Weak Signal Antenna Kit MOP
for:

American Tower (ATC)

Revision: A
June 16, 2015
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Revision History

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<th>Summary of changes</th>
<th>Rev</th>
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<tr>
<td>6-15-2015</td>
<td>Geiger</td>
<td>Original release version</td>
<td>A</td>
<td>Geiger/Swanson</td>
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1.0 Westell Overview

Westell Technologies, headquartered in Aurora, Illinois, is a global leader of intelligent site management, in-building wireless, cell site optimization, and outside plant solutions focused on service innovation at your network's edge. The comprehensive solutions Westell provides enable service providers, tower operators, and other network operators to reduce operating costs while improving network performance. With millions of products successfully deployed worldwide, Westell is a trusted partner for transforming networks into high quality, reliable systems.

Westell is very pleased to play an active role in American Tower's intelligent site monitoring solution. Westell continues to be a trusted partner for over four (4) years and continues to work very closely with your Network Operations Center (NOC) and Operations teams within each market to provide critical site performance data and alarm status relating to generator operation, fuel tank level, environmental conditions, aircraft warning light operation (AWL), and facilitate Notice to Airmen (NOTAM) procedures for AWL outages.

2.0 Document Summary

This document will provide a general overview of the various high gain antenna options offered by Westell to improve cellular signal strength at sites where the cellular signal level is too low for ATC NOC acceptance. All antenna mounting is assumed to be bolted to the H-frame unless there is a need to relocate or to install a hardline to the tower itself.

The high gain antenna options are:

- +9dB gain Omni-Directional antenna (wideband 3G/4G, all major US carriers)
- +8-10dB gain Log Periodic antenna (wideband 3G/4G, all major US carriers)

The antenna cable options are:

- 30ft or 50ft DA340 cable options available based on the deployment scenario
- 200ft .5" hardline coaxial cable

Westell part numbers are to be used for ordering purposes (highlight indicates default option):

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>560-000417</td>
<td>Omni Directional Quad Band +9dB Gain Antenna</td>
</tr>
<tr>
<td>560-000418</td>
<td>Log Periodic Quad Band +8-10 dB Gain Antenna</td>
</tr>
<tr>
<td>560-000414</td>
<td>30ft DA340 cable</td>
</tr>
<tr>
<td>560-000415</td>
<td>50ft DA340 cable</td>
</tr>
<tr>
<td>080-500859</td>
<td>200FT 4G HARDLINE CABLE KIT (antenna not included)</td>
</tr>
<tr>
<td>080-500869</td>
<td>Recommended Surge Suppressor for Hardline. Must be ordered separately. Refer to Section 8.0 for details.</td>
</tr>
</tbody>
</table>
3.0 Disclaimer

Westell strongly recommends the use of lightning protection when connecting antennas to hardlines that have the potential to conduct excessive surge in the event of a lightning strike. It is an optional item as ATC may not require lightning suppression for every hardline deployment due to existing protections that may be in place. It will be up to the site technician to specify appropriate protection levels.

This MOP does not describe the installation or the positioning of the high gain antenna on the tower. That is left to the discretion of the ATC Tower Tech and/or certified contractor(s). This procedure reviews the necessary steps in preparing the Westell RMC cabinet and Remote RMC-7xx for connection to a tower mounted high gain antenna.

4.0 Verification of Cellular Signal Strength

To verify the LTE modem signal strength being received at the RMC-7xx modem, the ATC NOC may log directly into the RMC-700 and enter the following CLI command:

```
>> show meas-table entry m*
```

Look for the signal strength field whose values are between 1 – 4, see Table 1, to determine receive level, knowing that it will vary depending on the antenna position itself (see yellow highlight):

<table>
<thead>
<tr>
<th>Name</th>
<th>State</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>modemMonitor__SignalStrength</td>
<td>in-band</td>
<td>3.00</td>
<td></td>
</tr>
</tbody>
</table>

Or use Optima’s Live View screen, for the site being commissioned to determine signal strength: (see Figure 1)

---

**Figure 1 - Live View Signal Strength Reference**
Should the signal level fall into the 2.0 or less category, the ATC NOC requires an external antenna be installed to boost signal strength to 2.1 or higher.

### 5.0 Omni-Directional Antenna

1. SMA Variant Torque Wrench (provided by installer)
2. Liquid-tight seal for cabinet entry point (provided by installer)
3. 560-000417 Omni-directional antenna
4. 560-000414 30ft DA340 cable (or other length as determined by the installer)

![Figure 2 – Omni-directional type Antenna and mounting bracket](image)

### 5.1 Determine mounting location

1. Secure end of DA340 cable having the N-type connector to the antenna itself.
2. The RMC-700 is equipped with two SMA connector type blade antennas, marked Diversity (left) and TX/RX (right).
3. Carefully unscrew and remove the right antenna marked TX/RX (see Figure 3).
4. After removing the blade antenna, carefully screw on the SMA end of the antenna cable and tighten according to industry standard.
5. Move the Omni-directional antenna around to different positions/heights to obtain the best signal level possible, noting that line of site to the hosting cellular tower will achieve the best signal possible.
   a. Refer to Section 4.0 to determine signal strength being received.
   b. Command will need to be repeated for each antenna position being measured.

5.2 Secure antenna and route cable
1. Once an acceptable location is identified, secure the antenna to the H-Frame (or other suitable location as approved by ATC management) using approved industry practices.
2. Route and secure the 30ft DA340 cable from the antenna to the Westell Remote. Antenna can be routed through an existing hole at the bottom of the cabinet (see Figure 4).
   a. Installer must properly seal the cabinet entry point to prevent the elements or insects from entering the cabinet.

6.0 Log Periodic Antenna
(1) SMA Variant Torque Wrench (provided by installer)
(1) Liquid-tight seal for cabinet entry point (provided by installer)
(1) Appropriate mounting pole (provided by installer)
6.1 Determine mounting location

1. Secure end of coaxial cable to the antenna itself.
2. The RMC-700 is equipped with two SMA connector type blade antennas, marked Diversity (left) and TX/RX (right).
3. Carefully unscrew and remove the right antenna marked TX/RX (see Figure 3).
4. After removing the blade antenna, carefully screw on the SMA end of the antenna cable and tighten according to industry standard.
5. Aim the log-periodic antenna by selecting an elevated mounting location that preferably has line-of-site to the donor antenna and “point” the antenna in the direction of the donor cell by slightly moving the antenna until the best signal level is achieved.
   a. Refer to Section 4.0 to determine signal strength being received.
   b. Command will need to be repeated for each antenna position being measured.

6.2 Secure antenna and route cable

1. Once an acceptable antenna mounting location is located, secure the antenna using approved industry practices.
2. Route and secure the 30ft DA340 cable (or other selected cable length) from the antenna to the Westell Remote. Antenna can be routed through an existing hole at the bottom of the cabinet (see Figure 4).
   a. Installer must properly seal the cabinet entry point to prevent the elements or insects from entering the cabinet.

7.0 Preparing the Outdoor Hardline Coaxial Cable

7.1 Required Tools

- 1” Drill bit – if available.
  - 1 1/16” drill bit is best for easy insertion of Liquid-tight connector
- Coax strip tool
- Crimp connector
- SMA Variant Wrench
- 3” adjustable wrench
Westell P/N 080-500859 - 200FT 4G CABLE KIT

080-500859 Contents
(1) 200ft .5” coaxial cable with Male N-type connector to unterminated stub
(1) N-type M Connector
(1) N-type F to Right Angle SMA adapter
(1) Liquid-tight connector
(1) Cabinet hole template drawing
(1) Hoisting grip
(2) Grounding kit

Note: This list is not all-inclusive. The installer may have to supply additional items to complete the installation given the site conditions, materials on site, or condition of mounting structures on site.

7.2 Installing the outdoor hardline coaxial cable
Secure the end of the coax cable with the male N-type connector to the high gain antenna. Route and secure the 200’ cable from the high gain antenna to the cabinet. Cut the stub end of the coax to length as needed to feed into the cabinet.

Grounding of the antenna itself will require the installation of the supplied grounding kit at both the top and bottom of the hardline. The top end of the hardline will be grounded to the tower and the bottom of the hardline will be grounded to the H-frame ground point or other approved ground point as determined by ATC prior to entry into the Westell RMC cabinet. Grounding kits will be installed onto the hardline by certified technicians using ATC approved methods.

Note: Installation of the high gain antenna shall follow ATCs recommended installation and grounding practices.

7.3 Preparing cabinet for outdoor hardline coaxial cable
Before installing the cabinet, you will need to drill a 1” hole through the bottom of the cabinet to accommodate the coaxial cable used for the outdoor high gain antenna.

1. Refer to Figure 6, drill the hole in the location shown for the high gain antenna cable.
2. After the hole is drilled, install and secure the Liquid-tight connector. Position the cabinet and mount in place. Next, prepare the stub end of the coax cable to accept the provided N-type male connector. Insert the coax cable through the Liquid-tight connector (see Figure 7).
3. Tighten the plastic nut on the Liquid-tight connector to secure the cable and seal the opening.
4. Using a crimping tool, install the N-type male connector on the end of the cable (see Figure 8).
   a. This will be connected to the supplied N-type Female to Right Angle SMA adapter cable connected to the RMC-700 Tx/Rx antenna post.
Figure 6 – Hardline Cabinet Hole Template

Figure 7 – ½” stub end cable install
5. Next screw on the N-type Female to Right Angle SMA adapter cable (see Figure 9) and tighten according to SMA specifications. Once completed, screw the N-type end of the cable to the outdoor cable.

Figure 8 – Hardline Cable with N-Type coupling in place

Figure 9 – N-type Female to Right Angle SMA adapter cable
8.0 Lightning Suppressor Kit for Hardline Coaxial Cable

When installing a high elevated antenna, especially in areas prone to lightning strikes, Westell strongly recommends using a lightning suppressor to protect any connected equipment against potential static electricity and lightning surges as a result of a sudden increase in electrical potential.

Westell offers a supplemental lightning suppressor kit that includes a lightning surge protector and necessary grounding cables.

8.1 Bill of materials

Westell part number: 080-500869

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Qty</th>
</tr>
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<tbody>
<tr>
<td>002-000097</td>
<td>Nextek PTR-C026 Surge Protector</td>
<td>1</td>
</tr>
<tr>
<td>023-800776</td>
<td>Ground Cable</td>
<td>1</td>
</tr>
</tbody>
</table>

8.2 Lightning Suppressor

The specified lightning suppressor is a NexTek PTR-C026, Westell part # 002-000097, (see Figure 10), which can be mounted on the end of N-type male connector inside the cabinet.

8.3 Grounding the Lightning Suppressor

Prior to installing the lightning suppressor it will need to be properly grounded. Using the supplied grounding cable kit, (see Figures 11 -12). Use the supplied ground wire for this connection. Verify that the cabinet ground lug is fully bonded to the H-frame or other suitable ground point using 8GA or larger wire and appropriate lugs.
8.4 Installation of a Lightning Suppressor

Mount the lightning surge protector part # 002-000097 between the N-type male connector inside the cabinet and the N-type Female to Right Angle SMA adapter cable, (see Figure 13).
Last, ground the grounding cable to the cabinet lug. As previously stated verify that the cabinet ground lug is fully bonded to the H-frame or other suitable ground point using 8GA or larger wire and appropriate lugs, (see Figure 14).

Figure 14 - Grounding the lightning suppressor to the cabinet ground lug