TRAIL COUNTER
FIELD MANUAL

TTC-4420

Version 6.00 1/08

Version 1.00 1/96
Version 2.00 9/00
Version 3.00 11/01
Version 4.00 3/03
Version 5.00 7/03

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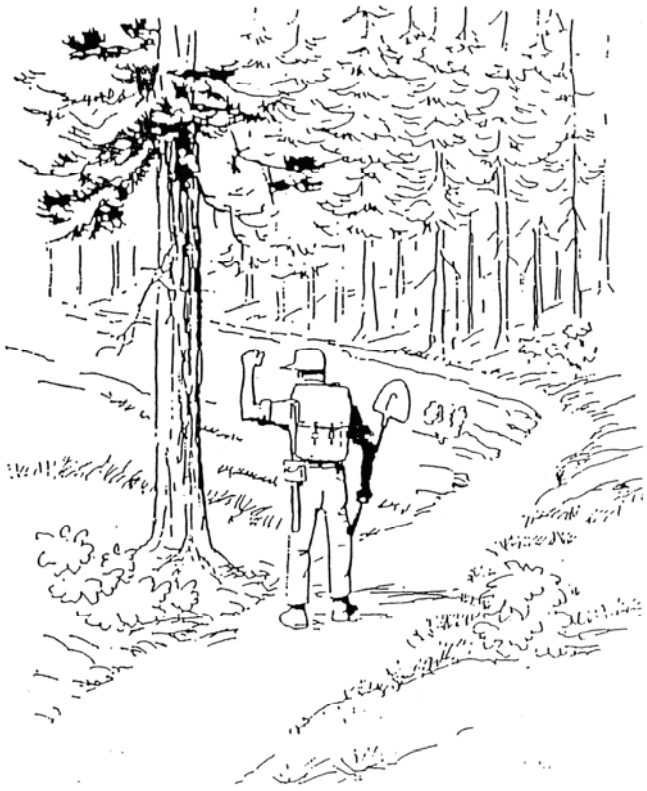
TRAIL TRAFFIC COUNTER
GENERAL DESCRIPTION

The TTC-4420 Trail Traffic Counter is a portable, battery powered instrument for counting traffic on forest trails. The original TCS-90 design was completed in 1972 at the Missoula Equipment Development Center, USDA Forest Service, Missoula, Montana and was manufactured according to the U.S. Department of Agriculture Forest Service Interim Specification for the last 13 years by Diamond Traffic Products located in Oakridge, Oregon.

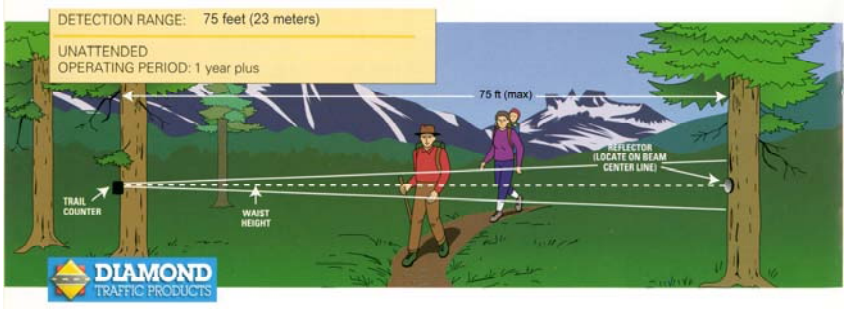


Diamond Traffic Products redesigned the trail traffic counter to use integrated circuits to lower battery consumption and allow use of “D” cell batteries and also offer an hourly time interval count recording feature with RS-232 serial data output. The new counter is lightweight, easy to conceal, resistant to false tripping, and operates one year or more on a set of “D” cell flashlight batteries. It consists of the following components—a scanner in a cast aluminum case, a three inch reflector, a keyfob with magnet and three mounting bolts. The scanner is mounted on one side of the trail, the reflector on the other side as shown in Figure 1. The scanner and the reflector can usually be separated up to 75 feet. The new TTC-4420 indicates return beam strength on its display and tells operator how strong the signal is. We recommend signal strength of 60 or above

The Trail Counter works as follows: the scanner sends a beam of pulsed infrared light to the reflector, which reflects the beam back to the scanner. When the scanner is deprived of a specific number of pulses by an object passing between the scanner and reflector, the unit will detect a person or object such as a car and advance the LCD display one digit. An audio alignment signal can be switched on using the key fob. The audio signal is muted only when the reflector is placed in the beam and the scanner is receiving the reflected light pulses.

To prevent detection by hikers, which may result in vandalism or tampering, the scanner housing has been designed to be as small as possible and is finished in dull camouflage. The infrared beam is not visible to the naked eye, and the counter cannot be heard when the audio signal is disabled.

The 15-75 foot range of the scanner gives field personnel opportunity to camouflage the unit in natural vegetation.



The counter has been designed so it cannot be tripped by falling leaves, walking sticks swung by hikers or other small objects, and to not register more than one count for long objects like horses and cycles. It has also been redesigned to not "run away" count in heavy rain or fog. The traffic counter will operate about 12 months on 4 "D" cell flashlight batteries. We recommend you install batteries each fall.

Specifications:

Batteries:	4 D-Cell Alkaline or Carbon Zinc (cold weather)
Life Expectancy:	D-Cell Approximately 12 Months With Alkaline
Range:	15-75'

Theory of Operation:
The TTC-4420 is a portable, battery operated, active infrared trail counter utilizing presence detection. With the exception of the output and input amplifiers, the unit has been fully digitized for increased accuracy and battery life. The TTC-4420 collects data in hourly intervals and the grand total. All data can be read off the counter display using the magnet to key "up" data. Optionally, an RS-232 serial port can be installed that can be read using the Data Hog and in the future a PDA.

Two circuits are employed—one circuit controls the pulsed infrared beam, detects hikers and sends a trigger pulse to the second circuit that displays and stores count data in memory.

Units with the time interval count recording feature record the count for hourly intervals into memory. The one hour time interval is a factory setting. Computer software can be used to yield count totals for 6 hours, 12 hours, one day, weekly, or monthly, etc. Software to accept and analyze data is available from Diamond Traffic Products.

Note: The counter can measure the passage of time but does not know the correct time of day. It starts measuring hourly intervals a few seconds after you set it up.

Suggestions:
The following suggestions may facilitate installation:

1. In some instances a drilled hole is very useful for starting the bolts in dense wood, such as oak.
2. The counters can be conveniently carried in a packsack.
3. A single-bit hand ax is useful for brushing out a light beam path, flattening a spot for the reflector, and as a hammer to start the mounting bolts.
4. A crescent or socket wrench is required to screw the mounting bolts into the tree.

OPERATION AND MAINTENANCE

Batteries

The trail counter starts operating as soon as the batteries are connected. It will operate until the batteries run down, approximately 12 months. The display will warn operator when batteries are in need of replacing. Message reads **low bat**. Replacement batteries should be readily available at the nearest hardware store. Use Alkaline "D" cell flashlight batteries in temperature range above freezing. Use carbon zinc batteries in below freezing weather. **Take great care to install batteries in correct orientation with positive battery terminal to positive holder terminal. In weather colder than –10 degrees F call Diamond Traffic for advice on lithium cold weather batteries.**

Battery Replacement

When new batteries must be installed, proceed as follows:

1. Open the battery compartment using the key on key fob.
2. Replace the old batteries paying attention to + and – orientation.
3. Test to verify that the counter is operating normally.

Reflectors

The reflectors, similar to roadside reflectors, are essentially corner reflectors, which return 90% of the incident light to the source, for any angle of incidence less than 30 degrees. The reflectors are difficult to hide and may be the target of vandals. For this reason, four reflectors are included in each counter package to replace lost or damaged reflectors. We strongly recommend that reflector be installed with a rain shield to keep water droplets off face of reflector.

INSTALLATION

Site Selection

Selection of the installation site will have an important effect on the results obtained from this counter. The following guidelines should be observed:

1. Selecting a site where the scanner and reflector can be installed well off the trail on both sides will minimize tampering by curious people or vandals.
2. Be careful to avoid selecting sites where people would be likely to stop, rest or mill around, such as scenic overlooks or level areas at the top of steep grades.
3. Avoid segments of trail heavily traveled by big game or range stock.
4. Locate 2 trees 15-75 feet apart so that the beam makes a 90-degree angle with the trail and so that the beam will be at waist height above the trail.
5. A site that is protected from the sun and weather will produce better results. However, the infrared receiver does incorporate a filter lens to remove unwanted light frequencies.

On –Site Installation

The following general procedure is provided on how to install the trail traffic counter. The installer should feel free to use their ingenuity.

1. Mount the scanner (use three bolts) and reflector on trees as shown in Figure 2. The scanner can be mounted with the lens assembly on either side of the tree—there is no "top" of the unit. Use of a string to locate the path from the scanner to the reflector may be helpful. Attach the string to the tree near the scanner and run the string to the desired location of the reflector. Remove any branches or other obstacles in the path.

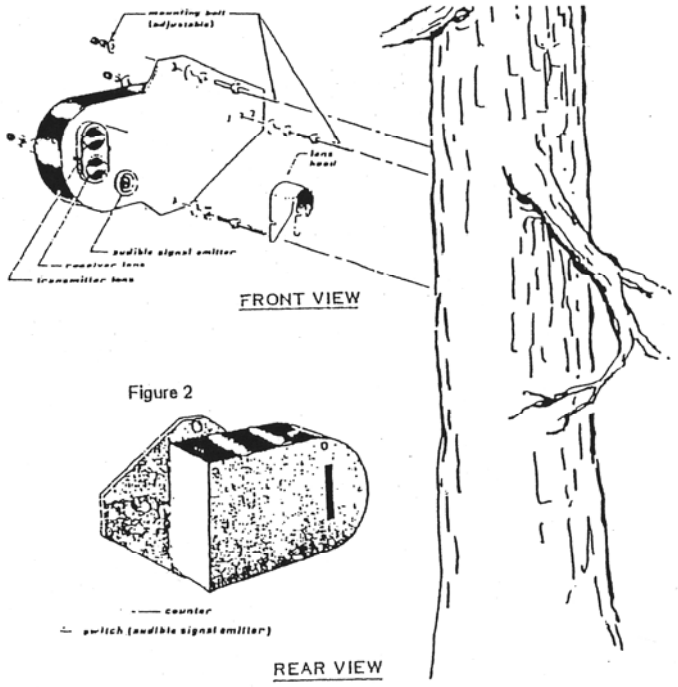
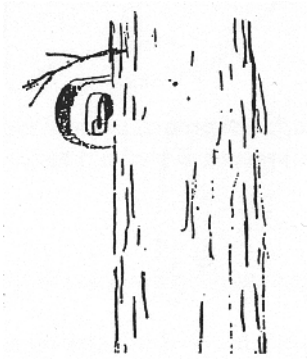


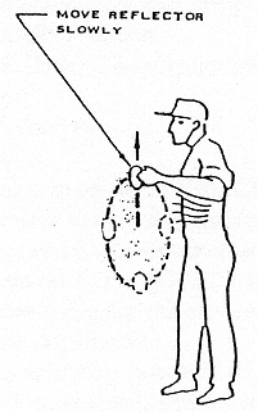
Figure 2

2. **Install the lens hood so that the hood will shade the lenses from precipitation and sunlight. This is important.**

3. Install four fresh "D" cell alkaline batteries. If operating in cold weather (freezing) use carbon zinc batteries



4. Hold the reflector in the beam, thus canceling the tone, and gradually move toward the desired reflector location. (NOTE: THE TONE GENERALLY CANNOT BE CANCELLED WHEN THE REFLECTOR IS HELD CLOSER THAN ABOUT 8 FEET FROM THE SCANNER.)
5. As the light beam leaves the scanner it spreads out in the shape of a cone. At the approximate reflector location, find the center of the beam by the following procedure.



6. Adjust the position of the scanner by means of the two nuts on each of the three mounting bolts until the center of the beam is at the desired place on the reflector tree (or post). Permanently fasten the reflector in the center of the four boundaries, using the wood screw.
7. Cover the installed reflector with your hand, and using the spare reflector verify that the beam is centered on the installed one. In other words, find the top, bottom, right and left edges of the beam. Adjust the scanner as necessary and tighten the nuts. Test by walking through the beam several times. Note: If unit is in operation mode, but has lost beam alignment, no sound will be heard and unit will not count.

You have mounted scanner and located a reflector position and you know how to align and capture the beam. You are ready to power up the counter.

8. **Power On**: Display will come on and display the name of the counter and the internal firmware version and release date.

   TTC-442X
   V1.00 10-1-01

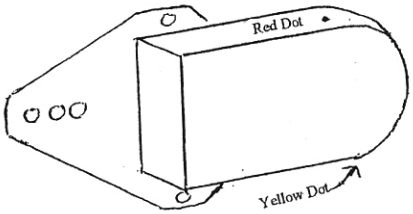
   Wait a few seconds for the next screen.

   Note: If a Datahog is connected at any time from this point on (even if the display is off) the Trail counter will display "Serial Active" and no other user operation is possible. To otherwise operate the Trail Counter, disconnect the Datahog.
9. **Serial Number**: The next screen displays the internal serial number. This number uniquely identifies the trail counter and identifies the date of circuit board manufacture, not the counter, by displaying the date of manufacture as a two-digit month, two-digit day, two-digit year, and then a two-digit day assembly sequence number.

   TTC-442X Serial
   ID #: 09280118 (example)

   Wait a few seconds for the next screen or activate yellow dot.

   Note: The serial number is important to the user during importing data to Centurion Software. Prior to importing, Centurion pauses and displays the serial number the data came from. Users can then fill in the correct Site ID, Starting Time, and Starting Date for the data



10. **Data Collection Status**: If the counter is not collecting any data at the Moment, the following screen is displayed (nothing is displayed if collection is active):

    Data storage is
    stopped.

    Wait a few seconds for the next screen or activate reset (red dot) to skip to the TOTAL COUNT display.

11. **Memory Status**: If memory contains no data, the following screen will appear

    There is no data
    in memory.

    If memory contains data, then the following appears ("x" is replaced with number of hours.

    Memory has x
    hours of data.

    If there is no data in the memory wait a few seconds for next screen.
    If there is data in memory, magnetically activate yellow dot to read it or red dot to skip to TOTAL COUNT screen.

    Notes: Manual Data: The display shows the first recorded hour total count:

    Total Hour #1
    Count: x

    Activate reset to skip to the TOTAL COUNT screen
    Activate display(the yellow dot) to display the next hour
    After 10 minutes or so of no activations, counter automatically moves to the TOTAL COUNT screen
    Note that you can't display the current hour's count. Only stored hours are displayed.

12. **Total Count**: When the counter is first powered on and not aligned with reflector the TOTAL COUNT screen will usually look like the following:

    Total: 0
    Hour: Stop! No

NOTE: The "0" on the top line is the total number of activations since you last started the counter collecting, or since it was powered on. The "Stop!" is the current hour total and says "Stop!" because the counter is not collecting data yet and storing it in memory. The "no" is the beam alignment indicator. ("no" means not in alignment). This changes to "AL" when beam is aligned. You will see this flicker between "AL" and "no" as people cross the beam.
You should be aware of the following:

Activate reset to start a new data collection (see QUICK SETUP below)
Activate Display to go back and redisplay data stored in memory (if any). See MEMORY STATUS above.

NOTES: The "Total" value will continue to count, even if data collection is stopped.

You can toggle on/off the sonalert by holding a magnet on Display and activating Reset with a second magnet before releasing Display. Note that this is not normally done because during the SETUP step you go through an alignment procedure with the siren. However, it can sometimes be useful if you want to hear the Siren without restarting collection. When the Siren is enabled, an asterisk ("") appears in the top right corner.*

When collecting is active, the "Stop!" changes to the current total count for the hour. At the beginning of each new hour, this value is reset to zero.

The trail counter continues to count and store data normally even when you are manually reading out data or connecting a DataHog to the serial port.
Once collection has started, the trail counter can store more than 400 days of hourly counts. If it fills up its memory, it will automatically stop storing new counts (but the Total Count continues to update).

You need to know that the trail counter does not know correct time or date. You must keep a record of time and date you started the trail counter.
If neither Display or Reset is activated for 10 minutes, the screen changes to the BLANK DISPLAY (see below).

If the voltage into the counter drops below 1.5V (0.75 per battery in 2X2 array), then the right side of the display shows "LOW BAT". The Trail Counter will turn off its beam and stop accepting new counts, which means zeros will be written to the memory. When the battery voltage rises above 1.5V, operation will begin again.

automatically. Even if the batteries go completely dead, data in memory will not be lost. Just install new batteries and retrieve data.

13. **Quick Set-Up Step List**
    Install batteries to power on
    Note serial number and site location
    At "total" screen touch magnet to red dot
    Align reflector to capture beam and silence sonalert.
    Counting will start in about 20 minutes.
14. **Quick Data Read List**
    Using Data Hog
        Connect Data Hog to Trail Counter RS-232 Serial Port
        Turn "On" Data Hog
        When Data Hog flashes complete code you are done
    Using Pencil and Notepad List
        Touch magnet to yellow display dot on side of counter
        Total count will be displayed
        Repeated magnet touches to yellow dot will bring up each hour interval. Copy data on notepad with pencil.
15. **When the unit is stored for more than one or two weeks remove the four "D" cell batteries**.
16. **How To Read Data**
    Counter is capable of recording one-hour interval counts of up to 420 days; touch magnet to yellow dot on side of counter, display will show grand running total with first touch and the number of interval totals stored in memory with second touch. Third touch will cause display to show the count for the first recorded interval. Successive magnet touches will bring up data for successive intervals. Remember the counter does not know what day it is or time of day, so you must keep in your notes, the day and time the court started and enter this into the computer when data is read out of Data Hog or PDA.
17. **Restarting a new count in the TTC-4420 Trail Counter:**
    If you are positive that all data stored in the trail counter has been transferred successfully to your PC you can erase the old date in the trail counter and reset the counter for a new count.

    To reset the counter and start a new counting cycle. You must first have the display active. If the display is blank, activate it by touching the magnet to the yellow dot.

After the display has become active touch the magnet to the red dot to continue the data deletion process. The display should read:

ACTIVATE DISPLAY TO CLEAR MEMORY

Next, to reaffirm you wish to delete memory again, touch the yellow dot (that activates the display) to reset the counter. While the counter is clearing the memory the display will read:

CLEARING MEMORY AND STARTING NEW

Note: If the siren sounds, the counter is not aligned with the reflector and needs to be adjusted. *See page 10*.

When the counter has captured the return beam from the reflector, the signal will stop and the counter will enter test mode to verify the reflector is aligned with the counter and at what percent the signal strength is. We recommend that you achieve a signal strength of 80% or better for optimal results. The counter will also collect "*test counts*" when the beam is broken for verification that the unit is working. You must block the beam for about 1/6 of a second or more. Easiest method is for someone to walk in between the counter and the reflector. The display should read as above:

BEAM ALIGN: xx%
TEST COUNT: ___

Once the counter is aligned and securely fastened to a tree, post or alternate mounting device, and you are ready to start your data collection cycle touch the magnet to the yellow dot. Now your new data collection cycle has begun. Remember to log the time and date as the counter does not record this information.

Note: The counter will eventually enter sleep mode, signified by the display going blank, to conserve battery life. This should occur in approximately 10-15 minutes after collection cycle has begun.

Repairs and Refurbishing

From time to time, specific repairs or general refurbishing of trail traffic counters may become necessary. The manufacturer maintains a facility for this purpose. Field units requiring these services should contact: Diamond Traffic Products, P.O. Box 1455 (Mail), 76433 Alder Street (UPS), Oakridge, OR 97463 541 782-3903

Warranty:

Diamond units are warranted against defective material and workmanship for a period of one year from date of purchase. In event of failure of the unit, return it to Diamond Traffic Products along with a written description about the nature of the problem. Send unit to:

Diamond Traffic Products
76463 Alder Street
Oakridge, OR 97463

If our inspection shows that problem was caused by defective material or workmanship within the limitations of the warranty, we will repair or replace the unit free of charge and return it prepaid. Repairs made necessary by normal or excessive wear or abuse, or for repairs for products outside the warranty period, will be charged at regular factory repair prices.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state. The obligation of the warrantor is solely to repair or replace the product. The warrantor is not liable for any incidental exclusion or limitations or incidental or consequential damages, so the above limitations or exclusions may not apply to you.