

ClearOne[®]

Beamforming Microphone Array 2

Group Microphone for Professional Conferencing

CEILING MOUNT INSTALLATION GUIDE



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BEAMFORMING MICROPHONE ARRAY 2 CEILING MOUNT INSTALLATION GUIDE

CLEARONE DOCUMENT

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Chapter 1: Getting Started

Congratulations on purchasing your Beamforming Microphone Array 2 (BFM2). The BFM2 is a 2nd generation Beamforming Microphone Array product featuring 24 microphones, and beamforming and adaptive steering technology designed specifically for the CONVERGE® Pro 2 (CP2) products: 128, 128D, 128T, 128TD, 128V, 128VD, 120, and 48T.

- » **IMPORTANT:** The BFM2 only can be used with CP2 systems. It is not compatible with first generation CONVERGE Pro or Beamforming Microphone Array systems.

CONNECTIONS

This section explains the connections in BFM2 installations.

POWERING A BEAMFORMING MICROPHONE ARRAY 2

Powering a BFM2 can be...

- from a CP2 via either a 200 or 650 ft. Peripheral-Link (P-Link¹), with a single cable carrying power, audio and control
- via a Power-Over-Ethernet (PoE) power supply/Injector², third-party or ClearOne provided (a ClearOne PoE Injector can power up to three BFM2 units)

PoE CONNECTION

Use the appropriate AC cord to connect the PoE power supply to the AC power. Then plug the PoE cable into the LAN+DC connection on the power supply. Route the PoE cable where it can be fed through a mount assembly or to the conference table with the BFM2. Figure 1 illustrates PoE Power Supply cable connections.

Figure 1

Power Over Ethernet (PoE) Power Supply
(Front and Back Views)



- » **NOTE:** The PoE connection is only for power, not control. If not using a ClearOne PoE Injector or similar specification standard PoE Injector, power must be supplied to individual units.

P-LINK CONNECTIONS

BFM2 units are connected to CP2 units and other BFM2 units via the P-Link. Each BFM2 unit has a P-Link In and P-Link Out connection that allows units to be “chained” together with the P-Link Out of one unit connecting to the P-Link In of the next unit, and can be chained with a set of either 200 or 650 ft. P-Link cables.

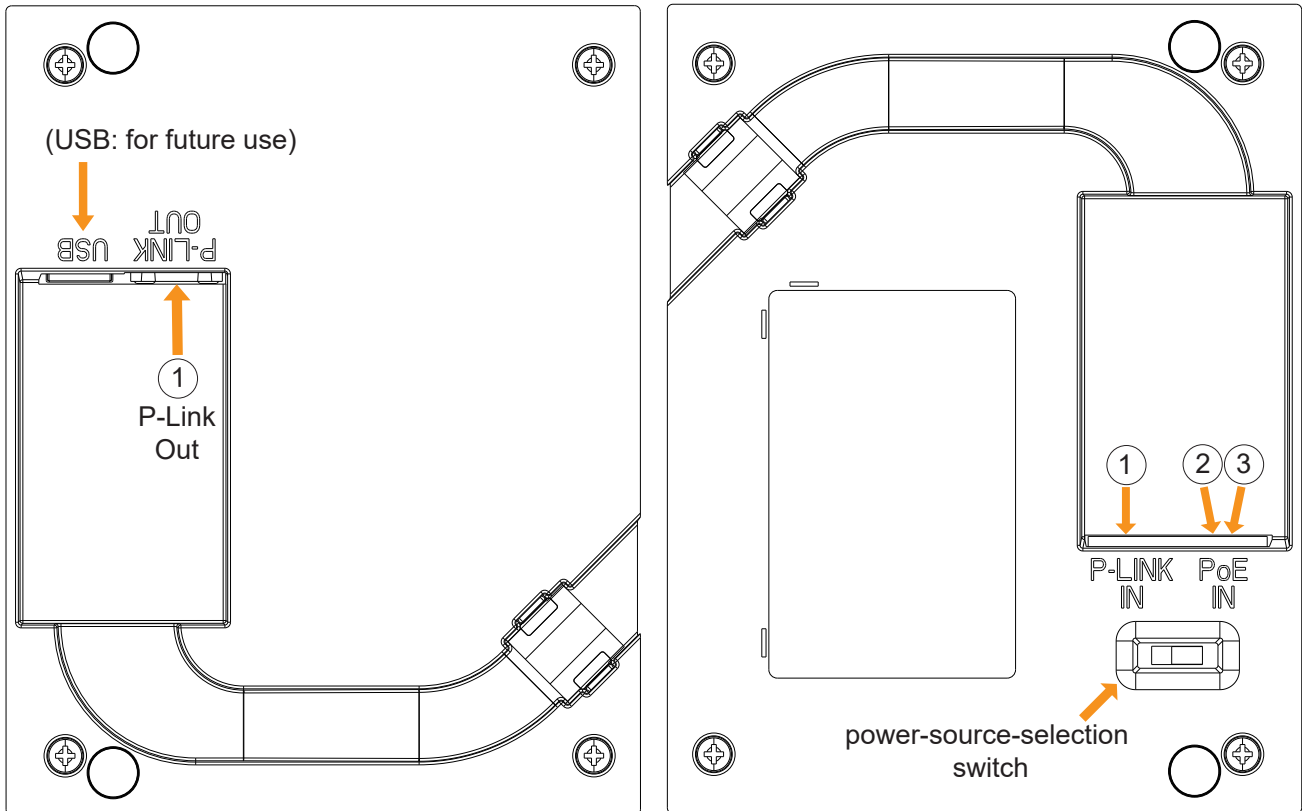


Figure 2

- » NOTE: The 650 ft. cable set can only be used in a P-Link chain of up to 3 BFM2 units.
- » NOTE: Cable lengths cannot be mixed in the same P-Link chain.

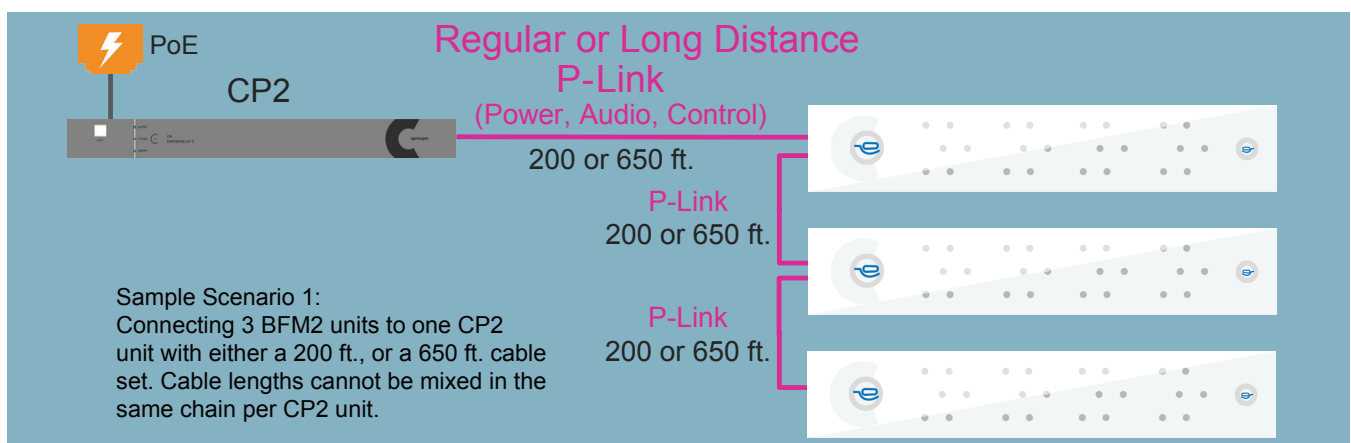


Figure 3

Up to three BFM2 arrays are supported per CP2 unit, as seen above in Figure 3.

2 Beamforming Microphone Array 2

S. No.	Feature	Regular P-Link	Long Distance P-Link
1	Applicable to all CP2 units	YES	NO (only supports CP2 AEC units)
2	Applicable to all peripheral units (BFM2, DIALOG 20 Receiver, USB Expander, GPIO Expander)	YES	NO (only supports BFM2)
3	Same CP2 and BFM2 hardware (no hardware changes, only software and firmware upgrades)	YES	YES
4	Applicable to already sold and installed units	YES	YES
5	Maximum distance between units	200 feet (~60 meters)	650 feet (~200 meters)
6	Carries power, audio, control	YES	YES
7	Maximum number of peripheral devices in one P-Link chain	12 (3 each: BFM2, DIALOG 20, USB Expander, GPIO Expander)	3 (3 BFM2 only)
8	Cable specification	CAT5e/CAT6, 24 AWG , solid conductor cable. Do not use Copper Clad Aluminum (CCA).	CAT6, 550 MHz, 23 AWG , solid conductor cable. Do not use Copper Clad Aluminum (CCA).
9	PoE Power Injector spec	56V, Mode B, Midspan – For 3 BFM2 units 48V, Mode B, Midspan – For 1 BFM2 unit	56V, Mode B, Midspan – For 3 BFM2 units 48V, Mode B, Midspan – For 1 BFM2 unit
10	No extra cost, free to upgrade	YES	YES

Up to 3 of each P-Link device type can be daisy-chained to a CP2 unit using a 200 ft. cable set.

- » **NOTE:** With a standard 200 ft. P-Link cable set, only one or two P-Link connections are required depending on where in the stack a BFM2 is placed. Only a P-Link In cable is required if the array is at the end of a stack; both a P-Link In and P-Link Out cable are needed if the stack continues to another array or CP2 unit.

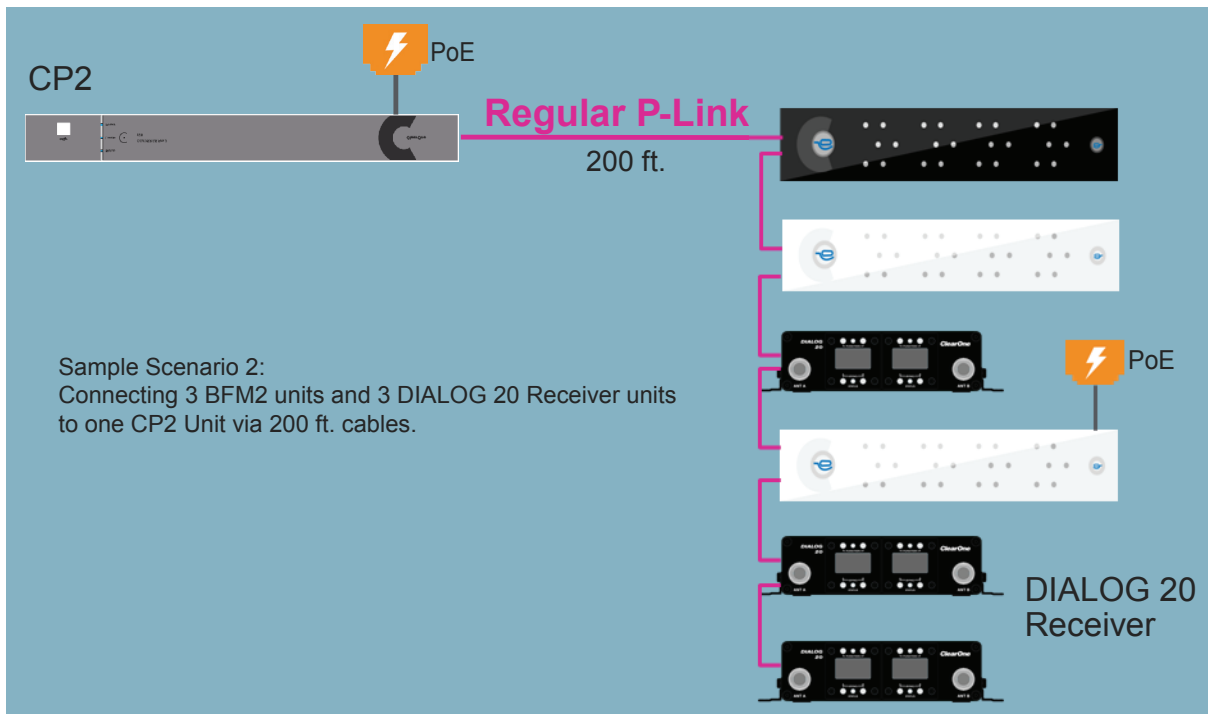


Figure 4

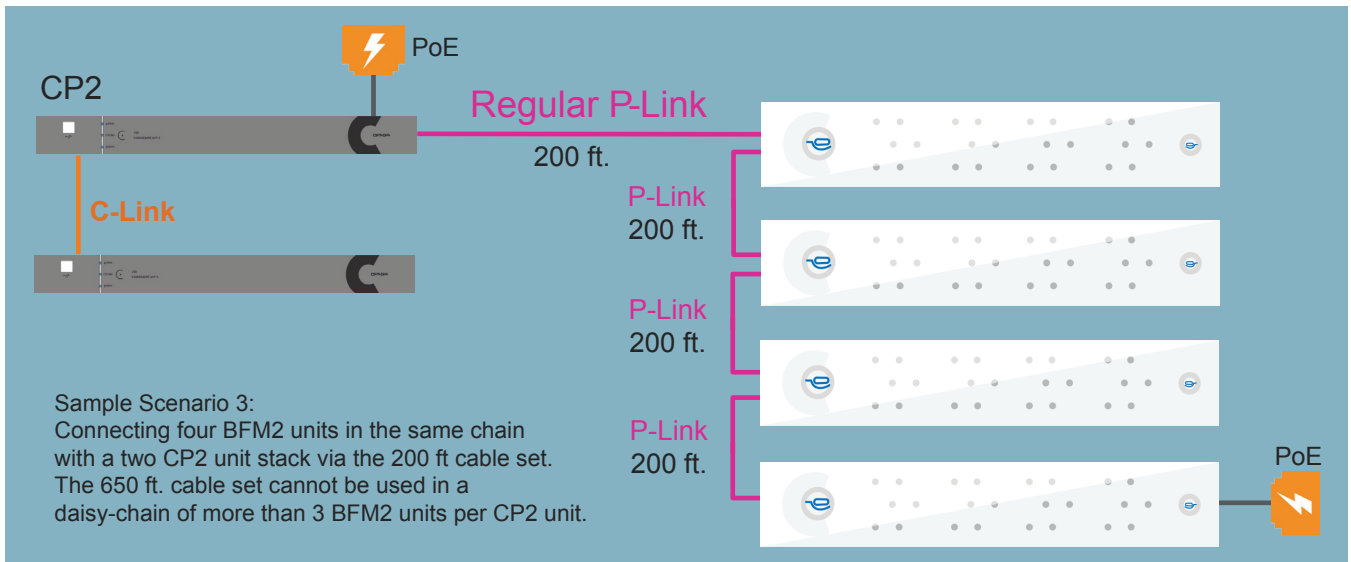


Figure 5

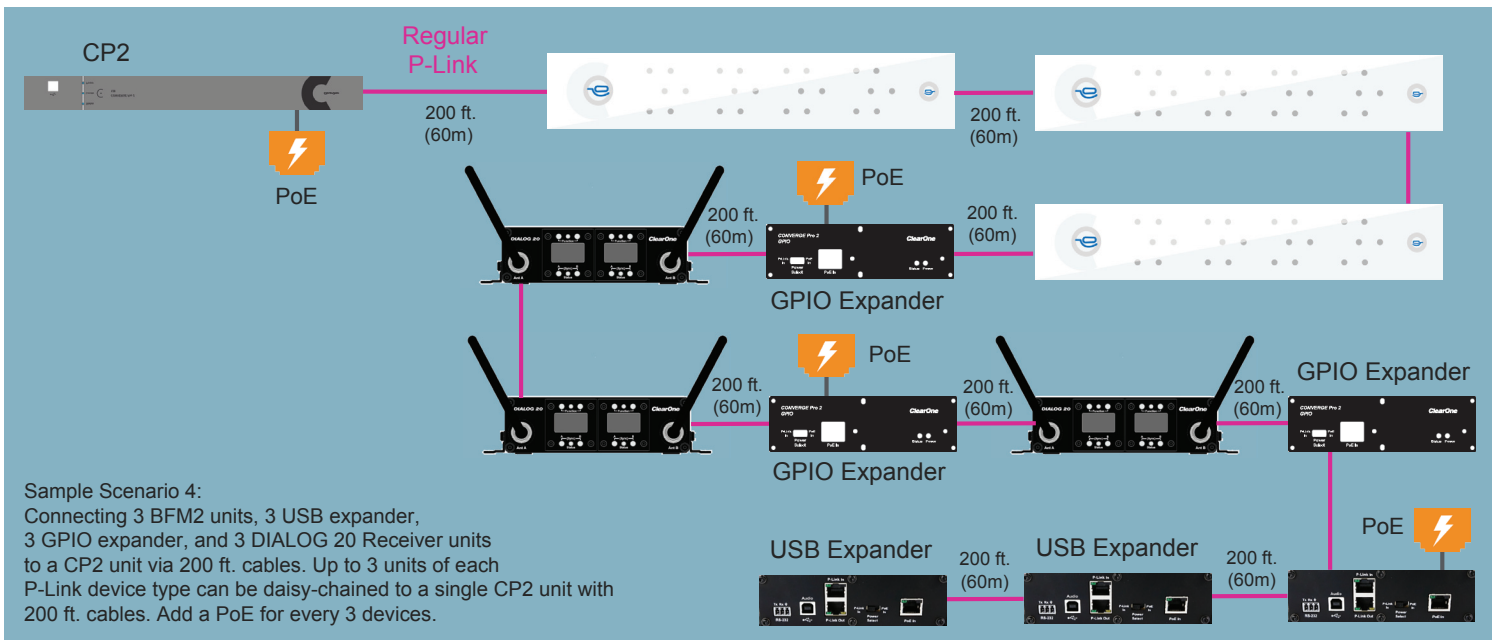


Figure 6

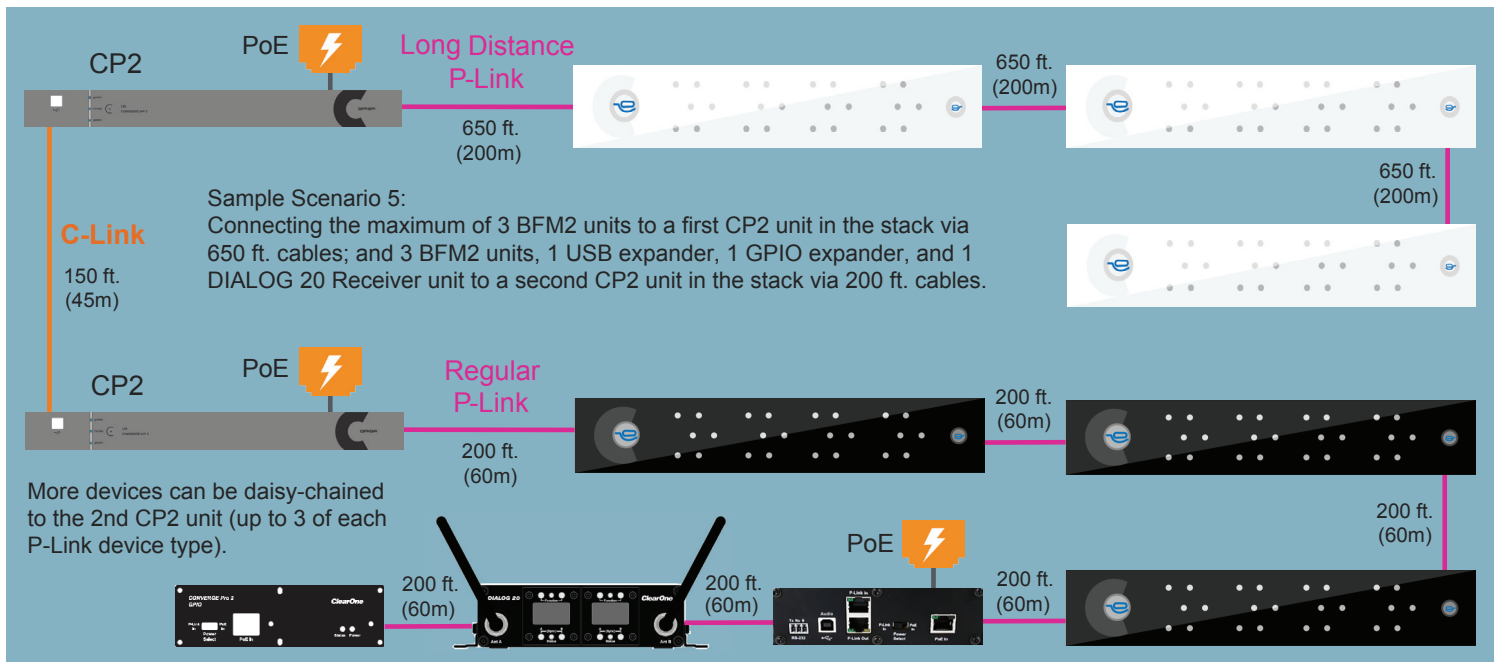


Figure 7

Instructions for connecting the BFM2 are in the Beamforming Microphone Array 2 Quick-Start Guide, and in the CONVERGE Pro 2 CONSOLE online help for configuring the BFM2.

- » **NOTE:** Firmware upgrades and BFM2 operation are performed via the P-Link connection. Plugging the PoE cable into the P-Link connections may cause damage to the BFM2.

Make sure CP2 firmware is updated. Instructions for updating the firmware can be found at:

http://www.clearone.com/resources#professional_audio

Instructions for updating BFM2 firmware are included in the Beamforming Microphone Array 2 Quick-Start Guide, which is found on the ClearOne website at:

http://www.clearone.com/resources#professional_microphones

Physically, the BFM2 supports use in ceiling-mounted, wall-mounted or table-mounted modes, giving you the option of a clutter-free conference room table area.

SKUS USED

The following SKUs may be used in a BFM2 installation:

Item	Part No.	
	White	Black
BFM2 for CONVERGE Pro 2	910-3200-201	910-3200-201-B
PoE Power Supply Kit for BFM2. Contains power supply, one AC power cable, and two 25-foot CAT5E or CAT6 RJ45 plenum cables (one used as the PoE cable and the other as a P-Link cable). If a PoE kit is not obtained, installers will need to provide their own PoE unit and all cables.	910-3200-202	
BFM2 Ceiling Mounting Kit with 12/24/36/48" Suspension Column	910-3200-203-12/24/36/48	910-3200-203-12/24/36/48-B
Gen-1 Ceiling Mounting Kit with 12/24/36/48" Suspension Column	910-001-005-12/24/36/48	910-001-005-12/24-B
Wall Mounting Kit (refer to Wall Mount Installation Guide)	910-001-006	910-001-006-B

» NOTE: All mounting kits are compatible with both the BFM1 and BFM2.

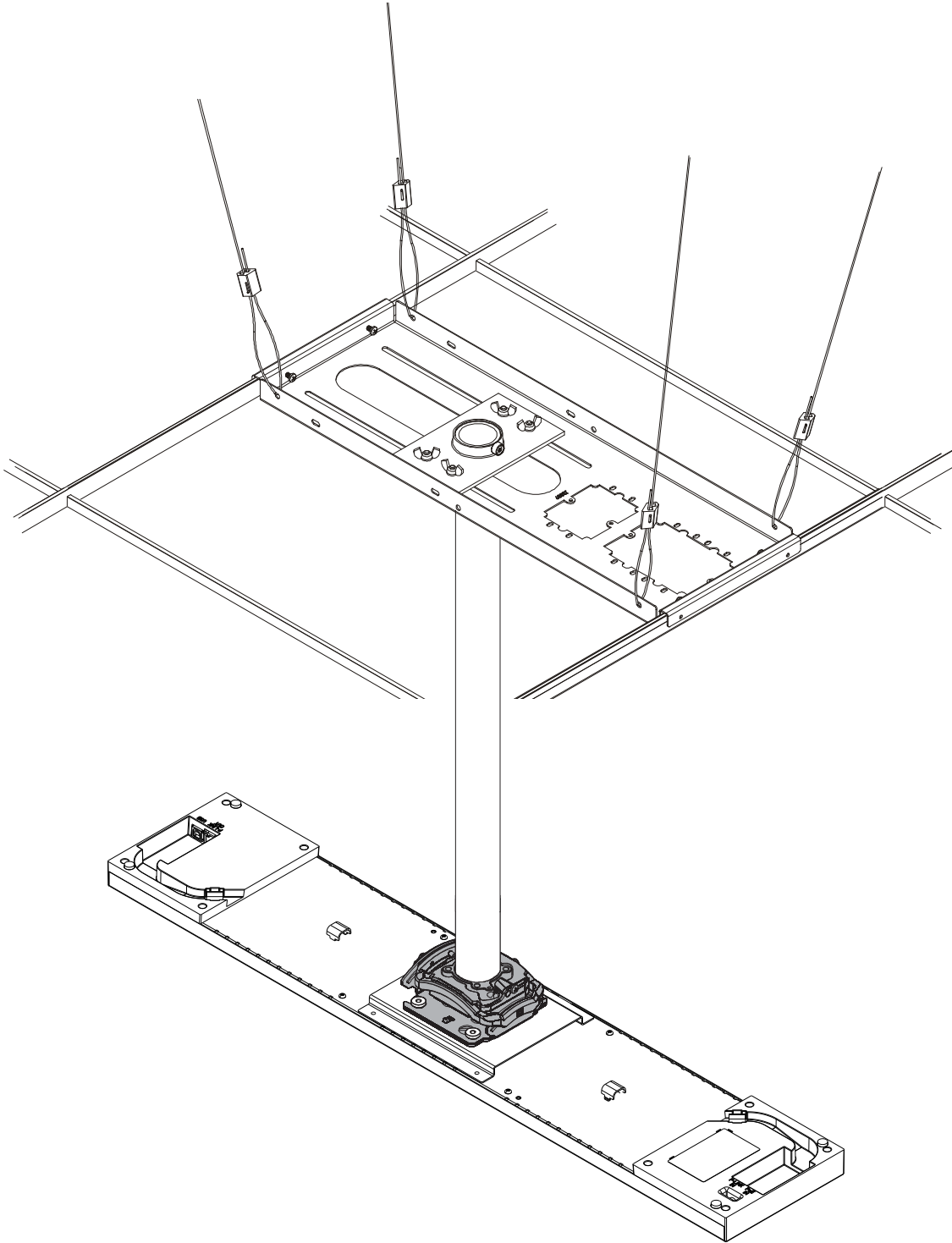
BFM2 CEILING MOUNTING KITS

What each BFM2 Ceiling Mount Kit includes:

Part No.		Kit	Includes		
White	Black		Mount + Bracket	Fixed Length Suspension Column	Lightweight Suspended Ceiling Kit
910-3200-203	910-3200-203-B	BFM2 Ceiling Mount Kit without Suspension column	Yes	No	Yes
910-3200-203-12	910-3200-203-12-B	BFM2 Ceiling Mount kit with 12" Suspension Column	Yes	12"	Yes
910-3200-203-24	910-3200-203-24-B	BFM2 Ceiling Mount kit with 24" Suspension Column	Yes	24"	Yes
910-3200-203-36	910-3200-203-36-B	BFM2 Ceiling Mount kit with 36" Suspension Column	Yes	36"	Yes
910-3200-203-48	910-3200-203-48-B	BFM2 Ceiling Mount kit with 48" Suspension Column	Yes	48"	Yes

Chapter 2: Ceiling Mount Installation

Once you have verified all the firmware updates and necessary connections made while executing the tasks outlined in the Beamforming Microphone Array 2 Quick-Start Guide, you can proceed to the physical installation of the BFM2 using one of our 2nd generation ceiling mount kits.



This section covers instructions for suspended ceiling mounting of the BFM2. For mounting to solid ceiling or flush mounting junction box, installers will need to obtain parts independently.

» **IMPORTANT:** ClearOne makes no claim that the information contained herein covers all details, conditions or variations, nor does it provide for every possible contingency in connection with the installation or use of this product.

TOOLS REQUIRED

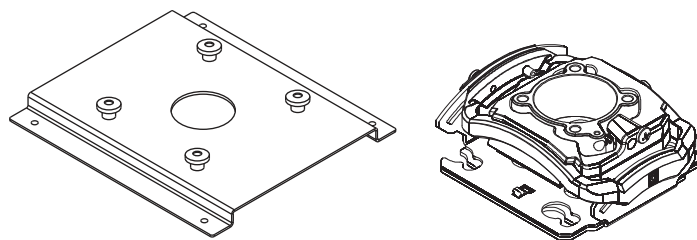
The following tools are required for suspension ceiling mount installation of the BFM2:



PARTS RECEIVED

The following parts are delivered with the BFM2 Mounting Kit:

Mount with Interface Bracket:



Interface Bracket

(P)

QTY 1



M3 x 8mm

(I)

QTY 4

Mount

(O)

QTY 1



Washer for M3 Screw

(Q)

QTY 4

Fixed Length Suspension Column:



Suspension Column

(N)

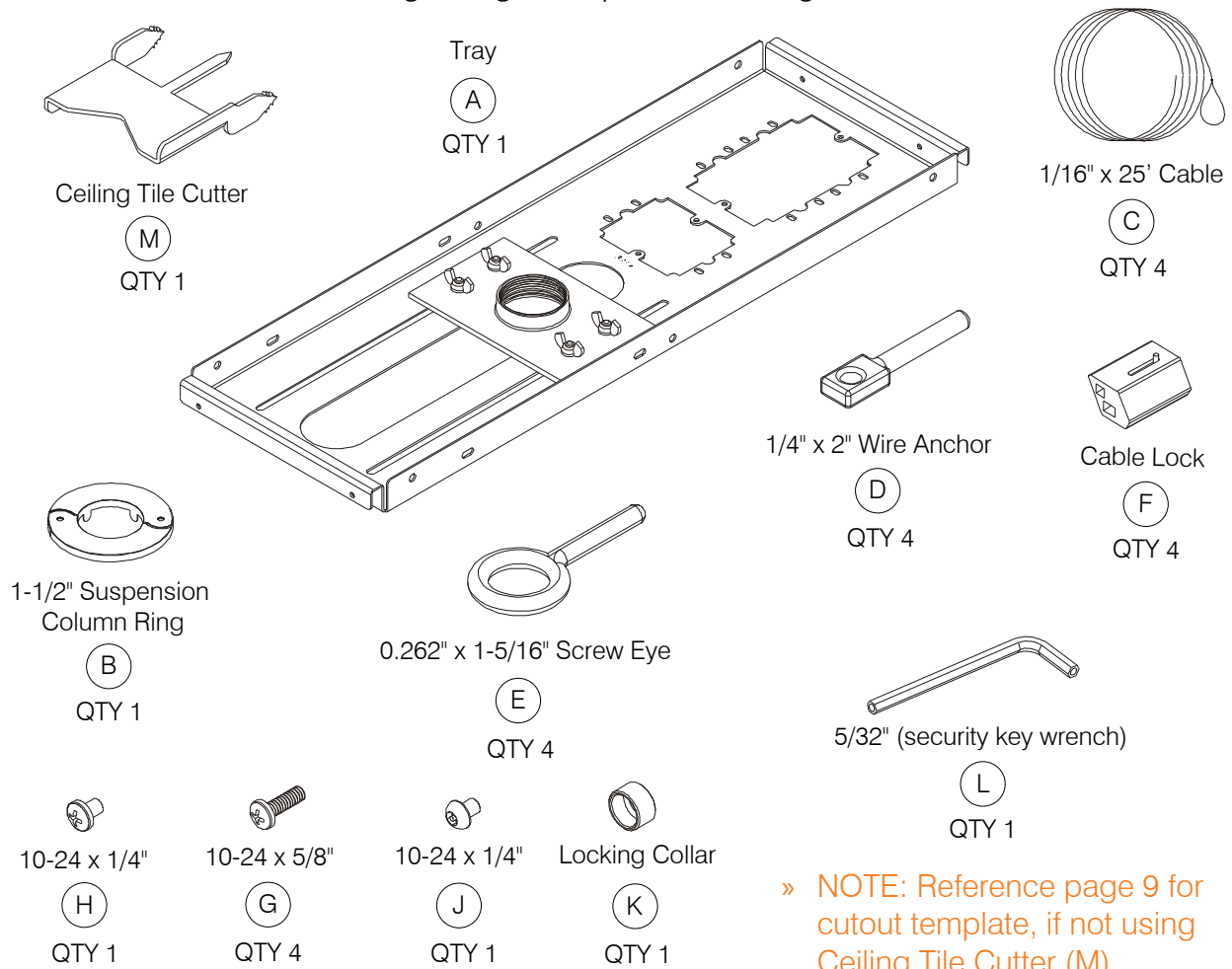
QTY 1

For SKUs without suspension columns and other ceiling types, the mount is also designed to be mounted to a 1.5" NPT or NPSM threaded suspension column, with a minimum of 4 usable threads, following ANSI/ASME B1.20.1 (Schedule 40, 0.154" minimum wall thickness).

» **NOTE:** It requires over 1" of threads to get 4 usable threads.

PARTS RECEIVED (CONTINUED...)

Lightweight Suspended Ceiling Kit:



The ClearOne parts received are designed to be mounted into a suspended ceiling.

- » NOTE: Your suspension column will vary by length based on the SKU purchased.
- » NOTE: For SKUs without suspension columns and other ceiling types, the mount is also designed to be mounted to a 1.5" NPT or NPSM threaded suspension column, with a minimum of 4 usable threads, following ANSI/ASME B1.20.1 (Schedule 40, 0.154" minimum wall thickness).

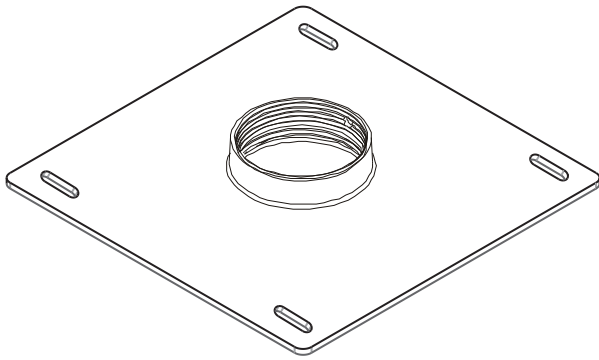
Please verify that you have all the purchased parts required to complete your installation. If any items from your order are missing or damaged, contact your ClearOne distributor immediately.

PARTS NOT INCLUDED

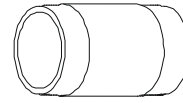
The following parts are required for solid ceiling or flush mount and need to be acquired independently by installers, depending on the configuration:



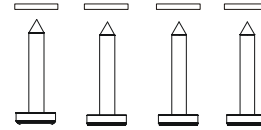
Ceiling fasteners must be appropriate to the ceiling type



Ceiling Plate (Example Only)
Varies by brand and model



2-1/2" to 3" suspension column



Four #10 flat washers,

Four #10 x 3" Phillips head wood screws

- » **IMPORTANT:** The installer is responsible to be sure the Beamforming Microphone Array is firmly attached to sturdy support (studs, or other mounting hardware) to hold the weight of the Beamforming Microphone Array and its mounting hardware.

REQUIRED PARTS CHECKLIST:

Mounting Type	Part				
	Mount + Bracket	Suspension Column	Suspended Ceiling Kit	Ceiling Fasteners	Ceiling Plate
Suspended Ceiling	Yes	Yes	Yes	No	No
Solid Ceiling or Junction Box	Yes	Yes	No	Yes	Yes

LEGEND

	Tighten Fastener		Hammer
	Loosen Fastener		Pencil Mark
	Phillips Screwdriver		Drill Hole
	Security Wrench		By Hand

MOUNTING TO SUSPENDED CEILING

The following diagrams show how to mount the BFM2 from a suspended ceiling.

PREPARATION

1. Determine exact location of suspension column on suspended ceiling. Mark location on lower (finished) side of ceiling tile with pencil.
2. Remove affected ceiling tile and any adjacent tiles required for access.
3. Press center tip of ceiling tile cutter (M) into finished side of ceiling tile at marked location. Cut suspension column hole through tile using back and forth hand twisting motion. Or use Figure 6 to the right for the cutout:
4. Reinstall ceiling tile with suspension column hole. Ensure tile is oriented properly.
5. Install tray (A) on top of ceiling tile so that end brackets engage primary (1.5" (38mm) high) rails of ceiling framework.
6. Loosen four wing nuts in upper side of tray.
7. Position tray and/or suspension column support to center support over ceiling tile hole.
8. Tighten wing nuts.

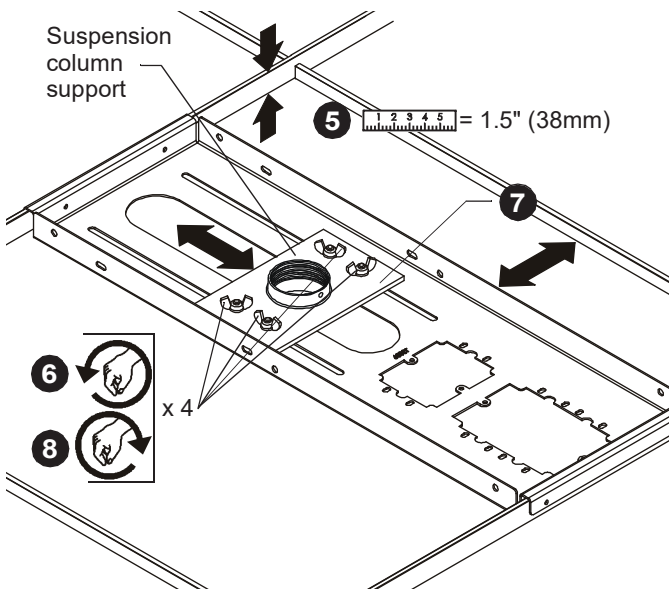
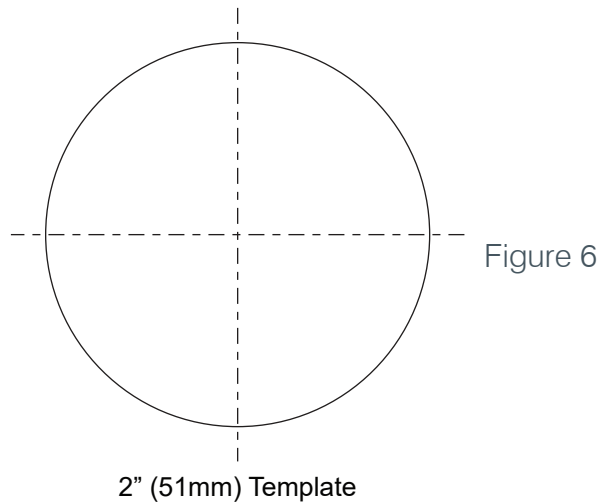


Figure 7

9. Examine ceiling structure (concrete, steel truss, or wood) above tray to identify four support cable anchor (C) locations. Each location should be approximately 15° outboard of support holes in tray. Mark locations with pencil.

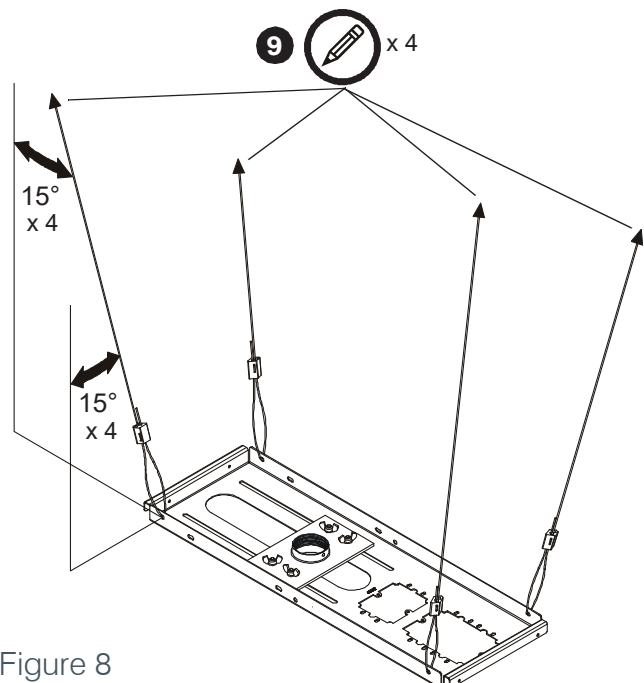


Figure 8

10. Remove tray and ceiling tile.

SUPPORT CABLE INSTALLATION

- » **IMPORTANT:** Installer is responsible for making sure ceiling structure can support five times the combined weight of all equipment. Reinforce ceiling structure as necessary before installing cables.

SOLID CONCRETE CEILING STRUCTURE

- » **IMPORTANT:** Anchors must be installed into structurally sound solid concrete with a minimum thickness of 1.75" (44.5mm) or greater. Installation into hollow concrete block, mortar, or concrete that exhibits cracking, spalling, or other defects may result in failure of anchor and serious personal injury or damage to equipment!
1. Drill 1/4" diameter x 1-3/8" deep hole at each marked cable anchor support location. Ensure hole is at least 2-1/2" from nearest concrete edge. Remove debris from hole.
 2. Tap anchor (D) into each hole to a depth of at least 1" (25mm).
 - » **IMPORTANT:** Failure to properly set anchor may result in failure of anchor and serious personal injury or damage to equipment!
 3. Using claw of hammer, set anchors (D) by pulling each out approximately 1/4" (6.4mm).
 4. Insert part of manufactured loop on cable (C) through hole in anchor (D). Insert end of cable (C) through loop. Repeat for 3 remaining support locations.

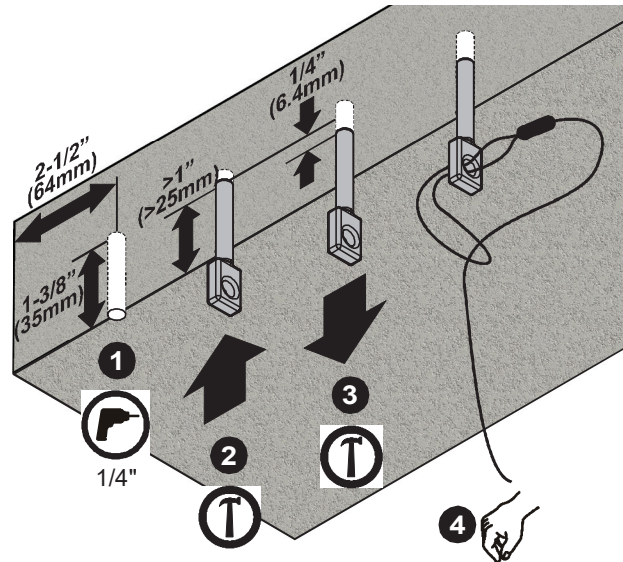


Figure 9

STEEL TRUSS CEILING STRUCTURE

1. Route end of cable (C) over truss at marked cable anchor support location and then through cable loop. Repeat for 3 remaining support locations.

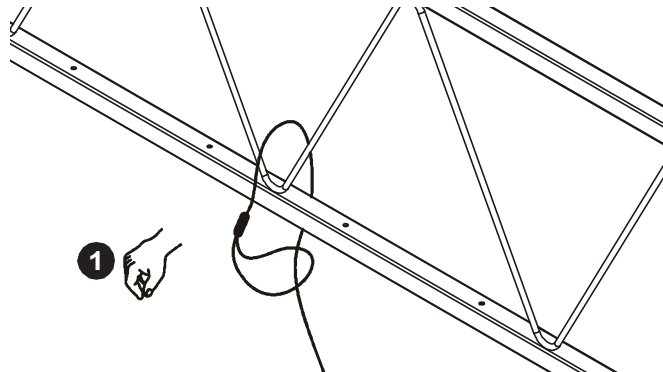


Figure 10

WOOD CEILING STRUCTURE

» **IMPORTANT:** Anchors must be installed into wood with a minimum thickness of 1.5" (38.1 mm) or greater.

1. Drill 5/32" diameter x 2" deep hole at each marked cable anchor (D) support location. Remove debris from hole.
2. Fully thread eye lag (E) into each hole.
3. Route end of cable (C) through eye lag (E), then through cable loop. Repeat for 3 remaining support locations.

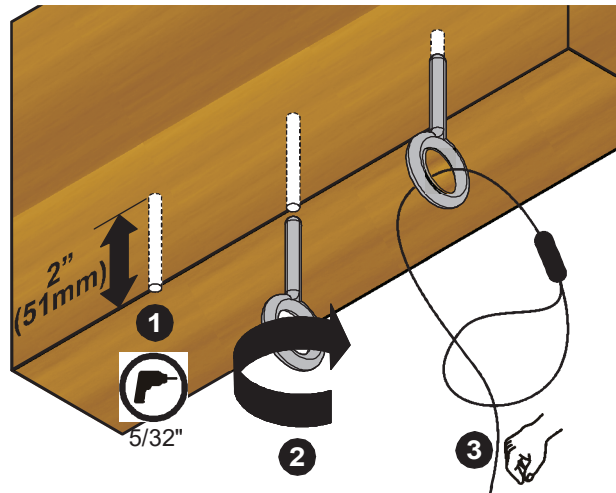


Figure 11

TRAY INSTALLATION

1. Reinstall ceiling tile with suspension column hole. Ensure tile is oriented properly.
2. Reinstall tray (A) on top of ceiling tile with suspension column support centered over hole in tile.
3. Position tray (A) with four screws (G) as required:
 - For 24" (610mm) Framework: Install screws through end bracket inside holes.
 - For 600mm (23-5/8") Framework: Install screws through end bracket outside holes.

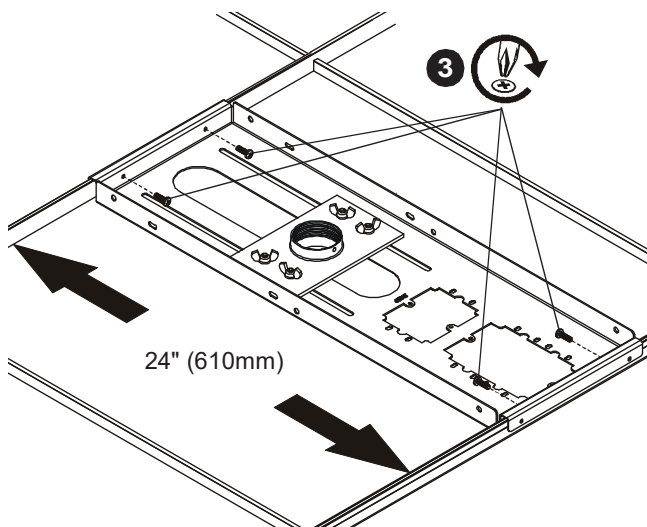


Figure 12

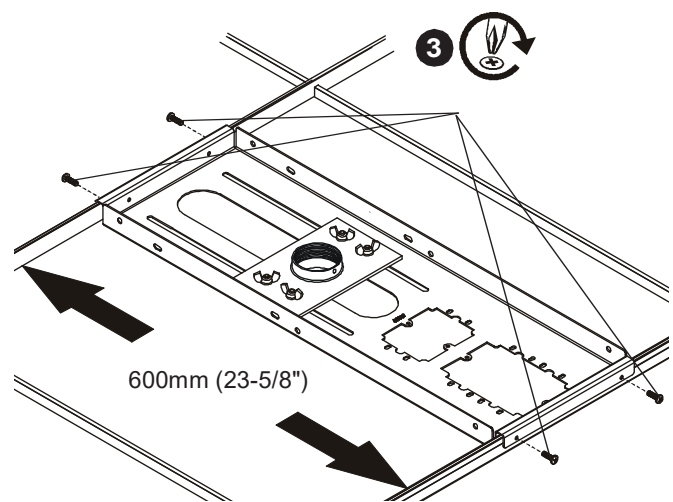


Figure 13

4. Thread each cable (C) completely through cable lock (F), corresponding hole in corner of tray (A), and completely through opposite side of cable lock (F). Adjust cable tension until tray (A) is supported entirely and evenly by all four support cables (C), but not so tight as to distort ceiling tile framework.
 - » NOTE: Cable lock (F) will allow cable to enter from only one direction per side, indicated by arrows on lock (F). Depress spring loaded pins on cable lock (F) to release cable tension.

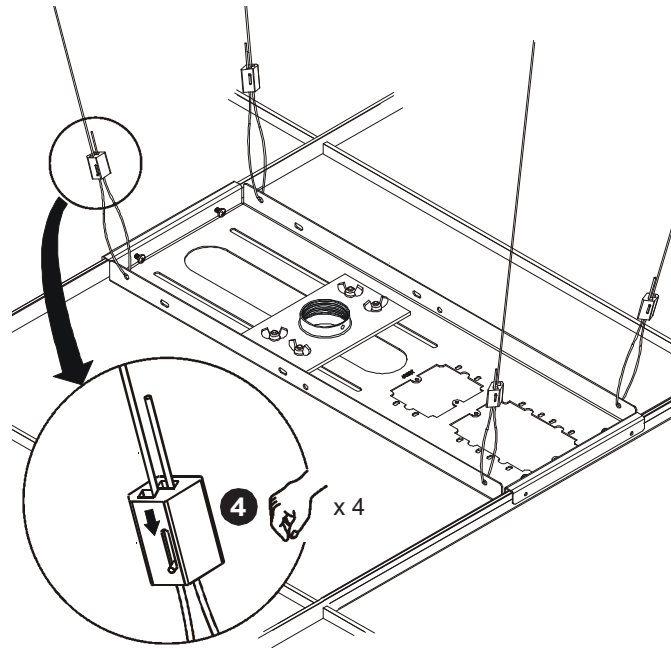


Figure 14

SUSPENSION COLUMN INSTALLATION

1. Install suspension column (N) into suspension column support until tight, with a minimum of four threads engaged.
2. Align mount (O) with end of suspension column (N).
3. Thread mount (O) up onto suspension column (N) by turning until hand tight with a minimum of four threads engaged.

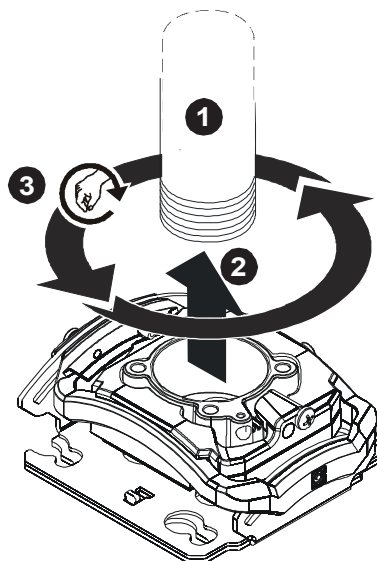


Figure 15

4. Secure suspension column (N) by one of the following methods:
 - Install one 10-24 x 1/4" Phillips pan head screw (H) into suspension column support, tightening firmly against column.
 - OPTIONAL: Install one 10-24 x 1/4" button head security screw (J) through locking collar (K) into suspension column support, tightening firmly against column.

» **NOTE:** Locking collar (K) is designed to spin, even when screw (J) is tight.

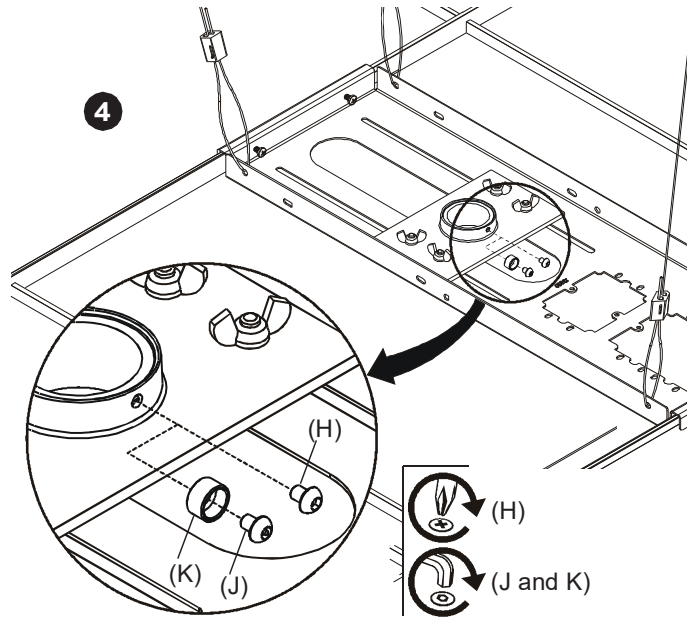


Figure 16

5. Install suspension column ring (B) on suspension column below ceiling tile. If necessary, bend four tabs inward to secure ring to column.
6. Reinstall remaining ceiling tiles as required.

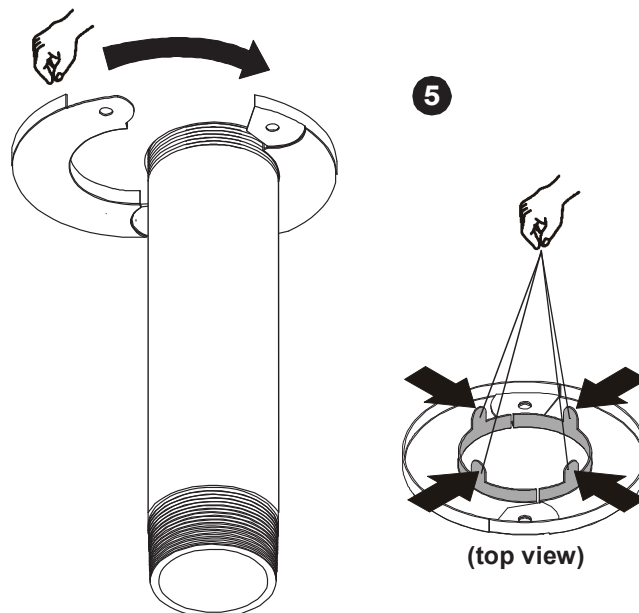
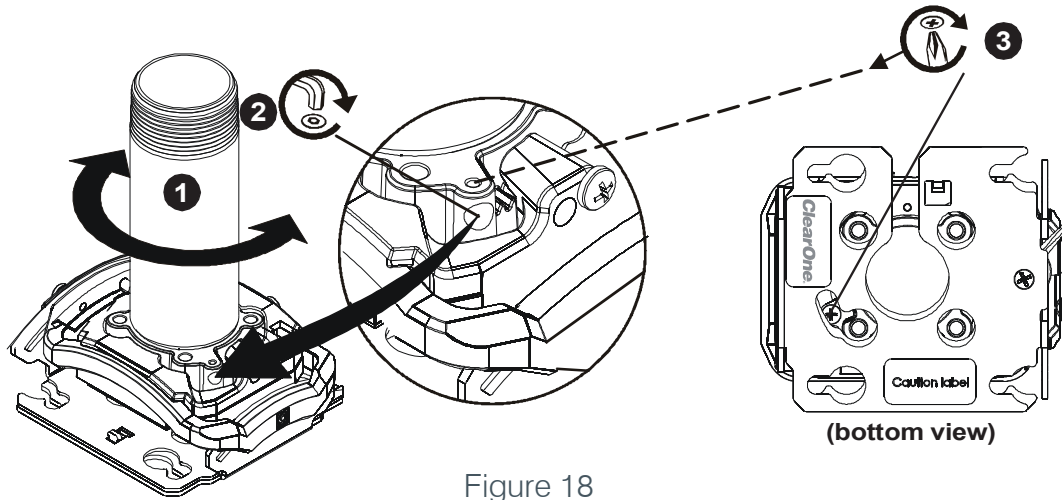


Figure 17

MOUNT ALIGNMENT

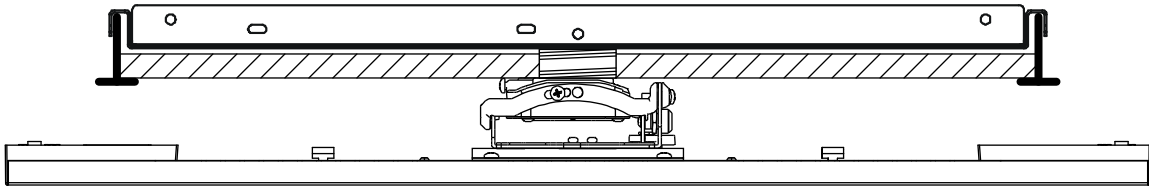
1. Turn mount (O) up to 1/2 turn clockwise or counter-clockwise until front of mount is facing target.
2. Secure mount to suspension column (N) by tightening set screw with a hex key wrench.
 - » **IMPORTANT: DO NOT OVERTIGHTEN!** Overtightening of set screw can damage threads on suspension column (N).
3. Turn security screw using a Phillips screwdriver until screw cannot be seen through access hole in mount.



FLUSH MOUNT INSTALLATION

The following diagrams show how to flush mount the BFM2.

SUSPENDED CEILING INSTALLATION



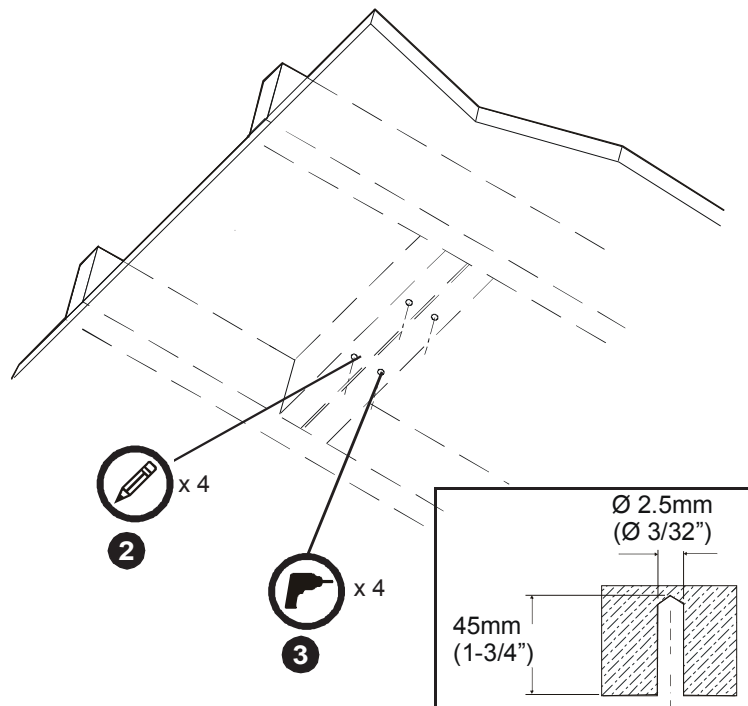
To safely flush mount the BFM2 to ceiling tile, you must use the suspended ceiling kit.

1. Follow the instructions for [mounting to suspended ceiling](#) [see page 9, section titled **MOUNTING TO SUSPENDED CEILING**], using a 2-1/2" to 3" suspension column instead (not included; see page 7, section titled **PARTS NOT INCLUDED**).

WOOD STUD INSTALLATION

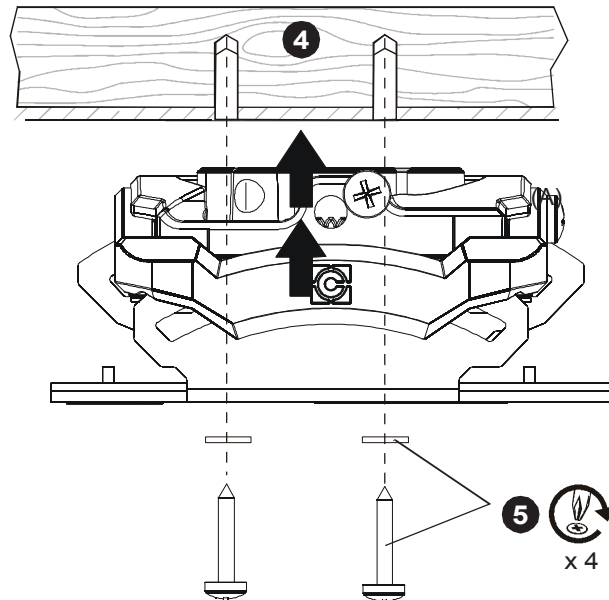
1. Determine mounting location.
 - » **IMPORTANT:** Improper installation can result in serious personal injury or damage to equipment! Structural members must be capable of supporting five times the combined weight of all equipment being mounted.
 - » Note: The mount is designed to be mounted to double 2" x 4" wood stud cross bracing (1-1/2" on center) between two ceiling joists; with a maximum drywall covering of 5/8".
2. Using the mount (O) as a guide, mark four mounting hole locations with a pencil. Hole locations must be centered on 2" x 4" cross braces.
3. Drill four 3/32" (2.5mm) diameter pilot holes to a depth of 1-3/4" (45mm) deep.

Figure 19



4. Align four mounting holes in mount (O) with four pilot holes.
5. Secure mount (O) to structure using four #10 flat washers and four #10 x 3" Phillips head wood screws (not included).

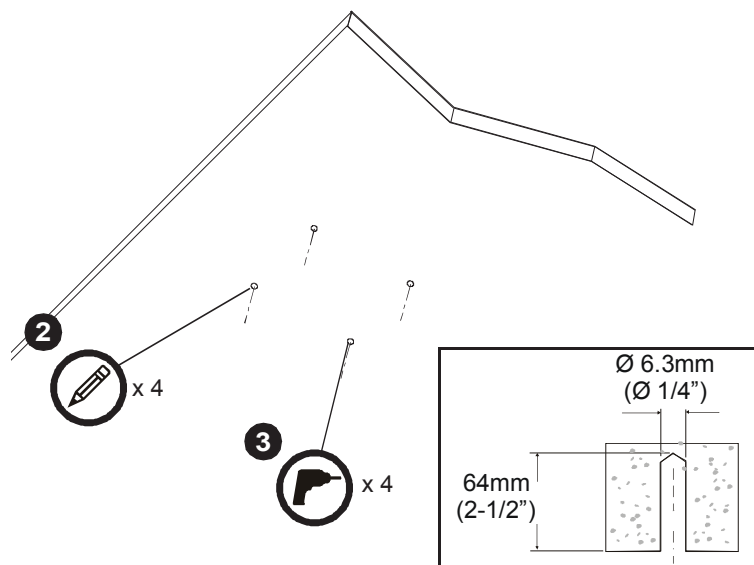
Figure 20



CONCRETE INSTALLATION

1. Determine mounting location.
 - » **IMPORTANT:** Improper installation can result in serious personal injury or damage to equipment! Structural members must be capable of supporting five times the combined weight of all equipment being mounted.
 - » **Note:** The mount is designed to be mounted to a concrete ceiling with a minimum thickness of 8" and a maximum drywall covering of 5/8".
2. Using the mount (O) as a guide, mark four mounting hole locations on ceiling using a pencil.
3. Drill four 1/4" (6.3mm) diameter pilot holes to a depth of 2-1/2" (64mm) deep.

Figure 21



4. Align four mounting holes in mount (O) with four pilot holes.
 - » **IMPORTANT:** Anchors (not provided) must be installed into structurally sound solid concrete. Installation into hollow concrete block, mortar, or concrete that exhibits cracking, spalling, or other defects may result in failure of anchor and serious personal injury or damage to equipment.
5. Install four 3/8" x 2-1/4" Grade 2 concrete anchors (not included) by inserting into pilot holes and pounding in until flush with mounting surface.
6. Secure mount (O) to structure using four #10 flat washers and four #10 x 3" Phillips head wood screws (not included).

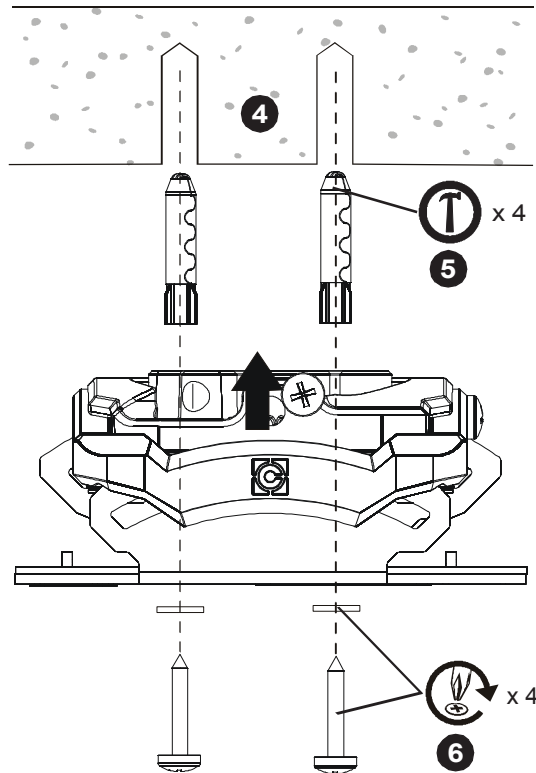


Figure 22

BEAMFORMING MICROPHONE ARRAY 2 INSTALLATION

INSTALL INTERFACE BRACKET

1. Secure interface bracket (P) to BFM2 using M3 x 8mm screws (I) and washers (Q).

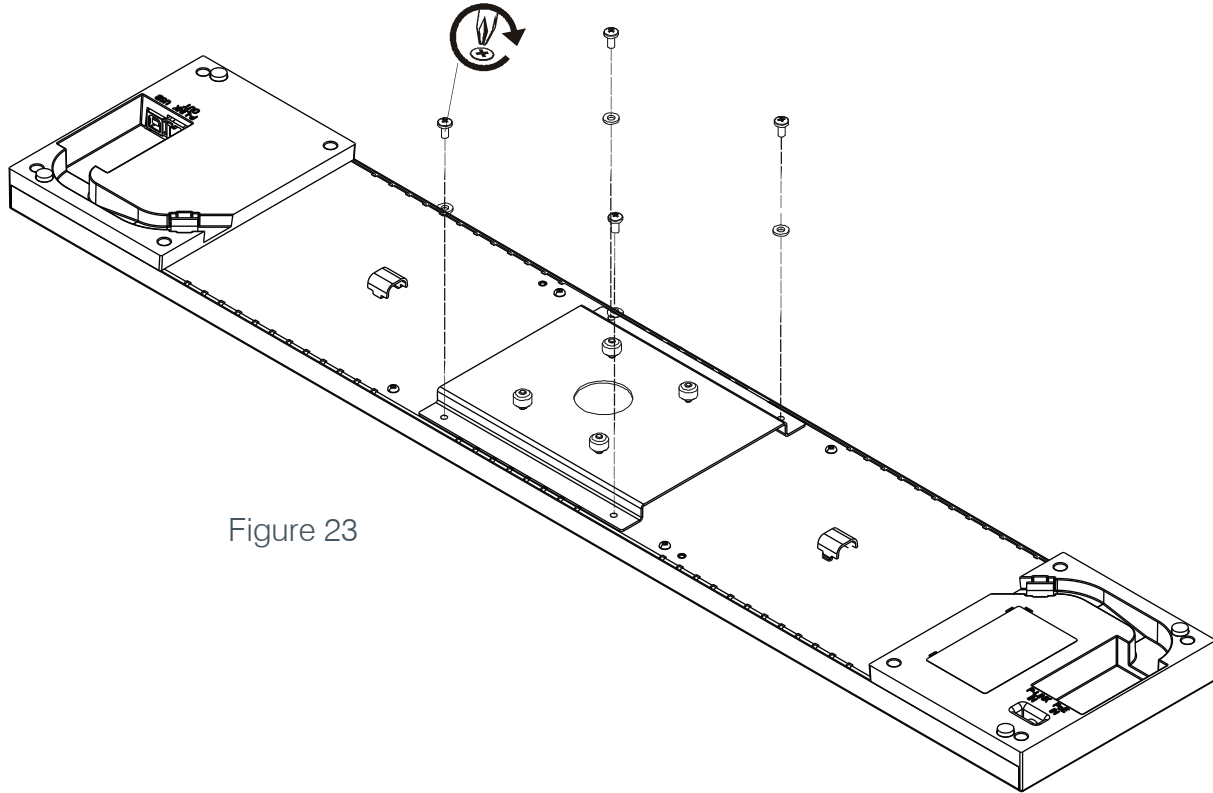


Figure 23

INSTALL AND SECURE MOUNT TO BRACKET

1. Orient BFM2 with bracket (P) as shown below.
2. Lift BFM2 so that bracket standoff fasteners are aligned with mounting slots in mount (O) base.
3. Slide bracket standoff fasteners into mounting slots in mount (O) base until screws are seated against the back of mounting slots.
4. Verify bracket standoff fasteners are properly seated in mounting slots in mount (O) base.

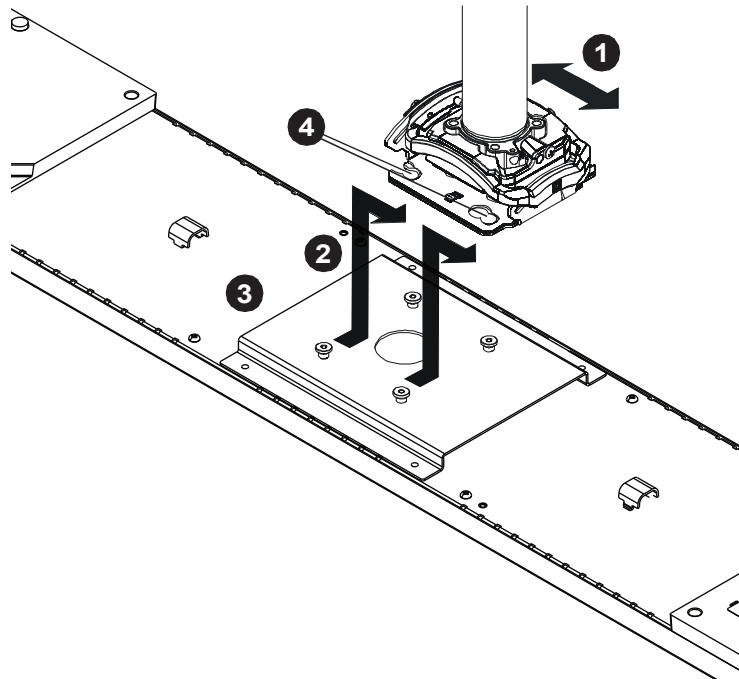


Figure 24

5. Move locking lever to “Locked” position as shown in Figure 25.
6. Insert key (not pictured) into lock and turn to secure BFM2 to mount (O).

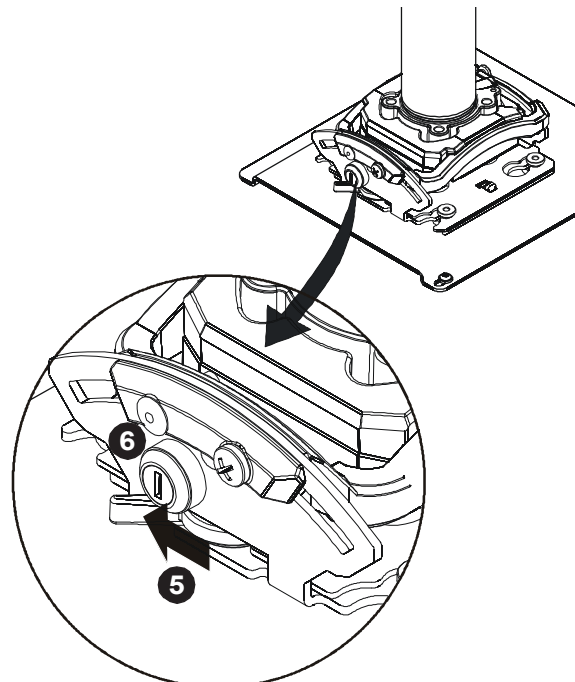


Figure 25

Example of complete BFM2 installation with cables connected and routed:

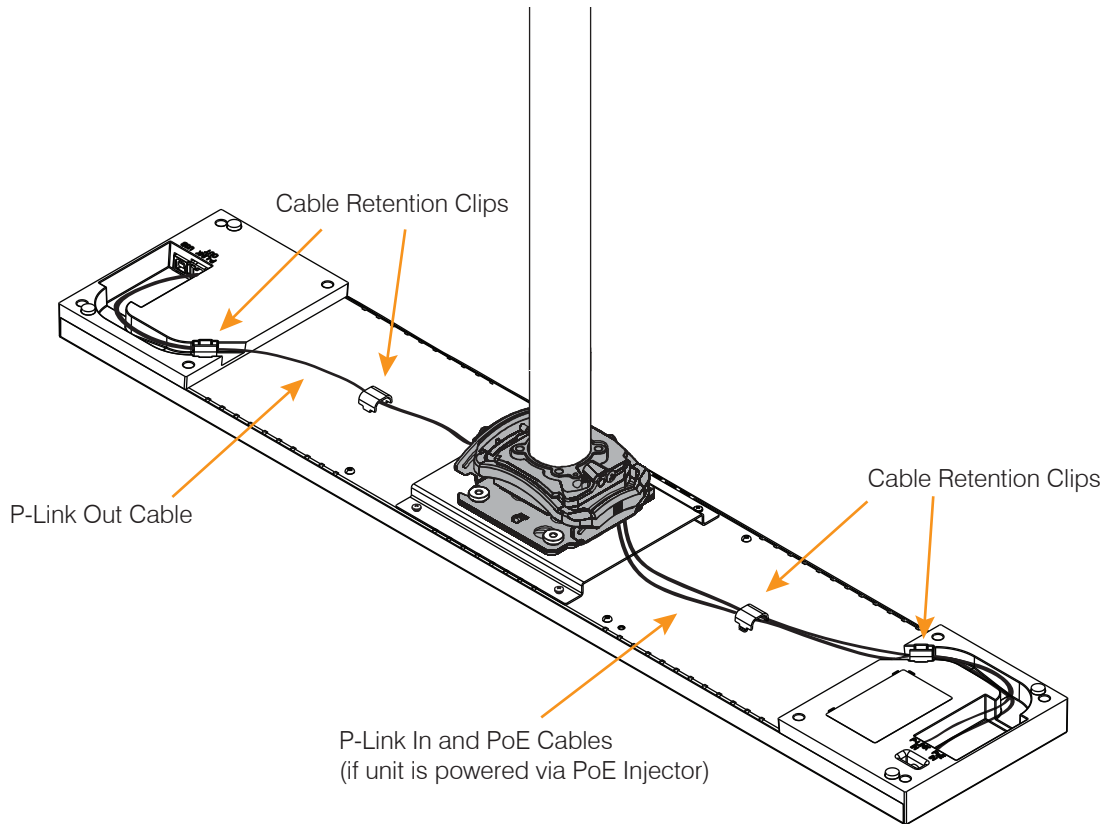


Figure 26

ADJUSTMENTS

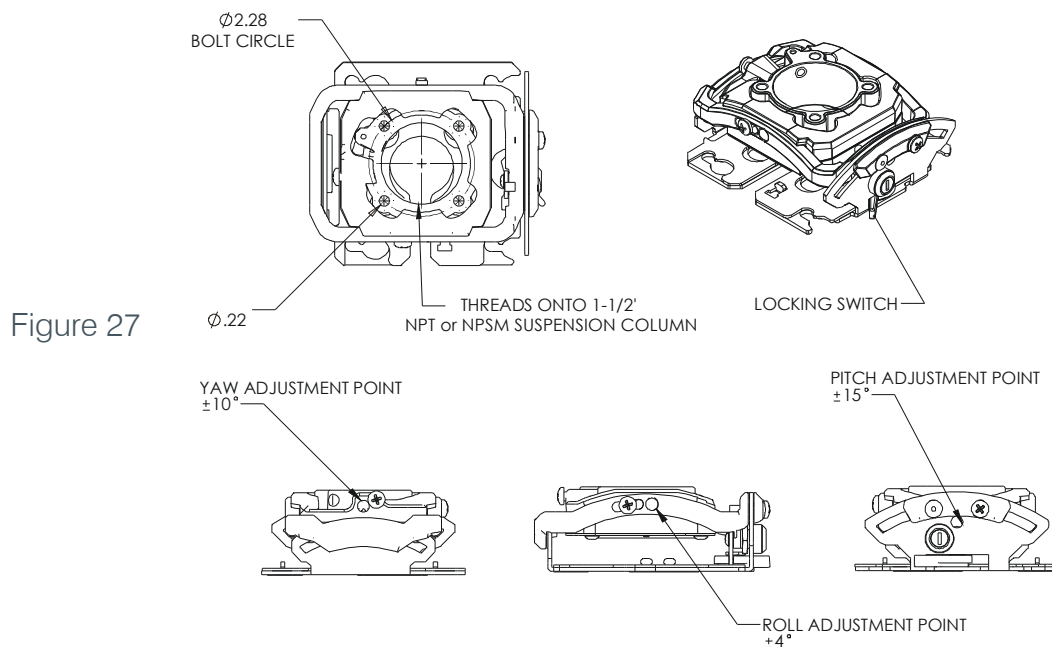


Figure 27

Yaw refers to the axis of rotation that will swivel the BFM2 relative to the suspension column. Pitch refers to the axis of rotation that will tilt the BFM2 side-to-side. Roll refers to the axis of rotation that will tilt the BFM2 end-to-end.

1. Loosen YAW, PITCH, or ROLL adjustment locking screw using a #2 Phillips screwdriver.
2. Turn YAW, PITCH, or ROLL micro-adjustment screw right or left using a #2 Phillips screwdriver until BFM2 is properly aligned.
3. Tighten YAW, PITCH, or ROLL adjustment locking screw using a #2 Phillips screwdriver.

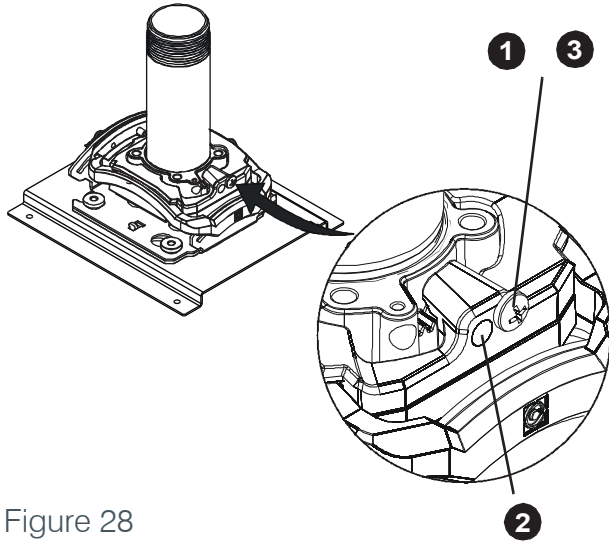


Figure 28

YAW ADJUSTMENT

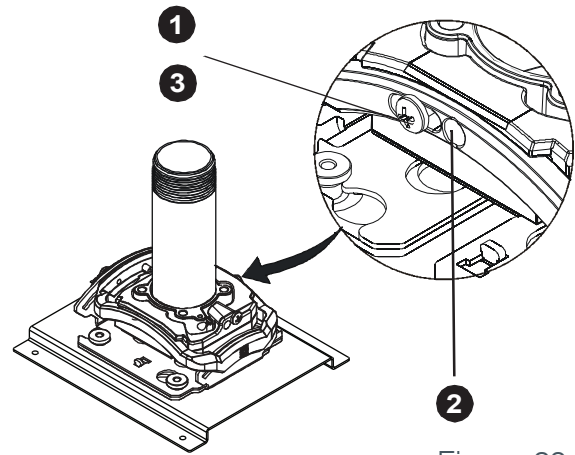
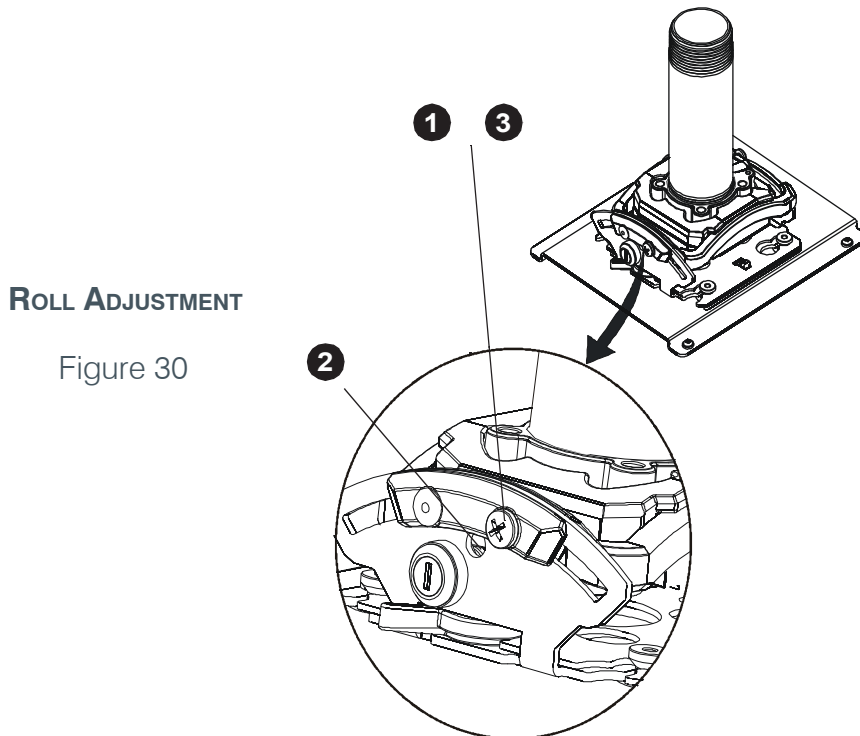


Figure 29

PITCH ADJUSTMENT



ROLL ADJUSTMENT

Figure 30

Service and Support

If you need assistance setting up or operating your product, please contact us. We welcome your comments so we can continue to improve our products and better meet your needs.

TECHNICAL SUPPORT

Telephone: 1.800.283.5936
E-mail: tech.support@ClearOne.com
Web site: www.ClearOne.com

PRODUCT RETURNS

All product returns require a Return Material Authorization (RMA) number. Contact ClearOne Technical Support before returning your product. Make sure you return all the items and packing materials that originally shipped with your product.

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