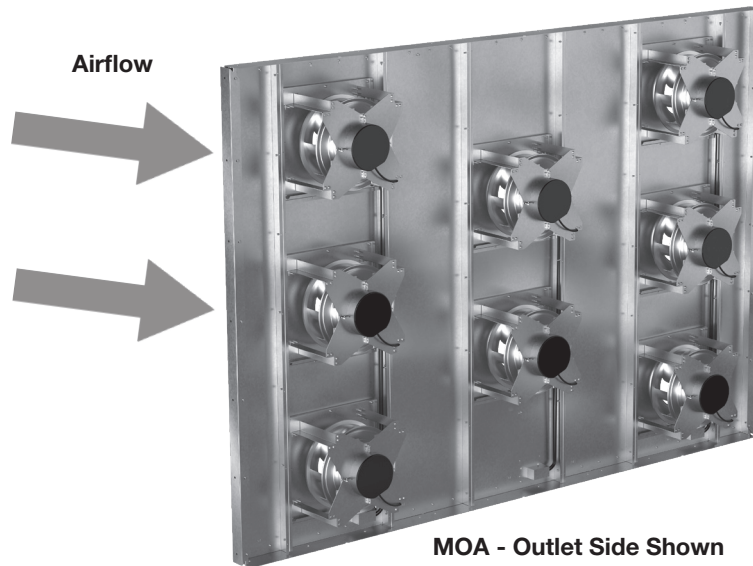


Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.



MOA - Outlet Side Shown

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DANGER

Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

CAUTION

When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

CAUTION

Precaution should be taken in explosive atmospheres.

DANGER

Pour écarter les risques d'incendie, de choc électrique ou de blessure grave, veiller à toujours débrancher, verrouiller et étiqueter la source de courant avant l'installation ou l'entretien.

ATTENTION

Lors de toute intervention sur la soufflante, le moteur peut être suffisamment chaud pour provoquer une douleur voire une blessure. Laisser le moteur refroidir avant toute maintenance.

ATTENTION

Faire preuve de précaution dans les atmosphères explosives.

General Safety Information

Only qualified personnel should install this array. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC), the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.
2. The rotation of the wheel(s) is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin the wheel(s) faster than max cataloged RPM. Adjustments to fan speed significantly effects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.

Receiving

The fan array system will ship knocked down, in multiple crates.

Upon receiving the product, check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier of any damage detected. The customer will make a notation of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading which is countersigned by the delivering carrier. If damaged, immediately contact the local sales representative. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

Handling

Arrays are shipped knocked down. Components will be on individual skids.

Storage

- Do not store outdoors
- Rotate the wheel monthly
- Energize the motor once every three months
- Store unit in location which does not have vibration

Arrays are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. The manufacturer will not be responsible for damage during storage. Improper storage which results in damage to the array will void the warranty. These suggestions are provided solely as a convenience to the user.

The ideal environment for the storage of the array and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Temperatures should be evenly maintained between 30°F (-1°C) and 110°F (43°C). Wide temperature swings may cause condensation and “sweating” of metal parts. All accessories must be stored indoors in a clean, dry atmosphere.

Remove any accumulations of dirt or debris and wipe clean before moving to indoor storage. To avoid “sweating” of metal parts, allow cold parts to reach room temperature. To dry parts and packages use a portable electric heater to get rid of any moisture build up. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3-1/2 in. (89 mm) off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

Inspection & Maintenance during Storage

While in storage, inspect array once per month. Keep a record of inspection and maintenance performed.

If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant on motor.

Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Wipe clean thoroughly with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive or WD-40® or the equivalent.

Removing from Storage

As the arrays are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion, until the fan equipment goes into operation.

Prior to fully assembling and installing the array and system components, inspect the array assembly to make sure it is in working order.

1. Check all fasteners, set screws, wheel(s), motor(s) and accessories for tightness.
2. Rotate the wheel(s) by hand and assure no parts are rubbing.

General Information

To ensure a successful installation, the instructions in this manual should be read and adhered to. Failure to comply with proper installation procedures may void the warranty.

NOTE

This installation manual is provided as a guide for installation, operation and maintenance of the Modular Open Array (MOA). It is the responsibility of the purchaser to provide qualified personnel experienced in the installation, operation and maintenance of the air movement and control devices. Instructions provided in this manual are a general guide intended to provide direction under various installation conditions. This instruction manual should be read in its entirety prior to installing the MOA or any of the related controls. Safety first, always follow safe work practices including proper PPE and electrical safety.

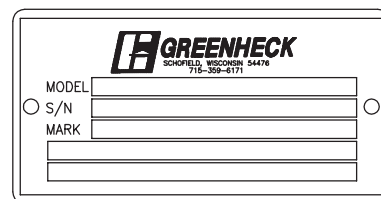
The following steps may not follow your fan style or size exactly. Additional or repetition of steps may be required for larger arrays.

General safety steps should be taken in this procedure, but special care needs to be taken with specific job site requirements. This may include, but is not limited to: fall protection, lockout tag out, gloves, masks and other forms of PPE. Review of jobsite specific procedures should be done before any work is started.

Unit and System Identification Tags

Each array has a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.

The tag shown is an example of an identification nameplate on the array. The information provides general details about the fan, as well as containing specific information unique to the unit. When contacting the local sales representative with future needs or questions, please have the information on this label available. Tags are mounted in an area which is clearly visible, usually on the side of the fan array.



Pre-Installation Information

Before installation, it is important to be certain the mounting surface will bear the operating weight of the unit. Fan arrays are for horizontal installation only.

For further details on safety practices involving industrial and commercial fans, please refer to AMCA Publication 410.

Moving Parts

All moving parts must have guards to protect personnel. Refer to local codes for requirements as to the number, type and design. Fully secure the wheel(s) before performing any maintenance. The wheel(s) may start "free wheeling" even if all electrical power has been disconnected. Before the initial start-up or any restart, check the following items to make sure that they are installed and secure.

- Do not spin the wheel(s) faster than the maximum cataloged fan RPM.
- Adjustments to fan speed significantly affects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.

Air Pressure and Suction

In addition to the usual hazards associated with rotating machinery, arrays also create a dangerous suction at the inlet. Special caution needs to be used when moving around an array, whether it is in operation or not. Before start-up, make sure the inlet area is clear of personnel and loose objects.

Installation

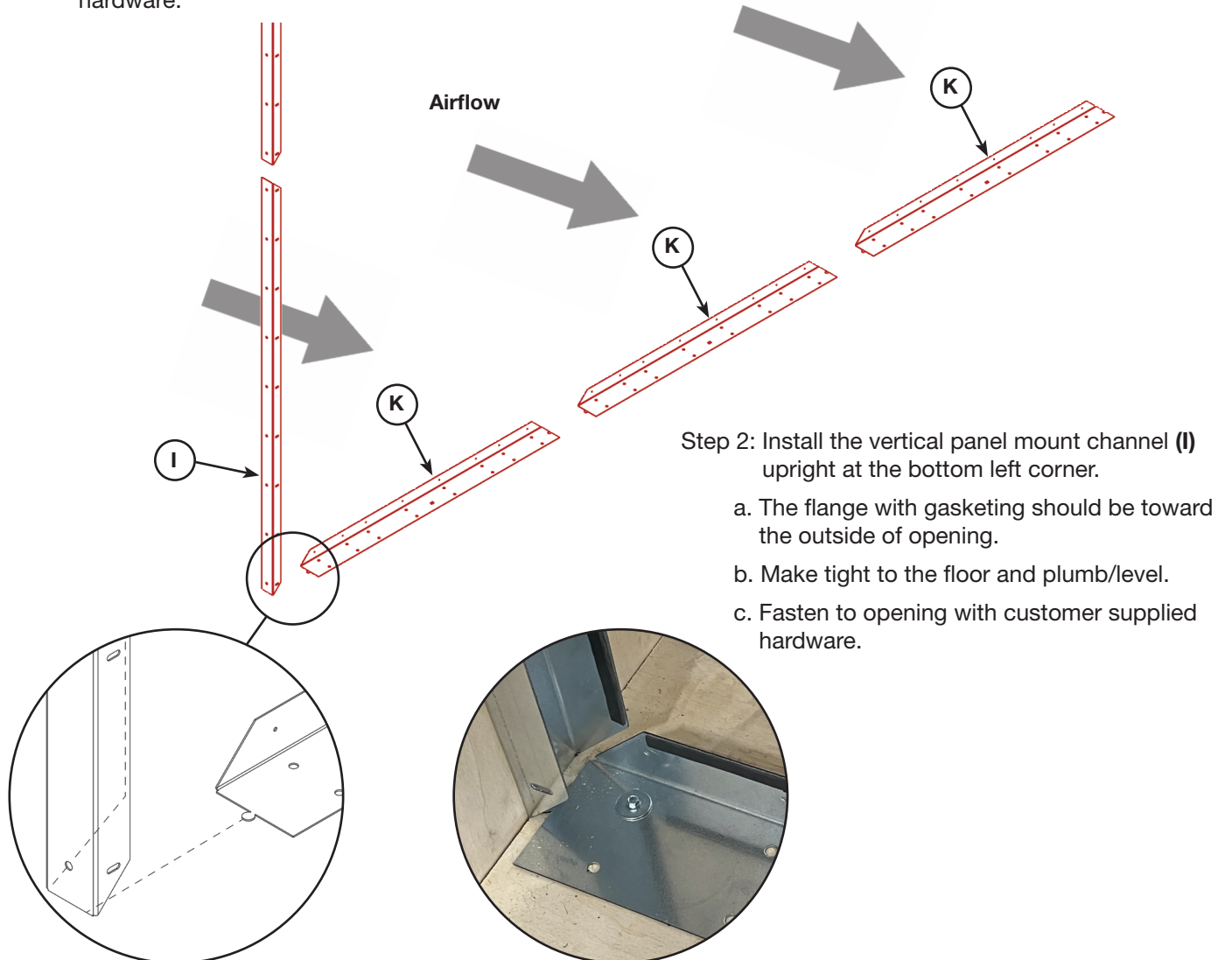
Locate and identify parts as listed on the Parts List. See exploded views at the end of this manual for assistance in identifying parts.

CAUTION

When installing an array, ensure the proper protective devices are used to protect personnel from moving parts and other hazards. The manufacturer is not responsible for injuries for persons completing the installation or maintenance on the array.

Parts List	
Part number	Description
A, B, C & D	Fan panels
E & G	End panel
F & H	Spacer panels
I	Vertical panel mount channel
J	Panel support angles
K	Horizontal panel mount angle
L	Layer channel
M	Layer channel connector
N	End cap layer channel
O	Horizontal reinforcement
415419	Bolt, HSF, .313-18X.75,GR5, ZP
416081	TRS,SHWH,.25-20X.5,ZP/WAX,TRI-LOBE

Step 1: Confirm the work area is flat and square, and that you are able to secure frame with customer supplied hardware.



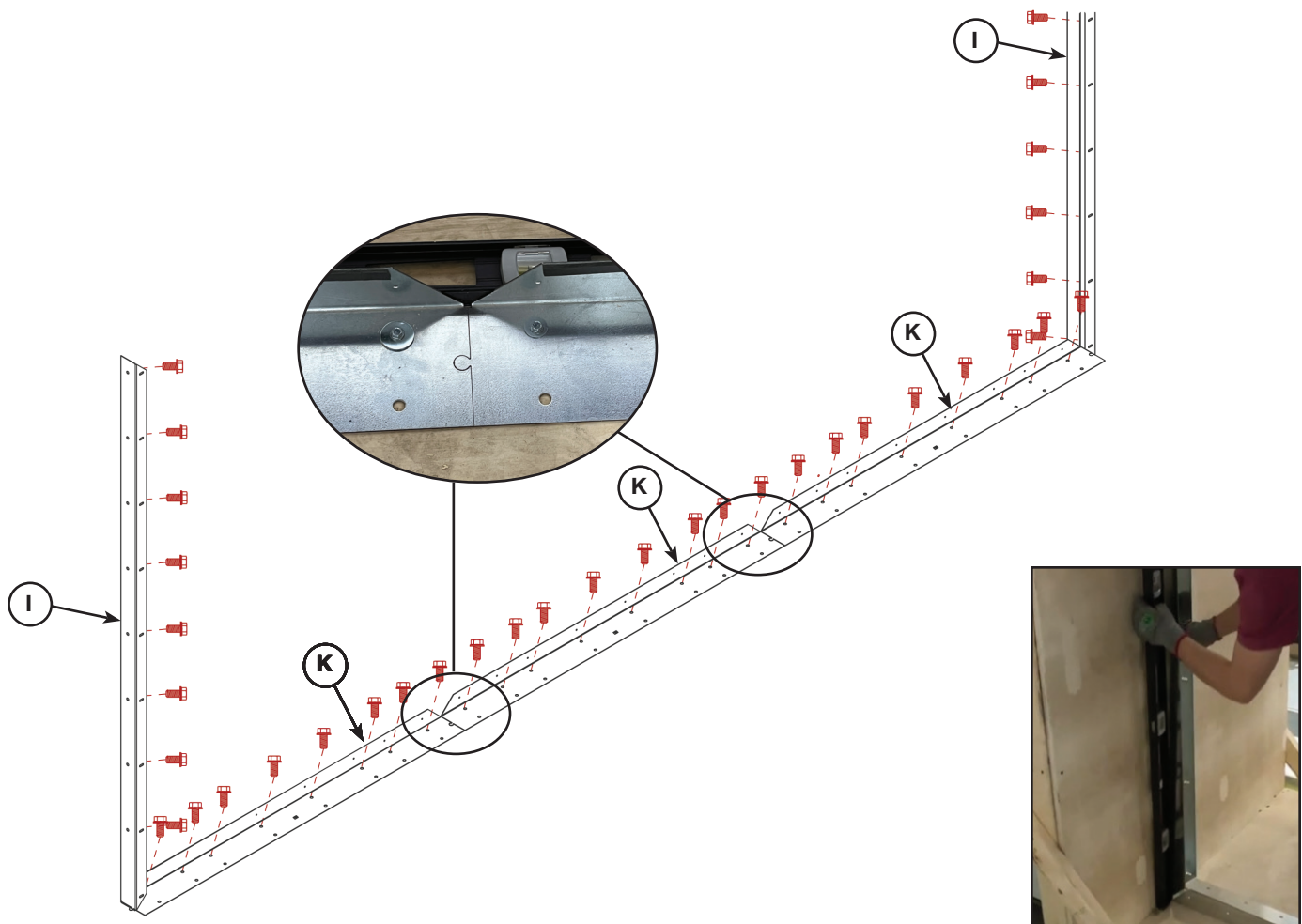
- Step 2: Install the vertical panel mount channel (I) upright at the bottom left corner.
- The flange with gasketing should be toward the outside of opening.
 - Make tight to the floor and plumb/level.
 - Fasten to opening with customer supplied hardware.



Step 3: Install first horizontal panel mount angle (**K**) to the floor of the opening. Push tab tight against the wall.

Step 4: Install remaining horizontal panel mount angles (**K**) to the floor.

- a. Connect pieces together using the tabs.
- b. Make all outside faces flush.
- c. Fasten to floor with customer supplied hardware using the holes closest to the outside face.

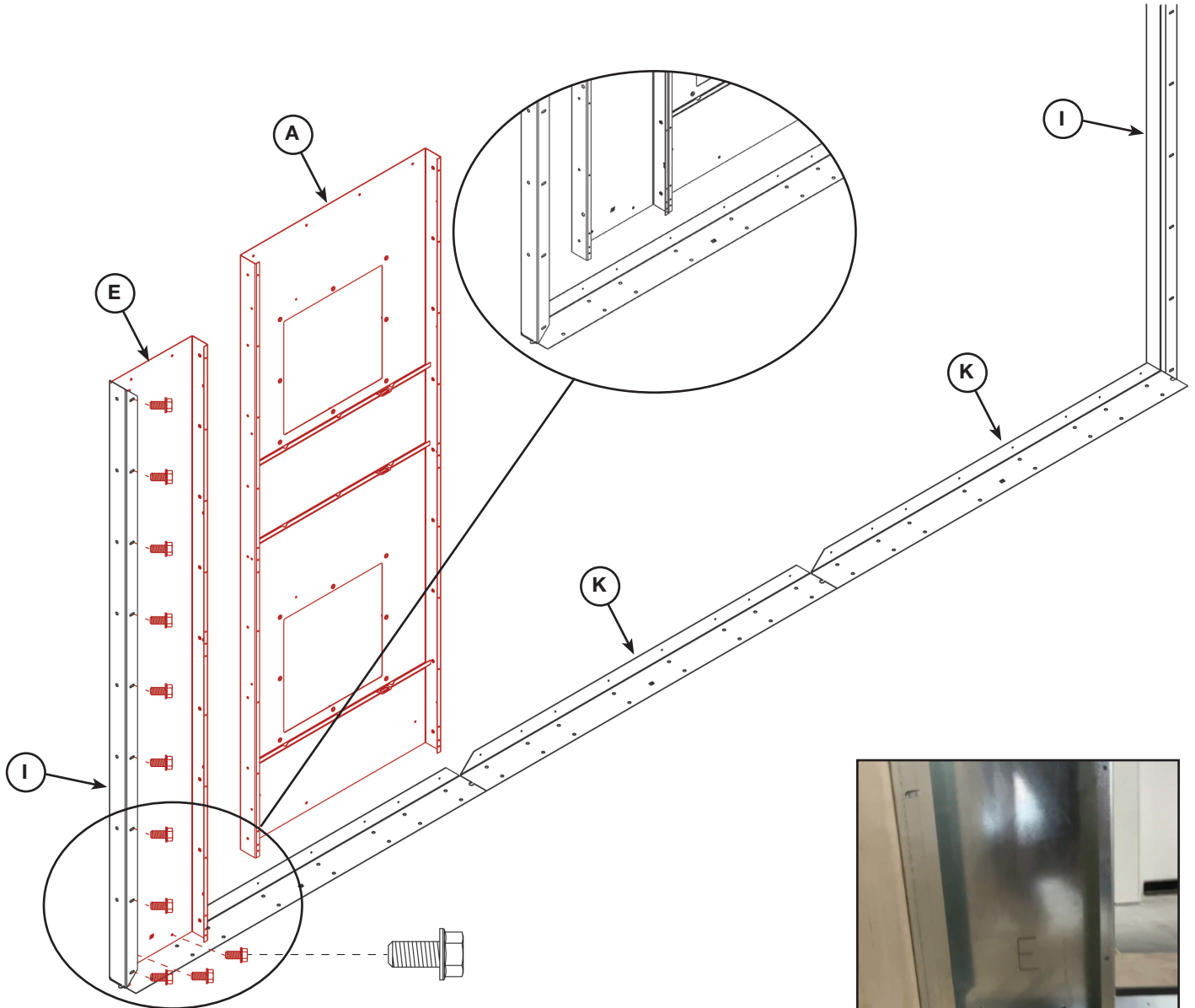


Step 5: Install the other vertical panel mount channel (**I**) upright on the right side of the opening.

- a. Make tight to floor and plumb/level.
- b. Make outside face flush with the horizontal panel mount angles (**K**) outside face.
- c. Fasten to opening with customer supplied hardware.

Step 6: Install end panel **(E)** to the left side of the array.

- a. Set into the horizontal panel mount angle **(K)** and tight to the vertical panel mount channel **(I)** and make plumb/level along the array plane.



416081 - 1/4 x 1/2 in. long screws

- b. Insert (2) **PN 416081** screws through the bottom holes of end panel **(E)** and horizontal panel mount angle **(K)**.
- c. Insert **PN 416081** screws through the side, end panel **(E)** and vertical panel mount channel **(I)**, as shown in the image above.

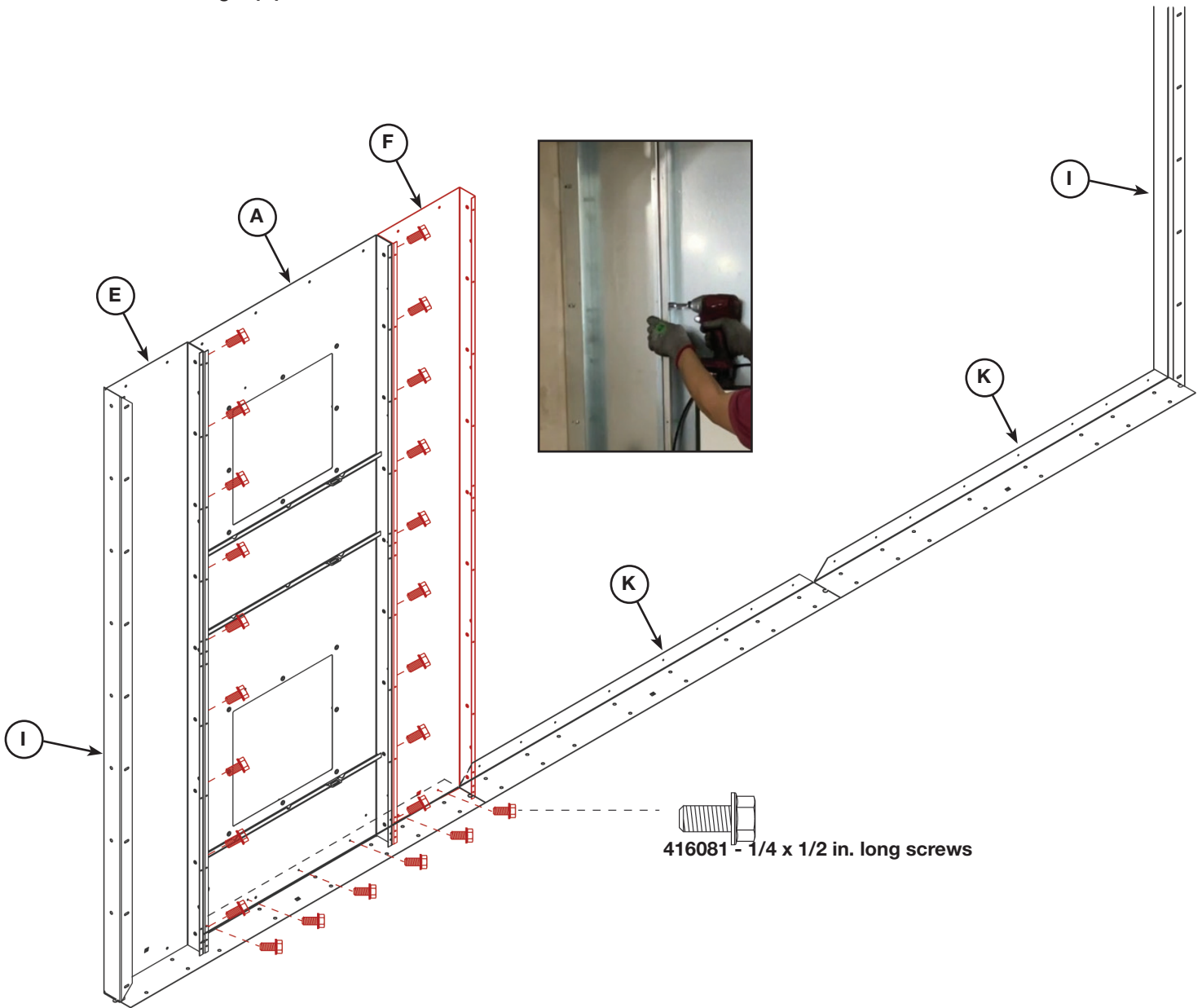
NOTE

Do not fully tighten the screws. When all panels are installed, go back through all the seams to tighten screws (Step 13).

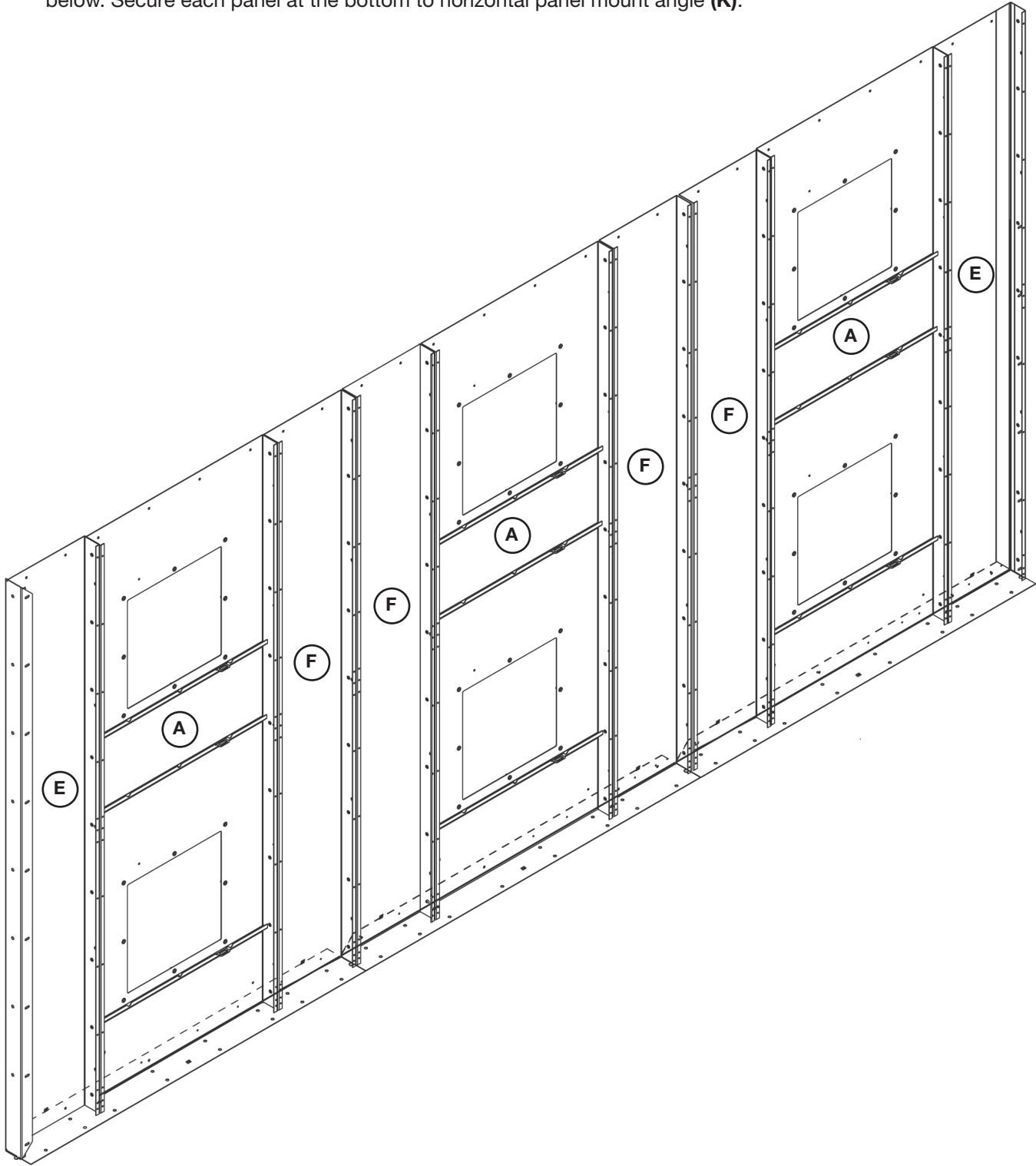


Step 7: Set in place, fan panel (A) and loosely fasten to end panel (E), then secure bottom to horizontal panel mount angle (K).

a. Set in place, spacer panel (F) and loosely fasten to fan panel (A), then secure bottom to horizontal panel mount angle (K).



b. Complete the layer by repeating the spacer panel (F), fan panel (A), and finally, end panel (E), as in the image below. Secure each panel at the bottom to horizontal panel mount angle (K).

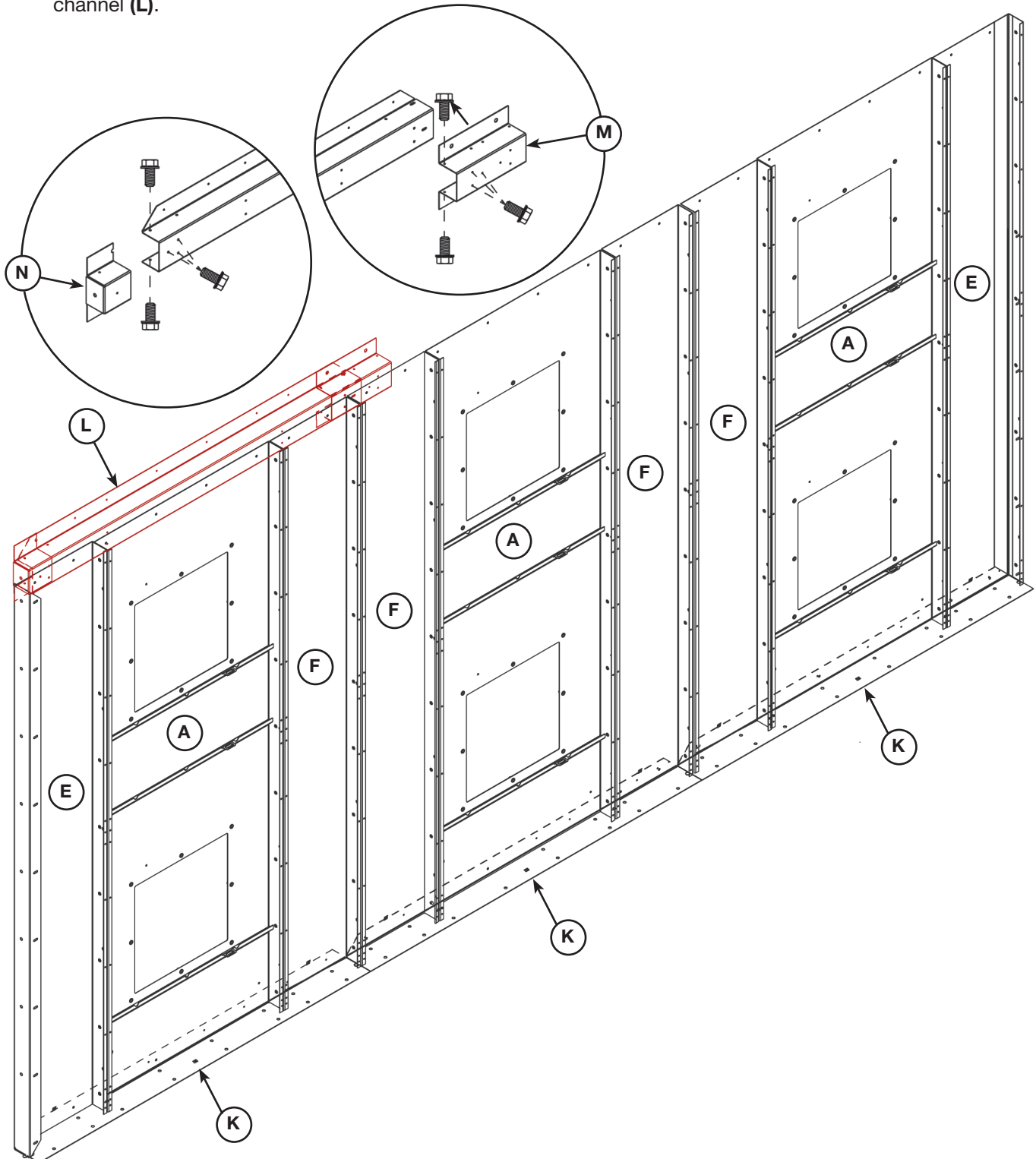


NOTE

If you do not use the middle layer channel section, skip to step 12.

Step 8: Assemble end cap layer channel (**N**) to layer channel (**L**) and join sections together loosely with **PN 416081** screws. Then set on top of panels.

- a. Connect with screws through the top of end panel (**E**), then fan panel (**A**), and spacer panel (**F**) and into layer channel (**L**).



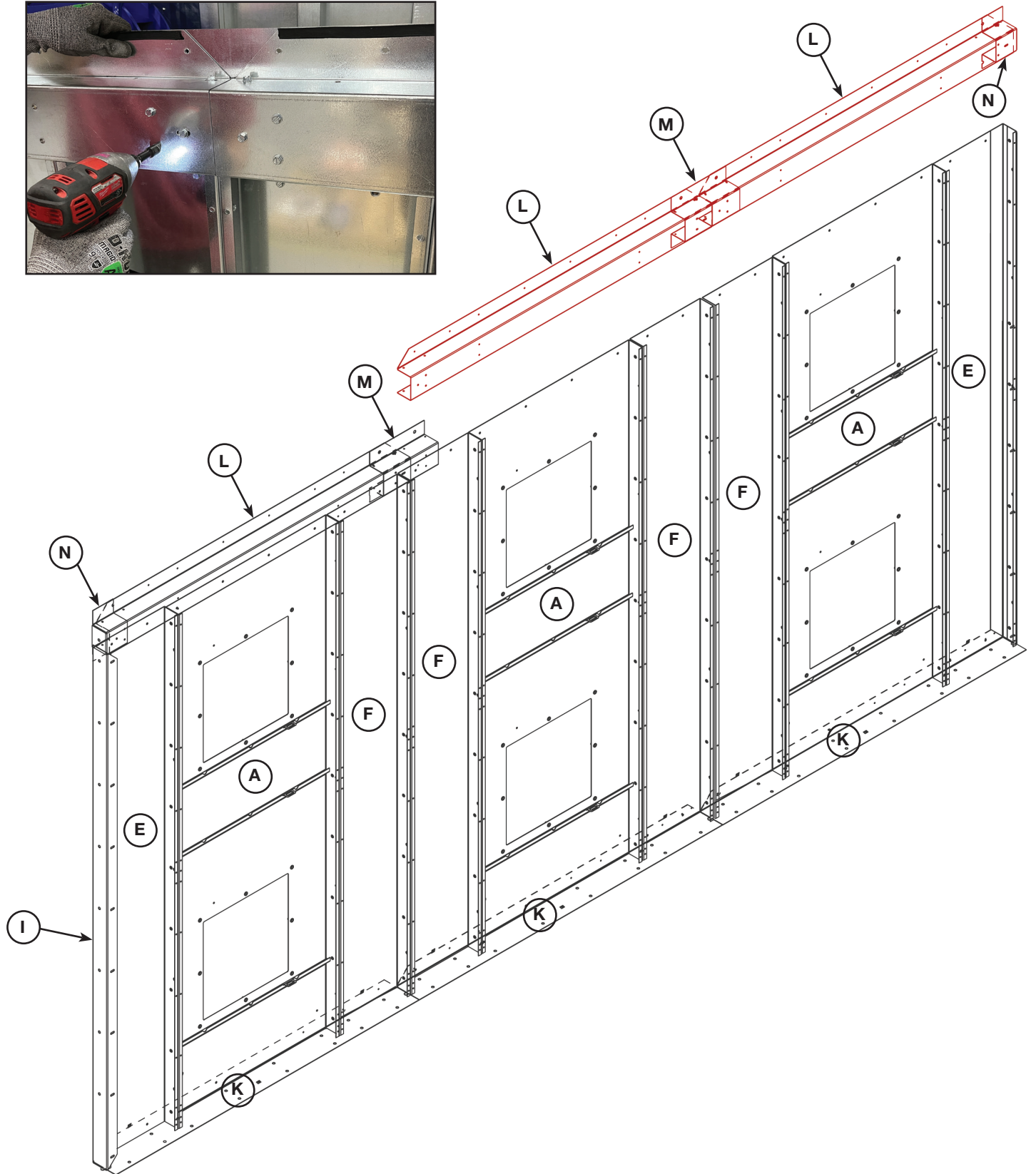
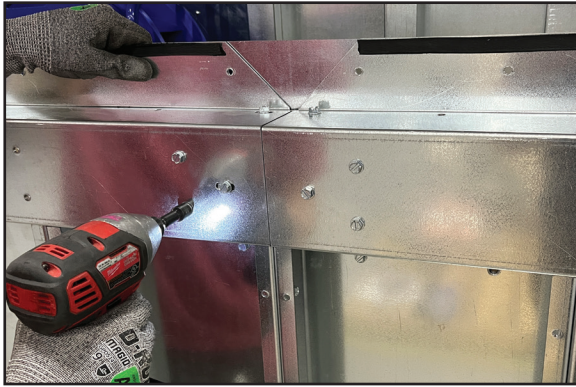
- b. Secure end cap layer channel (**N**) to wall from the back side, as shown in image below.



- c. Add layer channel connector (**M**) to splice next layer channel (**L**) using **PN 416081** screws.

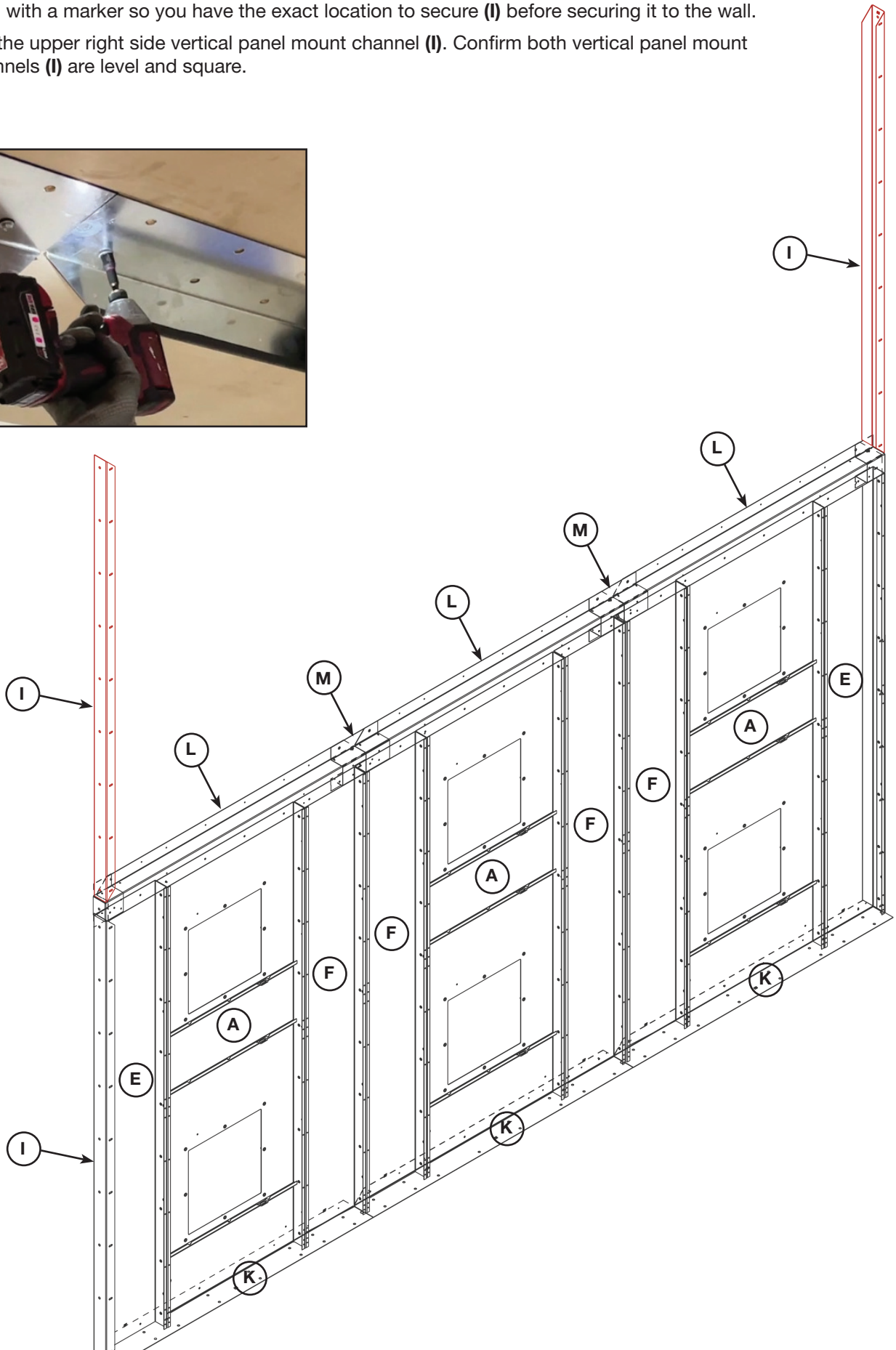
Step 9: Install the remaining layer channel (L) for this layer as dictated from step 6 to step 8.

- a. Finish bottom section with end cap layer channel (N) on the right side of array. Secure the end cap layer channel (N) to the wall from the back side.



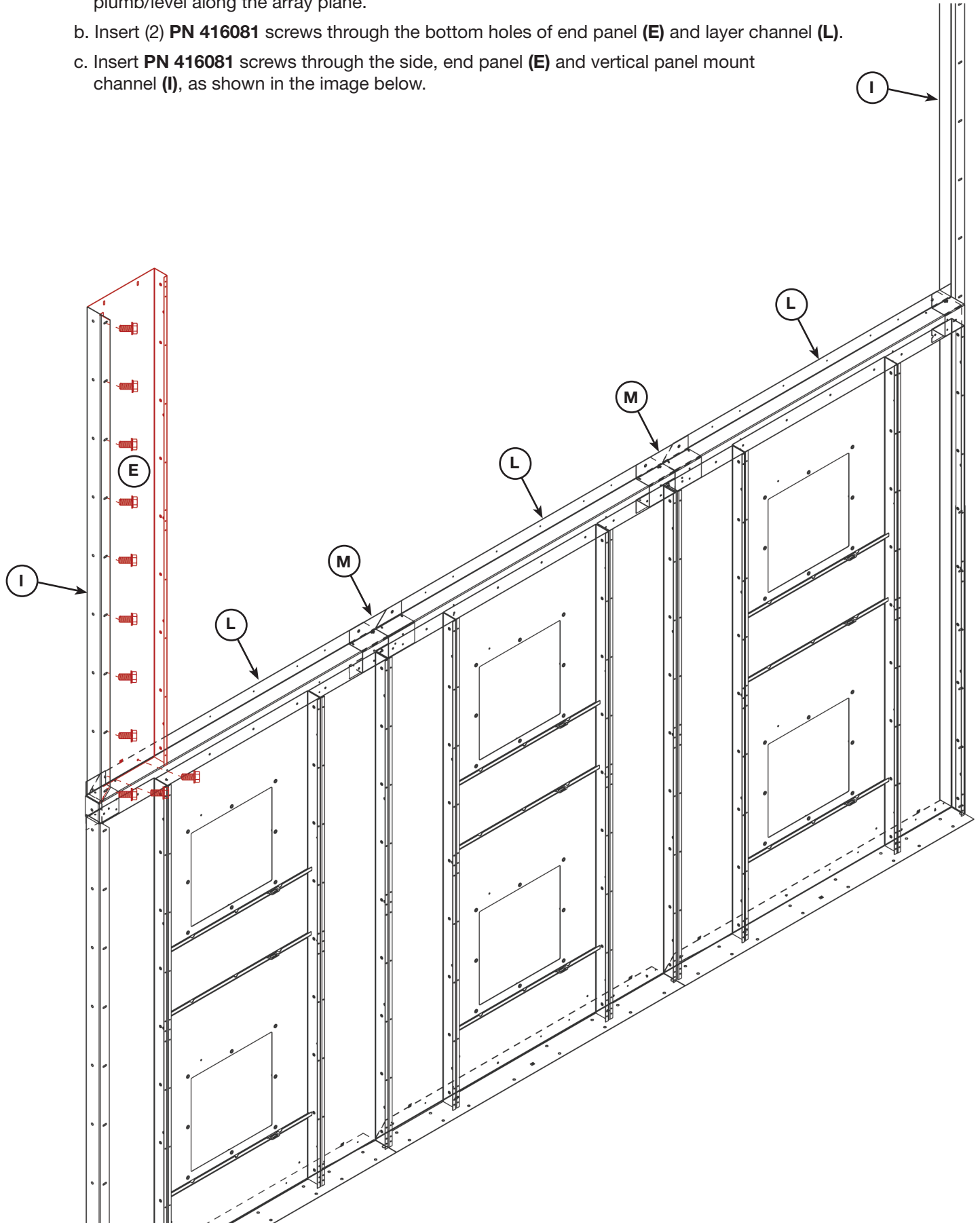
Step 10: When lower section is complete, set the upper left side vertical panel mount channel (I). You may want to temporarily put up the first end panel (E), along with the vertical panel mount channel (I) and mark the wall with a marker so you have the exact location to secure (I) before securing it to the wall.

- a. Set the upper right side vertical panel mount channel (I). Confirm both vertical panel mount channels (I) are level and square.



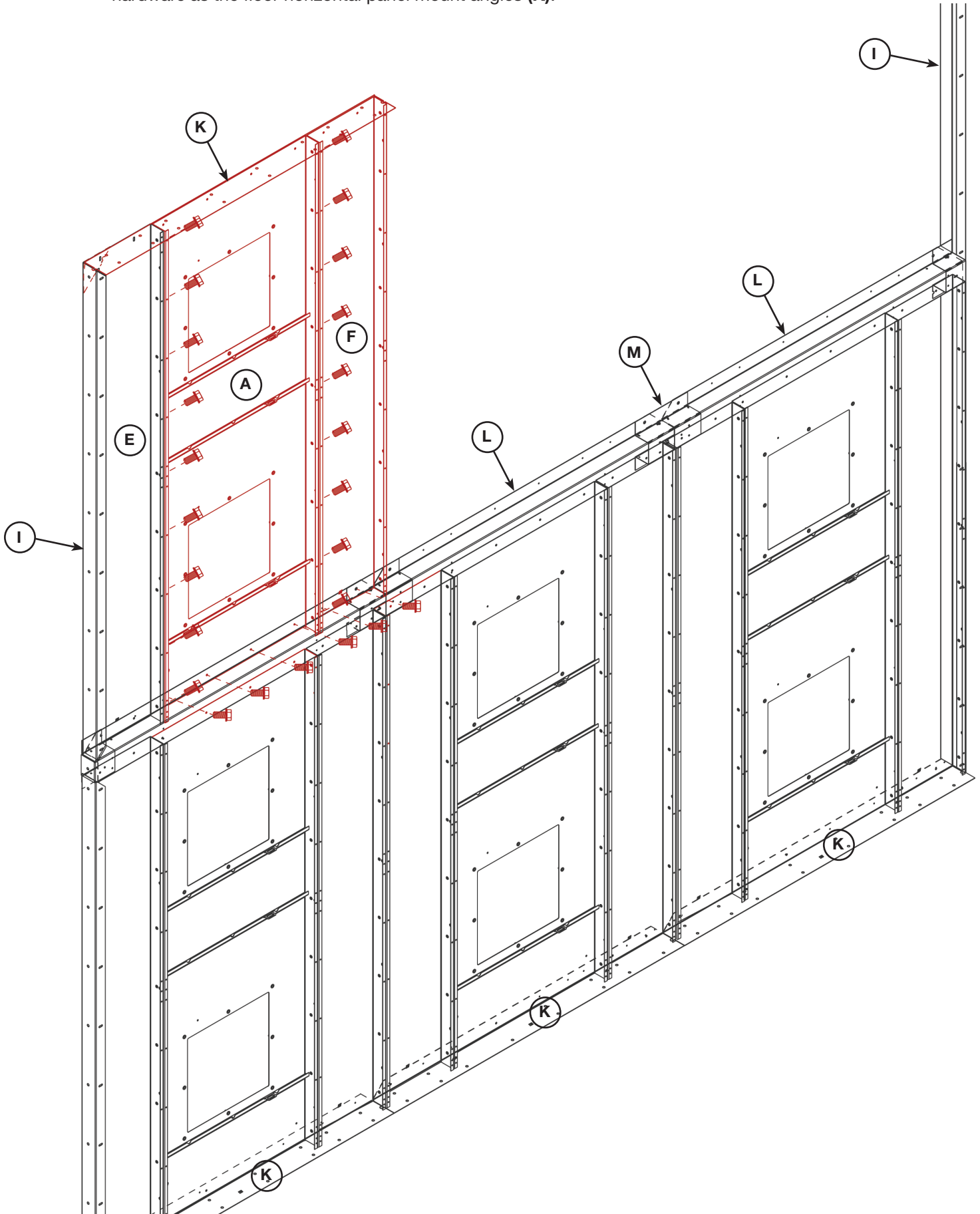
Step 11: After both vertical panel mount channels (**I**) are up and secure to the wall, install the first end panel (**E**) to the far left side of the array.

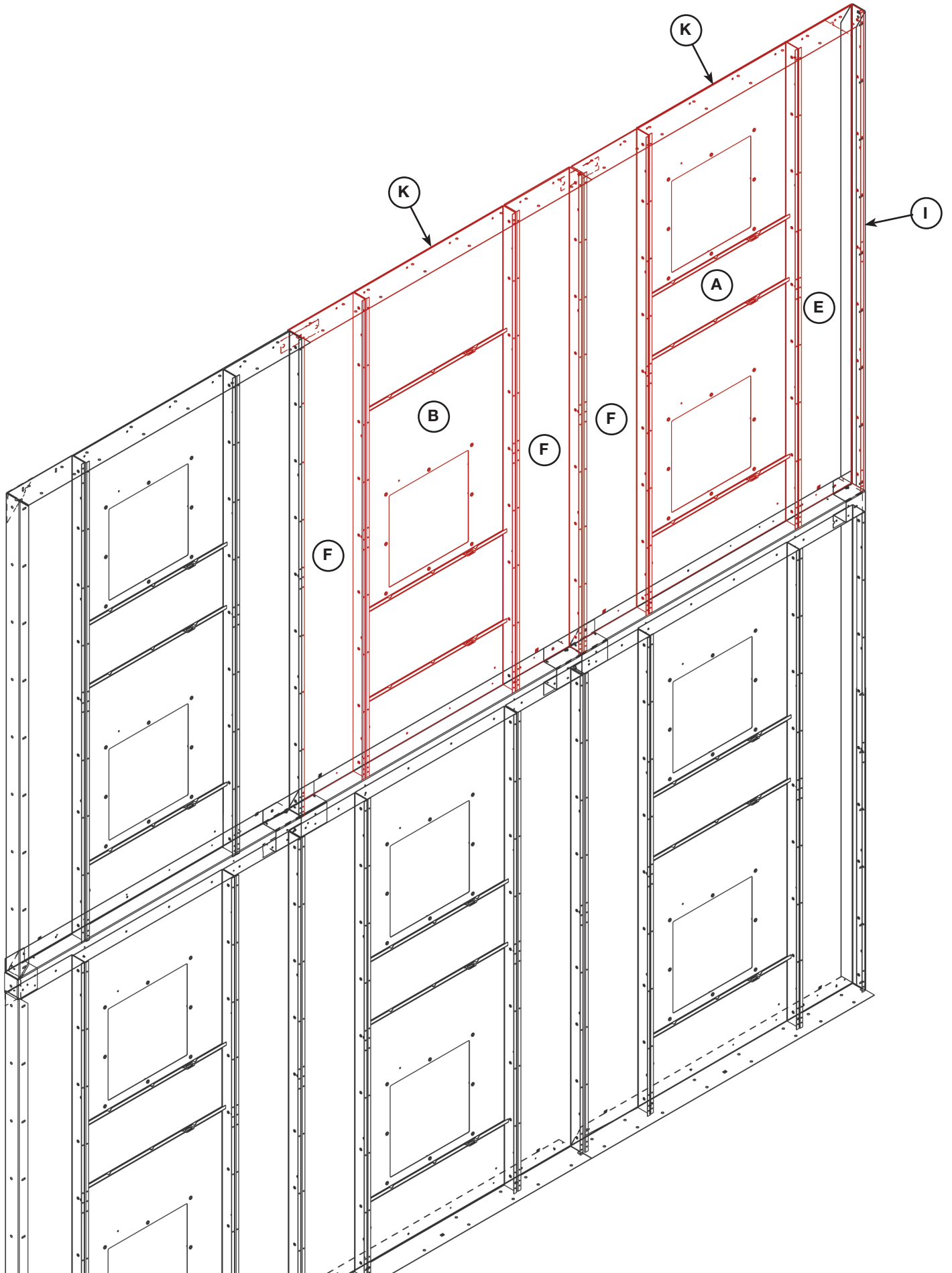
- a. Set end panel (**E**) into the layer channel (**L**) and tight to the vertical panel mount channel (**I**) and make plumb/level along the array plane.
- b. Insert (2) **PN 416081** screws through the bottom holes of end panel (**E**) and layer channel (**L**).
- c. Insert **PN 416081** screws through the side, end panel (**E**) and vertical panel mount channel (**I**), as shown in the image below.



Step 12: Continue with fan panels (A) and (B) and spacer panels (F).

- a. As you go, install horizontal panel mount angles (K) to the ceiling using the same customer supplied hardware as the floor horizontal panel mount angles (K).

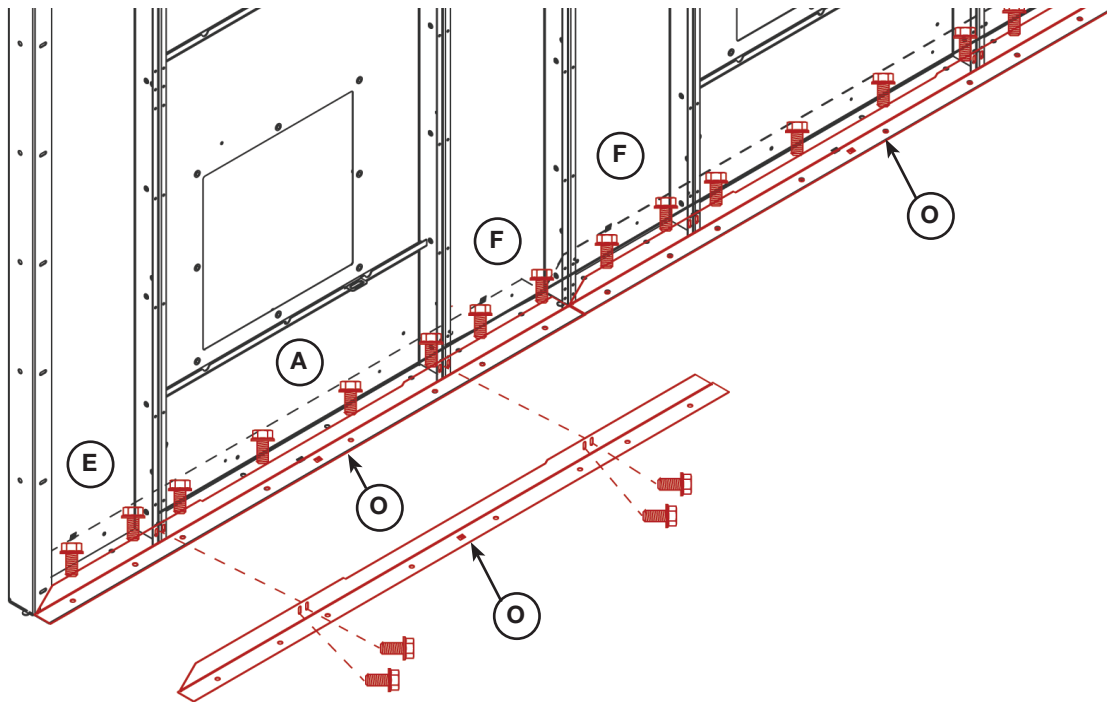




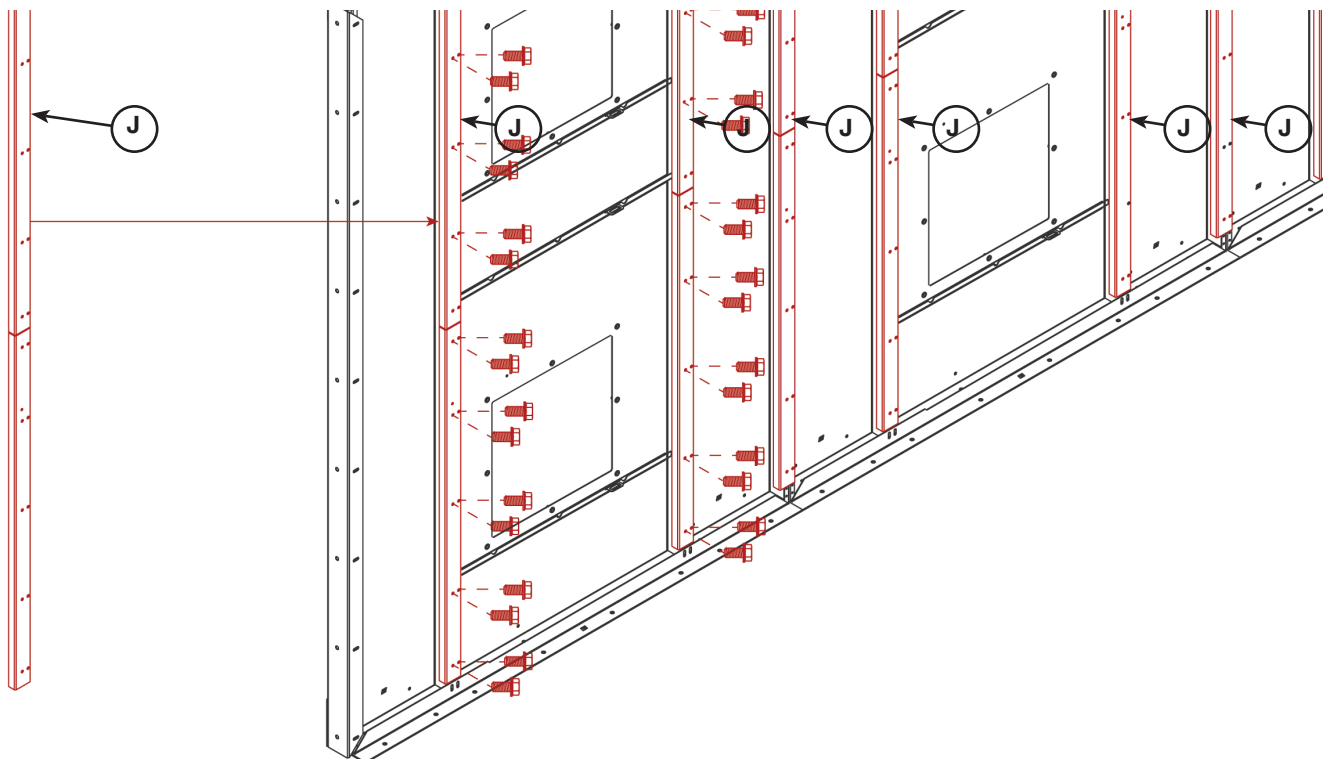
Step 13: When all panels and screws are installed, go back around to all the screws and check that they are tight.

Step 14: Fasten layer channel (**L**) to the top and bottom of opening through to the fan panels (**A**) and (**F**) and end panels (**E**) using the 1/4 x 1/2 inch screws **PN 416081**.

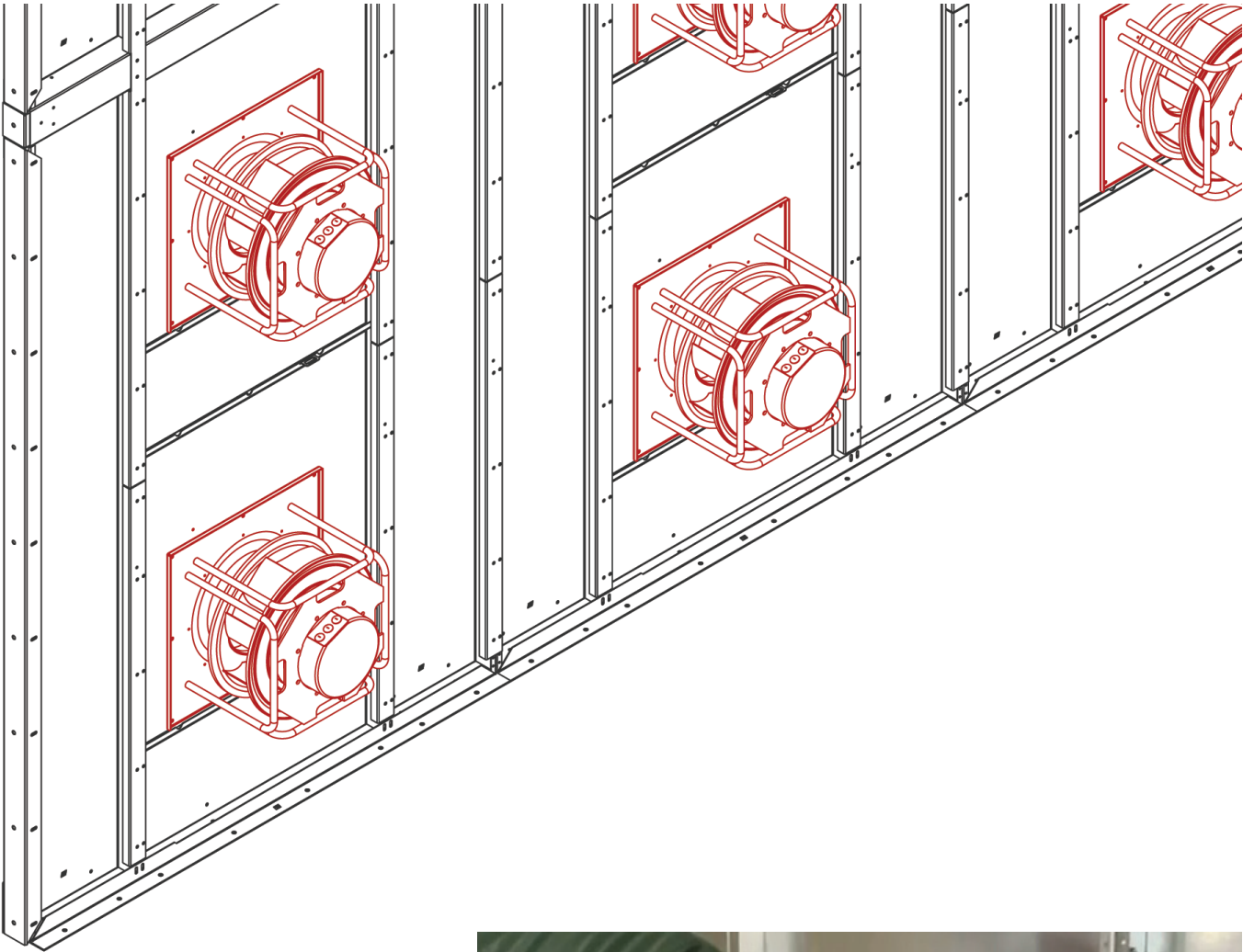
- a. Use customer supplied hardware through the second set of holes on the horizontal reinforcement (**O**) in the floor and ceiling.



Step 15: Fasten the panel support angles (**J**) between each panel with the flange.



Step 16: Install Fans into the designated locations in the array.



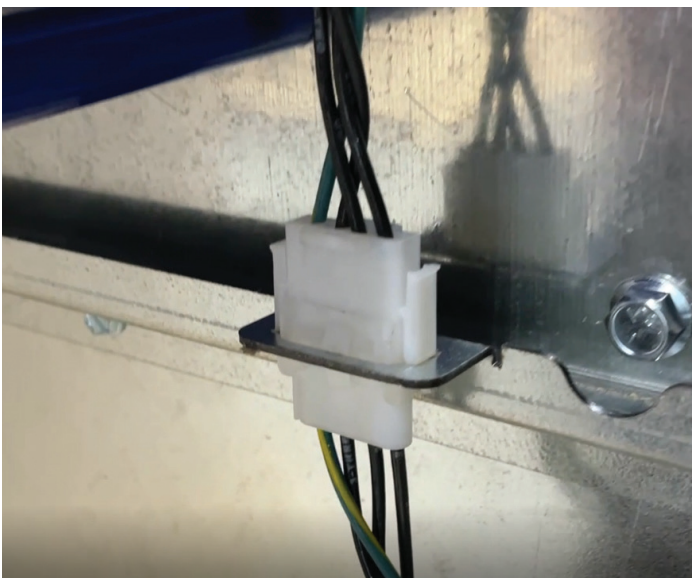
a. Fasten all motors in place using supplied hardware, Part 415419 - BOLT, HSF, .313-18X.75, GR5, ZP



b. Trim tubing to length and connect Sure-Aire tubes to the fans.



c. Plug the motors into the power cable plug going to the junction box.



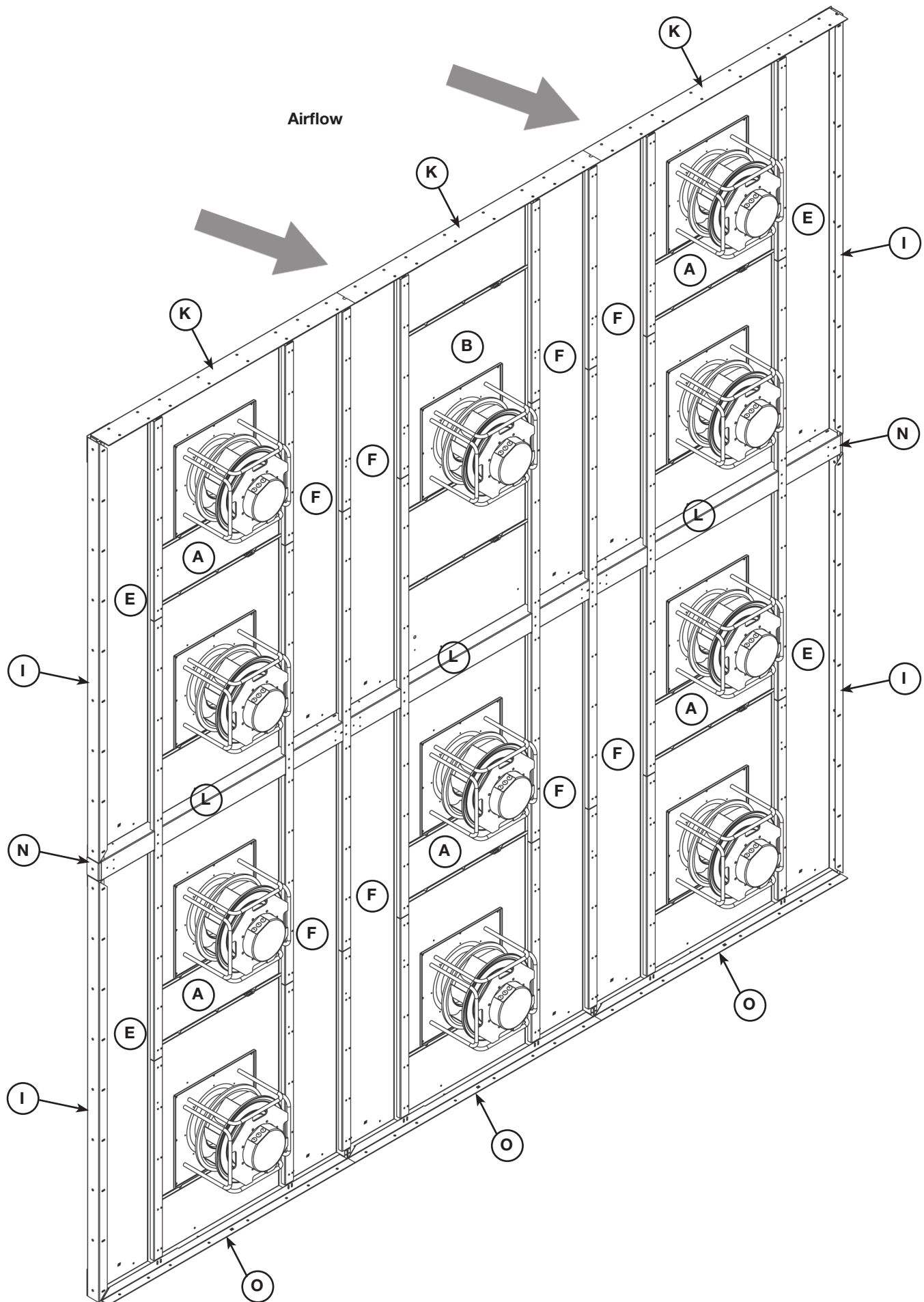
- d. Connect motors to each other using the ethernet cables working in a snake pattern from the bottom left, to the right.



- Step 17. Install power panel and control panel within X inches of each other and within X feet from the array.
- Connect the power panel and the control panel together with the provided cord.
 - Connect the power cable to each of the junction boxes and route the cables to the power panel.

CAUTION

Because of the possible danger to person(s) or property from accidents which may result from the improper use of the products, it is important that correct procedures be followed. Proper installation, maintenance and operation procedures must be observed. Follow instructions in all manuals. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided and are neither provided by, nor are the responsibility of the manufacturer. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved.



Electrical Connections

Before electrical connections are made, the supply voltage, phase and ampere capacity must be checked for compatibility with the fan motor. In addition, the supply wiring must be properly fused and conform to local and national electrical codes. If the unit is supplied with a safety disconnect switch, ensure proper wiring to the fan motor. Be sure the disconnect is switched to the “OFF” position before connecting supply wires. If no disconnect is supplied, ensure the supply wire is not live before connection. Supply wires are then connected to the optional safety disconnect switch (if supplied) or motor. For more information regarding electrical connections, please see Electrical IOM, part number 486462.

Unit Start-Up

CAUTION

Disconnect and secure to the “OFF” position all electrical power to the array prior to inspection or servicing. Failure to comply with this safety precaution could result in serious injury or death.

Visual Inspection of Equipment

The equipment type and arrangement should be verified as ordered at once when it arrives at the jobsite. When a discrepancy is found, the local sales representative must be notified immediately so that corrective action may be investigated. Also, verify electrical conformance to specifications. Unauthorized alterations and unauthorized backcharges will not be recognized by the manufacturer.

After the array has been assembled, installed and all utilities have been hooked up, the unit is now ready for operation.

Check

Before starting the array, check the following:

1. Confirm that building supply voltage matches the voltage for which the unit is wired.
2. Disconnect and lock-out all power switches to the array. See warning above.
3. Check all piping and wiring penetrations made by contractors for water tightness. All penetrations must be made watertight to prevent water damage to the unit and building.
4. Check all fasteners, set screws and locking collars on the array, bearings, drive, motor base and accessories for tightness.
5. Rotate the wheel by hand and assure no parts are rubbing. Remove any dirt or debris that may have accumulated during installation.
6. Check all guarding (if supplied) for being securely attached and not interfering with rotating parts.
7. Check all electrical connections for proper attachment.
8. Check for obstructions and foreign material that may damage the wheel.

Additional Steps for Initial Start-Up

1. Check for proper wheel rotation by momentarily energizing the fan. Rotation is always determined by viewing the wheel from the drive side and should correspond to the rotation decal affixed to the unit.

NOTE

One of the most frequently encountered problems with centrifugal fans is motors which are wired to run in the wrong direction. This is especially true with 3-phase installations where the motor will run in either direction, depending on how it has been wired. To reverse rotation of a 3-phase motor, interchange any two of the three electrical leads. Single phase motors can be reversed by changing internal connections as described on the motor label or wiring diagram.

2. Arrays with multi-speed motors should be checked on low speed during initial start-up.
3. Check for unusual noise, vibration or overheating of bearings. Refer to the “Troubleshooting” section of this manual if a problem develops.

Vibration

In Situ Vibration/Resonance Analysis

Resonance characteristics of the fan array must be checked in operation once field installed to determine interaction with the environment, and if necessary modified.

The vibration level of the fan array must be determined and regions above the limit value avoided. Resonance also must be identified and avoided during normal operation.

Regular observation of resonance points is necessary, at the very least at the intervals demanded in the operating instructions.

The vibration characteristics must be determined at least in the axial direction and transversely throughout.

Measurement of the vibration in all three axes is recommended and should be performed over the entire speed range to obtain a complete picture of the vibrations occurring in the application.

- Repetition of measurements: Every 6 months.
- Increase the speed gradually, by 5 Hz for example, and note down the readings in a table.

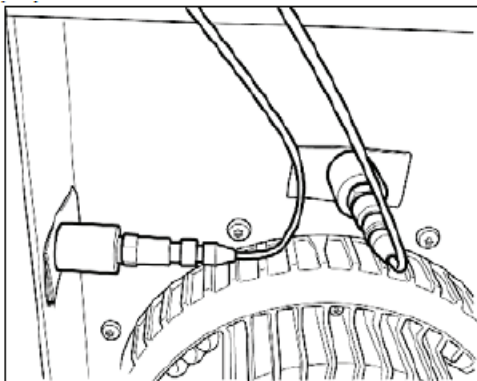
Speed in Hz	Speed in rpm	Vibration velocity in axis direction in in./sec (rms value)	Vibration velocity perpendicular to axis direction in in./sec (rms value)
20 Hz			
35 Hz			
... .			
... .			
60 Hz			

Proposal for measurement protocol

- For rigidly mounted fans, recommended in-situ vibration velocities of less than .250 in./sec in accordance with AMCA 204 and BV-3 grades.

Vibration Measurement on MOA Fan Array

An appropriate method is measurement at the motor fastening diameter on the motor support plate in the direction of the motor axis of rotation and perpendicular to this.



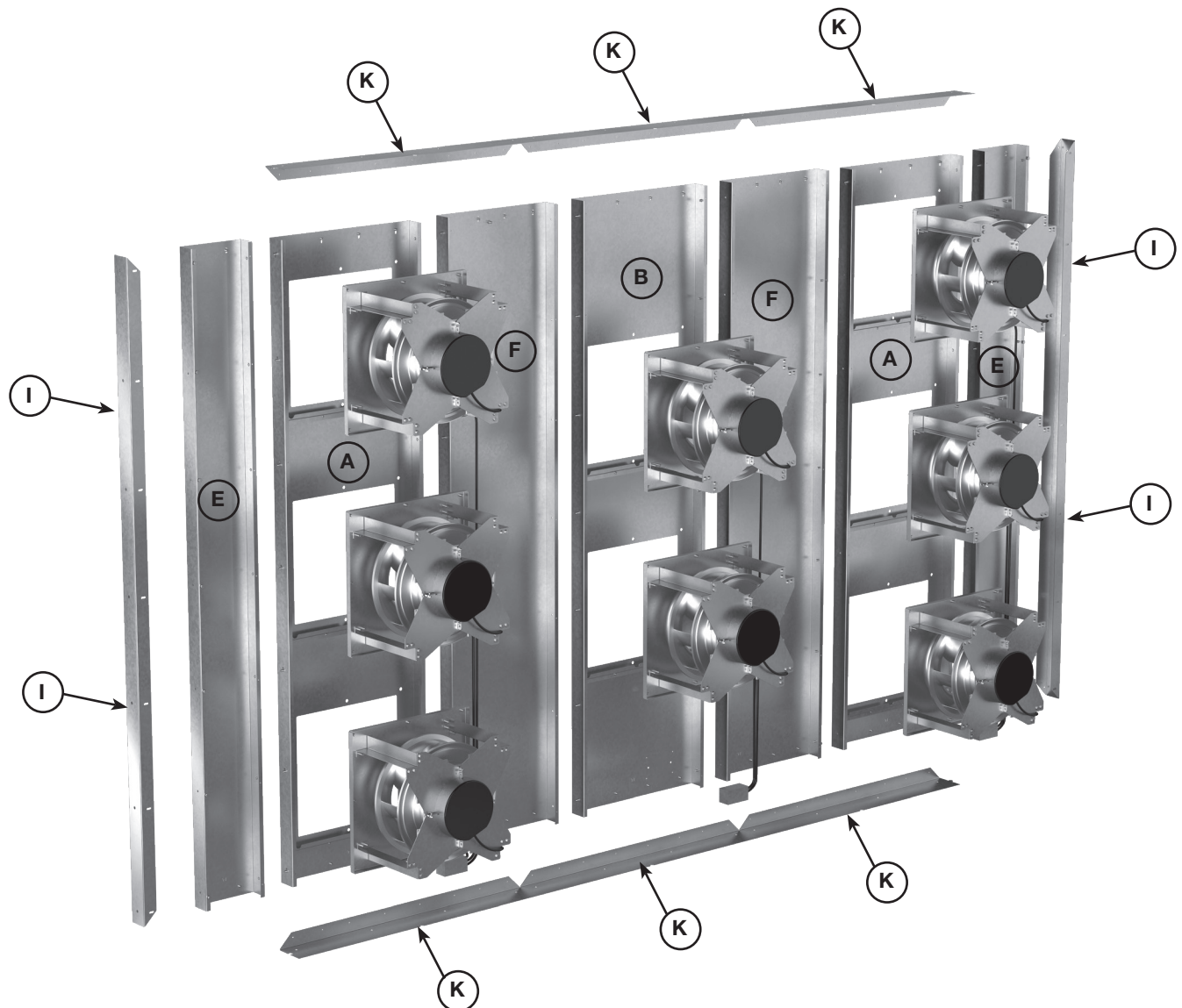
Action to be Taken in the Event of Excessive Vibration Loading

- Pass through point of resonance quickly on start-up.
- Always avoid resonant operation.
- Modify the design of the device/installation, e.g., using reinforcement braces.

Parts List

Parts List	
Part number	Description
A, B, C & D	Fan panels
E & G	End panel
F & H	Spacer panels
I	Vertical panel mount channel
J	Panel support angles
K	Horizontal panel mount angle
L	Layer channel
M	Layer channel connector
N	End cap layer channel
O	Horizontal reinforcement
415419	Bolt, HSF, .313-18X.75,GR5, ZP
416081	TRS,SHWH,.25-20X.5,ZP/WAX,TRI-LOBE

Go to <https://www.greenheck.com/> or call your local sales representative for questions or inquiries. To look up parts, go to <https://www.greenheck.com/parts>.



Routine Maintenance

CAUTION

When performing any service to the array, disconnect the electrical supply and secure the wheel.

Once the unit has been put into operation, a routine maintenance schedule should be set up to accomplish the following:

1. Wheel, motor bolts and set screws on the entire fan should be checked for tightness.
2. Any dirt accumulation on the wheel or in the housing should be removed to prevent unbalance and possible damage.
3. Inspect fan wheel and motor, looking for fatigue, corrosion, or wear.

Operation

All arrays should be run every thirty (30) days, or at least “bumped” every thirty days. It is preferred that each array is run as this causes all electrical and mechanical components to get up to temperature, displacing any formed condensation, redistributes load on bearings, and redistributes grease in the bearings (motor and shaft bearings).

CAUTION

Always check the fan RPM when adjusting the operating frequency. Do not exceed maximum class fan RPM of the wheel.

When operating conditions of the array are to be changed (speed, pressure, temperature, etc.), consult the factory to determine if the unit can operate safely at the new conditions.

Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Product warranties can be found online at Greenheck.com, either on the specific product page or in the literature section of the website at Greenheck.com/Resources/Library/Literature.

Greenheck’s Fan Arrays catalog provides additional information describing the equipment, fan performance, available accessories, and specification data.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at www.amca.org.

