

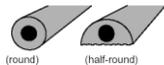
# General Guidelines for Road Tube Installation

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. We stock all the items listed below for your convenience

### 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'
- #RT-SYN-HR Half Round-Synthetic (100' or 120')
- #RT-SYN-3/16 MINI 3/16x3/8 OD Round-Synthetic-100'/120'



#CITY TUBE City Tube

### Tube Grip/Anchors



- #RTA-CL Road Tube Center Line Anchor
- #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 Plugs
- #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-PK-15 1.5 in long
- #RTA-PK-20 2 in long
- #RTA-PK-25 2.5 in long
- #RTA-DH-25 2.5 in long (Hardened)
- #RTA-DH-35 3.5 in long (Hardened)

### Chain



- #CHAIN-6 6 feet of 3/16 Link Chain—Stainless Steel

### 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 the vehicle into the vacant space that you were planning to use as a safe refuge. Always stay clear of 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 (table 1) below shows their properties and suggested applications.

Type	Properties	Application
<b>Natural (Isoprene)</b>	Stays flexible at colder temp (freezing). Very Strong.	Cold climates.
<b>Synthetic (EPDM)</b>	A synthetic/natural blend. Resistant to UV rays, less stretch than natural.	Hot and moderate climates, long term road installations.
<b>Mini Tube</b>	Smaller, Lighter weight, comes in synthetic and natural. 3/16in size.	Same as standard size applications.
<b>City Tube™</b>	2 Mini Tube Type, Rubber webbing does not stretch, Easy installation for urban and congested environments. Comes in synthetic.	City or Urban streets where cross traffic and accurate speeds are needed.

## 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 submerged 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 holes in the tube will draw in water that can block air signal to the counter. A small amount (ex: one tablespoon) of water can stop the pulse from reaching the counter and possibly damage the airswitch 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 20 feet will damage the air switches very. 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 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 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 will work 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 to 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 into 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 ¼" 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 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. 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 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 Install Center Line anchors (if needed):

Install the center line anchor(s) on the center line of the road using nails or concrete screws and secure the tube at the center line location after it is taut. These should be out tire travel paths as to not be normally run over by traffic. Be extra careful in the roadway and avoid traffic. Ideally, a second person is used to spot traffic. In a busy roadway, additional flagging may be necessary. Be safe!

### STEP #6 Attach Tube to Counter:

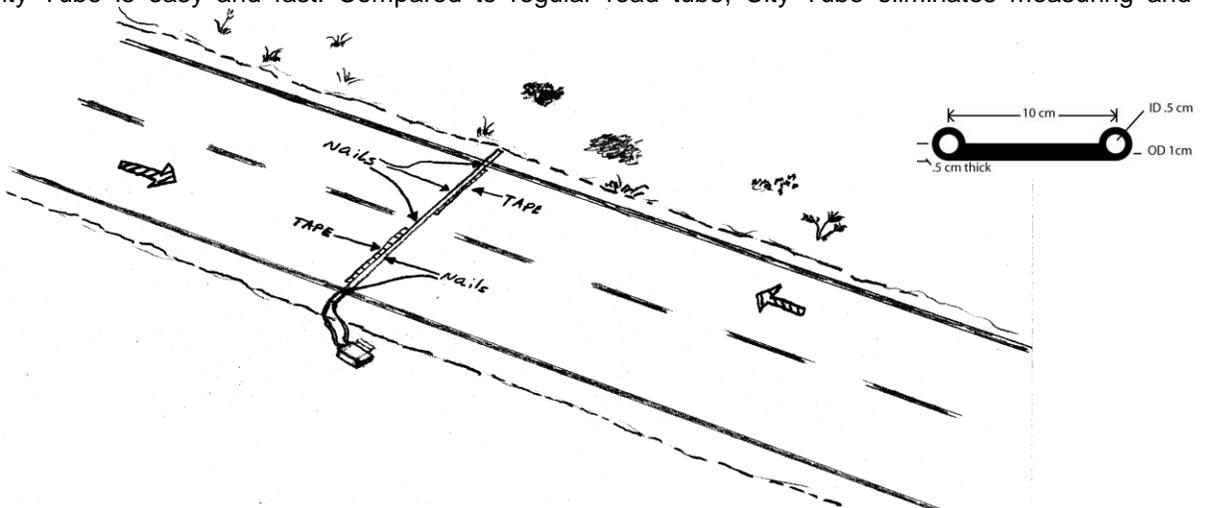
Make sure you have at least 10ft of tube between your anchor point and the traffic counter. You can coil any slack tube around or near the counter. Connect the open tube end to the appropriate nozzle on the counter making sure it is securely fastened to the nozzle. If you are installing more than one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



# E

## City Tube™ Installation

Installation of City Tube is easy and fast. Compared to regular road tube, City Tube eliminates measuring and installation time.



### STEP #1 Roll out City Tube

Before rolling out your City Tube be sure to note how wide your roadway is as you will want any extra City Tube to be located on the counter side of the road.

**NOTE:** City Tube is designed for traffic under 45MPH. Use in higher speed conditions is not recommended.

### STEP #2 Install Far Side Anchor:

Once you have rolled out your tube to the far side of the road, anchor it in with a nail/screw and a fender washer.

### STEP #3 Install Center Line Anchor:

To keep the City Tube from lifting, install an anchor in the center just as done in step #2.

### STEP #4 Install Near Side Anchor:

Install the near side anchor last and make sure the City tube is perpendicular and not twisted in the roadway just as in step #2 and #3.

### STEP #5 Tape Down Leading Edges:

To keep the City tube from lifting during operation taping is needed to be done on the leading edge of traffic (first hose in each direction). Secure tape to each edge lengthwise to both the City Tube and pavement. Be sure to make sure that the tape is secure.

### STEP #6 Connect to Traffic Counter.

Attach the two tubes to the traffic counter in the appropriate channels. If the City tube is new or does not have adapters installed you will need to install the two hose adapters at the edge of the City tube to connect the small hose fittings to the counter. These adapters attach using an adapter/joiner to connect to regular road tube that attaches to the traffic counter.

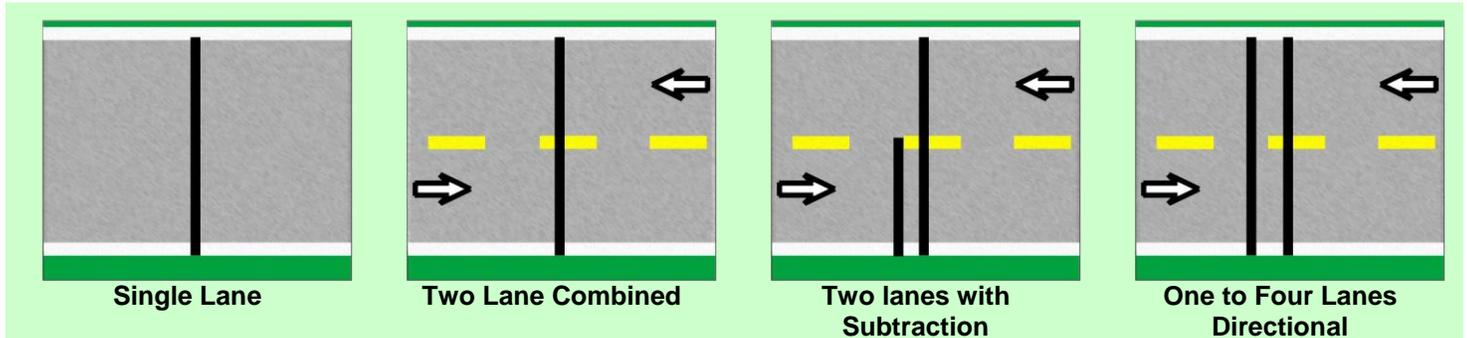


# F

## Common Road Tube Configurations

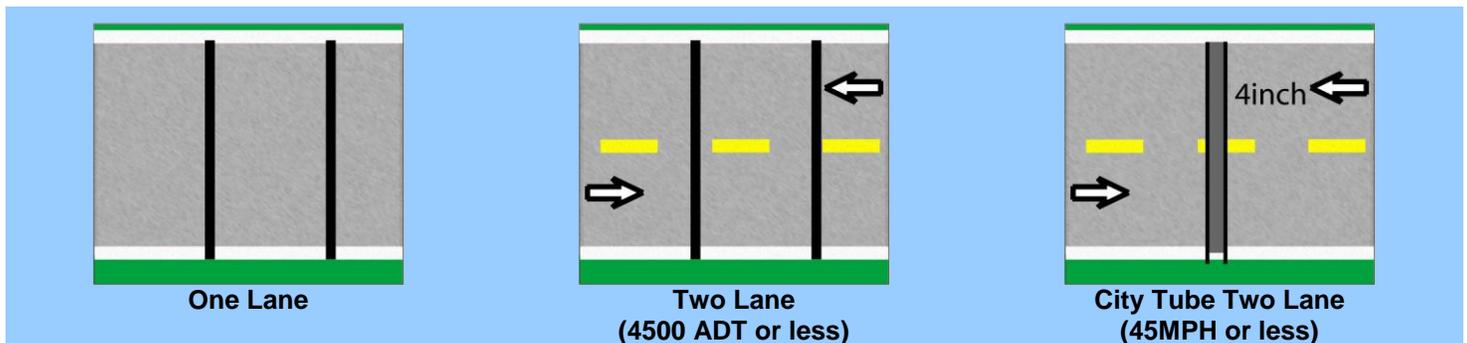
### 1 to 2 Lane Count Configurations:

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



### 1 to 2 Lane Classification Configurations:

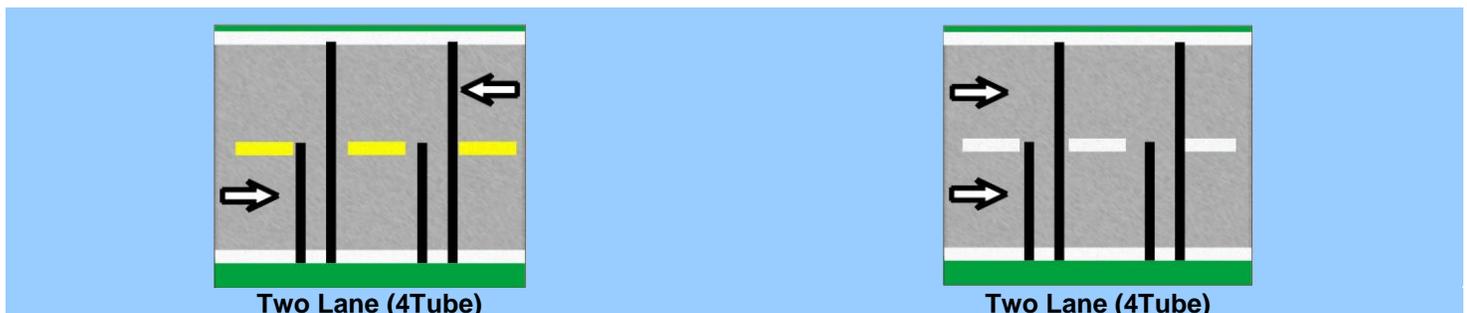
Classifying traffic and directional traffic (speed, axle, gap, headway) require two road tubes. Below are typical road tube layouts.



### 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. The new 4" wide **CITY TUBE**™ is specifically designed for urban traffic and is more suited for this application (ex: above right)

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.



# G

## 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.
	Airswitch 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) is failing	See "Counter does not count" and "Counter over counts" above.