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Questions concerning this warranty or any JAMAR Technologies, Inc. product should be directed by mail or telephone to:

JAMAR Technologies, Inc.
1500 Industry Road, Suite C
Hatfield, PA 19440
215-361-2244

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If you have any questions about the use of the TRAX RD Plus, please call the following number:

215-361-2244

Monday - Friday 8:00 AM to 5:00 PM Eastern time

You may also contact us by e-mail at:

sales@jamartech.com

Address any correspondence to:

**JAMAR Technologies, Inc.
1500 Industry Road, Suite C
Hatfield, PA 19440**

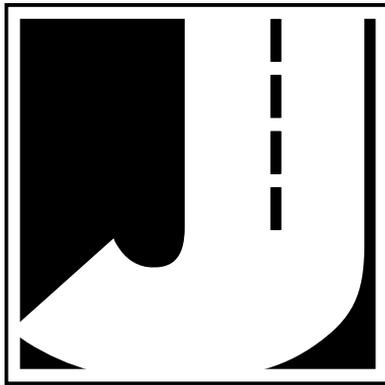
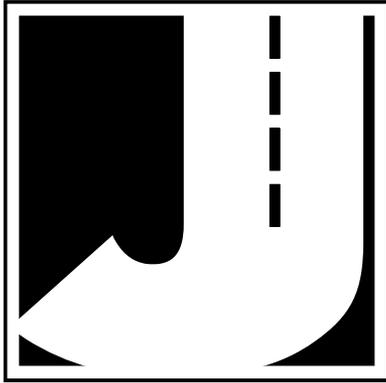


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Quick Setup Guide for the TRAX RD Plus

1. Turn the TRAX RD Plus ON.
2. From the Main Menu, **TAB** to “STAT” and hold down the **DO** key. Check the battery voltage (bat:X.Xv). For longer studies (week or more) the voltage should be at least 6.4. It can be less for shorter counts, but should not be below 6.1. Release the **DO** key when finished checking.
3. **TAB** to “Utilities” and press the **DO** key once. **TAB** to “Defaults” and press the **DO** key once.
4. **TAB** to “Space” and press the **DO** key once. Enter the spacing of your tubes for the study. This is only required for class, speed or gap types of studies. All of these studies require 2 ft. Hit the **DO** key when your selection is correct.
5. Hit the **DO** key twice with “Exit” flashing to return to the main menu. The default settings will remain stored in the counter for all future counts. You will not need to set them again unless you are going to do a different type of study.
6. From the Main Menu, press the **DO** key when “Count” is flashing.
7. Select a tube layout. Refer to the descriptions on the TRAX RD Plus or to Chapter 5 for the appropriate selection. **TAB** to your selection and press the **DO** key to select it.
8. You will then be prompted to select a site code. Press **DO** with “Yes” flashing to enter one or press **DO** with “None” flashing to not use a site code.
9. Press **DO** with “Start” flashing to begin your study!



Chapter 1

Introduction to the TRAX RD Plus

What is the TRAX RD Plus?

The TRAX RD Plus is an automatic traffic recorder designed and built by JAMAR Technologies, Inc to gather time-stamped raw data. It is designed for ease of use, but contains many options and features that are needed for comprehensive traffic data collection.

The TRAX RD Plus can store up to 150 different studies. It stores the type of study done, the date and time, a site code and the data for the study. It can also store GPS information. At any convenient time, you can transfer the data to your computer or a data module through the RS-232 serial port and process the data. Reports for volume, class, speed and gap can be generated using JAMAR's TRAXPro software.



How is the TRAX RD Plus powered?

The TRAX RD Plus is powered by a rechargeable lead gel battery. The solar panel also provides power when in the field, which extends the time before the battery needs to be recharged. Depending upon use, batteries may last for several months before they need to be recharged manually. The TRAX RD Plus displays the battery voltage when it is first turned on. This allows you to determine if there is enough battery power to complete a study. Generally, battery voltage should register at 6.3 VDC or higher for a full charge. Refer to Chapter 6 *Battery Care* for more information on battery maintenance.

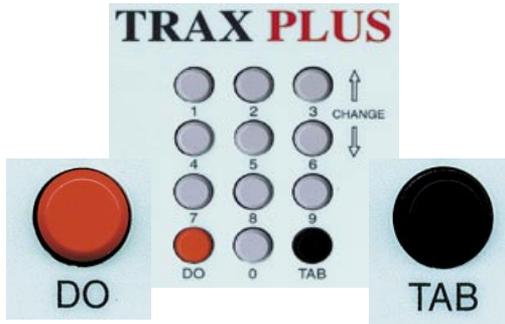
POWER ON, DO and TAB Functions



OFF/ON

An OFF/ON switch on top of the front panel is used to turn the unit on or off. A four line by 20-character display helps you select the proper entries. All options are clearly displayed, with the currently selected option flashing. The bottom two lines of the display are used to explain the option that is highlighted.

Two buttons are all that are used to move from menu to menu, and to select from the various options shown on the display. One key (TAB) is used to move the highlight to the option you want, and another is used to implement it (the DO key). In general, you press the TAB key until the option you want is flashing, and then press the DO key. If you move the highlight too far and overshoot the desired option, just keep pressing the TAB key until it is re-selected.



Before You Do a Study

Before you attempt to collect important data with the TRAX RD Plus we strongly recommend that you familiarize yourself with both the operation of the TRAX RD Plus and how to properly install your road tubes. Few things are more frustrating than trying to resolve problems when working on a tight deadline or with critical data.

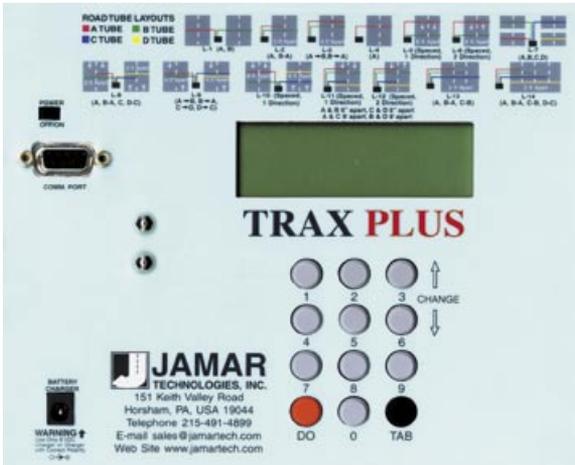
Whenever possible, we recommend that you perform a test study if you are new to the TRAX RD Plus or are planning to collect data that you have not in the past. This will help you become comfortable with the operation of the equipment and how the data is collected, which should make things easier when you have to do a real study.

Chapter 2

Operation of the TRAX RD Plus

Start-up Screens

A four-line, 20-character LCD display, located in the middle of the TRAX RD Plus' front panel, is used to display current options and status.



NOTE: The display of the TRAX RD Plus has a power-saving feature that turns off the screen if the unit has not been disturbed for several minutes. To bring the display back up, simply hit any of the gray keys on the keypad.

After you power on the TRAX RD Plus the sign-on screen is displayed. This shows the version numbers of the firmware in the TRAX RD Plus on the bottom line. The unit uses dual processors so the firmware version of each processor is shown.

The second screen, as shown below, displays the tube spacing that is set in the TRAX RD Plus, the amount of memory remaining for new studies, the number of counts stored in memory, the status of the battery and the time and date that is set in your TRAX RD Plus.



After a few seconds, the screen clears and the Main Menu is displayed.

Main Menu

COUNT UTILITIES STAT
******* MAIN MENU *******
Press DO to Count.
TAB changes option

The Main Menu is the starting point for all of the options in the TRAX RD Plus. The options on this screen are:

COUNT Program a new count.

UTILITIES Perform miscellaneous operations that include the option to download to a module, clear the counter, program the default settings, set the time & date, restore default tables and perform diagnostic tests on the TRAX RD Plus.

STAT Select to display available memory, counts stored, battery power, and time/date. This is the same screen as the second one shown after turning on the TRAX RD Plus. TAB until STAT is flashing then hold the DO key down to review the information on this screen. Approximately five seconds after releasing the DO key, the screen will return to the Main Menu.

Utilities Menu **Main Menu > Utilities**

The Utilities Menu contains an assortment of operations that are necessary and/or helpful to the operation of the TRAX RD Plus. Press the TAB key until Utilities is flashing, then press the DO key to enter this menu. When you have selected UTILITIES from the Main Menu the screen shown here is displayed.

```
MODULE CLR DEFAULTS
T/DATE SYS TEST EXIT
Data Module commands
Press DO key
```

Module **Main Menu > Utilities > Module**

The Module option allows you to use a JAMAR data module with the TRAX RD Plus. You can check the status of a module, erase a module, or download data into a module by connecting to the COM port on the TRAX RD Plus using the module cable.

```
STATUS WRITE ERASE
EXIT
Status: Data Module
Press DO Key
```

The module can hold multiple files from several different counters. With this feature you can download all of your data in the field and only have to transport the module back to your office for downloading into the software.

Status **Main Menu > Utilities > Module > Status**

This selection allows you to check whether there is data currently stored in the module.

Write **Main Menu > Utilities > Module > Write**

This selection allows you to download data from your TRAX RD Plus into the data module. You can choose to download all studies, or just new studies created since you last downloaded. You are asked to verify this selection several times to make sure this is what you want to do.

Erase **Main Menu > Utilities > Module > Erase**

This selection allows you to clear any data stored in the module. You are asked to verify this selection several times to make sure this is what you want to do. Once the data has been erased it cannot be restored.

Clear (Clr)

Main Menu > Utilities > Clr

The Clear option allows you to clear the memory of all data. You are given two chances to change your mind before data is removed from the nonvolatile memory.

Defaults

Main Menu > Utilities > Defaults

Note: The nonvolatile memory in the TRAX RD Plus will retain the default settings you program. These settings will be used for future traffic studies without having to re-enter the DEFAULTS menu.

Interval (Int)

Main Menu > Utilities > Defaults > Int

The Interval selection only applies to data collected in Volume Only mode. It allows you to internally store data in 5, 10, 15, 30, or 60 minute intervals. Use the TAB button to select INT and press DO. Use TAB to

highlight the number of minutes in which you would like the data stored. With the number flashing, press DO.

INT SPACE DT DTX DBV EXIT Select time interval for Binned Data

Space

Main Menu > Utilities > Defaults > Space

This allows you to set the proper spacing for the tube layout you will be using. Use the TAB button to select SPACE and press DO. Use the keypad to enter your correct tube spacing. When finished, press DO. **Note:** We recommend a minimum of a two foot spacing when collecting data for class, speed or gap analysis.

DT/DTX

Main Menu > Utilities > Defaults > DT

DT stands for Dead Time (also known as D-Bounce) which is the amount of time the air switch in the TRAX RD Plus will wait after it has recorded a pulse before it will accept another one. The DTX selection is a DT multiplier that allows you to use large dead times.

Use the TAB button to select DT and press DO. Use the keypad to enter in the DT and press DO when completed. Thirty-five ms is the normal setting

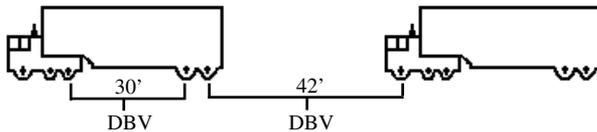
The maximum DT setting is 99 ms. However, if you need to use a longer time, the DTX selection allow you to set the dead time up to 990 ms. This setting is generally only used for very low speed counting. Refer to Chapter 7 for more information.

DBV

Main Menu > Utilities > Defaults > DBV

This selection allows you to set the default Distance Between Vehicles. Enter, in feet, the longest distance between consecutive axles of the largest vehicle you would expect to see at the study site. The TRAX RD Plus will use this number to determine if two axles could be from the same vehicle or if the distance is great enough that the axles must be from separate vehicles.

Example: setting the DBV for 36 ft. tells the TRAX RD Plus that any axles spaced at over 36 ft. apart must be from separate vehicles. In the example from the following diagram, a DBV setting of 40 feet would tell the TRAX RD Plus the axles spaced at 30 feet could be from the same vehicle, but the axles spaced at 42 feet must be from separate vehicles.



Time/Date

Main Menu > Utilities > T/Date

This option allows you to program the date and time to be used in your TRAX RD Plus. To use this option, press TAB until T/DATE is flashing and then press DO. Set the current time and date for your location starting with the hour. Use the Change buttons (3 and 6) to correct the settings as required. Use the TAB key to move from the hour setting to the minutes, then enter the correct number of minutes.

The same process can then be repeated to set the month, day and year. When completed, press the DO button. **NOTE:** The real time clock in the TRAX RD Plus uses a 24-hour military format; i.e. 5:00 P.M. is 17:00.

HR	MIN	MON	DAY	YR
14:06		02/	13	/06
Press		to change.		
Press DO to set date.				

System (Sys)

Main Menu > Utilities > Sys

This option allows you to program some of the system settings of the TRAX RD Plus. Like the Default settings, the System settings will be retained in the unit's non-volatile memory until changed.

**DATE UNITS PERM
FULLMEM SPLIT EXIT
Restore Default
Vehicle Table**

Date

Main Menu > Utilities > Sys > Date

This selection allows you to determine the format of the date used in the unit. The options are USA (month/day/year) or World (day/month/year).

Units

Main Menu > Utilities > Sys > Units

This selection allows you to determine the format of the units used in the TRAX RD Plus. The options are English or Metric.

Perm

Main Menu > Utilities > Sys > Perm

This selection allows you to determine whether the TRAX should be configured for mobile use, or for permanent location use. This setting affects how the unit can be downloaded.

When set for Mobile the TRAX will disable the serial port when it goes into power saving mode (the display turns off), which saves power. To be able to download you must then wake up the unit by pressing any of the keys. When set for Permanent, the serial port is never disabled so data can be downloaded remotely. We recommend that you leave the setting for Mobile unless you are using the TRAX at a permanent location and retrieving data remotely.

Fullmem

Main Menu > Utilities > Sys > Fullmem

This selection allows you to determine how the TRAX should respond if the memory is filled. The options are to Stop recording data or to Overwrite the beginning of the memory. In most cases you will never come close to filling the entire memory of the unit. The TRAX RD Plus' 16 MB of internal memory will record over 6 million vehicles before the memory is filled.

Split

Main Menu > Utilities > Sys > Split

This selection allows you to determine whether data should be recorded in continuous mode or if a new file should be started at midnight every day. The Never option tells the unit to never split the study while the Daily option tells it to split the study on a day by day basis. The Daily option is normally only used if the TRAX is set up at a permanent location, or if data is being retrieved while the unit is still recording data.

TEST

Main Menu > Utilities > Test

This option allows you to perform diagnostic tests on various features of the TRAX RD Plus to be sure they are operating correctly.

MEMORY DISPLAY KEYS
S.PORT TUBES EXIT
Test internal data
storage memory

Memory

Main Menu > Utilities > Test > Memory

The Memory test will check all memory locations in the unit's 8 MB memory. To perform the test, press DO while Memory is flashing and the TRAX RD Plus automatically starts testing the memory. The test does not affect any data that is stored in the unit.

Display

Main Menu > Utilities > Test > Display

The Display test allows you to view all segments of the liquid crystal display to be sure the display has not been damaged. To test the display, press DO after each of the screens that are shown.

Keys

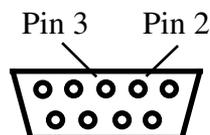
Main Menu > Utilities > Test > Keys

The Keys test allows you to check the functionality of each of the buttons on the keyboard. When in this test mode a simulation of the 12 keys is shown on the left side of the display. As you press a key an 'X' should briefly appear at the correct location in the simulation. Pressing the DO key will exit you from the test.

S. Port

Main Menu > Utilities > Test > S. Port

The Serial Port test allows you be sure that the port used for retrieving data from the TRAX is working correctly. To perform the test correctly the 2 & 3 pins of the port must be looped together. A straightened paper clip can be used to perform this test by carefully inserting one end into the 2 pin and the other end into the 3 pin.



NOTE: This test will fail if a test connector is not used properly. The cable used for downloading data cannot be used as a test connector.

Tubes

Main Menu > Utilities > Test > Tubes

The Tubes test allows you to check the quality of the air pluses that are being received by the TRAX from the road tubes. This test should be performed once the TRAX is in the field and connected to the road tubes to be used for the study. The test lets you to identify potential problems with the tubes, enabling you to take corrective action.

When a pulse is received while in test mode, the strength of the pulse is shown for about a second on the display of the TRAX. Pulse levels are broken down into 4 categories: 'X' for Poor, '-' for Fair, 'G' for Good and '!' for Excellent. In the example shown here, the pulse strength is excellent for the A, C and D tubes. However, the pulse strength for the B tube is poor, indicating that the tube should be checked, and possibly replaced.

```
A:XXXX ----- GGGG!!  
B:XXX  
C:XXXX ----- GGGG!!  
D:XXXX ----- GGGG!!
```

Press the DO or TAB key to exit the tube test screen.

Count Menu

When you select Count from the Main Menu, you are given the option of the type of layout you would like to use.

Tube Layout Selection

A screen similar to the one shown here is displayed when in the Tube Layout Selection Menu.



The TAB key is used to move through the layouts. A description of the currently flashing layout is displayed on the bottom two lines. Refer to Chapter 5 *Road Tube Layouts* for a more detailed description of the individual layouts.

Listed below is the type of data that can be analyzed from each layout.

Volume Only

- 1 or 2 Road Tubes L1, L2, L3, L4
- 3 or 4 Road Tubes L7, L8, L9, L13, L14

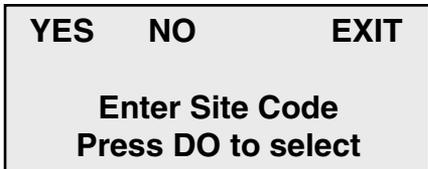
Volume, Class, Speed, Gap, Length & Following Distance

- 1 or 2 Road Tubes L5, L6
- 3 or 4 Road Tubes L10, L11, L12

Press DO when the layout you want to use is flashing. You will then be taken to the Site Code menu.

Site Code

The data in the TRAX RD Plus includes the date and time that the study was done, but no direct information on where the study was done. Correct use of the Site Code is a way for you to guarantee that the data you collected at a particular site was indeed collected there.



To enter a Site Code, press DO while YES is flashing. You then have the option of using either a numeric (numbers only) site code or an alpha-numeric (numbers, letters and symbols) site code.

Numeric Site Code

Numeric site codes can be one or two lines, with up to 20 characters on each line. Enter the value for the first line of the site code using the numbered key on the TRAX. Once done, press DO to move to the second line. Once the second line has been entered press DO and the code is stored. You are then returned to the Site Code selection screen, with the code you entered shown. Select OK to proceed to the Count Start-Up menu.

Alpha-numeric Site Code

Alpha-numeric site codes can be one or two lines, with up to 20 characters on each line. The alpha-numeric code can use numbers, lower case letters, upper case letters and/or symbols.

When you first enter the Alpha-numeric site code screen the first field is flashing, along with the OK selection. To enter a value, press the TAB key until the

field for numbers, upper case letters, lower case letters, or symbols is flashing. Use the Change keys (3 and 6) to scroll through the values for the option you've selected. Once the character you want is entered, press DO and the highlight will move to the next field.

0-9	A-Z	a-z	SYM	OK
- - Press DO for next - -				

Once the code you want has been entered, TAB to OK and press DO. You are then returned to the Site Code selection screen, with the code you entered shown. Select OK to proceed to the Count Start-Up menu.

Count Start-up Menu

The Count Start-Up menu allows you to immediately begin a count, check the status of the setup, or load GPS coordinates into the TRAX.

START STAT GPS
EXIT
Press DO to Start

Stat

When you select STAT from the Count Start-up menu, you are shown some summary information on the configuration of the TRAX.

L5: Two Equal Tubes
with spacing; 1 dir

DT: 35 ms

The first screen shows the tube layout selection and the Dead Time setting. Press the TAB key to see the current date and time as well as the Site Code. After you have tabbed through the available screens, you will be returned to the Count Start-up Menu.

GPS

This selection allows you to download latitude and longitude from a hand-held GPS unit into the TRAX. The TRAX RD Plus supports the NMEA protocol, which is a standard for the transmission of GPS data available in most GPS units.

To load GPS information into the TRAX, connect the GPS unit to the TRAX using the JAMAR GPS cable (also used with the data module) to link each unit's RS-232 serial port.

Receiving GPS Data
LAT:
LON:
Press DO to Accept

Some GPS units may require you send the data, other may automatically do so. In either case, if the information is properly sent you will see the latitude and longitude information appear on the TRAX's display. Press DO to return to the Count Start-up Menu.

Start

When you select Start from the Count Start-up menu, the TRAX RD Plus will begin recording data. You will be shown a screen that displays the data as it is being collected. There are several screens available for viewing while the TRAX RD Plus is collecting data. Press the TAB key to page through the available status screens.

Status Screens

The top line of this screen gives the layout that has been selected (L6) and the type of study being done (Basic). The next two lines represent the tubes that data is being recorded on (A, B).

```
L06 BASIC-DATA
A: *****
B: *****
CNT: 02 MEM:95% 6.4v
```

As the tires from an axle strike the tubes, an asterisk is recorded in the appropriate channel. The bottom line tells you what number count this study is (CNT:02), the percentage of memory available (MEM:95%) and the battery voltage (6.4v).

The top two lines of this screen tell you the layout selected and the how the tubes should be arranged for this study. The fourth line tells you what the dead time (or D-bounce) is set for (DT:25ms).

```
L6: Two Equal Tubes
with spacing; 2 dir

DT:25ms
```

The top line of this screen gives the date and time as they are set in the TRAX RD Plus. The next three lines provide information on the site code that has been programmed for the study.

```
07:13:12 04/13/06
SITE CODE:
3469788
```

Ending a Count

To end a count, turn the TRAX RD Plus off. The count will be stored in the TRAX RD Plus's internal memory. Additional studies can then be conducted with the unit. The TRAX RD Plus can hold up to 150 different studies in its memory.

There are also several other options that can be accessed by hitting the DO key while a study is in progress.

EXIT	MODULE	NEW
-------------	---------------	------------

The Module option allows you to access a data module while the study is in progress. Refer to page 2-4 for a more detailed description of the module options.

The New option will end the current study and immediately begin a new study with the same default settings.

The Exit option will return you to the Count Status screens.

Chapter 3

Downloading the TRAX RD Plus

Downloading a TRAX RD Plus

The TRAX RD Plus is designed to be downloaded to a computer or data module using its communications (serial) port. To properly download the unit you will need JAMAR's data analysis software, an available serial port on your computer, and a JAMAR universal download cable. The download cable uses a specific pin configuration. **Use of a standard serial cable can cause data to be lost or damage to occur to the TRAX.**

To prepare to download your data, connect the universal cable to a serial port on your computer. Some serial ports have 25 pins and some have 9. Generally, COM 1 is a 9 pin, COM 2 is a 25 or 9 pin. The ports may be labeled on the computer itself with COM 1 listed as 1 or A and COM 2 listed as 2 or B. The following tips should help you to avoid problems when download through a computer's serial port.

- 1) You must correctly identify what port you are plugging the cable into. The 25 and 9 pin connectors used for serial ports are also used for serial or parallel printers, mice, plotters, video cards and other devices. Just because your cable fits into a connector on your PC does not mean it is a serial port. Consult your computer instruction manual if you have any questions on which ports are serial ports on your computer.
- 2) Many computers have more than one serial port. You will need to know which serial port you are plugging the universal cable into. Serial ports are designated as COMx where x is a number from 1 to 16. You will need to know this number to download the unit.
- 3) Some devices that are plugged into a computer's serial port will not allow the TRAX RD Plus to download its data properly. These are devices that require a program (called a **device driver**) to be running in the computer at all times. These device drivers are very self-centered, and think that all the data coming into the serial port is for them. Digital cameras, mice, digitizer boards, PDAs and light pens are all devices that require these device drivers to be running. If you have to unplug a device from the serial port to plug your TRAX RD Plus in, or if you are using a switch box, be sure that the device does not have a driver running in memory.
- 4) If you have a conflict with another device on a serial port, or if your computer does not have a serial port, you can use a USB port by using a **USB to Serial Converter**. These devices allow serial peripherals, like

JAMAR equipment, to interface with a USB port. There are several of these devices available on-line and at computer stores. Go to the hardware support section of our web site (www.jamartech.com) for a link to one of these devices that we have tested and found to work well.

Once the universal cable is plugged into the computer, plug the **black** plug on the other end into the TRAX RD Plus. The TRAX will download all completed studies. If you have a count in progress that you would like to download you must end the count. Refer to page 2-16 for information on ending a count.

At this point, refer to your software manual for information on how to setup the software for downloading. Note that the TRAX RD Plus will automatically sense whatever baud rate you select in the software. The higher the baud rate, the faster your data will be dumped.

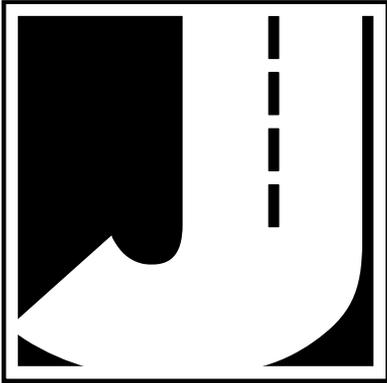
While the data is being downloaded, the display on the TRAX RD Plus will show:



```
TRANSFER IN PROGRESS
COUNT:01
BLOCK:000001
Sending Data...
```

The computer will show the data being received in blocks. Each block represents 4096 bytes of data. Once the data has been transferred to the computer, the TRAX display will return to the screen it was on before the download began.

Downloaded counts will remain in the memory of the TRAX until they are cleared. Refer to page 2-5 for information on how to clear the memory. **Do not clear the memory of the TRAX until you are certain that the data has been successfully downloaded to you computer.**



Chapter 4

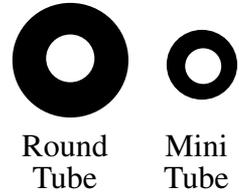
Road Tube Installation

Installing Road Tube

Proper road tube installation is very important for collecting accurate data with your TRAX RD Plus. The road tube and the TRAX RD Plus' air switches comprise the sensing device for the unit. As with all receivers, the sensor has to be functioning properly to record reliable information. With this in mind, examine your installations carefully and be absolutely certain that your unit is recording data as programmed.

Road tubes should be replaced on a fairly consistent basis. Older tube will eventually develop splits that can allow water to enter. When an air pulse is received, this water can be forced back into the unit's air switch, potentially causing serious damage. Do not risk expensive repair bills by trying to squeezing a few extra studies out of old tube. One rule of thumb is to replace tubes after 30 days of use.

Actual Size



The following installation instructions cover round tube (.25 inside diameter (ID) by .60 outside diameter (OD)), and mini-tube (.187 ID by .365 OD). These directions will assist you in placing your road tubes correctly on the road surface with confidence and a minimum of effort.

A slideshow demonstration of the proper techniques for installing road tubes can be viewed on the JAMAR web site at:

www.jamartech.com

We recommend viewing this demonstration if you are new to the process of installing road tubes, or would like additional tips on installation.

Tube Length

Tube length is **very critical** in order to record accurate vehicle data. The following guidelines should be followed for all studies regardless of simplicity. The lengths listed for each study below have shown to provide the best results based on extensive testing.

L1, L3, L4, L5, L6, L7, L9, L10 (Long tube setups)

To encompass all types of vehicles and speeds, a tube length of sixty (60) feet is recommended for round tube, fifty (50) feet for mini tube. These lengths should satisfy all requirements for normal street, road, highway and interstate traffic patterns.

L2, L8, L11, L12, L13, L14 (Short tube, long tube)

To ensure the pulses from the road tubes arrive at the counter in the proper order, the tube length must be the same from the edge of the road to the TRAX RD Plus. This will ensure that the pulse from the short tube arrives before the pulse from the long tube.

Example: You are using mini tube to install an L11 layout across two lanes of traffic and each lane is twelve feet wide. In order to ensure that the distance the air pulse has to travel from the edge of the road to the counter is the same for all tubes, you should use 38 feet for the short tubes (A & C) and 50 feet for the long tubes (B & D). The short tubes will be installed over only one lane (12 feet), leaving 26 feet of tube back to the TRAX RD Plus. The long tubes will be installed over two lanes (24 feet), but since they are 50 feet long, you will still have 26 feet back to the TRAX RD Plus. For round tube, the lengths would be 48 feet for the short tubes and 60 feet for the long tubes. **It is very important that the air pulses travel over the same distance when two or more tubes are used to record data.**

To accommodate the required length of tube, brass splices may be used. The splices are approximately three (3) inches long, hollow and do not restrict the flow of air. Do not use the splices on the roadway itself, only on the section of tube after the clamp nearest the TRAX RD Plus.

Tube Placement

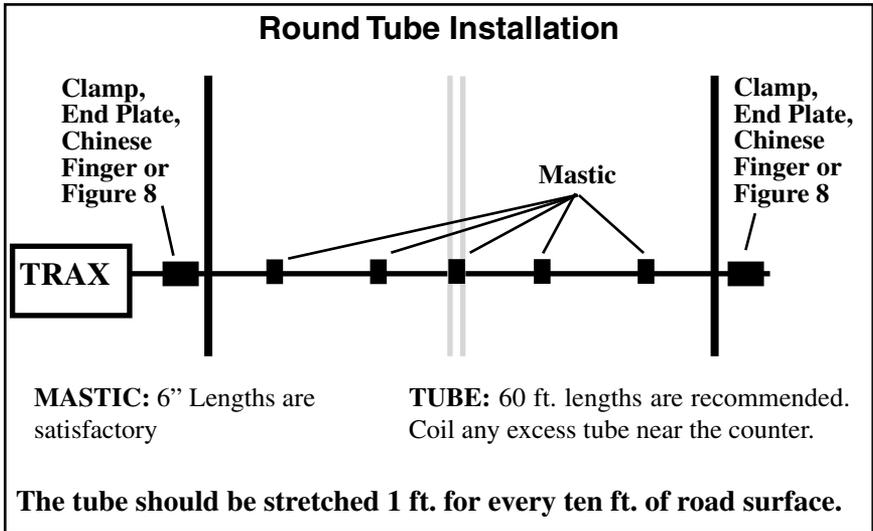
Tubes should be placed exactly perpendicular to the flow of traffic to prevent double counting. When using two or more tubes that must be set at specific distances from each other, always use a tape measure or ruler to measure from the center of each tube to determine the proper spacing. In short tube, long tube setups, the short tube should be installed to the zone line (center of the highway). Observe traffic to be sure that vehicles in the outer lane are not coming in contact with the short tube.

Installation

Round Tube (.25 ID x .60 OD)

Round tube should be stretched one foot for every ten feet of roadway when being installed. Each tube should be secured at each end of the roadway by using a galvanized C-Clamp, Chinese Finger, Figure 8 Grip or an End Plate. Whichever is used, ensure the proper nail size is used. Use the longer nail size (normally 2 1/2 inch or longer) in hot weather due to the softness of the asphalt. In cold weather applications, the asphalt becomes harder, making it more difficult to drive in the nails. In this situation, smaller nails (1 1/2 inch) can be used.

Next, secure the tube on the traveled portion of the road surface by using mastic. As a minimum, one piece of mastic should be placed on the zone line (middle of the road) and two pieces of mastic should be placed in each lane. Additional mastic should be used as deemed necessary to prevent the tube from moving when stuck by a vehicle.

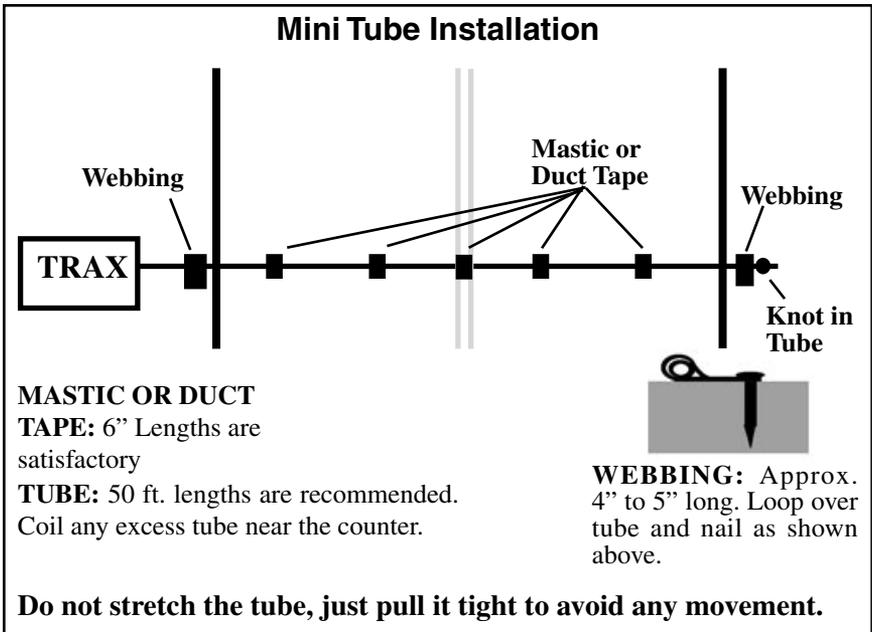


Mini-Road Tube (.20 ID x .375 OD)

Since mini tube is smaller and lighter than standard round tube, less hardware is required to install the tubes. Also, mini tube should **not** be stretched when installed, just placed on the road.

Webbing can be used to secure the tube at each end of the roadway. You may tie a knot at the far end of the tube instead of using an end plug or PK nail. Since the mini tube is light and low profile, you may use duct tape or two-inch mastic to secure the tube to the roadway. Generally, three pieces of tape/mastic are sufficient. To reduce wear and/or breakage of the tape, do not install the tape in the path of the vehicle tires.

When installing a short tube, long tube configuration (L2, L8, L11, L12) you may install both tubes completely across the road and tie a knot midway of the half tube. This eliminates nailing the half tube on the center line which can create a safety problem for installation personnel.



Checking for Accuracy

Once your tubes are installed and you are collecting data, observe the traffic as it is being recorded to be sure everything is working correctly. If possible, check the tubes periodically during the study to ensure they have not been damaged and data is being recorded as programmed.

Upon completion of your data collection, remove the tubes, clamps, nails and anything else that may be of danger to the motorists. The mastic may be hard to remove in some instances, especially in hotter weather. In those cases, it may be left on the highway and eventually it will blend into the asphalt from the flow of traffic.

Chapter 5

**Road Tube
Layouts**

Road Tube Layouts for the TRAX RD Plus

The TRAX RD Plus is equipped with fourteen pre-programmed tube layouts for recording traffic data. These are designated as L1 through L14 and represent the most common types of layouts used to record traffic data.

The following are descriptions of each of the layouts, and the type of data that can be collected with each. Each layout is different, but there are some common principles that should be used with any layout that is chosen.

- The condition of the road tubes, the manner in which they are installed and the length of the tubes are all critical to achieving good results. Refer to Chapter 4 *Road Tube Installation* for more information on this.
- A tube length of sixty (60) feet is recommended for round tube, and a tube length of fifty (50) feet is recommended for mini tube.
- In all tube setups of more than one tube, the tube length from the end of the road to the counter must be the same for all tubes.
- In all short tube, long tube layouts, the vehicle must strike the short tube first.
- To collect class or speed data, a minimum of two feet of tube spacing is required to achieve accurate results.
- Data can be collected with any of the tube layouts, since basic data is essentially a collection of all the sensor activations on an individual basis. However, to collect accurate data for class or speed, a minimum of two feet of tube spacing is required. If a layout says volume only, that is the only information you will be able to accurately get from it. For example, you can collect data with an L1 layout, but you will only be able to get volume or gap data, not class, speed, etc.

The diagrams for the following layouts assume a length of twelve feet per lane of traffic and are shown for round tube and mini tube.

Layout: L1 - Volume

Layout Type: Road Tubes

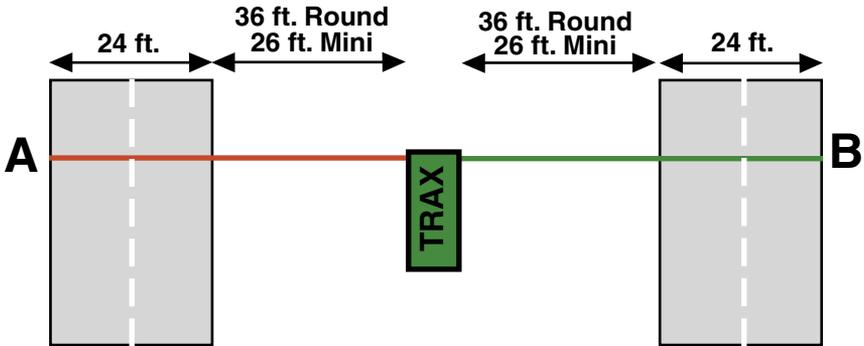
Sensors Used: 2 Road Tubes

Spacing: None

Data: Volume, Gap

Channels: 2 Channels, A, B

In this layout, channel “A” and channel “B” record independently.



Layout: L2

Layout Type: Road Tubes

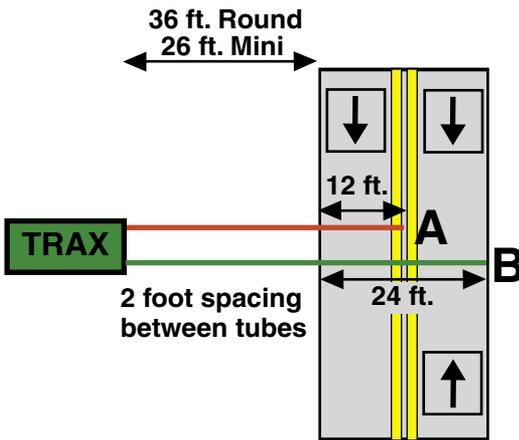
Sensors Used: 2 Road Tubes

Spacing: 2 Feet

Data: Volume, Gap

Channels: 2 Channels, A, B-A

In this layout, channel “A” and channel “B” record independently. The A tube is extended over one lane while the B tube is extended over two lanes.



Layout: L3

Layout Type: Road Tubes

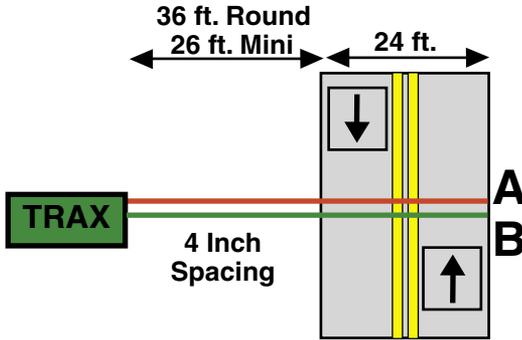
Sensors Used: 2 Road Tubes

Spacing: 4 Inches

Data: Volume, Gap

Channels: 2 Channels, A to B, B to A

In this layout, both tubes (A and B) are extended across the lanes to be counted.



Layout: L4

Layout Type: Road Tubes

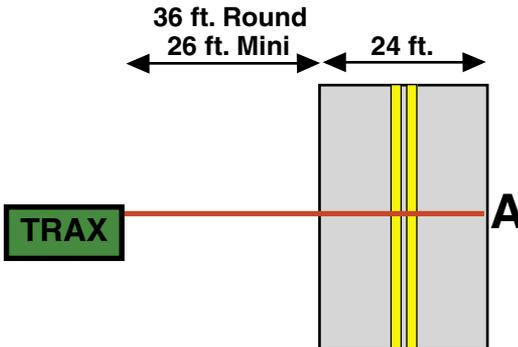
Sensors Used: 1 Road Tube

Spacing: None

Data: Volume, Gap

Channels: 1 Channel, A

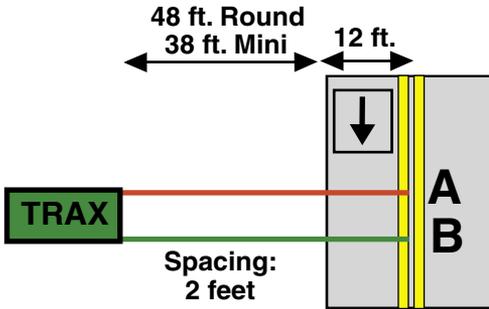
In this layout, one tube is extended across the lanes to be counted. This layout can be used with single direction or bidirectional traffic; however, there is no lane separation.



Layout: L5

Layout Type: Road Tubes
Sensors Used: 2 Road Tubes
Spacing: Two Feet
Data: Class, Speed, Gap, Volume
Directions: 1 Direction, A to B

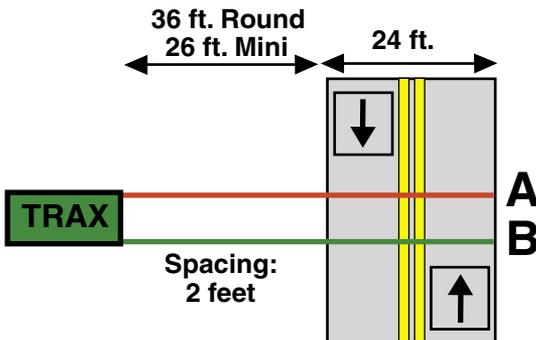
In this layout, both tubes (A and B) are extended across the lane to be studied. Channel A and channel B record dependent on each other. The tubes should be spaced two feet apart and be of equal length.



Layout: L6

Layout Type: Road Tubes
Sensors Used: 2 Road Tubes
Spacing: Two Feet
Data: Class, Speed, Gap, Volume
Directions: 2 Directions, A to B, B to A

In this layout, both tubes (A and B) are extended across the lanes to be studied. Channel A and channel B record dependent on each other. The tubes should be spaced two feet apart and be of equal length.



Layout: L7

Layout Type: Road Tubes

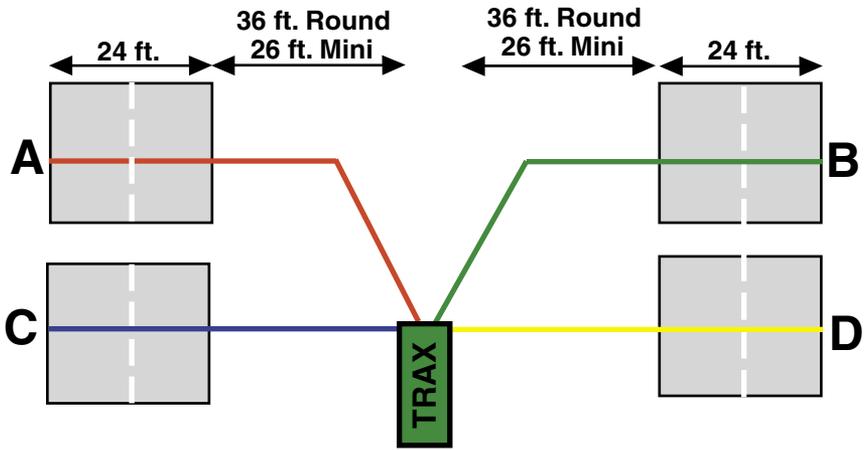
Sensors Used: 4 Road Tubes

Spacing: None

Data: Volume, Gap

Channels: 4 Channels, A, B, C, D

This layout is the same as the L1 layout, but with four tubes over four separate lanes rather than two tubes over two lanes.



Layout: L8

Layout Type: Road Tubes

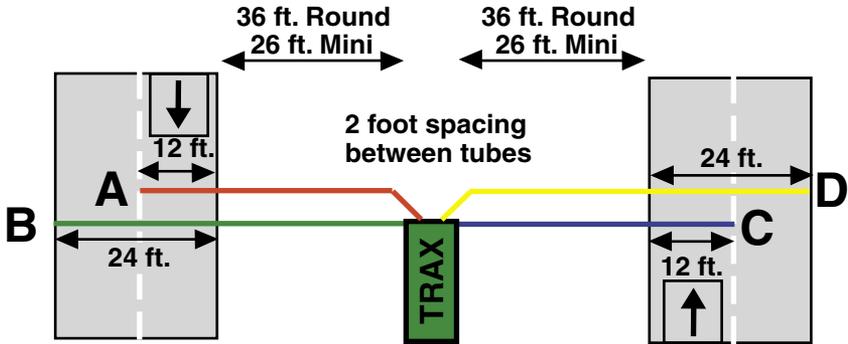
Sensors Used: 4 Road Tubes

Spacing: Two Feet

Data: Volume, Gap

Channels: 4 Channels, A, B-A, C, D-C

This layout is the same as the L2 layout, but with four tubes over four lanes rather than two tubes over two lanes.



Layout: L9

Layout Type: Road Tubes

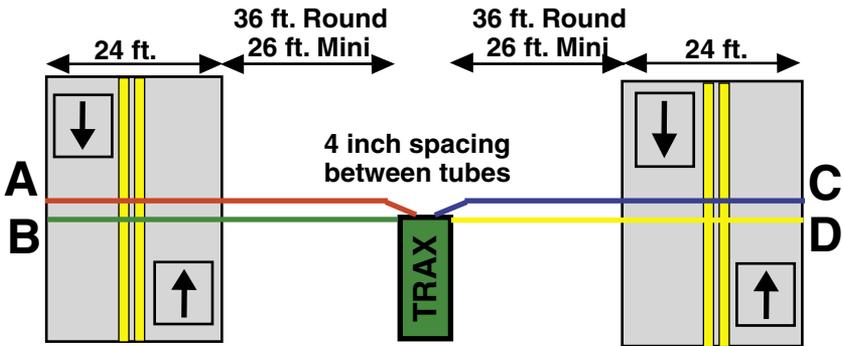
Sensors Used: 4 Road Tubes

Spacing: 4 inches

Data: Volume, Gap

Channels: 4 Channels, A to B, B to A, C to D, D to C

This layout is the same as the L3 layout, but with four tubes over four lanes rather than two tubes over two lanes. The tubes should be spaced four and a half inches apart.



Layout: L10

Layout Type: Road Tubes

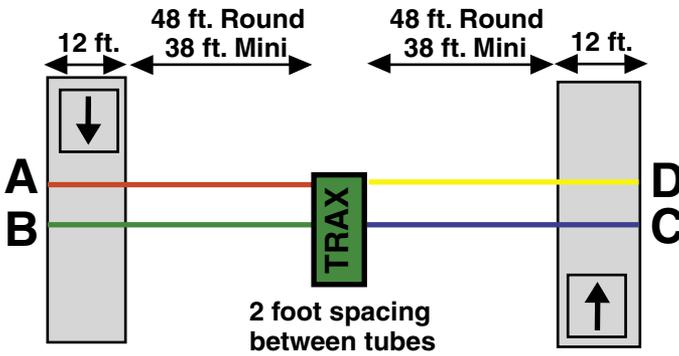
Sensors Used: 4 Road Tubes

Spacing: Two Feet

Data: Class, Speed, Gap, Volume

Directions: 2 Directions, A to B, C to D

This layout is the same as the L5 layout, but with four tubes over two lanes rather than two tubes over one lane. The tubes should be spaced two feet apart and be of equal length.



Layout: L11

Layout Type: Road Tubes

Sensors Used: 4 Road Tubes

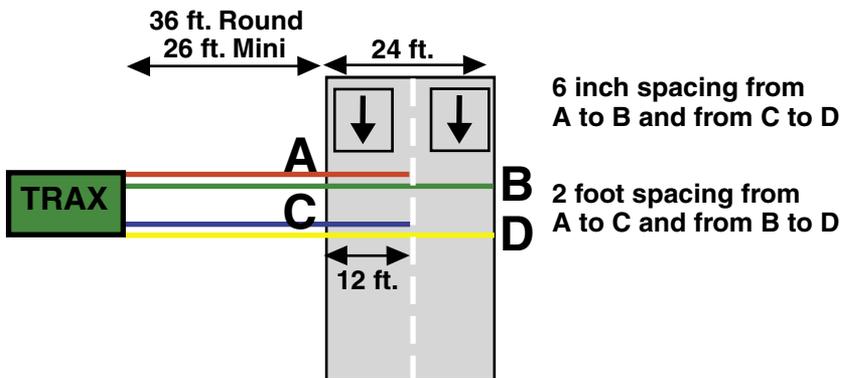
Spacing: Two Feet, A to C and B to D. Six inches, A to B, C to D

Data: Class, Speed, Gap, Volume

Directions: 1 Direction, A to C, B to D, With Lane Separation

This layout is the same as the L5 layout, but with the addition of two half tubes (A and C) to provide lane separation. This layout is for single direction traffic.

The A and C tubes should be spaced two feet apart, as should the B and D tubes. The A tube should be spaced six inches from the B tube and the C tube should be spaced six inches from the D tube. Remember, vehicles must always strike the short tube first.



Layout: L12

Layout Type: Road Tubes

Sensors Used: 4 Road Tubes

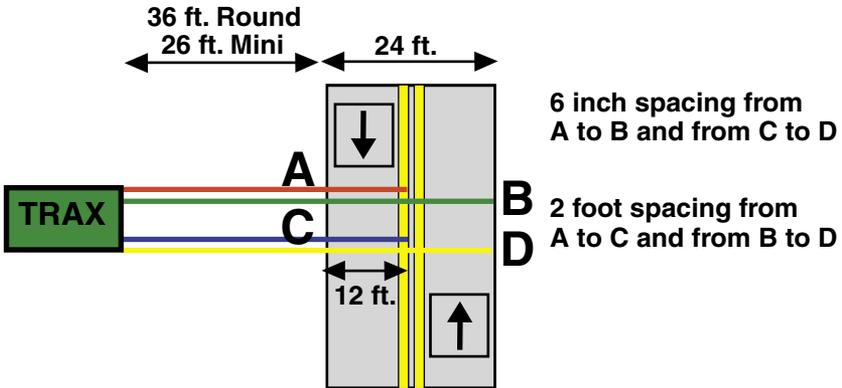
Spacing: Two Feet, A to C and B to D

Data: Class, Speed, Gap, Volume

Directions: 2 Directions, A to C, D to B

This layout is the same as the L11 layout, but for bidirectional traffic.

The A and C tubes should be spaced two feet apart, as should the B and D tubes. The A tube should be spaced six inches from the B tube and the C tube should be spaced six inches from the D tube. Remember, vehicles must always strike the half tube first.



Layout: L13

Layout Type: Road Tubes

Sensors Used: 3 Road Tubes

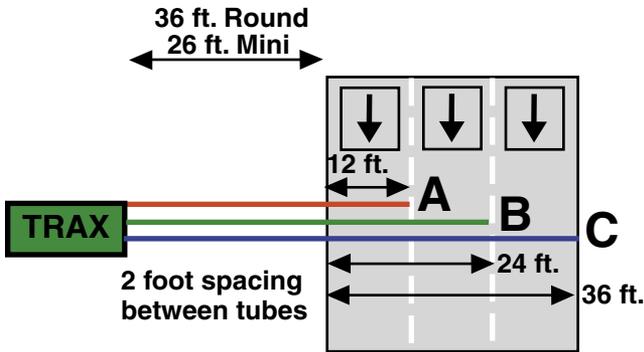
Spacing: Two Feet

Data: Volume, Gap

Channels: 3 Channels, A, B-A, C-B

This layout is the same as the L2 layout, but with the addition of a tube for a third channel.

The tubes should be spaced two feet apart. For improved accuracy with this type of data collection, we recommend that the L7 layout be used with the Road Ramp system to isolate each lane. Visit our web site at www.jamartech.com for more information.



Layout: L14

Layout Type: Road Tubes

Sensors Used: 4 Road Tubes

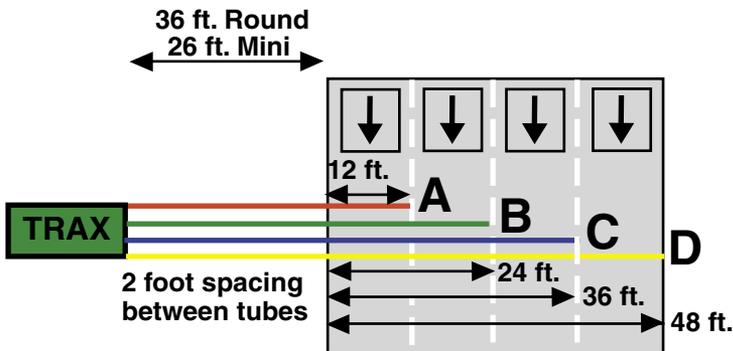
Spacing: Two Feet

Data: Volume, Gap

Channels: 4 Channels, A, B-A, C-B, D-C

This layout is the same as the L2 layout, but with the addition of two tubes for two additional channels.

The tubes should be spaced two feet apart. For improved accuracy with this type of data collection, we recommend that the L7 layout be used with the Road Ramp system to isolate each lane. Visit our web site at www.jamartech.com for more information.



Chapter 6

Battery Care

Battery Care

The following information regarding battery care is furnished to assist you in the use and maintenance of rechargeable batteries. Battery life is dependent on the user's preventative maintenance procedures. Establish regular routines for all of your batteries regardless of their usage.

The TRAX RD Plus turns itself off when the battery voltage falls to 5.9 volts. The TRAX also will not allow a new study to be started if the voltage is 6.0 or below. This is to prevent damage from occurring to the battery if the voltage were allowed to fall too low.

Charging a battery is very important for obvious reasons. Your TRAX depends on a fully charged battery to operate efficiently and to produce reliable and correct data. Batteries should not be allowed to sit in a discharged state for any length of time. Once the battery discharges below 5.8 volts, damage to the cells has already begun. Symptoms of a damaged battery are:

1. The battery will not charge to its full capacity of 6.4 volts or higher.
2. The battery will only hold a charge for a short time under load conditions.
3. The battery will discharge faster than normal during storage under no load.

With this in mind, recharge the battery to its highest potential (normally from 6.4 volts and up) once it has fallen to 6.1 or 6.0 volts. The battery can be charged through the charge port with the TRAX Battery charger (or a similar 6VDC charger with the correct plug and polarity). The battery may also be removed for charging if desired.

Solar Panel Use

If your TRAX is equipped with a solar panel, the panel can provide power to the unit when in the field and exposed to sunlight. This can extend the time between needing to recharge the battery, since the battery is not being used if the unit is able to get power from the solar panel. The solar panel draws sunlight and converts it to voltage which is regulated to as high as 7.0 volts.

If your TRAX is used frequently and exposed to sunlight often, the time span between needing to manually recharge the battery will be extended. However, if your unit is used infrequently, and not exposed to sunlight, you may need to recharge the battery more often.

Note that the Solar Panel will not generally charge the battery of the TRAX if the unit is in use. In this case, the power being supplied by the solar panel is used to directly power the TRAX itself. To charge the battery using the solar panel, the unit should be turned off and set in bright sunlight.

Manual Battery Charging

Monitor your battery voltage by checking the Stat screen of the Main Menu. We recommend that the battery be recharged to its highest charge level (usually 6.4 volts and above) once it discharges to 6.1 or 6.0 volts. A good battery may charge as high as 7.0 volts or better. A defective battery may not charge any higher than 6.1 volts after a reasonable charge time. Charge time will vary with the level of the battery voltage. Usually, a battery of 6.0 volts can be charged to its highest potential in 12 hours or less.

To manually charge the TRAX's battery, plug the TRAX Battery Charger (shown here) into an outlet, then connect it to the Battery Charger port of the TRAX.

*******CAUTION*******

Never plug a charger into a charge port unless you are absolutely sure of the voltage output and polarity.



We recommend that the TRAX be turned off during the charging process. However, the charger will still charge even if the TRAX is on. While the unit is charging, the light on the TRAX Battery Charger will be amber/yellow in color. Once the charge is complete, the light will be green. If there is a problem with the charge, the light will be red.

After a battery has been charged, allow it to sit for several hours then check the voltage to determine if the battery kept its charge. Some reduction in voltage is acceptable. However, if the battery falls below 6.1 volts, recharge it for a longer period of time. If this does not improve the charge, the battery is most likely defective and should be replaced.

Monitor your battery voltages frequently, charging when necessary, and you will extend the life of your battery.

Additional Notes

- **Do not** expose the battery to moisture or rain.
- **Do not** drop, hit or abuse the battery — it may break and expose the contents, which are highly corrosive.
- **Do not** short circuit battery terminals. Some batteries are protected with self-resetting fuses, but short circuits may still cause severe damage to the battery.
- It is normal for a battery to become warm to the touch during charging.
- It is normal for a battery to “self discharge” during prolonged storage. Always fully charge a battery prior to storage. While in storage, periodically check the batteries with a voltmeter to ensure they have not discharged below a level that may cause permanent damage.
- Always store in a cool, dry location.
- Keep batteries away from fire and do not incinerate — they may explode.
- Under no circumstances should you attempt to open the battery case.
- Always observe polarity when connecting your battery to any electronic/electrical device. If your device is not protected for improper battery hookup, you may cause severe damage to the electronic circuitry. The positive terminal may be indicated by a plus (+) sign or red mark. The negative terminal may be indicated by a minus (-) sign or black mark.
- The effectiveness of the solar panel can be reduced if it is dirty or scratched up. For best results, try to keep the panel clean.

Chapter 7

**Low Speed
Counting**

Low Speed Counting (Below 10 mph)

The TRAX RD Plus is capable of recording vehicle data as low as idle speeds and above with a high degree of accuracy. Tube length, tube placement, and the air switch D-bounce (DT) setting are important factors in achieving excellent results from this type of application. The following guidelines should be used for low speed volume installations.

Tube Length

The total length should not exceed forty (40) feet. Shorter lengths may be used provided the vehicle speeds do not exceed 30 mph.

Tube Placement

Tube placement should be perpendicular to the flow of traffic; however, when using a high DTX setting, a slight angle (by the tube or angled wheels of a vehicle) will not cause the counter to double count. Remember, this only applies to low speed counting - tubes should be placed correctly on the roadway regardless of low or high speed counting. As a reminder, two hits on the road tube represents one count in the volume mode. Additionally, the TRAX RD Plus will record a count even if the front and rear tires on only one side of the vehicle passes over the tube, as well as if both front and rear tires do.

Dead Time (DT/DTX)

The DT setting is measured in milliseconds which controls the output pulse interval from the air switch. Typically, the pulse interval is set at 20 to 40 milliseconds for normal operation. This setting will cover most speeds; however, speeds from idle to 10 mph will require the DT setting to be increased. When measuring volume in a very low speed situation, use a DTX setting of 200 to 300 milliseconds to avoid double counting.

The above rules may be varied slightly since each tube installation for low speed traffic counting is unique. The tube length and DT may be adjusted to fit your specific parameters. Once you have decided on your settings, monitor incoming data to ensure accuracy.

NOTE: Be sure to reset the DT setting once you have finished your low speed counting. Using an incorrect DT setting for average speed traffic will produce incorrect data.

Chapter 8

Trouble shooting

Troubleshooting

The following are some common questions/problems that can be encountered when using the TRAX RD Plus. The possible answers that are stated with them are not necessarily the only answer, but should be checked first before contacting us. If you cannot find the answer to your problem/question, do not hesitate to contact us. Contact information is listed on the first page of this manual.

There is no display visible on the TRAX RD Plus.

Check that the unit is not in its power-saving mode. The display automatically goes out when the TRAX RD Plus has not been disturbed for several minutes. To bring the display back up, hit any key.

The display on the TRAX RD Plus will not come on.

The battery voltage may have gone too low to power the display. Connect the TRAX RD Plus to a battery charger and charge for 12 hours, then see if the display comes up. If the unit was in the field collecting data when this problem occurred, turn the unit off, return it to your office and charge. Even if the battery voltage was too low to power the display, it may have been high enough to continue collecting data.

Serial Port test failed.

Make sure that you are using a test connector with the proper pin configuration. The test will fail if a test connector is not used. The cable used for downloading cannot be used as a test connector.

The data produced is not accurate.

Check the tube layout used in the field and the condition of the tubes. Make sure the tubes were set with the proper length, spacing and perpendicular to the flow of traffic. One simple condition check of a tube that is laid out in the field is to go to use the Tube Test diagnostic. Refer to page 2-9 for more information on this.

The TRAX RD Plus will not download.

Check your connection between the TRAX RD Plus and the computer. Refer to Chapter 3 *Downloading the TRAX RD Plus* for other items to check.

Additional support information can also be found on our web site at www.jamartech.com.

Appendix

Memory Table

The TRAX RD Plus contains 16 MB (16000KB) of flash memory. Each kilobyte of memory can hold approximately 512 axle hits. Refer to the following tables for an estimate of how long you can conduct a count before filling the memory.

Memory Left (KB)	Axles	Days of Operation			
		1000 ADT	5000 ADT	10000 ADT	20000 ADT
1	512	0.256	0.0512	0.0256	0.0128
5	2560	1.28	0.256	0.128	0.064
10	5120	2.56	0.512	0.256	0.128
100	51200	25.6	5.12	2.56	1.28
500	256000	128	25.6	12.8	6.4
1000	512000	256	51.2	25.6	12.8

ADT	Memory Usage (KB)						
	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	7 Days
1000	3.0	5.9	8.9	11.8	14.8	17.7	20.7
5000	10.8	21.5	32.3	43.1	53.8	64.6	75.4
10000	20.5	41.1	61.6	82.1	102.7	123.2	143.7
20000	40.1	80.1	120.2	160.3	200.3	240.4	280.4
50000	98.7	197.3	296.0	394.6	493.3	591.9	690.6
100000	196.3	392.6	588.9	785.3	981.6	1177.9	1374.2

Specifications

Size: 11" x 7" x 4.5"

Weight: Approximately 8 pounds

Power: Rechargeable lead gel battery with solar panel

Interface: RS-232 serial communications port, 9 pin DBS socket

Download Speed: Up to 115200 bps

Memory: 16 MB Internal Memory

Clock: Always active real-time clock

Data Collection Formats: Time-stamped raw data

Inputs: Up to four road tubes

Temperature Range: Minus 40F (-40C) to 165F (74C)

Date Format: USA (MM/DD/YY) or World (DD/MM/YY)

Units: English (feet) or Metric (meters)

Display: Wide Temperature, 4-line by 20-character LCD display

Output: Binary file capable of being read by JAMAR TRAXPro software

We are pleased that you have chosen the JAMAR TRAX RD Plus for your traffic analysis needs. We have strived to develop a unit that is easy to use and has the options that our customers require. The TRAX RD Plus has undergone extensive testing to verify the accuracy of its operations, and each unit is road tested before it leaves our facility. However, just like other complex electronic devices, problems can occur. We always suggested that users verify the continuing accuracy of any device they use. Verification against manual counts, or with a JAMAR Traffic Counter Tester, should be performed on an annual basis as required by the FHWA to assure proper operations and results.

Should you detect any problems with any of our products, please notify JAMAR Technologies immediately and discontinue use of the unit until we have verified its operation.

