarn uses publicly available 2.4GHz ISM spectrum, with a planning radius of roughly 1-3km in sub-optimal conditions. If required, 6km+ links are possible in good conditions with good line-of-site; all with a compact omni-directional antennae.

Yarn Mesh enables solar and battery powered devices to stream real-time telemetry from the field or farm, especially in remote environments.

Yarn Mesh overcomes the limitations of common point-to-point communications systems such as LTE (3G/4G/5G), NB-IoT, LoRa and SigFox by creating IPv6 enabled mesh communications links that **extend connectivity up, down, over and beyond**. Each new sensor/device extends the mesh's coverage. Yarn's mesh topology is ideally suited to enabling communication across hilly, mountainous and complex terrain environments where other communications solutions fail, are unavailable or cost prohibitive.

Yarn Mesh devices are accelerated by AI/ML through machine vision. Nodes/sensors can recognise and categorise events and then take action, all without needing cloud/server backed processing. This leaves the network free from large, frequent file transfers for off-network processing. Quiet networks use less power, which means smaller batteries, solar panels, and overall costs.

The AI/ML algorithms can be updated over the air too, along with sensor, radio, camera, or device firmware; that means less frequent trips into the field for maintenance, giving you and your team more time to focus energy on extracting the most from your operations.

2.5 IMS Overview

IMS (Integrated Management System) is a vendor agnostic piece of software developed by FTP and catering specifically to the needs of the modern operational environment. This cutting-edge platform collates data from a variety of third-party systems and hardware and presents them in an easy-to-understand interface. It is a single end-to-end monitoring system that records and reports your data in real time, 24 hours a day.

IMS grants you access to key information geospatially, relative to exact locations in your operational environment. This bird's eye view of your operations allows you to monitor and track asset performance and anticipate where and when issues might arise, enabling you to unlock vital performance gains. IMS is a fast, flexible and intuitive interface that gives you the ultimate vantage point.

Readily Available Data

IMS gathers data from connected assets and presents them in a single-pane-of-glass. View your data in real-time or turn back the clock to identify past events.

Make Informed Decisions

IMS visualises data not only from connected devices on-site, but also pulls data from important external databases, applications and key systems to give projects or organisations access to the information that's important to them.

Vendor Agnostic

FTP can pull data from any device that is connected to your network and display that data on the IMS platform.

Resource Optimisation

With technology continually improving and demands in the agriculture sector increasing, effective communications are key to ensuring that all the tools available to farmers are available and performing. IMS provides the ability to set up cost-effective wireless wide-area networks in remote locations that can readily integrate the range of different devices and systems to run your operation.

Improve Operational Intelligence

Operational Intelligence is vital to running an effective operation. It focuses on your day-to-day operations and ensures you are operating your business at maximum efficiency so that you can make more informed and accurate decisions.

3 Yarn Mesh Use-Cases

Yarn Mesh enables data-driven environmental management by enabling people, organisations, and projects to connect data from sensors and devices across large geographic areas, quickly and cost effectively. Yarn Mesh provides a secure, ubiquitous, low-power communications network that can support a large range of sensors, devices, and use-cases.

Yarn Mesh has been designed from the ground-up to support communications in remote and complex terrain environments, such as farms, catchments, conservation land and wilderness areas.

In Environmental Management, FTP's Yarn Mesh is intended but not limited to supporting use-cases across a range of areas. A high-level summary of these areas (sectors) and their use-cases for Yarn Mesh technology is listed in the table below.

Yarn Mesh use-cases for Environmental Management		
Industry	**Sectors**	**Use Cases**
Environmental Management	Predator Control	• Trap telemetry from the field • 'Smart' trap integration • 'Manual' trap integration • Live capture trap support • Trail cameras • Personnel location • In-field messaging • Image classification • Passive tracking • Active tracking • Audio classification • Trap control
	Water Management	• Flow/Level/Quality monitoring
	Soil Management	• Nutrient leaching and runoff monitoring
	GHGs & Carbon	• Monitoring GHG levels and flux
	Health & Safety	• In-field workers, worker safety
	Situational Awareness	• In-field workers, worker safety, operations, vehicles

3.1 Environmental Management

A key Environmental Management focus for Yarn Mesh is supporting predator control operations from small scale to large landscape scale operations in the most remote corners of the world. Yarn Mesh has designed hardware devices such as the TrapNode specifically to support predator control programmes and operations.

The AT520-AI by NZAutoTraps, is powered by the Yarn Mesh TrapNode. The AT520-AI and TrapNode are part of the Predator Control functionality suite within FTP's IMS Enviro Manager software platform.

This guide focuses on deploying the AT520-AI and connecting it to Yarn Mesh for the purpose of predator control.

4 AT520-AI Safety Information

4.1 Specific Warnings

- Always handle the trap with care and follow the safety instructions.
- Never place hands or fingers inside the trap.
- Ensure the kill bar is down and the battery is disconnected before handling.
- The trap trigger is sensitive and can be activated by a bump or knock.
- Use the provided tools for maintenance to avoid direct contact with the trap mechanism.

WARNING: Kill Bar Force and Speed:

The trap closes the kill bar with significant force and speed when triggered.

This presents a risk of severe injury. Never place your hand inside the trap for any reason. Always treat the trap as armed, even when it is not set.

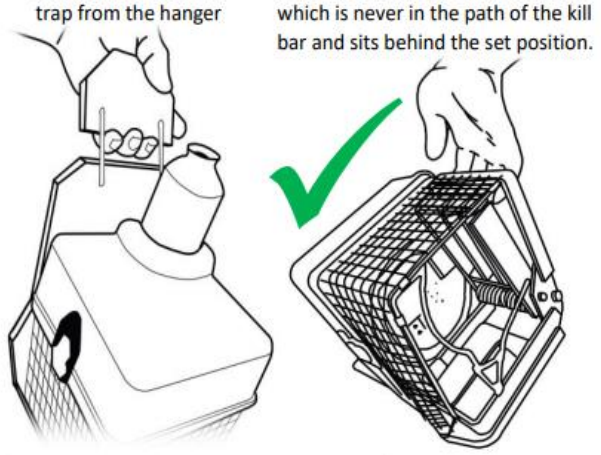
4.2 Using the AT520-AI Safely

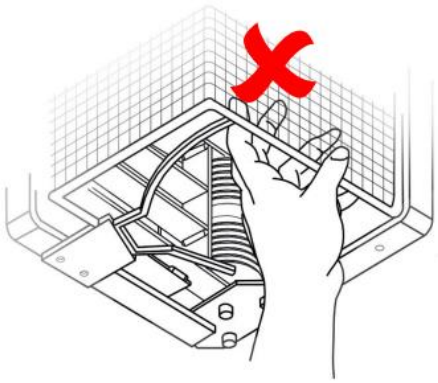
- Never move the trap while it is turned on or armed
- Never put hands or fingers into the kill zone even if the trap is disarmed and the kill arm not set.
- Always carry the unit by its articulated panel or back bar

Kill-Bar Direction

Carry or handle the trap from the hanger

You can also carry from the back bar which is never in the path of the kill bar and sits behind the set position.





Even if not set, the mechanism should be treated with an adequate level of vigilance

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WARNING: NEVER PLACE A HAND OR FINGER INTO THE INSIDE OF THE TRAP UNDER ANY CIRCUMSTANCE

5 Installation Instructions

5.1 Unpacking and Inspecting the Components

Included Components

Open the box or if a palletised shipment ensure you have received all the components necessary for installation:

- AT520-AI trap (TrapNode is factory installed)
- Integrated battery pack
- Battery charger (for initial setup, if required)
- Bait pouch
- Mounting screws
- Antenna
- Solar panel
- Solar panel mounting bracket

Customer Supplied Installation Components

You will need to source the following components to ensure your installation aligns with recommended and best practice:

- Wooden Running Board
- Running Board Screws

5.2 Installation Pre-requisites

The following pre-requisites need to be in place prior to installation of any AT520-AI trap:

1. **RF Plan Complete:** An IMS RF Plan for the area where AT520-AI traps are planned to be installed MUST be complete prior to field installation work commencing.
2. **RF Plan Approved:** The IMS RF Plan for the area must be approved by the FTP Yarn Mesh team.
3. **Gateway Installed:** The Yarn Mesh Gateway must be installed first.
4. **Relays Installed:** The Yarn Mesh Relays must be installed second (after the Gateway).
5. **Ready to install your AT520-AI's:** Once Yarn Mesh Gateways and Relays are installed, then AT520-AI traps can be installed in the field.
    - Yarn Mesh Relays provide the backbone infrastructure and coverage required for trapping networks in complex terrain environments.

- Yarn Mesh Gateways provide IP (internet) access to connect Yarn Mesh devices via public internet (4G or satellite IP broadband service) to FTP's secure IMS cloud hosted services.

5.3 Installation Process - Step-by-Step

1. Installing the Trap

6. **Unpack the AT520-AI**:
   - Carefully remove the AT520-AI and its peripherals from the box.
7. **Connect the Antenna**:
   - Attach the antenna to the AT520-AI antenna mount.
8. **Connect the Solar Panel**:
   - Connect the 3-pin (8mm) solar panel input to the solar input plug on the righthand side of the TrapNode.

2. Mounting the Trap

1. **Select Mounting Location**:
   - Find a suitable tree or fence post within the planned Yarn Mesh coverage area.
   - For possums, rats, and mice: Mount the trap 300mm above a ramp or platform. Recommended mounting height is 1.2m above the ground.
   - If targeting feral cats only: Mount trap lower to the ground with the ramp at a shallower angle.
   - In kiwi zones or around domestic pets: Mount the trap at least 750mm high using a ramp, maintaining a 300mm distance between the top of the ramp and the bottom of the trap.
   - Ensure the antenna on the AT520-AI trap has line of sight to a Yarn Mesh Relay, another AT520-AI trap or another suitable Yarn Mesh device.
2. **Secure the Trap to the Mounting Location**:
   - Use the provided mounting screws to secure the trap to the surface.
   - Secure the 'rat strap' by clamping it behind or fixing it to the ramp.
   - Secure the ramp under the trap with two 100mm screws (customer supplied).

3. Installing the Antenna

1. **Connect the Antenna**:
   - Attach the antenna to the AT520-AI antenna mount.
   - Always install the antenna before powering the trap on.
   - Failure to connect the antenna first risks destroying the electronics.

CAUTION: Failure to connect the antenna prior to powering on the TrapNode could result in unrepairable damage to the mesh radio's power amplifier. Costs for replacing AT520-AIs with damaged power amplifiers are not covered by warranty and rest solely with the customer.

4. Installing the Solar Panel

1. **Select Location for Solar Panel**:
    - Choose a location that receives ample sunlight.
    - Ensure the solar panel is facing North.
    - The Sunseeker mobile app should be used to find North and identify which direction to aim the panel for maximum solar gain during winter months.
    - Sun Seeker - Solar AR Tracker - Apps on Google Play
    - Morning or afternoon sun is acceptable. If there's a gap in the canopy that will give good light for at least an hour, point the panel in that direction.
2. **Mount the Solar Panel**:
    - Use the provided mount and screws to secure the solar panel.
    - Ensure the solar panel is clean and free from debris to maintain optimal performance. Do not attempt to disassemble or repair the solar panel yourself.
3. **Connect the Solar Panel**:
    - Plug the solar panel cable to the TrapNode.
    - Secure the solar panel cable screw connector by turning it clockwise.

5. Connecting the Battery

1. **Remove Trap Lid**:
    - Remove the lid from on the trap.
    - The battery is disconnected from factory to prevent the trap arming during shipping.
2. **Connect the Battery**:
    - Connect the (yellow) battery plug, ensuring the key is located correctly.
3. **Power On**:
    - Underneath the bait pouch tray, locate the power switch for the Yarn Mesh TrapNode.
    - Slide the TrapNode power switch to the on position (towards the backboard of the trap).
    - Wait 10 seconds, then press the button to activate the trap.

6. Commission the Trap and Connect to Yarn Mesh

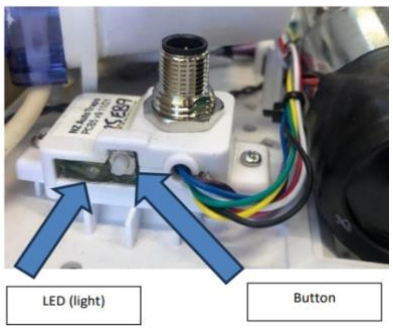
1. **Use the Yarn Companion Mobile App**
    - Within 15 minutes of powering the AT520-AI on (via the TrapNode battery and power switch) connect to it using the Yarn Companion App from your mobile.
    - See section 5.4 Using the Yarn Companion Mobile App below.

7. Installing the Bait

1. **Open the Bait Compartment**:
    - Open the lid of the trap to access the bait compartment.
2. **Secure the Bait Pouch**:
    - Secure the bait pouch or bladder under the lid of the trap.
3. **Connect the Bait Tube to Pouch:** Insert the clear tube into the lid of the mayonnaise pouch, do not remove the lid.

4. **Replace Bait**:
    - Replace the bait pouch every 6-12 months as required.
5. **Prime the AutoTrap Bait Pump and Test Lure Position on Ramp:**

    - Push the trap function button 3 clicks to set the bait to manual pump (LED amber/orange).
    - Press and hold the function Button to run the pump.
    - Fill the bait tray and ensure that some bait runs over and drips onto the running board.
    - Manual pump operation will time out after 30 minutes.
    - Note: if you only push the function button 2 times, the trap will test fire.



6. **Replace Trap Lid:**
    - Replace the lid of the trap and secure using clips and rubber lid straps.

5.4 Using the Yarn Companion Mobile App

Instructions for using the Companion App to commission an AT520-AI or TrapNode are detailed below. However, we recommend downloading and reading the detailed instructions for the Yarn Mesh Companion App, contained in the Yarn Mesh: Companion App - Commissioning and UI Guide, located here: https://ftpsolutions365.sharepoint.com/:w:/s/FTPDocumentation/EZedDqCOOoxCn5t1wWRYBiMBRufZBcLZ86C5XyA0aVd2oA?e=t4XaPI

5.4.1 Overview

The Yarn Companion mobile app is a digital tool for field personnel deploying and maintaining the AT520-AI traps. It is available for smartphones running the Android operating system.

5.4.2 Downloading and Installing the App

1. **Download the App**:
    - Download the Yarn Companion app from the Google Play Store by searching for "Yarn Companion."
2. **Install the App**:
    - Open the app and follow the on-screen instructions to complete the installation.

5.4.3 Connecting to the AT520-AI over Bluetooth

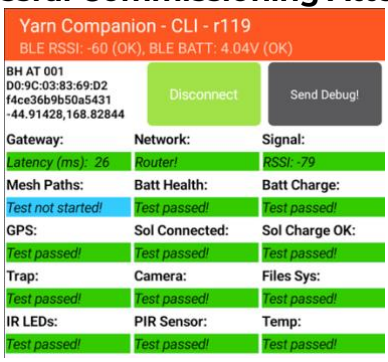
1. **Open the App**:
    - Open the Yarn Companion app and click on the "Scan" button to search for nearby Bluetooth devices.

2. **Select Device**:
    - The AT520-AI traps will appear in the list with their Bluetooth interface ID. Select the device you want to connect to.

5.4.4 Running Tests

1. **Initiate Tests**:
    - The app will automatically run a series of tests against the AT520-AI by connecting to the TrapNode.
2. **Interpret Results**:
    - Test results use a 'traffic light' color code system:
        - **Green**: Full pass (good)
        - **Yellow**: Minor issue but okay
        - **Red**: Test has failed; you need to change the relevant input and re-run the test for it to pass.
3. **Resolve Issues**:
    - If a test fails (red), investigate the failed item and rectify it before re-running the tests to re-validate.

Successful Commissioning Attempt



Failed Commissioning Attempt

5.4.5 Naming the AT520-AI in IMS

1. **Set Device Name**:
    - Once all tests have passed (green), you can set the device name for the AT520-AI.
2. **Register Name**:
    - Enter a name for the device in the Yarn Companion app. This name will be registered as the "Asset Name" in the IMS backend system.
3. **Importance of Naming**:
    - Naming the device is important as it allows Yarn Mesh support to identify and manage each device from the backend system.

5.4.6 Command List for Yarn Companion App

1. **Scan**: Searches for nearby Bluetooth devices.
2. **Connect**: Connects to the selected device.
3. **Testing**: Once connected the series of tests to validate device functionality run automatically.
4. **Set Device Name**: Allows the user to name the device for IMS registration.
5. **Send Debug**: Sends debug information to Yarn Mesh support for troubleshooting.

5.4.7 Yarn Companion - TrapNode Tests

The following table provides detailed information on the tests performed by the Yarn Companion app:

Test Name	Purpose
Gateway OK	Checks if the TrapNode can access the local Yarn Gateway
Network OK	Checks if the TrapNode can access the Yarn Cloud services
Solar Panel OK	Checks if the Solar Panel is connected and receiving voltage
Mesh Paths OK	Verifies mesh network connectivity
GPS OK	Confirms GPS coordinates
Signal OK	Checks signal strength to the nearest Yarn node
Solar Sunlight OK	Verifies solar panel power generation
Battery Charge	Checks battery charge level
Battery State OK	Confirms battery is installed and connected
Trap OK	Verifies communication with the connected AT220 trap
Temperature OK	Checks the temperature sensor
IR OK	Verifies IR proximity sensors
Camera OK	Tests the camera functionality
Accel OK	Checks the onboard accelerometer
Compass OK	Tests the onboard compass

5.4.8 Yarn Companion - TrapNode Test Statuses

The test results are color-coded to indicate the status:

Yarn Companion - TrapNode Test Result Status	
Colour	Status Colour meaning
Blue	Test not started
Light Blue	Test in progress
Green	Test passed
Yellow	Sensor degraded
Orange	Potential issue
Red	Test failed

5.4.9 LED Functions

The following table provides information on the LED functions for the AT520-AI:

LED Colour	Flashing	Solid
Red	Network Error	Low Voltage
Green	System On	Charge Ok
Blue	Node Visible	Trap Message

The LED colour and state (flashing or solid) indicates the device status.

5.4.10 AT520-AI Button Functions

The following table provides detailed information on the button functions for the AT520-AI:

Function	Button Sequence	Description
Check Trap Status	Press function button 1 once.	Displays current battery status via LED colour and flash sequence.
Manual Trigger	Press function button 2 times.	Manually triggers the trap.
Manual Bait Pump Mode	Press function button 3 times, then hold button to pump lure.	Manually pumps bait.
Clear current Mode and Return to Auto Mode	Press function button 4 times.	Exits setup mode and returns to normal operation