
**The University of Michigan
Network Working Group
IT Commons Initiative
2.4 GHz Indoor Wireless Local Area Network Technical Paper
October 5, 2005**

This document has been assembled and published to provide a guideline for units who wish to install a highly robust 2.4 GHz Wireless Local Area Network (WLAN). It is understood that factors such as funding, low user density, or other specific issues may require installations that need not completely follow the guidelines set forth. In such cases, these guidelines should still provide a useful starting point. We recommend that any departures from these guidelines should be made only after careful consideration of all relevant engineering and desired performance factors.

This document was originally published as a vendor requirements document. The purpose was to enable maximum user density and to minimize Radio Frequency (RF) related concerns for larger deployments.

U-M units who have questions about or are interested in installing a wireless network should contact their ITCOM Project Manager:

<http://www.itcom.itd.umich.edu/customer/projectmanager.html>



Requirements for 2.4 GHz Wireless LAN design at The University of Michigan

1. Pre-Survey walkthroughs shall consider placement based on proximity to cable trays, minimizing conduit installations, aesthetic restrictions / considerations, minimize vandalism / theft, and building material type effects on signal propagation for antenna placement.
2. Only a Laptop PC shall be used.
3. PDA's shall not be used for site survey work, but may be used for troubleshooting purposes.
4. Client Card shall be a Cisco AIR-CB21-A-K9. Only those client cards manufactured after December 2004 shall be used. Those cards are identified as described in Appendix 1.
5. AP's shall be Cisco 1200 with IOS software, or other as agreed upon in advance.
6. Air Magnet shall be used in active site survey mode on the laptop. Later versions with the calibration option shall be set to AIR-CB21 calibration settings on the pull down menu.
7. Surveyor shall insure that the associated AP is the correct AP, that the displayed data rate is 54 Mbps at close proximity to the AP (< 10 feet), and that standard OFDM data rates are displayed as the signal level decreases. CCK transmissions shall be disabled on the AP when surveying.
8. The use of power levels greater than 10mW is discouraged, especially in multi-floor environments. However, it is understood that some installations will require higher power levels, and these should be thoroughly surveyed and documented.
9. The use of low gain antennas is strongly encouraged. When in doubt, antenna types / installations shall be discussed with U-M ITCOM engineers and / or appropriate unit staff before or during the survey process.
10. Target signal contours for 802.11(g) shall be $-77\text{dbm} \pm 3\text{db}$.
11. If noise levels exceed -90dbm , steps should be taken to provide for channel changes or determine and mitigate the source of the noise / interference.
12. Any documented data rate contours shall be based on the Air Magnet active site survey data rate and shall not be discerned from other sources.
13. Post site surveys shall be conducted and documented with a -77dbm to -80dbm contour.

Requirements for 2.4 GHz Wireless LAN design at The University of Michigan

14. Auditorium designs shall weigh in favor of using a maximum of 3 AP's in distributed locations. The design constraints shall be evaluated with U-M ITCom engineers and / or appropriate unit staff prior to the pre-site survey.
15. The design guideline shall be zero potential for co-channel interference at the specified contour levels of $-77\text{dbm} \pm 3\text{db}$.
16. All Incident RF coverage on floors above and below the surveyed floor / AP shall be documented in the Pre-Site Survey coverage maps. Incident RF coverage of $-77\text{dbm} \pm 3\text{db}$ shall be indicated on the same floor plan as that of the desired RF coverage, by floor, unique AP identifier, and appropriate channel color.
17. The laptop model and serial numbers, client card MAC address, and AP MAC address used in the survey shall be provided in the pre-site survey report.
18. Antenna manufacturer and part number shall be included in the pre-site survey report. These specific antennas, including cable lengths, shall be used for the pre-survey when prescribed in the report.
19. Photographs of each intended installations shall be provided, it shall show only the single antenna type to be installed and the proper orientation. Additional graphics shall be included to clarify orientation or other critical details, as appropriate.

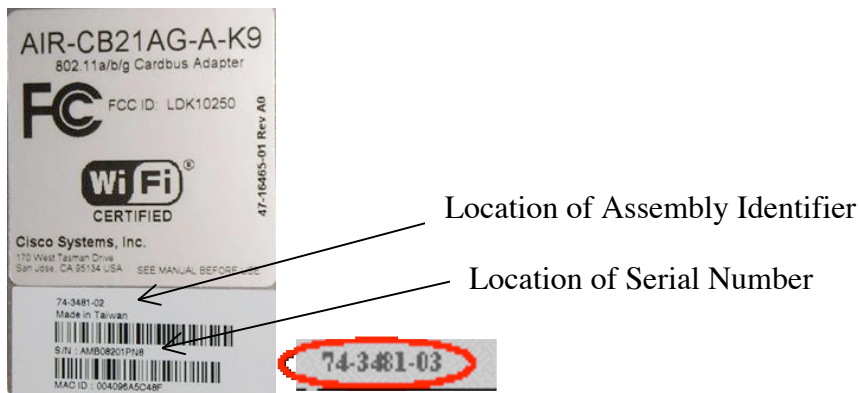
Appendix 1 – Identification of proper Cisco Client Card

The new version of the CB21AG can be identified in two ways: (1) via the Assembly Identifier shown on the MAC / Serial Number label and (2) via the Serial Number shown on the MAC / Serial Number label and Aironet Desktop Utility (ADU).

Assembly Identifier

The Assembly Identifier is located on the top of the MAC / Serial Number label as indicated below:

Old Assembly Identifier (located on MAC / Serial Number label)	New Assembly Identifier (located on MAC / Serial Number label)
74-3481-02	74-3481-03



Serial Number

The new version of the CB21AG can also be identified by Serial Numbers (S/N) starting with S/N FOC0849N1BD. The S/N is readable on the MAC / Serial Number label and via the Aironet Desktop Utility (ADU).

Interpreting the Cisco Serial Number

Cisco S/N format is LLLYYWWXXXX.

Legion:

LLL = Location code (i.e. FOC = FoxConn China)

YY = Year code (08 = 2004...09=2005...etc...)

WW = Week code (weeks 01 to 52)

XXXX = Base-34 Alpha Numeric Unique identifier (Includes 0 to 9 & entire alphabet except I & O).

Any CB21AG S/N with year/week code of 0849 (YYWW) or greater is the new, reworked card.

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Document History

Date	Rev	Description of Change
August 16, 2004	1.0	Initial Release
September 30, 2004	1.1	Added Incident Coverage Requirement Removed redundant photograph requirement Clarified AP type and software details
October 27, 2004	1.2	Added cover page
October 5, 2005	1.3	Revised Cover Page Numbered Requirements Clarified proper Client Card to be used (4) Removed Channel 11 Restriction Clarified / Modified Antenna type guidance (9) Clarified Signal Contour Specification (10) Removed redundant incidental coverage requirement Modified Auditorium guideline (14) Removed reference to proprietary information Added Appendix 1