HGAC Bicycle Pneumatic Tube Counter Tip Sheet

Pneumatic tubes or road tubes can be used to count bicycle traffic. Typical vehicle counters are used with some special settings to conduct off and on street bike counts. This tip sheet documents site selection and settings for the Time Mark traffic counter. In addition it will cover user types and best practices.

User Types and Best Practices

Bicycle volume counts are typically conducted for 24 hours a day for seven days a week. An extra seven days of counts should be conducted if any inclement weather or special events occur during the original time period. Time of day variations provide an insight to the types of riders. Recreational riders tend to be in the early morning, evening, and on weekends and holidays. Commuting riders tend to be during the weekday morning and afternoon peak periods. Utility trips can be any time of day or day of week, as they are typically quick shopping trips or short errands.

There are several bicycle rider types:

- A (Advanced) – Experienced riders who can operate under most traffic conditions
- B (Basic Bicyclists) – Casual riders including adults and teenagers who are less confident of their ability to operate in traffic without special provisions for bicycles
- C (Children) – Pre-teen riders whose roadway use is initially monitored by parents

Many times a facility caters to the trip type or rider type. Almost all riders feel comfortable on a multi-use trail and typically only the advanced riders feel comfortable on a bike lane on a major arterial.

Site Selection

The site selection should be based on what is needed for the type of study being conducted. Some counts are done for operations and others for planning purposes. Count location should be based on the group of riders targeted for the count (recreational, commuting, utility), and sites should be in a level tangent area to avoid turns and stopping on the road tubes.

Urban Site Location

There are several urban bike facility types:

- Trail / Multi Use Path
- Bike Lane and Cycle Tracks
- Shared Lane “Sharrows” (mixed traffic - bikes and motor vehicles)

The data recording setups are slightly different if you are counting mixed traffic versus only bikes. In all cases you should determine a location on a level straight away. Ideally, bicycles should be counted separately from motor vehicles. So if you are counting on a street with a bicycle lane, have one set of tubes on the bike lane and one set across all lanes. This cannot be done on a Shared Lane facility.

Time Mark Traffic Counter Settings

There are two locations where settings need to be adjusted. The first is in the counter equipment hardware (counter box). When you have the VIAS software running and are connected to the counter, you should see the screen depicted in Figure 1. On this screen SELECT the "Counter Setup" button on the left, you should then see the screen shown in Figure 2. On this screen, SELECT the "Advanced" button on the right side of the screen. The Advanced Counter Settings dialogue box will appear (as shown in Figures 3 and 4).

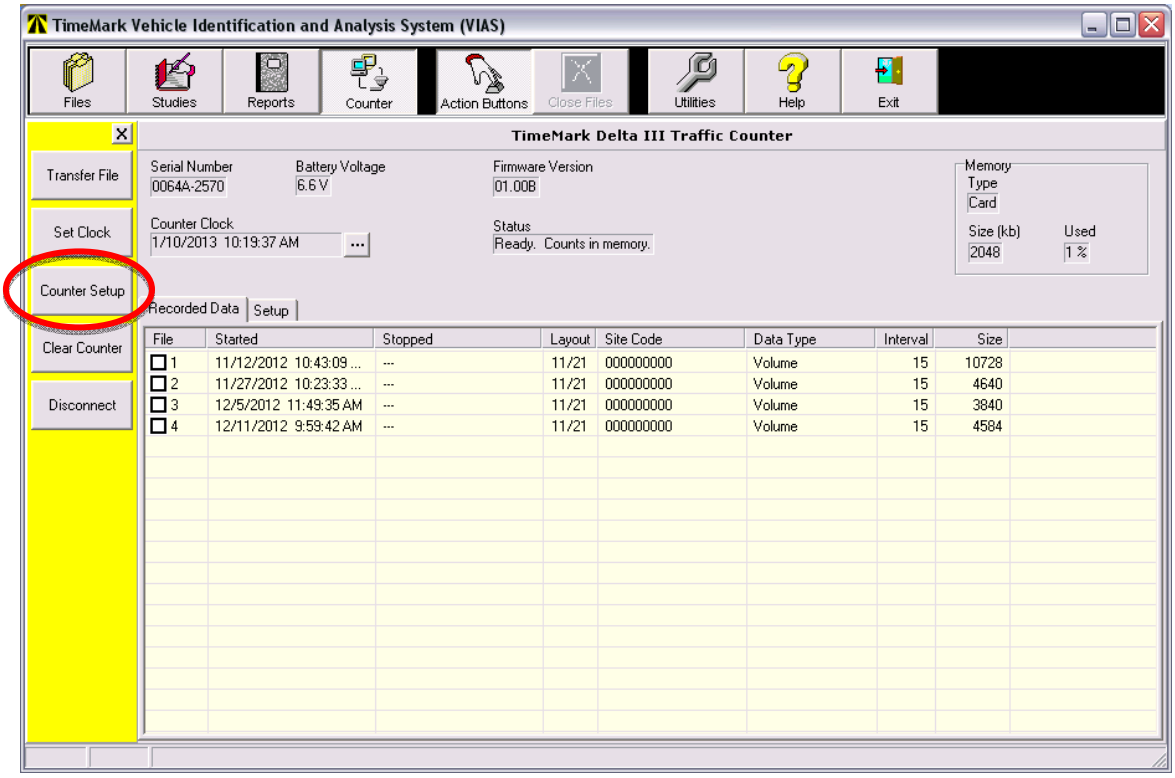

Figure 1. TimeMark VIAS Hardware Settings

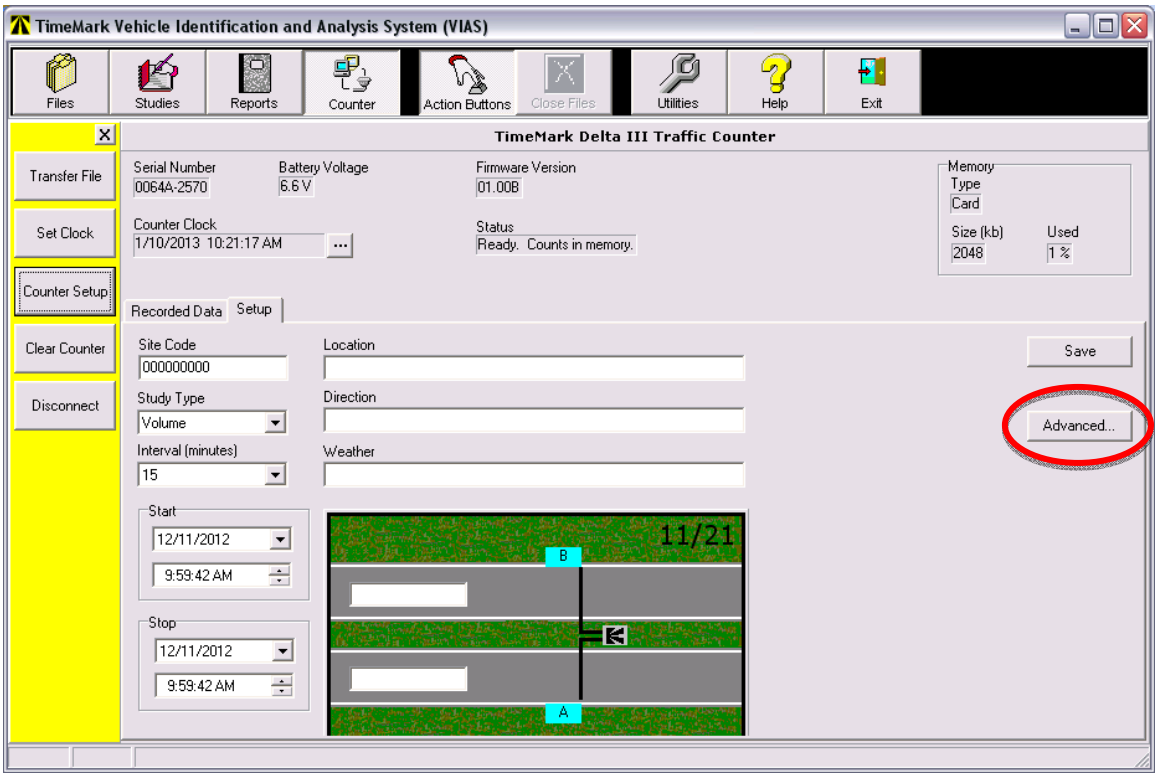

Figure 2. TimeMark VIAS Hardware Settings

The counter hardware settings shown in Figure 3 are used for bicycle counts only (not motor vehicles):

- Dead Time = 20
- Sensitivity/Threshold = 15

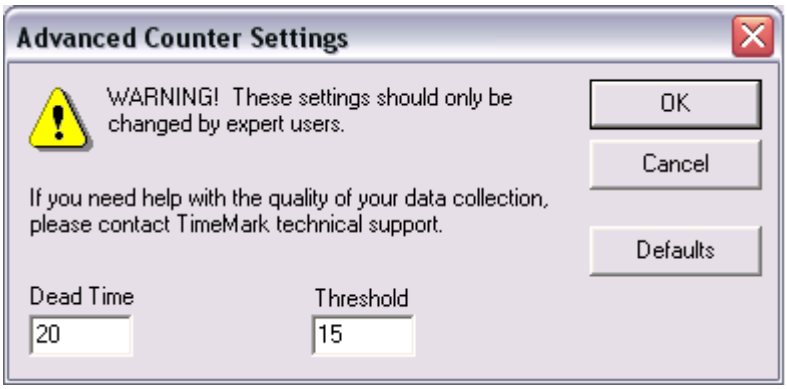

Figure 3. TimeMark Hardware Advanced Counter Settings for Bicycle Setup

These settings are changed by connecting to the counter and changing settings on the counter itself. Normally, we use different settings as shown in Figure 4 for counting typical motor vehicles on roads; these settings are:

- Dead Time = 10
- Sensitivity/Threshold = 30

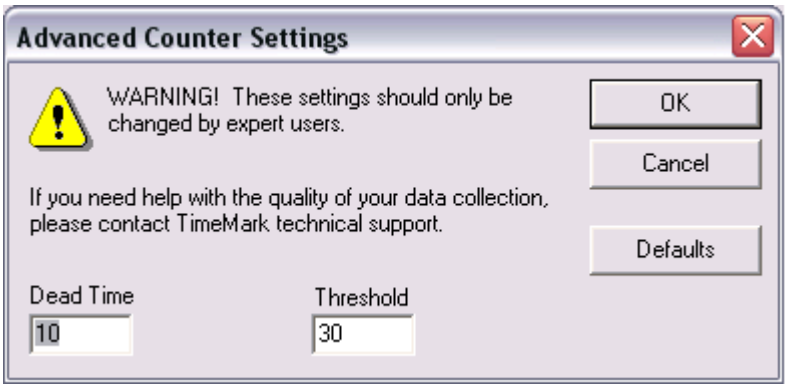

Figure 4. TimeMark Hardware Advanced Counter Settings for Vehicle Counts

Note that these settings are based on the Delta III Classifiers – the newer NT versions do not allow a numeric value of 1-100 to be used for Threshold/Sensitivity. Instead, a value from 1-5 is used, and this does not allow for a full range of adjustment. The normal sensitivity for motor vehicles with the NT is "1 - High". Also, note that if these bike hardware settings are used on a typical roadway to count motor vehicles, the counts will likely be very high due to double-counting caused by a lower sensitivity threshold and longer dead time such that extra (double) hits are not excluded.

The tube setup for bicycle counts always has a six foot spacing for tube pairs. When using a 2-tube setup, Setup 51 is used, and the A & B tubes go across a bike lane or sometimes across a bike lane and vehicle lane. Setup 67 can also be used utilized to collect more robust data for certain lane configurations. In this setup, four tubes are used; tubes A & C extend across the bike lane and tubes B & D extend across the bike lane and vehicle lane(s). Using tubes of equal length is very important because of the shorter time between pulses (caused by shorter axle spacing and close proximity of the bike lane to the counter box). Make sure to have all tube pairs (A & C and/or B & D) identical in length within 2 inches. Generally, shorter tubes are preferred for bikes, as it is thought that the weaker bike air pulse may get lost along a long tube; however, observation has shown this is not much of a problem for tubes up to 50 feet in length.

When downloading and processing the data, use certain system settings found in VIAS under Utilities – System Settings – Analysis as shown in Figure 5. Standard layout is:

- Min Speed = 5 mph
- Max Speed = 100 mph
- Max Accel/Decel = 5 mph/s
- Software Dead Time = 10 Ms.

These default settings work well for vehicles and for the most part they are sufficient for bicycles, particularly if you are counting mixed traffic. If you are trying to count a bicycle only lane, a slight adjustment of these settings may work a little better. The adjusted bicycle settings as shown in Figure 6 follow:

- Min Speed = 5 mph
- Max Speed = 50 mph
- Max Accel/Decel = 5 mph/s
- Software Dead Time = 40 Ms.

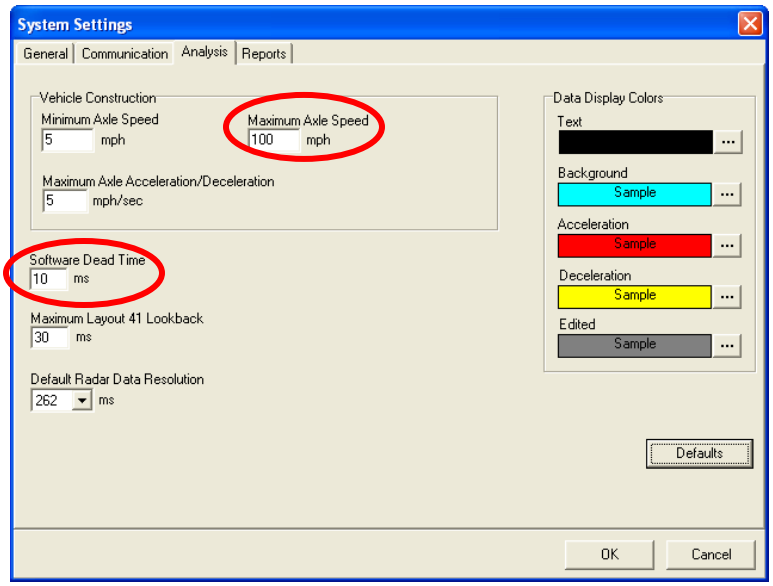

Figure 5. Time Mark VIAS Traffic Counter Download Typical System Settings for Counting Motor Vehicle Traffic.

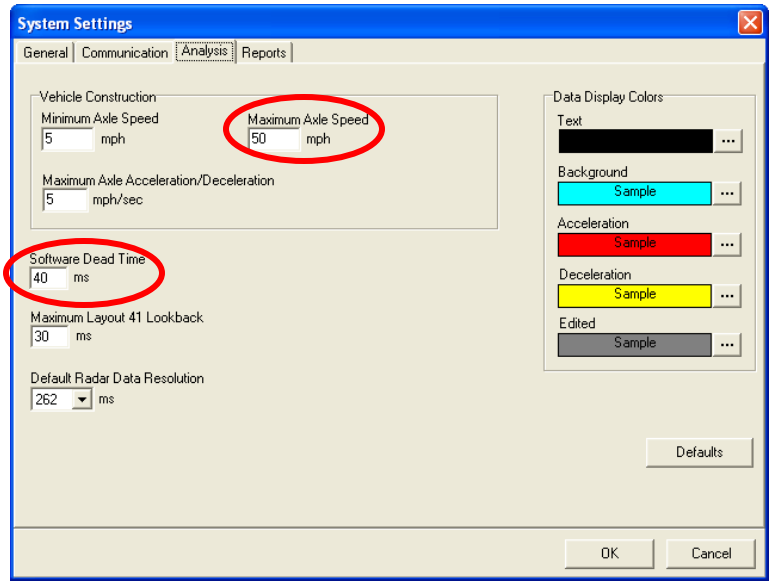

Figure 6. Time Mark VIAS Traffic Counter Download Typical System Settings for Counting Motor Vehicle Traffic.

It is a good idea to check the settings before going in the field to limit the exposure from a traffic safety perspective but to also ensure the settings are correct for the bike counters. It is also helpful to use some blue painters tape to label that counter as a bike counter so that when crews are deploying equipment the correct counter can be used for the correct type of count.
Using a one foot of stretch per 10 foot of tube length between securing devices is recommended.

Data Retrieval

Data can be retrieved in the field or the units can be brought in after data collection. Follow the procedures in the Time Mark Manual to retrieve data. Once the data is downloaded and saved, it will need to be processed as a classification count using a specific classification scheme developed specifically for bicycle counts.

After a few trial tests, we settled on a classification scheme called "TTI – Bikes (30)", which has 4 classes (bikes, cars, motorcycles, and pickups). Each class is defined by axle spacing as shown in the screenshot Figure 7.

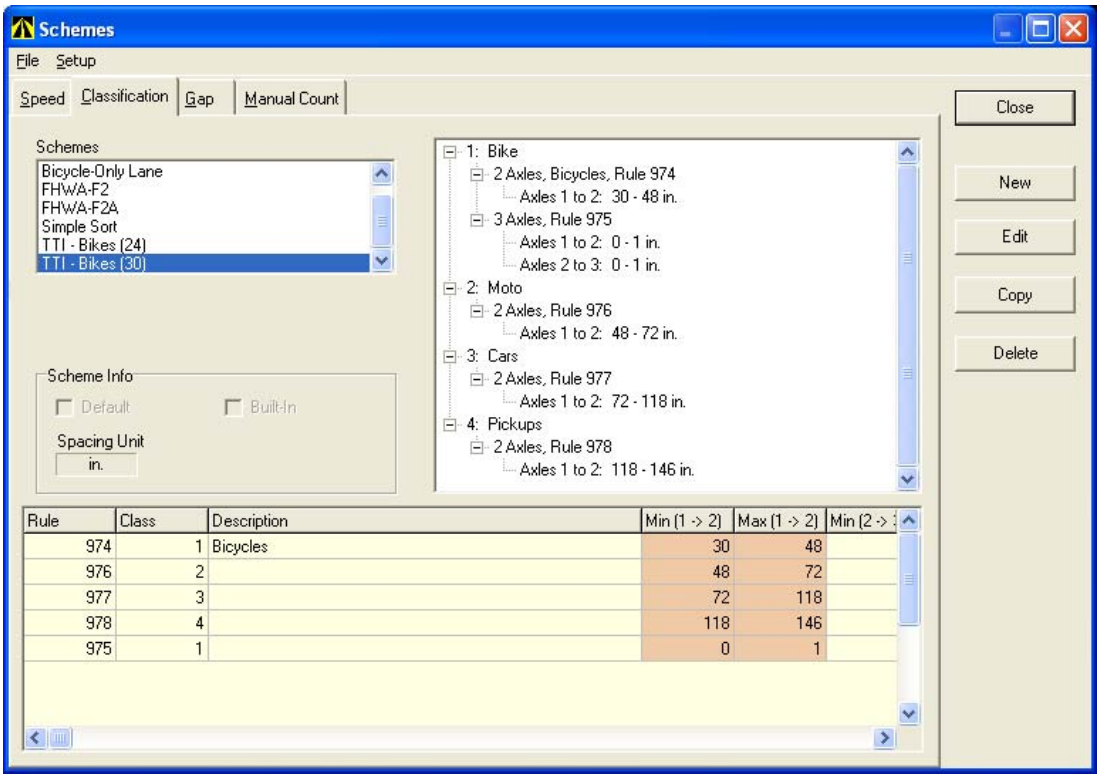

Figure 7. Time Mark VIAS Software Settings for TTI Bikes (30), Bicycle Classification Scheme.

This classification scheme must be created in VIAS the first time that it is to be used. Under Schemes – Classification, SELECT the "New" button, and add the various vehicle classes and axle rules to match what is shown in Figure 7. The four vehicle types and all axle rules shown in Figure 7 should be used exactly as shown. The 3 axle bicycle rule helps with a software requirement in VIAS so that the software does not exclude vehicles.

QAQC/ Data Storage

Once data is collected and retrieved a series of quality control checks should be conducted to ensure accuracy of the count. Import the data into a spreadsheet and use pivot tables and charts to check:

- Day of Week Plots
- Time of Day Plots
- Reasonableness of Data – High/Low

Once data has been through agency QAQC checks, a copy of the data should be sent to HGAC to be included in a region non-motorized count database.

Data should include:

- CSV Time Mark Electronic Data File (VIAS Export - Default Volume Format)
- Meta Data
    - Count Location – general description of the count area and the land use and activity and area around the count location.
    - Latitude and Longitude Coordinates
    - Key Map Page and Square
    - Direction of Travel by Tube
    - Type of Facility (bike lane, shared use path, other)
    - Adjacent traffic lane counts (always helpful)
    - Count Conditions – Typical, Special Event, Commuting, Recreation, Mixed, etc.
- Time Mark Count File Information
    - Start of Count Date; August 9, 2012
    - Start of Count Time; 14:15
    - Sensor Layout; 51
    - Location; Heights Blvd. Bike Lane - North of 17th Street
    - Direction; Northbound
    - Weather; Clear and Hot