ARC-EDGE Technical Manual Portable Tactical SD-WAN & MANET Communications Kit with Starlink Mini Version 1.0 (May 2026) **Developed by ORB Aerospace, Inc.**

Document Control

- **Product Designation:** ARC-EDGE
- **Purpose:** Turnkey, backpack-deployable resilient communications system integrating SD-WAN, MANET mesh radio, Layer 2 switching, and LEO satellite backhaul.
- **Intended Users:** Entry-level to senior network engineers, tactical operators, emergency responders, and field personnel.

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1. Introduction & Mission Overview

The **ARC-EDGE** is a compact, self-contained, battery-powered tactical communications kit designed for rapid deployment in remote, mobile, or contested environments. It delivers resilient multi-transport connectivity combining enterprise-grade SD-WAN optimization, tactical MANET mesh networking, local Gigabit switching, and Starlink Mini LEO satellite uplink.

Key Capabilities

- Resilient connectivity via SD-WAN, MANET, LTE/5G (optional), and LEO satellite.
- Supports voice, video, data, UAV/ISR control, and ATAK/Win TAK, MAVEN, MINOTAUR integration.
- Rapid setup: under 3 minutes
- Rugged backpack form factor with Pelican transport case.
- Off-grid operation: 6–12+ hours (load-dependent; expandable with solar).
- NDAA/TAA compliant.

Operational Scenarios

- Tactical edge node / mobile command post.
- Disaster response and humanitarian operations.

- Beyond-line-of-sight (BLOS) UAV ground control.
- Secure relay for ISR and command data.

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2. Safety Warnings & Information

Read Before Operating – Critical

Power Safety

- Use only approved 100W USB-C PD cables and chargers. Starlink Mini requires stable 100W PD (20V/5A minimum recommended).
- Never short-circuit batteries. Disconnect during storms or cleaning.

Battery Handling

- Do not puncture, disassemble, or expose to extreme heat. Isolate and stop using if any unit swells, overheats, or leaks.
- Store at 50–80% charge for long-term.

Ergonomics & Physical

- Adjust shoulder, sternum, and waist straps before carrying. Distribute weight evenly.
- Total packed weight 30~35 lbs / 13.6~15.9 Kg **RF & Environmental**
- Maintain ≥8 inches (20 cm) separation between antennas (MPU-5, Starlink Mini) and personnel.
- Deploy Starlink Mini on stable surface with clear 110° sky view. Avoid heavy rain/snow buildup or high winds without secure mounting.
- Provide ventilation during high-load operation. Open backpack if hot.
- Do not operate near explosive atmospheres or fuel. Do not drop or submerge.

Starlink Mini Specific

- Heater should be OFF for outdoor operations above 20°C.
- IP67 rated but protect connectors.

Failure to follow may damage equipment, cause injury, or void warranty.

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3. System Specifications

Overall System

- **Packed Dimensions (approx.):** Tactical Deployment Pack: 22" H × 14" W × 10" D; Pelican Case: 24" H × 18" W × 12" D.
- **Total Weight:** including Starlink Mini 30~35 lbs / 13.6~15.9 Kg
- **Power Autonomy:** 6–12+ hours (≈379 Wh total from 4× batteries); expandable with solar.
- **Deployment Time:** <10 minutes.
- **Operating Temperature:** –30°C to +50°C (component-dependent; MPU-5 to +85°C).
- **Ingress Protection:** IP65/IP68 on key components.

Throughput & Performance

- SD-WAN: Up to 950 Mbps (1300B packets).
- MANET: 100+ Mbps, self-forming/healing mesh.
- Aggregate: Up to 2 Gbps (multi-transport).

Power System

- 4×100PD batteries (94.7 Wh each → 379 Wh total).
- 100W USB-C PD output per unit.

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4. Components & Detailed Specifications

Component	Description & Key Specs
Tactical Edge Appliance (TEA-710)	SD-WAN router. Dimensions: 8.11" × 7.07" × 1.38". Weight: 2 lb. Ports: 4×1G RJ45 (configurable LAN/WAN), 1× SFP, USB 3.0. Throughput: 950 Mbps. Features: DMPO, IPsec, QoS, ZTP, BGP/OSPF. SFP fiber LC & copper included.
8-Port Gigabit Layer 2 Switch (SE3008)	Switching capacity 16 Gbps. VLAN, QoS, LACP support. Compact desktop.
Rechargeable Batteries (4× 100PD)	94.7 Wh each. 100W PD, simultaneous charge/discharge.

Component	Description & Key Specs
~~**Persistent Systems MPU-5 MANET Radio**~~	~~3x3 MIMO Wave Relay. Dimensions (chassis): 1.5" × 2.6" × 4.6". Weight: 13.8 oz. Up to 10W TX, AES-256, IP68, MIL-STD-810G. Interfaces: Ethernet, USB, serial, video, PTT.~~
Starlink Mini Satellite Terminal	Portable LEO terminal with Ethernet + Wi-Fi. Power: 25–40W avg (peak 60W+). IP67. Requires clear sky and active subscription.
Rugged Operations Backpack + Pelican Case	Modular, waterproof construction. Organized compartments.
Cabling & Accessories	Cat6 Ethernet cables, 100W USB-C PD cables, power distribution harness, SFP transceivers (fiber LC + copper), Starlink kickstand/pipe adapter.

5. Quick Deployment Steps (under 3 minutes)

[IMAGE PLACEHOLDER – STEP-BY-STEP PHOTOS]

1. **Unpack** — Open Pelican case. Remove backpack and Starlink Mini.
2. **Power Setup** — Connect 4× batteries in parallel via distribution harness. Verify full charge.
3. **Core Connections** — Power TEA-710, 8-port switch, and MPU-5 via USB-C PD cables. Attach MPU-5 antennas.
4. **Starlink Mini** — Deploy on stable surface with clear sky. Connect Ethernet (Starlink LAN → TEA-710 WAN port; use SFP copper if needed). Power via 100W PD. Use Starlink App for obstruction check and activation.
5. **Power-On Sequence** — Batteries → Starlink Mini (wait for solid LED) → MPU-5 → Switch → TEA-710.
6. **Activate & Verify** — TEA-710 uses Zero-Touch Provisioning (ZTP) via Orchestrator. Connect laptop to switch. Verify internet, SD-WAN optimization, and MANET mesh.

Pre-Operation Checklist

- Batteries fully charged.
- Starlink registered/updated with clear sky confirmed.
- All cables inspected and seated.

- Backpack straps adjusted.
- Test all links.

5.1 ARC-EDGE Technical Manual – Expanded Section SD-WAN Configuration Details (TEA-710 / SD-WAN Edge)

The **Tactical Edge Appliance (TEA-710)** is a SD-WAN Edge 710 appliance. It provides intelligent, policy-driven multi-transport WAN optimization, dynamic path selection, and secure overlay networking. Pre-configured by ORB Aerospace for ARC-EDGE deployments, it emphasizes **Starlink Mini** as the primary uplink with optional secondary transports (cellular, MPU-5 MANET, fiber/copper backup, etc.).

Default Port Configuration (Factory / ORB Pre-Set)

- **GE1 & GE2**: LAN ports (default private segments for local devices, switch, MPU-5, laptops).
- **GE3, GE4, GE5, GE6 and SFP**: WAN ports (for internet/uplinks such as Starlink Ethernet).
- **SFP Support**: Includes fiber LC transceiver (1000BASE-SX/LX) and copper RJ45 transceiver for flexible WAN connectivity.
- **USB 3.0**: For optional cellular modem.
- **Wi-Fi 6** (on 710-W variant): Available for local access or secondary connectivity.

Note: In the ARC-EDGE kit, Starlink Mini Ethernet connects to a WAN port, recommend start with connecting to GE6 port. All other GE ports default to LAN.

Zero-Touch Provisioning (ZTP) Activation

The TEA-710 uses **Zero-Touch Provisioning** for rapid, cloud-managed deployment:

1. **Power on** the Edge and connect a WAN uplink (Starlink).
2. The Edge automatically reaches the **ORB Orchestrator** (cloud-hosted VMware SD-WAN Orchestrator).
3. Receive an activation email/link from ORB Aerospace.
4. For initial local access (if needed):
    - Connect a laptop to a LAN port (GE1/GE2).
    - Or join the temporary Wi-Fi SSID vcwifi (password: vcsecret).
5. Follow the activation link to assign the device to your customer profile.

6. The Edge pulls its full configuration (interfaces, business policies, security, etc.) automatically.

Activation typically completes in minutes once Starlink provides connectivity.

Orchestrator Management (Primary Configuration Interface)

All advanced configuration occurs centrally in the **ORB Orchestrator** web portal (no local CLI required for standard use). Contact Info@orb.aero for more details

Key Configuration Elements (Managed via Profiles):

- **Profiles**: Templates applied to one or many Edges. ORB provides a pre-built ARC-EDGE profile optimized for tactical/multi-transport use.
    - Assign the Edge to a Profile during/after activation.
    - Changes to the Profile propagate to all associated Edges.
- **Interfaces & Transport Groups**:
    - Automatic link discovery for public WAN (Starlink).
    - Manual configuration for private links (e.g., MPLS, fiber).
    - Transport types: Public Internet, Private, Cellular, etc.
    - Starlink treated as high-latency but high-bandwidth primary; DMPO optimizes accordingly.
- **Business Policies** (Application-Aware Routing):
    - Prioritize real-time traffic (VoIP, video, ATAK, UAV control) over best-path links.
    - Dynamic Multipath Optimization (DMPO): Packet duplication, FEC (Forward Error Correction), jitter buffering, and intelligent steering across available transports.
    - QoS, bandwidth limits, and application SLAs.
- **Security**:
    - IPsec VPN overlays (AES-256).
    - Stateful firewall.
    - Segmentation and zero-trust policies.
    - DoD-compliant options available.
- **Routing**:

  - BGP/OSPF support for integration with existing networks.
  - Service insertion (e.g., cloud security services).
- **Monitoring & Analytics**:
  - Real-time visibility of all links, applications, and flows.
  - Path health, throughput, latency, jitter, and packet loss metrics.
  - Historical reporting.

Recommended ARC-EDGE Profile Settings (ORB Pre-Configured):

- Starlink as primary WAN with aggressive DMPO for satellite variability.
- Failover/aggregation with secondary links (cellular, MANET via switch).
- Local breakout or backhaul policies based on mission needs.
- High-priority queues for tactical traffic (voice, video, C2).

Integration with Other ARC-EDGE Components

- **Starlink Mini**: Ethernet → TEA-710 WAN port → Optimized SD-WAN overlay. Use Starlink App for obstructions; bypass mode recommended for full SD-WAN control.
- **8-Port Switch**: Connects local devices + MPU-5 to LAN ports.
- **MPU-5 MANET**: Acts as a transport or local mesh extension; traffic can be steered via SD-WAN policies.
- **Power & Redundancy**: Battery system supports continuous operation; monitor power draw (TEA-710 ~15-20W typical).

Advanced Configuration & Customization

- **ORB Help Desk** can push custom profiles, business policies, or firewall rules remotely.
- For on-site tweaks: Limited local web UI or Orchestrator-assisted changes.
- High Availability (HA): Possible with additional Edge (contact ORB).
- Firmware Updates: Managed centrally via Orchestrator.

Troubleshooting SD-WAN Issues

- **No WAN Link**: Verify Starlink connectivity (app), cable to correct WAN port, Orchestrator status.
- **Activation Failure**: Check internet reachability to Orchestrator; confirm activation email/SID.

- **Poor Performance**: Review Orchestrator Monitor tab for link metrics; adjust Business Policies.
- **LED Status**: Refer to Edge 710 Quick Start (Green = operational).

For full Orchestrator training, detailed profile editing, or mission-specific policies (e.g., UAV ISR optimization), contact ORB Aerospace Support at or Info@orb.aero.

6. Operation

- **SD-WAN Management:** Access ORB Orchestrator with provided credentials for monitoring, policies, and activation.
- **MANET Mesh:** MPU-5 self-forms/heals. Refer to Persistent Systems documentation for advanced config (ATAK integration supported).
- **Local Networking:** Connect devices to 8-port switch.
- **Power Management:** Monitor battery levels. Use parallel configuration for maximum runtime.
- **Starlink:** Router or bypass mode (recommended for SD-WAN optimization).

Shutdown (Reverse Order) TEA-710 → Switch → MPU-5 → Starlink Mini → Batteries. Stow Starlink flat.

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7. Maintenance & Troubleshooting

Routine Maintenance

- **Daily:** Inspect cables, zippers, Starlink surface.
- **Weekly:** Check battery charge (keep >50%), update Starlink firmware.
- **Monthly:** Full power cycle and link tests.
- **Annually:** Professional inspection recommended.

Common Issues & Solutions

- **No Starlink:** Check app for obstructions/sky view; verify Ethernet & power cable.
- **No SD-WAN:** Confirm ZTP/Orchestrator activation; check WAN port.
- **No Power:** Verify 100W PD cables and battery charge.
- **Overheating:** Open backpack for ventilation; reduce load.

- **MPU-5 Issues:** Confirm antennas and power.

Help Desk Tip: Store batteries at 50–80%. Clean connectors regularly.

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8. Warranty & Support

Standard 1 Year Limited Warranty covers manufacturing defects for integrated ARC-EDGE system (TEA-710 integration, switch, harness, backpack, cabling). Individual components (batteries, Starlink Mini, MPU-5) follow manufacturer warranties.

Optional Multi-Year Extended Warranty available.

Exclusions: Misuse, unauthorized modifications, consumables (cables), Starlink service.

Claims: Call us with proof of purchase. Register online within 30 days.

For advanced configuration, custom profiles, or remote assistance, contact Info@orb.com

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9. Appendices

Not Included (User-Supplied or Optional)

- Active Starlink subscription.
- Laptop/PC/tablet.
- Frequency-specific MPU-5 antennas.
- Solar panels.
- Cellular USB modem.
- Additional cables or mounting hardware.

Compliance

- NDAA/TAA Compliant.
- ITAR/EAR: EAR99 (Star Shield variant ITAR-controlled).

Future Enhancements

- Solar integration, additional radios, custom firmware. Contact ORB for options.

This Technical Manual consolidates all provided documentation into a single reference. Specifications subject to change. For the latest version, diagrams, QR codes to videos/datasheets, or customizations, contact ORB Aerospace.

Starlink performance depends on active subscription and environmental conditions. Safe operations!