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BULLETIN
BUL-037

Radio Assembly and Set-up

Introduction

This document provides a basic procedure, along with generic recommendations and guidelines, for assembling and physically setting up a Kairos radio and corresponding antennae.

Note 1: The Operator Control Unit (OCU) must be physically connected, via an Ethernet cable, to the Ground Control Station (GCS).

Note 2: Aiming sector antenna/e on a Kairos Freestanding Tripod Tower requires either an elevated work platform (e.g., cherry picker, boom lift, or basket crane) and the appropriate platform personnel, or at least 4 people who are physically capable of raising and lowering the tower multiple times. Kairos strongly recommends use of an elevated work platform when available.

If attaching the radio and antennae to a Kairos Freestanding Tripod Tower, please refer to the Freestanding Tripod Tower Assembly documentation to assemble the tripod, insert the mast, connect the radio and antennae, and then raise and rotate the tower.

1. Survey the existing tower to determine suitable mounting locations for the omni-directional antenna/e, sector antenna/e, and Radio Enclosure (p/n: KA200-18-0924). The mounting locations should:
   • Provide clear line of sight coverage of the proposed operational area.
   • Be free from any outside RF disturbances, including tower grating.
   • Be as far away as possible from interfering RF sources.
   • Be as high as possible to maximize radio coverage.
   • Be below any existing LSP (lightning surge protection) devices.
   • If connecting all antennae and the radio enclosure to a single, vertical pole, ensure there is at least a 38 inch mounting area.
   • The omni-directional antenna/e can be directly connected to the radio enclosure. If directly connected then the unit should be positioned with the antenna/e below the radio enclosure. This maximizes protection from environmental elements.
   • If a single location cannot be found to mount both antennae, they may be placed in different locations that meet the other requirements listed. An extra cable is frequently provided for this contingency. If needed, alternate LMR-400 coax cable can be used.

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- If the identified location does not have a 3" maximum OD pipe mounting area, a length of pipe may be attached to the tower structure to provide a better mounting solution for the radio and antenna.

2. Mount the omni-directional antenna/e, sector antenna/e, and Radio Enclosure.

NOTE
The following procedure assumes the installation of a 900MHz omni directional antenna (p/n: 3RD-00259), a 2.4GHz L-COM sector antenna (p/n: 3RD-00278), and a Radio Enclosure on a single pole or mast, using RAM Mount pipe brackets (HRD-0015) and a Right-angle Radio Mast Bracket (p/n MCH-440). *Adjust the procedure as appropriate for each installation.*

a. Mount the RAM Mount pipe bracket for the radio enclosure 32.0" from the top of the pole, and secure with the included stainless steel (SS) hose clamps or the 3-4" SS hose clamp (p/n: HRD-00307). Ensure the enclosure RAM Mount's orientation is clear of any passing personnel.

b. Mount the RAM Mount pipe brackets for the 2.4GHz L-COM antenna 22.0" and 9.5" from the top of the pole, and secure with the included stainless steel hose clamps or the 3-4" SS hose clamp. Ensure the antenna RAM Mounts' orientations are clear of any passing personnel and in-line with each other on the pole.

c. Mount the Right-angle Radio Mast Bracket near the top of the pole, and secure with the included hardware.

d. Secure the 900MHz omni directional antenna to the Right-angle Radio Mast Bracket. If appropriate for the location, the antenna may be mounted upside down (e.g., under a catwalk).

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e. Secure the Radio Enclosure to the bottom RAM Mount, with the electrical and RF connections oriented down to maximize environmental protection.

f. Secure the 2.4GHz L-COM antenna to the remaining RAM Mounts. NOTE: The beam width of the 2.4 GHz antenna is 120°.
   - If the operation area exceeds this area, additional antennae may be needed.

g. If mounting to a Kairos Freestanding Tripod Tower, the tower can be lifted and rotated to adjust the horizontal rotation of the antenna. The tower will need to be lowered to adjust the horizontal angle of the antenna.

3. Connect LMR-400 Coax cables (one 5' length for each antennae is standard, one longer length is frequently provided as a spare), as follows:
   a. Install a length of Coax cabling between the 2.4GHz antenna and the port labeled "2.4GHz" on the bottom of the radio enclosure.
   b. Install a length of Coax cabling between the 900MHz antenna and the port labeled "900MHz" on the bottom of the radio enclosure.

4. Connect CBL-088 to the Radio Enclosure "POE" port.

CAUTION
The "POE" and "Enet" ports both accept standard Cat5e cables; however, the ports themselves are NOT interchangeable. Connecting a power over Ethernet (POE) source to the 'Enet' port WILL damage the Radio Enclosure, and WILL require repair by Kairos Autonomi personnel.

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5. Verify all mounting fasteners, connections, and cables are secure.
6. Secure all cabling to the tower.
7. Provide appropriate power.
   ENSURE only the Cat5e cable from the "POE" port is connected to a power supply. See the previous CAUTION message for more information.
   • Solar with battery backup – see the Solar Panel with Battery Backup Assembly and Setup documentation.
     • 120V nominal AC power, via Ubiquity POE Adapter (p/n: 3RD-00300).
         i. Plug CBL-085 from the Radio Enclosure's "POE" port into the "POE" port on the Ubiquity splitter.
         ii. Plug the Ubiquity splitter into a 120V nominal AC outlet.
8. Adjust the sector antenna/e position to best align, horizontally and vertically, with the GCS antenna/e.
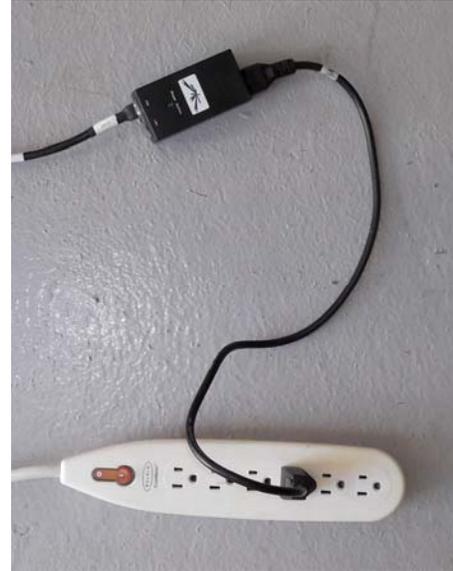
CAUTION
The Radio Enclosure accepts 12-15VDC. If less than 12VDC is provided then the radio may not power on. If more than 15VDC is provided the radio MAY be damaged and MAY require repair by Kairos Autonomi.

9. Fine-tune the sector antenna's aim, *as follows*:
   a. Start-up the OCU according to the Operations Manual.
   b. On the OCU, launch WinBox (C:\GC07\winbox.exe), click the "…" button. From the drop-down select the IP address of the radio (IP can be found on the radio label), then click the "Connect" button. On the left side of the window, click the "Wireless" tab. In the "Wireless Tables" window, locate the entry with a "Radio Name" that corresponds with the antenna being aimed (e.g., "Backhaul-AP-A").
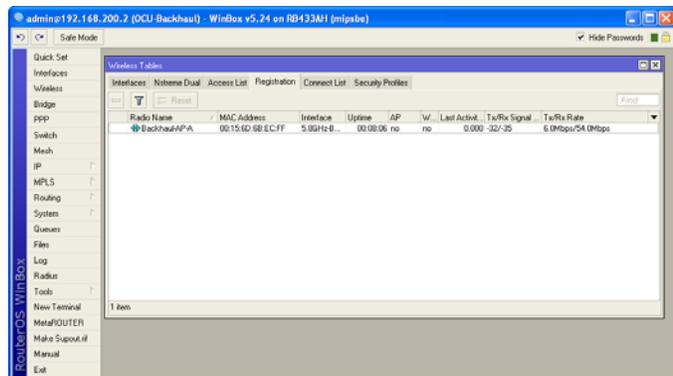
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   c. Optimize antenna vertical orientation, *as follows*:

       i. On the OCU, note the "Tx/Rx Rate" values.

      ii. Physically reorient the sector antenna in a single direction by a few degrees (e.g. downward or upward).

         • If the subsequent "Tx/Rx Rate" values are higher then repeat step ii moving in the same direction.

         • If the subsequent "Tx/Rx Rate" values are lower then repeat step ii moving in the opposite direction.

      iii. Repeat step ii until the "Tx/Rx Rate" values are at the highest values possible.

   d. Optimize antenna horizontal orientation by repeating step c with left/right adjustments.

   e. Once an optimal vertical and horizontal position has been identified, secure the antenna in place.

   f. Repeat step 9 for each sector antenna.