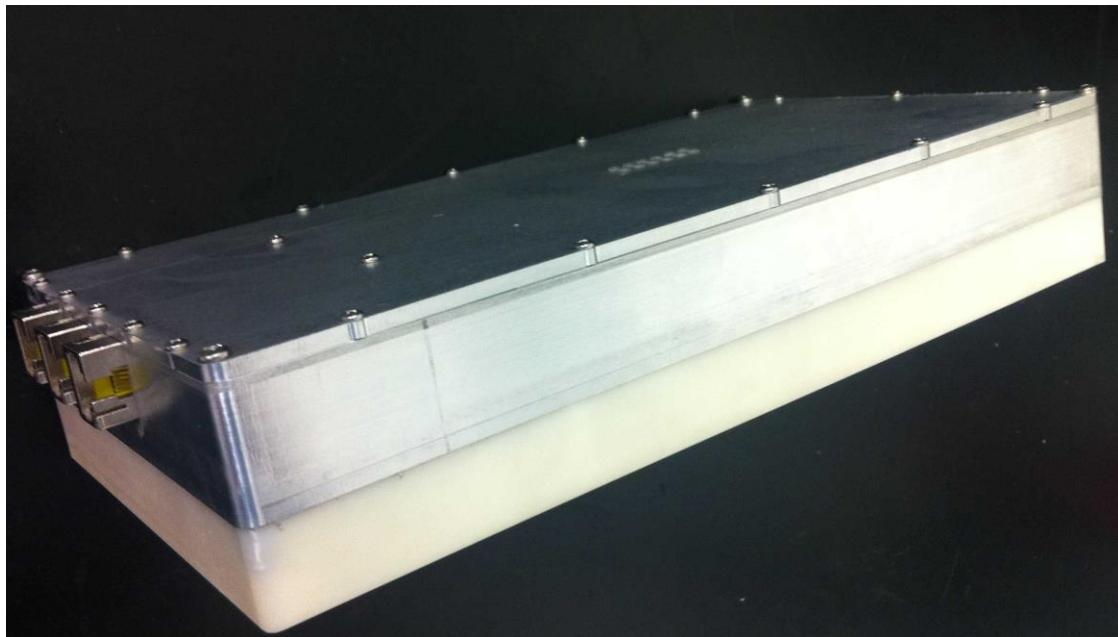




BTI-AP-7161

Installation Guide

Dated: 7 February 2013



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office@boycetechnologies.com

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Introduction

The BTI-AP-7161 access point is packaged to be mounted in various Passenger Station (PS) LAN and Help Point devices in order to extend existing transit network coverage throughout the station environment. The BTI-AP-7161 access point provides the latest 802.11n 3x3 Multiple Input Multiple Output (MIMO) tri-radio design together with mounting solutions which permit rapid and aesthetically pleasing deployments within station infrastructure.

True perimeter security is provided using either a dedicated dual band sensor or software mode for both 2.4 GHz and 5 GHz bands to deliver 24x7 rogue detection and termination.

The BTI-AP-7161 access point is optimized with Motorola Solutions WiNG 5 intelligence, extending QoS, security, and mobility services to the access point to support better capacity and performance. The BTI-AP-7161 access point is ideal for transit deployments.

Deployments can be managed using the Motorola Solutions WiNG 5 architecture. The WiNG 5 architecture is a solution designed for 802.11n networking. It leverages the best aspects of independent and dependent architectures to create a smart network that meets the connectivity, quality, and security needs of each user and their applications based on the availability of network resources, including wired networks.

WiNG 5 is a Third Generation WLAN solution which incorporates the best of both the first generation Autonomous Access Point WLAN and the second generation Centralized Controller Based WLAN.

The control plane is now distributed between the access points and the controllers. The network administrator has the flexibility of directing the data plane either being forwarded directly from the access points, or via the controllers. By distributing intelligence and control between the wireless controllers and access points, the WiNG 5 network can route directly via the best path, as determined by factors including the user, the location, the application, and the available wireless and wired resources.

Once adopted by a Motorola Solutions RFS4000, RFS6000, RFS7000, or NX 9000 series controller, the BTI-AP-7161 access point is managed as an Adaptive AP running the WiNG 5 network management protocol. WiNG 5 networks extend the current differentiation that Adaptive Access Points offered to the next level by now having the services and security available at every point in the network. The traffic flow is optimized to prevent wired congestion, as well as wireless congestion. Traffic flows dynamically, based on user and application, and finds alternate routes to work around any possible network choke points. Mixed-media application optimization is the hallmark of WiNG 5 networks.

Extending the indoor network to the outdoors increases the need to guard against unwanted intruders and attackers, and monitor network performance and availability. In addition to industry standard security for clients and radio backhaul, the BTI-AP-7161 access point provides true perimeter security using either a dedicated dual band sensor or software mode in the 2.4 GHz and 5 GHz bands. Concurrent around-the-clock dual band Network Assurance sensing and wireless traffic is provided together with spectrum analysis, eliminating the need for separate devices.

An access point can function as a Wireless Intrusion Protection System (WIPS) sensor and upload sensor mode operation information to a dedicated WIPS server. WIPS protects your wireless network, mobile devices, and traffic from attacks and unauthorized access. WIPS provides tools for standards compliance and around-the-clock 802.11a/b/g wireless network security in a distributed environment. WIPS allows administrators to identify and accurately locate attacks, rogue devices, and network vulnerabilities in real time and permits both a wired and wireless lockdown of wireless device connections upon acknowledgement of a threat.

Capacity in video surveillance solutions is critical to the performance of many networks designed to monitor and provide safety. To assist with the deployment of video surveillance networks where the camera application resides, the BTI-AP-7161 access point offers band unlocked radio flexibility. The user can choose between 2.4 GHz, 5 GHz and 4.9 GHz bands for the radio type. The BTI-AP-7161 access point supports 3x3 MIMO technology, reaching a maximum data rate of 300 Mbps to maintain high performance and better quality of transmission.

The BTI-AP-7161 access point is designed to optimize network availability through preemptive intelligence which dynamically senses weak or failing signals, securely moves mobile users to alternate access points, and boosts signal power to automatically fill RF holes and ensure uninterrupted mobile user access.

The BTI-AP-7161 access point band unlocked radios allow flexibility and deployment options for the public safety market. The powerful radio increases coverage, performance, and obstruction penetration for outdoor use.

Receiver sensitivity is increased proportionally so users have an increased ability to maintain high performance access for mobility and client devices in the network.

Document Conventions

The following graphical alerts are used in this document to indicate notable situations:



NOTE Tips, hints, or special requirements that you should take note of.



CAUTION Care is required. Disregarding a caution can result in data loss or equipment malfunction.



WARNING! Indicates a condition or procedure that could result in personal injury or equipment damage.

Hardware

There are currently two BTI-AP-7161 access point models

Model Number	Description
BTI-AP-7161	7161 Access Point Radio 802.11n US
BTI-AP-7161-S	7161 Access Point Radio 802.11n US with Sensor US

BTI-AP-7161 Antenna Accessories

NOTE Antennas must be ordered separately. They are not included with the BTI-AP-7161.

Part Number	Description
FXP.503.01.0150C	Internal Taoglas 2.4/5 GHz MIMO Flex Antenna 150mm 1.27OD SMA (M)
MA671.C105111.G10	External Taoglas 4.5-4.9 Spartan 3-1 MIMO, 1M CFD200, SMA (M)
MA672.C105111.G10	External Taoglas 5.0-5.6 GHz Spartan 3-1MIMO, 1M CFD200, SMA (M)

Mounting Accessories

Part Number	Description
BTI-AP-7161-HPU	Help Point Unit Adapter Plate
BTI-AP-7161-RAD	Help Point Unit Antenna Radome

Package Contents

Carefully remove all protective packing material from around the BTI-AP-7161 access point and save the container for later storage and shipping.

Record the serial numbers on the shipping cartons and BTI-AP-7161 access points for warranty claims and reference during software download procedures.

When opening the shipping cartons, inspect the equipment for damage. If you find any damaged equipment or any equipment is missing, contact Boyce Technologies, Inc. Support immediately.

Each BTI-AP-7161 model number includes the following parts:

- BTI-AP-7161 access point
- RJ45 Patch Cable
- BTI-AP-7161 Access Point Installation Guide (this document)

The following items are not included with the BTI-AP-7161 access point models but can be ordered from Boyce Technologies, Inc.:

- Antennas
- Mounting brackets/kits
- PoE power supply and accessories
- RFS controllers (if required)

The following items are not provided by Boyce Technologies, Inc. and can be sourced from other suppliers, partners, or distributors:

- TVSS protection unit
- Grounding wire

Hardware Installation Guidelines



CAUTION All device wiring must comply with the *National Electric Code (NEC)* or regulations and procedures defined by the regulatory bodies of the country or region where the devices are being deployed. All local building and structure codes must be observed.



WARNING! Strictly observe the following safety precautions and warnings when installing.

Precautions

Before installing a BTI-AP-7161 model access point, verify the following grounding and transient surge protection notes:

The installation professional should be familiar with all grounding requirements and regional codes and ensure that the access point and mounting asset are properly grounded.

The cable can be attached to the unit using the following method:

- Loosen the grounding screw, insert the grounding cable with lug onto the stud and tighten the nut.
- For Ethernet and transient surge protection, it is recommended that a commercially available off-the-shelf Transient Voltage Surge Suppressor (TVSS) be provided on all shielded CAT5E Ethernet connections.



CAUTION All device wiring must comply with the *National Electric Code (NEC)* or regulations and procedures defined by the regulatory bodies of the country or region where the devices are being deployed. All local building and structure codes must be observed.

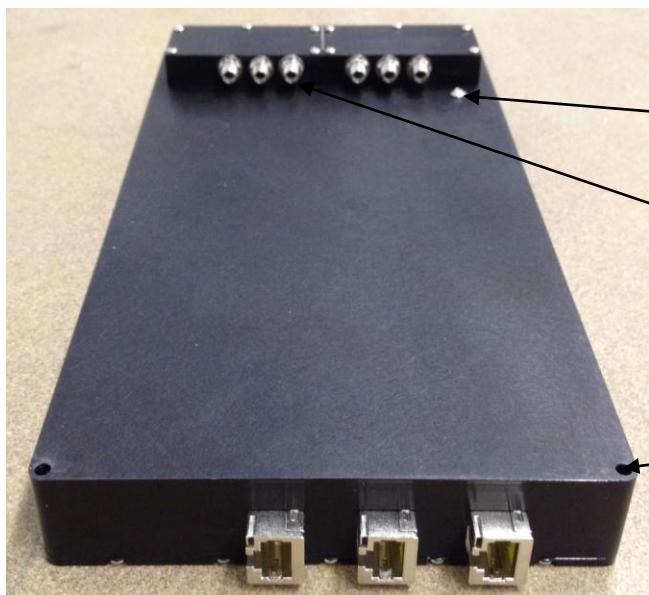
Warnings

- Read all installation instructions and site survey reports, and verify correct equipment installation before connecting the access point to its power source.
- Remove jewelry and watches before installing this equipment.
- Verify that the unit is grounded before connecting it to the power source.
- Verify that any device connected to this unit is properly wired and grounded.
- Connect all power cords to a properly wired and grounded electrical circuit. Verify that the electrical circuits have appropriate overload protection.
- Attach only approved cords to the device.
- Verify that the power connector and socket are accessible at all times during the operation of the equipment.
- Do not hold any component containing a radio such that it is very close to or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not work with power circuits in dimly lit spaces.
- Do not install this equipment or work with its power circuits during thunderstorms or other weather conditions that could cause a power surge.
- Verify there is adequate ventilation around the device, and that ambient temperatures meet equipment operation specifications.
- Do not operate a portable transmitter near unshielded blasting caps or in an environment where explosives are present unless the transmitter is especially certified for such use.
- Refer to your site survey and network analysis reports to determine specific requirements for each deployment.
- Assign installation responsibility to the appropriate personnel.
- Identify and document where all installed components are located.
- Identify and prepare Ethernet and console port connections.
- Verify that cable lengths are within the maximum allowable distances for optimal signal transmission.

Hardware Overview

Ports and Connections

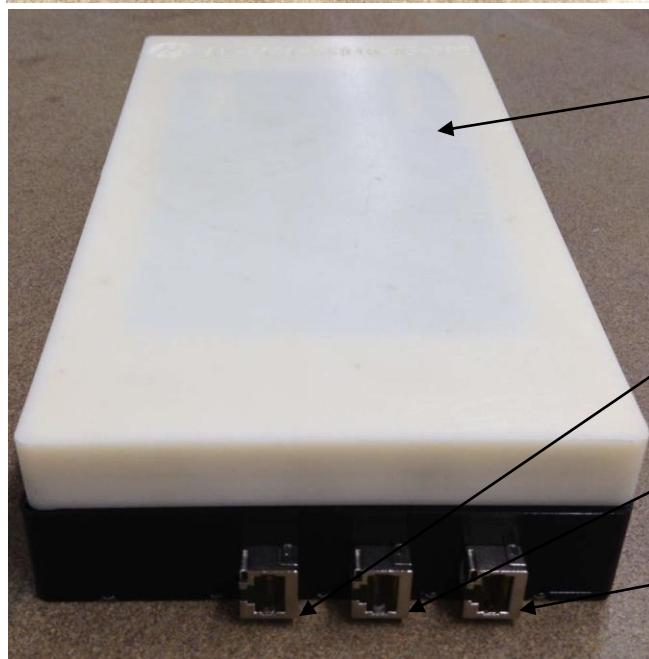
- The BTI-AP-7161 has the following port designations:
- Antenna ports R1-A, B and C, R2-A, B and C
- Console Port
- GE1/POE - LAN port
- GE2 - WAN port



Reset Cover Screw

Antenna Connections

Mounting Screw Hole

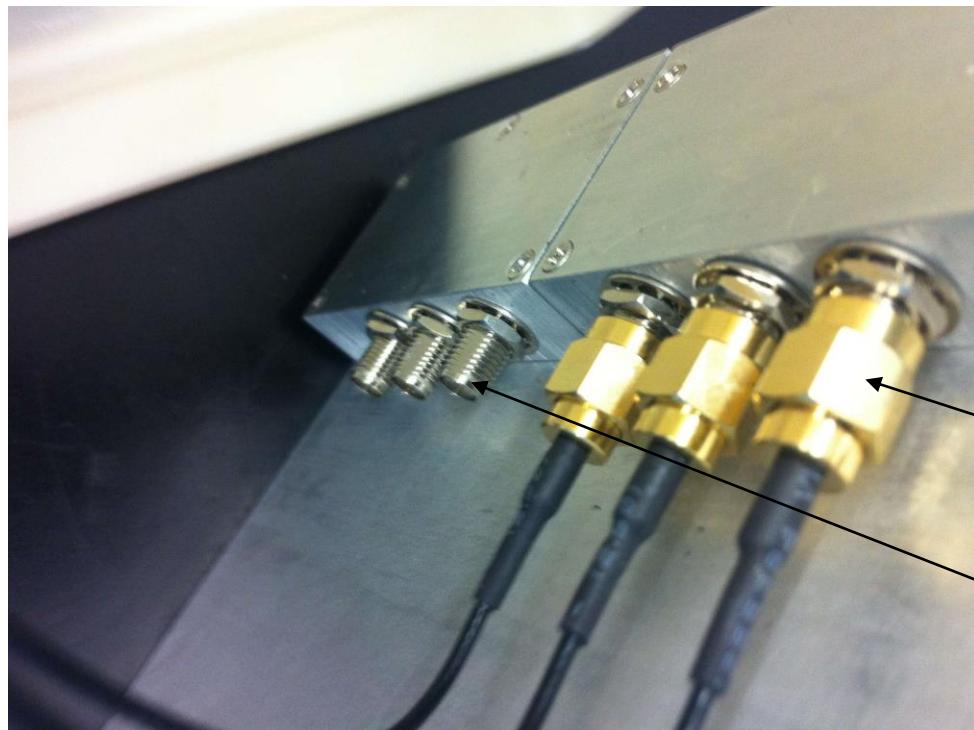
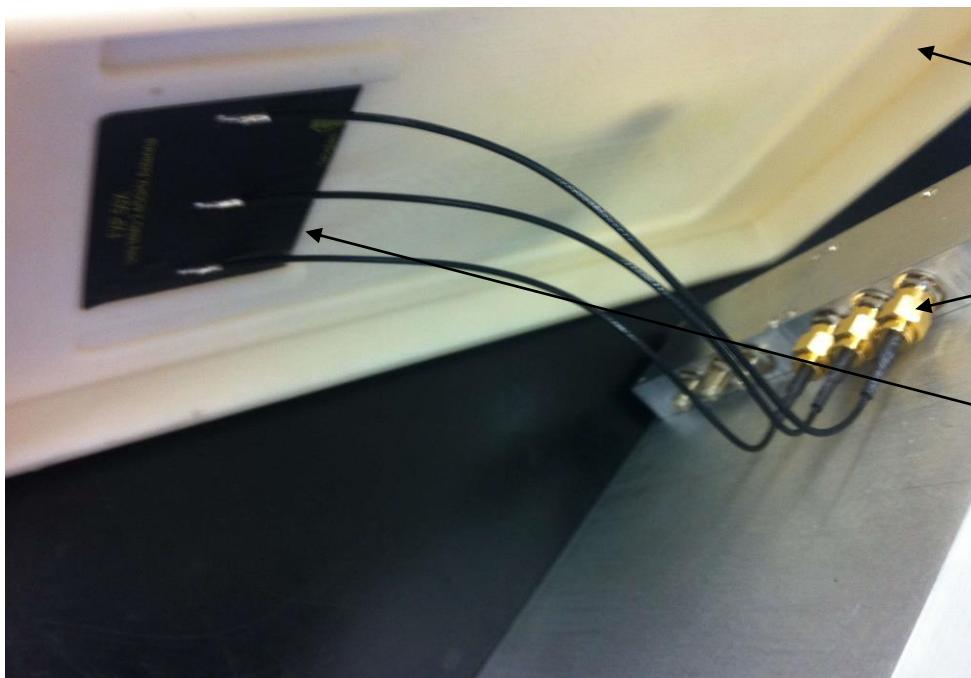


Antenna Radome

GE2 Port

GE1 (PoE) Port

Console Port



WARNING! Antenna ports where no antenna is mounted must be properly terminated using an approved terminator.

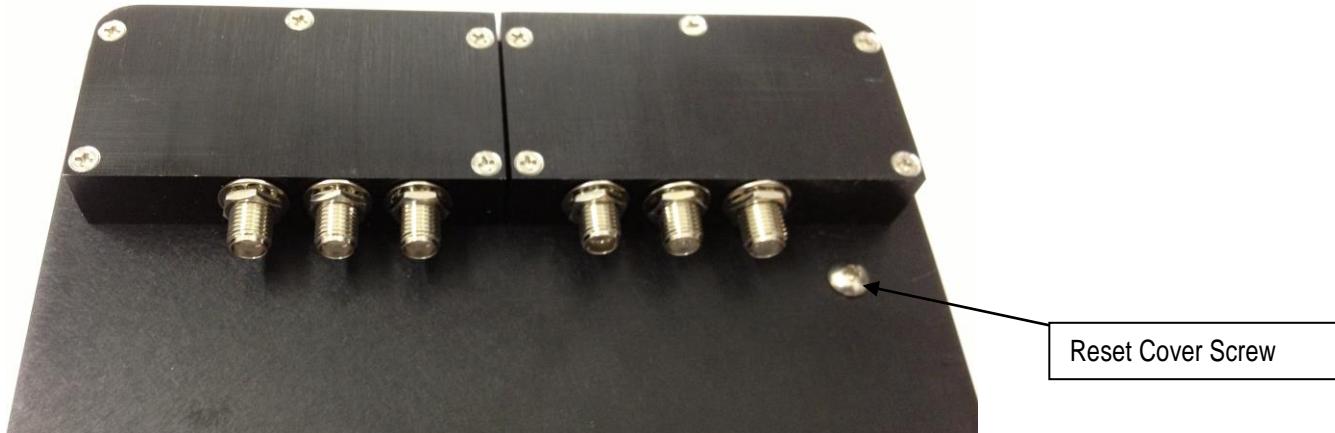
Reset Button

The BTI-AP-7161 access point can be physically reset using the factory reset hardware button. The button is located inside the reset port near the SMA antenna connectors.

The reset button is only enabled for a ten second interval as the unit boots up. It can be accessed by removing the Philips head screw using a #1 Phillips head screwdriver. Push the button to reset the access point. Confirm that the reset cycle was completed and replace the screw.

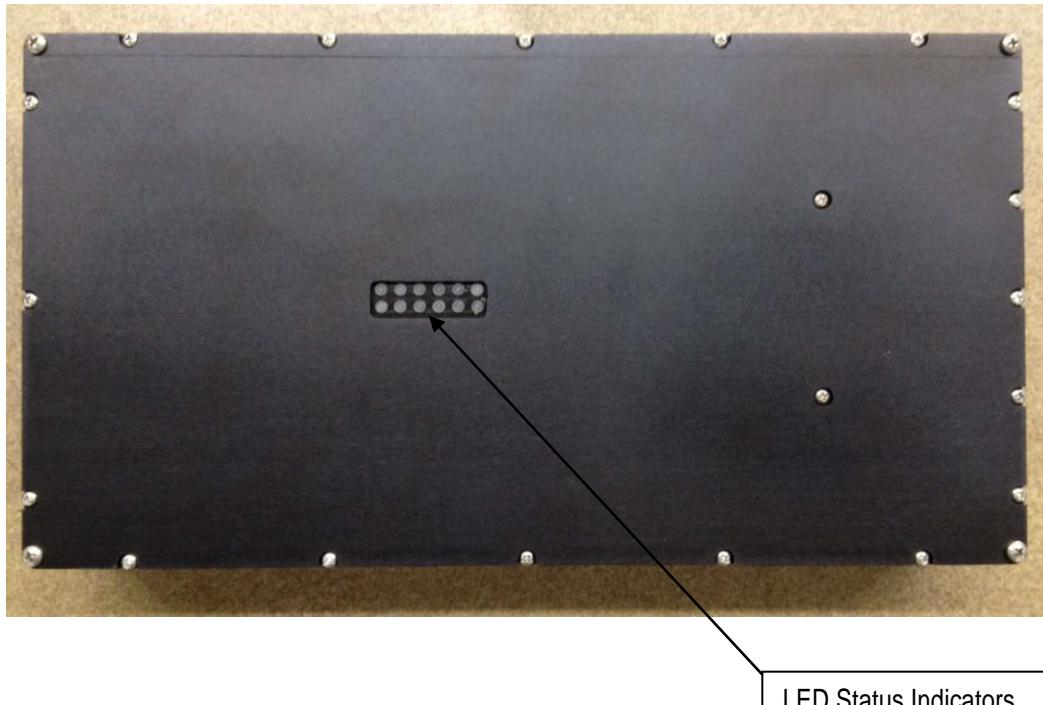
To perform an external hardware reset and to restore the access point default settings:

1. Using a #1 Phillips screwdriver, remove the cover screw from the external reset port.
2. Gently press and hold the reset button.
3. If any of LEDs 2 through 6 are active, it indicates that the unit has booted successfully and the operational software is running.



LED Indicators

The BTI-AP-7161 access point access point has twelve LEDs on the top of the access point housing.



The access point utilizes two different colored lights below each LED. Only one light displays within an LED at any given time. Every light within each LED is exercised during startup to allow the user to see if an LED is not functioning. The LEDs turn on and off while rotating in a circular pattern. Since two LEDs feed each light pipe, the pattern is from left to right (LEDs 1 to 6), then right to left (LEDs 6 to 1).

The top housing LEDs have the following display patterns and functionality:

Two Radio LEDs

A two radio model access point (P/N BTI-AP-7161) has the following unique LED behavior:

LED 1 (Sensor)	LED 2 (2.4 GHz)	LED 3 (5 GHz)	LED 4 (GE2/WAN)	LED 5 (GE1/LAN)	LED 6 (System)
Not Used	Blinking Emerald indicates 802.11 b/g/n activity.	Blinking Amber indicates 802.11a/n activity.	LED Off indicates the port is not connected.	LED Off indicates the port is not connected.	Solid Red indicates diagnostic mode.
	Solid Emerald indicates a radio is present but not configured.	Solid Amber indicates a radio is present but not configured.	Blinking Green indicates normal operation.	Blinking Green indicates normal operation.	Blinking Red at 1 second interval indicates POST failure.
			Rapidly blinking Yellow indicates a port error.	Rapidly blinking Yellow indicates a port error.	Solid White following diagnostic mode indicates booting.
					Blinking Red and White at 1 second interval indicates "no adoption."
					Solid White indicates normal operation.



WARNING! If LED 6 remains blinking **Red** for longer than 10 minutes, cycle the power to the unit. If the condition persists, contact service.

Three Radio LEDs

A three radio model access point with sensor (P/N BTI-AP-7161-S) has the following unique LED behavior:

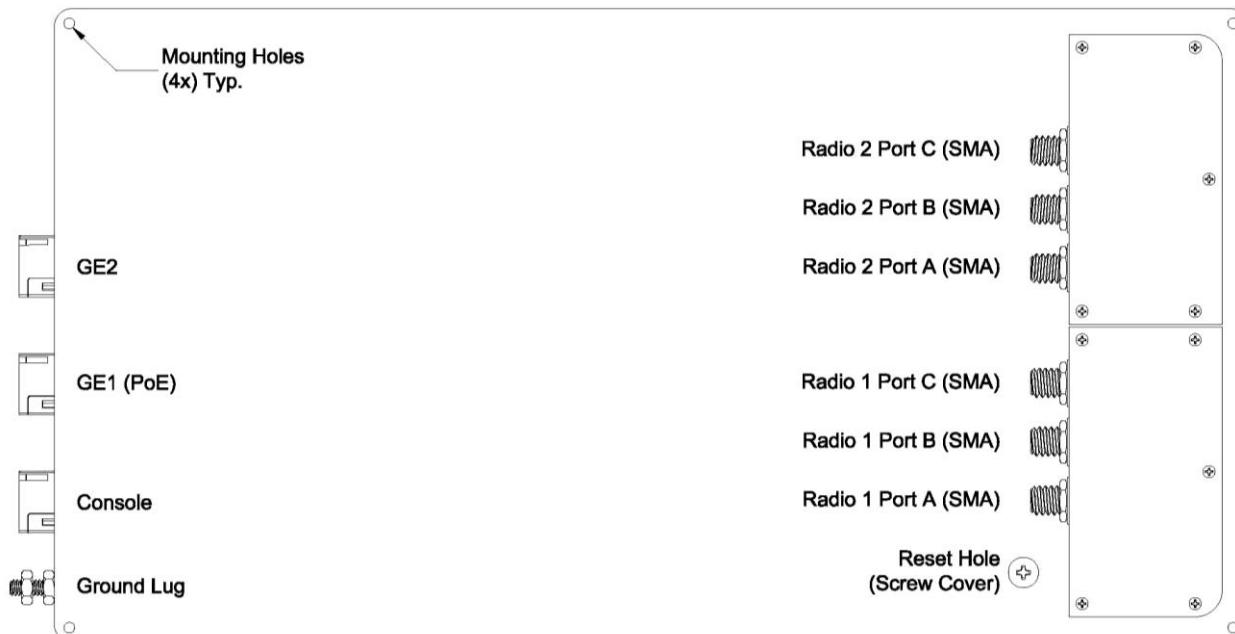
LED 1 (Sensor)	LED 2 (2.4 GHz)	LED 3 (5 GHz)	LED 4 (GE2/WAN)	LED 5 (GE1/LAN)	LED 6 (System)
Blinking Emerald and Amber at 2 second interval indicates a radio is present but not connected to a server. Solid Amber indicates a radio is present and connected to a server.	Blinking Emerald indicates 802.11 b/g/n activity.	Blinking Amber indicates 802.11a/n activity.	LED Off indicates the port is not connected.	LED Off indicates the port is not connected.	Solid Red indicates diagnostic mode. Blinking Red at 1 second interval indicates POST failure. Solid White following diagnostic mode indicates booting.
			Rapidly blinking Yellow indicates a port error.	Rapidly blinking Yellow indicates a port error.	Blinking Red and White at 1 second interval indicates "no adoption."
					Solid White indicates normal operation.

Mounting and Installation

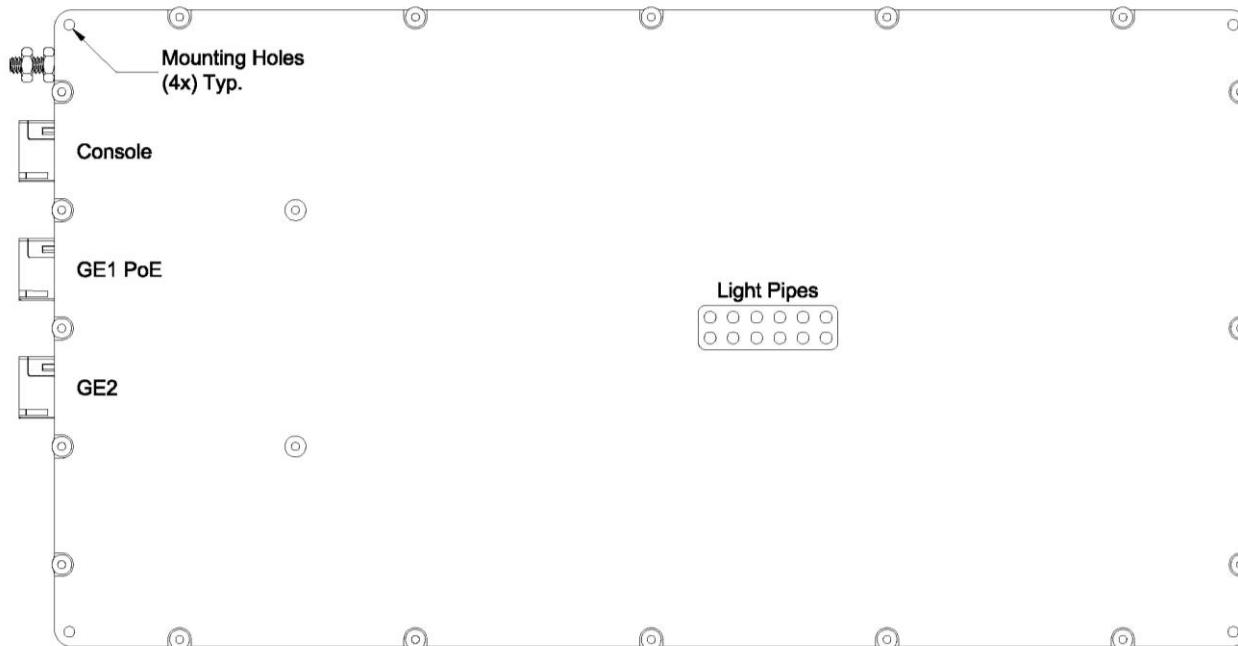
The BTI-AP-7161 has been developed as a compact module which is intended to be mounted to additional devices which shall provide the required thermal conduction to dissipate heat generated during operation.

The BTI-AP-7161 is designed to be mounted on a chassis or panel which provides the required heat sink.

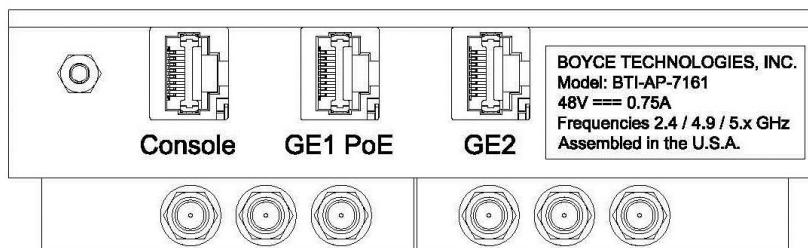
When installed in standalone access point enclosures and vertical aggregators the BTI-AP-7161 access point is attached to a mating heatsink and panel or door. When local antennas are required, the antenna radome situates the Taoglas antennas appropriately to the overall enclosure.



BTI-AP-7161 Top View
For use in Access Point Enclosures and Vertical Aggregators

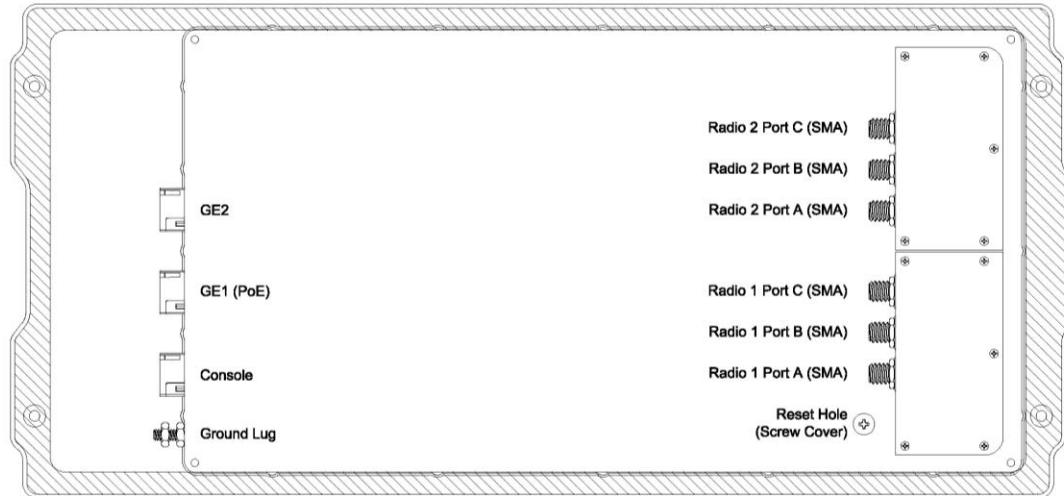


BTI-AP-7161 Bottom View
For use in Access Point Enclosures and Vertical Aggregators

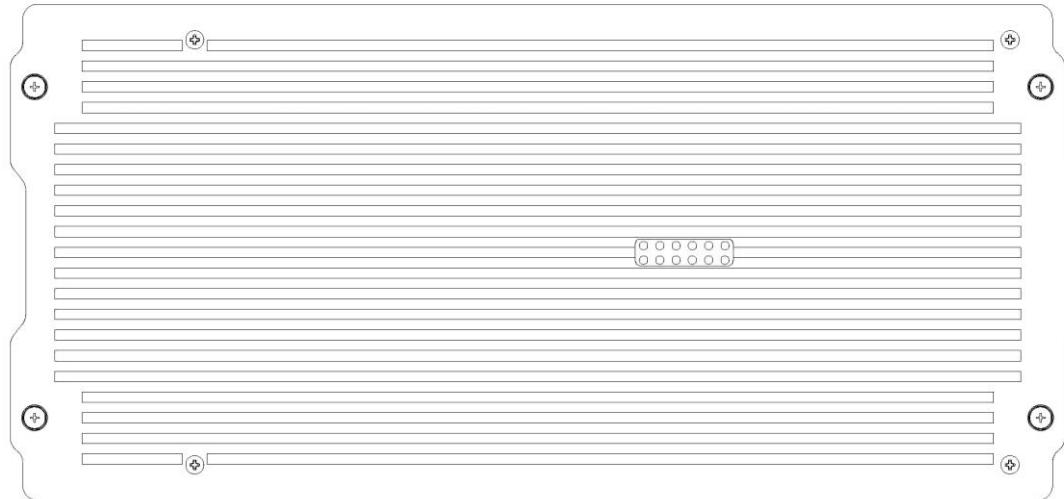


BTI-AP-7161 End View
For use in Access Point Enclosures and Vertical Aggregators

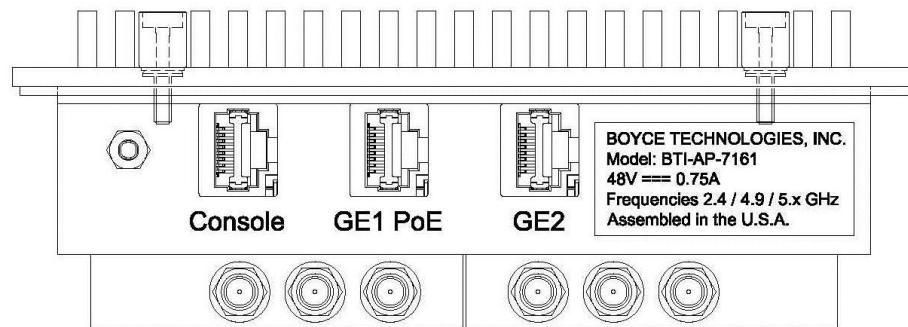
When installed in the BTI-HPU-6860, BTI-HPU-6260, or the BTI-HPU-5660, the access point is attached to a mating heatsink and panel which installs within the Help Point. The antenna radome situates the Taoglas antennas at the appropriate location to provide coverage through the blue beacon.



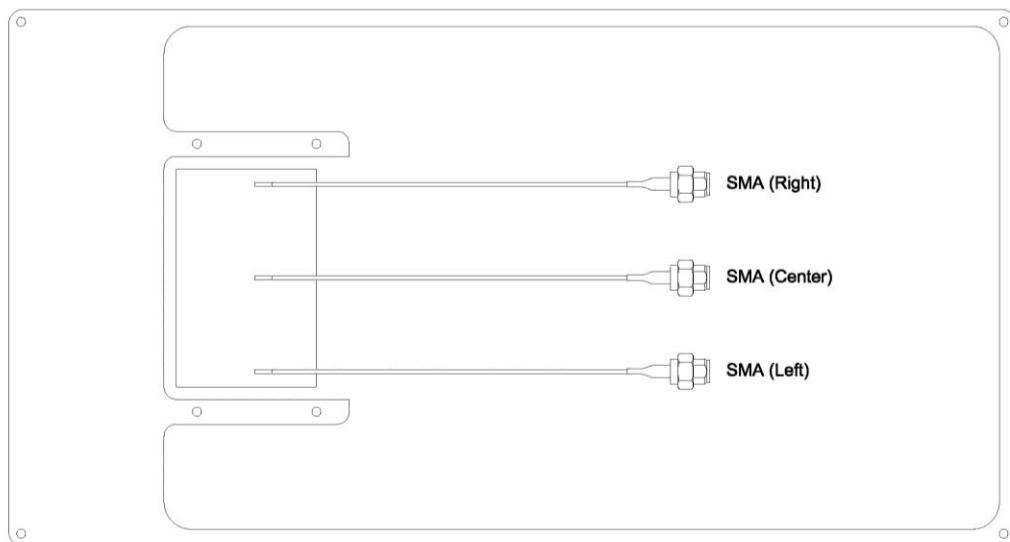
BTI-AP-7161 Top View
For use in Help Point Units



BTI-AP-7161 Bottom View
For use in Help Point Units



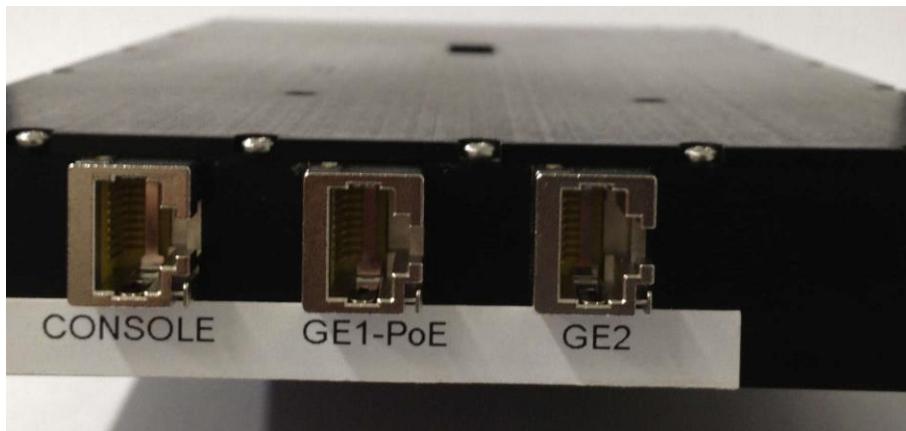
BTI-AP-7161 End View
For use in Help Point Units



BTI-AP-7161 Radome
For Integrated Antenna

Power over Ethernet

The BTI-AP-7161 is provisioned to be powered exclusively by Power over Ethernet (PoE).



Power over Ethernet (PoE) is the power source for the BTI-AP-7161 access point. For optimal performance, a BTI-AP-7161 can be powered by an 802.3at compliant injector and RFS controllers that support 802.AT PoE.

If located within 100 meters of the controller and a PoE port is available, the BTI-AP-7161 access point can also be connected directly to one of the following Motorola Solutions controllers:

- RFS4000
- RFS6000
- RFS7000
- NX9000

A standard CAT5E cable can be used to provide the connection to the BTI-AP-7161. The GE1/POE port on the BTI-AP-7161 is where the standard CAT5E cable will connect to the access point and use of the weatherproof RJ45 plug kit that comes with the unit will maintain a weatherproof seal for outdoor installation at the Ethernet port.

When using controllers, the total power limits for the BTI-AP-7161 must be considered. The two radio configuration draws less power than a three radio configuration. If sufficient power is not available, the BTI-AP-7161 software will disable the third radio and throttle back performance on all radio and Ethernet interfaces.

Basic BTI-AP-7161 Access Point Configuration

The BTI-AP-7161 access point receives its configuration once adopted by a Motorola Solutions RFS4000, RFS6000 or RFS7000 series controller. There are no required initial configuration settings beyond verifying power and LED functionality for the access point. Once adopted, the access point is managed by its connected controller and can receive periodic firmware when available.

Antenna Type Configuration

For the BTI-AP-7161 access point to operate properly, the antenna type and antenna gain must be configured manually. Select antenna type with following command:

```
ap71xx-XXXXXX (config-device-xx-xx-xx-xx-xx-xx-if-radio1)#service antenna-type ap7161-dipole
```

Select antenna gain with following command:

```
ap71xx-XXXXXX (config-device-xx-xx-xx-xx-xx-xx-if-radio1)# antenna-gain <units in dBi>
```

These changes can also be made in the device profile configuration file.



NOTE For FCC and ETSI requirements, set the 2.4 GHz radio gain to 8 dBi and set the 5 GHz radio gain to 10 dBi.

Automatic Channel Select Override

Under certain conditions (e.g. the presence of a 40 MHz channel intolerant client or a legacy device on the extension channel), a radio which has been configured for 40 MHz channel operation may automatically select the 20 MHz channel. To override or restore automatic channel selection, use the following commands:

```
ap71xx-XXXXXX (config-device-xx-xx-xx-xx-xx-xx-if-radio1)#service ignore-ch-width-mgmt ap71xx-XXXXXX (config-device-xx-xx-xx-xx-xx-xx-if-radio1)#no service ignore-ch-width-mgmt
```

This change can also be made in the device profile configuration file.

Specifications

Hardware Specifications

Operating Voltage	36-57 VDC
Operating Current	Not to exceed 750 mA@48 VDC
Power In (PoE)	PoE support inbound power- 802.3AT on GE1/POE port
Ethernet Ports	2 Gigabit Ethernet ports
Dimensions (unit) mounted	10.150" High, 5.392 Wide", 1.865" Thick
Weight (Unit)	Less than 3lbs.
Mounting	Flange mounted on various panels
LED	12 top mounted weatherized LEDs with multifunction read
Uplink	2 Gigabit Ethernet Ports (GE1/POE, GE2) autosensing
Antenna Connectors	6 SMA for 2 Radio, 8 SMA for 3 Radio
Console Port	RJ45
Hardware Reset	Screw covered near SMA ports, Dependant on firmware

Environmental Specifications

Operating Temperature	-40 to +70 degrees Celsius
Storage Temperature	-40 to +85 degrees Celsius
Operating Humidity	5-95 percent
Electrostatic Discharge	EN61 000-4-2. Air +/-1 5kV, Contact +/-8kV
Enclosure	Designed for NEMA 12, corrosion resistant enclosure
Shock	IEC60721-3-4, Class 4M3, MIL STD 810F
Operational Vibration	IEC60721-3-4, Class 4M3

Radio Specifications

Network Standards	IEEE 802.11 a/b/g/n, 802.11e, 802.11i, WPA2, WMM, and WMM-UAPSD
Supported Data Rates	802.11b/g: 1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 802.11a: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 802.11n: MCS 0-15 up to 300 Mbps
802.11n Support	3x3 MIMO with 2 spatial streams 20MHz and 40MHz channels supported 300Mbps data rates per radio Packet aggregation (AMSDU, AMPDU) Reduced interframe spacing
802.11 b/g/n	Operating frequency 2.4 - 2.483 GHz Maximum EIRP 32 dBm*
802.11 a/n	Operating frequency 4.940 GHz - 4.990 GHz and 5.25 GHz - 5.35 GHz and 5.470 GHz - 5.825 GHz Maximum EIRP 34 dBm*

*Maximum EIRP may vary based on local standards for the area of deployment.

Networking and Software Specifications

Security	Stateful Firewall, IP filtering, NAT, 802.1X, 802.11i WPA2, WPA 24x7 Dual band sensor capabilities *(subject to software license keys and sensor radio SKU) Advanced forensics Connectivity troubleshooting Wireless Intrusion Prevention LiveRF
Quality of Service (QoS)	WMM, WMM-UAPSD, 802.1p, Diffserv and TOS
Routing	Layer 3 routing, 802.1q/p, DynDNS, DHCP server/client, BOOTP Client, PPPoE and LLDP

Approvals

Radio	FCC Title 47, part 15, part 90; EN 301 489-17 EN 301 893, v1 .5.1 DFS; EN 300 328
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Warranty

- One (1) year on BTI-AP-7161 hardware
- (90) day on software

Regulatory Compliance

This device is approved under Boyce Technologies, Inc.

All Boyce Technologies, Inc. devices are designed to be compliant with rules and regulations in locations they are sold and will be labeled as required. Any changes or modifications to Boyce Technologies, Inc. equipment, not expressly approved by Boyce Technologies, Inc., could void the user's authority to operate the equipment.

Boyce Technologies, Inc. devices are professionally installed; the Radio Frequency Output Power will not exceed the maximum allowable limit for the country of operation.

Antennas: Use only the supplied or an approved replacement antennas. Unauthorized antennas, modifications, or attachments could cause damage and may violate regulations.

FCC Approval Statement

Federal Communications Commission
Office of Engineering and Technology
Laboratory Division

Interim Plans to Approve UNII Devices Operating in the 5470 - 5725 MHz Band with Radar Detection and DFS Capabilities

The FCC, NTIA, FAA and industry are working to resolve interference to Terminal Doppler Weather Radar (TDWR) systems used near airports that has occurred from some outdoor wireless systems operating in the 5470 MHz – 5725 MHz band. These wireless devices are subject to Section 15.407 of our rules and when operating as a master device they are required to implement radar detection and DFS functions. We are continuing our work to develop long-term equipment authorization test procedures that will ensure that the devices comply with our rules that include protecting the TDWR operations. In the interim, the Commission will now allow certification of wireless master devices with radar detection function and with DFS capability, if they meet the following conditions:

Devices will not transmit on channels which overlap the 5600 – 5650 MHz band.¹

Devices intended for outdoor use will be further restricted, as follows:

Devices must be professionally installed when operating in the 5470 – 5725 MHz band.²

Grantees must provide owners, operators and all such installers with specific instructions in their user's manual on requirements to avoid interference to TDWRs and information that meets the following instructions:

Any installation of either a master or a client device within 35 km of a TDWR location shall be separated by at least 30 MHz (center-to-center) from the TDWR operating frequency 3, 4, and 5.

- The devices subject to the requirements in this KDB can select the initial channel for operation to avoid TDWRs and apply the Uniform Channel Spreading requirements (see FCC 06-96 in ET Docket 03-122 released June 30, 2006) on the remaining available frequency band of operation. All the other test procedures including the test radar patterns remain the same at the present time. A revision to the measurement procedure with modification to the Uniform Channel Spreading requirement and other changes will be released in the future. The Commission will also address the issue of any field upgrade option at that time.
- The grantee must identify the specific expertise and the training required by the installers for installing these types of devices.
- In some instances it is possible that a device may be within 35 km of multiple TDWRs. In this case the device must ensure that it avoids operation within 30 MHz for each of the TDWRs. This requirement applies even if the master is outside the 35 km radius but communicates with outdoor clients which may be within the 35 km radius of the TDWRs.
- The requirement for ensuring 30 MHz frequency separation is based on the best information available to date. If interference is not eliminated, a distance limitation based on line-of-sight from TDWR will need to be used. In addition, devices with bandwidths greater than 20 MHz may require greater frequency separation.
- 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.
- Devices must meet all of the other requirements specified in Section 15.407, and it is prohibited to include configuration controls (e.g. country code settings or other options to modify DFS functions) to change the frequency of operations to any frequency other than those specified on the grant of certification for US operation.
- All applications for equipment authorization must clearly show compliance with all of the technical requirements under worst case parameters, under user or operator control, based on frame rates, listen/talk ratios and user data transfer conditions.
- All the devices subject to the DFS requirements must be submitted to the Commission's Laboratory Division for pre-grant testing and equipment authorization.

The applicant must ensure that all equipment authorization applications subject to this interim procedure include appropriate attestations that the device has no option to change the DFS parameters and that transmissions are disabled at least in the 5600 – 5650 MHz band. The application must include the user's manual with the appropriate installation and operations requirements for the installers and operators.

We are continuing to evaluate additional measures that may need to be taken to further ensure against interference caused by 5 GHz outdoor wireless systems located near airports. While manufacturers have an obligation to ensure that their equipment complies with FCC rules, and must take steps to ensure their devices are unlikely to cause harmful interference, Section 15.5 of the Commission's rules also places an obligation on users of devices to avoid causing interference and to correct any interference that may occur.

We encourage the manufacturers to include information for the users, including the operators and installers, to ensure that they understand that it is incumbent on them to cooperate with manufacturers to implement any changes necessary to facilitate compliance.

Devices may be optionally designed not to transmit on channels which overlap 5570 – 5680 MHz instead of requiring installers to perform site-by-site adjustments. In that case it is still required that the devices should be installed professionally and the procedures for registering the device in the industry database should be included in the Users Manual.

A voluntary WISPA sponsored database has been developed that allows operators and installers to register the location information of the UNII devices operating outdoors in the 5470 – 5725 MHz band within 35 km of any TDWR location (see <http://www.spectrumbridge.com/udia/home.aspx>). This database may be used by government agencies in order to expedite resolution of any interference to TDWRs.

For example, device software must not have any country code options or software configuration settings which allow an end user to modify the DFS operation or impact the performance of DFS. See KDB 594280.

The TCBs are not permitted to approve transmitters with radar detection capabilities. See KDB 628591.

The manufacturers may consider taking steps providing clear instructions to operators and installers of devices as to the need to comply with rules for use of the band, guidance on registration of devices and any other processes that are designed to avoid interference. They may use methods that include, but are not limited to, instructions in manuals, notification on product web pages and service bulletins issued for products in the field.

TDWR Location Information

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
GA	ATLANTA	W 084 15 44	N 33 38 48	5615 MHz	962	113
IL	MCCOOK	W 087 51 31	N 41 47 50	5615 MHz	646	97
IL	CRESTWOOD	W 087 43 47	N 41 39 05	645 MHz	663	113
IN	INDIANAPOLIS	W 086 26 08	N 39 38 14	5605 MHz	751	97
KS	WICHITA	W 097 26 48	N 37 30 26	5603 MHz	1270	80
KY	COVINGTON	W 084 34 48	N 38 53 53	5610 MHz	942	97
KY	LOUISVILLE	W 085 36 38	N 38 02 45	5646 MHz	617	113
LA	NEW ORLEANS	W 090 24 11	N 30 01 18	5645 MHz	2	97
MA	BOSTON	W 070 56 01	N 42 09 30	5610 MHz	151	113
MD	BRANDYWINE	W 076 50 42	N 38 41 43	5635 MHz	233	113
MD	BENFIELD	W 076 37 48	N 39 05 23	5645 MHz	184	113
MD	CLINTON	W 076 57 43	N 38 45 32	5615 MHz	249	97

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
MI	DETROIT	W 083 30 54	N 42 06 40	5615 MHz	656	113
MN	MINNEAPOLIS	W 092 55 58	N 44 52 17	5610 MHz	1040	80
MO	KANSAS CITY	W 094 44 31	N 39 29 55	5605 MHz	1040	64
MO	SAINT LOUIS	W 090 29 21	N 38 48 20	5610 MHz	551	97
MS	DESOTO COUNTY	W 089 59 33	N 34 53 45	5610 MHz	371	113
NC	CHARLOTTE	W 080 53 06	N 35 20 14	5608 MHz	757	113
NC	RALEIGH DURHAM	W 078 41 50	N 36 00 07	5647 MHz	400	113
NJ	WOODBRIDGE	W 074 16 13	N 40 35 37	5620 MHz	19	113
NJ	PENNSAUKEN	W 075 04 12	N 39 56 57	5610 MHz	39	113
NV	LAS VEGAS	W 115 00 26	N 36 08 37	5645 MHz	1995	64
NY	FLOYD BENNETT FIELD	W 073 52 49	N 40 35 20	5647 MHz	8	97
OH	DAYTON	W 084 07 23	N 40 01 19	5640 MHz	922	97
OH	CLEVELAND	W 082 00 28	N 41 17 23	5645 MHz	817	113
OH	COLUMBUS	W 082 42 55	N 40 00 20	5605 MHz	1037	113
OK	AERO. CTR TDWR #1	W 097 37 31	N 35 24 19	5610 MHz	1285	80
OK	AERO. CTR TDWR #2	W 097 37 43	N 35 23 34	5620 MHz	1293	97
OK	TULSA	W 095 49 34	N 36 04 14	5605 MHz	712	113
OK	OKLAHOMA CITY	W 097 30 36	N 35 16 34	5603 MHz	1195	64
PA	HANOVER	W 080 29 10	N 40 30 05	5615 MHz	1266	113
PR	SAN JUAN	W 066 10 46	N 18 28 26	5610 MHz	59	113
TN	NASHVILLE	W 086 39 42	N 35 58 47	5605 MHz	722	97
TX	HOUSTON INTERCONTL	W 095 34 01	N 30 03 54	5605 MHz	154	97
TX	PEARLAND	W 095 14 30	N 29 30 59	5645 MHz	36	80
TX	DALLAS LOVE FIELD	W 096 58 06	N 32 55 33	5608 MHz	541	80

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
TX	LEWISDALE DFW	W 096 55 05	N 33 03 53	5640 MHz	554	31
UT	SALT LAKE CITY	W 111 55 47	N 40 58 02	5610 MHz	4219	80
VA	LEESBURG	W 077 31 46	N 39 05 02	5605 MHz	361	113
WI	MILWAUKEE	W 088 02 47	N 42 49 10	5603 MHz	820	97113

Wireless Country Approvals

Regulatory markings are applied to the device signifying the radio(s) are approved for use in the following countries: United States, Canada, Australia, and Europe.

Please refer to the *Declaration of Conformity (DoC)* for details of other country markings. This is available at: <http://www.motorola.com/doc>.

Note 1: For 2.4 GHz Products: Europe includes, Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Operation of the device without regulatory approval is illegal.

Health and Safety Recommendations

The Federal Communications Commission (FCC) with its action in ET Docket 96-8 has adopted a safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC certified equipment. Boyce Technologies, Inc. products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this radio according to the instructions found in this manual will result in user exposure that is substantially below the FCC recommended limits.

Warnings for the Use of Wireless Devices

Please observe all warning notices with regard to the usage of wireless devices.

Potentially Hazardous Atmospheres

You are reminded of the need to observe restrictions on the use of radio devices in fuel depots, chemical plants etc. and areas where the air contains chemicals or particles (such as grain, dust, or metal powders).

Safety in Hospitals

Wireless devices transmit radio frequency energy and may affect medical electrical equipment. When installed adjacent to other equipment, it is advised to verify that the adjacent equipment is not adversely affected.

RF Exposure Guidelines

The device complies with internationally recognized standards covering human exposure to electromagnetic fields from radio devices.

Reduce RF Exposure - Use Properly

Only operate the device in accordance with the instructions supplied.

Remote and Standalone Antenna Configurations

To comply with FCC RF exposure requirements, antennas that are mounted externally at remote locations or operating near users at stand-alone desktop or similar configurations must operate with a minimum separation distance of 28 cm from all persons.

Power Supply

Use only a power-over Ethernet 802.3at compliant solution. The required power rating is 25.5 Watts.

Wireless Devices - Countries

Country Selection

Select only the country in which you are using the device. Any other selection will make the operation of this device illegal.

Operation in the US

The available channels for 802.11 b/g operation in the US are Channels 1 to 11. The range of channels is limited by firmware.

The FCC requires that the FCC ID label be placed on the outside of the device. If the device is placed in a protective enclosure that requires tools to access, a permanent label with FCC ID must be placed on the exterior of the protective enclosure

Radio Frequency Interference Requirements - FCC



This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential 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/TV technician for help.

Radio Transmitters (Part 15)

This device complies with Part 15 of the FCC Rules. 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.

Radio Frequency Interference Requirements - Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Devices using the 5.470 – 5.725 GHz band shall not be capable of transmitting in the 5.60-5.65 GHz band in Canada, make sure that Canada is the country selected during setup to ensure compliance.

Radio Transmitters

This device complies with RSS 210 of Industry & Science 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.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that permitted for successful communication.

This device has been designed to operate with the antennas listed in this guide, and having a maximum gain of 8 dBi (2.4 GHz) and 10 dBi (5 GHz) for radios one and two. Antennas not included in this list, or having a gain greater than 8 dBi (2.4 GHz) and 10 dBi (5 GHz) for radios one and two, are prohibited for use with this device. This device has been designed to operate with the antennas listed in this guide, and having a maximum gain of 4.5 dBi (2.4 GHz) and 7.5 dBi (5 GHz) for radio three. Antennas not included in this list, or having a gain greater than 4.5 dBi (2.4 GHz) and 7.5 dBi (5 GHz) for radio three, are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Label Marking: The Term "IC:" before the radio certification signifies that Industry Canada technical specifications were met.

This device has been designed to operate with the antennas listed.