Wireless Access Point (AP) Installation Process for Contractors at CMU.v13

PREFACE: This is an older document which still has generic relevance; however some models of AP's and mounts are outdated. Please contact Network Operations and/or Communications Cabling Infrastructure for current details.

Overview –This document details the current process that contractors are to follow for the installation of wireless Access Points (APs). This includes installation of the AP's, data jacks, mounting brackets, enclosures, patch cords connected to specific ports, antenna positioning, and removal of temporary stickers. Projects may call for one or several options depending on the model of AP and locations. Contractors need to check individual Scopes of Work and floor plans to correctly match these various options. Outdoor AP's are not addressed in this document.

CMU will provide the contractor with floor plans, APs, antennas, AP mounting brackets, patch cords. AP's are costly devices and tested in advance for proper operation. Contractors are to take care not to drop/damage APs. Please report any mishaps rather than continue to mount an AP that may have been damaged. The overall goal is to minimize the disruption of users and time spent in offices, labs, and classrooms. When data outlets need to be installed, the contractor can mount the AP at the same time, limiting the amount of access to a given room. Prior to contractor work, Network Operations will have already tested the wireless coverage in all areas. Testing is done with mobile survey AP kits to find the optimum locations for the APs. Temporary stickers will be placed to mark AP locations.

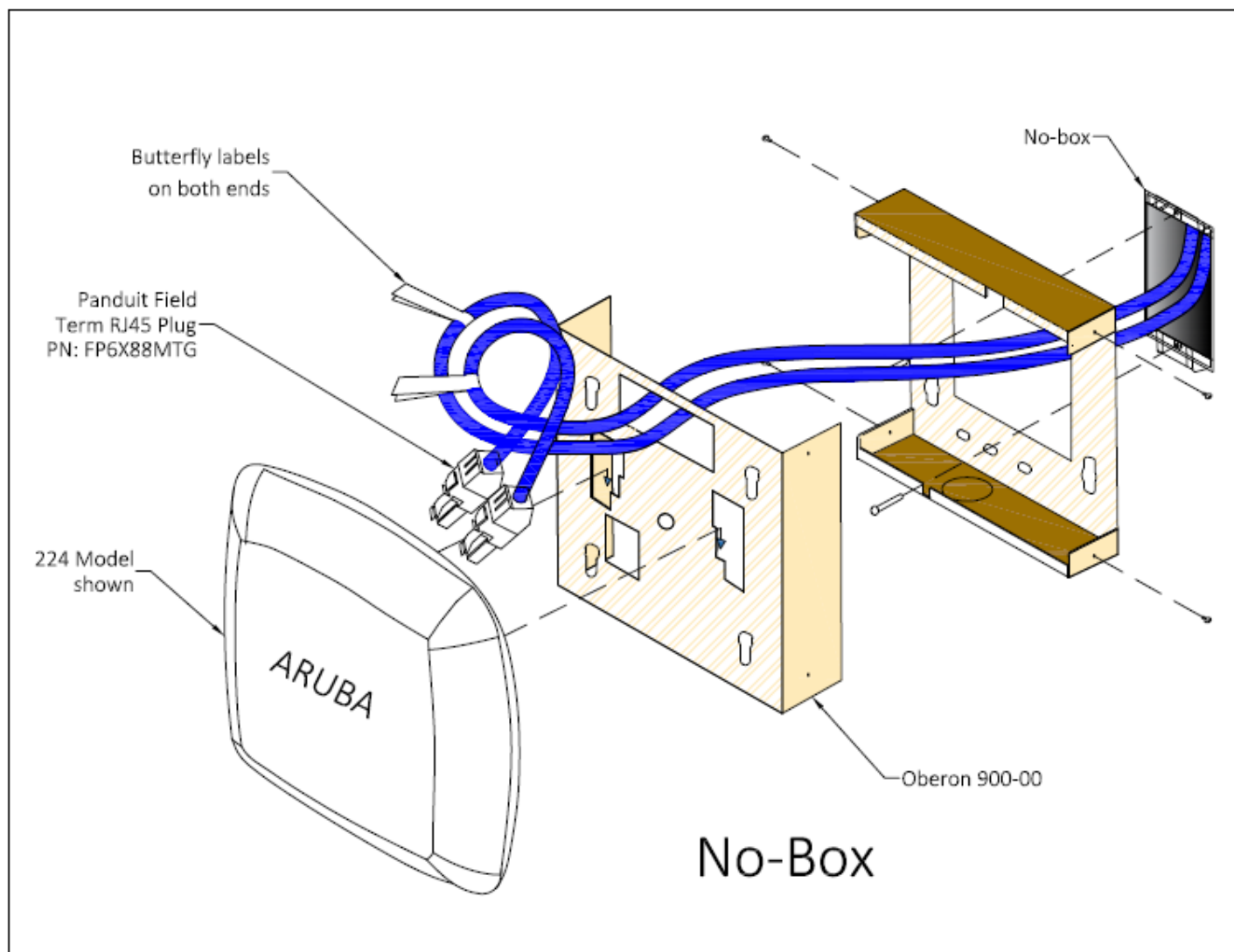**The general steps for AP installation by Contractors are…**
1. Verify outlet can be installed within vicinity of AP (if new outlet).
2. Mark location of AP bracket.
3. Remove temporary sticker marking AP location.
4. Install AP bracket on wall, hard ceiling, or drop ceiling.
5. Install communications outlet (if new outlet needs to be installed). Label and test.
6. Install patch cords into ports on AP.
7. Install antennas (if detachable).
8. Install AP onto bracket if wall or hard ceiling mounted. Install AP/bracket onto grid if drop ceiling mounted. For mounting on drop ceiling grid, contractor must take precautionary measures not to cut hole in ceiling tile too large of an opening for the cable to pass through. It should be notched just enough to allow two Cat6A cables to pass through.
9. Connect the Cat6A patch cords to jacks and corresponding AP ports (see Page #5 chart for correct patch cord to outlet configuration).

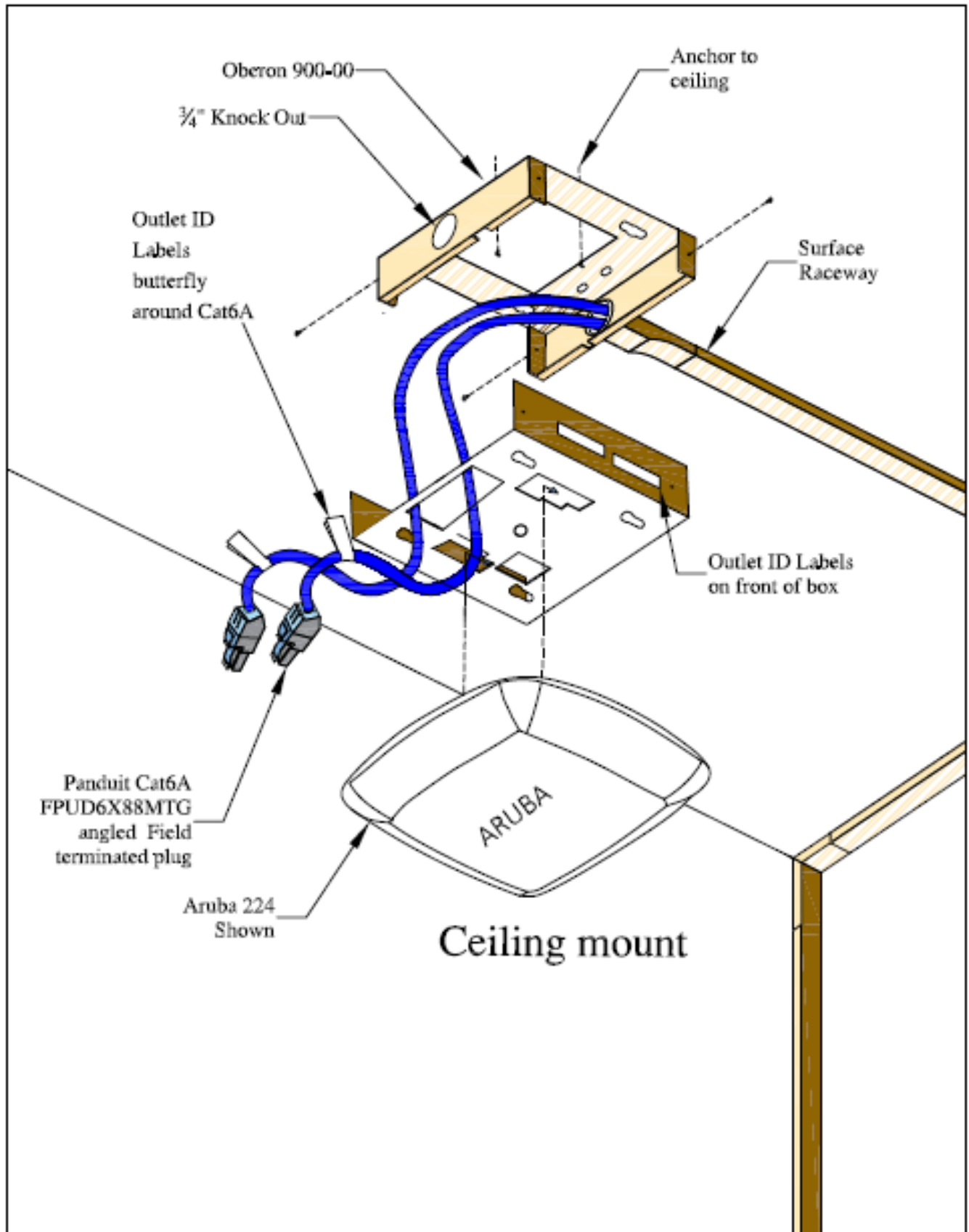*NOTE: Failure to install all antennas -before- plugging patch cord into the communications outlet can damage the AP.*

General Mounting Height, Clearances, Coverage and Performance Guidelines –
- Clearances for ceiling mounted AP's are shown in the diagram on Page #4. This takes into account final clearance of existing, and future, APs that need to fit near vertical surfaces such as adjacent walls. As an example: an AP-220-MNT-W2 mount is 5.5" wide, however an AP-215 is 7" wide, whereas an AP-220 is 7.8" wide. For more details, refer to the drawings on the follow pages.
- For wall mounted AP's, the *minimum* height Above Finished Floor (AFF) to *center* of AP body is 7' and the *maximum* height AFF to the center of AP body is 7' 6".
- For instances where the ceiling height is below 8', mount the AP where the top of the antenna is 6" below the ceiling. Leaving the 6" space will ensure the AP signal is radiating properly. If the ceiling is at 8', then mount the AP at the minimum (7' at the *center* of AP body). If the ceiling is over 8', then mount the AP at the maximum (7'6" at the *center* of AP body).
- Designs shall provide for a minimum of one Access Point for every 200 to 800 square feet (drywall construction) or 50 to 400 square feet (hard plaster or masonry construction) of interior space, depending on capacity-to-performance ratio. Example: classrooms and lecture halls will require denser placements.
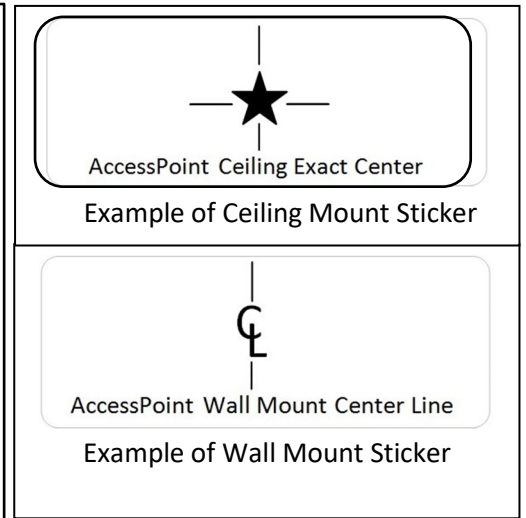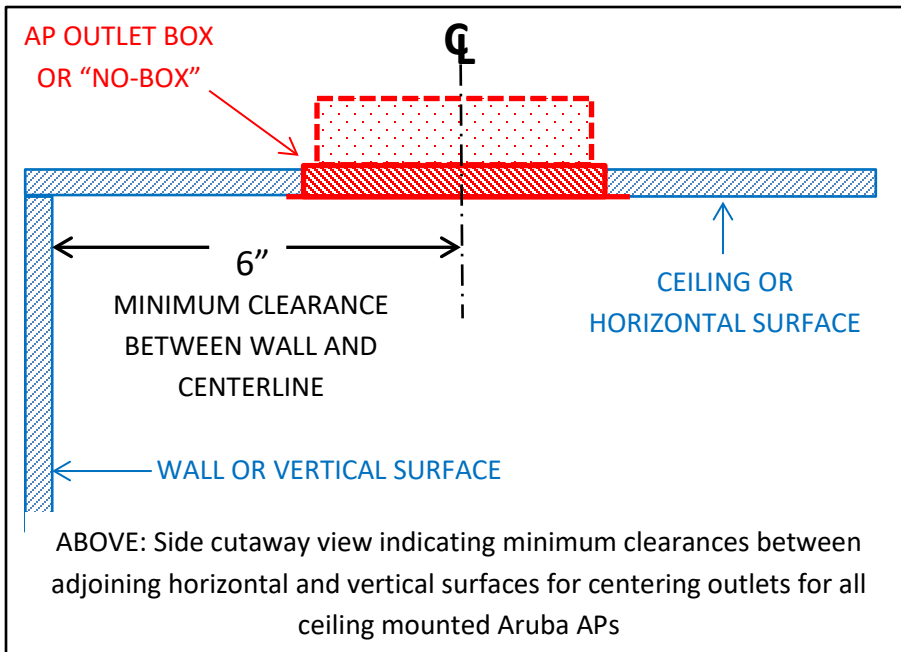
900-00 SERIES MOUNTING EXAMPLES:

Butterfly labels
on both ends

Panduit Field
Term RJ45 Plug
PN: FP6X88MTG

No-box

224 Model
shown

ARUBA

Oberon 900-00

No-Box

WALL MOUNTED NO BOX INSTALLATION

Oberon 900-00

¾" Knock Out

Anchor to ceiling

Outlet ID Labels butterfly around Cat6A

Surface Raceway

Outlet ID Labels on front of box

Panduit Cat6A FPUD6X88MTG angled Field terminated plug

Aruba 224 Shown

ARUBA

Ceiling mount

CEILING MOUNT USING SURFACE RACEWAY

AP Clearance Details - Installing outlets with only AP-215s in mind may not allow enough clearance for future AP's which may have a larger footprint. Therefore, the center of an outlet box, mount or AP should not be less than 6" from an adjacent perpendicular surface, which will accommodate AP's that are up to 8" wide.
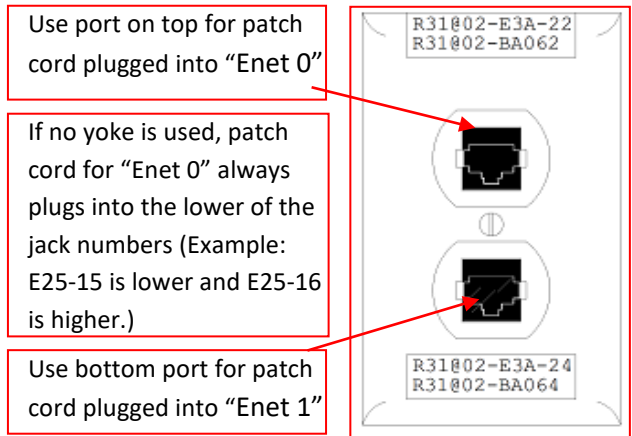

AP OUTLET BOX OR "NO-BOX"

6"

MINIMUM CLEARANCE BETWEEN WALL AND CENTERLINE

CEILING OR HORIZONTAL SURFACE

WALL OR VERTICAL SURFACE

ABOVE: Side cutaway view indicating minimum clearances between adjoining horizontal and vertical surfaces for centering outlets for all ceiling mounted Aruba APs

AccessPoint Ceiling Exact Center

Example of Ceiling Mount Sticker

AccessPoint Wall Mount Center Line

Example of Wall Mount Sticker

AP & Outlet Locations – Projects will be preceded by placement of temporary, removable stickers to mark exact locations of ceiling mount AP's and exact horizontal center of wall mounted APs. Exact placement is desired. However, if installation requires horizontal repositioning of wall mounted APs, contractors can relocate center of AP to left or right up to 18" in either direction. Since relocation of one AP can affect overall wireless coverage, any variation from the planned locations of ceiling mounted APs must be approved by CMU. Contractors are to remove any temporary stickers, taking care not to harm wall or ceiling finishes.

Floor Plans – The floor plans provided by CMU will be labeled to show the AP and data outlet locations, as well as the name of each AP and the outlet labels to be used. The outlet labels provide information for which closet, rack, panel and port each cable is to terminate within the communications closet. A spreadsheet with matching information will also be provided to the contractor. The APs will be labeled to correspond to the labels of the APs shown on the floor plans. It is important to match each AP with the location to where it is to be installed.

AP Mounting Brackets – It is important to match the correct AP mounting bracket to the model of AP. Each bracket is specific to the model of AP, and each model has multiple brackets based on construction. Each model AP may have multiple mounting bracket options, depending if using a hard ceiling or drop ceiling. Due to the force required to install the drop ceiling bracket onto AP and to prevent damage to the drop ceiling spline, *first attach bracket to AP before attaching bracket to spline*.

Use of Category-6A Cabling – *All* communications outlets for APs are to have two (2) of Category-6A cables/jacks installed using Panduit plenum rated cabling with blue jacketing (***Part# PUP6AM04BU-UG***). When installing outlets for new building construction, outlets are to be installed above the ceilings with a coil of extra cabling. A final wireless site survey will be conducted so the final location of the outlet / AP can be determined. Once finalized, the contractor will then complete the outlet and mount installation.

Correct AP Ports & Faceplate Jacks – Ethernet patch cord/s must be inserted at each end to match jacks of each duplex outlet to ports on APs. Verify that plug is fully inserted in outlet jack by observing clicking sound of tab on modular plug. A 12" patch cord must connect to the correct port on the AP without exceeding a minimum bend radius of 4 x the diameter of the cable jacket. APs have multiple ports that the patch cords can be plugged into. Some AP's have a "Console" port that is not to be connected. Verify that the plug is fully inserted into each AP by observing clicking sound of tab on modular plug. These ports are uniquely labeled. The specific ports that the patch cords are to plug into are shown in the table and diagram on this page.

Use port on top for patch cord plugged into "Enet 0"

If no yoke is used, patch cord for "Enet 0" always plugs into the lower of the jack numbers (Example: E25-15 is lower and E25-16 is higher.)

Use bottom port for patch cord plugged into "Enet 1"

R31002-E3A-22
R31002-BA062

R31002-E3A-24
R31002-BA064

Access Point Model	Available Ports	Port/s to Plug Into	Antenna Type	Notes
215	"USB", "ENET" & "CONSOLE"	"ENET"	Internal, not visible/adjustable	Ceiling mount only. For drop ceilings: install bracket on AP before attaching to drop ceiling spline
214	"USB", "ENET" & "CONSOLE"	"ENET"	External, removable	Wall mount. Positioning of antennas may be challenging
225	"ENET 0", ENET 1" & "CONSOLE"	"ENET 0" & "ENET 1"	Internal, not visible/adjustable	Ceiling mount only. For drop ceilings: install bracket on AP before attaching to drop ceiling spline
224	"ENET 0", ENET 1" & "CONSOLE"	"ENET 0" & "ENET 1"	External, removable	Wall mount. Positioning of antennas may be challenging
315	"USB", "ENET" & "CONSOLE"	"ENET"	Internal, not visible/adjustable	Ceiling mount only. For drop ceilings: install bracket on AP before attaching to drop ceiling spline
314	"USB", "ENET" & "CONSOLE"	"ENET"	External, removable	Wall mount. Positioning of antennas may be challenging
325	"ENET 0", ENET 1" & "CONSOLE"	"ENET 0" & "ENET 1"	Internal, not visible/adjustable	Ceiling mount only. For drop ceilings: install bracket on AP before attaching to drop ceiling spline
324	"ENET 0", ENET 1" & "CONSOLE"	"ENET 0" & "ENET 1"	External, removable	Wall mount. Positioning of antennas may be challenging

Future Use AP outlets – Scopes of Work for some projects may call for additional AP outlets to be installed without APs, for future use. After installation of cable and terminating jacks, all outlets are to be tested. After passing cable testing, the jacks of the future use outlets are to be covered with a blank that matches surrounding surfaces. In finished areas, use a Wiremold V5748 and nylon plate, for example. In areas where there are less ascetics concerns, such as Mechanical spaces, use regular job-box with plate. Check the particular Scopes of Work for details.

Category-5E upgrades – Scopes of Work for some projects may call for replacing existing AP outlets with one or two Category-5E cabling/jacks with two Category-6A cables/jacks. Check the particular Scopes of Work for details.

Oberon model "1012-00" Right Angle Wall Mount for Horizontal Mounted APs – The Oberon Wall Mount, Model-1029-00, has now been replaced with the new model "1012-00". The 1012-00 Mount will allow use of horizontal mount AP's in locations, such as residence halls, to avoid using wall mount APs that are prone to having external antennas tampered with. This model still mounts over a single gang box or can be installed over a double gang box (preferred). It can be field modified to rotate a single gang box 90 degrees, and also be installed with direct conduit penetration (for hard surfaces) by use of 1" knockouts on either side. The 1012-00 is the same dimensions as previous models. It is equipped with an AP Receiving Plate that replaces the Aruba bracket and features a hinged/lockable cover. Also included is a ty-wrap used as a tether between the AP and the mount so that the AP does not fall and cause injury and to prevent the AP from being damaged.

The *Oberon 1012-00* are being used in all residence halls for wall mounted AP's. All horizontal mounted APs are to have LEDs facing away from the wall. Follow these steps for installation…

STEP-1 Prior to mounting on wall, attach Aruba AP to Oberon AP Receiving Plate with screw provided. Make sure Ethernet ports are visible through receiving plate.

STEP-2 Determine location of communications faceplate on wall, taking into consideration that it is recommended to mount one side of the enclosure directly to a stud if possible. Install outlet/faceplate and labels.

STEP-3 Open cover, using key/lock, and place mount over the communications faceplate. Mark the 4 screw locations. Given the combined weight of adapter and AP, the preferred installation is over a secured double gang work box using 4 screws into work box and 4 more screws (#10 x 2") tapping with appropriate anchors through keyhole openings and into wall. It is preferred if one side of the keyhole openings were to penetrate a stud. Realizing that the preferred installation is not always feasible, variations of the installation are allowable. Make sure not to compromise the overall attachment to the wall, as to avoid creating a safety hazard.

STEP-4 Plug Ethernet patch cord/s into the Ethernet port/s of AP. Secure AP and Receiving Plate to the mount, using enclosed key to lock the 4 standoff posts into mount. Turn key to middle position so AP is secure, but lid can still open to complete the installation process. Plug other end of patch cord/s into the jack of the communications faceplate. (See chart and diagram on Page #5 for proper port to jack placement).

STEP 5 Install enclosed ty-wrap from the mount to the AP Receiving Plate. This will provide security when installing and servicing the AP, preventing the AP from falling. The ty-wrap should be secured to where it starts to grip to itself (about an inch protruding through the ty-wrap's opening) and the protruding end should be cut flush with the ty-wrap opening.

STEP-6 Adhere label to left side of enclosure's front edge that corresponds to the label of the top jack, then adhere label to right side of enclosure's front edge that corresponds to the label of the bottom jack (as shown in picture on Page #7). Secure cover by closing and turning key towards wall. Contractor is to return all Mount keys to CMU after completion of project.
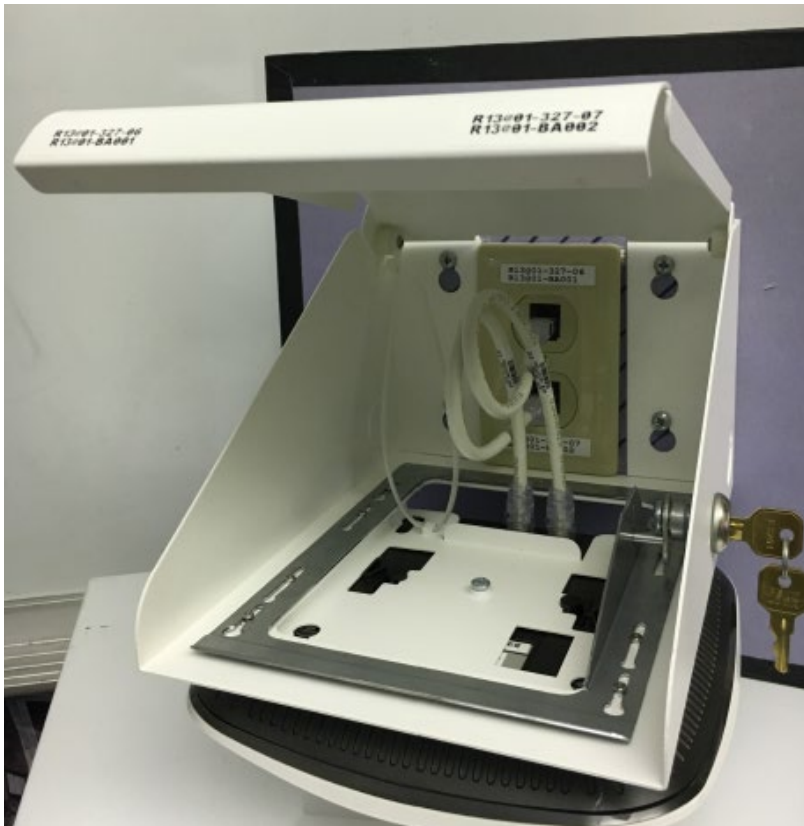
Oberon Model 1012-00 Mount AP receiving plate slides onto AP and locks with screw in center of plate.
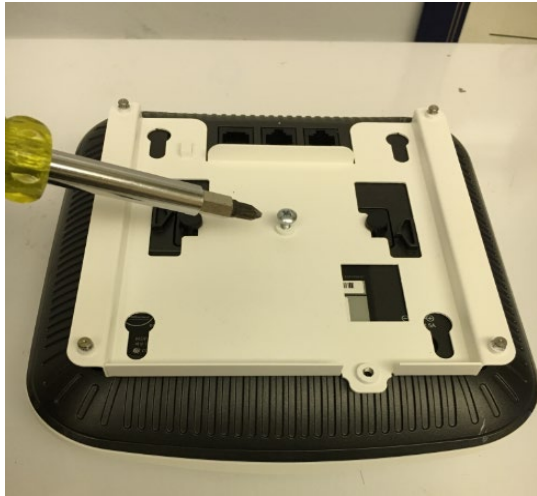
Installing receiving plate to Oberon model 1012-00

Oberon Model 1012-00 mount shown installed with an AP over workbox with outlet jacks and faceplate. AP slid into place of receiving plate and secured with screw. Receiving plate secured to mount with lock/key in middle position. Mount secured to wall with 4 screws into work box, further secured to wall with 4 screws/anchors using keyhole slots. Ty-wrap tether installed. Outlet labels installed on faceplate and outside of AP mount. Patch cords installed into both jacks, ENET0 and ENET1 of AP.

Receiving plate secured to Oberon model 1012-00 by use of key/lock mechanism.

Oberon 900-HC AP Mount- The Oberon 900-HC AP Mount is used for installations where the ceilings are too high to mount an AP and provide wireless signal to the users. This mount is similar to the Oberon 900-00 except it has a solid back with a ¾" knockout. This knockout is used to except a ¾" conduit, using the appropriate connectors, which will connect to a junction box on the ceiling. Make sure all conduit connections follow the NEC codes using the appropriate "screw type" box connectors, as shown in the photos. This will provide a "pendulum" AP installation, lowing the AP and wireless signal closer to the users. The two CAT6A permanent cables will feed through the conduit and will be terminated with two CAT6A jacks. The cables will be labeled with butterflied style labels. Follow the chart and diagram on Page #5 for proper AP Ethernet port to outlet connections. See photos below for further reference.

Front view of the Oberon 900-HC Mount

Open view of the Oberon 900-HC Mount – When plugging in the two patch cords, the Net "Enet0" port plugs into the lower cable ID# and the "Enet1" plugs into the higher cable ID#. For example, if R13@01-325-*15* and R13@01-325-*16* are the 2 cable ID #'s, R13@01-325-*15* is the lower of the cable ID #'s.

Oberon 1013-00
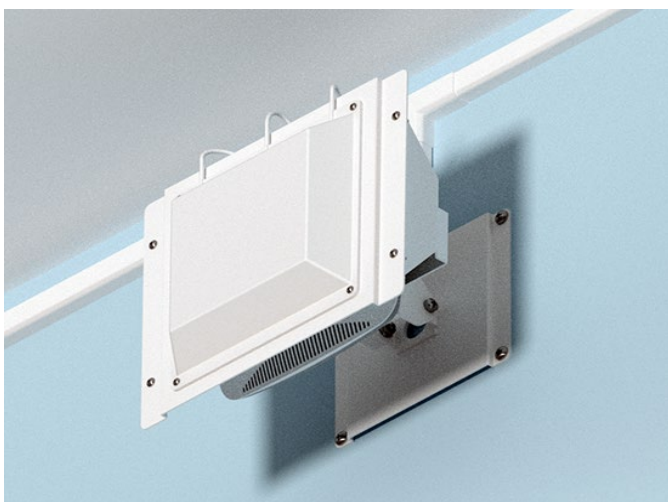
The Oberon 1013-00 is a 2-axis articulating AP / Antenna mount. AP and directional antenna attach to this mount, and the antenna can be pointed in any direction to achieve desired wireless coverage. Wall mount bracket can be placed directly over data outlet.

Drop Ceiling Mounted APs - Each Aruba model AP-215, 225 and 325 horizontal mounted APs comes with two drop ceiling brackets, one bracket for 9/16" wide rails and one bracket for 15/16" wide rails. Some ceiling tiles protrude below the rails and require cutting so that the tiles reseat properly. These type of tiles are also known as "Tegular" (Armstrong's term for protruding tiles or recessed rails).

For mounting on drop ceiling rails, contractor must take precautionary measures not to cut hole in ceiling tile too large of an opening for the cables to pass through. It should be notched just enough to allow two Cat6A cables to pass through.

All ceiling mounted APs are to have LEDs facing away from the wall. Outlet labels are to be placed on outlet faceplate above drop ceiling as well as on adjacent drop ceiling rails.

Aruba provides Model AP-220-MNT-C2 for other types of drop ceilings that includes one bracket for Open (Silhouette) rails and one bracket for Flanged (Interlude) ceiling rails as show below.
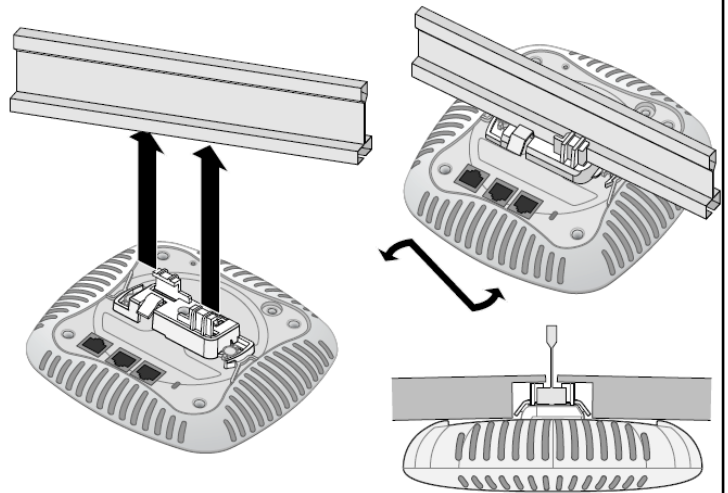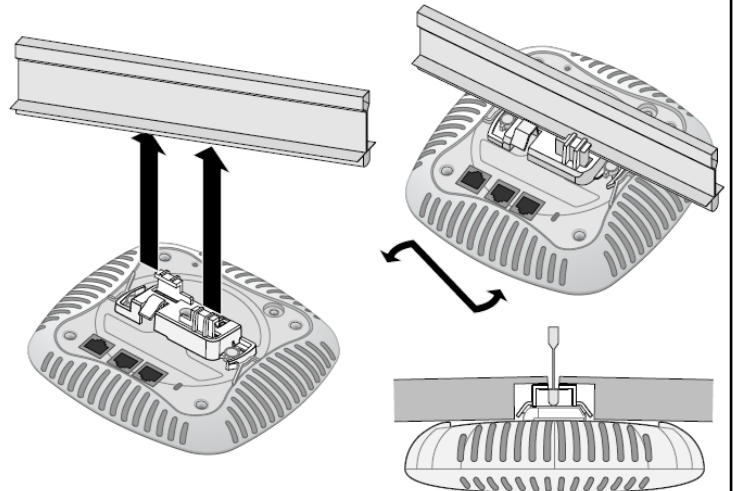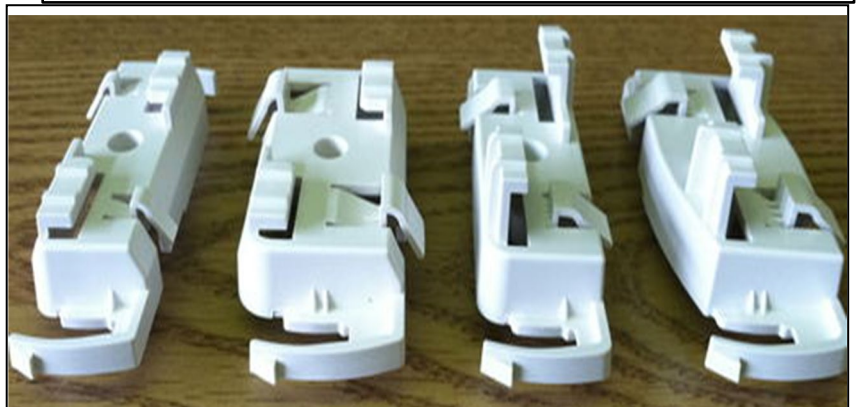

Figure 2 *Open Rail Installation*

Figure 3 *Flanged Rail Installation*

Cutting of ceiling tiles to allow tiles to reseat properly for Tegular ceiling tiles.


Correct outlet labeling on drop ceiling rails and correct orientation of Aruba AP with LEDs facing away from wall.

From left to right: Brackets for 9/16" wide rails and 15/16" wide rails (included with each Aruba model 225/325 ceiling mounted AP). Brackets for Flanged and Open rails shown in white. Black is available as well (included in Aruba Model AP-220-MNT-C2).

Panduit TX6A Field Term Plugs – This is the preferred method of cable termination for "No-Box" wall and ceiling AP installations (See pages 2 and 3 for diagrams). There are two versions of the Field Term Plugs, straight (P/N: FP6X88MTG) and angled (P/N: FPU6X88MTG). The Field Term Plugs can be installed directly to the Cat6A cable without the use of a jack. Pictured below are examples of the angled Field Term Plug, which is a better solution for AP installations due to the bend radius of the Cat6A cables.
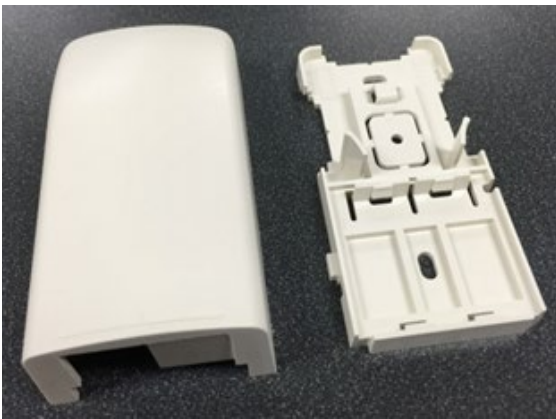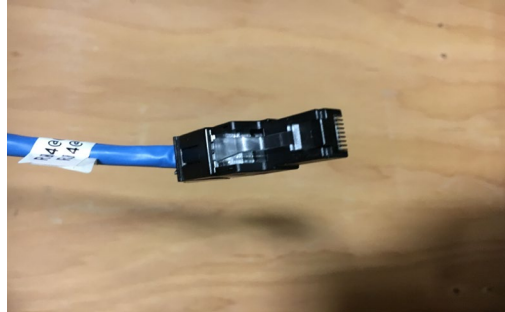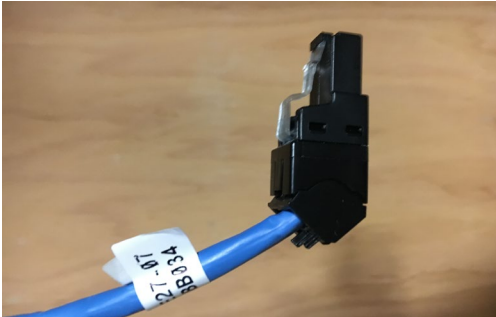
Using Biscuits for Drop Ceiling AP Installs-
Biscuits can be used where the Field Term Plugs are not feasible. Panduit "biscuit" Part# CBX2IW-AY, separated to show internal structure. On left is the top with one open slot to accept a Category-6A jack and a knockout to be removed to accept the 2nd jack.
Two Cat6A cables will be run to each AP location. The jacks are to be contained by use of a 2 jack surface mount (also known as a "biscuit") which is Panduit part# "CBX2EI-AY" (ivory) or part# "CBX2IW-AY" (off white) which will contain a quantity of 2 of Panduit Mini-Com Category-6A jacks part # "CJ6X88TGBL".

Cables terminated and secured with plastic ty-wrap (provided with biscuit) with enough pressure so ty-wrap does not distort cable jacket. Jacks installed on base and outlet labels installed on cover.

Removal of Factory installed Stickers on APs- In some cases, contractors may receive APs with stickers containing "SN" numbers, "MAC" numbers, and bar codes. If so, contractors should remove those stickers and discard. Please ignore the pictures in this document incorrectly showing stickers still on deployed APs.

224 Antenna Positions Top View

Aruba 324 side view 900 series box mounted on solid surface

Aruba 324 with antenna using a 900 series box mounted on solid surface

Antenna Positioning – Several different models of AP's may be used within the same building. Some models have internal antennas that do not require positioning and some have detachable, external antennas that require positioning. Proper antenna positioning is important for optimum coverage and performance. Contractors are to position external antennas based on the model of AP as per the following diagrams...

Aruba Model 200 Series 802.11AC APs - As of June 2014, Aruba models 224 and 225 AP's will be deployed in place of the 130 series. These AP's can use mounting brackets similar to the brackets for the 130 series and can use the same adapter plates on the Oberon mounts. These units are slightly larger, heavier and provide for faster network speeds.

Aruba 324 and 325 Types of Mounts and Antenna Positioning
These AP's will be used on either hard ceiling mounted or on wall surfaces using the Oberon 900 series mount (or with AP-220-MNT-C2 as shown above) to secure to the wall, ceiling or drop ceiling grid. Reference drop ceiling spline mounting on page #9. For patch cord portal, reference chart on page #5.
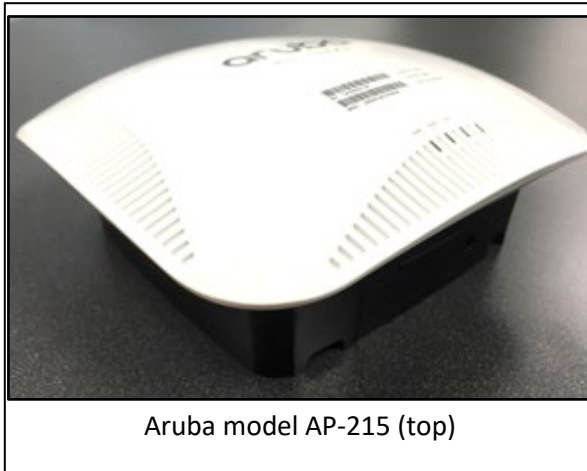

Aruba 324 view from below; Note Labels on bottom of 900 series box

Changing the color of the surface of Aruba 220 series APs - We have found a few occasions where the glossy white surface of a 220 series AP will not blend well with its surroundings. An example is where CMU had created "black box theaters" where all surfaces within are painted flat black. CMU had taken measures to paint the surface of the AP to

match which can void warranties. A "cover" is now available for each model of the Aruba 220 series. The cover is paintable and can be attached and detached from the AP surface without warranty concerns.
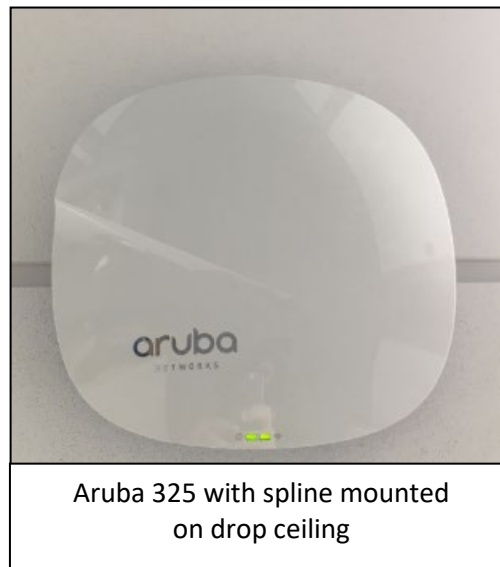
Aruba Models AP-214 and AP-215 802.11AC APs - As of January 2015, Aruba models AP-214 and AP-215 will be used for many new deployments. The AP-214 is similar to the model AP-224 with external antennas that need positioned similarly. The AP-215 is

Aruba model AP-215 (top)

Back of Aruba model AP-215 (similar to 214, 314, and 315) showing "ENET" port in upper right (circled in yellow).

similar to the model AP-225 with internal antennas, no need to be concerned with antenna positioning. The AP-214 and AP-215 are both slightly smaller than their 220 series counterparts. Like the models AP-224 and AP-225, the 210 series APs also uses the same model mounts (Aruba AP-220-MNT, or Oberon) and follow the

same installation processes shown on preceding pages. Only one patch cord is required to connect each AP-214 or AP-215. There are two ports on the AP-214 and AP-215 however; the patch cord should only be connected to the port labeled "ENET", as shown in the picture to the right. When horizontally mounted, the USB port is to face towards the wall with LEDs facing outward.


Aruba 325 with spline mounted on drop ceiling

Portal side of AP-324 and AP-325, showing "ENET0" and "ENET1" ports (circled in yellow).

Aruba 220 Series Mounts – In cases where aesthetics and security are not as much of a concern, the model AP-220-MNT will be used. Examples of locations are on concrete walls of mechanical or electrical areas. The mounts come in both beige and black and will hold the 210, 220 and 320 series AP's. This mount should be centered where the sticker has been located. The communications outlet should be installed within 4 to 8" from the center of the mount, typically to the left or right. It is important for antenna orientation that mounts on walls are to be installed with clips on each side as shown in the picture to the right.
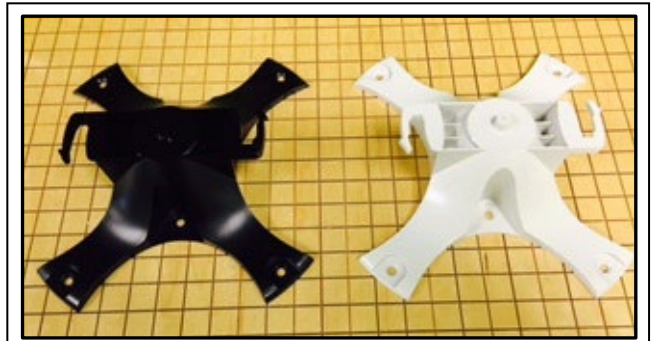
Aruba 220 Series Mounts

Oberon 1006 Series Right-Angle Wall Bracket – The Oberon 1006 series brackets can be used in installations where security is less of a concern, such as in Academic buildings. CMU has been using these brackets with the Aruba AP-325s. Pictured below is an example of an Oberon 1006-AP325 in production. Notice the position of the bracket with the flush mounted outlet. When using this solution, the two Cat6A patch cords should be 6 inches in length, instead of the 1 foot cords usually used in AP installations.

Patching and Painting – In many cases, contractors will be asked to remove existing AP's and brackets which may leave anchor holes and mismatches in paint. Contractors are to provide Network Operations with any AP's and brackets that have been removed. Contact information for the painters that many CMU groups use are:

Mauro Nofi, 412-370-3477, nofipaintinginc@gmail.com
Chuck's Quality Painting, Chris Blackmon, 412-224-0128, Cqpinc@live.com

CMU Contact info –
Pete Bronder, Manager of the Communication Cabling Infrastructure Office, 412-268-8582, pete@cmu.edu
Daryl Hollinger, Manager of Network Operations, 412-268-5260, dhollinger@cmu.edu