IntelliCom WAN 1720
Outdoor Mesh Node

Installation Manual

IntelliCom™

Contents

1 Safety

There are several types of safety-alert messages which may appear throughout this instruction sheet as well as on labels attached to the node. Familiarize yourself with these types of messages and the importance of the various signal words, as explained below.

DANGER

"DANGER" identifies the most serious and immediate hazards which will likely result in serious personal injury or death if instructions, including recommended precautions, are not followed.

WARNING

"WARNING" identifies hazards or unsafe practices which can result in serious personal injury or death if instructions, including recommended precautions, are not followed.

CAUTION

"CAUTION" identifies hazards or unsafe practices which can result in minor personal injury or product or property damage if instructions, including recommended precautions, are not followed.

NOTICE

"NOTICE" identifies important procedures or requirements that can result in product or property damage if instructions are not followed.

In addition, alert symbols are used to warn of electric shock hazard or forbidden operations, as shown at right.

Caution!
Risk of electric shock!

Do not open cover

Following Safety Instructions

If you do not understand any portion of this manual and need assistance, contact your nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website, www.sandc.com.

Or, call S&C Headquarters at (773) 338-1000; in Canada, call S&C Electric Canada Ltd. at (416) 249-9171.

Caution!
Risk of electric shock!

Power Lines Can Be Lethal

When working near power lines, follow ALL safety procedure as appropriate for the types and voltages of power lines.

Do not open cover

- Dangerous voltages inside.
- No serviceable parts inside.
- Refer to qualified service personnel.
- Unit must be disconnected from power prior to servicing.

To Avoid Falling, Use Safe Procedures When Working At Heights Above Ground

- Select equipment locations that will allow safe and simple installation.
- Don't work alone. A friend or co-worker can save your life if an accident happens.
- Don't attempt repair work when you are tired. Not only will you be more careless, but your primary diagnostic tool - deductive reasoning - will not be operating at full capacity.
- Use approved non-conducting ladders, shoes, and other safety equipment. Make sure all equipment is in good repair.
- If a tower or pole begins falling, don't attempt to catch it. Stand back and let it fall.
- If anything such as a wire or pole does come in contact with a power line, DON'T TOUCH IT OR ATTEMPT TO MOVE IT. Instead, save your life by calling the power company.
- Don't attempt to erect antennas or towers on windy days.
- MAKE SURE ALL TOWERS AND POLES ARE SECURELY GROUNDED, AND ELECTRICAL CABLES CONNECTED TO ANTENNAS HAVE LIGHTNING ARRESTORS. This will help prevent fire damage or human injury in case of lightning, static build-up, or short circuit within equipment connected to the antenna.
- The IntelliCom WAN Node has built-in lightning protection, but antennas still need their own lightning protection. Be sure that any other equipment connected to the IntelliCom 1720 node also has the same level of protection.
- The base of the antenna pole or tower must be connected directly to the building protective ground or to one or more approved grounding rods, using 10 AWG ground wire and corrosion-resistant connectors.
- Refer to the National Electrical Code for grounding details.

IF AN ACCIDENT SHOULD OCCUR WITH THE POWER LINES: DON'T TOUCH THAT PERSON, OR YOU MAY BE ELECTROCUTED.

- Use a non-conductive dry board, stick, or rope to push or drag them so they no longer are in contact with electrical power.
- Once they are no longer contacting electrical power, administer CPR if you are certified.
- Immediately have someone call for medical help.

2 IntelliCom WAN Node Installation

Package Contents

The IntelliCom WAN 1720 package contains the items shown in Table 2.1.

Item	Qty
Warranty & registration card	1
CD with Software; Reference Guide; Hardware Installation Guide; EULA	1
2.4/5 GHz dual-band omni antennas, detachable	6
IntelliCom WAN 1720 , NEMA-4X enclosure	1
N to reverse-polarity SMA adapter	6
Mounting bracket for pole and wall mounting. Designed to fit 37 mm to 50 mm (1.5 in to 2.0 in) poles.	1
Mounting Kit, including U-bolts, M6x1.0-80mm, with flat washers, split washers, nuts. Claw-tooth pole grippers. M6x1.0-40mm hex bolt. M6x1.0-20mm hex bolt. Hex-head socket wrench.	1
AC power cord with NEMA 5-15 (US) plug. Other IEC cords are available separately.	1

Table 2.1 Package Contents
This table lists the items contained in your IntelliCom WAN 1720 kit.

This hardware installation guide describes how to install the IntelliCom WAN 1720 node safely. It is intended to be installed by trained professionals. Be sure to read and understand all installation and safety instructions before proceeding with the installation.

Initial Setup & Configuration

You should set up and test your nodes indoors, on a bench or table, before installing them. This will allow you to pre-configure the nodes so that they are all on the same RF channel, etc. You will use IntelliCom View Pro to configure the nodes and create a small mesh network. Test the network settings you plan to use.

Radio Upgrades

IntelliCom WAN 1720 nodes are shipped in a default configuration. Only one of the two radios, Radio 1, is enabled. The second radio, if needed, must be enabled via a license and IntelliCom View Pro software. Likewise, the MIMO capability must be enabled for those nodes which require it.

Steps in the Staging Process

1. Check to see that all nodes are visible in IntelliCom View Pro. If not, troubleshoot per directions in the IntelliCom View Pro Reference Guide.
2. Set the Country Code for your country of operation.
3. Re-verify that all nodes are visible.
4. Apply MIMO upgrade licenses to nodes which will require them. For nodes requiring dual-radio operation, apply dual-radio upgrade licenses.
5. Verify that dual-radio nodes have both radios correctly meshed.
6. Verify that MIMO-enabled nodes show 802.11n radio options.
7. Label each node. We recommend that the label be large enough to be visible from the ground when the unit is mounted. The label should include the last four digits of the node serial number, for easy identification in the field. Many installers mark the unit with number of active radio (1 or 2), MIMO status, and the type of antenna to be connected to each radio.

Note: The staging antennas provided with the nodes are for temporary use only. They MUST be replaced with outdoor-rated antennas as soon as the mesh is staged and operational. The staging antennas are NOT waterproof and NOT moisture resistant. If used outdoors, the antennas will fail.

3 Outdoor Installation

Installing the Node - An Overview

1. Pre-assemble the antenna, node, and other devices to a metal pole or other sub-assembly. Then, attach the assembly to the mast, tower, or other mounting system. It is often easier to install all devices to one object, such as a pole, and then attach the pole to the roof. In many cases, connecting the devices to a pole already attached to the roof top can be difficult and dangerous.
2. A lightning surge suppressor must be used. Some antennas include one. If not, you must install a lightning suppressor.
3. Install the antenna higher than the node. Take care when locating the node far away from the antennas; a short antenna cable gives better performance than a longer one. When possible, use antenna cables less than three meters long.
4. The node and its antenna must both be grounded.
5. Use weatherproofing kits that include non-vulcanized rubber to weatherproof connectors and antennas. All Ethernet cables must be waterproofed; standard RJ-45 connectors do not last outdoors.
6. Power over Ethernet: Consider which devices require PoE and what the required input voltage will be. Ports 2 and 3 on the node can supply up to 13W each of PoE-compliant power.
7. Connect peripheral devices to the node.
8. Connect power to the node and peripherals.

Tools Needed

For IntelliCom 1720 outdoor nodes, you will need:

- #2 Phillips screwdriver.
- Small adjustable wrench.
- Wire cutters to cut tie wraps around cables.
- Weatherproofing kit – this kit provides electrical tape and butyl mastic.

Depending on the installation location, you may need ladders, a lift truck, or other means to access the actual installation locations.

Preparing Earth Ground

The IntelliCom 1720 node must be properly connected to earth ground. Failure to do so may result in equipment damage, injury, or death. The product warranty does not cover damages resulting in part or in whole from improper grounding. Consult your location's building and electrical codes regarding antennas and follow them, or consult the National Electric Code (NEC).

- If connecting to a tower or pole, connect the base of the tower pole directly to the building's ground or to one or more approved grounding rods using 10 AWG ground wire and corrosion-resistant connectors.
- Connect the grounding cable to rain gutters only if the rain gutter is connected to earth ground.
- Ground rods should be copper-plated, 1.8 - 2.4 m (6 - 8 ft) long.
- Install all grounding components in straight lines. If bends are unavoidable, do not make sharp turns.
- Earth-to-ground should not be more than 10 ohms.
- Understanding the soil is very important in order to create a proper earth ground. If your soil is rocky or sandy, drive your ground rods and then pull them back out and dump an approved ground enhancement material into the holes where the grounding rods go. Then replace the grounding rods. Keep in mind that some salt compounds are corrosive and can cause copper to corrode.

Antenna Placement

S and C recommends the use of antennas specifically designed for MIMO applications. While it is possible to select and mount six individual antennas, determining correct placement and spacing is difficult. Use an antenna engineered for best results with MIMO.

If you are not using three antennas on each radio, install antennas in order, from the front of the unit toward the back. Do not 'skip' antenna connections.

Mounting Outdoor Antennas

Once you determine which RF band to use, you can order spectrum-specific high-gain antennas from S and C or another supplier.

Many installers prefer to mount the node and its associated antennas to a short bar, typically about 2 meters long. This entire bar assembly is then mounted horizontally to the vertical mast of the main antenna structure.

Mounting the IntelliCom WAN 1720

You can mount the node to a wall, a light pole, or an irregularly shaped pole. The universal mounting bracket has been designed with multiple holes and slots to allow mounting with bolts, straps, or other methods. Extra nuts and bolts are provided for this purpose; don't be alarmed if you have leftover fasteners when installation is complete.

The Universal Mounting Bracket contains holes and slots to allow it to be mounted via U-bolts or straps. Use four screws (not supplied) to attach the universal mounting bracket securely to the wall using the four holes near the top and bottom of the universal mounting bracket. Use appropriate anchors when attaching to masonry or other materials.

Pole Mounting

1. Insert the two U-bolts through the holes in the claw-toothed piece.

2. On each U-bolt, place a washer, a lock washer, and a nut. Smaller pole diameters usually require a second nut as a spacer to hold the bracket away from the U-bolt clamp. Finger-tighten the nuts. There should be about 12-15 mm (1/2-5/8") of U-bolt sticking past the second nut.
3. Mount the second U-bolt. Use the mounting bracket as a guide to correctly space the two U-bolts, then tighten the nuts. A horizontal pole-mount is also shown for reference.

   Use lock washers and nuts to secure the bracket to the U-bolts. Installation on a horizontal pole is the same, you just use different holes in the mounting plate.

Using Mounting Straps

For poles with diameters larger than 50 mm (2") or irregularly shaped poles, use mounting straps (not supplied) to mount the node.

1. Position the universal mounting bracket against the pole.
2. Thread two mounting straps around the pole and through the slots located near the top and bottom of the universal mounting bracket. Secure the mounting straps.

FIGURE 3.1 Mounting Bracket

Your node shipped with a two-piece mounting bracket as shown in the upper photo. To mount the node, remove the outer piece, by loosening the thumb screws. The inner bracket can be left attached to the node, as shown in the lower photo.

FIGURE 3.2 Mounting Examples

Vertical pole and horizontal pole mounts; the universal bracket mounted to a pole.

Connecting Cables

After your node is mounted, attach the antennas, the power cable, and any Ethernet cables you need. In Figure 3.3, note that all of the weatherproof caps have been removed from for illustrative purposes. You should not leave any unused connector uncovered.

Note the location of the weatherproof cap that has the reset button under it, at bottom left in Figure 3.3. To reset the unit, apply power and wait until the unit has fully booted and the status light has come on. Then use a paperclip to press and hold the reset button until the status LED blinks. This takes about 12 to 15 seconds.

FIGURE 3.3 Power and Ethernet Connectors

From left to right: AC Power, DC Power, Ethernet Port 3 (PoE), Ethernet Port 2 (PoE), Ethernet Port 1 (no PoE), USB (not used).

Below, from left to right: reset button (under threaded cap), Power LED, Status LED, Radio 1 Mesh LED, Radio 2 Mesh LED, Ethernet.

Power Connection

Connect the suppled AC power cable to AC power and to the IntelliCom 1720 node.

Powering Other Ethernet Devices

Ports 2 and 3 can provide IEEE 802.3af Power over Ethernet (PoE) functionality to Powered Devices (PD) connected to these ports. Port 1 cannot.

Connecting Antennas

When connecting antennas, connect them in numerical order 1-2-3. If you are not using three antennas per radio, do not 'skip' antenna connectors.

FIGURE 3.4 Antenna Connectors

From left to right: Antenna 1, Antenna 2, Antenna 3. The antenna 1 connector is at the top of the unit (farthest from the power and Ethernet connections) on both the left and right side.

Appendix A Specifications

Mode	Frequency (GHz)	Restrictions
802.11a	5.15-5.25	50 mW; indoor (US)
802.11n	5.25-5.35	250 mW, DFS (US)
	5.725-5.825	none
	4.9-5.090	Japan only
	4.94-4.990	US Public Safety
	5.470-5.725	ETSI 301.893, U-NII
802.11b/g/n	2.412-2.484	400 mW

Modes		Max TX Power
802.11a	5.725-5.825 UNII-3	26 dBm
802.11n		26 dBm
		24 dBm
		23 dBm
	5.470-5.735 UNII	23 dBm
	5.25-5.36 M UNII-2	23 dBm
	5.15-5.25 UNII-1	17 dBm
802.11b	2.412-2.484	24 dBm
802.11g	2.412-2.484	26 dBm
802.11n		26 dBm

Table 4.2 Wireless Interface

These tables describe the technical limits of the nodes. Various country restrictions may further limit available choices.

Supported Data Rates & Standards

- 802.11a 6/9/12/18/24/36/48/54Mbps
- 802.11a 1⁄4 and 1⁄2 rates for 4.940 – 4.990 GHz Public Safety Band
- 802.11b 1/2/5.5/11Mbps
- 802.11g 6/9/12/18/24/36/48/54Mbps
- 802.11n 6.5/13/19.5/26/65/130/ (20MHz LGB)
  7.2/14.4/21.7/28.9/72.2/144 (20MHz SGB)
  13.5/27/40.5/54/135/270 (40MHz LGB)
  15/30/45/60/150/300 (40MHz LGB)
- Network Standards: IEEE 802.11a/b/d/g/e/f/h/i/n
- Dynamic Frequency Selection (DFS) capable in conjunction with S and C Software application

Mesh Protocol

- S and C AutoMesh Protocol

Mesh Management Software

- IntelliView Pro™ mesh management software

Security & Encryption

- Security: WPA—64/128/256 w/TKIP, AES

Network Ports

- Three 10/100/1000 Mbps Ethernet ports with weatherproof connectors, LED activity indicator
- IEEE 802.3, 802.3u compliant
- CSMA/CD 10/100/1000 autosense
- Ports 2, 3 PSE Power over Ethernet per 802.3af

Enclosure

- Cast aluminum NEMA-4X/IP66 enclosure
- Six N-type antenna connectors
- Two weatherproof power connectors (AC and DC)
- Three weatherproof Ethernet connectors
- System LEDs (power, status, mesh (per radio), Ethernet)
- Weight: 12 lbs (5.5 Kg) with bracket
- Dimensions: 8.8” x 11.2” x 4” (220 x 280 x 100 mm)

Power

- AC Input: 90-240 VAC, 50-60 Hz, 0.9A
- DC Input: 12 VDC ±15%, 3 A
- Port 2: IEEE 802.3af compliant PoE (PSE), 13.5 W max
- Port 3: IEEE 802.3af compliant PoE (PSE), 13.5 W max

Environmental Specifications

- Operating temperature: -40º C to +60ºC
- Storage temperature: -40º C to +85º C
- Humidity (non-condensing): 10% to 90%
- Storage humidity (non-condensing): 5% to 95%
- Maximum altitude 15,000 feet (4600 meters)

Appendix B Regulatory

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in an office installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

FIGURE 5.5 FCC Class A Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

FIGURE 5.6 FCC Part 15 Statement

This equipment has been tested pursuant to FCC Part 90, DSRC-C mask certification, and is approved for use in the US on Public Safety bands by licensed Public Safety agencies.

Pursuant to Part 90.1215, use of antennas with gain greater than 9 dBi and up to 19 dBi in the 4.940 - 4.990 GHz Public Safety band is permissible without reduction of TX output power. The antenna shall have a directional gain pattern in order to meet the requirement of point to point and point to multi-point operation.

FIGURE 5.7 FCC Part 90 & Public Safety Statement

Any modifications made to this device that are not approved by S and C, Inc. may void the authority granted to the user by the FCC to operate this equipment. Antenna(s) for this unit must be installed by a qualified professional. Operation of the unit with non-approved antennas is a violation of U.S. FCC Rules, Part 15.203(c), Code of Federal Regulations, Title 47.

FIGURE 5.8 Modification & Antenna Installation Statement

FIGURE 5.9 FCC Radiation Exposure Statement

To ensure compliance with the FCC's RF exposure limits, the antenna used for this transmitter must be installed to provide a separation distance from all personnel. The distance must be 76 cm.

The transmitter must not be co-located or operated in conjunction with any other antenna or transmitter. Installers and end users must follow these installation instructions.

FIGURE 5.10 FCC Canadian Compliance Statement

This Class A Digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe A respecte les exigences du Reglement sur le material broilleur du Canada.

This device complies with Class A Limits of Industry Canada. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

S and C IntelliCom 1720 wireless mesh nodes are certified to the requirements of RSS-210 for 2.4 and 5 GHz spread spectrum devices. The use of this device in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.

Canadian units will not transmit in the 5600-5650 MHz band.

FIGURE 5.11 DFS Notice

IntelliCom 1720 devices are subject to Section 15.407 of FCC rules and are required to implement radar detection and DFS functions. They are DFS-certified, and will not transmit on channels which overlap the 5600 – 5650 MHz band (channels 120, 124, 128).

Devices intended for outdoor use are further restricted, as follows:

Any installation of a device within 35 km of a Terminal Doppler Weather Radar (TDWR) location shall be separated by at least 30 MHz (center-to-center) from all TDWR operating frequencies (as shown in Table 5.3).

Procedures for the installers and the operators on how to register the devices in the industry-sponsored database with the appropriate information regarding the location and operation of the device and installer information is included.

Table 5.3 US Terminal Doppler Weather Radar Installations

ST	City	Longitude	Latitude	Frequency
AZ	Phoenix	W 112 09 46	N 33 25 14	5610 MHz
CO	Denver	W 104 31 35	N 39 43 39	5615 MHz
FL	Ft Lauderdale	W 080 20 39	N 26 08 36	5645 MHz
FL	Miami	W 080 29 28	N 25 45 27	5605 MHz
FL	Orlando	W 081 19 33	N 28 20 37	5640 MHz
FL	Tampa	W 082 31 04	N 27 51 35	5620 MHz
FL	West Palm Beach	W 080 16 23	N 26 41 17	5615 MHz
GA	Atlanta	W 084 15 44	N 33 38 48	5615 MHz
IL	Mccook	W 087 51 31	N 41 47 50	5615 MHz
IL	Crestwood	W 087 43 47	N 41 39 05	5645 MHz
IN	Indianapolis	W 086 26 08	N 39 38 14	5605 MHz
KS	Wichita	W 097 26 13	N 37 30 26	5603 MHz
KY	Covington Cincinnati	W 084 34 48	N 38 53 53	5610 MHz
KY	Louisville	W 085 36 38	N 38 02 45	5646 MHz
LA	New Orleans	W 090 24 11	N 30 01 18	5645 MHz
MA	Boston	W 070 56 01	N 42 09 30	5610 MHz
MD	Brandywine	W 076 50 42	N 38 41 43	5635 MHz
MD	Benfield	W 076 37 48	N 39 05 23	5645 MHz
MD	Clinton	W 076 57 43	N 38 45 32	5615 MHz
MI	Detroit	W 083 30 54	N 42 06 40	5615 MHz
MN	Minneapolis	W 092 55 58	N 44 52 17	5610 MHz
MO	Kansas City	W 094 44 31	N 39 29 55	5605 MHz
MO	Saint Louis	W 090 29 21	N 38 48 20	5610 MHz
MS	Desoto County	W 089 59 33	N 34 53 45	5610 MHz
NC	Charlotte	W 080 53 06	N 35 20 14	5608 MHz
NC	Raleigh Durham	W 078 41 50	N 36 00 07	5647 MHz
NJ	Woodbridge	W 074 16 13	N 40 35 37	5620 MHz
NJ	Pennsauken	W 075 04 12	N 39 56 57	5610 MHz
NV	Las Vegas	W 115 00 26	N 36 08 37	5645 MHz
NY	Floyd Bennett Field	W 073 52 49	N 40 35 20	5647 MHz
OH	Dayton	W 084 07 23	N 40 01 19	5640 MHz
OH	Cleveland	W 082 00 28	N 41 17 23	5645 MHz
OH	Columbus	W 082 42 55	N 40 00 20	5605 MHz
OK	Aero. Ctr TDWR #1	W 097 37 31	N 35 24 19	5610 MHz
OK	Aero. Ctr TDWR #2	W 097 37 43	N 35 23 34	5620 MHz
OK	Tulsa	W 095 49 34	N 36 04 14	5605 MHz
OK	Oklahoma City	W 097 30 36	N 35 16 34	5603 MHz
PA	Hanover	W 080 29 10	N 40 30 05	5615 MHz
PR	San Juan	W 066 10 46	N 18 28 26	5610 MHz
TN	Nashville	W 086 39 42	N 35 58 47	5605 MHz
TX	Houston Intercontl	W 095 34 01	N 30 03 54	5605 MHz
TX	Pearland	W 095 14 30	N 29 30 59	5645 MHz
TX	Dallas Love Field	W 096	58 06	N 32 55 33
TX	Lewisville Dfw	W 096	55 05	N 33 03 53
UT	Salt Lake City	W 111	55 47	N 40 58 02
VA	Leesburg	W 077 31 46	N 39 05 02	5605 MHz
WI	Milwaukee	W 088 02 47	N 42 49 10	5603 MHz

Revision History

Version	Release Date	Notes
1.0	29 Aug 2011	Initial Release.

IntelliCom™