



Threaded Gun Systems Technical Manual

1.562 - 7.000 inch

MAN-TGS1-000 (R02)

Owen Oil Tools LP

12001 CR 1000

Godley, Texas, 76044, USA

Phone: +1 (817) 551-0540

Fax: +1 (817) 551-1674

www.corelab.com/owen

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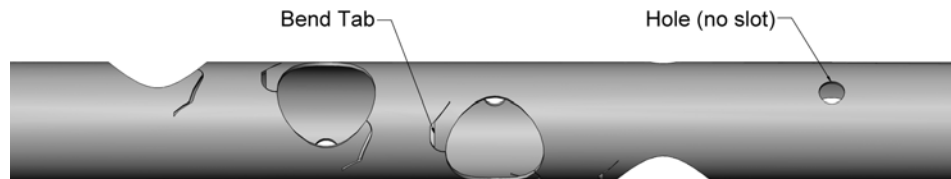
1.0 Threaded Gun Systems Overview

Owen Oil Tools offers a wide variety of Threaded Gun systems; varying in OD size, length of carrier, the number of shots per foot (SPF), phasing of charges, charge type, and explosive materials.

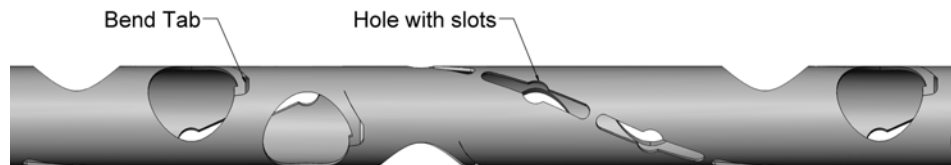
The procedures in this manual are strictly a suggested method for loading Threaded Gun systems with explosive charges. This manual does not cover Slick Gun systems. It is understood that each customer or company may have their own rules, procedures, or recommended way of loading perforating guns. Owen Oil Tools does not want to contradict these procedures in any way or form. We strongly suggest that our customers observe and abide by all the rules and regulations pertaining to the handling and transportation of explosive components.

Once a gun system has been chosen for a particular job application, the loading procedures will be based on one of three basic styles. The three styles are; the External Wrap, Internal Wrap and the Internal Weave. The three examples below, will help identify these systems.

External Wrap- With this system the shaped charge seats all the way through the tube strip. It is held in place by bend tabs and Det Cord Clips. This system features a round hole in the tube strip (no slot).

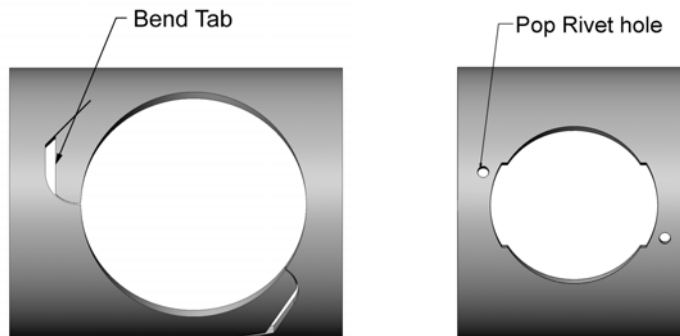


Internal Wrap- With this system the shaped charge seats all the way through the tube strip. It is held in place by bend tabs (no Det Cord Clips required). This system features a round hole with slots in the tube strip.

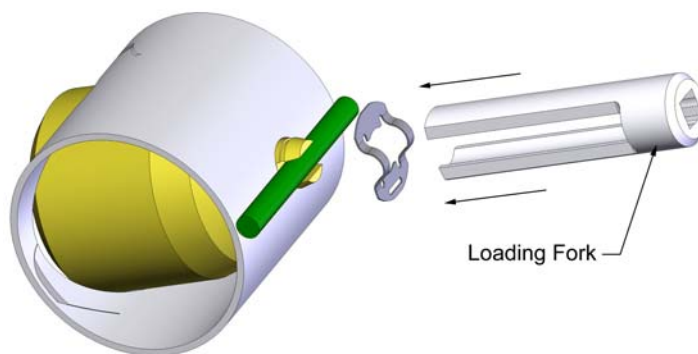


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Internal Weave- With this system the shaped charge seats half way through the tube strip. It is held in place by either bend tabs/Det Cord Clips or Pop Rivets.

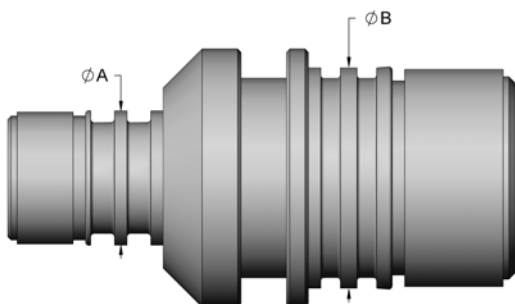


For systems that require Det Cord Clips, Owen recommends installing them by using an Owen Loading Fork.



Using Subs with Threaded Gun Systems

There are many types of subs that can be used with Owen Threaded Gun Systems. Often these subs can be used several times without problems. However, over time, these subs can and will swell. Because of this, Owen recommends using the graphic and chart below to reference maximum sub dimensions.



Gun OD (in.)	Max. Diameter (in.)		Max. Diameter (mm.)	
	(A)	(B)	(A)	(B)
1.687	1.305	1.308	32	32
2.125	1.305	1.717	32	42
2.375	1.305	2.123	32	52
2.500	1.305	2.159	32	54
2.750	2.174	2.404	54	60
2.875	2.174	2.562	54	64
3.125	2.808	2.814	70	70
3.375	2.808	2.869	70	72
4.000	2.808	3.495	70	88
4.500	2.808	3.996	70	99
5.125	2.808	4.559	70	114
7.000	2.808	6.308	70	159

2.0 Pre-Assembly



Warning: Explosives are destructive by nature! Do not attempt to disassemble or alter explosive products in any manner! Do not crush, hammer, pinch, impact, pull wires or abuse any explosive product!



Warning: Always be sure to follow safe operating practices as found in API RP-67 in accordance with governmental regulations, company policies and manufacturer's recommendations!



Note: Before loading, visually inspect the carrier and components for any defects and make sure that all threads and seal bores are clean.

Once you have obtained all the necessary hardware and explosives for your particular job application, there are a few steps to start with that are common to the three styles of gun systems. These common steps are as follows.

2.1 Place the gun on a loading table or workbench.


2.2 Mark the outside of the carriers to correspond with the zones to be perforated. Start with the bottom shot and measure upward. Don't forget to take into account the lengths of any subs which will be used to connect the carriers together. Mark these zones clearly and label accordingly.


2.3 If there are thread protectors on the ends of the carrier, remove them.


2.4 Determine which end has the alignment pin End Plate (it should be identified by a stenciled "load" mark), then remove the retaining Snap Ring to extract the tube strip. While the Locking Ball (on the opposite end) will still have to be loosened so that the tube strip can be removed, it should not be necessary to remove the Snap Ring on the Locking Ball End Plate. By leaving the Snap Ring in place, it will act as a stop when reinserting the loaded tube strip.

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2.5 Remove the tube strip, lay it next to the carrier it was removed from and mark the tube strip to match the carrier.

 *Note: Only remove enough tube strip assemblies that can be safely loaded on your work bench at one time.*


 *Note: Line up the charge holes in the tube strip with the scallops cut in the carrier to mark accurately. This will also ensure you have the correct density and phasing for the tube strip and carrier being used.*

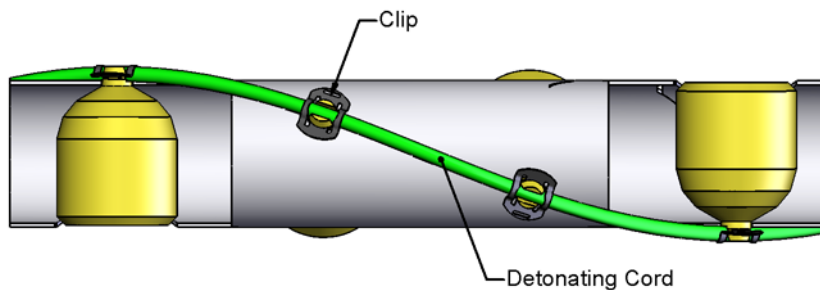
 *Note: The Locking Ball and the alignment pin on the End Plate must align with the opening of the first charge hole in the tube strip.*

3.0 External Wrap, Boostered Connections

 *Note: Owen recommends using the Locking Ball End Plate as the top and the Alignment Pin end as the bottom. This way the long Transfer Tube is on the Locking Ball End Plate and will be inserted first into the carrier after loading. This also helps protect the long Transfer Tube from breaking during handling.*

The detonating cord on this style, is placed on the outside of the tube strip and spirals around, connecting the charges forming the explosive sequence. You should leave the top and bottom charge holes blank, before installing the det cord. Do not to remove the endplates at this time.

 *Note: With external wrap style tube strips, the det cord is held in place by using Det Cord Clips.*



3.1 Install the End Plate Inserts and use a locking compound on the insert threads. The inserts are provided in the Booster Transfer Kit.

3.2 To load the charges, start at the designated top end of the tube strip and insert a charge through the large hole until the det cord slot of the charge sticks out through the small hole. Secure in place by using the bend tab on the tube strip. The charge should not be able to move side to side. Continue to load the required charges to complete the tube strip.



Note: Insert only the number of charges that you need loaded. The tube strip can either be fully or partially loaded.

3.3 Next, using Owen Super Cutters, cut a sufficient length of det cord that will completely load your tube strip and that will allow for the Transfer Tube. One method of doing this, is to wrap the det cord around the tube strip following the charge holes. Take that length and add 2 ft (61 cm). It is always better to have too much, than not enough.



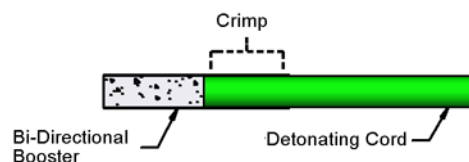
Note: To determine the next length of det cord to be cut, measure the first cut length before loading, then measure the scrap length when finished. Subtract the scrap length from the original cut length to determine the length of the next piece of det cord.



Warning: Never load a tube strip when the det cord is still attached to the roll! Cut the necessary length of cord, then remove the roll from the loading area!

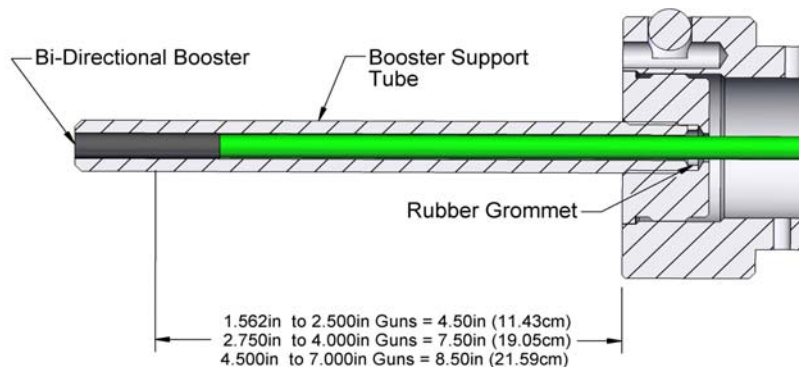
3.4 Make a clean, squared-off cut on one end of the det cord by using an Owen Super Cutter tool.

3.5 Visually inspect the cut, then install the proper Bi-directional Booster over the end of the det cord and crimp in place by using Owen Super Crimpers.

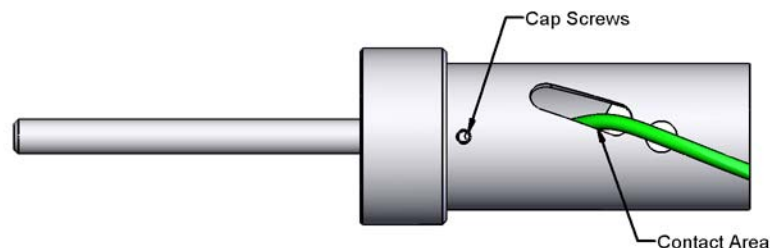


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3.6 Insert the crimped Booster and cord through the center hole in the End Plate/insert at the top end of the tube strip until approximately 10 in (25 cm) sticks out. Slide the Rubber Grommet (provided in the Booster Transfer Kit) over end of cord until it's against the End Plate. Slide the Booster Support Tube (provided in transfer kit) over the cord and thread into End Plate. This will push the rubber grommet into the threaded recess. As you thread in the tube, position the end of the Booster flush with the top of the support tube. Tighten firmly by hand to compress the rubber grommet around the det cord.



3.7 To prevent chafing the det cord on the metal edge of the det cord slot in the tube strip, wrap some electrical tape or rubber tubing around the det cord at the contact area as shown below.



3.8 Insert a charge into the first charge hole as required. Lay the det cord in the first charge slot (you may need to rotate the charge so that the det cord groove aligns with the path of the det cord) and secure in place using a Det Cord Clip.

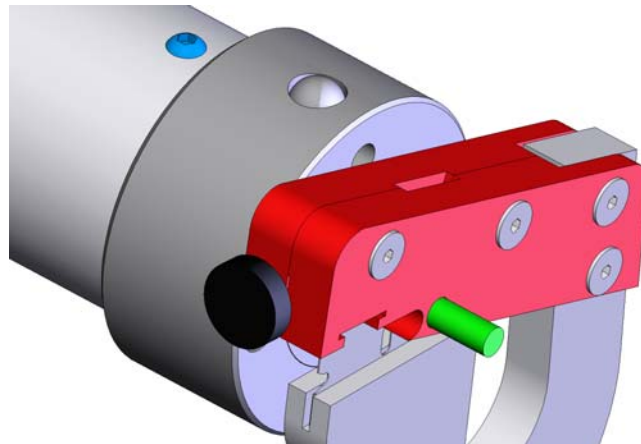


Caution: Be careful not to nick or cut the det cord when inserting it into the slot of the charge or installing the Det Cord Clip!

3.9 Once the det cord is attached to the charge, spiral the cord around the tube strip to the next charge/charge hole and secure in place. Continue down the length of the tube strip until you reach the last charge hole.

3.10 Position the det cord across the last charge hole of the bottom of the tube strip, then put it through the slot and insert it through the bottom End Plate. Refer to the loading tip in step 3.7 concerning det cord chafing. This establishes the path of the det cord and aids in cutting the correct length for connecting to the Booster.

3.11 Make a clean and squared-off cut of the det cord $\frac{3}{8}$ in to $\frac{7}{16}$ in (.95 cm to 1.1 cm) from the face of the End Plate. If using Owen Super Cutters, place the cutter head against the End Plate to make the cut.



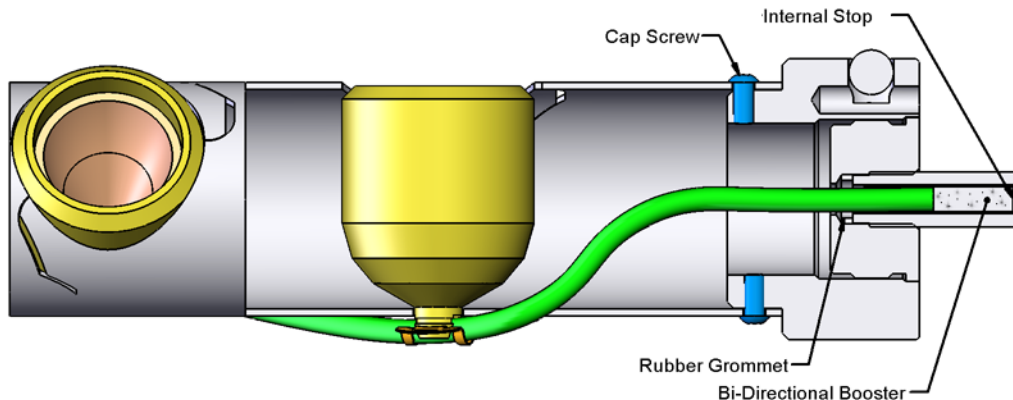
3.12 Carefully remove the End Plate without disturbing the cut.

3.13 Crimp a Bi-directional Booster on the det cord. Insert the boosted cord through the End Plate, then secure the End Plate to the tube strip using the 2 Cap Screws.

3.14 Install the bottom charge and secure it in place with a Det Cord Clip.

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3.15 With the End Plate secured to the tube strip, slide the rubber grommet over the end of Booster up to the End Plate. Thread the Booster Retainer (provided with the Booster Transfer Kit) into the End Plate compressing the rubber grommet. Make sure that the Booster stays against the internal stop of the Booster Retainer and tighten firmly.



Note: If the gun is used as a bottom gun, it is still recommended to use a Booster (even if you use a loaded tube strip as a bottom gun and a bottom Booster is not needed for the explosive transfer). Operational plans often change at the last minute and additional guns may need to be added to the bottom gun.

3.16 The fully loaded external wrap style tube strip is now complete and is ready to be installed in its accompanying carrier. The installation of the tube strip is covered in section 9.0.

4.0 External Wrap, Non-Boosted Connections

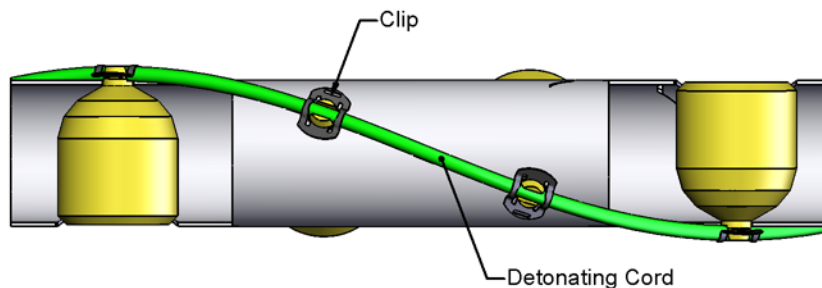


Note: Owen recommends using the Locking Ball End Plate as the top and the Alignment Pin end as the bottom.

The detonating cord on this style, is placed on the outside of the tube strip and spirals around, connecting the charges forming the explosive sequence. You should leave the top and bottom charge holes blank, before installing the det cord. Do not to remove the End Plates at this time.



Note: With the external wrap style tube strip, the det cord is held in place by using Det Cord Clips.



4.1 To load the charges, start at the designated top end of the tube strip and insert a charge through the large hole until the det cord slot of the charge sticks out through the small hole. Secure in place by using the bend tab on the tube strip. The charge should not be able to move side to side. Continue to load the required charges to complete the tube strip.



Note: Insert only the number of charges that you need loaded. The tube strip can be fully or partially loaded.

4.2 Next, using Owen Super Cutters, cut a sufficient length of det cord that will completely load your tube strip and that will allow for det cord initiation. One method of doing this, is to wrap the det cord around the tube strip following the charge holes. Take that length and add 3-4 ft (0.9 - 1.2m). It is always better to have too much, than not enough.



Note: To determine the next length of det cord to be cut, measure the first cut length before loading, then measure the scrap length when finished. Subtract the scrap length from the original cut length to determine the length of the next piece of det cord.



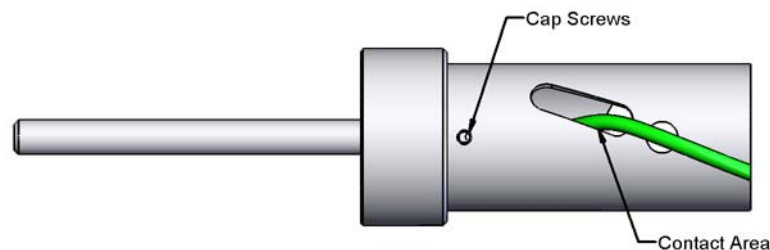
Warning: Never load a tube strip when the det cord is still attached to the roll! Cut the necessary length of cord, then remove the roll from the loading area!

4.3 Make a clean, squared-off cut on the end of the det cord by using an Owen Super Cutters tool.

4.4 Visually inspect the cut, then install the proper end seal over the end of the det cord and crimp in place by using Owen Super Crimpers.

4.5 Insert the crimped end seal and cord through the center hole in the End Plate at the top end of the tube strip until enough det cord sticks out for your operational requirements

4.6 To prevent chafing the det cord on the metal edge of det cord slot in the tube strip, wrap some electrical tape or rubber tubing around the det cord at contact area as shown below.



4.7 Insert a charge into the first charge hole as required. Lay the det cord in the first charge groove (you may need to rotate the charge so that the det cord groove aligns with the path of the det cord) and secure in place using a Det Cord Clip.



Caution: Be careful not to nick or cut the det cord when inserting it into the slot of the charge or installing the Det Cord Clip!

4.8 Once the det cord is attached to the charge, spiral the cord around the tube strip to the next charge/charge hole and secure in place. Continue down the length of the tube strip until you reach the last charge hole.

4.9 Position the det cord across the last charge hole of the bottom of the tube strip, then put it through the slot and insert it through the bottom End Plate. Refer to the loading tip in step 4.6 concerning det cord chafing. This establishes the path of the det cord and aids in cutting the correct length for det cord initiation.

4.10 Make a clean and squared-off cut of the det cord.

4.11 Crimp an end seal on the det cord.

4.12 Install the bottom charge and secure in place with a Det Cord Clip.

4.13 The fully loaded external wrap style tube strip is now complete and is ready to be installed in its accompanying carrier. The installation of the tube strip is covered in section 9.0.

5.0 Internal Wrap, Boostered Connections

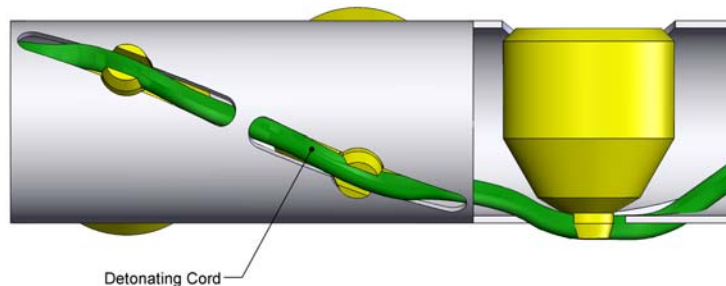


Note: Owen recommends using the Locking Ball End Plate as the top and the Alignment Pin end as the bottom. This way the long Transfer Tube is on the Locking Ball End Plate and will be inserted first into the carrier after loading. This also helps protect the long Transfer Tube from breaking during handling.

The detonating cord on this style, is placed on the inside of the tube strip and spirals around, connecting the charges forming the explosive sequence. Do not to remove the endplates at this time.



Note: With the internal wrap style tube strip, the det cord is held in place by the charge and tube strip (no Det Cord Clips are required).



5.1 Install the End Plate Inserts and use a locking compound on the insert threads. The inserts are provided in the Booster Transfer Kit.

5.2 Next, using Owen Super Cutters, cut a sufficient length of det cord that will completely load your tube strip and that will allow for the Transfer Tube. One method of doing this, is to wrap the det cord around the tube strip following the charge holes. Take that length and add 2 ft (61 cm). It is always better to have too much, than not enough.



Note: To determine the next length of det cord to be cut, measure the first cut length before loading, then measure the scrap length when finished. Subtract the scrap length from the original cut length to determine the length of the next piece of det cord.



Warning: Never load a tube strip when the det cord is still attached to the roll! Cut the necessary length of cord, then remove the roll from the loading area!

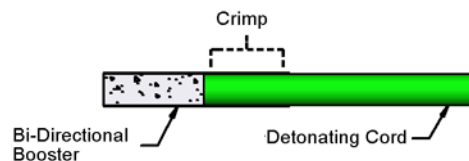
5.3 Place the det cord through the tube strip and through both End Plates.



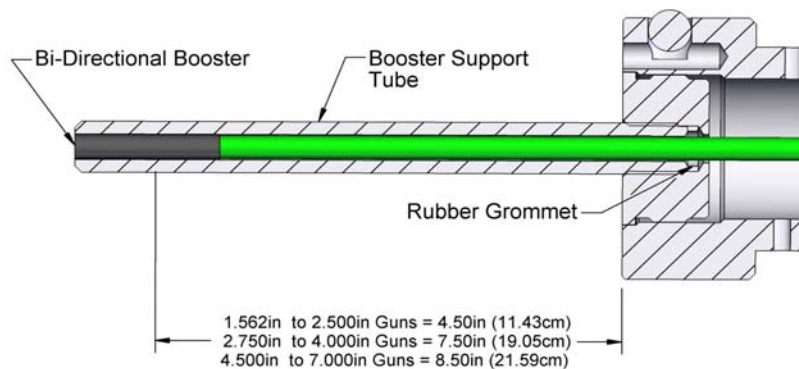
Note: To help run the cord through the tube strip, use a non-sparking Fish Tape or Fish Tape Leader (used by electricians and plumbers). Insert the fish tape through tube strip and attach det cord to its end using electrical tape. Withdraw the fish tape, pulling det cord through tube strip. Be careful not to scrape the outer covering of the cord as the fish tape is retracted.

5.4 Make a clean, squared-off cut on the top end of the det cord by using an Owen Super Cutters tool.

5.5 Visually inspect the cut, then install the proper Bi-directional Booster over the end of the det cord and crimp in place by using Owen Super Crimpers.



5.6 Insert the crimped Booster and cord through the center hole in the End Plate/insert at the top end of the tube strip until approximately 10 in (25 cm) sticks out. Slide the Rubber Grommet (provided in the Booster Transfer Kit) over end of cord until it's against the End Plate. Slide the Booster Support Tube (provided in the Booster Transfer Kit) over the cord and thread into End Plate. This will push the rubber grommet into the threaded recess. As you thread in the tube, position the end of the Booster flush with the top of the support tube. Tighten firmly by hand to compress the rubber grommet around the det cord.



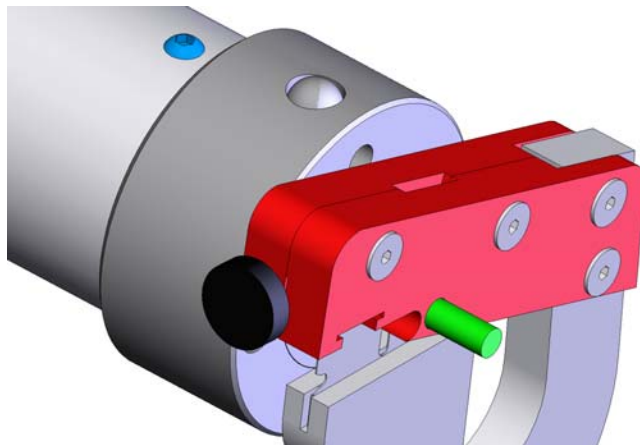
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5.7 To load the charges, start at the designated top end of the tube strip and insert a charge through the large hole until the det cord grooves of the charge sticks out through the small hole (you may need to rotate the charge so that the det cord groove aligns with the path of the det cord). Secure in place by using the bend tab on the tube strip. The charge should not be able to move side to side. Continue to load the required charges to complete the tube strip.



Note: Insert only the number of charges that you need loaded. The tube strip can be fully or partially loaded.

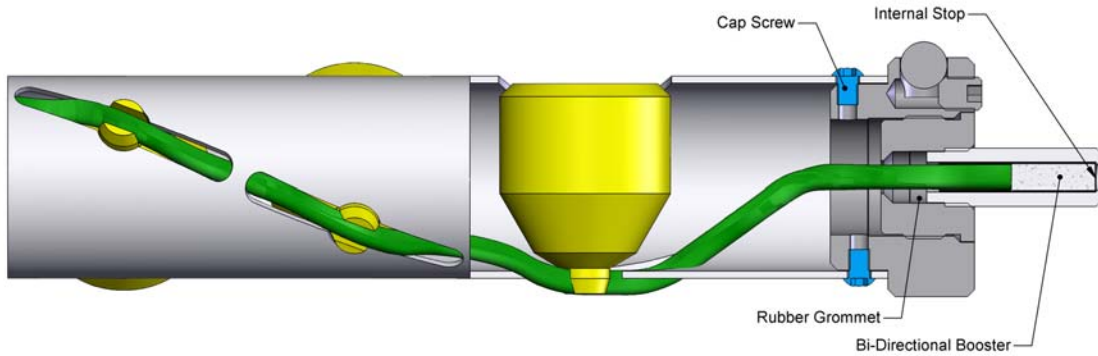
5.8 Make a clean and squared-off cut of the det cord $\frac{3}{8}$ in to $\frac{7}{16}$ in (.95 cm to 1.1 cm) from the face of the bottom End Plate. If using Owen Super Cutters, place the cutter head against the End Plate to make the cut.



5.9 Carefully remove the End Plate without disturbing the cut.

5.10 Crimp a Bi-directional Booster on the det cord. Insert the boosted cord through the End Plate, then secure the End Plate to the tube strip using the 2 Cap Screws.


5.11 With the End Plate secured to the tube strip, slide the rubber grommet over the end of Booster up to the End Plate. Thread the Booster Retainer (provided with the Booster Transfer Kit) into the End Plate compressing the rubber grommet, making sure that the Booster stays against the internal stop of the Booster Retainer and tighten firmly.




Note: If the gun is used as a bottom gun, it is still recommended to use a Booster (even if you use a loaded tube strip as a bottom gun and a bottom Booster is not needed for the explosive transfer). Operational plans often change at the last minute and additional guns may need to be added to the bottom gun.

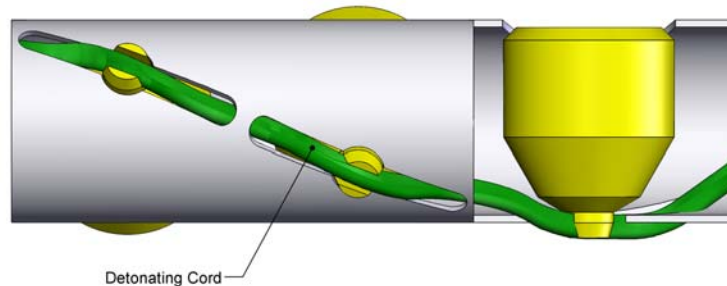
5.12 The fully loaded internal wrap style tube strip is now complete and is ready to be installed in its accompanying carrier. The installation of the tube strip is covered in section 9.0.

6.0 Internal Wrap, Non-Boostered Connections

 *Note: Owen recommends using the Locking Ball End Plate as the top and the Alignment Pin end as the bottom.*


The detonating cord on this style, is placed on the inside of the tube strip and spirals around, connecting the charges forming the explosive sequence. Do not to remove the endplates at this time.


 *Note: With the internal wrap style tube strip, the det cord is held in place by the charge and tube strip (no Det Cord Clips are required).*



6.1 Install the End Plate Inserts and use a locking compound on the insert threads.

6.2 Next, using Owen Super Cutters, cut a sufficient length of det cord that will completely load your tube strip and that will allow for det cord initiation. One method of doing this, is to wrap the det cord around the tube strip following the charge holes. Take that length and add 3 - 4 ft (0.9 - 1.2m). It is always better to have too much, than not enough.

 *Note: To determine the next length of det cord to be cut, measure the first cut length before loading, then measure the scrap length when finished. Subtract the scrap length from the original cut length to determine the length of the next piece of det cord.*

 **Warning: Never load a tube strip when the det cord is still attached to the roll! Cut the necessary length of cord, then remove the roll from the loading area!**

6.3 Place the det cord through the tube strip and through both End Plates.



Note: To help run the cord through the tube strip, use a non-sparking Fish Tape or Fish Tape Leader (used by electricians and plumbers). Insert the fish tape through tube strip and attach det cord to its end using electrical tape. Withdraw the fish tape, pulling det cord through tube strip. Be careful not to scrape the outer covering of the cord as the fish tape is retracted.

6.4 Make a clean, squared-off cut on the end of the det cord by using an Owen Super Cutters tool.

6.5 Visually inspect the cut, then install the proper end seal over the end of the det cord and crimp in place by using Owen Super Crimpers.

6.6 Make sure enough det cord sticks out for your operational requirements

6.7 To load the charges, start at the designated top end of the tube strip and insert a charge through the large hole until the det cord grooves of the charge sticks out through the small hole (you may need to rotate the charge so that the det cord groove aligns with the path of the det cord). Secure in place by using the bend tab on the tube strip. The charge should not be able to move side to side. Continue to load the required charges to complete the tube strip.




Note: Insert only the number of charges that you need loaded. The tube strip can be fully or partially loaded.

6.8 Make a clean and squared-off cut to the det cord sticking out of the bottom End Plate.

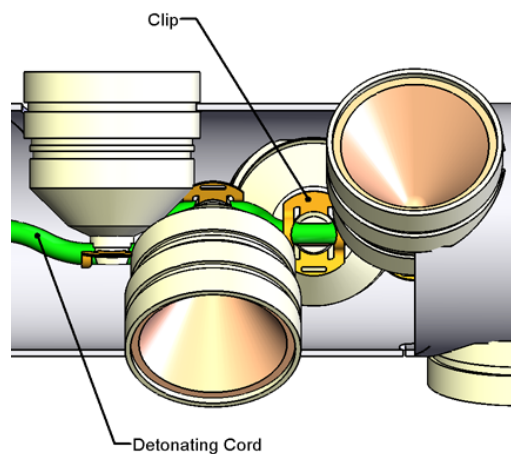
6.9 Crimp an end seal on the det cord.

6.10 The fully loaded internal wrap style tube strip is now complete and is ready to be installed in its accompanying carrier. The installation of the tube strip is covered in section 9.0.


7.0 Internal Weave, Boostered Connections


 *Note: Owen recommends using the Locking Ball End Plate as the top and the Alignment Pin end as the bottom. This way the long Transfer Tube is on the Locking Ball End Plate and will be inserted first into the carrier after loading. This also helps protect the long Transfer Tube from breaking during handling.*

The detonating cord on this style, is placed on the inside of the tube strip and weaves from charge to charge to form the explosive sequence.



7.1 Using Owen Super Cutters, cut a sufficient length of det cord that will completely load your tube strip and that will allow for the Transfer Tube. One method of doing this, is to add 3-4 ft (0.9 - 1.2m) to the length of the tube strip. It is always better to have too much, than not enough.

 *Note: To determine the next length of det cord to be cut, measure the first cut length before loading, then measure the scrap length when finished. Subtract the scrap length from the original cut length to determine the length of the next piece of det cord.*

 **Warning: Never load a tube strip when the det cord is still attached to the roll! Cut the necessary length of cord, then remove the roll from the loading area!**

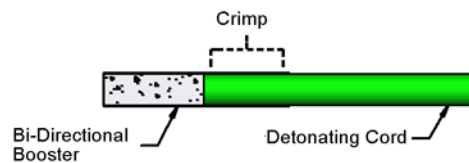
7.2 Place the det cord on the inside of the tube strip and through both End Plates.



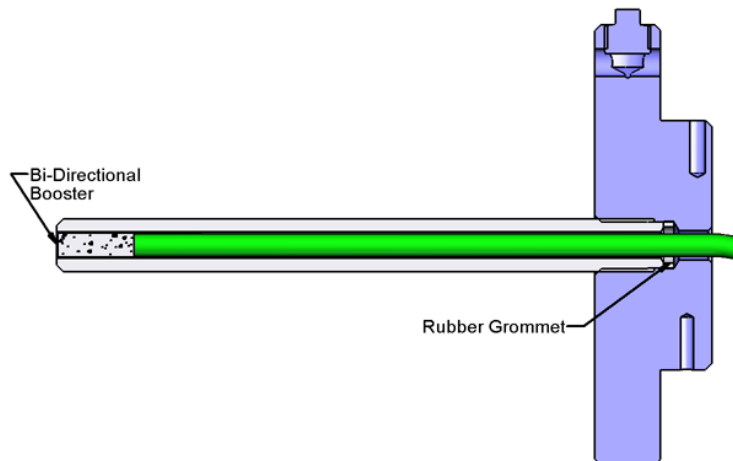
Note: To help run the cord through the tube strip, use a non-sparking Fish Tape or Fish Tape Leader (used by electricians and plumbers). Insert fish tape through tube strip and attach det cord to its end using electrical tape, then withdraw fish tape, pulling det cord through tube strip. Be careful not to scrape the outer covering of the cord as the fish tape is retracted.

7.3 Make a clean, squared-off cut to the end of the det cord by using an Owen Super Cutters tool.

7.4 Visually inspect the cut, then install the proper Bi-directional Booster over end of det cord and crimp in place by using Owen Super Crimpers.

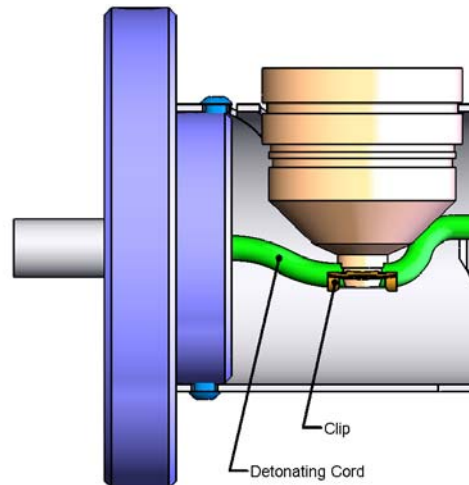


7.5 Insert the crimped Booster and cord through the center hole in the End Plate insert at the top end of the tube strip until approximately 10 in (25 cm) sticks out. Slide the Rubber Grommet (provided in the Booster Transfer Kit) over end of cord until it's against the End Plate. Slide the Booster Support Tube (provided in the Booster Transfer Kit) over the cord and thread into End Plate. This will push the rubber grommet into the threaded recess. As you thread in the tube, position the end of the Booster flush with the top of the support tube. Tighten firmly by hand to compress the rubber grommet around the det cord.



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7.6 Starting with the first or top charge, insert it in the tube strip hole with the cord slot on the charge straddling the det cord. Install a Det Cord Clip over the cord and charge prongs, snapping in place. Allow a little slack in cord so when fully seated in tube strip, the cord is not stretched or in tension.



7.7 Once the charge is seated, slide the charge groove onto the stationary tab of the tube strip hole and secured it in place using either the bend tab or with the provided Pop Rivets.

7.8 Proceed to the next charge in the explosive sequence, repeating steps 7.6 and 7.7.

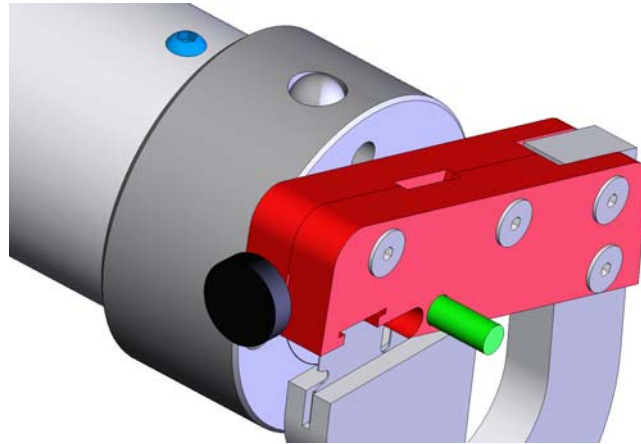


Note: Owen recommends installing a Det Cord Clip on every charge.

7.9 With the tube strip fully loaded and all of the charges clipped and locked in place, proceed with boosting.

7.10 After securing the det cord in the last charge at the bottom of the tube strip, insert it through the bottom End Plate.

7.11 Make a clean and squared-off cut of the det cord 3/8 in to 7/16 in (.95 cm to 1.1 cm) from the face of the End Plate. If using Owen Super Cutters, place the cutter head against the End Plate to make the cut.



7.12 Carefully remove the End Plate without disturbing the cut.

7.13 Crimp a Bi-directional Booster on the det cord. Insert the boosted cord through the End Plate and secure to the tube strip using the 2 Cap Screws.


7.14 With the End Plate secured to the tube strip, slide the rubber grommet over the end of Booster up to the End Plate. Thread the Booster Retainer (provided with transfer kit) into the End Plate compressing the rubber grommet, making sure that the Booster stays against the internal stop of the Booster Retainer and tighten firmly.



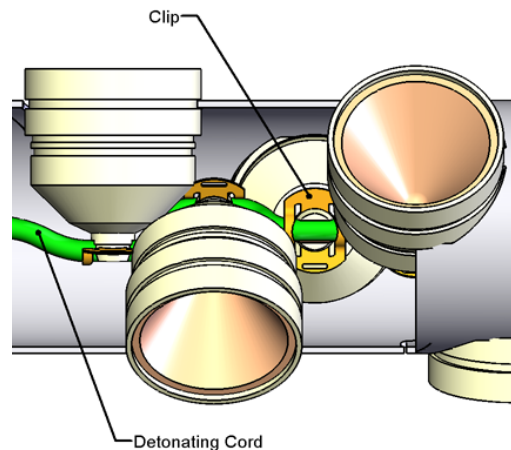
Note: If the gun is used as a bottom gun, it is still recommended to use a Booster (even if you use a loaded tube strip as a bottom gun and a bottom Booster is not needed for the explosive transfer). Operational plans often change at the last minute and additional guns may need to be added to the bottom gun.

7.15 The fully loaded Internal Weave style tube strip is now complete and ready to be installed in its accompanying carrier. The installation of the tube strip is covered in section 9.


8.0 Internal Weave, Non-Boosted Connections


 *Note: Owen recommends using the Locking Ball End Plate as the top and the Alignment Pin end as the bottom.*

The detonating cord on this style, is placed on the inside of the tube strip and weaves from charge to charge to form the explosive sequence.



8.1 Using Owen Super Cutters, cut a sufficient length of det cord that will completely load your tube strip and that will allow for the Transfer Tube. One method of doing this, is to add 3-4 ft (0.9 - 1.2m) to the length of the tube strip. It is always better to have too much, than not enough.

 *Note: Measure the cut length before loading, then measure the scrap length when finished. This will help determine the next piece of det cord to be cut.*

 **Warning: Never load a tube strip when the det cord is still attached to the roll! Cut the necessary length of cord, then remove the roll from the loading area!**

8.2 Place the det cord on the inside of the tube strip and through both End Plates

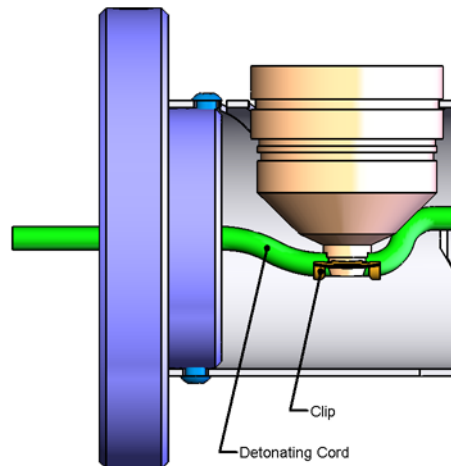


Note: To help run the cord through the tube strip, use a non-sparking Fish Tape or Fish Tape Leader (used by electricians and plumbers). Insert fish tape through tube strip and attach det cord to its end using electrical tape, then withdraw fish tape, pulling det cord through tube strip. Be careful not to scrape the outer covering of the cord as the fish tape is retracted.

8.3 Based on your operational requirements, make a clean, squared-off cut to the end of the det cord by using an Owen Super Cutters tool.

8.4 Visually inspect the cut, then install the proper end seal over end of det cord and crimp in place by using Owen Super Crimpers.

8.5 Starting with the first or top charge, insert it into the tube strip hole with the cord slot on the charge straddling the det cord. Install a Det Cord Clip over the cord and charge prongs, snapping in place. Allow a little slack in cord so when fully seated in tube strip, the cord is not stretched or in tension.



8.6 Once the charge is seated, slide the charge groove onto the stationary tab of the tube strip hole and secured it in place using either the bend tab or with the provided Pop Rivets.

8.7 Proceed to the next charge in the explosive sequence, repeating steps 8.6 and 8.7.



Note: Owen recommends installing a Det Cord Clip on every charge.

8.8 Make a clean and squared-off cut of the det cord.

8.9 Crimp an end seal on the det cord.

8.10 The fully loaded Internal Weave style tube strip is now complete and ready to be installed in its accompanying carrier. The installation of the tube strip is covered in the next section.

9.0 Installation of a Loaded Tube Strip

9.1 The carrier to be loaded must be on sturdy supports and be at an elevation of such to make inserting the loaded tube strip easy and safe.

9.2 The opening of the Snap Ring should be positioned so that it aligns with the scallop of the last charge and so that the Locking Ball set screw on the End Plate will be accessible.

9.3 Lift the loaded tube strip from the loading bench and carry it to the accompanying carrier. Use as many people as necessary to safely handle the tube strip.



Note: Owen recommends that a minimum of 2 - 3 people be present when moving/handling guns over 10 ft long. Personnel should be evenly distributed along the gun's length when moving/handling.



Warning: A loaded tube strip can be very heavy, especially the larger diameter tube strips, and must be handled accordingly to prevent personal injury, dropping or bending the tube strip!



Caution: Do not damage or break the Booster Transfer Tube (if applicable), during insertion! Do not pinch the det cord or Booster during insertion!

9.4 Be sure that the ball is still disengaged. Insert the tube strip, Locking Ball End Plate first, into the carrier. The pinned End Plate must go in last.



Warning: *For non-boosted connections, use a non-sparking Fish Tape or Fish Tape Leader to prevent the tube strip from crushing or binding the det cord while inserting!*

9.5 Slowly slide the loaded tube strip into the carrier. Be careful not to cause any damage to the components of the loaded tube strip.

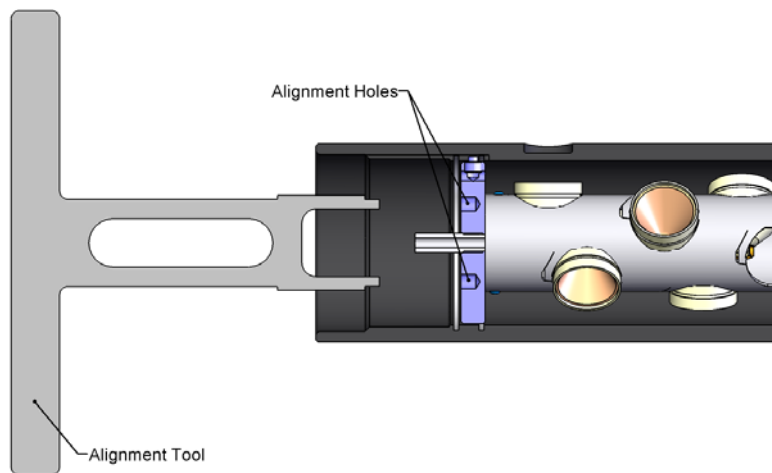


Note: *When inserting the tube strip; line up the top and bottom charges with their corresponding scallops on the carrier. This will minimize the alignment rotation of the tube strip, while inserting.*



Warning: *If any difficulty is encountered while inserting the tube strip, STOP and check for the cause of the difficulty! If necessary, pull the tube strip back out of the carrier and determine the problem! Never beat or force a loaded tube strip into a carrier!*

9.6 Align the alignment pin with the slot in the threads. Push the tube strip up against the Snap Ring in the top of the carrier, by using the Alignment Tool. This tool was specially designed to avoid contact with the bottom Booster and Booster Retainer.



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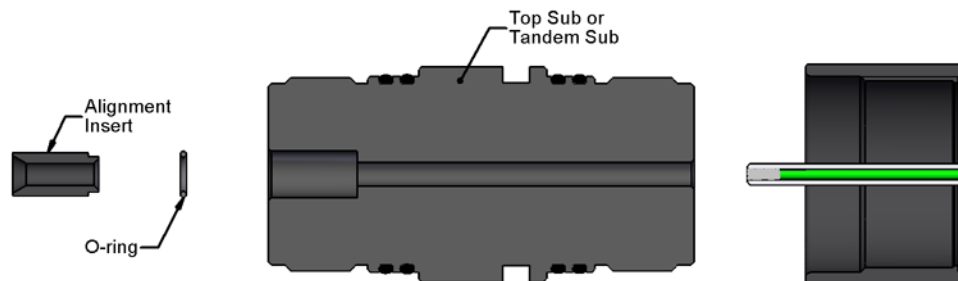
9.7 With the End Plate against the Snap Ring, tighten the Locking Ball Set Screw until the ball is against the inside of the carrier. Do not over tighten.



Note: The top set screw should be accessible through opening in Snap Ring.

9.8 Install the bottom Snap Ring. The loaded tube strip is now secured in its scalloped gun carrier.

9.9 The next step is to install the proper Top or Tandem Sub. Place the appropriate size O-rings on the sub, apply grease to threads and O-rings, thread it into carrier and tighten.



9.10 If a Top or Tandem Sub is being used with boosted connections, install an Alignment Insert and O-ring (provided with the Booster Transfer Kit) into the sub.



Note: Install all other hardware as applicable.

9.11 Install tie down subs on both ends of gun carrier as applicable and affix the proper explosives shipping label on the carrier.

9.12 The loaded scalloped gun system is now ready for shipping or transportation.

10.0 Fully Blank Gun Assembly

The blank gun assembly can be used as either a top gun safety spacer or for spacing between loaded perforating zones. The blank gun doesn't use a tube strip because the blank gun End Plates are secured in the carrier by a set of Snap Rings (provided in the Blank Spacer Kit). The carrier used for this assembly does not require scallops on the exterior surface. If you want to, you can use an empty scalloped gun. A blank carrier can be cleaned and reused again. Owen recommends using a blank carrier with the same outside diameter as the perforating guns. This way, all the connections will be the same and no specialized subs or crossovers will be required. The blank carrier lengths are the same as the available gun carriers.

10.1 Using Owen Super Cutters, cut the det cord to the appropriate length. The length of carrier plus 2 ft (61 cm) should be sufficient. Remove det cord roll from work area.

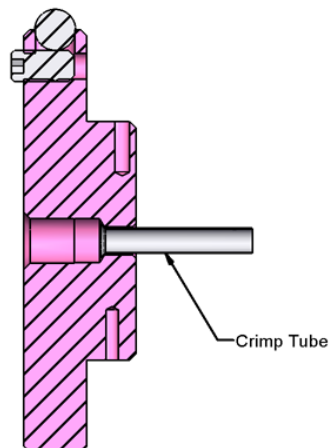


Warning: *Never load det cord that is still attached to a roll! Cut the necessary length of cord, then remove the roll from the loading area!*



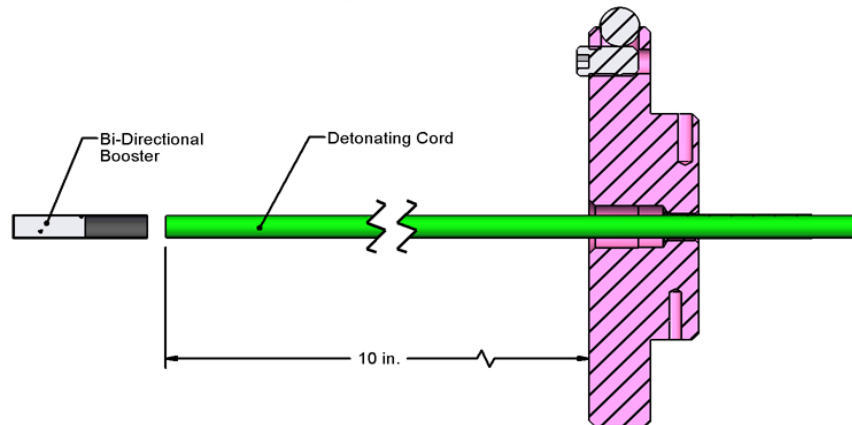
Note: *Since the blank gun does not use a tube strip to help support the weight of the det cord, a Crimp Tube (provided in Blank Spacer Kit) must be used.*

10.2 Insert the Crimp Tube into threaded recess of the End Plate so that the flared end of the Crimp Tube is seated in the bottom of the threaded hole.

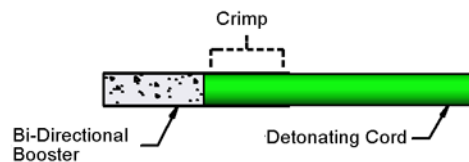


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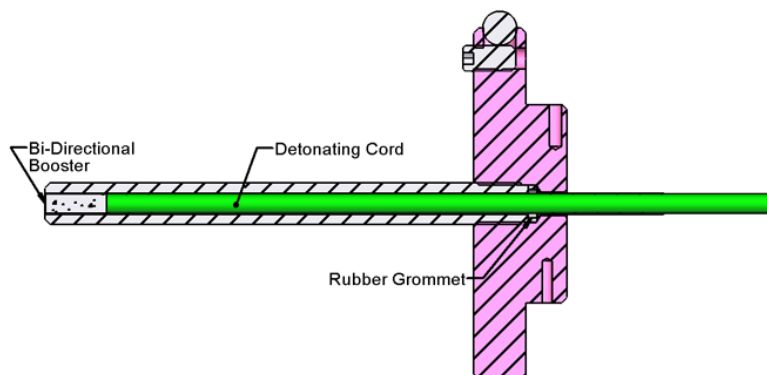
10.3 Do not install a bi-directional Booster at this time, because the Booster will not pass through the crimp tube. Insert the end of the det cord through the crimp tube and out the top of the End Plate so approximately 10 in (24 cm) sticks out. Make a clean, squared-off cut to one end of the det cord using Owen Super Cutters



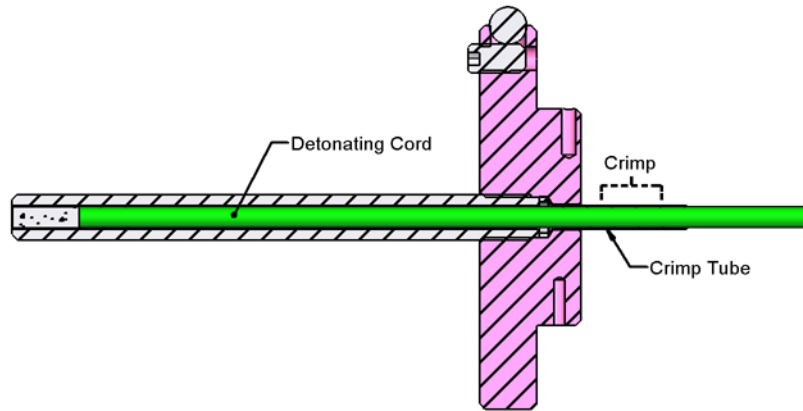
10.4 Make sure the cut is squared-off and clean, then install the proper Bi-directional Booster over end of det cord and crimp in place by using Owen Super Crimpers.



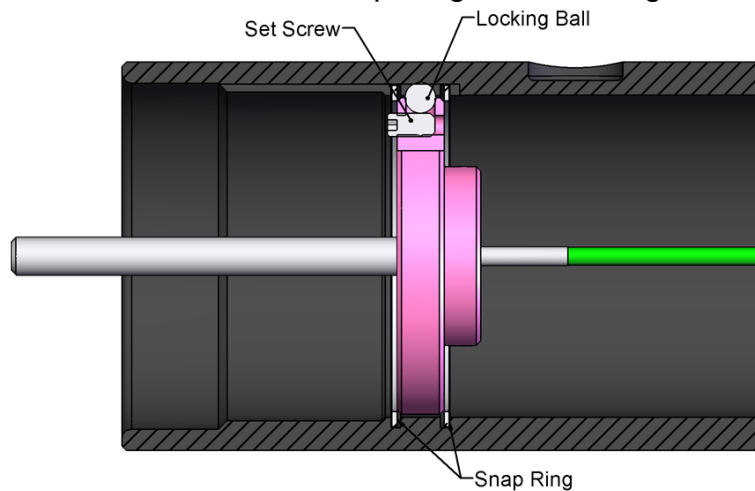
10.5 Slide the Rubber Grommet (provided in the Blank Spacer Kit) over the end of cord until it's against the End Plate. Slide the Booster Support Tube (provided in the Blank Spacer Kit) over the cord and thread into the End Plate. This will push the Rubber Grommet into the threaded recess. As you thread in the tube, position the end of the Booster flush with the top of the support tube. Tighten firmly by hand to compress the rubber grommet around the det cord.



10.6 With the support tube firmly tightened and the Booster flush with the end of the tube, crimp the crimp tube onto the det cord using Owen Super Crimpers. This will help support the weight of the det cord when the blank gun assembly is in the vertical position.



10.7 Install a Snap Ring in the second groove at the designated top end of the carrier. Feed the loose end of the det cord (using a non-sparking Fish Tape or Fish Tape Leader) through the entire length of the carrier until you can insert the assembled End Plate against the Snap Ring. Secure in place by threading in the set screw in the End Plate. With the End Plate secured, install a Snap Ring in the outer groove of the carrier.



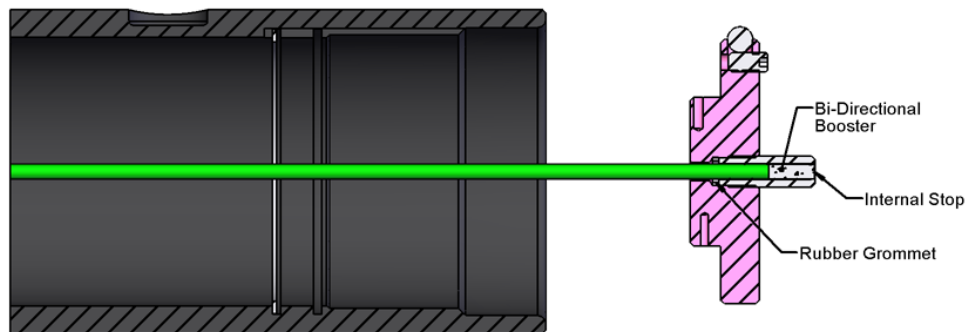
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10.8 On the opposite end of the carrier, pull out the excess det cord and then install a Snap Ring in the second groove of the carrier.

10.9 Make a clean, squared-off cut of the det cord, approximately 2 - 3 in (5 - 8 cm) from the edge of the carrier.

10.10 Crimp a Bi-directional Booster on the det cord.

10.11 Insert the boosted cord through the End Plate and slide on a rubber grommet. Thread the Booster Retainer (provided in the Blank Spacer Kit) firmly into the End Plate. Make sure that the rubber grommet has been compressed enough, so that the Booster stays against the internal stop of Booster Retainer and tighten firmly by hand.



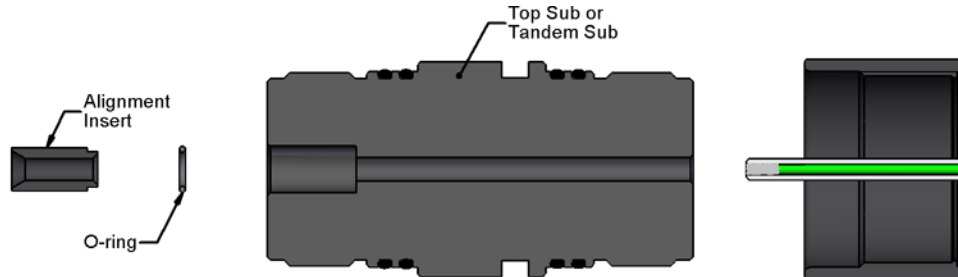
10.12 Using the alignment tool, rotate the End Plate clockwise. This will twist the det cord in the carrier causing the End Plate to pull itself into the carrier up against the Snap Ring.



Caution: Only twist enough to pull in the cord!

Once in alignment, secure the End Plate with the set screw. Install the outer Snap Ring.

10.13 The next step is to install the proper Top or Tandem Sub. Place the appropriate size O-rings on the sub, apply grease to threads and O-rings and thread into carrier; tighten.



10.14 If a Top or Tandem Sub is being used with boosted connections, install an Alignment Insert and O-ring (provided with the Booster Transfer Kit) into the sub.

10.15 Install tie down subs on both ends of the blank gun carrier and affix the proper explosive shipping label to the carrier.

10.16 The Blank Gun Assembly is now ready for shipping or transportation.

