# Training New Operators on Mesh Equipment

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A mesh network is only as capable as the operators who deploy and use it. A structured training programme ensures that operators at all levels can perform their expected functions reliably under the stress of an actual emergency - not just in the familiar environment of their home or club meeting.

## Operator Competency Levels

A three-level competency framework gives training coordinators a clear structure and gives operators a defined progression path. This Level 1/2/3 framework is this book's own construct (referenced from the companion page "Running a Mesh Communications Exercise"), not an external standard:

### Level 1: Basic User

A Level 1 operator can independently power on a node, connect to it via the Meshtastic app on a smartphone, send and receive text messages, and verify that their node appears on the network map. This level is appropriate for neighbourhood participants who will carry a node during an incident but are not responsible for network infrastructure. Expected training time: 60-90 minutes in a group setting, followed by self-directed practice at home.

Level 1 competency checklist:

- Powers on node and confirms LED status
- Connects smartphone to node via Bluetooth
- Sends a test message to the group channel
- Confirms message was received by at least one other node. A successful test confirms the link worked at that moment; mesh delivery is best-effort and not guaranteed, so re-test

periodically and do not assume a one-time success means the link is reliable.
- Locates their own node on the map view
- Can describe what to do if the node battery dies (recharge procedure)

## Level 2: Configured Operator

A Level 2 operator can configure node settings (channel name, PSK, transmit power, GPS interval), change channels in response to a security compromise or coordination need, assist a Level 1 operator with connectivity problems, and interpret basic RSSI and SNR readings to assess link quality. This level is appropriate for neighbourhood zone leaders and ARES/RACES members who are part of the communications plan. Expected training time: 4-6 hours total, including hands-on configuration exercises. When adjusting transmit power, operators must keep the node within FCC Part 15.247 limits (max 1 W / 30 dBm conducted) and account for antenna gain above 6 dBi requiring a dB-for-dB power reduction; never exceed the device's certified output.

Level 2 competency checklist (in addition to Level 1):

- Changes node name and role settings
- Configures a new channel with a specified PSK
- Adjusts transmit power and GPS reporting interval. **Never set transmit power above the legal limit for your region/band.** In the US 915 MHz ISM band, stay within FCC Part 15 limits (1 W / 30 dBm conducted, EIRP-capped); do not exceed the device's certified output. Ham-mode operation is separate and governed by Part 97.
- Reads and interprets RSSI/SNR values for two active links
- Assists a Level 1 operator who cannot connect via Bluetooth
- Documents node configuration in the deployment log

## Level 3: Infrastructure Operator

A Level 3 operator can plan and deploy a mesh network for a defined area, select and mount infrastructure node hardware (antenna selection, weatherproofing, power supply), troubleshoot RF issues (interference, path loss, multipath), and train Level 1 and Level 2 operators. This level is appropriate for team leaders, club technical officers, and EMCOMM coordinators. Expected training time: 10-20 hours of structured training plus documented field deployment experience.

# Running a Mesh Familiarisation Session in 90 Minutes

A 90-minute session can introduce complete beginners to the basics, but expect some participants — especially genuinely non-technical people — to need follow-up help, particularly with Bluetooth pairing and app setup, before they can operate reliably under stress. Plan self-paced practice and a refresher rather than treating one session as full Level 1 competency. Suggested schedule:

1. **0-15 min:** Introduction to LoRa and mesh networking (what it is, why it matters for emergency communications, how it differs from cellular and WiFi).
2. **15-35 min:** Hardware overview: show and pass around nodes, explain the indicator LEDs, demonstrate pairing with a smartphone.
3. **35-65 min:** Hands-on practice: each participant pairs their smartphone to a node, sends a message, and locates their node on the map. Facilitator circulates to assist.
4. **65-80 min:** Scenario walk-through: facilitator narrates a simple scenario (power outage, neighbourhood check-in) and participants practice the check-in procedure.
5. **80-90 min:** Q&A, resource distribution (quick-reference card, link to Meshtastic documentation), and next steps (how to get a node, Level 2 training dates).

# In-Person vs. Self-Paced Training

In-person training is strongly preferred for Levels 1 and 2, because the most common failure modes (Bluetooth pairing issues, incorrect channel configuration) are easiest to diagnose and correct when a knowledgeable facilitator is physically present. Self-paced video training works well as a supplement for operators who miss a session or need to review a specific procedure. Several ARRL and Meshtastic community members have published tutorial videos suitable for self-paced Level 1 and Level 2 training. Level 3 training requires field experience that cannot be replicated in a self-paced format.

# Maintaining Operator Readiness

Skills degrade without practice. Scheduling quarterly mesh nets (structured on-air sessions where operators check in, pass practice traffic, and report node status) keeps all operator levels engaged and surfaces equipment problems before they matter in a real incident. Pairing quarterly nets with the exercises described in the companion page "Running a Mesh Communications Exercise" (which uses the Level 1/2/3 framework defined on this page) provides a complete readiness maintenance programme.

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