TECHNICAL ACQUAINT # 124a

SUBJECT: **9160 Wireless Gateway Installation Guide**

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DATE:

DISTRIBUTION: **TA and FCN Distribution List**

IMPORTANT: The 9160 must be installed by qualified Psion Teklogix personnel.

Choosing The Right Location

Typically, Psion Teklogix conducts a site survey in the plant and then recommends the preferred locations for the 9160s. These locations provide good radio coverage, minimize the distance to the host computer or network controller, and meet the environmental requirements.

Environment

The 9160 Wireless Gateway should be located in a well-ventilated area and should be protected from extreme temperature fluctuations (i.e. direct heater output, shipping doors or direct sunlight). If a protective cover is required, it must have enough ventilation to maintain the 9160's surface at or near room temperature.

Refer to "Chapter 25: Specifications" in the *9160 Wireless Gateway User Manual* for a more detailed description of environmental requirements. Keep in mind that the long term stability of this equipment will be enhanced if the environmental conditions are less severe than those listed in this manual.

The 9160 should be situated away from the path of vehicles and free from water or dust spray. The 9160 should only be mounted in the upright position, as shown in Figure 1 below. This orientation minimizes the risk of water entering the 9160, should the unit accidentally be sprayed.

The 9160 is attached to a vertical surface using four fasteners on the rear plate (type of fasteners are dependent on mounting surface). The top two holes in the rear plate are slots, allowing the unit to be hung in position before the remaining bolts are installed. The bolts used for installation are SAE 1/4-20.
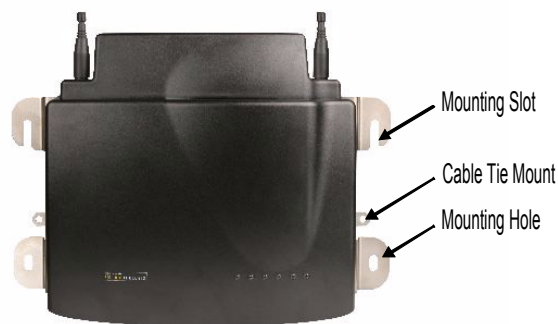
Figure 1: 9160 Installation Position

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Maintenance

The 9160 has no internal option switches and does not require physical access; all configuration settings are done remotely (see "Navigating to Basic Settings" in the *9160 Wireless Gateway User Manual*). Environmental and radio communication considerations do still apply.

Radios

Mini-PCI 802.11g radio without integrated antenna (standard).

Mini-PCI 802.11a/g radio without integrated antenna (optional second radio).

Power And Antenna Cables

Power

To prevent accidental disconnection and stress on the 9160, antenna and power cables should be secured within 30 cm of the unit. Secure the cables with ties to the cable tie mounts on the 9160 (see Figure 1 above). A single phase power outlet (range 100 to 240 VAC rated 1.0A minimum) should be installed within one metre (3.1 feet) of the 9160. The 9160 automatically adjusts to input within that power range. The power cable is removable and is available in the power type specific to your location. The 9160 AC power supply has a universal input via a standard IEC320 connector.

To eliminate the need for AC wiring, the 9160 Wireless Gateway is compliant with IEEE 802.3af and can be powered over its Ethernet connection. For detailed information, see "Power Over Ethernet Requirements" in the *9160 Wireless Gateway User Manual*.

WARNING: ***To avoid electric shock, the power cord protective grounding conductor must always be connected to ground.***
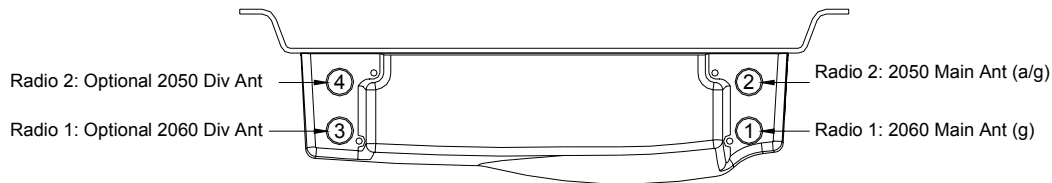
Antennas

The type of antenna required for each installation depends on the coverage requirements and the frequencies used. For more detailed information on the Psion Teklogix antennas available for use, please refer to TA071. Generally, a site survey determines the appropriate antenna.

The 9160 has four reverse-thread SMA jacks on top. The two front connectors can connect to RA2060 (802.11g), and the two rear SMAs can connect to RA2050 (a/g). See Figure 2.

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9160 with 2x SS RAD - TOP VIEW

Radio 2: Optional 2050 Div Ant — ④
Radio 1: Optional 2060 Div Ant — ③
Radio 2: 2050 Main Ant (a/g) — ②
Radio 1: 2060 Main Ant (g) — ①

NOTE: Tighten SMA connector to 8 lb/in (0.9 N/m).

Figure 2: 9160 Top View

The RA2050 and RA2060 radios support transmit and receive antenna diversity. With transmit diversity the radio decides if it wants to transmit on the main or diversity antenna port. Transmit diversity switching is much slower than diversity switching, typical dwell time is in the order of seconds. Diversity switching is done on each packet received.

Normally the same antenna is used for both the main and diversity port. There is a special case where different antennas are used, such as setting up a WDS link in Europe where the EIRP puts a limit on the gain of the main antenna. Please refer to TA# 065 for more information.

A dual band 'screw-on' articulated blade antenna is available for small areas. A maximum of two screw-on antennas is allowed, and they can be used with either Radio 1 or Radio 2. In other words, you can install the screw-on antennas on SMA jacks 1 and 3 (for Radio 1), or 2 and 4 (for Radio 2) ONLY. Never install them in any other combination, doing so will cause interference between the radios (even if one operates in the 2.4 GHz and the other in the 5 GHz band.)

WARNING: Never operate the 9160 without a suitable antenna or a dummy load.

IMPORTANT!

1. FCC Requirement

   To meet FCC regulatory approval, the max RF power in the 9160 must be set according to the type of antenna used. As professional installers, Psion Teklogix personnel must abide by this rule or risk legal action brought against the company.

   To set the maximum RF output from the radio follow these steps:

   - telnet to the 9160.

   - Enter "max_tx wlan0 xx" to set maximum transmit power to xx% of Radio 1's default value. Similarly, "max_tx wlan1 xx" sets the maximum transmit power for Radio 2 (a/g). Example: if max_tx is set to 60% and "Transmit power" on the web UI is set to 50%, the total power transmitted is 30%, (0.6 x 0.5 = 0.3). See Table 1 for values.
     Tip: determine the radio type (RA2050 or RA2060), then determine if operating in a country that follows FC or ET regulations, and finally, read the % value for the antenna in use.

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2.   9160 Software Power Setting vs. Antenna (per FCC Requirement)

NOTE: The FCC imposes a limit on maximum transmit power based on antenna gain, not effective radiated power at the antenna. Therefore power settings for FCC application do not take into account cable loss.

Antenna (2.4GHz only)	Gain	PTX Part #	RA2060 Power Limit Setting (%) [1]
Omni	2dBi	30222	100%
	2dBi	9001953	100%
	5dBi	93977	100%
	7dBi	94070	100%
	8dBi	1000642	100%
	12dBi	21266	100%
Patch	6dBi	9002812	25%
	8.5dBi	9001951	16%
Yagi	10dBi	9000047	25%
	14dBi	21268	10%

(1) 100%=+19dBm

Table 1: RA2060 Power Limit Setting

Frequency	Antenna	Gain	PTX Part #	RA2050 Power Limit Setting (%) [2]
2.4-2.5GHz	Omni	2dBi	30222	100%
2.4-2.5GHz		2dBi	9001953 *	100%
2.4-2.5GHz		5dBi	93977	100%
2.4-2.5GHz		7dBi	94070	100%
2.4-2.5GHz		8dBi	1000642	50%
2.4-2.5GHz		12dBi	21266	20%
2.4-2.5GHz	Patch	6dBi	9002812	40%
2.4-2.5GHz		8.5dBi	9001951	20%
2.4-2.5GHz	Yagi	10dBi	9000047	40%
2.4-2.5GHz		14dBi	21268	16%
5.15-5.35GHz	Omni	4dBi	9001953 *	100%
5.15-5.35GHz		6dBi	9002008	40%
5.25-5.35GHz		10dBi	9002009	100%
5.725-5.825GHz		12dBi	9001950	100%
5.25-5.35GHz	Patch	10dBi	9001952	100%
5.725-5.825GHz		18dBi	9002007	100%
5.725-5.825GHz	Dish	28dBi	9002006	20%

(2) 100%=+19dBm

Table 2:   RA2050 Power Limit Setting

3. ETSI Requirement

TBD

Connection To Outdoor Antenna

The antenna must be installed by a qualified service person and installed according to local electrical installation codes. The antenna should be located such that it is always at least 15 ft (4.6 m) high and 10 ft (3 m) from the user and other people working in the area.

For a 9160 connecting to an outdoor antenna, all the following notes are applicable:

1. The shield of the outdoor antenna coaxial cable is to be connected to earth (independent of the 9160) in the building installation, provided the installation is acceptable to the authorities in the country of usage.

2. A supplementary equipment earthing conductor is to be installed between the 9160 and earth—that is, in addition to the equipment earthing conductor in the power supply cord.

3. The supplementary equipment earthing conductor may not be smaller in size than the unearthed branch-circuit supply conductors (min 0.75 sq. mm nominal cross-sectional area or 18AWG). The supplementary equipment earthing conductor is to be connected to the 9160 at the terminal provided, and connected to earth in a manner that will retain the earth connection when the power supply cord is unplugged. The connection to earth of the supplementary earthing conductor shall be in compliance with the appropriate rules for terminating bonding jumpers in the country of usage. Termination of the supplementary equipment earthing conductor is permitted to be made to building steel, to a metal electrical raceway system, or to any earthed item that is permanently and reliably connected to the electrical service equipment earthed.

4. Bare, covered, or insulated earthing conductors are acceptable. A covered or insulated earthing conductor shall have a continuous outer finish that is either green (Canada and USA only), or green-and-yellow (all countries).

5. Avoid servicing during an electrical storm. There may be a remote risk of electrical shock from lightning.

6. For Finland, Norway, and Sweden, the equipment is to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied. The permanently connected PROTECTIVE EARTHING CONDUCTOR is to be installed by a SERVICE PERSON.

WARNING: For RF safety considerations, users are not allowed to approach close to the antenna.

Psion Teklogix supplies the coaxial cable required to connect the 9160 to the antenna. When determining the location of the antenna, the coverage requirements of the antenna are considered in conjunction with the environmental requirements of the 9160. The coaxial cable must be routed and secured using wire anchors and/or coaxial nail clips. A few extra inches of cable are required near the antenna and the 9160 to make disconnection easier.

Connecting To External Devices

This section contains general guidelines for connecting the 9160 to external devices such as network controllers, base stations, host computers, PCs, and video display terminals.

Ports

Figure 3 shows the locations of the port and power connectors on the base of the 9160. The port pinouts are described in "Appendix B: Port Pinouts and Cable Diagrams" in the *9160 Wireless Gateway User Manual*.
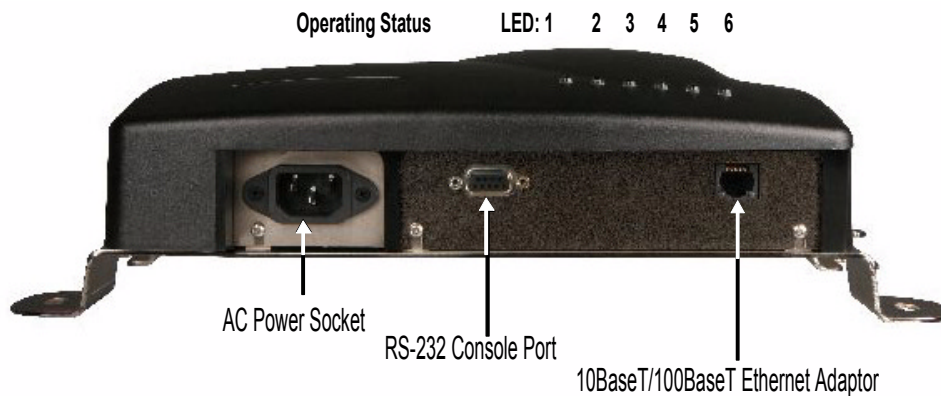
Figure 3: 9160 Port And LED Locations

LAN Installation: Overview

Because the 9160 provides Ethernet connectivity, it can be added to an existing LAN. Generally, LAN installations are handled with the help of the network administrators, as they are familiar with their network and its configuration.

Once the 9160 is installed, connected and powered on, the system administrator can access the unit to check the configuration and to assign the 9160 its unique IP address. This may be done through the network (see " Changing The Configuration With A Web Browser" on page 7). Subsequent changes in the network, such as the addition of stations or users, would also require that the 9160 configuration be changed.

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IMPORTANT: *Once the 9160 is configured and rebooted the first time, the DHCP should be disabled—unless the 9160 obtains its IP address from a server.*

LAN Installation: Ethernet

The 9160 is a high-performance controller that supports 100Mb/s Fast Ethernet LANs, as well as 10Mb/s, with both full and half duplex operation. It comes equipped with a 10BaseT/100BaseT card (using a category-5 twisted pair cable, an RJ-45 connector, running at a rate of 10 or 100Mb/s).

NOTE: The 9160 does not support any connection type other than Ethernet 10BaseT and 100BaseT.

For a description of port pinouts, refer to "Appendix B: Port Pinouts and Cable Diagrams" in the *9160 Wireless Gateway User Manual*.

Ethernet Cabling

The maximum cable segment length allowed between repeaters for the 9160 (10BaseT/100BaseT Ethernet cabling) is 100 m.

Status Indicators (LEDs)

The high-performance 9160 has six status indicators on the front of the enclosure, as shown in Figure 3. The numbered and coloured LEDs on the front of the unit indicate the operating status for each port, as described in Table 3.

LED Number	Name	Function	Colour
1	Ethernet link	Link indicator for 10BaseT/100BaseT: ON = good link; OFF = no link	yellow[*]
2	Ethernet activity	Ethernet LAN activity (Rx/Tx)	green
3	Radio 1 status	Radio 1 activity (Rx/Tx)	green
4	Radio 2 status	Radio 2 activity (Rx/Tx)	green
5	Not used	Always off (unused)	green
6	Power	LED On solid = Unit powered LED Off = No power to unit	green

[*]*LED 1 colour shows orientation of LEDs when viewed from a distance.*

Table 3: 9160 LED Functions: Front Enclosure

Connecting A Video Display Terminal

An ANSI compatible video display terminal (e.g., DEC VT220 or higher), or a PC running terminal emulation, is used for diagnostic purposes.

The terminal is connected to the RS-232 port on the 9160 (see Figure 3). This port is normally set to operate at 19,200 baud, 8 bits, 1 stop bit, no parity. To comply with Part 15 of the FCC rules for a Class B computing device, only the cable supplied (Part no. 19387) should be used.

Changing The Configuration With A Web Browser

The 9160 Flash memory can be reconfigured remotely via the network using a standard HTML Web Browser such as MS Internet Explorer (version 4.0 or later) or Firefox. See "Chapter 4: Quick Steps for Setup and Launch" in the *9160 Wireless Gateway User Manual* for instructions on changing the parameters and general configuration settings.