PinPoint

PinPoint Corporation

System Hardware Introduction

FCC Regulations

This system 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.

Warnings

Changes or modifications not expressely approved by PinPoint Corporation could void the user's authority to operate the equipment.

Contents

Section 1: Introduction to the System

WELCOME

Welcome to the 3D-iD system. The 3D-iD system is an LPS (Local Positioning System) designed to take asset and personnel tracking to the next level. Where GPS supplies global, outdoor, positioning data, the 3D-iD LPS system provides local, indoor and outdoor, positioning data. In addition, the system comes with a variety of tools that enable you to track and monitor "tagged" assets in three-dimensional space. The purpose of this manual is to introduce you to the system's technology and walk you through the an overview of its installation.

There are myriad applications for the technology – applications which previous technologies, due to their many limitations – cannot address. In manufacturig and distribution applications, the 3D-iD system can help shippers find containers in shipping yards. In healthcare, it can be used to insure that hospitals can keep track of their valuable assets, decreasing lost equipment and increasing efficiency.

The 3D-iD system relies on a combination of hardware and software. Before examining the system's operation, we'll take a brief look at the components that make up the system. The two elements relevant to an end-user include:

- Tags that are attached to assets or people which are to be tracked
- A suite of software applications that present the user with information about Tag locations and conditions.

The remaining elements, all of which have to be installed and configured, include:

- The Antennas,
- The Cell Controllers
- The software infrastructure.

In this manual, we'll briefly explore each of these elements.

How the 3D-iD System Works:

The 3D-iD system is comprised of two basic parts, a hardware and a software system. The combination of the two systems allows tags to be located, tracked and secured throughout an installation site. The hardware side of the system generates Tag Antenna Distance (TAD) data, while the software side of the system converts that data to other forms, and presents it to the end-user.

The hardware side of the system consists of three parts: Tags, Antennas and Cell Controllers.

- Tags are the objects tracked – they can be affixed to an asset or person, allowing the system to track that asset or person.
- Antennas are stationary devices from which TAD distances are measured. They are supplied with DC power via their coaxial cable connection to a Cell Controller.
- Cell Controllers are the brains of the hardware side of the system. They coordinate the antennas and use the roundtrip time required for a radio signal to travel from an antenna to a tag to calculate the distance between the Tags and Antennas. This is what we call TAD (Tag-Antenna Distance) data.

Once TAD data has been generated, it is forwarded to a ViewPoint Server on the software side of the system. Which then converts that data into Location and Alert data and publishes it to client applications.

Location (or LOC) data is data that indicates the Location (which are derived from logical statements involving TAD variables) that a tag is in. A Location can be a room, a wing or even an entire floor, depending on the configuration of the system.

Alert (or ALR) data is data that is generated based on certain ‘trigger’ events for single tags or pairs of tags. There are two basic groups of alert conditions. The first group, alerts associated with a single tag, can be set when a tag enters or exits an area or when a tag remains within a certain location for a set period of time. The second group, alerts associated with a pair of tags, can be triggered when one tag enters an area without the other, when the two tags are near one another or when the two tags are far from one another.

Detailed information about the ViewPoint Server is available in the User's Manual. In brief, ViewPoint's NT Services (which are programs that run in the background on the server, and require no user input) receive the TAD data. These services then use lookup tables created by the user when the software system is setup to convert the TAD data into Location (LOC) and Alert (ALR) data. The services then publish that data to various client applications which end-users use to view specific data. The services can also publish data to a Recorder service, which saves data to a database.

Combined, the hardware and software elements of the PinPoint system can generate a wide variety of data based on the location of tags.

How the Hardware Works:

The purpose of PinPoint's 3D-iD's hardware system is to determine the distance between tags and antennas. There are three elements involved in this process. The first two are the tags and the antennas. The third is the cell controller, which coordinates the actions of the tags and antennas – and interprets their signals.

Each tag is 'on' (and detectable) for a very short period of time. Because this "on" time is so brief - relative to the "off" times - the chances of two tags being on at once are very remote. With this in mind, we can examine the Cell Controller's operation. The Cell Controller's basic job is to record the amount of time a radio signal takes to go between each antenna and the tag which is currently 'on' and back. The Cell Controller can calculate the distance between a single Antenna and a Tag from the transmission time and the speed of light. The following is the procedure it follows for deriving the time needed for a radio signal to travel between the Tag and the Antenna:

1. The Cell Controller sends an antenna a spread spectrum radio signal to broadcast to the tags at 2.442GHz.
2. Whichever tag is on at that moment (assuming one is on and in range of the antenna):
    2.1. Receives the signal
    2.2. Converts it to 5.770GHz
    2.3. Modulates its unique serial number on the return signal
    2.4. Retransmits the signal
3. The current antenna receives the signal and sends it back to the Cell Controller.
4. The Cell Controller receives the signal and runs filters to remove multi-path and then demodulates the signal.
5. The Cell Controller determines the delay between the sent and the received message and then uses that to calculate the distance between the tag and the antenna.
6. The newly created Tag Antenna Distance (TAD) data is then forwarded to the Cell Controller's subscribers in the software system.
7. The Cell Controller then returns to step one, cycling the next antenna. The Cell Controller cycle time is fast enough for every antenna on a Cell Controller to detect a tag during that single tag's 'on' time.

8. By cycling constantly, the Cell Controller repeats the process for every tag within reach of its antennas.

The 3D-iD tags are designed using L^3RF technology. They are designed for Long range, Long battery life and Low cost. In an open environment, a tag can be “seen” at more than 100 feet. This is a far greater distance than traditional RFID tracking technologies can offer. In addition, a tag’s battery typically lasts over 1 year. With some configurations, a tag’s battery can last over 5 years.

What defines the tag as an L^3RF device? The technology is proprietary, however, there are some interesting technologies involved.

Spread Spectrum Technology:

First and foremost, the system uses direct sequence spread spectrum technology. Spread spectrum is used because the technology allows for clear transmission over long distances with little signal strength. In addition, spread spectrum technology allows for the operation of many devices within a single frequency range. This removes the impractical requirement that a frequency be set aside soley for use of the 3D-iD system. *Direct Sequence* spread spectrum is used because alternatives, such as frequency hopping spread spectrum, require significantly more complex hardware and far greater system synchronization. This hardware would complicate Tag, Antenna and Cell Controller design, raise maintenance costs, increase Tag weight and significantly increase the initial costs of the system. For more details, see the *www.pinpointco.com*

Dual Frequency Technology:

The 3D-iD system also relies on a unique dual frequency architecture. The Antennas send signals to the Tags at 2.442GHz. The Tags respond with a 5.770GHz signal. The dual frequency approach is used to remove the complexities of separating modulated Tag responses from unmodulated radio reflections when both lie within a single frequency. Take as an example a signal that is broadcast by an antenna at one frequency when the antenna is listening at that same frequency. Metal walls and other objects might bounce back a “false” return signal that would be difficult to distinguish from a geniune Tag return signal. If the tag responds at another frequency, in this case, at 5.770GHz, its signal need only be separated from the surrounding noise - not from very similar versions of itself.

While the 3D-iD system benefits from the strenths of L^3RF technology, it must be kept in mind that various factors can negatively influence the effectiveness of the system. Shorter “chirp” rates - the rates at which the tag announces its presence - will result in shorter battery lives. In addition, microwave ovens, thick walls and metal surfaces - among other things - can significantly impact an Antennas effective range.

Rule Sets

A brief examination of rule sets is suggested before the installation overview is begun. While the technician who carries out the site survey will define the location rule set for the site, an understanding of what rule sets are is very important.

Rule Sets define how the software side of the 3D-iD system interprets TAD data. An end-user has very little use for TAD data in and of itself. For example, knowing how far a wheelchair is from a particular antenna is of little practical use to a nurse sitting at a desk. Far more useful would be some sort of data indicated which room a wheelchair is in - or perhaps simply an alert if a wheelchair goes someplace it is not supposed to. Rule Sets, which are lookup tables of a sort, were created to convert TAD data to more useful formats.

As previously mentioned, alert sets are used to convert TAD data into two other forms of data.

> The first of these is Location (or LOC) data. Location data is data that indicates the Location (which are derived from logical statements involving TAD variables) that a tag is in. A Location can be a room, a wing or even an entire floor, depending on the configuration of the system.
>
> The second kind of data is Alert (or ALR) data. Alert data is generated from Location data. Alert data is data that is generated based on certain 'trigger' events for single tags or pairs of tags. There are two basic groups of alert conditions. The first group, alerts associated with a single tag, can be set when a tag enters or exits an area or when a tag remains within a certain location for a set period of time. The second group, alerts associated with a pair of tags, can be triggered when one tag enters an area without the other, when the two tags are near one another or when the two tags are far from one another.

Location Data

TAD data is converted to LOC data by means of a Location Rule Set. The first kind of Rule Set is called a Location Rule Set. A Location Rule Set works by reading in TAD data and testing it against a list of user-defined statements. Each statement is associated with a Location. These statements are descriptions of locations in terms of TAD data. For example, a basic statement, in plain english, might read “A tag is in this location if it is within 10 feet of Antenna 2 on Cell Controller 1 and more than 20 feet from Antenna 3 on Cell Controller 1. “

A very common type of Location statement is called the *closest to* statement. Just like a tag can be said to be in a location because it is less than 15 feet from a certain antenna, it can also be said to be in a location if it is closest to a particular antenna. This can allow for a very simple definition of locations. A basic *closest to* statement might read “A tag is in this location if it is *closest to* Antenna 2 on Cell Controller 1.” Please note, *a tag is assigned to the location associated with the first statement in the list that is true*.

The Location Rule Set statements can make use of a standard array of boolean and functional operators. Without exploring the actual syntax, these statements include *and*, *or*, *not*, *parenthetical* and *closest to* statements. All behave as they would normally be expected to.

A syntax reference for Location Rule Sets is available in the ViewPoint User’s Manual.

Alert Data

An Alert Rule Set is used to convert Location Data to Alert Data. The idea behind Alert data is quite simple. When Tag location data matches certain conditions, an Alert will be fired. There is no need to define conditions before installing the system. Doing so might be counterproductive, as many of the Alerts depend on the assets the tags themselves are attached to. But, it is important to have a general idea about what kinds of alerts will be created. The details of Alerts pertain to the types of Locations that should be created -- and, by extension, on where antenna should be placed.

For reference, there are 8 Alert Types, 4 of which are Single Tag Alert Types and 4 of which are Paired Tag Alert Types:

Single Tag Alert Types

Entry: The Entry Alert is triggered when the associated Tag enters a particular location.

Exit: The Exit Alert is triggered when the associated Tag exits a particular location.

Stationary: The Stationary Alert is triggered when the associated Tag remains in the indicated location for a set period of time.

TimeOut: The Timeout alert is fired when a Tag was last heard from in the indicated location, but has not been heard from in any location for a set period of time. Any subsequent chirp from this Tag in any location clears this Alert.

Paired Tag Alert Types

Escort: The Escort Alert is triggered when the tag selected first in the pair enters a particular location without the second tag.

Pair: The Pair Alert is triggered when either tag enters a particular location without the other.

Friend: The Friend Alert is triggered when two tags within a particular location are separated by more than a set distance.

Foe: The Foe Alert is triggered when two tags within a particular location are nearer than a set distance from each other.

Section 2: Installation Planning

Customer Consultation

The first step in setting up a 3D-iD Installation is the customer consultation. A customer's needs must be assessed before any hardware placement work can begin. There is a series of questions that must be answered before work can proceed. The following are the questions which must be answered:

What type of coverage is required?

There are several basic types of coverage. These include:

Portal Coverage
Which is coverage of entrances and exits

Zonal Coverage
Which is coverage of certain locations, or zones

Tracking Coverage
Which is the fullest type of coverage allowing the tracking of real time movement.

Antennas can be placed much more sparingly if portal coverage is all that is required. Greater antenna density will be required if broader coverage is necessary.

Where is coverage required?

Once the type of coverage has been assessed, it is generally a good idea to lay out where coverage is actually required. Working from a floorplan, required locations can be drawn. For example, if laying out portal coverage, locations should be drawn around entrances and exits. The technicians carrying out the site survey and antenna layout procedure can then use the Locations drawn on the floorplan as a road map for antenna placement.

What types of assets are to be tagged, and for what purpose?

There is a tradeoff between a tags' reporting rates and the amount of time required to track them. In a situation where there are 500 tags, each reporting every second, and all within the domain of a single cell controller, the Cell Controller will have a difficult time tracking the tags quickly. If, however, those 500 tags are reporting in every 3 seconds the Cell Controller will be able to see all of them far more quickly. Tags can be set to report at a variety of intervals. For assets which need to be closely monitored, like notebook computers, faster reporting will probably be required. If an asset does not need to be closely monitored, the Cell Controller will have an easier time tracking tags if the tag reporting time is larger. The tag reporting time is technically referred to as its chirp time. More detailed documentation on chirp times and how they affect Cell Controller behavior is available in the Tag Specification in Section 3 of this manual.

Are the client systems able to run the ViewPoint Client software?

The client systems must be running with the minimum characteristics described in the Equipment Descriptions and Specifications.

Is the infrastructure prepared for the 3D-iD Components?

A great deal of infrastructure work can be done later in the process. But it should be understood that existing ethernet and power drops, as well as predefined routes which are setup for cabling can greatly simplify the installation procedure.

Initial Site Survey

Once the customer's requirements have been examined, a site survey can be carried out. While we will briefly explain what the survey is and why it is done, referral to a PinPoint technician for your actual site survey is highly recommended. As the process is extremely complicated, our technicians are very practiced at it and effective at quickly and accurately completing it.

A site survey is carried out in order to ensure that assets will be tracked in the areas where they must be tracked. Working from the customer's coverage requirements, the placement and direction of antennas must be precisely determined. Correctly placed antennas will allow for easier location and alert configuration.

The initial site survey involves setting up a test 3D-iD system and extensively testing various possible antenna positions to ensure that tags can be "seen" by antennas where coverage is required. In determining which antenna positions to test many factors are taken into account. Among them,

- The effects of metal surfaces such white boards or metal equipment on RF signals.
- The effects of microwave ovens and other RF emitters.
- The types of wall construction at a facility. Wall Construction can and will affect the visibility of Tags by Antennas. Standard drywall constructions do not drastically affect Antenna performance. However, cinderblock, "firewalls", hard plaster and many older style constructions will stop the Antenna signal.
- Holes in walls (such as doors or windows) that may more easily permit the transit of RF signals.

While the site survey is being carried out, the exact locations of every antenna and Cell Controller are chosen. In addition, the strength of the antennas' signals and the signal to noise threshold used to filter the tags' return signals are set for each antenna. When placing Cell Controllers and Antennas, care is taken to ensure that they are within cabling length of each other.

Once the site survey is complete, the installer will have available a floorplan detailing the placement of every antenna, Cell Controller and Server (although there is greater leeway in Server placement). With this information in hand, the actual installation of the 3D-iD elements can proceed.

Physical Installation

The physical installation of the 3D-iD system involves the placement of 4 components. These include, as mentioned in the Installation Planning section, the Antennas, Cell Controllers and Servers. In addition, tags must be attached to assets. While extensive documentation on the actual installation of all of these elements is available in the packaging for each element, a brief explanation of the installation process is included below. It is generally suggested that the elements of the 3D-iD system be installed in the following order:

1. Antennas
2. Cell Controllers
3. Antenna/Cell Controller Cabling
4. Tags
5. 3D-iD Server
6. ViewPoint (Client) Software Installations

Antennas

1. Attach the base of the antenna mount to the wall where the antenna should be placed. In situations where the antenna is to be mounted in other types of locations, such as under a drop ceiling, additional mounting creativity might be required.
2. Attach the antenna to the mount, and align it in the manner determined by the technician during the site survey.
3. The antenna must be installed so that there is at least a 6 inch gap between it and any possible contact with people. Failure to install it in this fashion may invalidate the user's license to operate this product.

Cell Controllers

1. Place the Cell Controller in the location determined earlier.
2. Ensure that the Cell Controller has adequate ventilation.
3. Attach the power and network cabling to the Cell Controller.

Antenna/Cell Controller Cabling

For each Cell Controller/Antenna combination:

1. String cable from the Cell Controller towards the Antenna. Leave 1-2 feet of cable at the Cell Controller. In order to avoid bends or kinks – which will cripple the accuracy of antenna readings - do not attach the cable to the Cell Controller.
2. Coil the extra cabling near the antenna to allow for easier movement of the antenna should the need arise.
3. Connect the cable to both the Cell Controller and the Antenna
4. Label the cable at both ends for future reference. A potential labeling scheme could be based on the Cell Controller Antenna port that the Antenna is connected to.

Tags

1. PinPoint 3D-iD tags should be mounted securely and fixed to the asset. Since the tag's antenna is not omni-directional, try to make certain it is always facing the same way as the asset moves throughout the facility.
2. Make certain that access to the removable battery cover plate on the tag is maintained.
3. Tags must always be mounted with THE BATTERY SIDE FACE DOWN AGAINST THE ASSET. The top of the tag contains the antenna structures, and it is essential that this side stay facing up in order to ensure strong broadcast and reception of RF signals.

3D-iD Server

The 3D-iD Server is perhaps the most complex element to install. Detailed information is available on the ViewPoint installation process with the ViewPoint documentation. The below is a greatly (perhaps too much so) simplified Server installation process. Once you have located an appropriate PC for a primary server and it has been placed on the same subnet as the Cell Controllers:

1. Both DHCP and IIS must be loaded and configured.
2. The 3D-iD server software must be installed on the system.
3. The Configurator application must be run – which involves such procedures as defining the rule sets.
4. Afterwards, the ViewPoint Control Panel must be run on the system in order to define and start the services that will be running on the server.
5. Once the primary server is setup, start up the Cell Controllers that are on the same subnet as the primary server. When you turn on each Cell Controller you will be greeted by one of three beep patterns:
   - An ascending scale indicates that the Cell Controller is working properly.
   - A high-low (daa-dum) tone indicates that something is wrong with the Cell Controller's network connection (is DHCP configured correctly).
   - A Beethoven's fifth (daa-dum-dum-dum) indicates that something is wrong with the Cell Controller's hardware.

There can be additional servers beyond the primary server. These servers host services, but not the Configurator database. In most large scale installations, these additional servers are suggested for load balancing reasons. It is also suggested, for network traffic reasons, that these additional servers be running on the same subnet as the primary 3D-iD server. See the ViewPoint User's Manual for information on installing these servers.

ViewPoint (Client) Applications

To load the client systems simply:

1. Run the ViewPoint Setup program, install the end-user applications.
2. Configure each of the end-user applications by specifying the services they should connect to.

Installation Verification

There are tools that can be used to test whether an installation is functioning correctly. The bulk of those tools are accessible through software. Detailed assistance with those tools is available in the software documentation. However, a summary follows below.

Cell Controller Waveform Viewer – this Cell Controller based applet, accessible from the Configurator, displays waveform data from the Cell Controller's antennas. It can be used to verify that the antennas are hooked up and operating correctly. An X-Window viewer such as Xceed is required to use this utility.

TADView – this application can be used to verify that the Cell Controller is properly broadcasting TAD data. It can also be used to test TADder Service broadcasts.

Location Viewer – this application can be used to verify the functioning of Location Services.

Alert Viewer – this application can be used to verify the correct functioning of Alert Services.

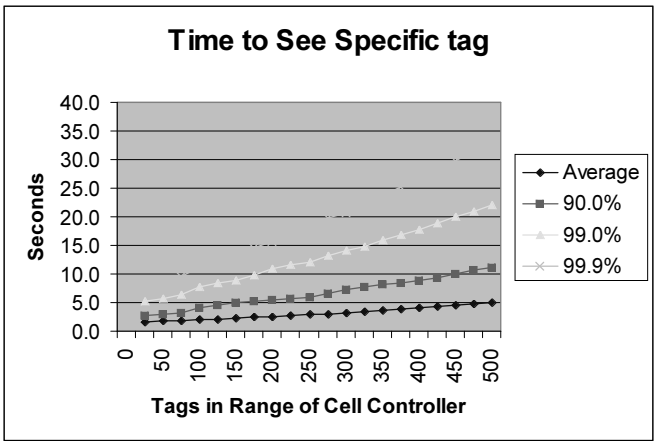
Section 3. Equipment Descriptions and Specifications

TAGS

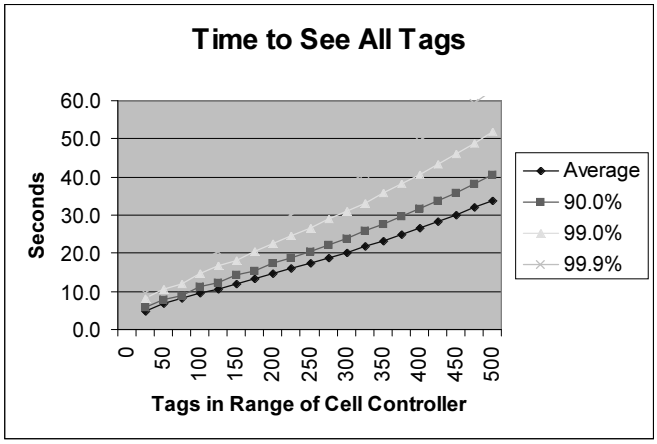
The tag is one of three key elements in the PinPoint 3D-iD hardware system. PinPoint 3D-iD Tags are radio frequency tags that are mounted onto assets or people that are to be tracked. Each tag contains a 2-structure antenna in the opposite configuration of the PinPoint 3D-iD Antenna, but at 500 milliwatts of power. The tag's 5.8 GHz broadcast provides the Cell Controller with a distance measurement from a given antenna, and allows the ViewPoint application to display the location of the tagged item.

Tags can be mounted on flat or curved surfaces using PinPoint's tag mounting kits. Tags are available in asset design or as personnel tags.

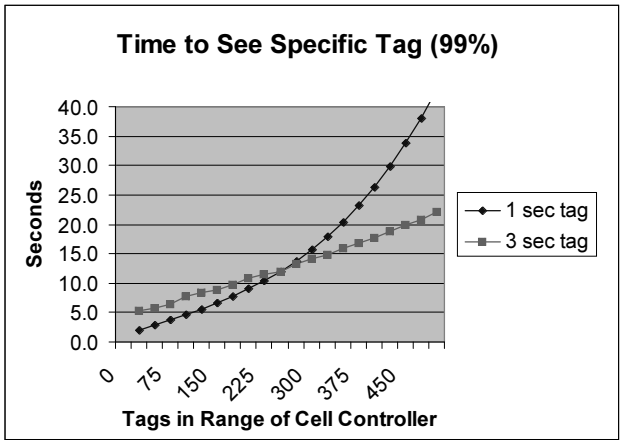
TAG DETECTION



A Tag's chirp length is 2.3ms. While a Tag is chirping, it is responding to incoming signals. A Tag can only be detected by an antenna only while it is chirping. Tags chirp asynchronously, meaning they are not synchronized to the reader or to each other. To prevent two Tags from continuously chirping in synchronization, the chirping interval includes a randomized offset, utilizing a function that incorporates the Tag's ID. The combination of the offset and the very short 2.3 millisecond Tag signals minimize the number of Tag collisions. There is a possibility that Tag reads will be lost due to "collisions", particularly if there are large numbers of Tags in range of a given Cell Controller.



A Tag's chirp interval (the period at which it repeats its chirp) can be set if necessary. A variety of chirping intervals are supported in the T20 tag. The default chirp interval is 3 seconds. Alternatively, chirp intervals of 0.5, 1, 2, 3, 4, 5, 10, 15, 20, 30, 45, or 60 seconds can be set in the factory, in accordance with end-user requirements. Faster chirp rates mean Tags will be detected more rapidly. On the other hand, Tags with faster chirp rates have shorter battery lives. Generally, chirp intervals are set lower for critical hardware and higher for for larger, less mobile or less critical assets such as desks.



System performance depends on the number of Tags in range of individual cell controllers, and whether the Tags chirp frequently or infrequently. For example, if 50 Tags within range of a single Cell Controller are configured to chirp at the default rate of 3 seconds, there is a 99% chance of seeing a specific tag within 5 seconds, and a 99% chance of seeing all Tags within 8 seconds. With 100 Tags, these values increase to 6 and 12 seconds, respectively.

The associated graphs provide performance estimates for various Tag populations within range of a single Cell Controller, up to 500 tags. Two graphs assume the default of a 3-second tag, a third graph shows similar data with a 1-second Tag. Most installations have a large number of Cell Controllers, with the Tags divided among them. For example, if an installation has 750 Tags equally divided among 10 Cell Controllers, system performance can be estimated based on 75 Tags per cell controller. Increasing the number of Cell Controllers, or decreasing the number of chirps per tag can increase system capacity.

With populations of 100 tags or fewer, performance can be substantially improved by configuring tags to chirp more frequently. The third chart shows performance of a tag that chirps once per second, compared with the default of 3 seconds. Note that 3-second tags perform better with tag populations of 300 or more, while 1-second tags are better at lower overall tag populations.

T20 Battery Life

The battery life of a T20 tag is over a year (1.2 years) with a tag that chirps once every three seconds, which is the default. Configuring tags to chirp more frequently then every three seconds reduces battery life roughly proportionally. For example, a tag that chirps twice as frequently will have approximately half the battery life.

Similarly, battery life may be extended by programming tags to chirp less frequently. This is particularly a consideration for asset tracking applications. The battery life roughly doubles by increasing the chirping interval from 3 to 20 seconds.

The T20 is our most current tag model.

Tag Read Range and Orientation Considerations

PinPoint T20 Tags can be read at a distance of 80 meters (250 feet) under ideal conditions. This specification provides margin for the Tag to be read in a wide variety of typical indoor conditions, such as through walls. Specifically, the Tag is designed to be powerful enough to be read through sheet rock walls, but lacks the power to be read through concrete and metal typically found in floor construction. The ability to be read through walls allows Cell Controller antennas to be placed in a hallway, and read the tags in adjacent offices. The inability to be read through floors ensures that a Tag's location will always be identified on the correct floor. This is consistent with many applications, where great precision is not needed as long as the floor is correctly identified.

The Tag's antenna is linearly polarized. In combination with the circularly polarized Cell Controller antenna, the result is that the tag is insensitive to rotation around the radial axis.

The T20 Tag is normally attached to assets or worn as a badge. Therefore, to conserve power the Tag's antenna is designed to emit power from the front of the Tag only. The HPBW (Half Power Beam Width) is approximately 80 degrees on the vertical axis, and 120 degrees on the horizontal axis. Multipath environments typical for indoor applications usually enable a Tag to be read at distances up to about 20 meters, even if the Tag is facing away from the Cell Controller's antenna.

Technical Specification

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.

Tag Size:	2.5" x 3.5" x 0.75"
Transmission Frequency:	5.774GHz
Reception Frequency:	2.884GHz
Survivable Temperature Range:	-40°C (-38°F) to 70°C (158°F)
Operational Temperature Range:	0°C (32°F) to 50°C (122°F)
Effective Range:	3-120' from Antenna
Accuracy/Resolution:	System will locate tag within 10' of actual location 99% of the time.
Radiation Pattern:	180° radiation pattern from outer (Antenna) surface
Default Duty Cycle:	5 sec
Battery Life:	12 months at 5 second duty cycle

Cell Controllers

The Cell Controller acts as the brains for the PinPoint hardware system. The PinPoint Cell Controller is an active network peripheral, which transmits and receives a radio frequency signal through attached antennas. This signal is returned from a 3D-iD tag and translated by the Cell Controller into Tag Antenna Distance information (TAD data). The translated TAD data is then sent from the Cell Controller to a server via standard TCP / IP over an Ethernet LAN. Each PinPoint Cell Controller can support up to 16 antennas and comes with a single 10 / 100 BT network interface. The PinPoint Cell Controller acts as a DCHP client; therefore receiving it's networking addressing information from a DHCP server across the LAN.

The Cell Controller is a Linux based system running proprietary software developed by PinPoint. The hardware is a Pentium system with custom PinPoint developed boards providing customized processing and communications capabilities.

The Cell Controller's transmit and receive signal strengths - as well as other settings, can be altered via the Cell Controller Interface, which is in turn available through the Configurator application. For additional assistance, see the Configurator application and its accompanying documentation.

HARDWARE/SOFTWARE:

A PinPoint 3D-iD Cell Controller (code named C20) includes:

- 4 x 4 switching antenna cards
- a 10 / 100 BT network interface card
- a power cord
- and PinPoint 3D-iD Cell Controller Software version 1.0 or higher

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TECHNICAL SPECIFICATION

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.

Dimensions:	18” x 9” x 6”
Range:	3 to 125 feet
Performance:	Detect 1 tag in a population of:
	100 4.6ms tags within 10 seconds 99% of the time
	500 4.6ms tags within 30 seconds 99% of the time
Number of Antennas:	Between 1 and 16
Required Antenna Cable Length:	All cables must be exactly 100’ long
Operational Temperatures:	*10°C (50°F) - 35°C (95°F)*
Survivable Temperatures:	*-40°C (-38°F) - 65°C (149°F)*

Antennas

The antenna actually broadcasts messages to the tags and receives the tags' responses. The antennas are designed to work exclusively with the PinPoint 3D-iD Cell Controller. The antenna is composed of 2 structures, one designed to transmit and one to receive. The transmit structure broadcasts a 2.4 GHz radio frequency signal at 1 watt of power generated from the Cell Controller. When this signal is picked up by a 3D-iD tag, the tag responds with a 5.8 GHz signal which is picked up by the receive structure on the antenna. Each antenna is connected to the Cell Controller by a dedicated piece of plenum or riser rated coaxial cable. The coaxial also supplies the AC needed to power the antenna.
The coaxial cable is connected to a dedicated port on one of the Cell Controller's 4 x 4 multiplexing switching antenna cards.

Antennas can be mounted flush against walls with provided wall mounting hardware, suspended above ceiling tiles or mounted on tripods.

Technical Specification

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.

Frequency:	Tx: 2442 + 83.5 MHz
	Rx: 5800 + 150 MHz
Power:	12 V DC (supplied from coaxial cable)
Radiation Pattern:	Ellipto-conical (62° azimuth, 32° elevation)
Dimensions:	10" x 7"x 2"
Environment:	-20°C – 40°C (operating range)
	5% - 95% humidity, no condensation

See Cell Controller/Antenna Data Sheets for details

ViewPoint Servers

TheViewPoint Server is an active network peripheral which uses Microsoft's DHCP server services to assign IP addresses to PinPoint cell controllers, receive tag / antenna / distance (TAD) information from the cell controllers and deliver TAD and alert data to client connected to the local area network. The server uses standard TCP / IP protocol, and, unless a router is installed, must be on the same LAN segment as the cell controller. The server runs the full suite of the ViewPoint 3D-iD software, and PinPoint's proprietary services, Location Service, Alert Service, Tracker Service, Tadder Service and Broker Service. The server is also where location rules sets, alert information, tag information, Cell Controller and antenna profiles are stored and distributed.

Server System: Minimum Hardware Requirements:

- Pentium 133 or better processor
- Minimum of 128 MB of RAM
- CD ROM drive
- 3.5" floppy disk drive
- 10 / 100 Ethernet adapter
- 500 MB of free HDD space

Server System: Minimum Software Requirements:

- Microsoft Windows NT Server version 4.0
- Service Pack 3 or higher
- TCP / IP protocol
- Microsoft Internet Information Server
- Microsoft DCHP Server
- Microsoft Internet Explorer 4.0 or Netscape Navigator 4.0
- NT Option Pack 4
- Microsoft Access(optional)

ViewPoint Clients

The ViewPoint Clients are Microsoft Windows 95, 98, 2000 or NT machines connected to the local area network via TCP / IP protocol, and running the ViewPoint 3D-iD Client software. 3D-iD clients will be able to track, locate and secure tagged assets and people by running any of the client application installed on the machine, these include:

Location Viewer which allows the user to view Tag Locations by area.

Finder which allows the user to search for Tags by Serial Number, by Resource, by Tag Group, and by Location.

Alert Viewer which allows the user to monitor Alert Conditions as they arise.

Floorplan Viewer which serves as a unified viewer of Tag Antenna Distance, Location, and Alert data.

Tracker which allows the user to access historical Tag Location and Alert data.

3D-iD clients can reside anywhere on the network, provided they have access to the subnet where the server resides.

Client System: Minimum Hardware Requirements:

Pentium 90 or better processor
Minimum of 32 MB RAM (64MB RAM for clients running NT Workstation 4.0)
CD ROM drive
3.5” floppy disk drive
10 / 100 Ethernet adapter
200 MB of free HDD space

Client System: Minimum Software Requirements:

Microsoft Windows 95, 98 or NT Workstation version 4.0 (Service Pack 3 or higher)
TCP / IP protocol
Microsoft Internet Explorer 4.0 or Netscape Navigator 4.0

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