

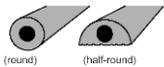
# General Guidelines for Road Tube Installation

The following guide is a reference for installing road tubes for portable counting and classification purposes. This guide is meant to help you insure that installation is done properly and safely. Please make sure to take caution when out on the road to avoid injury or possible death.

## Supplies

Depending on the road type (ex: asphalt, concrete, gravel) the supplies need to install road tube are listed below.

### Road Tube



#RT-SYN	1/4x9/16 OD Round-Synthetic-100'/120'
#RT-NAT	1/4x9/16 OD Round-Natural-100'/120'
#RT-SYN-3/16	3/16x9/16 OD Round-Synthetic-100'/ 120' – <i>Special Order Only</i>
#RT-SYN-HR	Half Round-Synthetic (100' or 120') – <i>Special Order Only</i>
#RT-SYN-3/16 MINI	3/16x3/8 OD Round-Synthetic-100'/120' – <i>Special Order Only</i>

### Tube Grip/Anchors



#RTA-CF HR	Road Tube Grip (Chinese Finger) Half Round
#RTA-CF R 3/8	Road Tube Grip (Chinese Finger) Round 3/8 O.D. Mini Tube
#RTA-CF R 9/16	Road Tube Grip (Chinese Finger) Round 9/16 O.D. Tube
#RTA-8 MINI	Road Tube Figure 8 Cable Grip for Mini Road Tube
#RTA-8	Road Tube Figure 8 Cable Grip
#RTA-GC 3/8	Road Tube Galvanized "C" Clamp
#RTA-GC 9/16	Road Tube Galvanized "C" Clamp
#WWB-1.5	1 1/2" Black Web Belting (50-yard roll)

### Road Tube End Plugs

(matching Allen wrench)



#EP-312	Road Tube End Plug
#EPW-313	Allen Hex Wrench

### Duct Tape



#MMT2	2" MarMac Road Tape (60' roll)
#MMT4	4" MarMac Road Tape roll (60' roll)
#MMT6	6" MarMac Road Tape roll (60' roll)
#MMT12	12" MarMac Road Tape roll (60' roll)

### Lock



#LOCK-AML	American Lock - 3-inch Shackle-Brass
#LOCK-2/4/6	Huski 5" Hardened Shackle-SS-Keyed Alike
#LOCK-OLY	Olympus Lock 3 1/2" Shackle
#LOCK-WB	Wilson-Bohemia Lock 4 1/2" Shackle

### Nails/Spikes

#RTA-SN-35	3.5 in long (Hardened)
#RTA-SN-25	2.5 in long (Hardened)



### Tape Measure



### Sledge Hammer



### Counter



### Pry bar



### Gloves



▪ **SAFETY FIRST! -**



1. **Working in the roadway is dangerous. Make sure drivers can see you. Wear a bright orange or yellow safety vest and hat at all times.**
2. **Do not assume that drivers always see you. Never turn your back on traffic.**
3. **Do not assume that drivers know which direction you are going to move next. They may steer their vehicle into the vacant space that you were planning to use as a safe refuge. Always stay clear of the roadway when traffic is approaching.**
4. **Do not hold onto the road tube while vehicles drive over it. They can snag the tube pulling it through your hands.**

*Diamond Traffic Products does not provide any guarantee of safety or proper installation with this guide. This guide is ONLY meant for reference and does not provide the reader with any rights or legal liability to Diamond Traffic Products. As with any hazardous working environment, common sense is implied.*

## **A** Selecting Road Tube

Proper selection of Road Tube can extend the life of your tube, improve data accuracy and prevent damage to your counter unit. Always use tubing that is designed for vehicle counting. There are two main types of rubber tube available. The table below shows their properties and suggested applications.

<b>Type</b>	<b>Properties</b>	<b>Application</b>
<b>Natural (Isoprene)</b>	Stays flexible at colder temp (freezing). Very Strong. 1/4" inside, 9/16" outside diameter.	Cold climates.
<b>Synthetic (EPDM)</b>	Resistant to UV rays, less stretch than natural. 1/4" inside, 9/16" outside diameter.	Hot and moderate climates, long term road installations.
<b>Mini Tube</b>	Smaller, lighter weight, synthetic (EPDM). 3/16" inside, 3/8" outside diameter. <i>Available by special order only.</i>	Same as standard size applications.

## B

### Checking Road Tubes before Placement

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#### Road Tube Condition:

- Road tubes can have holes or cuts in them from previous use. Bend the road tube continuously for the entire length and look for small cracks that indicate that the tube is getting old and may provide poor results. Check the tube for holes at 2 PSI (maximum) of air pressure with the tube submersed in water. If there are any bubbles, then the tube has a hole or crack. One or two small holes may be usable; however, it is a sign of a tube that will eventually fail. In wet conditions those holes in the tube will draw in water that can block air signals to the counter. A small amount (ex: one tablespoon) of water can stop the pulse from reaching the counter and possibly damage the air switch in the counter.

#### Road Tube Obstructions:

- Dirt and insects can get into the tube; clear these out with compressed air. To remove water before use (if you don't have access to compressed air) start from the far end of the tube and raise it to chest height then slowly walk the length of the tube causing each section to be raised to evacuate any water.

#### Road Tube Length:

- Keep the length of the road tube no shorter than 30 feet and no longer than 100 feet. **The ideal length is 40 to 60 feet.** Road tubes shorter than 30 feet will damage the air switches very quickly. Lengths longer than 60 feet will start to miss some axle hits that occur beyond 60 feet.
- Make sure that tubes used for classification are the **same physical length**. If they are more than 6 inches in difference, you need to cut them to be equal length. When stretching tubes used for speed or axle classification take care to stretch both tubes the same amount.

#### Insert End Plugs:

- The end of the road tube that is not connected to the counter should have a plug in it to keep out water, dirt and insects in order to allow the air switch to function properly. A concrete nail will work temporarily however; they will work themselves out of the tube over time. Also the threaded end plugs can also work themselves out unless inserted about 1 1/4" inches into road tube. To absolutely stop them from working out, use bailing wire and place a couple wraps around tube between end of plug and the end of the tube.

## C

### Selecting Your Count Site Location

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- **Location:** Choose a spot preferably on a straight, flat roadway with free flowing traffic between 10mph and 70+mph. Diamond air switches will work consistently down to 6mph and over 100mph and beyond.
- **Speed Consideration:** Vehicles traveling faster than 70mph especially trucks will cause the road tube to slap or bounce excessively on the road surface. At speeds in excess of 60mph we highly recommend taping the road tube every 10 feet to the road to prevent road tube bounce.
- **Road Surface Condition:** Avoid rutted and potholed roads. They cause the road tube to slap and could cause the counter to double count. Consider the quality of pavement you are driving nails into, if it is poor, then your nails or tape may not stay in place for the duration of your study.
- **Problem Locations:** Stay away from traffic signals and other places where cars are likely to stop, drastically slow down or speed up. If you count the legs of an intersection, counting the outbound lanes will work better. If you must count the inbound lanes, place road tubes where traffic is moving at least 7 mph (ex: midblock placement). Likewise, hills and off ramps can be counted, but take precautions to prevent the tube from being rolled or pulled down the road causing tears in the tube and inaccuracy in speed calculations. Use road tape to secure the tube in each lane to the road surface for best results.

# D

## Road Tube Installation

Road tube is held in position on the road by a wide variety of fixtures. Most are designed to attach the road tube at the edges of the road. On very wide roads centerline clamps are used or the tube can be taped to the road in the center. Most securing devices attach to asphalt/concrete with concrete nails. The nail is driven into the asphalt until the nail head sticks up 1/4" above the pavement. Most securing hardware is designed to slip over the nail head and is held in position by the tension of the road tube. In hot weather (90 degrees and above) we recommend, where possible, that you drive 12" spikes into the dirt alongside the road.

### **STEP #1 Install Anchor on the Far End (opposite side of the road).**

Use a small sledge or engineers hammer to place your nail in the pavement. Measure out the distance between tubes if you are installing more than one tube and place your other nail/anchor appropriately.

### **STEP #2 Layout Tube Across Roadway:**

After attaching your road tube grip and securing your end plug, walk your tube across the roadway and secure it with your anchor. After it is secure, return to the near side to place your anchor in the pavement.

**NOTE:** Do not hold onto a road tube when a vehicle drives over it. Occasionally a vehicle can "grab" the tube pulling it and all of the metal attached to it right out of your hand(s).

### **STEP #3 Install Near Side Anchor:**

Check to make sure your tube will lay perpendicular to the road and then place your nail/anchor. It's critical that you place the tube so both wheels of a single axle strike it at the same time. Attach the road tube to the anchor using your grip.

### **STEP #4 Stretch Tube:**

To tighten the tube, stretch your tube about 10 to 20% to be taut. If the roadway has ruts, potholes or the tube will not stay in place, mastic or heavy tape will be needed to ensure that the tube does not move or detach during the study. If your roadway width is greater than 50ft, proceed to step 5 otherwise proceed to step 6.

**NOTE:** For Traffic traveling faster than 55MPH, securing the road tube with tape is recommended at least every 10ft.

### **STEP #5 Attach Tube to Counter:**

Make sure you have at least 10ft of tube between your anchor point and the traffic counter. You can loosely coil any slack tube around or near the counter. Connect the open tube end to the appropriate nozzle on the counter making sure it is securely fastened to the nozzle. If you are installing more than one tube, measure out the distance between tubes (identical to step #1) and Repeat steps 2-6 for each tube you are installing.

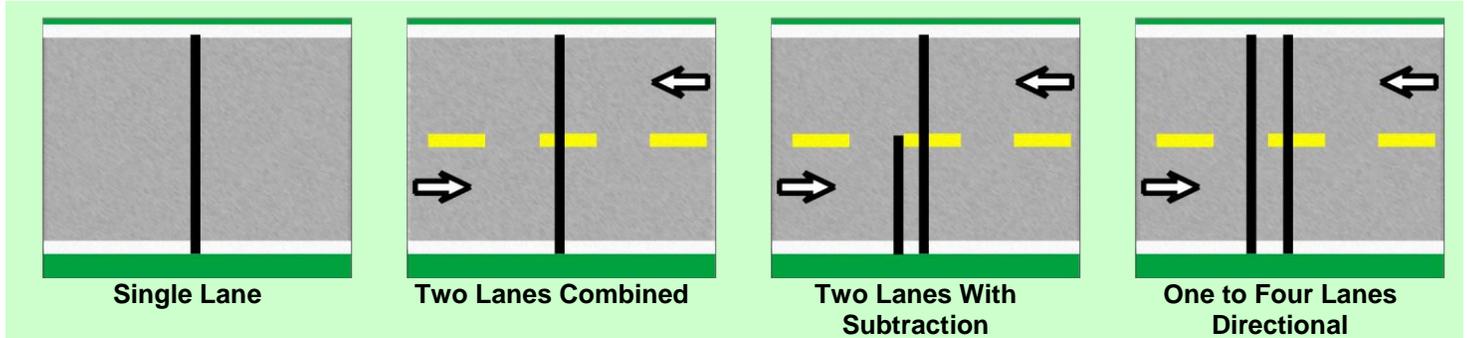


# E

## Common Road Tube Configurations

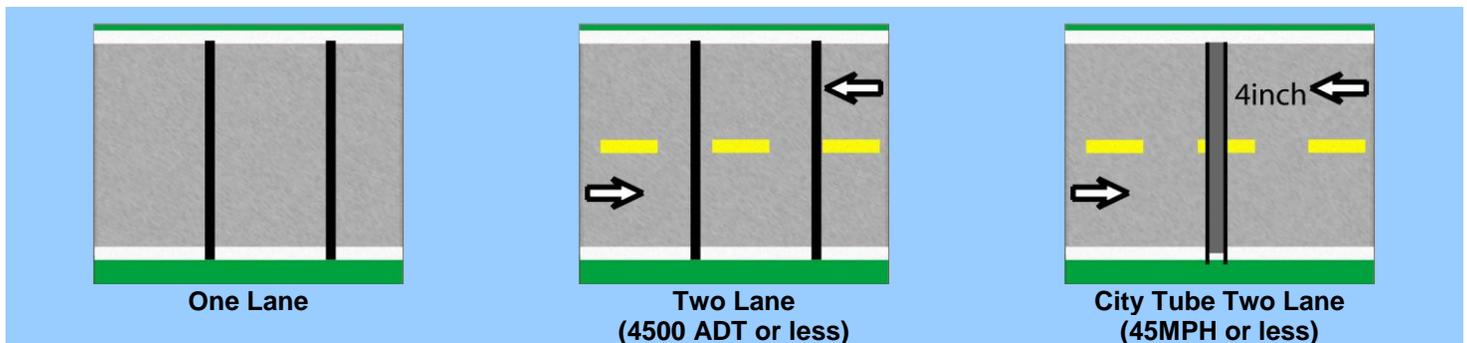
### 1 to 2 Lane Count Configurations:

Counting traffic for lanes only requires one tube per lane or one tube for combined counts. Interval and non-interval counts can be performed with the following layouts.



### 1 to 2 Lane Classification Configurations:

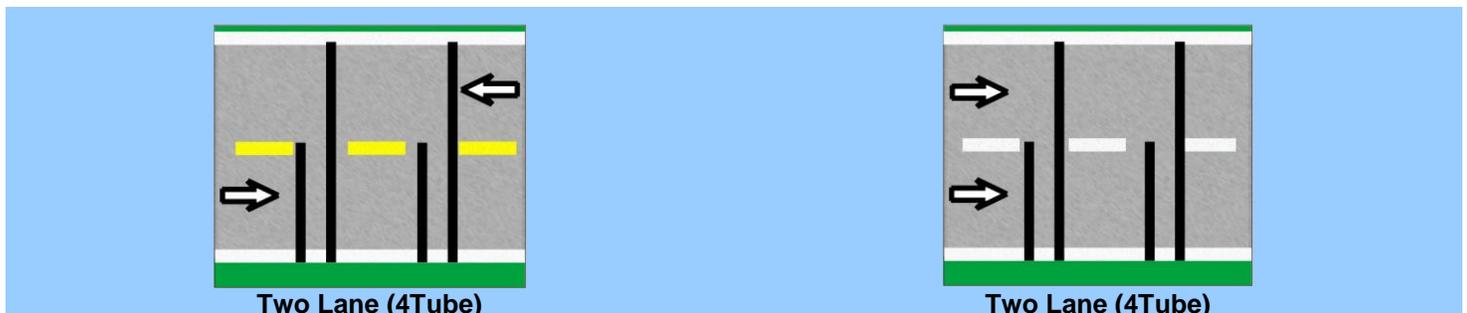
Classifying traffic and directional traffic (speed, axle, gap, headway) require two road tubes. Below are typical road tube layouts.



### Classifying 2 Lanes Using Four Road Tubes

The classifier will classify a two-lane road of opposite direction traffic using only two road tubes (ex: above middle), but you may record bogus vehicle data when two vehicles cross at the same time, especially in heavy traffic. We do not recommend classifying more than one lane of traffic with two road tubes.

Classifying two lanes with four road tubes works well. Road tubes 1 and 2 are placed only across the first lane. Road tubes 3 and 4 are placed across both lanes. See diagrams below. The short tube should be placed one foot in front of the long tube. With a three-foot spacing between the first long tube and the second short tube. This yields a 4-foot spacing between both short tubes and both long tubes.



# F

## Troubleshooting

Problem	Cause	Solution
Counter Does Not Count	Tube(s) not connected.	Properly connect tubes to air nozzles on counter.
	Tube is too long.	Make sure the tube is no longer than 60ft.
	No end plug inserted.	Make sure an end plug is inserted into opposite hose end.
	Tube is bad (has cracks or holes)	Replace road tube.
	Air switch is damaged	Replace counter air switch. (repair needed)
Counter Over Counts	Tube is too short	Use proper length tube (40ft - 60ft)
	Tube is slapping or bouncing on pavement	Tape road tube down to pavement surface.
	Tube is not straight	Reinstall tube to be perpendicular to traffic.
	Location is unsuitable for counting (traffic too slow)	Move to suitable location with free flowing traffic conditions.
Counter Counts Intermittently	Tube is bad (has cracks or holes)	Replace road tube.
	Tube is too long	Make sure the tube is no longer than 60ft.
	No end plug inserted	Make sure an end plug is inserted into opposite hose end.
	Airswitch is Failing	Replace counter air switch. (repair needed)
Classifier Shows SnMis	Tube layout not correct	Check tube layout and proper tube numbers, double check which tubes are connected to counter nozzles
	One of the tubes is over counting	See "Counter Over Counts" above.
	One of the tubes is under counting	See "Counter Does Not Count" above.
Classifier Speeds Or Axle Counts Are Incorrect.	Tube layout not correct	Check tube layout and proper tube numbers, double check which tubes are connected to counter nozzles
	Hoses are not equal length	Measure all hoses and make sure they are equal in length from side of road to counter nozzle
	Tube(s) failing	See "Counter Does Not count" and "Counter Over Counts" above.

## Testing Road Tube Air Signal:

- Testing the road tube for proper signal is recommended if you suspect a tube failure. If you do not have a tester, you can use the counter to verify the tube is operating by using the display or monitor function. It is not recommended to manually test tubes (DO NOT insert the tube into your ear or mouth for any reason at any time).

If you have all your road tubes installed and connected to the counter, you are ready to test for proper operation. Turn the counter “on” and press the key that will bring up “configure system” (see instruction on inside of lid for a listing). Press the enter key when the display shows configure system. If you are going to do time interval count with no speed or axle data collection, select “count” from the choices of “raw”, “binned”, “count” or “sensor”. Then press the enter key until you are back to configure system. If you need binned, speed or axle data, select “binned” and press enter until “configure system” shows on screen.

From “configure system” press “1” key to get “starting collecting”. Step through the program and verify proper operation. In count only you will know if the road tubes are registering properly. If classifier is set to speed and axle classify and you get questionable results or a lot of sensor miss codes check for proper road tube operation by reprogramming the counter to operate in count only and set it to count every axle and not divide by two. Then verify that each road tube counts the correct number of axles and that they show up in the correct channel of the counter. Do this in “test sensor” mode located almost at the end of the programming setup for count. In test sensor you can zero the count on the display after each vehicle passes by pressing the “0” key. That will eliminate the need to add and subtract axle numbers in your head.

<ul style="list-style-type: none"> <li>Four-pound sledge/engineers hammer</li> </ul>	<ul style="list-style-type: none"> <li>Your preferred road tube grips and anchors</li> </ul>	<ul style="list-style-type: none"> <li>Road tube(s) and traffic counter(s)</li> </ul>
<ul style="list-style-type: none"> <li>Padlock(s)</li> </ul>	<ul style="list-style-type: none"> <li>Road tube end plug(s)</li> </ul>	<ul style="list-style-type: none"> <li>Tape measure</li> </ul>
<ul style="list-style-type: none"> <li>Pry bar to remove nails</li> </ul>	<ul style="list-style-type: none"> <li>2 ½ “and 3 ½” concrete nails</li> </ul>	<ul style="list-style-type: none"> <li>Six foot lengths of chain/security cable</li> </ul>
<ul style="list-style-type: none"> <li>Duct Tape</li> </ul>	<ul style="list-style-type: none"> <li>Safety vest, hat, and gloves</li> </ul>	<ul style="list-style-type: none"> <li>12” dirt spikes</li> </ul>

- The road tube needs to be secured to the road at the edges of the road. If the distance between securing devices is over 50 feet you should have a securing device in the middle to keep the tube from bowing or drifting at the center. Also for traffic over 60 mph we recommend taping tube every 10 feet if you are speed or axle classifying.
- Pre-placement of securing hardware on the road tube at the approximate location will make installation on roadway safer and quicker.
- We recommend that you secure the end of tube opposite the counter first. Take required number of nails plus spares, a hammer and your tube to the far side of the road and drive the nails into the asphalt, concrete, or dirt.
- Hook your securing hardware, that you pre-attached to the end of the road tube, over the nail’s head. When you have plenty of space between traffic, deploy the tube across the lane or lanes of traffic.
- When installing road tubes for classification, measure the tube spacing at both ends to ensure accurate classification.
- Do not hold onto a road tube when a car drives over it. Occasionally a vehicle can “grab” the tube pulling it and all of the metal attached to it right out of your hands.
- Make sure that you stretch the road tubes about 10-20% to keep it tight to the road. If you are having trouble keeping road tube where you want it, a quality mastic tape will help.
- Plug the tube into the counter.

For additional assistance, contact [sales@diamondtraffic.com](mailto:sales@diamondtraffic.com) or call 866-782-3903.