

Grid and Reel System Installation Guide

Instructions for installing or upgrading a building with an existing system

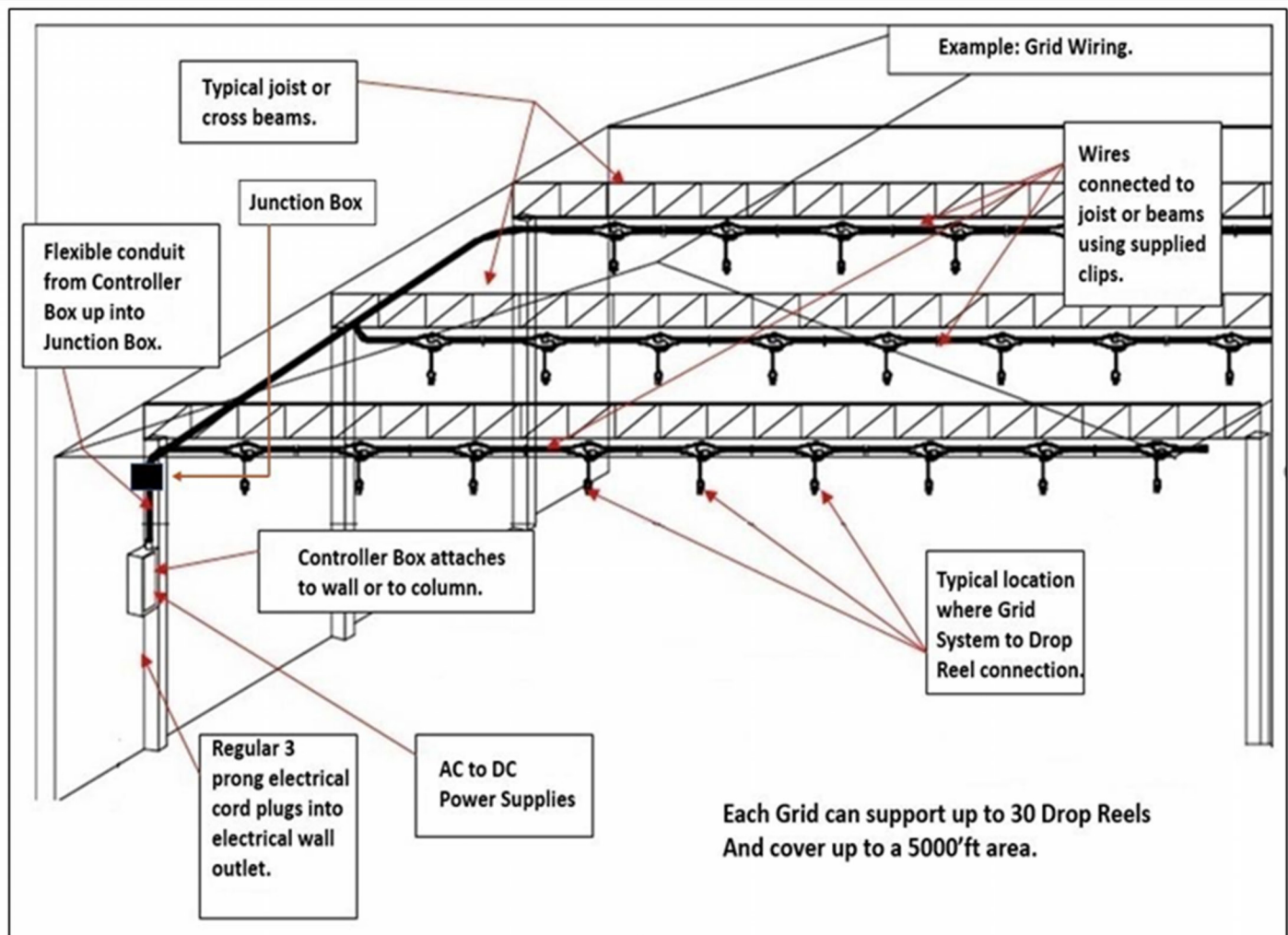
Prior to Starting Work:

1. All vehicles and generators must be removed from the building.
 - As required, you can work around some equipment depending on lift reach.
2. Safety / Risk assessment should be completed.
3. Scissor lift or forklift with personnel cage available during grid install.
4. Suggest creating a map of the building to show where the grids and reels will be placed.

This will make installation and grid set up much easier. This does not have to be perfect, just an estimate, size, amount of equipment, locations, etc. Map should include:

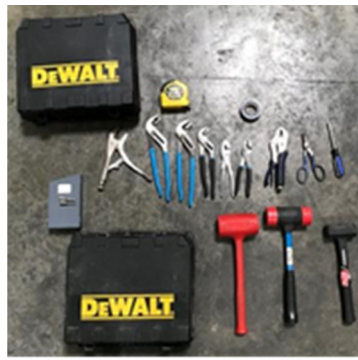
- Width and length of the building
- Location of AC outlets and where each grid power supply will be placed
- Equipment type and numbers to help determine amount of drop reels
- Grid lay out inside of building. Keep in mind that each grid can support up to 5k sq. ft., and 30 drop reels.

Example of Grid and Reel system schematic for reference.



Tools, equipment and personnel needed:

This is NOT all inclusive. Some buildings may require additional tools for installation. Example: Buildings with concrete support beams would need concrete drill bits, along with concrete fasteners / support brackets for the control box, conduit, junction box, grid zone wires, and drop reels.



Personnel or Tool	Description:
2- or 3-man scissor lift or forklift with personnel cage	Lifts must be available for the duration of the installation. Lifts must be able to reach the highest point inside the building.
Lift operation teams	These will be the 2 or 3 personnel that are operating the lifts during grid installation. Lift team members must be trained, licensed and available to operate the lift systems during entire installation. Suggest extra teams to relieve personnel during installation. Example: if you have 2 lift systems for the install, you should have at least 3 teams licensed and ready.
Minimum of two personnel are required for most tasks	You will want more to ensure the installation is done in a reasonable amount of time. Example: if you are installing 6 grids you would want at least 2 lift teams, and 4 ground personnel to help assemble grids and prep reels for hanging during installation.
Building managers	Approve prior to install the location of grid power supply boxes, conduit, grid hangers, and reel supports. Depending on building configuration modifications may be required to attach power supply box, conduit, grid hangers and reel supports. Building managers should be available to review and approve any required modifications that arise during installation.
PPE	Eye, hearing and hard hat protection for all personnel.
PPE for lifts	Harness and lanyards. Assemble <u>all</u> required fall protection for the lift systems being used <u>prior</u> to grid installation.
Dead blow hammer	At least 1 per lift team.
Scotchlok pliers (highly recommended).	Suggest 1 per grid assemble team (this is usually 2 or 3). These are used to clamp the drop reel harnesses to the grid wire harness as it is assembled. These pliers make the process faster and help to eliminate weak or bad connections.
Multimeter, tape measures (several), channel locks, slip joint pliers and side cutter pliers	These will be needed for various tasks during grid assemble and installation.
Battery powered drill	Extra battery or charger. 3/16" drill bit along with a 5/16" and a 7/16" nut driver

Installation:

Move the boxes for the Grid and Reel System into the work area. Carefully unpack the boxes separating the trash from the parts to avoid confusion.

NOTE: There will be a lot of small parts, boxes, wires etc. along with parts left over. We suggest as the grids / reels are assembled you separate the parts needed from recycling and trash.

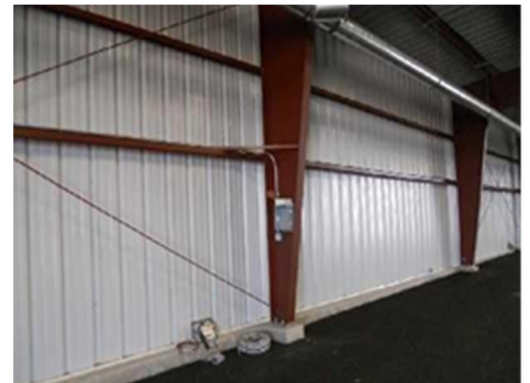


Step 1: Control Box installation:

1. Install new or remove old power supply controller box.
2. Install the new controller box where the old one was if previously installed.
3. If installing the power supply / controller box for the first time you must identify the best location: See example at right. This box is located on the support beam, next to a 110VAC outlet. The box will be out of the way of equipment and easily mounted to the support pillar.



Note: In some buildings you will be able to use the self-tapping screws provided in the grid kit to attach the controller box to the building. These will be referenced multiple times in this guide. In a normal warehouse or climate humidity controlled (CHP) this is an easy and straightforward process. However, some locations have hardened concrete supported buildings for hurricanes or other reasons. The building manager should be consulted and the best way to attach the controller box should be identified. The grid system kit does NOT come with any concrete attachment pieces.



4. Once the location is determined:
 - Mark the holes where the controller box will be mounted for new installation. There are 4 corner holes, but the box can also be mounted with 2 through the casing for curved pillars, etc.
 - Pre-drill the holes with the 3/16" drill bit and use self-tapping screws (part of grid system) to attach it to the support pillar or wall.

Note: reminder, the grid system kit does NOT come with any concrete attachment pieces. If you have a hardened building with concrete support posts and or concrete reinforced cross beams you will need to purchase additional attachment pieces. We suggest you consult your public works and building manager to discuss the best attachment pieces and approve the drilling / modifications required prior to installation.

Step 2: Conduit, controller to junction box wires harness, junction box prep and installation:

Note: We recommend you use the new wiring when upgrading a pre-installed system. Many systems were installed 10+ years ago and the grid system comes with all new wiring.

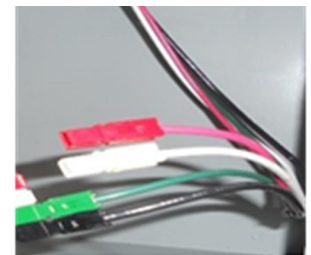
1. You will need to determine where to mount the junction box. This is usually directly above the controller box but can be wherever it works best for the building / structure you are mounting the grid in. On older systems install by Logitech they did not use a junction box. If there is not one, install the one provided with the grid system.



Junction Box

2. Measure the distance from the controller box to where you are mounting the junction box.

3. Take the controller box to the junction box wire harness and lay it out on the floor. This is the wire harness that has the red, white, green, and black wires along with connection clips on one end. Measure the distance needed from the connector clips to the junction box. Is there enough wire harness length to go from the controller box to the junction box? If your building has a high ceiling, you may need to look at placing your junction box lower. The Grid system comes with 25' of flexible conduit and 3 conduit clamps.



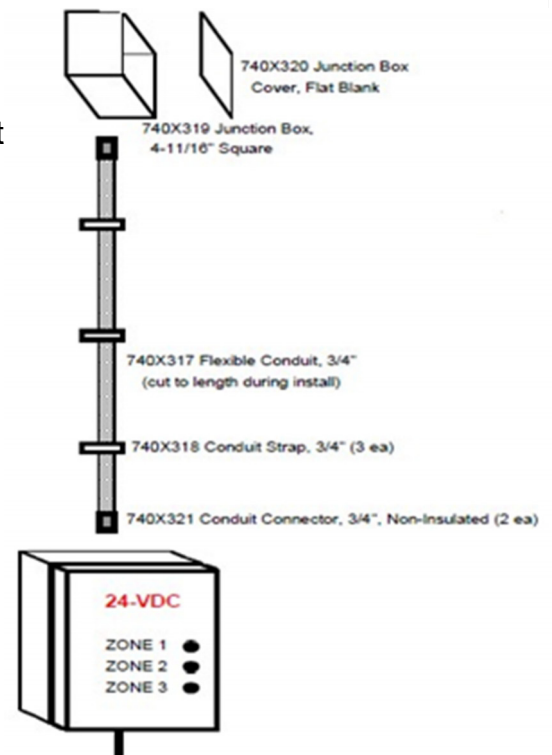
Controller box to junction box wire harness.

4. Take the flexible conduit and lay it out on the floor. Measure the distance needed from the controller box to the junction box. Is there enough conduit to reach from the controller box to the junction box? If your building has a high ceiling, you may need additional $\frac{3}{4}$ " flexible conduit to reach the junction box or you can move the junction box lower.

5. At this point ensure you are comfortable with the placement of the junction box AND you have enough conduit and wire harness to reach it from the controller box. Once you are certain this requirement has been met:

- Mount the junction box. This can be done with the $\frac{3}{16}$ " drill bit and self-tapping screws.
- Cut the harness as required or at least 12" longer than the estimated needed length. Ensure that it is cut at the end without the connection clips.
- Cut the flexible tubing as required to the distance needed from the controller to the junction box.

6. Next: you will need to feed the wire harness through the conduit. This can be done using lacing wire or other means.



7. Once the wire is fed through the conduit. Attach the connector ends of the harness coming out of the conduit to the controller box corresponding wires. Secure the conduit to the top of the controller box using the supplied conduit connector.

8. The loose wire end should be secured prior to raising the conduit to the junction box. This is usually done with a couple zip ties (comes in kit). Failure to do this may cause the wires to drop back down into the conduit when it is raised.

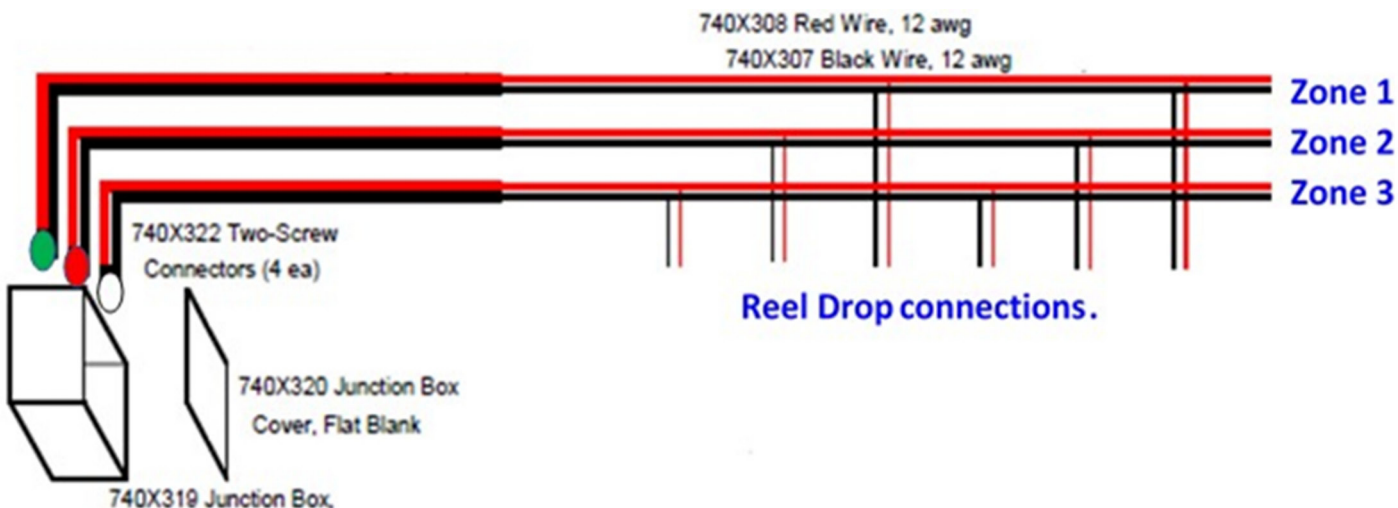
9. Raise the conduit and attach to the junction box using the supplied conduit connector. Because of height this is usually done by the lift crew while at the location you have designated for the junction box mounting.

10. Attach conduit clamps securing the conduit using 3/16" drill bit and self-tapping screws.



Step 3. Preassemble the grid zone wires: This can be done at the same time or even before step 2 if you have multiple teams.

Info: Each grid can have up to 3 zones coming out of the junction box. Each of these zones can support up to 10 drop reels, for a total of 30 max drop reels per grid. See below example. From the junction box you see the 3 zones going out to support reel drops.



1. Measure the distance from the outside farthest reel drop you would like in the zone to the junction box. This can be an estimate but suggest a high estimate to leave some wiggle room with the wires.

2. Next, determine how many drops you will want per zone. Example: If you have a building that is 50' x 100', with 30 pieces of gear. This building has 4 beams that run across it. One zone will have 8 pieces of large gear parked in it, and the back half of the building has 20 pieces of smaller gear.



In this example, as with the pic above, the best fit may be to run zone 1 (with 8 drop reels) along the first support beam and zones 2 / 3 (with 10 each drop reels) across beams 3 and 4.

3. It is up to the unit how they would like their layout of reels to support their equipment density. Each reel has a 38-foot retractable cable reach. Therefore, they do NOT need to be very close together. Normally the reels are spread out to best accommodate the entire floor unless you have a lot of small equipment stacked. Examples for both are below:



4. Reiterating, spacing is up to the end user. There is no set pattern. However, you should not place more than 10 reels on any one zone and no more than 30 reels on any one grid system. Your supporting FSR can help with determining the best grid / reel distribution for your building.

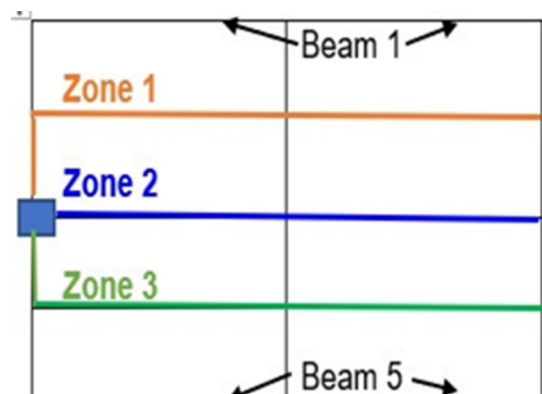
5. Next: You will need to lay out the zone 12 AWG wire on the shop floor and cut to the appropriate length. This is done once you have measured and mapped out the general zone pattern. Your FSR has some examples that units have used to map out their grids.

Example: you have a warehouse area that is 50' across, and 100' long.

- You will be using 1 grid system broken up into 3 zones to support the area.
- There are 5 beams that span across the inside of the warehouse. One at each end and 3 in the middle.
- You have 110VAC power at all beams near the left side wall.
- Therefore, your controller box will be located near a 110VAC power source centered on the building at cross beam 3.
- Zone 1 will run on beam 2, Zone 2 on beam 3, and Zone 3 on the 4th beam.

Example Zone 1: Spans the 50' across the shop, and the beam it will be attached to is 25' from the junction box:

- Suggest cutting the zone main 12 AWG wires (1 black and 1 red) at 80'. This will allow the 5' extra plus a 5' cushion at the far side (discussed below) to ensure there is enough wire to loop secure on the far wall and reach the junction box.
- We suggest starting and ending the zone drops at least 5 feet from each wall (unless gear is stored right next to the wall, as with the above stacked generators pic).



- Based on the equipment you plan to park you want 8 drops evenly spread out to support gear in Zone 1. 50 feet span for zone 1 now is 40 feet with the 5 feet of space on each wall.
- 40 feet = 480 inches, $480 / 8 = 60$ ".
- Therefore, to spread the 8 drops evenly across the zone 1 span of 40 feet we would place the 8 drop reel harness connections at an even 60" apart starting with the first drop at 5 feet from the far wall.

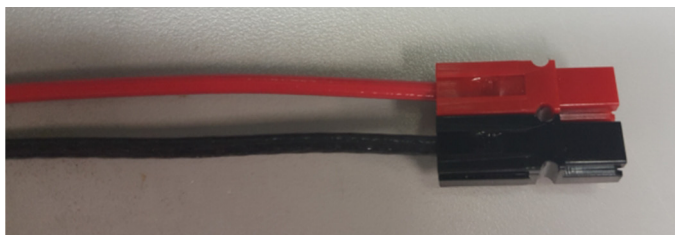
Note: To reiterate, you can space the drops for the best fit in your shop. If there is a corridor in the middle, adjust the spacing to accommodate that gap. If you have 6 small pieces of gear on one part of the zone and 4 large pieces of gear in the other part; you can tighten the gap for the 6 and lengthen the gap for the other 4, etc.

6. With the grid zone wire laid out on the shop floor measured and cut we are now ready to start connecting the drop reel harness connections. There will be 30 of these that come with each grid kit, but in the case with the above example we are using 8 for zone 1 on our grid.

7. Take the drop reel to grid harness and lay them out on the grid wires at the prior designated spacing and marked intervals. These points can be marked however works best for your shop. Most use the supplied electrical tape to hold the red and black grid zone wires together during assembly and to mark the locations of the drop reel to grid harness connections.

8. Example from previous page: We suggest working from the farthest point in your zone back to the junction box.

- If we are starting at 5 feet from the far wall is where we want our first connection. Use a small loop of wire to secure the end. Just double over and use 2 zip ties to secure a small loop (keep the length standard, maybe 10 inches).
- Then connect the first drop reel harness using the supplied Scotchlok connections (pliers are not provided but are highly recommended) 10" from the looped off end. This is the first drop reel location on this grid zone.
- Next, we will work our way back across the zone wires towards the junction box connection end connecting our drop reel harness' using the supplied Scotchlok connections. With our example we will connect every 60 inches until all 8 drop reel harness' connections are locked in on the grid zone wires.



Drop reel to grid harness. The plug shown will be used later to connect to drop reel.



Use the Scotchlok pliers to secure the drop reel harness to the grid with the supplied Scotchloks.

9. Once each drop reel harness is connected to the grid zone wires, we highly suggest that you ground test it prior to hanging it in the building. Testing is straightforward using a multimeter and it's much easier to fix any issues on the ground prior to it hanging in the building.

How to ground test the zone wiring:

- Select continuity check on your multimeter.
- Strip ½" of insulation from black and red zone wire ends that will be connected to the wires in the junction box.
- Place a multimeter lead on the exposed NEG (black) wire for the zone, and check continuity with the first drop reel harness plug corresponding NEG (black) side. Switch to the exposed POS (red) wire and check continuity with the first drop reel harness plug corresponding POS (red) side. As you are doing this ensure that the Scotchlok connection is tight and completely seated.
- Repeat this for ALL drop harness plugs for that zone. Repair any Scotchlok connection if you do not have continuity on any of the harnesses.

Step 5: Preassemble the Drop Reels and Chains.

Next you will need to prepare the drop chains and the reels for mounting. We recommend that you do this on the ground, at a table or bench.



1. Determine the correct beam clip for your building. There are 2 sizes that come with the grid kits, and these will accommodate the vast majority of normal beams in warehouses across the military.
 - The lift crew should take the beam clips up to the ceiling support beams and determine the appropriate size.
 - The beam clip should require that a dead blow hammer be used to place it on the beam.
 - The teeth on the clip should 'bite' the beam and it should not move.
 - Keep in mind there are some buildings with hardened beams (such as concrete reinforced) or odd sized beams, etc. These will require a different attachment device that is NOT included in your grid kit.
2. The height of your warehouse ceiling will determine how long the chains should be.

Example: If you have a 20' ceiling a 2' chain should be adequate.

Keep in mind:

- The reel has a 38' retractable cord.
- The reel also has a 6' cord on the top of it that connects to the reel harness on the gird zone.
- The reel harness is about 18" long, so your chains should be no longer than 7 feet at most.
- If you have a high ceiling, you can lengthen the reel harness with 12 gauge wire as needed to accommodate. However, the longer the chain = the more the swing it will have and if it is left too low it could be caught on equipment moving through the building.

3. Many warehouses are not flat across and if so the support beams where you will attach your gird zones and reels will slope with the building.

4. The reels for your warehouse do not need to be level across the floor; however, it does make it easier to see the lights when they are all at the same height.

Example: The center of the warehouse is 24' and the outside edges are 20', which is a 4' slope. IF you want the reels even you would want shorter chains (if any) near the outside edges and longer chains at the center.

Note: The length can be changed once mounted by adding or removing chain links using S hooks. However, it is MUCH easier to lay this out on the ground prior to hanging them.

5. Once you determine the length (if any) for your chains:

- Cut the chains using the side cutter pliers to the length desired. If you are using different lengths to accommodate beam slope, than ensure you mark which chain length and reel is which.
- Take the beam clip that matches the width of your support beams and connect it to one end of the chain with an "S" clip.
- Take the other end of the chain and use another "S" clip to connect it to the top loop on the drop reel.
- Use your pliers to squeeze the S clip closed. Some units double up the chains and S clips for additional strength. One chain and 1 S clip at each end is adequate when installed properly, but there is no issue with doubling up if desired.



Step 6: Hanging the Grid Zone wires and Drop Reels.

This will be done by the personnel using the lift systems, with support from personnel on the ground.

- The lift personnel will need the following on the lift cage with them:
 1. All required safety gear, restraints, etc.
 2. Zip ties (lots of them)
 3. Beam clips that match the beam size you are hanging the zone on
 4. Dead blow hammer(s)
 5. Wire strippers and pliers



- The ground personnel will need to move the zone wires and provide reels as needed.
Note: Due to limited space most lifts cannot accommodate more than a few reels at a time.

1. Lift crew should start at the farthest point on the grid zone
 - Position the lift near the farthest point on the zone
 - Have the first couple of reels with chains and beam clips attached in the lift cage with them
 - Secure the grid zone wires farthest end. Use a zip tie to attach the loop (that was made at the far end of the zone wires earlier) to the lift cage to ensure it doesn't fall

Note: Suggest doing 1 zone at a time at first to get comfortable with the installation. After that, IF you are comfortable you can engage in hanging multiple zones at once.

2. As the lift crew starts to raise the cage the ground crew will ensure that grid zone wires are free and do not get caught on any gear. They will also be on hand to bring more reels, tools, etc. as needed.
3. Lift crew raised up to support beam at farthest reel location (from the junction box) reel location.
4. Attached 1 beam clip past the location for the first Drop Reel. This should match the length of the end loop you placed earlier on the zone wires.

Example: we want our first Drop Reel 5' from the wall and to have a 10" wire loop at the end of our zone wires.

Measure 5' from the wall, and then back toward the wall 10". Attached the first beam clip there.

5. Take the zone wires loose from the lift cage by cutting the zip tie (secure the wires in your hand to ensure they are not dropped).
 - Attach the end wire loop of the zone wires to the beam clip using another zip tie.

6. Attached the Drop Reel / chain using the beam clip (you previously installed) to the location for the first Drop Reel.

Example: ours would be 5' from the far wall. This will be the only measurement the lift crew should need to do for grid zones.

7. Attach another beam clip next to the Drop Reel beam clip and secure the zone wires to this beam clip using a zip tie.

8. After the reel is hung, use wire ties to hold the wires to the chain. It will make it look a lot better and improve the strength of your system

9. Now work your way back toward the junction box attaching the zone harness with beam clips and the Drop Reels as you go along.

➤ Ensure the zone harness doesn't have large loose areas.

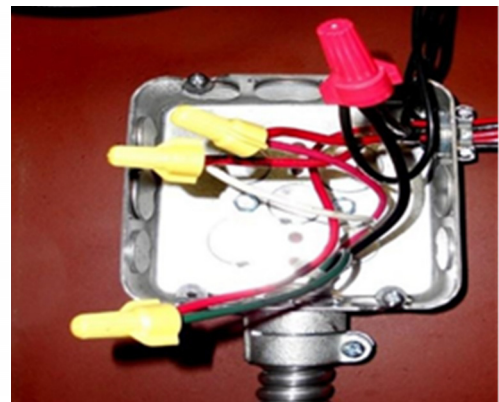


10. Once you get past the last Drop Reel run the zone harness along the support beam toward the junction box. Secure it as you go using beam clips, zip ties, etc.

Step 7: Attaching Zone wires to junction box.

1. Zone wires are run to the junction box. Here they will connect with the wires that are run up the conduit from the controller box.

2. Place the zone wires you are connecting into the junction box via the side entrance and cut away excess wire as needed.



3. Strip away 1/2" of insulation from the POS and NEG zone wires.

4. Using the wire nuts provided with the gird kit you will now connect the wires in the junction box to the grid zone wires.

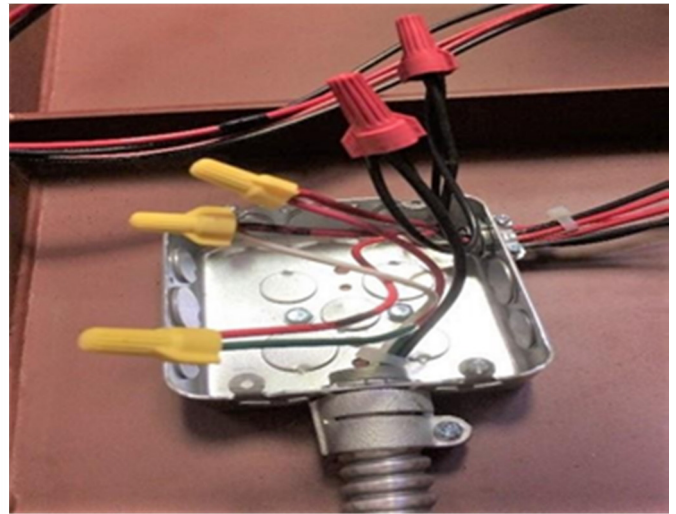
Note: There are wires for 3 grid zones at the junction box coming up from the controller box. There will be a red, green, white and black wire there. The black is ground for ALL zones and the other three (red, green and white) wires each represent a zone power wire.

5. We will now connect one zone power wire from the controller box to our red wire from the zone wiring that goes out across the zone.

Example: If this is the first zone we are setting up on this grid we can use any of the power wires (red, green and white) and ground (black). As we build the next zone we would connect to another power wire and ground.

See the Example pic at right: There are 3 zones wired in for power and ground.

- One green wire to red zone wire.
- One red wire to red zone wire.
- One white wire to red zone wire.
- All three zone ground wires connected to the *black wire.



*If you can't fit all the black wires into the wire nut use a small jumper wire as pictured above to complete the attachment.

6. Place the cover on the junction box after all 3 zones are connected.

Note: If you do not use all the zones just cover the ends of the power wires with electrical tape before you place the cover on the junction box.

Step 8: Power on system and check for proper operation

Note: once the zone wires for any zone are connected you can plug in the controller box and turn on power to check for proper operation. If you don't have a light on the reel after you plug it in you will have to do some troubleshooting.

1. Plug in the controller box and the system will auto start. There is no on / off switch as it is designed to run 24/7 once installed. See next page for Drop Reel LED explanations.

2. Contact your supporting FSR if you have any questions on Grid / Reel installation, troubleshooting, etc. FSR areas of support and contact information are on page 14.



24V REEL, 24-Volt Battery Charger Maintainer with Reel



The 24V Reel charging system monitors each battery. When a battery is fully charged, it shuts off the charge current but continues to pulse the battery to remove sulfation crystals. Colored LEDs indicate battery state-of charge allowing for touch free operation.

Red Monitor LED: check the battery connection or the battery voltage is less than 22-Volts

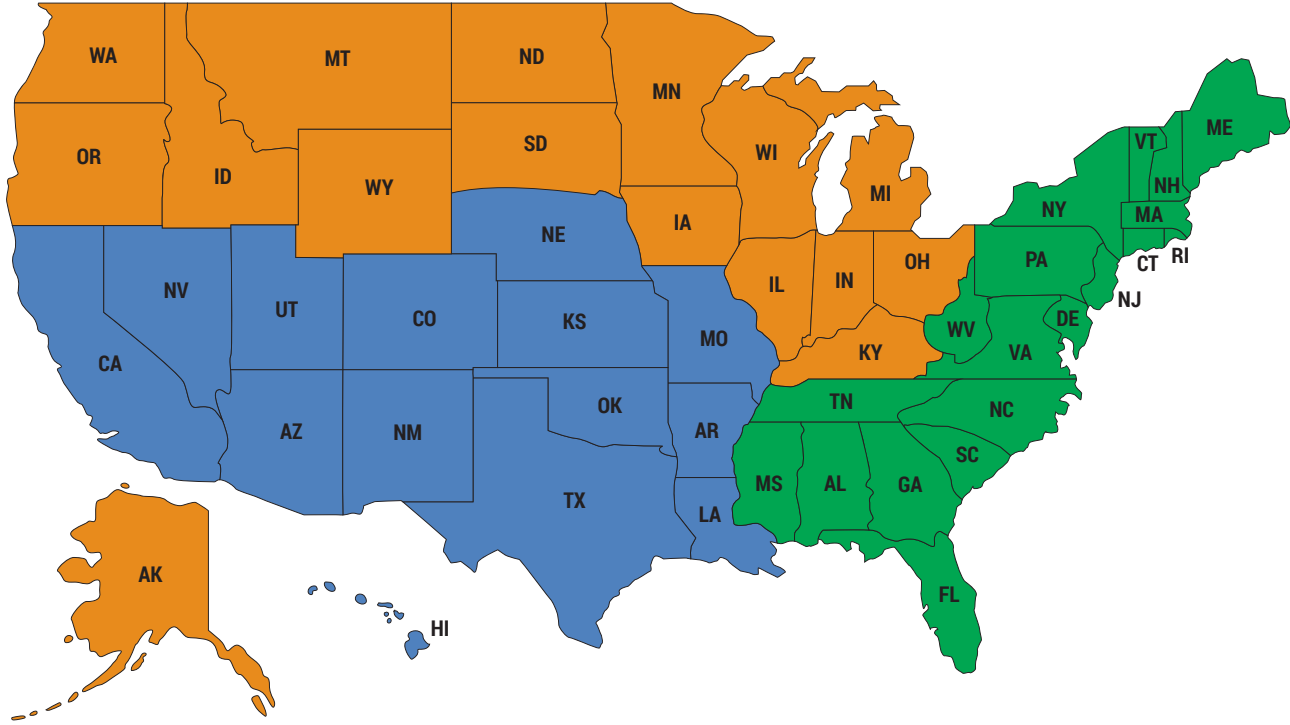
RED Pulse LED: Pulse Technology is continually 'Pulsed'/applied to the battery in order to remove sulfation crystals off the battery plates.

Note: If no LED lights are illuminated, the Reel is not plugged into the Grid.

Solid Green Charge LED: System is fully charged
Flashing Green Charge LED: System is charging

2023 PulseTech™

Military Territory Map



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