Wi-Fi Site Survey & Design Report

Customer Name
Customer Address Line #1
Customer Address Line #2
Customer Address Line #3
Customer Address Line #4

Report Prepared By
Engineer Name

Survey Date
Day Month Year

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1 DOCUMENT HISTORY

Version	Date	Comments
Version 1.0		Original Version

2 PURPOSE & SCOPE

Hard-wired data capture systems can be specified fairly readily using pre-defined specifications of distance, number of units and data throughput requirements. RF systems are less straight forward as they are much more affected by their operating environment. It is therefore necessary to perform a site survey in order to ensure that an RF system will operate reliably in your environment and to understand how the system will function in the conditions under which it will be expected to operate. This document is the result of a site survey performed at your facility.

NOTE TO INSTALLATION ENGINEERS

It is recommended that you initially read section 12 WHAT HAPPENS NEXT and then print out Sections 7, 8 and 9.

The purpose of this document is to provide a comprehensive report detailing the findings of the site survey conducted at your facility. This report has been divided into relevant sections as follows.

Section 3 SITE INFORMATION
This section provides information specific to your facility including a description of the site itself and the prevailing conditions (stock levels etc) at the time of the survey.

Section 4 CUSTOMER REQUIREMENTS
This section details your specific requirements, examples of which are the locations where radio reception is required, the type of wireless devices proposed for wireless connection and the required data throughput speed.

Section 5 IMPORTANT ASSUMPTIONS
This section defines the assumptions on which the site survey has been based.
It is important that you make yourselves aware of the statements made in this section.

Section 6 ENVIRONMENT ANALYSIS
This section summarises the findings of the environment analysis. This is conducted to assess the environment for potential sources of interference to the proposed Wi-Fi solution.

Section 7 WI-FI SITE SURVEY
This section details the Wi-Fi Site Survey process and includes results of the various tests together with any recommendations.

Section 8 WI-FI INSTALLATION
This section details the hardware required and includes ôbest practiceô guidelines on installing the access points and antennas.

Section 9 HARDWARE INSTALLATION GUIDELINES
This section provides ôbest practiceô guidelines for installation the various hardware components.

Section 10 FACILITY DIAGRAMS
The site plans in this section identify the locations of each of the proposed access points. The required Wi-Fi coverage areas are shaded in blue. All locations where Wi-Fi readings have been recorded are numbered and marked on the plan.

Section 11 SITE SURVEY TOOL SCREEN SHOTS
Signal readings are captured for a 30 second time-frame at strategic points within the facility. The site survey tool screen shots showing these readings are contained in this section for reference purposes.

Section 12 GENERAL SITE PHOTOGRAPHS
If permission is granted by the customer this section shows general photographs of the site. This can use useful to capture the various areas nominated for Wi-Fi coverage. They also capture the conditions on the day of the survey.

Section 13 WHAT HAPPENS NEXT
This section provides insight in to ówhat happens nextôin terms of how the proposed equipment in installed and commissioned and who should do it.

Section 14 GLOSSARY OF TERMS
This section provides an explanation of acronyms used in this report.

3 SITE INFORMATION

3.1 Site Details

Customer Name	
Address	

3.2 Contact Details

Contact Name	Mobile #	E-Mail Address

4 CUSTOMER REQUIREMENTS

4.1 Coverage Requirements

The areas of the site requiring Wi-Fi coverage are identified on the site plans located in section ó10 FACILITY DIAGRAMSô later in this report.

In the event of a single access point failure, sufficient coverage exists from neighbouring access point to maintain continued connectivity (at lower signal levels) until the failed access point is replaced. In the event of an access point failure, the area this access point served is likely to yield a lower data throughput speed for the period of time this access point is out of commission but will still support connection of wireless clients to the host computer.

It is recommended that a spare access point be ordered to provide coverage in the event of an access point failure.

4.2 Connectivity Requirements

The proposed Wi-Fi infrastructure must be capable of supporting connectivity from Intermec Wi-Fi data capture terminals.

4.3 RSSI/Data Throughput Requirements

Cisco model 2600e dual 2.4 GHz and 5 GHz radio access points have been recommended.

4.3.1 Intermec Data Capture Devices

The Wi-Fi infrastructure must be capable of supporting data traffic. The maximum data throughput speed of 54Mbps is desirable. It should be recognised that the primary objective is to provide Wi-Fi coverage in all required areas to support a minimum SNR of 20dB and above to support reliable communication for data traffic.

4.4 Redundancy Requirements

The customer has not identified any specific requirements in terms of redundancy.

5 IMPORTANT ASSUMPTIONS

DW WiFi provide the site survey on the understanding that all tests and subsequent results are based on a generic survey utilising test equipment such as a laptop fitted with a PCMCIA wireless adapter card and site survey software. This equipment provides best result analysis and provide best placement for the wireless infrastructure access points.

Coverage found using this equipment normally represents best coverage provided for a multitude of client devices. Such client device specifics such as types of fitted antennas and locations / positions of fixed wireless clients can change the connectivity found. These changes are out of our normal control after the site survey however as reasonably practicable the site survey provides best endeavours to cover these possible changes.

DW WiFi does not guarantee RF coverage in the event that the layout of the site changes in any way after the site survey has been conducted. DW WiFi recommends that a second RF site survey be conducted in such circumstances to re-appraise the site.

Please also note that it can be impractical to provide RF coverage in any locations within your specified coverage area where the area is by its very nature constantly changing in layout and material storage.

To provide adequate cover to cater for all eventualities (using Spread Spectrum RF) would mean specifying such a volume of access points and antennas as to render the project uneconomical and to increase the chance of over coverage causing cross channel interference issues.

Additionally, it has been found that some environments are such that a higher number of access points are required to provide the level of overall coverage at higher data rates and or where a resilient solution is requested. This being the case, coverage cell overlap within the same frequency (channel) will degrade the overall solution by increasing the level of associated interference. The only option in these circumstances is to switch off and or reduce the power output of certain access points to a degree where the individual coverage cells are reduced.

Best endeavours will be made by DW WiFi to provide coverage in all circumstances and the potential problem areas will be highlighted within the report if known at the time of the survey. Recommendations for storage will also be made by DW WiFi in these circumstances if thought to be useful in improving RF coverage. If such areas are found to require alternative placement of wireless equipment and or specialised protection of any device, DW WiFi may require to visit site as a chargeable visit and or change the required items on the corresponding materials list.

The above factors are agreed prior to the site survey and detailed on the pre site survey questionnaire and also discussed on site with the contact prior to the site survey coverage check to ascertain your requirements, any subsequent change in policy will result in changes that could require a second site survey and subsequent costs passed on.

6 ENVIRONMENT ANALYSIS

This process is conducted to assess the environment for potential sources of interference to the proposed Wi-Fi solution. Transmissions on the frequencies used by Wi-Fi technology are undesirable and will be a source of interference to the proposed Wi-Fi solution. This will serve to reduce the performance of the proposed Wi-Fi solution. Symptoms are likely to include lower data transmission speeds and unreliable connectivity. It is hence increasingly important to assess the environment and identify any interference risks present.

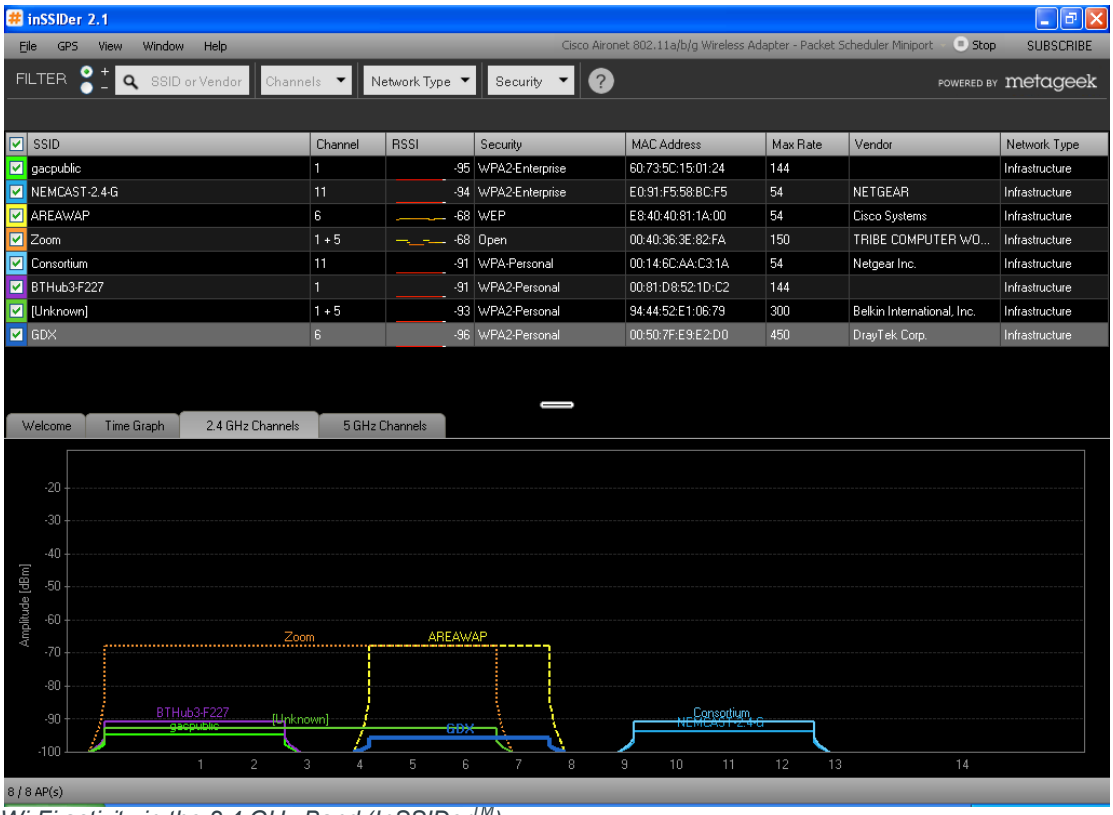
There are some sources of interference that originate off your site and are often outside of your control. It is, nevertheless, useful to identify the Wi-Fi radio channels that are vulnerable to such interference sources as it proposed Wi-Fi solution can often be configured to use non-affected radio channels.

Another more serious threat comes from point to point data links as these solutions deploy high gain directional antennas to produce a highly focused beam of radio energy. This is an issue if your site falls on the path of an external wireless point to point link.

Specialist Wi-Fi tools are used to analyse the environment on your site. The results are used to assess the risk of interference and identify any measures that can be taken to mitigate any risks that have been identified.

6.1 Interference Threat from Wi-Fi Access Points in 2.4 GHz Band (inSSIDer)

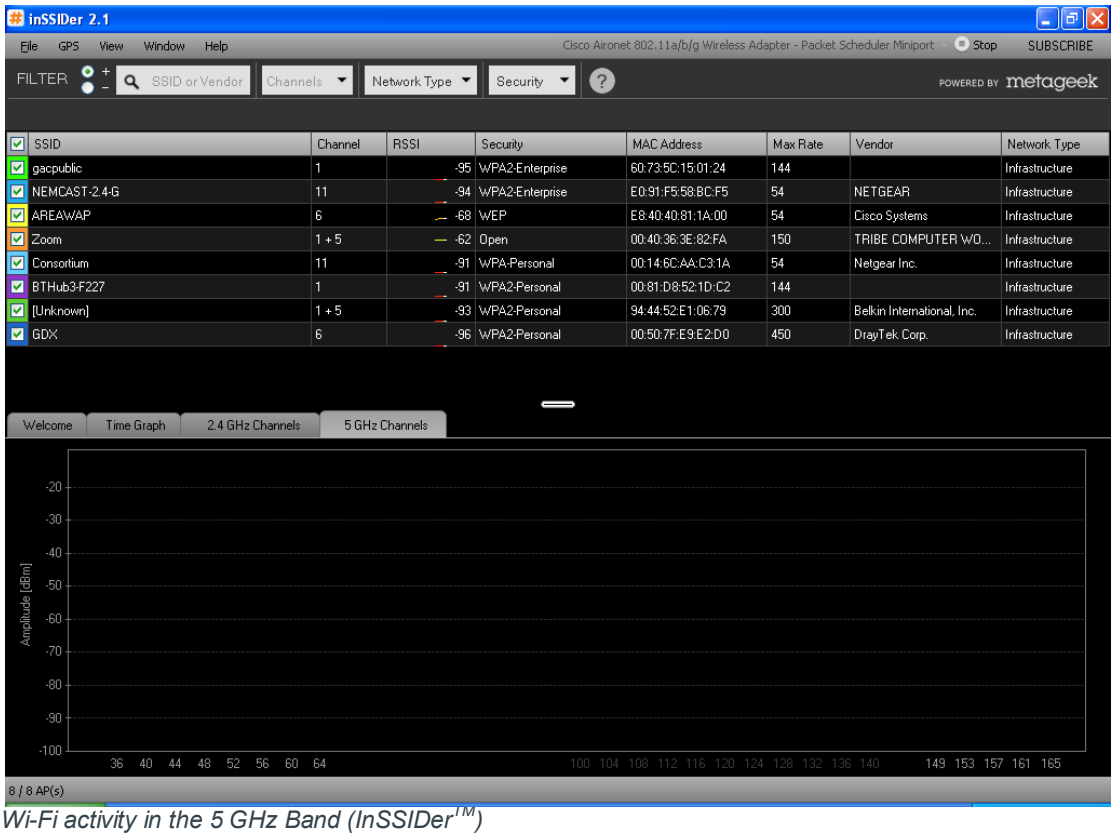
The screen shot below courtesy of the inSSIDer software utility shows all Wi-Fi access points detected that are operating in the 2.4 GHz Wi-Fi band.



Wi-Fi activity in the 2.4 GHz Band (InSSIDer™)

6.2 Interference Threat from Wi-Fi Access Points in 5 GHz Band (inSSIDer)

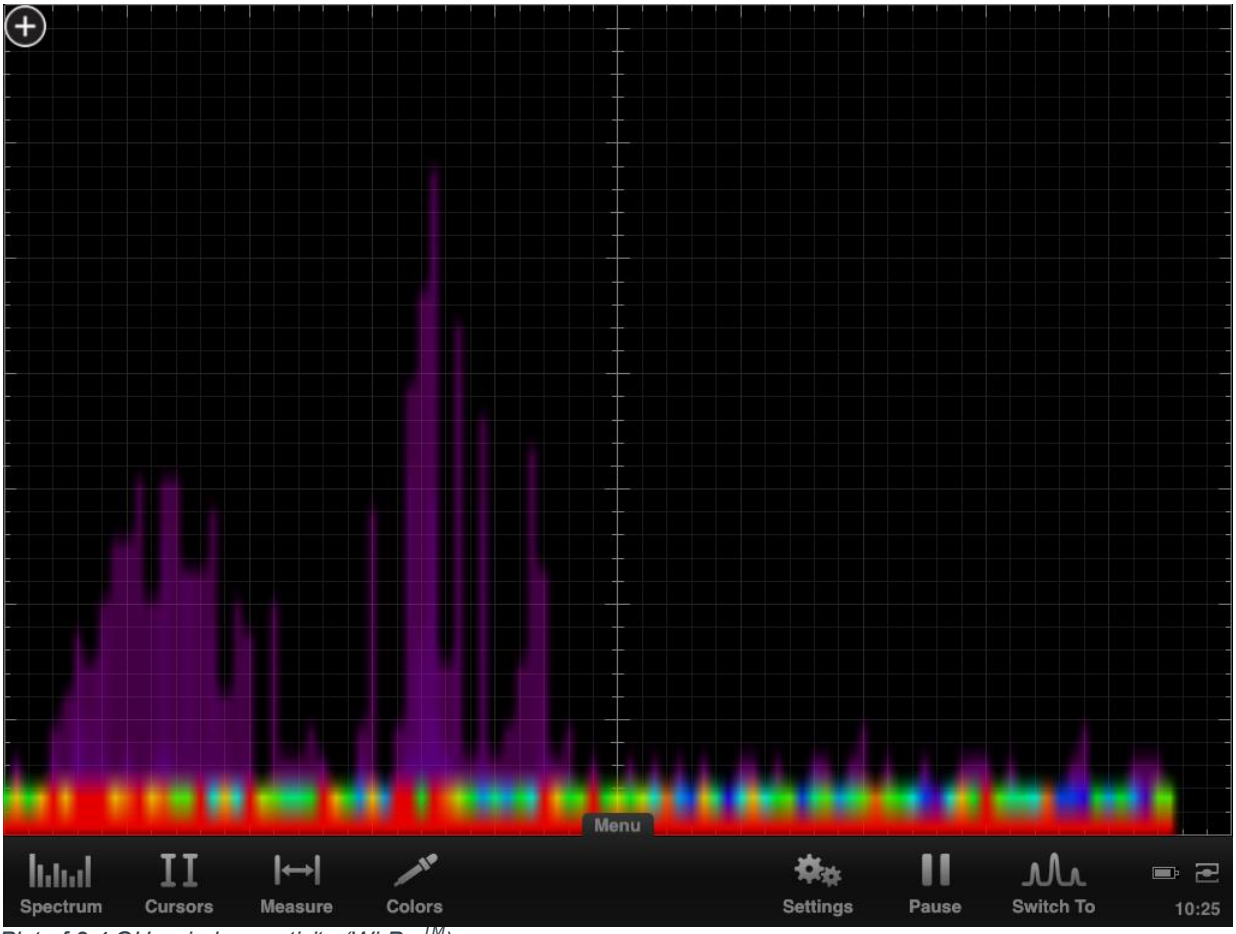
The screen shot below courtesy of the inSSIDer software utility shows all Wi-Fi access points detected that are operating in the 5 GHz Wi-Fi band.



Wi-Fi activity in the 5 GHz Band (InSSIDer™)

6.3 Interference Threat in 2.4 GHz Band (Wi-Pry™)

The screen shot below courtesy of Wi-Pry™ shows radio transmissions in the 2.4 GHz Wi-Fi band.



Plot of 2.4 GHz wireless activity (Wi-Pry™)

6.4 Environmental Analysis Summary

Analysis using inSSIDer showed a number of existing Wi-Fi access points operating in the 2.4 GHz band. Testing on the 2.4 GHz band as part of the site survey process suggested the threat level in terms of interference was low. The higher radio channels in the 2.4 GHz band were free on the day of the survey.

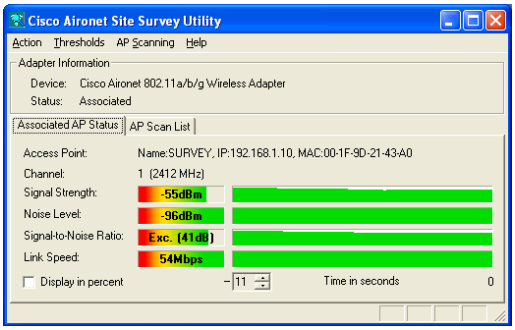
Analysis using Wi-Pry showed no obvious threat in terms of transmissions on the 2.4 GHz interface.

7 WI-FI SITE SURVEY

Please reference section ô11.4 Cisco Site Survey Utility Screen Shotsô The 'Associated Status Screen' was captured at each of the numbered test locations throughout the nominated Wi-Fi coverage areas of the site. The numbered test locations are identified on the site plan in section '10 FACILITY DIAGRAMS'.

The Wi-Fi Site survey process uses a laptop computer fitted with a Cisco dual band WLAN network interface card This is configured to associate to a mobile Cisco access point, able to be deployed in any location with any combination of Cisco antennas.

Cisco Dual Band WLAN card



Cisco Site Survey Utility Screen

The Cisco Site Survey utility is used for conducting Wi-Fi data capture site surveys in the 2.4 GHz and 5 GHz bands and provides the following dynamic information relating to the connection between the laptop and the mobile access point:

- Signal Strength (Measure of raw signal strength)
- Noise level (A reading of the background noise at this location)
- Signal-to-Noise Ratio (A measure of the signal quality)
- Link Speed (Data throughput speed in Mbits per second)

Cisco provide guidelines on the recommended SNR (Signal-to-Noise Radio) for reliable data communications, this being 20dB and above. It is possible to maintain a reliable connection below this figure but this affords a 'comfort zone' to compensate for changes to the environment (fluctuations in background noise, interference etc).

The site survey process entails identifying each location where Wi-Fi coverage is required and then deploying a temporary mobile access point in this location fitted with appropriate antennas. The Cisco Site Survey utility is then used to capture readings at regular test locations throughout the required coverage area. The access point coverage cell can be mapped by observing the SNR reading. The coverage cell boundary will show an SNR reading of approximately 20dB.

The above process can be repeated throughout the site, adjusting the location the mobile access point is deployed and the antenna types to optimise the coverage patterns and ensure each access point coverage cells overlaps to ensure seamless roaming of Wi-Fi client devices between coverage cells.

7.1 Wi-Fi Site Survey Readings - 2.4 GHz Band (Warehouse)

Test Reading	Signal Strength (dBm)	Noise Level (dBm)	SNR (dB)	Link Speed	Access Point
#09	-59	-95	36	54	AP01
#10	-41	-91	50	54	AP01
#11	-58	-92	34	54	AP01
#12	-54	-92	38	54	AP01
#13	N/A	N/A	N/A	N/A	N/A
#14	N/A	N/A	N/A	N/A	N/A
#15	N/A	N/A	N/A	N/A	N/A
#16	-66	-92	26	54	AP01
#17	-55	-93	38	54	AP01
#18	-54	-92	38	54	AP01
#19	-58	-91	33	54	AP01
#20	N/A	N/A	N/A	N/A	N/A
#21	N/A	N/A	N/A	N/A	N/A
#22	-60	-94	34	48	AP01
#23	-57	-91	34	54	AP01

Access Point Test Readings - 2.4 GHz Band (Warehouse)

7.2 Wi-Fi Site Survey Readings - 2.4 GHz Band (Offices)

Test Reading	Signal Strength (dBm)	Noise Level (dBm)	SNR (dB)	Link Speed	Access Point
#01	-67	-91	24	54	AP01
#02	-68	-92	24	54	AP01
#03	-68	-93	25	54	AP01
#04	-64	-93	29	54	AP01
#05	-61	-96	35	54	AP01
#06	-70	-94	24	54	AP01
#07	-70	-95	25	54	AP01
#08	-68	-93	25	48	AP01
#24	-63	-95	32	54	AP01
#25	-66	-95	29	54	AP01
#26	-65	-94	29	54	AP01
#27	-55	-94	39	54	AP01
#28	-55	-92	37	54	AP01

Access Point Test Readings - 2.4 GHz Band (Warehouse)

7.3 Wi-Fi Site Survey Readings - 5 GHz Band (Warehouse)

Test Reading	Signal Strength (dBm)	Noise Level (dBm)	SNR (dB)	Link Speed	Access Point
#09	-51	-93	42	48	AP03
#10	-50	-92	42	54	AP03
#11	-52	-92	40	54	AP03
#12	-57	-92	35	54	AP03
#13	N/A	N/A	N/A	N/A	N/A
#14	N/A	N/A	N/A	N/A	N/A
#15	N/A	N/A	N/A	N/A	N/A
#16	-65	-93	28	54	AP03
#17	-59	-92	33	54	AP03
#18	-61	-94	33	54	AP03
#19	-58	-93	35	54	AP03
#20	N/A	N/A	N/A	N/A	N/A
#21	N/A	N/A	N/A	N/A	N/A
#22	-60	-93	33	54	AP03
#23	-61	-93	32	54	AP03

Access Point Test Readings - 5 GHz Band (Warehouse)

7.4 Wi-Fi Site Survey Readings - 5 GHz Band (Offices)

Test Reading	Signal Strength (dBm)	Noise Level (dBm)	SNR (dB)	Link Speed	Access Point
#01	-59	-94	35	48	AP03
#02	-70	-93	23	54	AP03
#03	-72	-93	21	54	AP03
#04	-70	-94	24	54	AP03
#05	-67	-93	26	54	AP03
#06	-66	-93	27	48	AP03
#07	-73	-94	21	48	AP03
#08	-76	-94	18	48	AP03
#24	-67	-93	26	48	AP03
#25	-64	-93	29	48	AP03
#26	-64	-93	29	54	AP03
#27	-62	-93	31	54	AP03
#28	-60	-93	33	54	AP03

Access Point Test Readings - 5 GHz Band (Warehouse)

7.5 Wi-Fi Theoretical Data Speed Readings - 5 GHz Band (Office Areas)

Test Reading	Theoretical Data Speed (Mbps)	Access Point
#02	270	AP03
#24	300	AP03
#28	300	AP03

Wi-Fi Theoretical Data Speed Readings - 5 GHz Band (Offices)

7.6 Wi-Fi Data Aggregate Data Speed Readings - 5 GHz Band (Office Areas)

Floor	Average Aggregate Transmit Speed (Mbps)	Average Aggregate Receive Speed (Mbps)
#02	~60	~90
#24	~130	~110
#28	~140	~110

Wi-Fi Aggregate Data Speed Readings - 5 GHz Band (Offices)

7.7 Wi-Fi Site Survey Summary

A total of 2 Cisco Standalone 2600e Dual Band access points have been proposed to provide the required redundant Wi-Fi coverage in the warehouse. Access point AP02 has been proposed to provide redundant coverage in the event of a failure to access point AP01.

On the request of Sketch Studios a further 1 Cisco Standalone 2600i Dual Band access point has been proposed to provide the required Wi-Fi coverage in the office areas.

It is likely that any Wi-Fi laptops and tablet devices used in the offices will require much faster data speeds over the Wi-Fi interface than the data capture devices proposed for the warehouse. It is recommended that, where possible, these devices are connected to the 5 GHz band. The option to configure the 5 GHz radio interface to a 40 MHz channel width will maximise data throughput speed.

The survey access point was re-configured to channel bond two adjacent radio channels in the 5 GHz band to provide a maximum theoretical data connection speed of 300 Mbps. The Windows 'Wireless Network Connection Status' window was captured in selected locations on the ground and first floors to identify the theoretical data connection speed.

A DOS utility was also used to generate data transfer (transmit and receive) between a wireless laptop and a second laptop connected to the survey access point via Ethernet. This is able to dynamically measure the aggregate data throughput speed.

The aggregate data throughput speeds were consistently high throughout the first floor with speeds of over 100 Mbps at both ends of the first floor. Aggregate data throughput speeds on the ground floor were good (between 60 and 90 Mbps) but lower than those observed on the first floor.

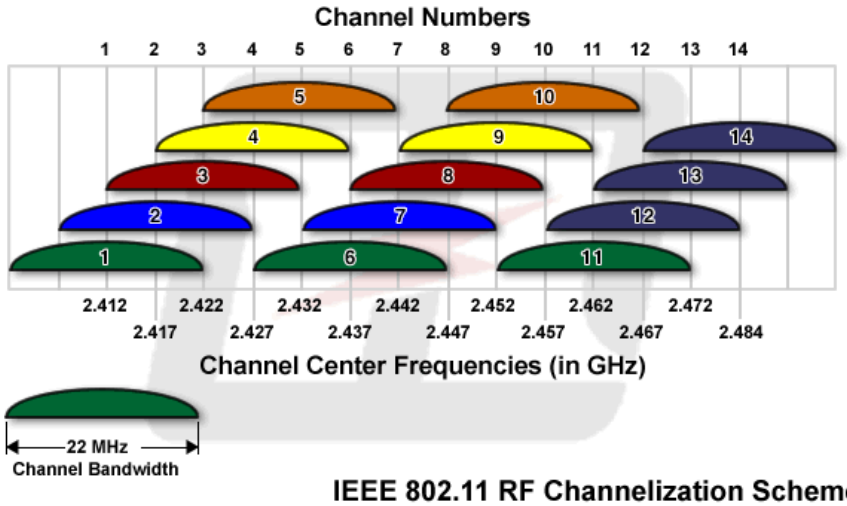
In the event that the aggregate data throughput speeds on the ground floor are not acceptable a fourth access point will be required. This is best deployed centrally on the ground floor.

7.8 Wi-Fi Site Survey Recommendations

7.8.1 Allocation of Radio Channels (2.4 GHz)

The term ôco-channel interferenceôrefers to the undesirable symptoms inflicted on radio clients operating in areas of a site where two coverage cells overlap from two adjacent access points operating on the same radio channel. This results in data being transmitted on the same frequencies often resulting in poor connectivity. There are only three radio channels that are ônon-overlappingôthat can be used in the 2.4 GHz spectrum occupied by 802.11g Wi-Fi. There are hence compromises that sometimes need to be made when deploying the access points.

The diagram below shows the centre frequencies of each of the 14 Wi-Fi radio channels operating in the 2.4 GHz frequency range on the X axis. The coloured shapes above represent access points configured to each of the 14 available radio channels. Each radio channel consumes a bandwidth of 22 MHz. This hence overlaps several radio channels.



IEEE 802.11 RF Channelization Scheme

This diagram hence shows that there is only room for three non-overlapping radio channels. The green shapes represent 3 access points configured to transmit/receive on radio channels 1, 6 and 11. As can be seen from the diagram, other valid channel allocation policies are:

- 1, 6, 12
- 1,6, 13
- 1, 7, 12
- 1,7, 13

NB. Radio channel 14 has been ignored as it is not available in ETSI regulated countries of which UK is a member.

The interference on radio channel 9 in Unit 1 may require Pollards to consider operating a 2 radio channel policy of 1 and 13 only for access points deployed near to the offices.

8 WI-FI INSTALLATION

8.1 Required Hardware

The Wi-Fi Site Survey identified a requirement for deployment of a total of 3 Cisco WAPs (Wireless Access Points) to provide Wi-Fi coverage of the nominated areas of the site.

Part Number	Description	Images	Qty
SAPK1	Cisco 2602i Omni AP Kit Kit Contents: 1 x Cisco 2602e Access Point 1 x Cisco 2600 Mounting Bracket		1
SAPK2	Cisco 2602e Omni AP Kit Kit Contents: 1 x Cisco 2602e Access Point 1 x Cisco 2600 Mounting Bracket 4 x Cisco Dual Band Omni Antennas		2
PWRINJUK	Cisco Power Injector Kit (UK) Kit Contents: 1 x Cisco Single Port Power Injector 1 x UK IEC Power Cord		3

IMPORTANT
DW WiFi does not provide consumables that will be required for parts of the installation. These are typically Ethernet patch cables, cables ties, cable clips, and bespoke brackets. These must be sourced by the customer.

8.2 Access Point AP01 Deployment - Warehouse

Part Number	Description	Qty
SAPK2	Cisco 2602e Omni AP Kit	1
PWRINJUK	Cisco Power Injector Kit (UK)	1

8.2.1 Installation – Access Point AP01

INSERT PHOTOGRAPH HERE

AP01 Access Point Required Location

Access point kit should be wall mounted in the location denoted by the blue circle in the photograph above.

Please reference Section '9.1 Wall Mounting SAPK2 Cisco 2602e Omni AP Kit' for guideline instructions on installing this access point kit.

NB. Please reference section '13.10.1 Powering Access Points using Power Injectors'. This includes a schematic diagram detailing how to install the power injector kit inside the local Ethernet switch cabinet.

8.3 Access Point AP02 Deployment - Warehouse

Part Number	Description	Qty
SAPK2	Cisco 2602e Omni AP Kit	1
PWRINJUK	Cisco Power Injector Kit (UK)	1

8.3.1 Installation – Access Point AP02

INSERT PHOTOGRAPH HERE

AP02 Access Point Required Location

Access point kit should be wall mounted in the location denoted by the blue circle in the photograph above.

Please reference Section '9.1 Wall Mounting SAPK2 Cisco 2602e Omni AP Kit' for guideline instructions on installing this access point kit.

NB. Please reference section '13.10.1 Powering Access Points using Power Injectors'. This includes a schematic diagram detailing how to install the power injector kit inside the local Ethernet switch cabinet.

8.4 Access Point AP03 Deployment - First Floor Offices

Part Number	Description	Qty
SAPK1	Cisco 2602i Indoor Office AP Kit	1
PWRINJUK	Cisco Power Injector Kit (UK)	1

8.4.1 Installation – Access Point AP03

INSERT PHOTOGRAPH HERE

AP03 Access Point Required Location

The access point should be mounted to the suspended ceiling in the location denoted by the blue circle in the photograph above.

Please reference Section '9.2 Mounting SAPK1 Cisco 2602i Office AP Kit to False Ceilings' for guideline instructions on installing this access point kit.

NB. Please reference section '13.10.1 Powering Access Points using Power Injectors'. This includes a schematic diagram detailing how to install the power injector inside the local Ethernet switch cabinet.

9 HARDWARE INSTALLATION GUIDELINES

This section provides best practice guidelines for installation of the access point kits. It covers recommendations for mounting the various access point kits in a number of environments.

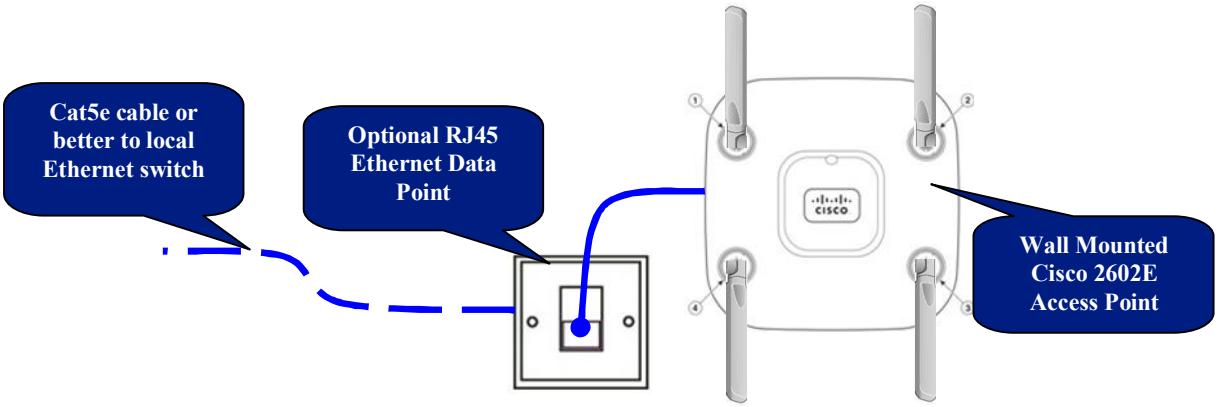
9.1 Wall Mounting SAPK2 Cisco 2602e Omni AP Kit

This kit includes 4 dual band dipole omni-directional antennas. It provides omni-directional dual band coverage.

Each of the 4 antennas (pictured left) attaches 'screw fit' to the 4 dual ***band*** antenna ports located on the front face of the access point.

The diagram below shows a recommended installation. The access point must be mounted to the wall using the mounting bracket that ships with the antenna. It is imperative that the top two antennas are both pointing vertically upwards towards the ceiling and the bottom two antennas are both pointing vertically downwards towards the floor. Ensure that the antennas are free of any metal obstructions to maximise signal propagation and lower the risk of block the signal.

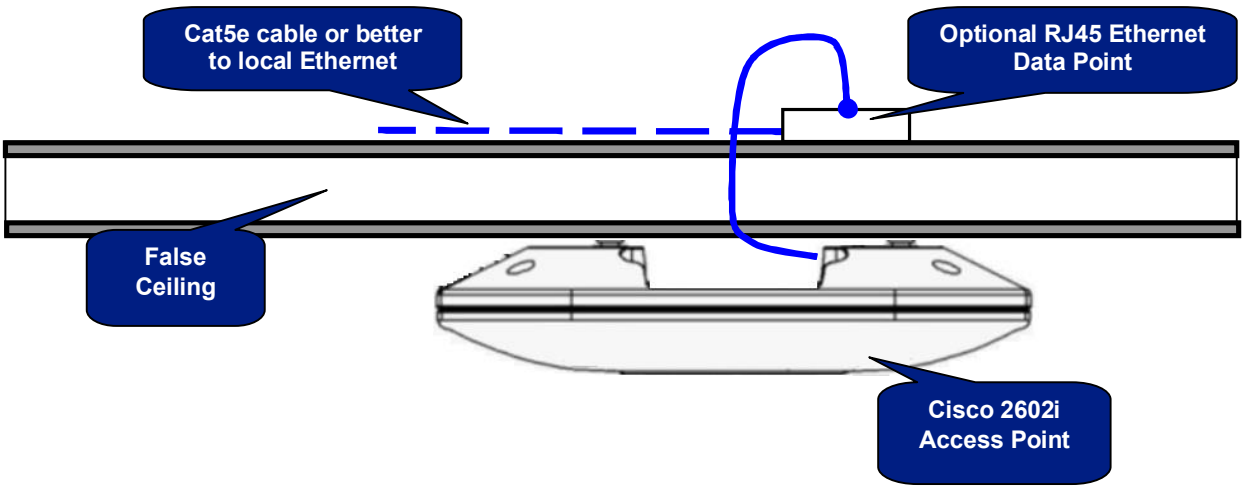
Cat5e or better Ethernet data cabling must be routed from the nearest Ethernet switch to the access point location where it must be connected to the yellow port marked 'Ethernet' on the back of the access point. An Ethernet data port is recommended (see diagram below) together with a short Cat5e UTP patch cable for connection to the access point.



9.2 Mounting SAPK1 Cisco 2602i Office AP Kit to False Ceilings

The diagram below shows a recommended installation. Included with the Cisco access point are fittings specifically for mounting the access point to false ceilings. The fittings attach to the metal lattice that supports the ceiling tiles. Please follow the guideline instructions that ship with the access point for correct installation.

Cat5e or better Ethernet data cabling must be routed from the nearest Ethernet switch to the access point location where it must be connected to the yellow port marked 'Ethernet' on the back of the access point. An Ethernet data port is recommended (see diagram below) together with a short Cat5e UTP patch cable for connection to the access point. Ideally, for aesthetics, the Ethernet data port short be installed above the false ceiling as depicted in the diagram below.



10 FACILITY DIAGRAMS

Communications coverage was requested for the areas specified within the boundaries indicated by the blue shaded areas in the following facility diagrams.

In order to ensure communication in the desired areas of coverage the threshold for signal to noise ratio (SNR) of 20dB or above is adhered to, beyond this level data loss can occur. Please be aware that this will not guarantee response times for the RF network as the wired network traffic and host application response times will be a factor.

The following page contains the floor plan for the facility. Where appropriate, it has been annotated to show access point and antenna locations.

IMPORTANT
DW WiFi applies a threshold SNR (Signal to Noise Ratio) of 20dB to identify a coverage footprint around each access point. This facilitates a reliable connection for data communication but also compensates for fluctuations in ambient conditions, stock levels etc. It should be noted that the usable coverage footprint often extends beyond this 20dB threshold perimeter.

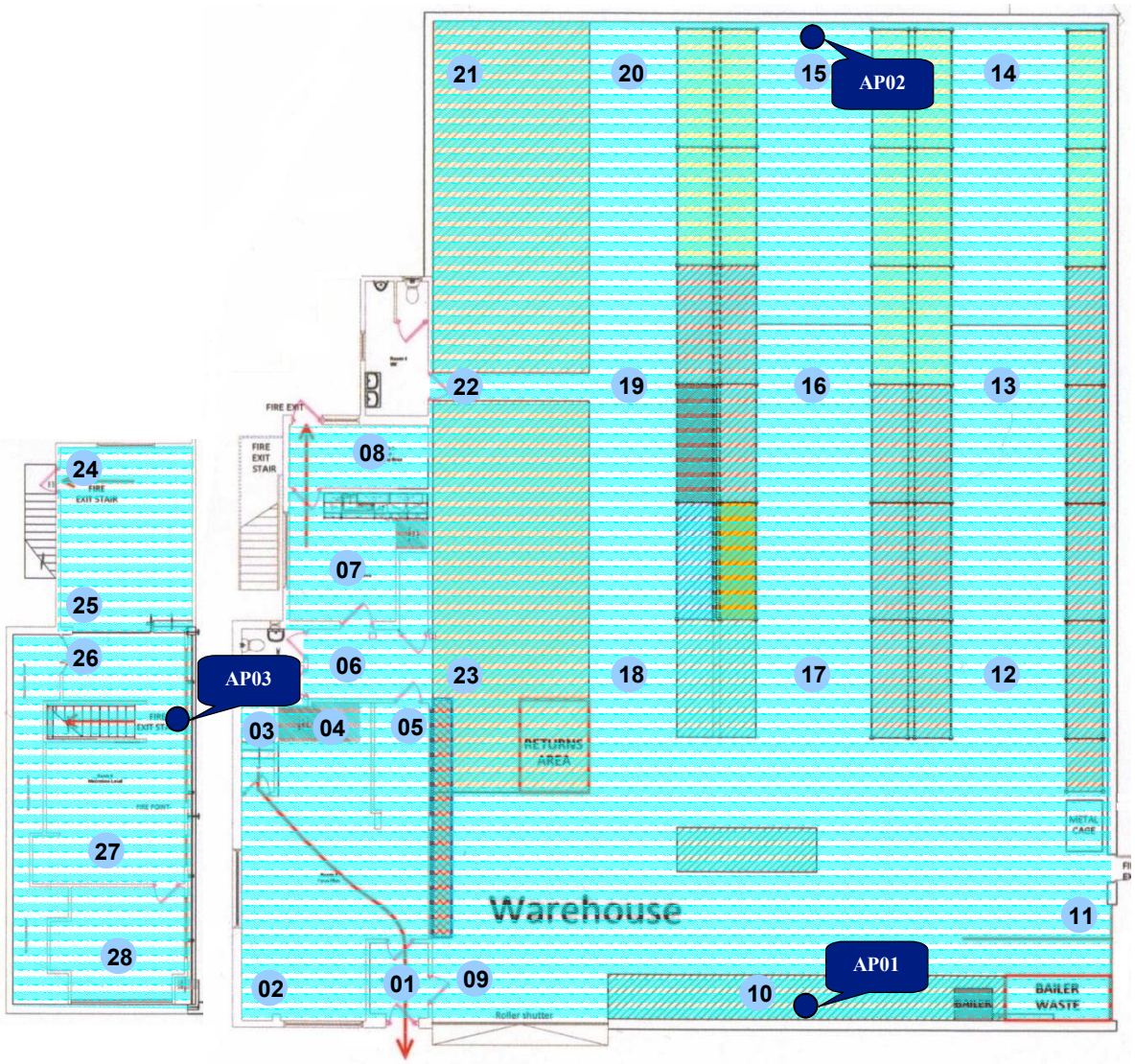
It should be noted that the radio signal of a Wi-Fi network is dynamic and as such areas outside this 20dB threshold perimeter can potentially be unreliable for data communication due to a number of factors (some of which are listed below)

- Humidity
- Stocking Levels
- Employees
- Background noise
- Wi-Fi transmissions
- Sources of interference in range (2.40 GHz to 2.4835 GHz)

Please note that any areas of the site where devices are not being used for data communication but are routes taken to move between areas can tolerate an SNR less than 20dB.

10.1 Site Plan - Unit 1

	Proposed Wi-Fi Coverage Area	17	Wi-Fi Test Reading Location
	Proposed Cisco Access Point Locations		



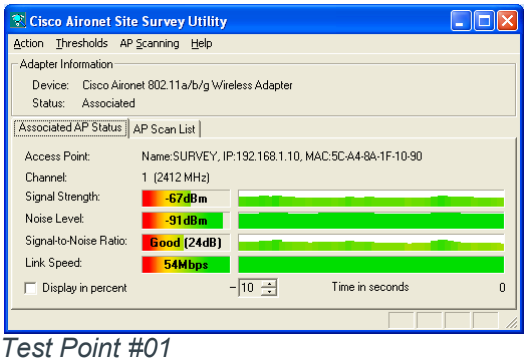
11 SITE SURVEY TOOL SCREEN SHOTS

11.1 Cisco Site Survey Utility Screen Shots

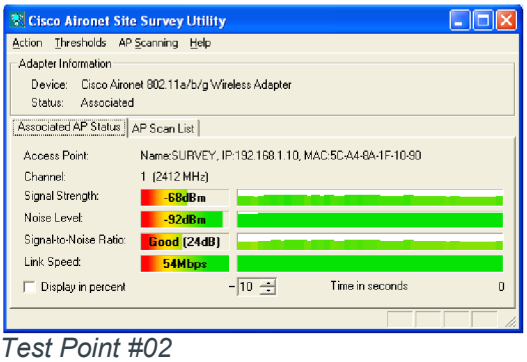
The following screen shots show a snapshot of dynamic signal readings recorded by the Cisco Site Survey Utility software using a Cisco IEEE 802.11abg wireless LAN PCMCIA card in a laptop. They correspond to the test locations annotated on the site plan(s). Each screen depicts a 30 second continuous test and provides the following information about the radio connection of the laptop PC Wi-Fi client at the test location:

- Signal Strength (Measure of raw signal strength)
- Noise level (A reading of the background noise at this location)
- Signal-to-Noise Ratio (A measure of the signal quality)
- Link Speed (Data throughput speed in Mbits per second)

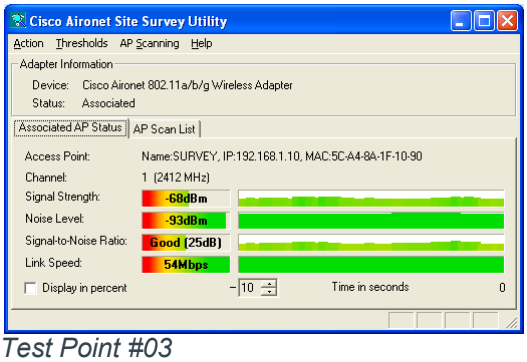
11.1.1 AP01 Test Wi-Fi Readings - 2.4 GHz Band



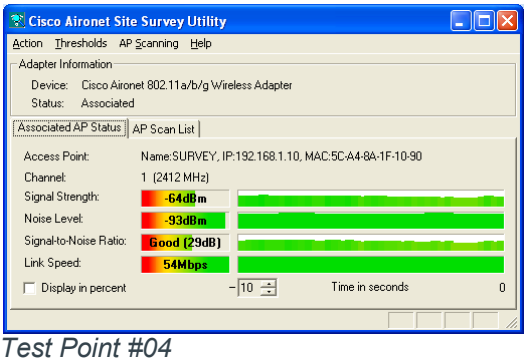
Test Point #01



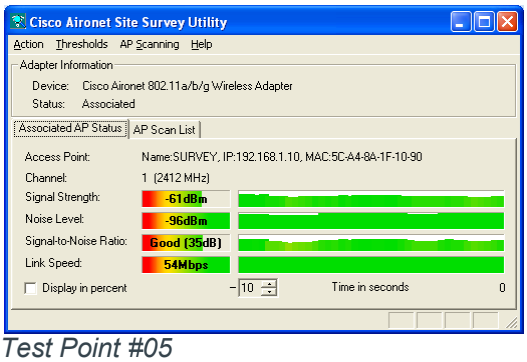
Test Point #02



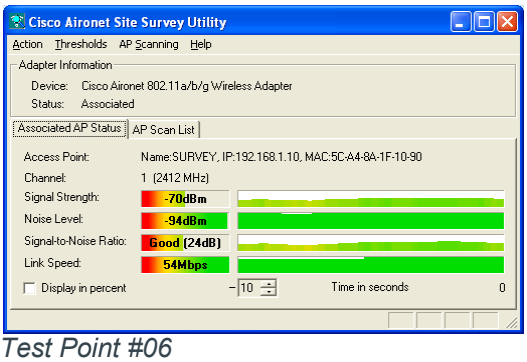
Test Point #03



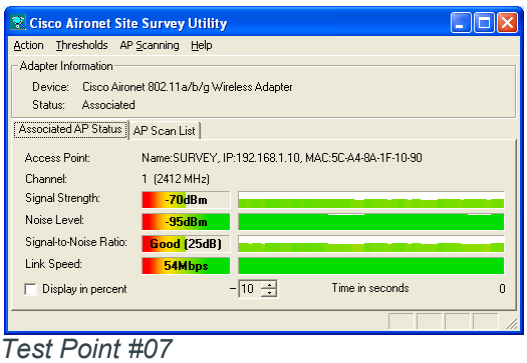
Test Point #04



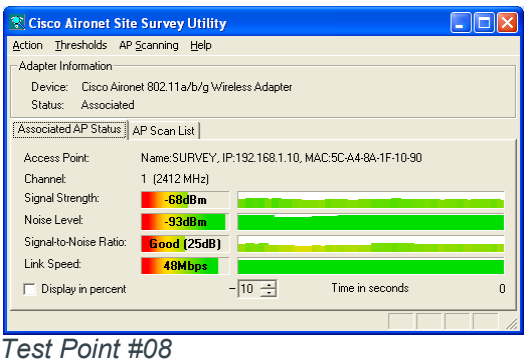
Test Point #05



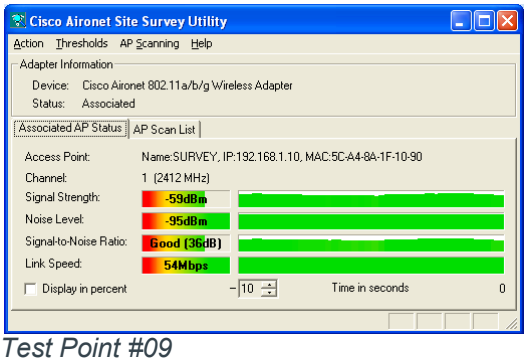
Test Point #06



Test Point #07



Test Point #08



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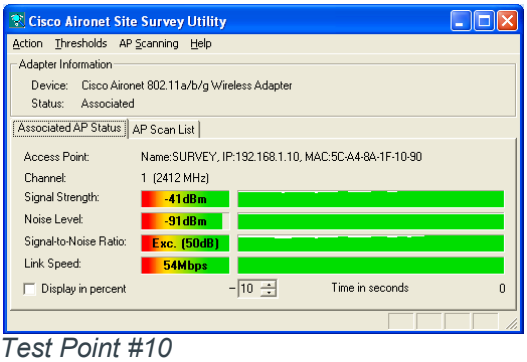
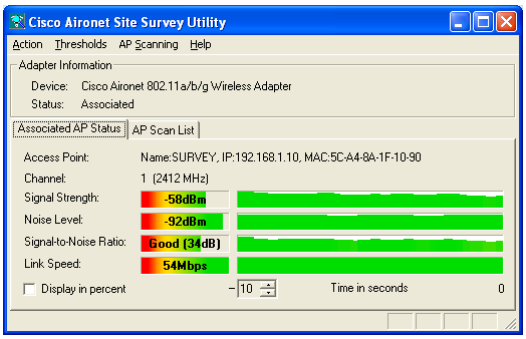
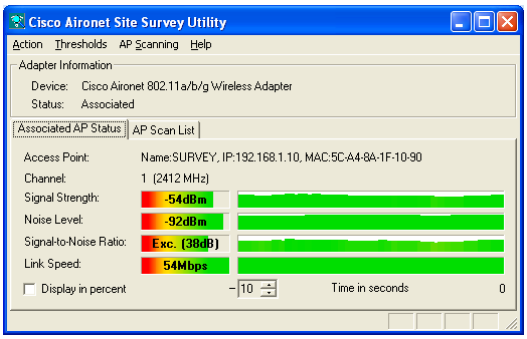


Test Point #10



Test Point #11

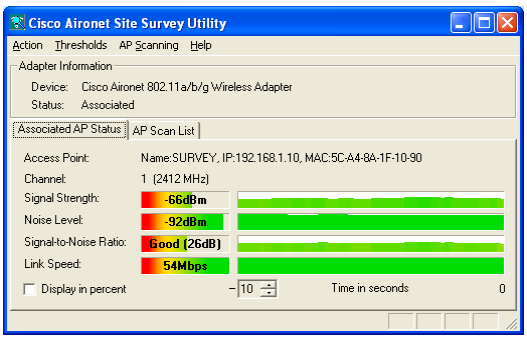


Test Point #12

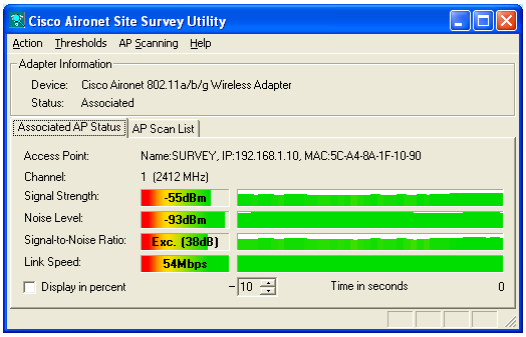
No Access
Test Point #13

No Access
Test Point #14

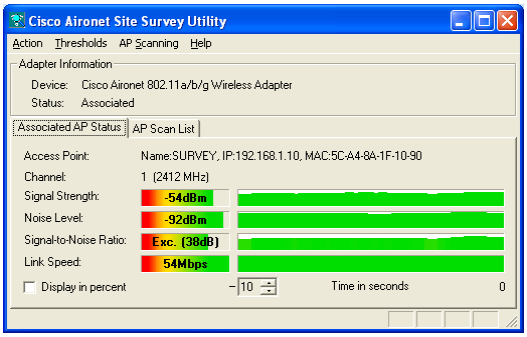
No Access
Test Point #15



Test Point #16



Test Point #17



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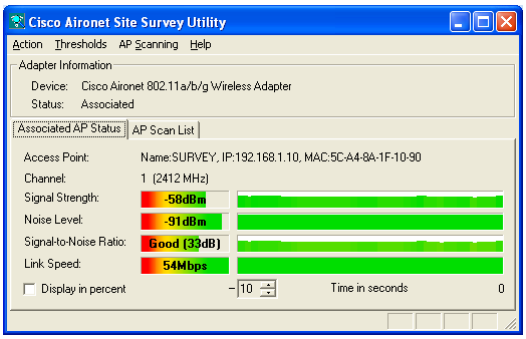
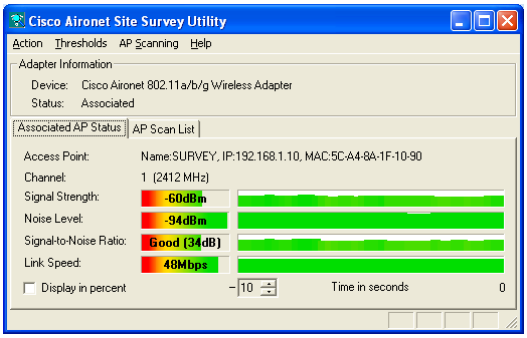


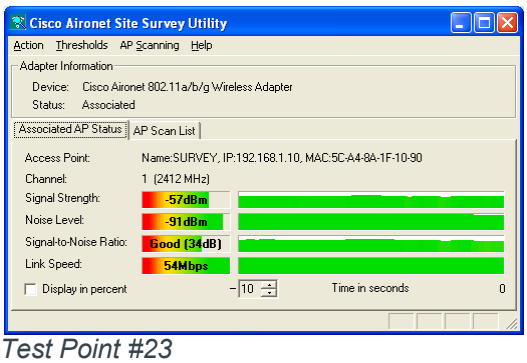
Test Point #19

No Access
Test Point #20



No Access
Test Point #21

Test Point #22



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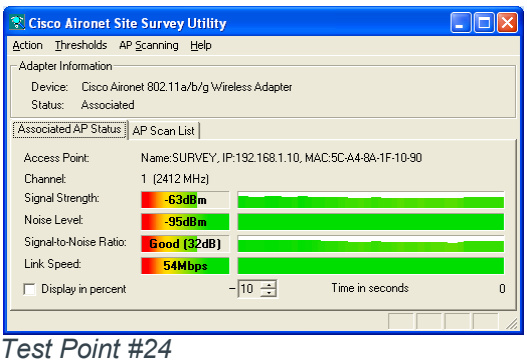

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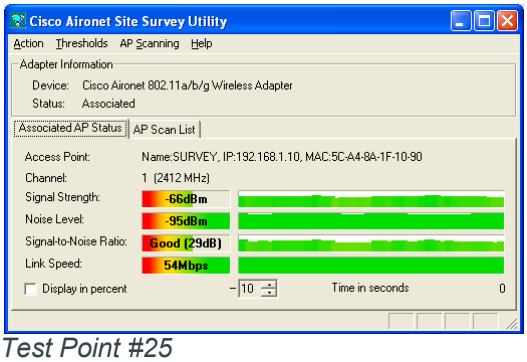
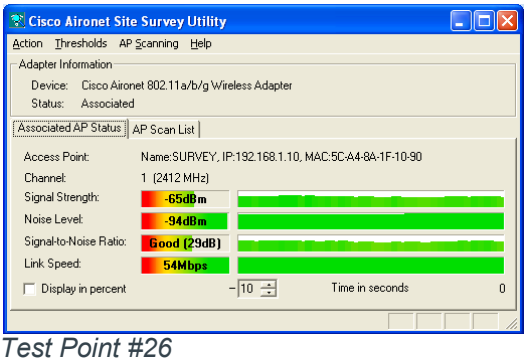
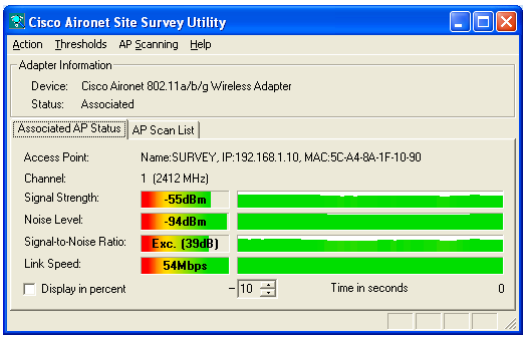


Test Point #25



Test Point #26



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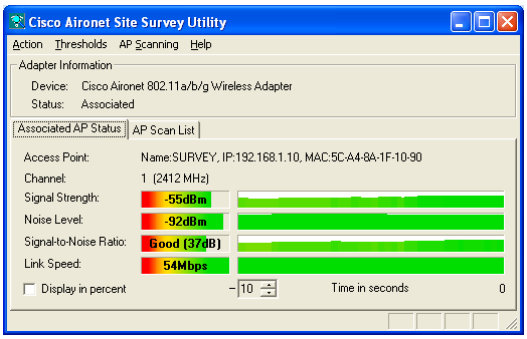
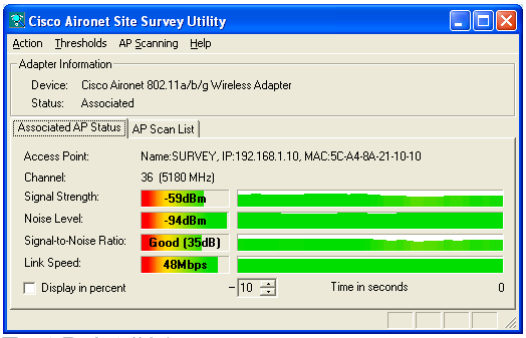
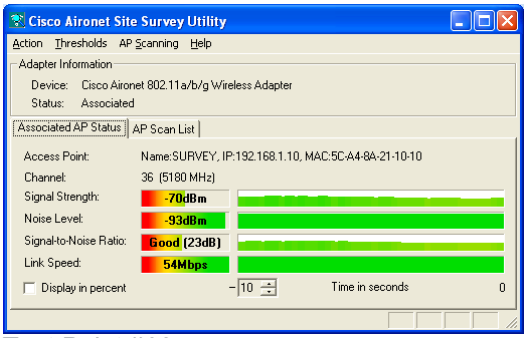


Test Point #28

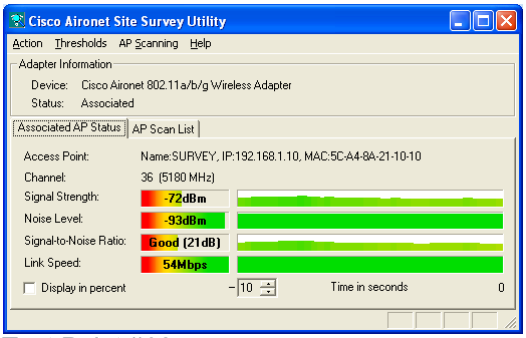
11.1.2 AP01 Test Wi-Fi Readings - 5 GHz Band



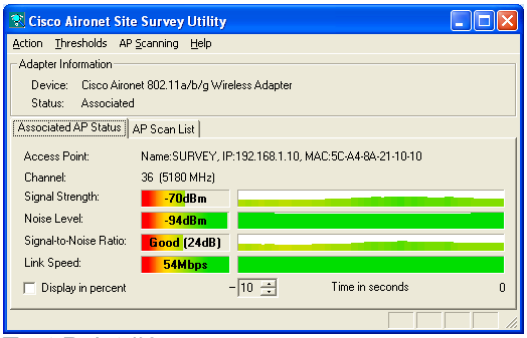
Test Point #01



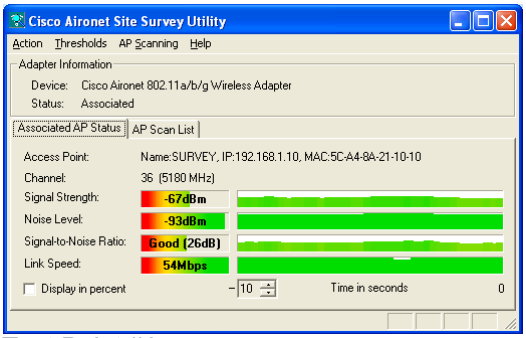
Test Point #02



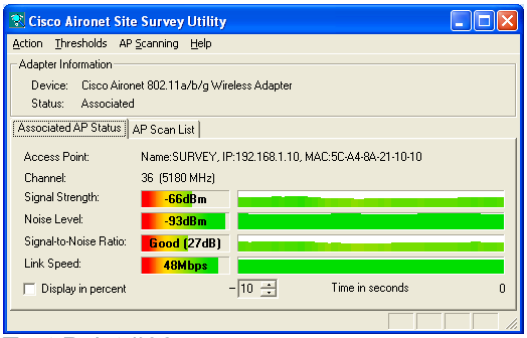
Test Point #03



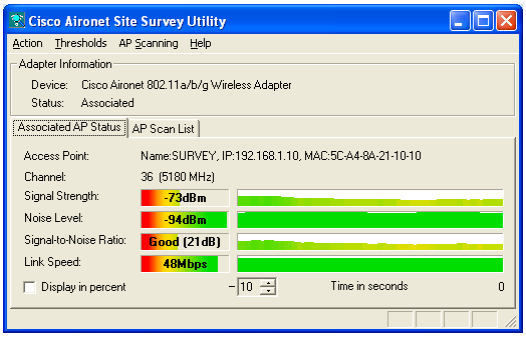
Test Point #04



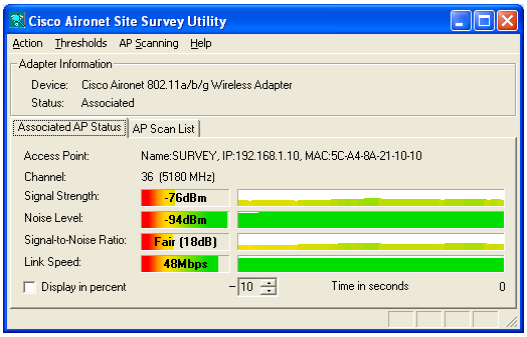
Test Point #05



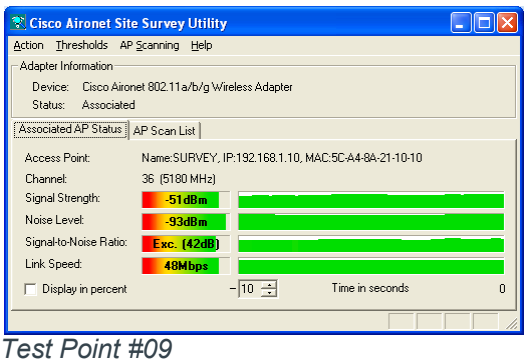
Test Point #06



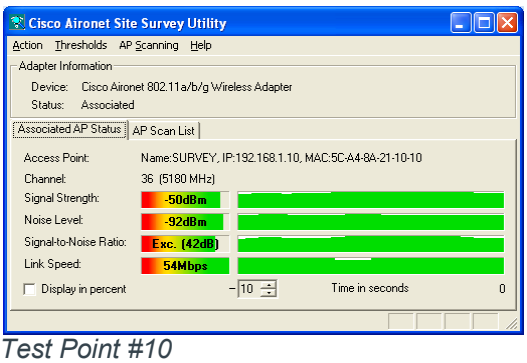
Test Point #07



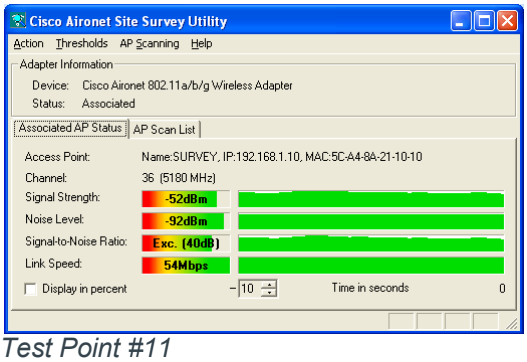
Test Point #08



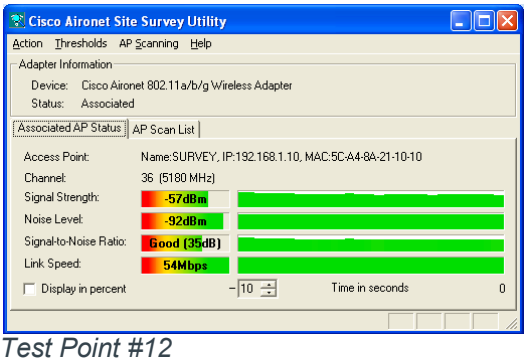
Test Point #09



Test Point #10



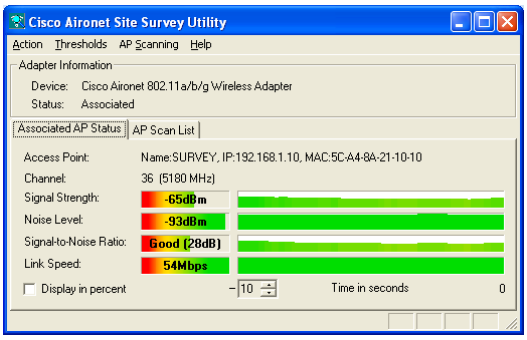
Test Point #11



Test Point #12

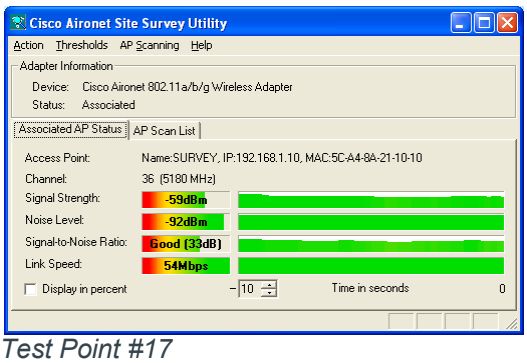
No Access
Test Point #13

No Access
Test Point #14

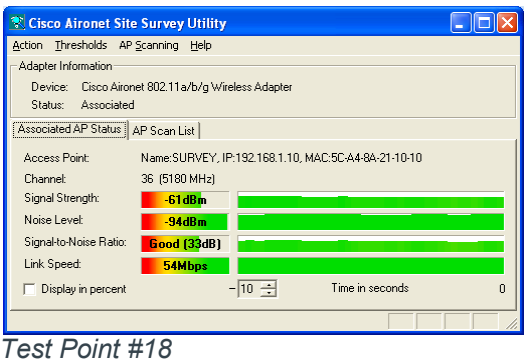


No Access
Test Point #15

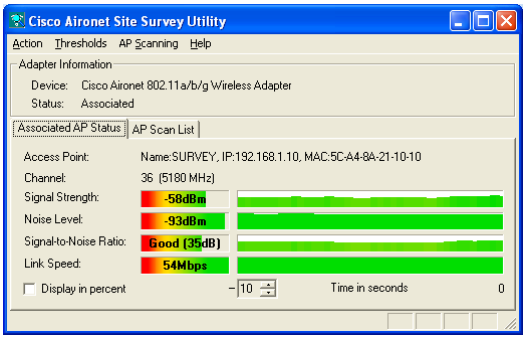
Test Point #16



Test Point #17



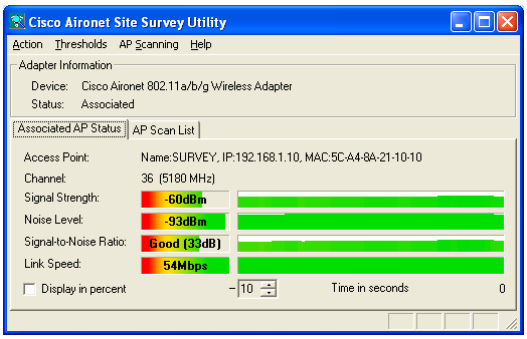
Test Point #18



Test Point #19

No Access

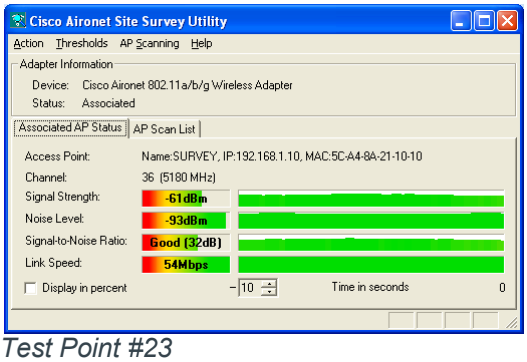
Test Point #20



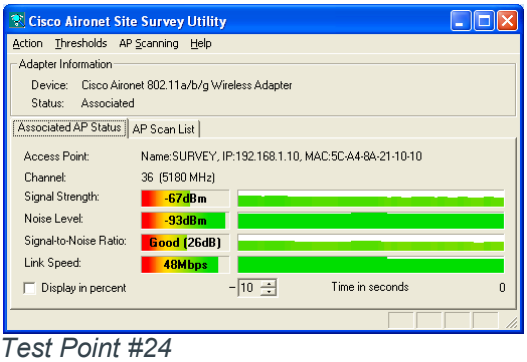
Test Point #22

No Access

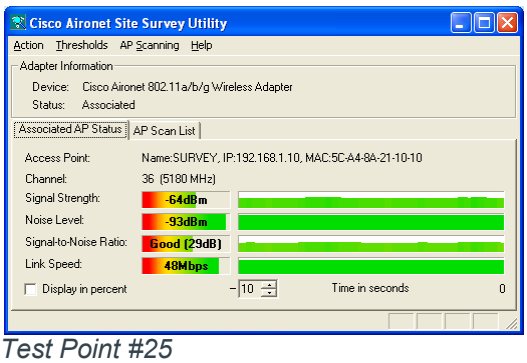
Test Point #21



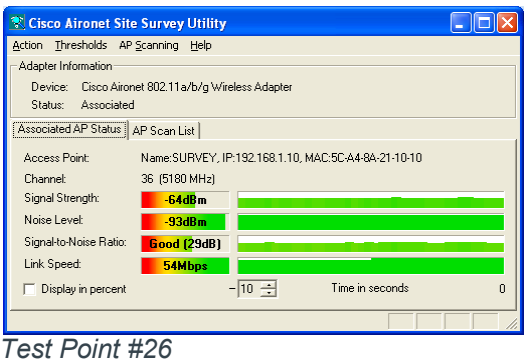
Test Point #23



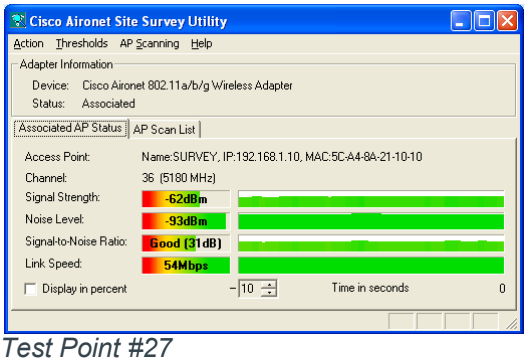
Test Point #24



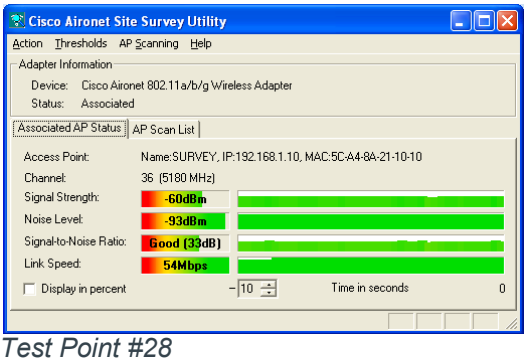
Test Point #25



Test Point #26

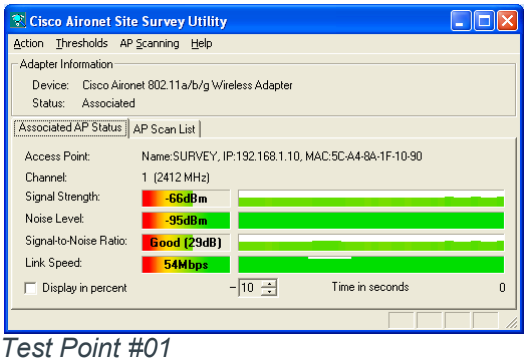


Test Point #27

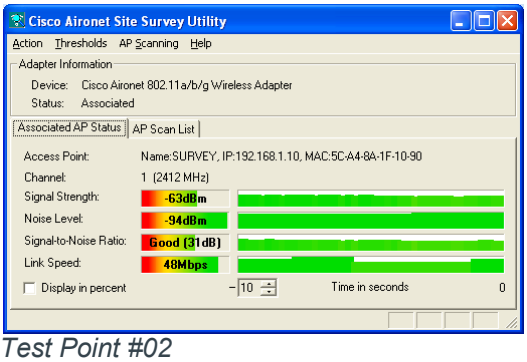


Test Point #28

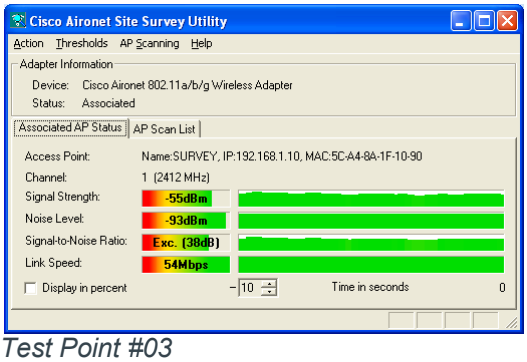
11.1.3 AP03 Test Wi-Fi Readings - 2.4 GHz Band



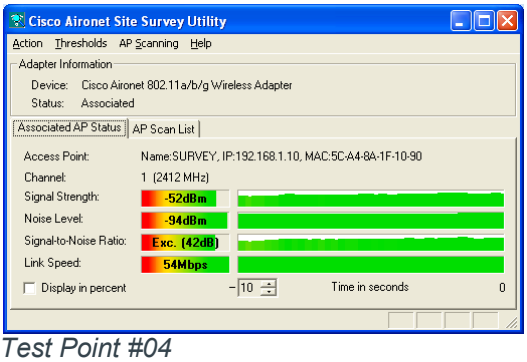
Test Point #01



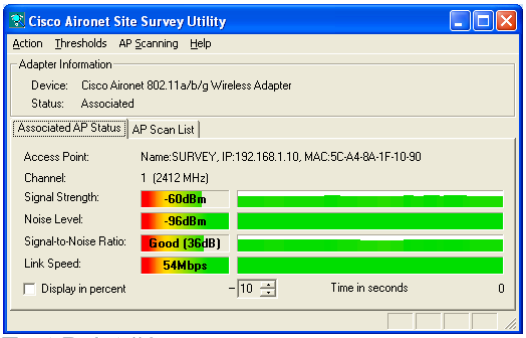
Test Point #02



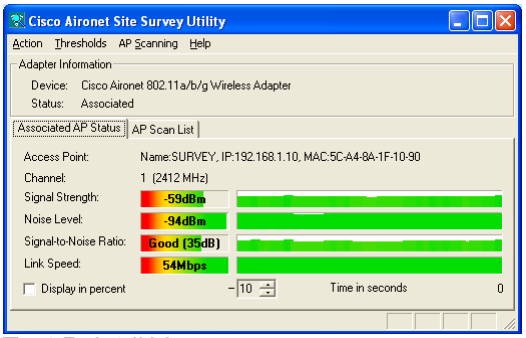
Test Point #03



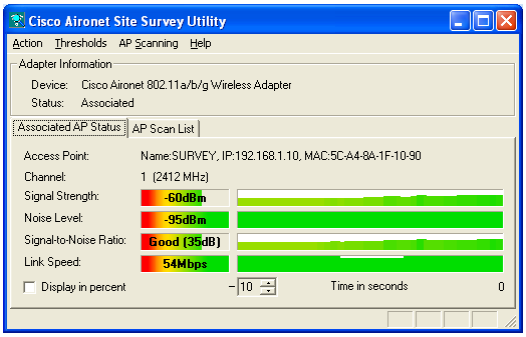
Test Point #04



Test Point #05



Test Point #06



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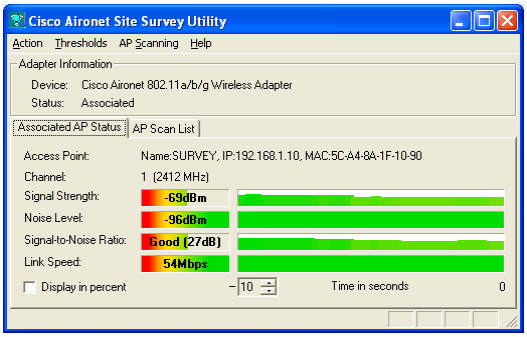

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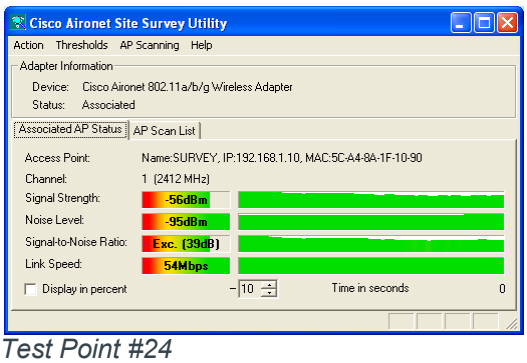

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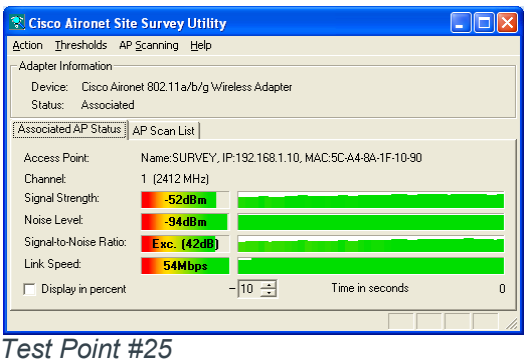

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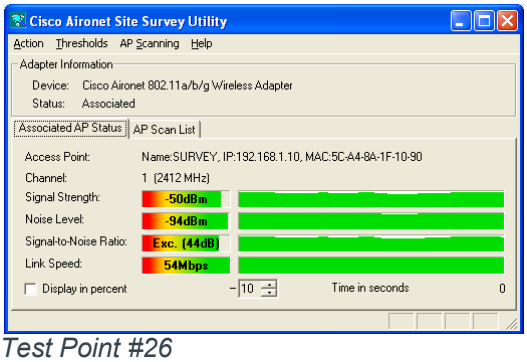

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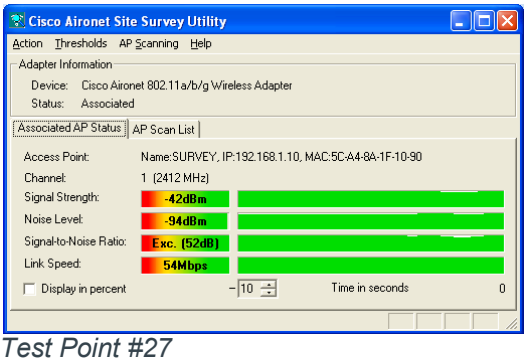

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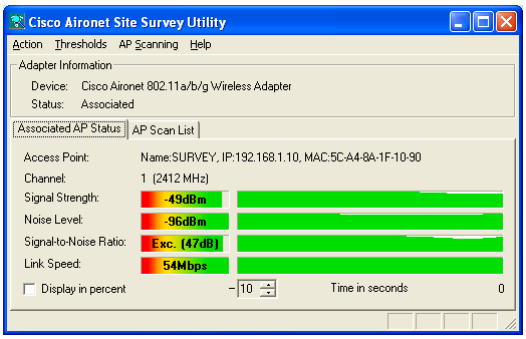
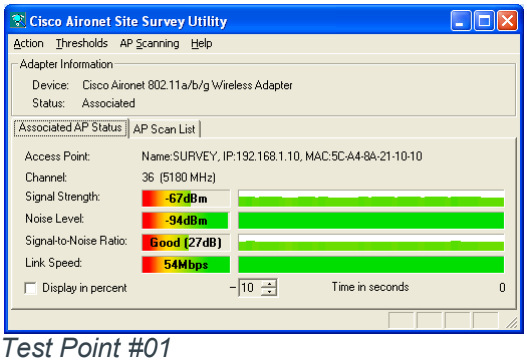
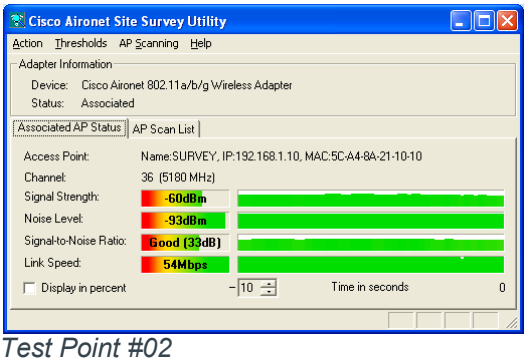


Test Point #28

11.1.4 AP03 Test Wi-Fi Readings - 5 GHz Band



Test Point #01



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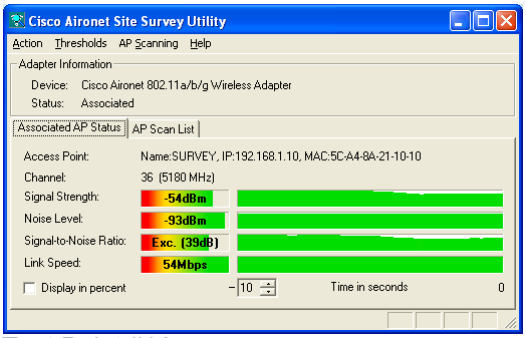

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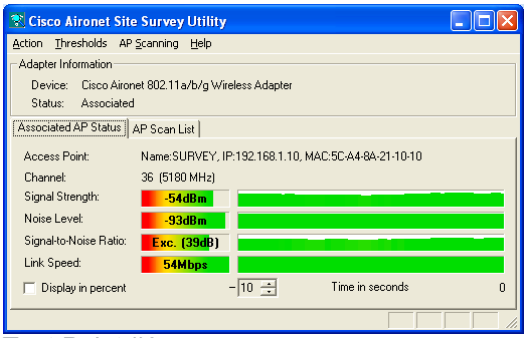

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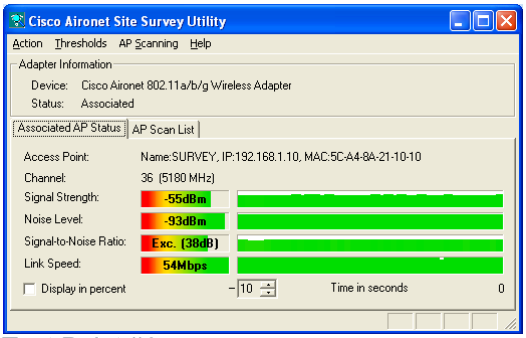

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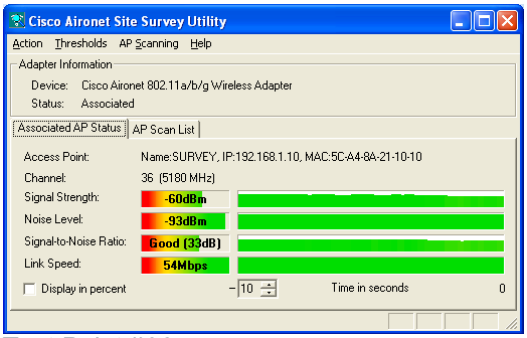

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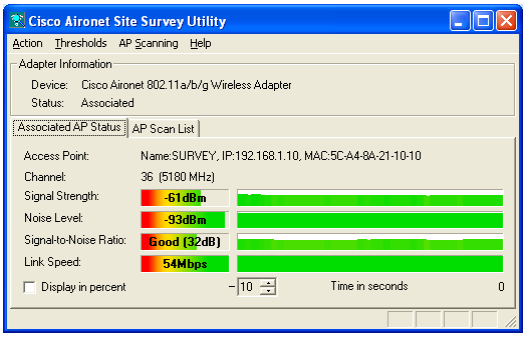

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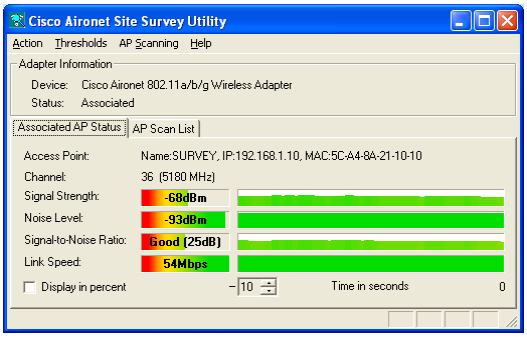
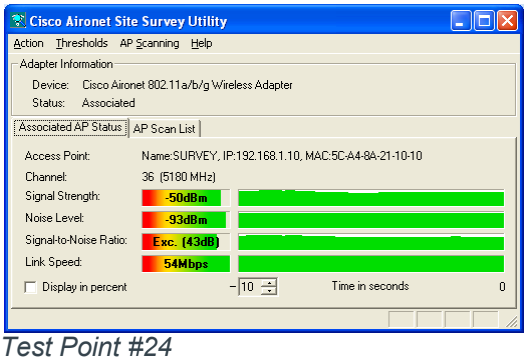
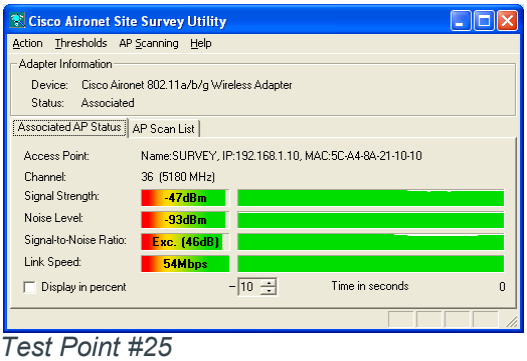


Test Point #08



Test Point #24



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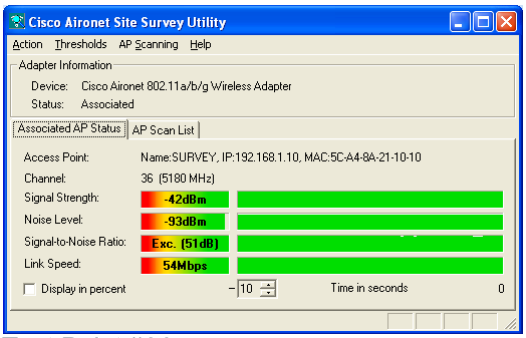

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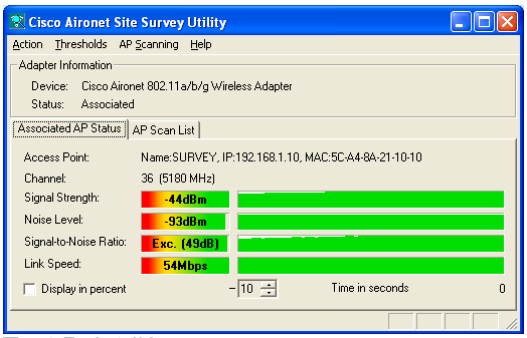

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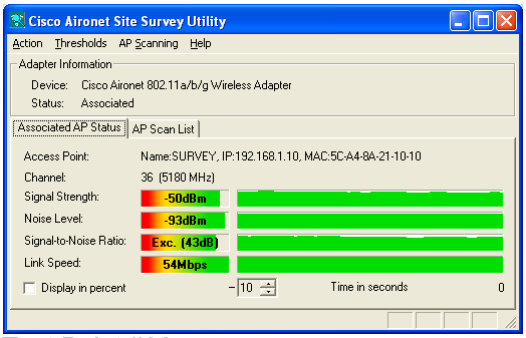
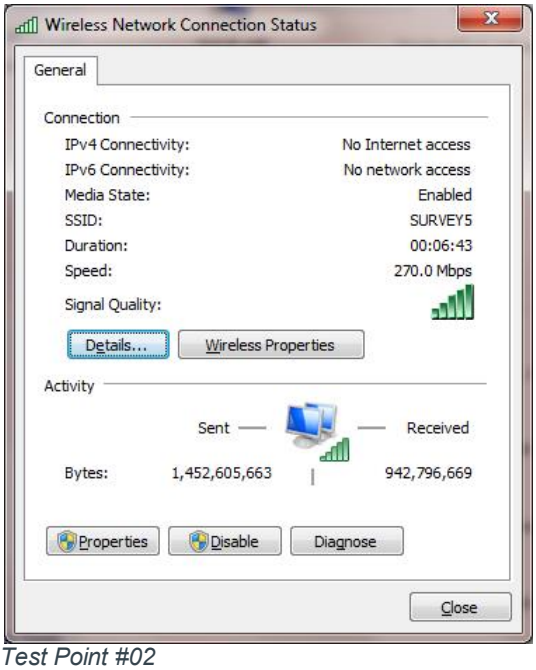
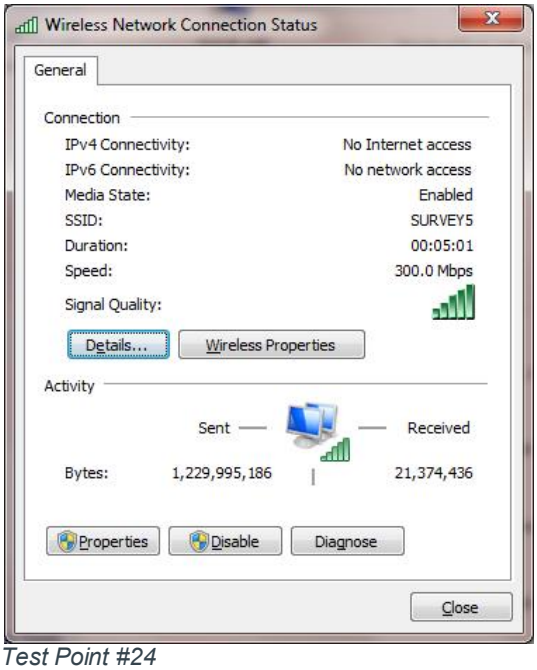


Test Point #28

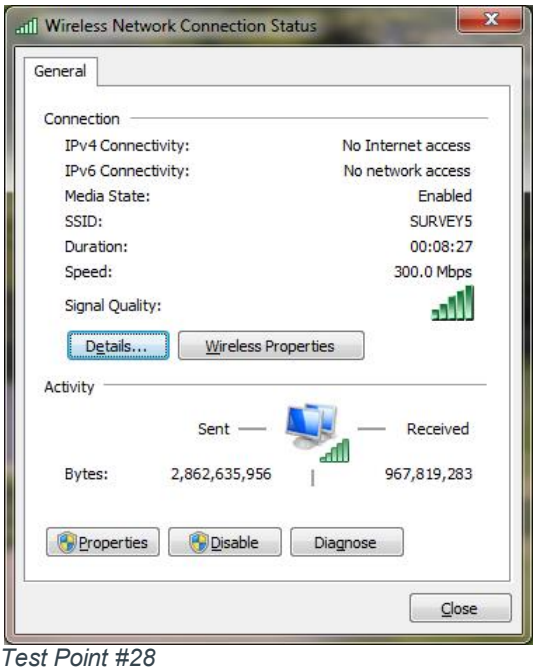
11.1.1 AP03 Test Wi-Fi 802.11n Data Throughput Readings (5 GHz Band)



Test Point #02

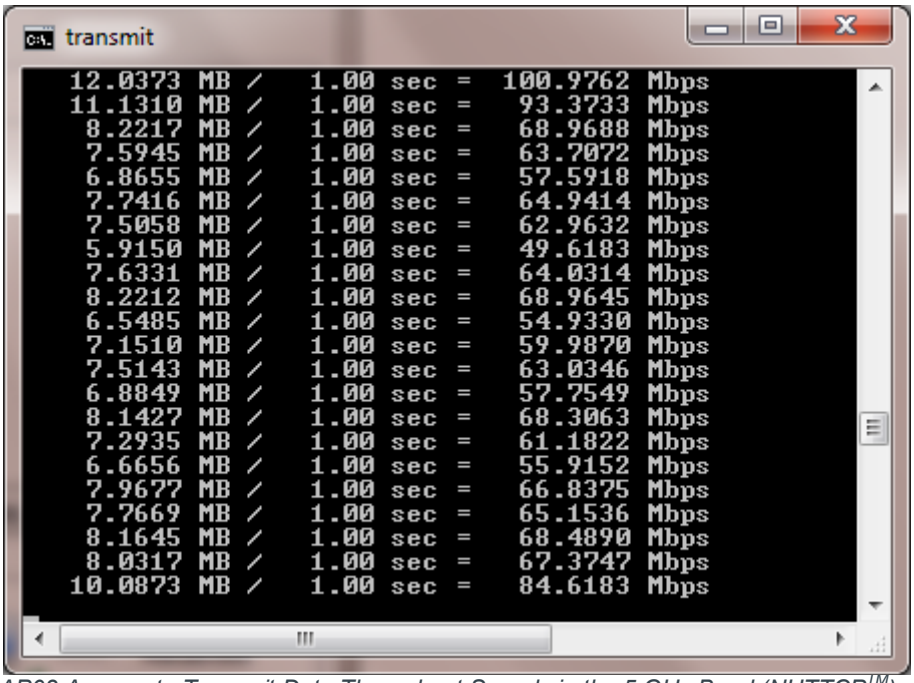


Test Point #24

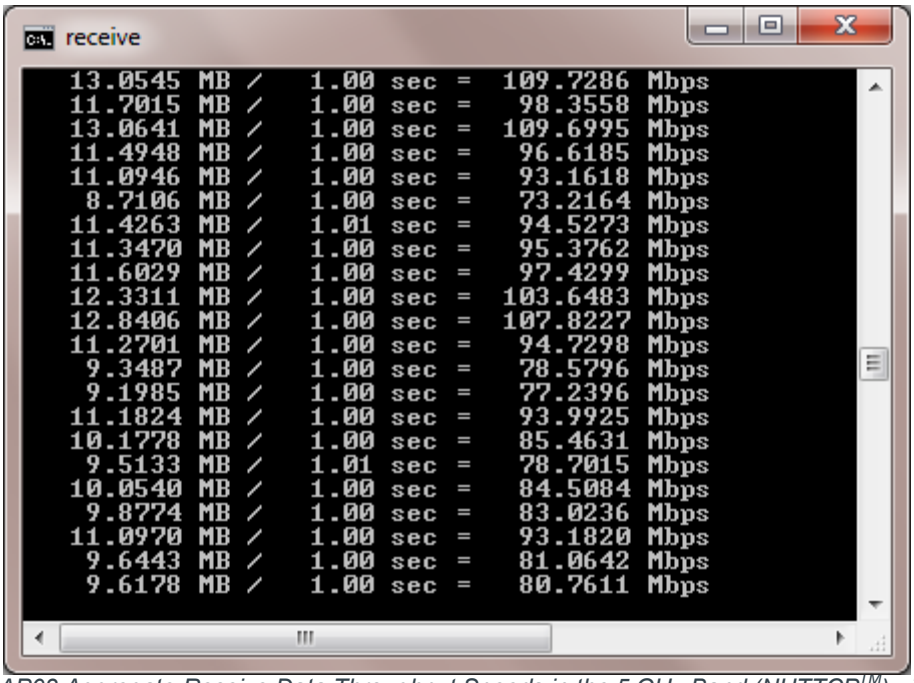


Test Point #28

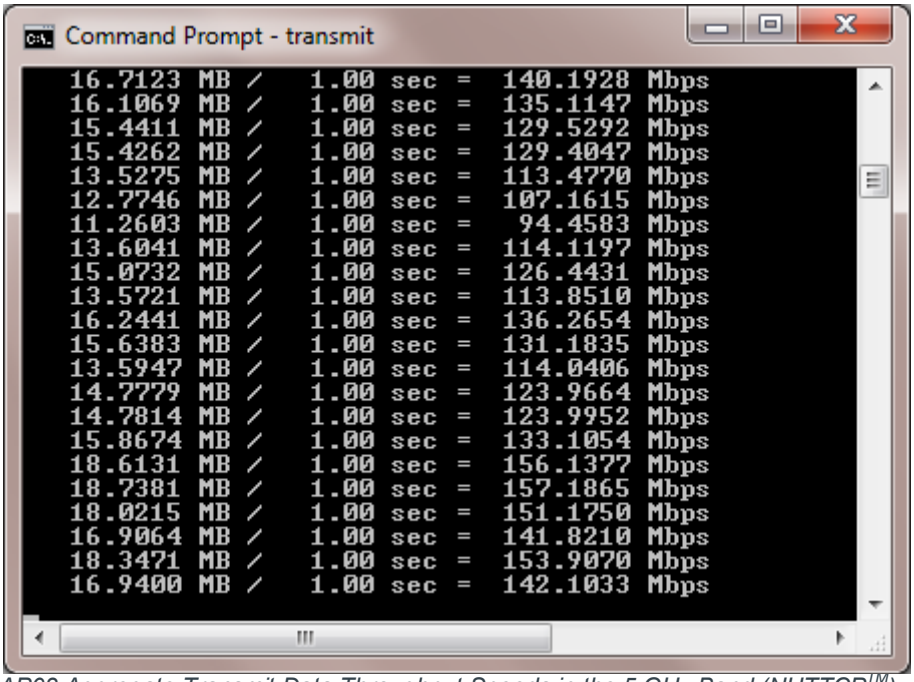
11.1.2 AP03 Aggregate Data Throughput Speeds (NUTTCP 5 GHz Band)



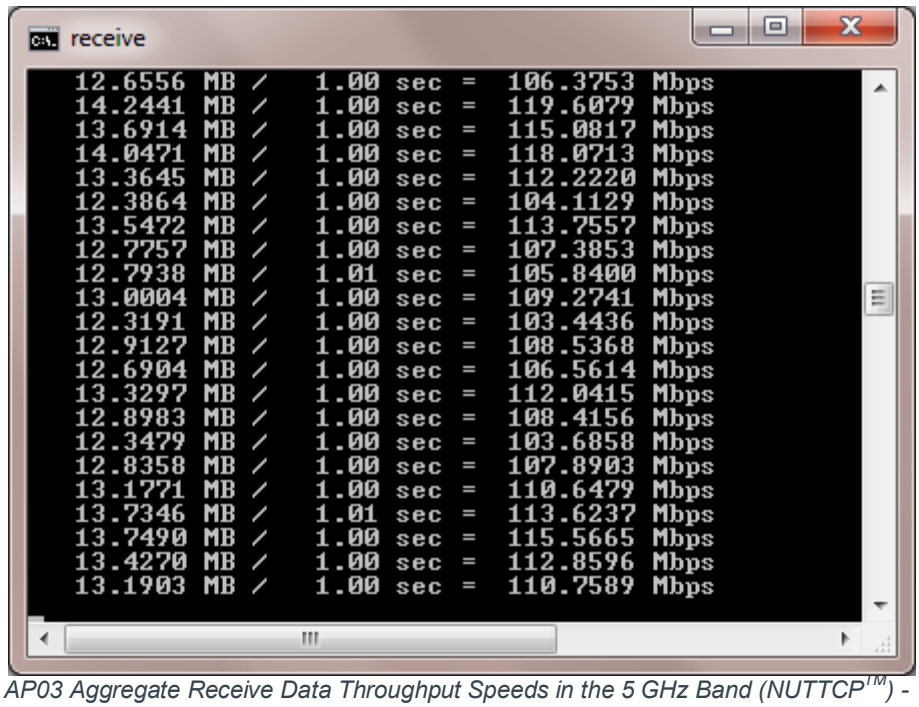
AP03 Aggregate Transmit Data Throughput Speeds in the 5 GHz Band (NUTTCP™) - Test Point #02



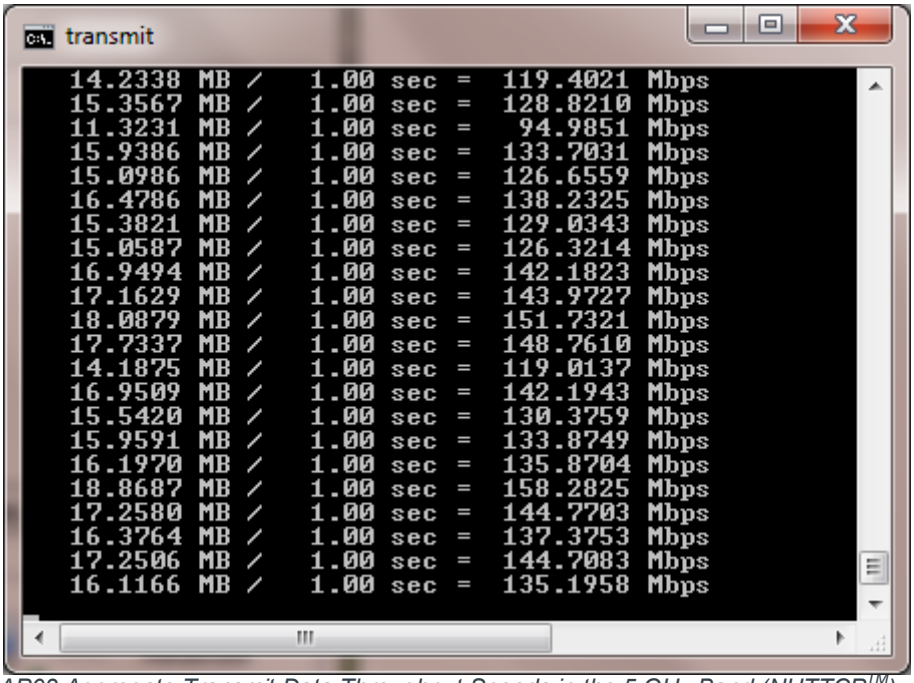
AP03 Aggregate Receive Data Throughput Speeds in the 5 GHz Band (NUTTCP™) - Test Point #02



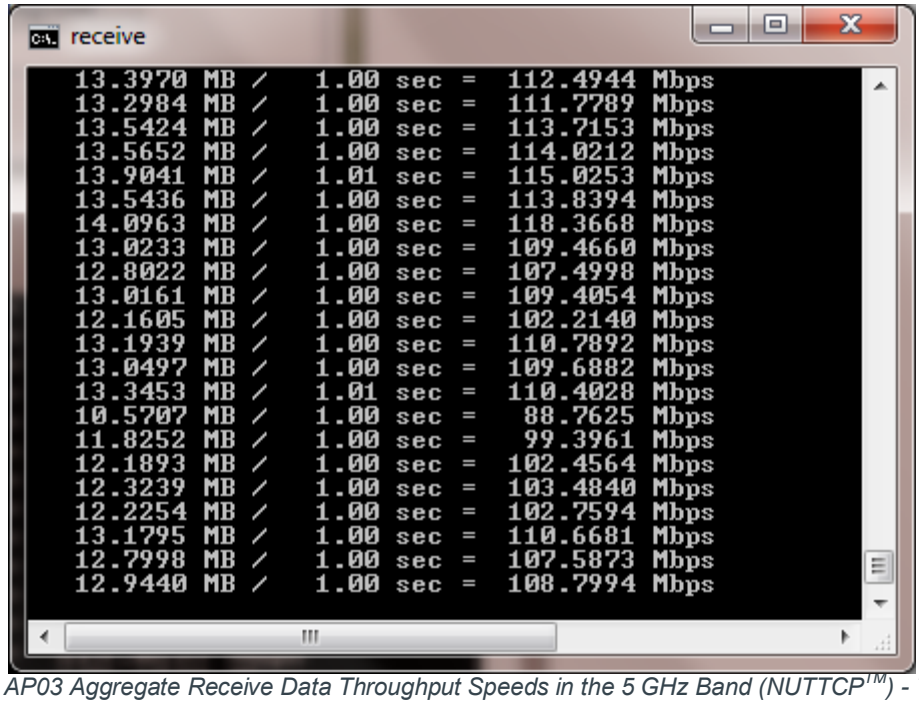
AP03 Aggregate Transmit Data Throughput Speeds in the 5 GHz Band (NUTTCP™) - Test Point #24



AP03 Aggregate Receive Data Throughput Speeds in the 5 GHz Band (NUTTCP™) - Test Point #24



AP03 Aggregate Transmit Data Throughput Speeds in the 5 GHz Band (NUTTCP™) - Test Point #28



AP03 Aggregate Receive Data Throughput Speeds in the 5 GHz Band (NUTTCP™) - Test Point #28

12 PHOTOGRAPHS

Permission was granted to take photographs on the day of the survey.

12.1 General Site Photographs

These photographs serve as an indication as to the conditions on the day of the survey. They provide an impression as to the layout of the site and the levels of stock.

View 01 - Warehouse

13 WHAT HAPPENS NEXT

13.1 SITE PREPARATION FOR CONFIGURATION & COMMISSIONING

DW WiFi does not undertake the physical installation of the equipment.

This survey document is hence designed to provide sufficient detail to enable either you or your preferred contractor to physically install the equipment supplied by DW WiFi and to provide connectivity in terms of Ethernet cabling to your existing network.

DW WiFi offer a service described as ñConfiguration & Commissioningò whereby we visit site to commission the Wi-Fi equipment and then perform radio and connectivity tests to prove functionality of the Wi-Fi system. (Please reference Section 13.6 ï WIRELESS CONFIGURATION & COMMISSIONING).

DW WiFi requires a number of site preparation steps to be completed and tested by you or your preferred contractor prior to arriving on site in the event that our services are called upon.

DW WiFi now supplies access points that are either conventionally powered via standard mains supplies or powered via the IEEE 802.3af Power over Ethernet standard. The proposed access points are power over Ethernet only.

You therefore have the option to power the access points from their existing switches provided that they conform to the IEEE 802.3af standard and that the 90 meters maximum cable length Ethernet rule is observed.

As an alternative DW WiFi can supply single port Cisco Power over Ethernet injectors to perform the same function.

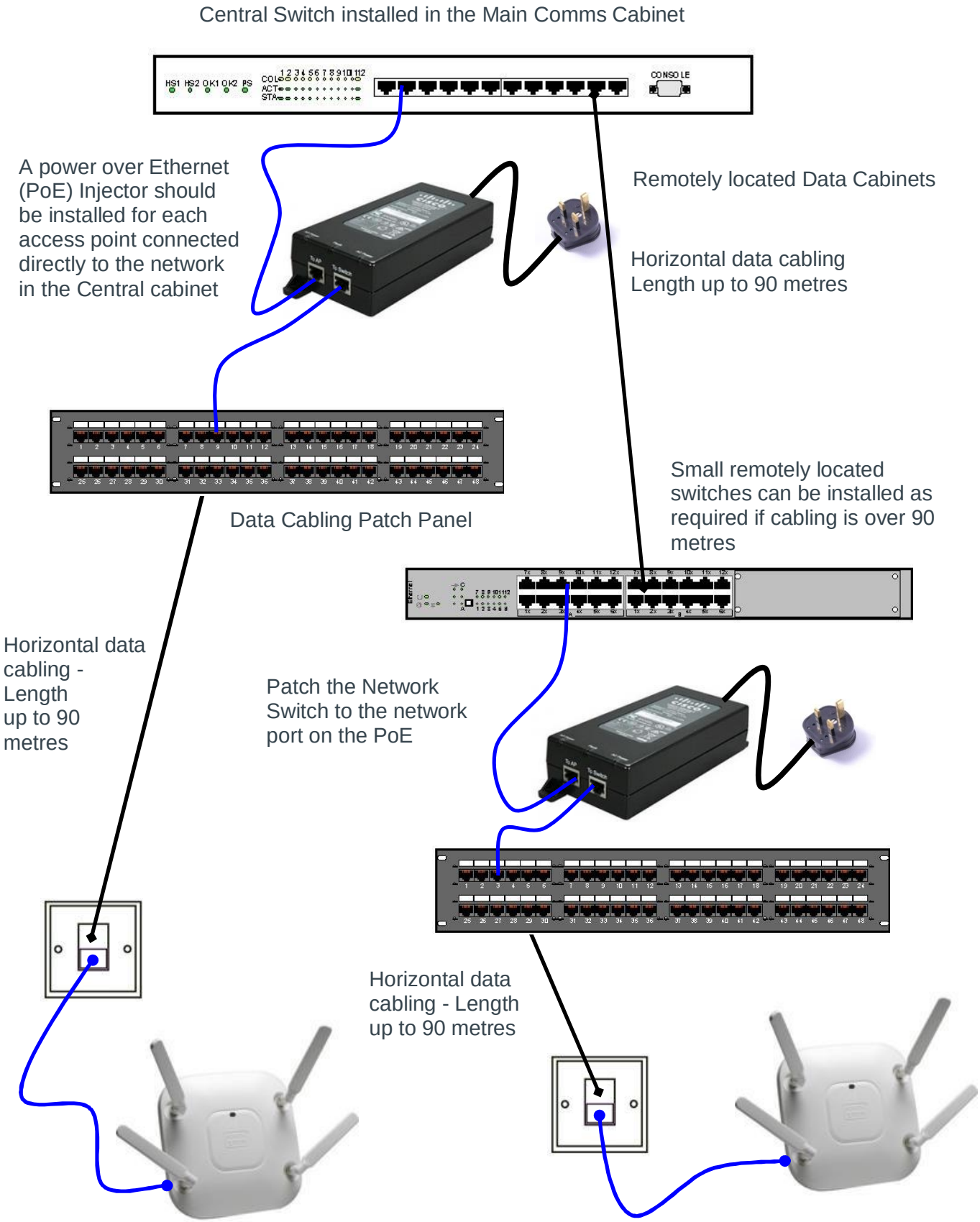
NB. The Cisco Access Points proposed for this installation are equipped with a 10Base-T / 100BaseT (UTP via RJ-45 connector).conforming to the IEEE 802.3 standard.

13.2 Cabling Requirements

The following steps must be completed if applicable to the product type. Please reference the appropriate network topology diagram for insight into how the components are connected.

- If required a 13A socket 240V single switched outlet should be provided within 1 metre of each Cisco PoE injector.
- A connection must be made between each PoE injector (Data In) And your switch using a short UTP cable (minimum Category 5).
- A second length of Ethernet cable of the same specification must be routed from the PoE injector (Data and Power Out) to the access point. It must not exceed 90 meters.
- The cabling installer must terminate and test the new cable runs before the RF can be connected and tested.

13.3 NETWORK TOPOLOGY



13.4 Access Point Installation

- The location(s) that are specified in this site survey report for the placement of the Access Point(s) must be prepared so that they will accept the Access Point(s).
- The Access Point mounting brackets must be installed in readiness to receive the Access Points.
- The proposed antennas must be installed in the directed locations. All interconnection coaxial cables must be adequately routed from the antenna locations to the wireless access points. Any access holes made to provide a route through any temperature controlling material must be filled.

13.5 Access Point Mountings

In the event that the wall-mounting bracket supplied is unsuitable then it is your responsibility to engineer a mounting surface to mount the access point on to.

In normal practice it is best to provide and secure a wooden back panel to any steel structural support or wall that may result in reflection of signals by using suitable clamps. This back panel will provide the means to adequately mount the proposed wireless hardware and associated items easily and neatly as well as provide a non reflective surface behind any antenna.

Where the proposed access points are to be mounted (Upright or Inverted) to a structural steel beam, and where the antennas are in clear air either above or below the beam a wooden back panel is not always required as other options for mounting are available. The important issue when mounting the wireless access point in this location is that the antennas are in clear air and are visible from most directions.

Depending on the locations proposed for the wireless devices (access points) the orientation of the devices and the orientation of the associated antennas may be required to be varied. This usually means mounting the devices either vertically with the antennas pointing downwards when mounted at high level or antennas pointing upwards when mounted to walls at varied heights. There is also the occasion where the proposed devices may be required to be mounted flat to a structural beam.

13.6 WIRELESS CONFIGURATION & COMMISSIONING

Commissioning the Wi-Fi kit is an additional Professional Service offered by DW WiFi. The commissioning process involves a number of steps as described here:

- An initial site review will be conducted. During this walk through, DW WiFi will visually inspect the installed AC outlets, Ethernet cable runs, and Access Point location platforms, mounting brackets, antennas or external enclosures.

- When all access points are in place and powered on DW WiFi will test the Ethernet connection using a network ñpingòtest. In the event that the ñpingòtest fails and the network connection is at fault it is your responsibility to remedy the network connection.

- When access points are in situ and functional the RF devices will be ñpingedòfrom a networked PC to prove full connectivity to the host computer.

- Finally, a walk test will be conducted to confirm quality of signal and radio coverage has been provided in all areas as per the survey requirements.

13.7 Assumptions

It is important that the following work has been undertaken prior to the day of commissioning:

- Installation and testing of the Ethernet network points at each access point location.

- Installation of any required electrical services, including provision for the required number of power over Ethernet injector units

- Installation of the access points including mounting brackets for the access points plus any additional antennas, brackets and interconnecting cables.

13.8 Access Point configuration

During installation, DW WiFi will ensure the correct configuration of each Access Point. Future Access Points will need to be configured to avoid communication problems. DW WiFi will also require that you supply network information on request to enable each Access Point configuration.

13.9 Fast Ethernet

With certain types of fast Ethernet switches it is recommended that the access points be connected to a separate segment of the network and that segment be permanently set to 10Mbits/sec at half duplex.

13.10 Power over Ethernet

Early generations of Cisco access points ñ**do not"** conform to the IEEE 802.3af standard for Power over Ethernet therefore only use Cisco certified Switches and or Power Patch Panels to provide inline power. In the event that your switches do NOT support this standard DW WiFi can supply Cisco PoE injectors to power the access points instead.

One injector will be required for each access point. Please make sure that there is adequate space available within any communications cabinet for the injectors.

As with normal Ethernet installations the maximum single run between the patch panel and the Access point is 90m when using category 5 UTP cable.

The injector is installed with a standard UTP cable into the incoming port from the patch panel, and a length of standard Category 5 (or above) UTP cable from the injector to the Access Point.

The injector can then be connected to the power point. It is normal practice to install the devices adjacent to the patch panel itself.

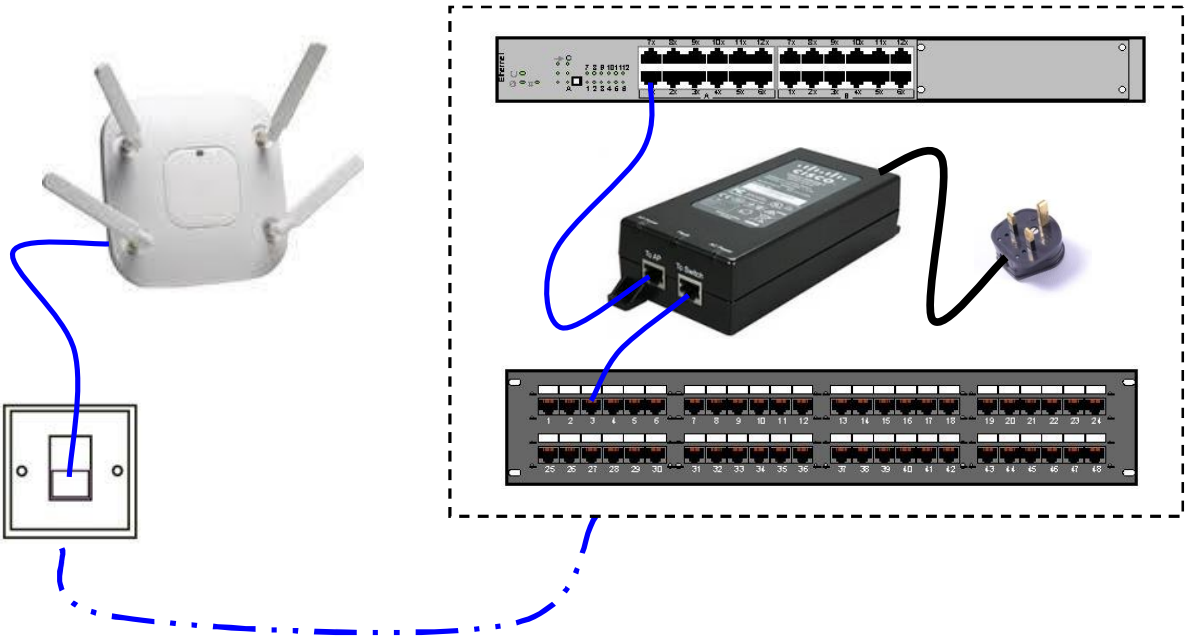
It s normal practice to install the injectors centrally, within the data cabinet (as close to the network switch as possible). Suitable numbers of standard 13A power outlets must be available within the cabinet to provide mains power to the injectors.

It is important that no other device be connected to the cable between the PoE injector and the Access Point. Therefore it may be essential to have the injector immediately after a repeater in case of a long run (longer than 90m) from the patch panel.

13.10.1 Powering Access Points using Cisco Power Injectors

By default DW WiFi specifies a single port ôPower over Ethernetô power injector. One power injector will be required per access point. As its name suggests, it injects power onto the Ethernet data cable and hence provides a means of powering the access point remotely.

The diagram below depicts a typical installation. This shows a single Cisco access point powered using a Cisco power injector located in the network cabinet. The power injector must be connected to the access point power supply which in turn requires a standard IEC mains cable and a standard 240V mains socket.



Please make sure that there is sufficient space inside your network cabinet to fit the required number of Cisco power supplies and power injectors. Please also ensure that provision has been made in the cabinet to plug in to required number of IEC mains plugs that will supply 240V mains power to each Cisco power supply.

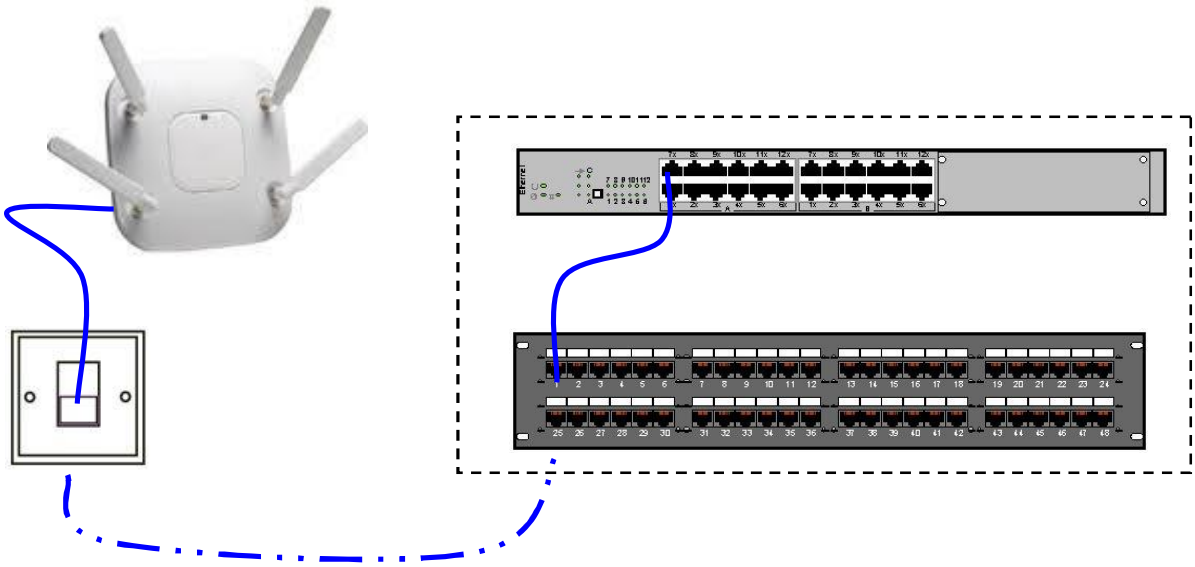
As with normal Ethernet installations the maximum single run between the patch panel and the Access point is 90m when using category 5 UTP cable. The injector is installed with a standard UTP cable into the incoming port from the patch panel, and a length of standard Category 5 (or above) UTP cable from the injector to the Access Point.

NB. It is important that no other device be connected to the cable between the PoE injector and the access point. It may therefore be essential to have the injector immediately after a repeater in case of a long run (longer than 90m) from the patch panel.

13.11 Powering Access Points Using 802.3af Compliant Ethernet Switch

All current models of Cisco 802.11g and 802.11a access point now support the IEEE 802.3af standard for power over Ethernet. It is hence possible to power the access points with any Ethernet switch supporting the 802.3af standard. Each access point obviously needs to be patched into a ϕpower enabledôport on the switch.

The diagram below depicts a typical installation. This shows a single Cisco access point powered via one of the ϕpower enabledôports on the network switch.



As with normal Ethernet installations the maximum single run between the patch panel and the Access point is 90m when using category 5 UTP cable. For cable runs between the local switch and the access point that are more than 90 meters it is recommended that fibre be used with the necessary fibre converters each end of the cable run. Please see the next section for recommendations when using fibre.

14 GLOSSARY OF TERMS

MAC

This is an acronym for Media Access Control, the globally unique hardware address of an Ethernet network interface card.

Roaming

Roaming is the ability to move seamlessly from the coverage area of one Wireless Access Point to another with no loss in connectivity.

SNR

SNR stands for Signal to Noise Ratio. It represents the relationship between the usable intended signal and the amount of extraneously noise present. It is expressed in dB. If the SNR limit is exceeded the signal transmitted will be unusable.

SSID

SSID is an acronym for Service Set Identifier. The SSID is a sequence of up to 32 letters or numbers that is the ID, or name, of a wireless local area network. The SSID is set by a network administrator and for open wireless networks; the SSID is broadcast to all wireless devices within range of the network access point.

WEP

WEP is a security protocol that is designed to provide a wireless local area network (WLAN) with a level of security and privacy comparable to that of a wired LAN by encrypting the data that is transmitted.

WPA

Wi-Fi Protected Access (WPA) is a data encryption specification for 802.11 wireless networks that replaces the weaker WEP. Created by the Wi-Fi Alliance before an 802.11i security standard was ratified by the IEEE, it improves on WEP by using dynamic keys, Extensible Authentication Protocol to secure network access, and an encryption method called Temporal Key Integrity Protocol (TKIP) to secure data transmissions.

DSSS

This is an acronym standing for Direct Sequence Spread Spectrum and describes the radio technology.

ETSI

The European Telecommunications Standards Institute (ETSI) is an independent, non-profit, standardization organization in the telecommunications industry (equipment makers and network operators) in Europe.

IOS

This is an acronym for ôInternetwork Operating Systemôand refers to the console interface of the Cisco access points.

RSJ

This is an acronym standing for ôRolled Steel Joistô

.

RSSI

This is an acronym standing for ôReceived Signal Strength Indicationôand is a measure of the signal strength in a given area.

PoE

This is an acronym standing for ôPower over Ethernetôand refers to the IEEE 802.113af standard for powering devices remotely via Ethernet data cable.

RF

This is an acronym standing for ôRadio Frequencyôand is more commonly known as Wi-Fi.

Wi-Fi

This stands for ôWireless Fidelityôand is a trademark of the Wi-Fi Alliance, founded in 1999 as Wireless Ethernet Compatibility Alliance (WECA), comprising more than 300 companies, whose products are certified by the Wi-Fi Alliance, based on the IEEE 802.11 standards (also called Wireless LAN (WLAN) and Wi-Fi). This certification warrants interoperability between different wireless devices.