

The standard NPN-410X/ZPN-1000 display substructure is vertical aluminum tubing with mounting pass-through holes and shims for attachment to a wall or equivalent structure. The panels are self-drilled into the vertical tubes at four points per panel. The tubes must be vertically level, or plumb, on the face and sides, horizontally level on the top/bottom across multiple tubes, vertically flat along each tube, and horizontally flat across multiple tubes.

Tubes come in two different types (panel-to-panel tubes and narrow tubes for the far-left and far-right edges of the display face) in nine different sizes ranging from one panel high to a maximum of nine panels high. Refer to **Figure 1**. Each panel height has two mounting pass-through holes.

1. Attach $\frac{3}{4}$ " plywood to the wall before substructure attachment if the holes in the tubes do not line up with studs on the wall. Other wall materials such as concrete should not require the $\frac{3}{4}$ " plywood, but refer to the contract-specific Shop Drawing for verification.
2. Check the wall for flatness and levelness with a laser level (or a level and string if a laser level is not available). Refer to **Figure 2**.

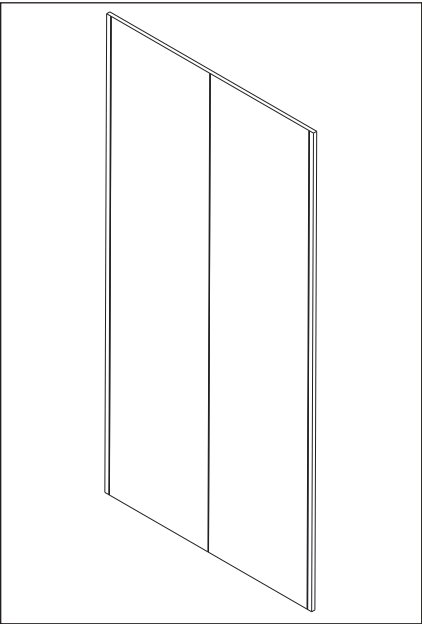


Figure 2: Marked Tube Positions

- a. A three-plane laser level is preferred. Set the Z-plane a set distance from the wall. Mark the tube positions and make note of the high and low points of the wall along the tube screw position.

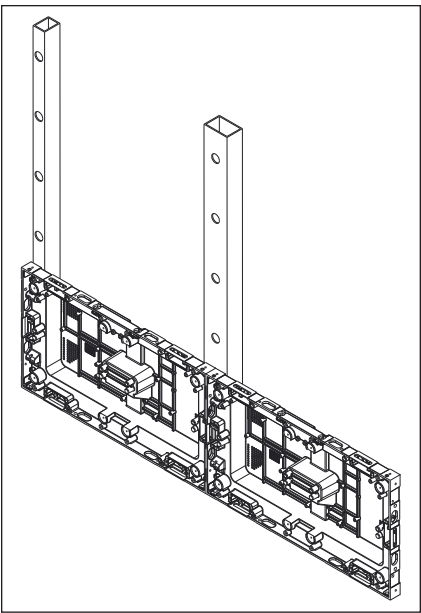


Figure 1: Tube Type

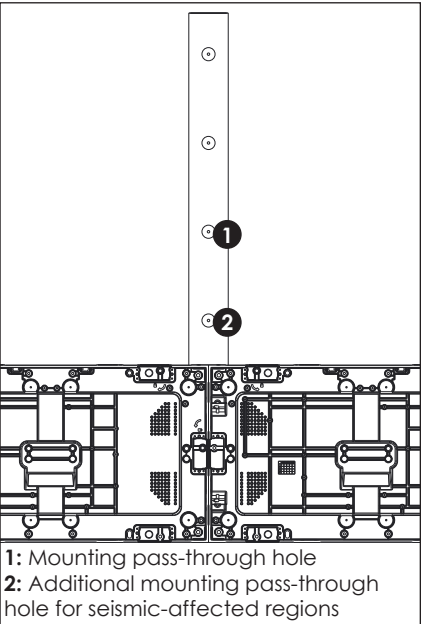


Figure 3: Attach Tube

- a. A string level can be used if a laser level is unavailable. Mark the tube positions and install all vertical tubes. Mount each tube to the wall with one screw and secure a string line taut across all vertical tubes. It is recommended to run two string lines per vertical tube. This method will show the highest point of the wall. Shim all remaining tubes to touch the string line.
3. Fill the required hole(s) in the tubes. Refer to **Figure 3**. In seismic-affected regions, two holes per panel height must be filled. In all other regions, only one hole per panel height is required. Refer to the contract-specific Shop Drawing for details on how many holes to fill.
 4. Attach the tube (center tube first) and use a large level to ensure the side of the tube is level. Refer to **Figure 4**. Tubes will recess $\frac{1}{4}$ " from both the top and bottom of the display. Refer to **Figure 5**.

Ensure the tube is positioned vertically within $\frac{1}{4}$ " of the specifications on the Shop Drawing. Start the tube mounting hardware through the tube into the wall, but do not tighten down.

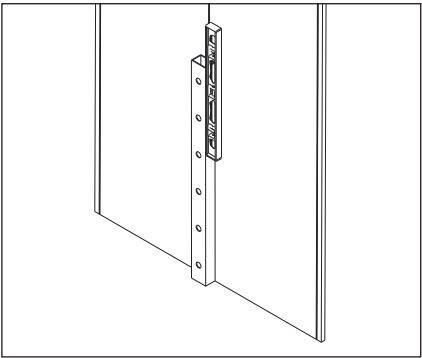


Figure 4: Verify Plumb First Tube

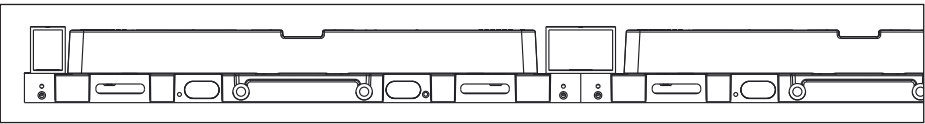


Figure 5: Tube on Panel (Top View)

5. Add shims on the started hardware between the tube and the wall and use a level to ensure the tube remains plumb to the wall and flat over the entire length of the tube. Refer to **Figure 6**. If the appropriate amount of shims is not used, the wall anchors can bow.

Note: The shims on the left and right tubes should be oriented so the tail/tag sticks out behind the display and out of sight when the display is fully installed. Refer to **Figure 7**.

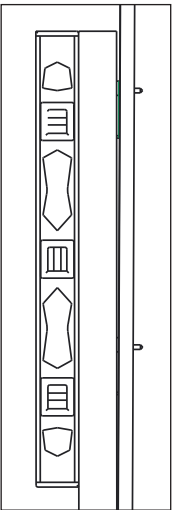


Figure 6: Verify Plumbness

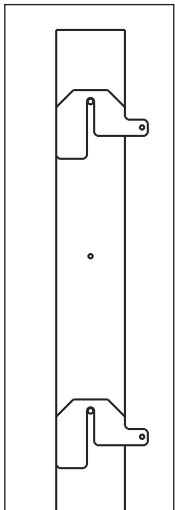


Figure 7: Shim Orientation

6. Repeat **Steps 1-5** to attach the remaining tubes to the right and left of the center tube. Level each tube separately. Refer to **Figure 8** and **Figure 9**. Place shims between the wall and the tube until the tube is plumb. Each individual tube should be level within $\frac{1}{4}$ " from the lowest to highest point along the entire vertical length of the display tube(s).

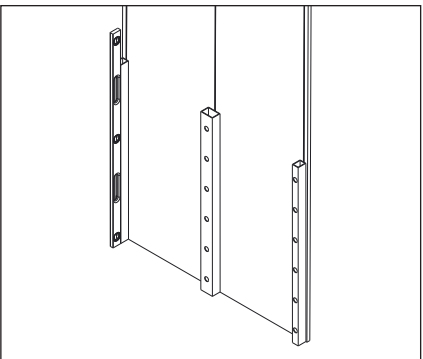


Figure 8: Check Plumbness

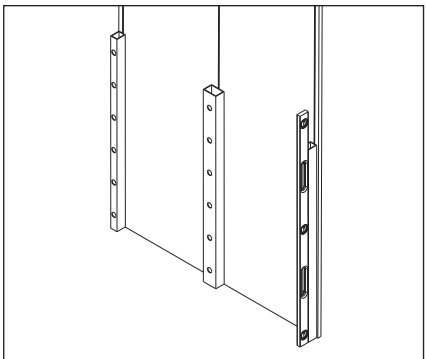


Figure 9: Check Plumbness

7. Check the flatness at the top and bottom of the tubes (**Figure 10**), along the height of the tubes (**Figure 11**), and diagonally across the tubes (**Figure 12**), measuring across three tubes at a time, to ensure it does not exceed the max out of flat of $\frac{1}{16}$ " and there is no rocking. Each individual tube should be level within $\frac{1}{4}$ " from the lowest to highest point along the entire vertical length of the display tube(s). If the tube does not meet the level with a gap greater than $\frac{1}{4}$ " or if there is rocking, add shims to the affected tubes to bring them into spec.

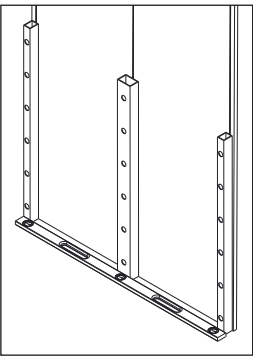


Figure 10: Check Flatness

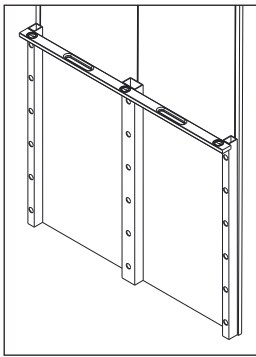


Figure 11: Check Flatness

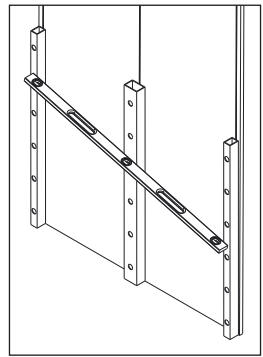


Figure 12: Check Flatness

8. Re-level any individual vertical tube that was adjusted but do not remove the shims that were added to make the tube faces flat to each other. Repeat this step, incrementing one tube to the right or left so all tubes in the display are plumb, level to each other, and flat to each other. After this has been verified, tighten down the tube hardware to the wall.

9. Repeat **Steps 1-8** if additional rows of tubes are required. Space the tubes approximately $\frac{1}{2}$ " apart vertically. Refer to **Figure 13**. Tighten down the hardware and quality check the plumbness and flatness.

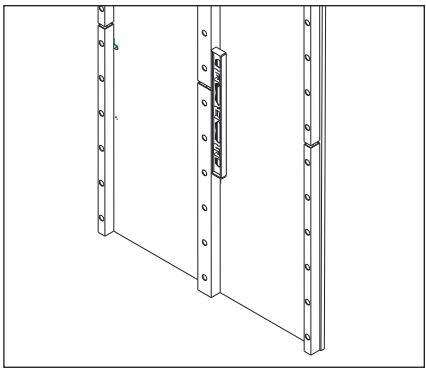


Figure 13: Install Second Row

After the tube hardware is tightened down and the tubes are level and flat, begin panel installation. Refer to the appropriate Installation & Service Quick Guide: NPN-4100 (**DD3830324**), NPN-4101 (**DD4133945**), NPN-4102 (**DD4174150**), or ZPN-1000 (**DD4175845**).