

## **Diamond Knowledge Base**

### **Road Tube Installation Guide**

#### General Guidelines for Road Tube Installation- An Overview

##### Introduction

The following information is to be used as a reference for best practices when installing road tubes for portable traffic counting and vehicle classification purposes. Please make sure to take caution when out on the road to avoid injury or possible death. 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.

### **REMEMBER SAFETY FIRST! Working on any Roadway is Dangerous**

Always wear bright reflective orange and/or yellow traffic safety vests, hard hats and safety gear at all times. Always work with at least one additional person designated as a "spotter" (this person's sole responsibility is to alert others as to vehicle activities and proximities during station installation, configuration and maintenance). Never turn your back on vehicle traffic. Make certain drivers can see you (it's always better to assume that drivers cannot see you). Always stay clear of roadway when traffic is approaching. Stay alert to vehicle traffic and proximity when on roadway shoulder(s) and/or approaches (drivers are known to steer their vehicle into vacant space that you may be planning to use as a safe refuge). Never hold on to and/or stand on any secured and/or unsecured section of road tube while vehicles drive over or strike it (it is highly possible for a vehicle to catch or snag the tube, pulling it potentially causing severe injury to yourself or others).

### **Selecting Your Count Station or Site**

**Location:** Necessary for the overall success of any campaign, choosing a station (or site) with the least number of variables that could adversely impact data collection is critical. It's preferable to select a site on a straight, flat roadway with free flowing traffic between 10mph and 70mph (or more).

**Speed Consideration:** Vehicle speeds as low as 6mph and to over 100mph (and beyond) may be accurately collected using Diamond Traffic Counters and Classifiers. If not using one of our counters, it's best to contact your unit's manufacturer support team to verify speed accuracy tolerances. Vehicles traveling faster than 70mph (especially heavy haulers, tractor/trailers, and truck) 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.

## Selecting Road Tube

Proper selection of Road Tube can extend the life of your tube, improve data accuracy and prevent damage to your traffic classifier or counter unit depending upon the application. Always use tubing that is designed for vehicle counting. There are two main types of rubber tube available, natural and synthetic. The table (table 1) below shows their properties and suggested applications:

Type	Properties	Application
Natural (Isoprene)	1/4" - 9/16" inches in size. Full or Half-Round. Stays flexible at colder temps (freezing). UV degradation over extended periods of time, very strong, good stretch properties.	Preferred in Cold Climates, Short term road installations.
Synthetic (EPDM)	1/4" - 9/16" inches in size. Full or Half-Round. A blend of natural and synthetic materials. Performs better in hot temps (< 90+ F). Resistant to UV rays, strong, moderate stretch (when compared to Isoprene).	Preferred in Moderate to Hot Climates, Long term road installations.
Mini Tube	3/16 inches in size. It is smaller, lighter in weight and comes in both Natural and Synthetic options.	Same as above for both Natural and Synthetic in normal tube shapes and sizes.
City Tube	Dual Mini Tube Type with Webbing in between. Webbing does not stretch. Synthetic only.	Easy installation, best used in City/Urban streets where heavy cross traffic and accurate speeds are needed.

## Checking Road Tubes Prior to Placement

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 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.

Selecting Your Count Site Location

## 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 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 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.

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.

## **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.

### 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.

## Troubleshooting

Problem	Cause
Counter does not count	Tube(s) not connected. Tube is too long. End plug missing or not inserted.
Synthetic (EPDM)	Natural (Isoprene)
Mini Tube	Natural (Isoprene)
City Tube	Natural (Isoprene)

Counter does not count      Tube(s) not connected. Tube is too long. No end plug inserted.

Tube is bad (has cracks or holes) Airswitch is damaged Counter Over Counts Tube is too short

Tube is slapping or bouncing on pavement

Tube is not straight

Location is unsuitable for counting (traffic too slow)

Counter Counts Tube is bad (has cracks or holes) Intermittently Tube is too long

No end plug inserted

Airswitch is Failing Classifier Shows SnMis Tube layout not correct

One of the tubes is over counting One of the tubes is under counting Classifier speeds or axle Tube layout not correct counts are incorrect.

Hoses are not equal length

Tube(s) is failing

Properly connect tubes to air nozzles on counter.

Make sure the tube is no longer than 60ft.

Make sure an end plug is inserted into opposite hose end.

Replace road tube.

Replace counter air switch. (repair needed)

Use proper length tube (40ft - 60ft)

Tape road tube down to pavement surface.

Reinstall tube to be perpendicular to traffic.

Move to suitable location with free flowing traffic conditions.

Replace road tube.

Make sure the tube is no longer than 60ft.

Make sure an end plug is inserted into opposite hose end.

Replace counter air switch. (repair needed)

Check tube layout and proper tube numbers, double check which tubes are connected to counter nozzles

See "Counter Over Counts" above.

See "Counter does not Count" above.

Check tube layout and proper tube numbers, double check which tubes are connected to counter nozzles

Measure all hoses and make sure they are equal in length from side of road to counter nozzle See "Counter does not count" and "Counter over counts" above.

## 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

#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  
#RTA-CL Road Tube Center Line Anchor (matching Allen wrench)

#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

#EP-312 Road Tube End Plugs

#WWB-1.5 1 1/2" Black Web Belting (50 yard roll)

#EPW-313 Allen Hex Wrench

#MMT2 2" MarMac Road Tape (60' roll)

#LOCK-AML American Lock - 3 inch Shackle-Brass

#MMT4 4" MarMac Road Tape roll (60' roll)

#MMT6 6" MarMac Road Tape roll (60' roll)

#LOCK-OLY Olympus Lock 3 1/2" Shackle

#MMT12 12" MarMac Road Tape roll (60' roll)

#LOCK-WB Wilson-Bohemina Lock 4 1/2" Shackle

#RTA-DH-35	3.5 in long (Hardened) 2.5	#CHAIN-6	6 feet of 3/16 Link
#RTA-DH-25	in long (Hardened)		Chain—Stainless Steel
#RTA-PK-25	2.5 in long		
#RTA-PK-20	2 in long 1.5 in lon		
#RTA-PK-15			

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