

## Recommended Installation Practices for RF Transmission Systems

Revised 2025 (3 Pages)

### A. Purpose

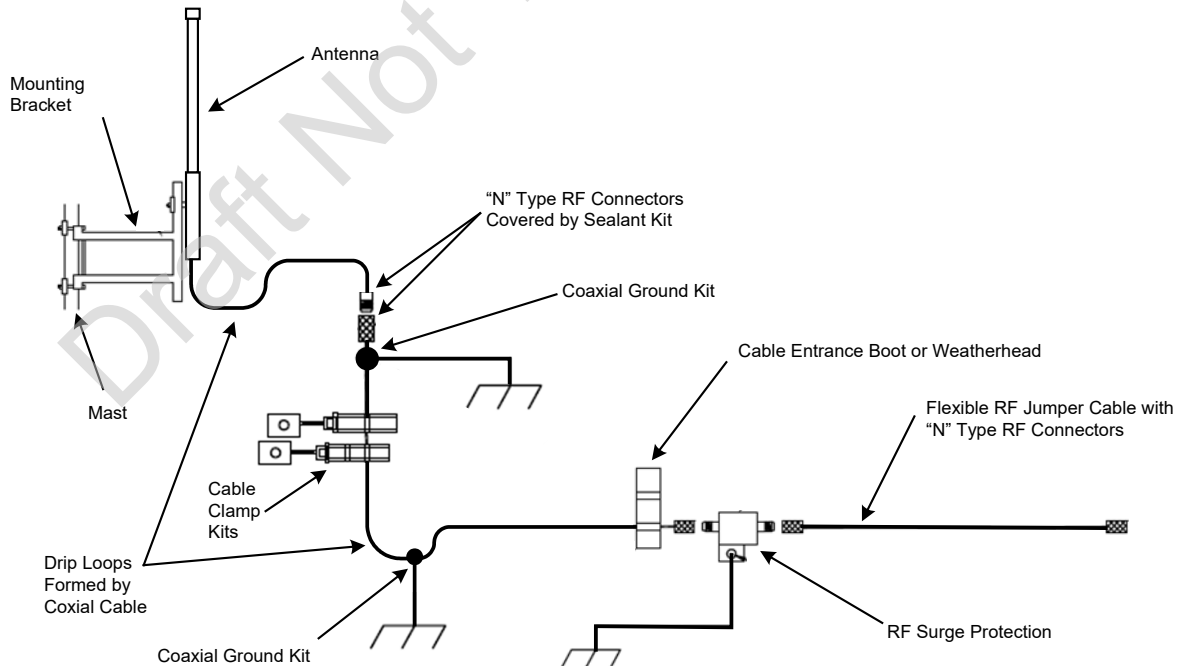
This manual part contains recommended installation practices associated with the RF transmission systems supporting the application of voice, data, and Global Navigation Satellite System (GNSS) radio receivers / transceivers located at wayside and base station locations.

### B. General

It is anticipated that proper RF design practices are followed and that the components selected for RF transmission systems will meet the prescribed RF Link Budgets and predicted area of coverage for the area of operation. The RF transmission system should be installed to meet stated design requirements providing RF coverage for the intended area of operation.

### C. RF Transmission System Guidelines

1. The RF system design process will define transmission system components that are directly related to proper system performance and will include components specific in design for the intended application as well as common hardware. Figure 2442-1 below provides an illustration of a typical RF transmission system.



**Figure 2442-1: Typical RF Transmission System Arrangement**

2. Supporting GNSS antennas are to be installed in accordance with the manufacturer's instructions for the selected equipment.
3. Selection of individual RF transmission system components should meet RF design criteria and include the appropriate considerations for wind and ice loading conditions for the installation.
4. The installation of the RF transmission system should maintain proper clearances in accordance with applicable National and State Electrical codes.
5. Mounting / Mechanical
  - a. The selected antenna should be mounted in accordance with specification from vendors.
  - b. Apply ice guards if appropriate.
  - c. Securing of cables.
6. Cable Entry
  - a. RF transmission cables should be direct burial or contained in conduit and should use a weather-head or through-wall rubber boot.

**D. Electrical Interface**

1. RF transmission line and connector selection should be of the proper impedance to match the selected antenna and RF transceiver equipment.

**E. Physical Interface**

1. The fixed receptacle on the ITC radio for connection to the RF transmission system should be an M39012/03 (example: Amphenol 82-4438) type "N" (50-ohm) connector. The mating connector should be an M39012/01 (example: Amphenol 82-4427) connector.
2. Coaxial cable connectors should comply with the recommendations provided by the selected manufacturer.
3. Coaxial cable and connectors should conform to ITC communications system requirements and selected manufacturer's equipment.
4. All RF connections located outside of the equipment enclosure should be sealed and weatherproofed with an approved weatherproofing kit designed for the style of the applied RF connector.

5. Physical Interfaces should be installed per manufacturer's recommendation.

#### F. RF Surge Protection

1. Should be installed in the equipment case as close as possible to the point of entry of the RF transmission line.
2. Should be of multi-strike design.
3. Should be selected for proper frequency and power requirements for the system installation.
4. Should be properly grounded in accordance to the manufacturer's recommendation.
5. Devices may be either bulkhead or surface mount design.

#### G. Grounding

1. Grounding of the antenna support structure:
  - a. The support antenna structure should be connected to a good earth ground. If the antenna mast is a single mast structure such as a pole, monopole, or fold-over antenna tower, a minimum of one earth ground is required. If utilizing a three or four leg antenna tower, each leg of the tower should be connected to a good earth ground.
  - b. At a minimum, coaxial cable ground kits should be applied to the RF feedline at the top and bottom of the feedline and connected to the provided earth ground.
2. Earth Grounds
  - a. Earth grounds shall conform to Manual Part 19.1.14 Recommended Practices for Installation and Maintenance of Grounds for Communications Facilities.

#### H. Compliance

RF system design and deployment of ITC radio installations shall conform to Manual Part 21.1.6 Recommended Guidelines for Antenna Support Structure Siting.