TRAIL COUNTER FIELD MANUAL

TTC-4430

Version 1.00 03/20

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TRAIL TRAFFIC COUNTER
GENERAL DESCRIPTION

The TTC-4430 Trail Traffic Counter is a portable, battery powered instrument for counting pedestrians on forest trails. The original TCS-90 design was completed in 1972 at the USDA Forest Service Equipment Development Center in Missoula, Montana. It was manufactured according to the U.S. Department of Agriculture Forest Service interim specification by Diamond Traffic Products located in Oakridge, Oregon.
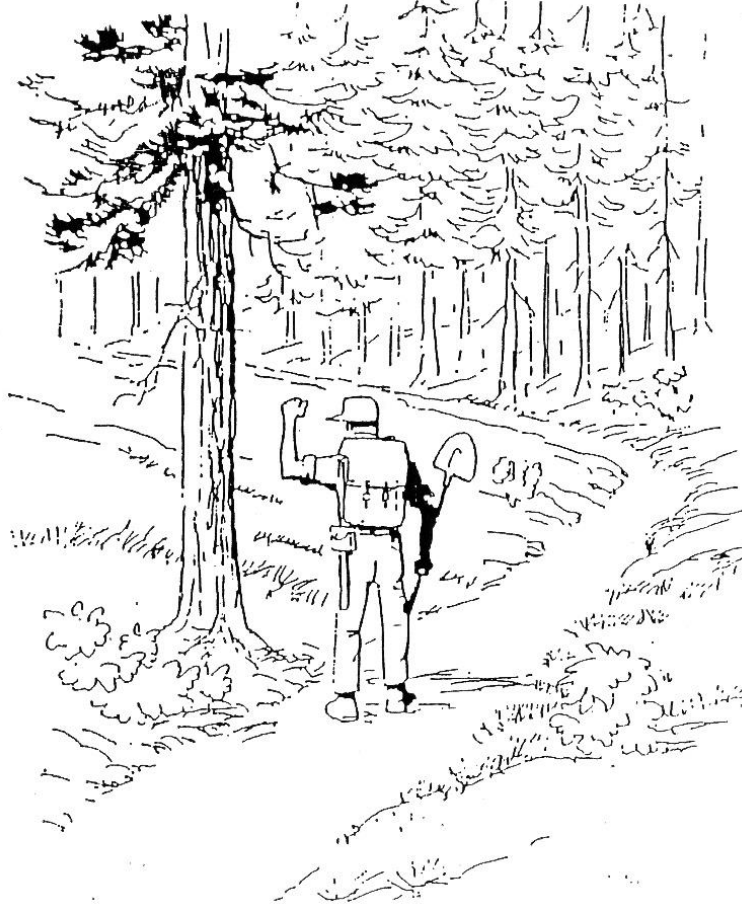
Diamond Traffic Products later redesigned the trail traffic counter using integrated circuits to lower battery consumption, allow use of "D" cell batteries and offer an hourly time interval count recording feature with RS-232 serial data output. The new counter is lightweight, easy to conceal, resistant to false tripping, and operates for about one year on a set of "D" cell flashlight batteries. It consists of the following components – a scanner housed in a cast aluminum case, a three-inch reflector, a keychain with magnet and three mounting bolts. The scanner is mounted on one side of the trail, the reflector on the other side as seen in the next figure. The scanner and the reflector can usually be separated by up to 65 feet. The new TTC-4430 provides a return beam strength as a percentage on its display. We recommend signal strength higher than 80 percent.

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 and advance the LCD display by one digit. The audio signal (sonalert) 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 audio signal is not active during data collection. The 15-65 foot range of the scanner gives field personnel the opportunity to camouflage the unit in natural vegetation.
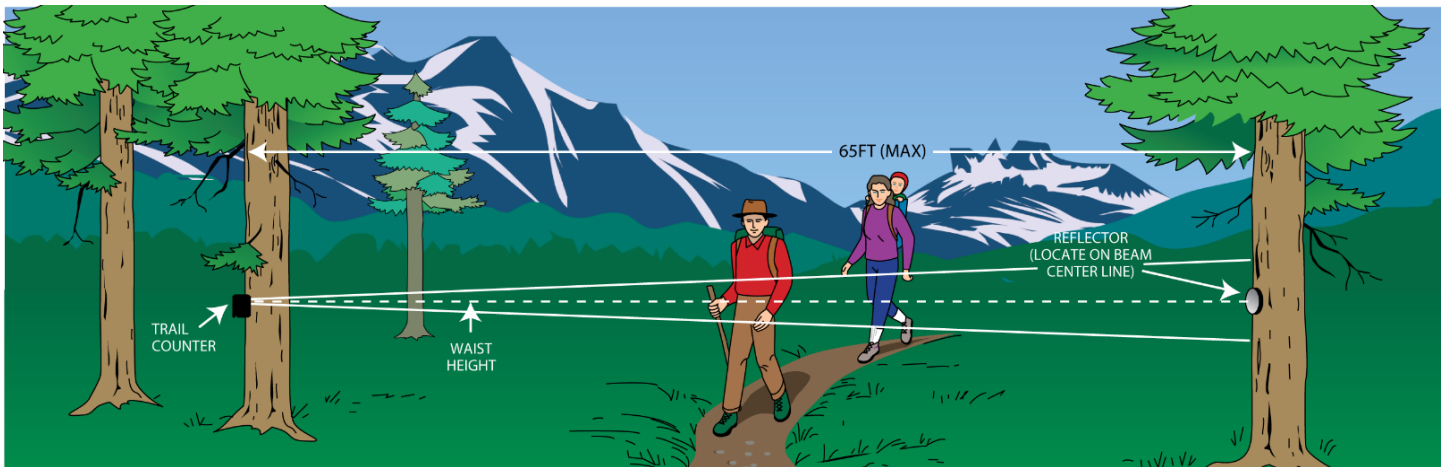
The Trail Counter has been designed so it cannot be tripped by falling leaves or walking sticks used by hikers or other small objects. It should not register more than one count for long objects like horses and carried canoes. The Trail Counter has also been designed to prevent "runaway" counts in heavy rain or fog. The Trail Counter will operate for about 12 months on 4 "D" cell flashlight batteries. We recommend you install fresh batteries at the start of your hiking season.

Specifications:	
Batteries	4 D-Cell alkaline or Carbon Zinc (cold weather)
Life Expectancy	D-Cell Approximately 12 months
Range	15'-65'

Theory of Operation:
The TTC-4430 is a portable, battery operated, active infrared trail counter utilizing presence detection. Except for the output and input amplifiers, the unit has been fully digitized for increased accuracy and battery life.

The Trail Counter uses a pulsed infrared beam to detect hikers. When a sizeable object breaks the pulsed beam long enough, the Trail Counter will then increment both the current interval count as well as the grand total.

To interact with the Trail Counter, the user will use the included keychain and magnet to activate one of two magnetic touch points. The first touch point is a Yellow dot located near the external serial port. The second touch point is a Red dot located on the opposite side of display from the Yellow dot.

The Yellow dot is used to activate the counter's display, to change menus, and to manually step through recorded data during data retrieval.

The Red dot is used to activate the reset or setup sequence and to change menu items.

The TTC-4430 has two modes of operation, "Classic" and "Enhanced".

Classic mode offers the original functionality of the TTC-4420. Data can be manually retrieved or extracted with our Data Hog. Extracted data can only be processed with our Centurion software.

The Enhanced mode allows for the same operation as Classic and adds additional features not found on the TTC-4420. Data can be retrieved using a direct serial connection to a computer that is running our Centurion software (no Data Hog required). The unit can be programmed with current date & time along with a 'Site ID' that will be included with the recorded data. Data can be recorded in specified interval lengths (1, 5, 15, 30 minutes, 1, 2, 3, 6, 12, or 24 hours). The intervals can either be synchronized to the clock (next full interval i.e. next full quarter hour for 15-minute intervals) & calendar or start at end of manual setup (if setup is completed at 10:37, the selected interval length begins at 10:37).

All recorded data can be manually read from the counter's display using the provided keychain & magnet to step from the Grand Total to each recorded interval from the start of data collection. Centurion software can also be used to combine smaller interval lengths to longer ones for easy display of data in report format (e.g. 15 minutes to 1 hour).

Suggestions:

The following suggestions may help facilitate installation:
1) In some instances, a drilled (pilot) 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-edge 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 also recommended to screw the mounting bolts into the tree.
5) A Phillips and flat head screwdrivers.
6) A 100-foot length of string.

OPERATION AND MAINTENANCE:
Batteries

The trail counter turns on as soon as the batteries are connected. It will operate until the batteries run down, approximately 12 months. The display will warn the operator (visually) when the batteries are in need of replacing. The message will read '**low bat**'. Replacement batteries should be readily available at the nearest hardware store. Use Alkaline "D" cell flashlight batteries for temperatures 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 zinc cold weather batteries.**

Battery Replacement

When new batteries must be installed, proceed as follows:
1. Open the battery compartment using the included keys.
2. Unplug the battery pack and leave unconnected for at least 5 minutes.
3. Unscrew the top of the battery pack and remove the old batteries.
4. Replace the old batteries paying attention to + and – orientation.
5. Replace the battery pack top and secure with the original screws.
6. Wait the remaining 5 minutes prior to reconnecting the battery pack, the TTC-4430 needs time to drain any residual power from the unit.
7. Test to verify that the counter is operating normally.

Note: Connecting new batteries to the unit too soon will cause unwanted conditions. Please allow at least 5 minutes between changing out old batteries for new batteries.

Reflectors

The reflectors, similar to roadside and bicycle 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, three reflectors are included in each counter package to replace lost or damaged reflectors. We strongly recommend that the reflector be installed with a rain shield to prevent water droplets from forming on the face of the reflector.
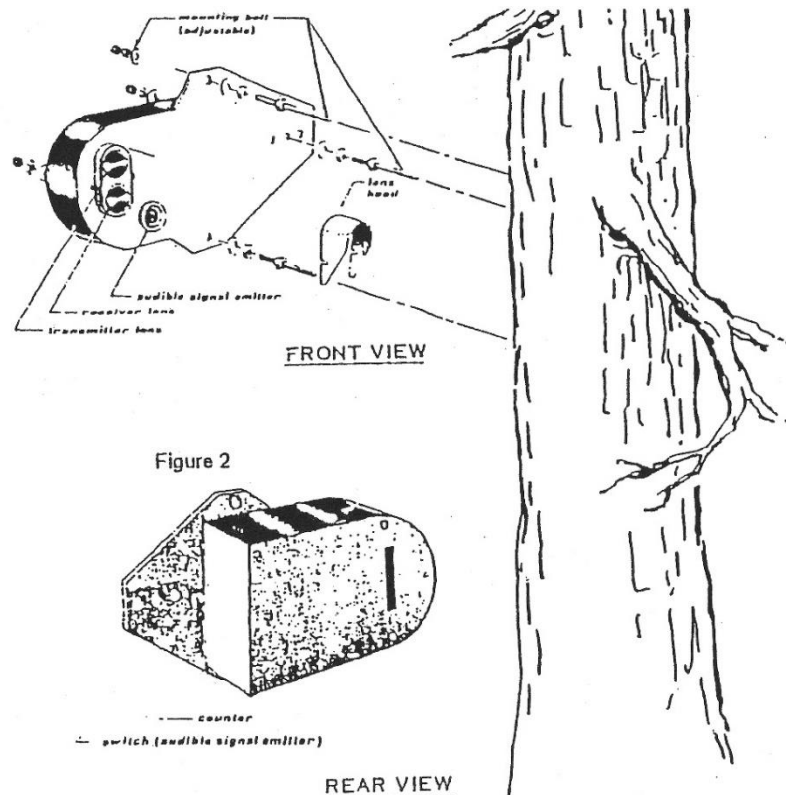
INSTALLATION

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 Select a site where the scanner and reflector can be installed, well off of the trail on both sides to minimize tampering by curious people or vandals.
2 Be careful to avoid selecting sites where people would be likely to stop, rest or mill about, 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 15-65 feet apart so that the beam makes a 90-degree angle with the trail and at a height that the beam will be between waist and sholder height for most of the hikers using 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 lense to help remove unwanted light frequencies.

On-Site Installation

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

1 Mount the scanner (use three bolts) on the tree as shown in the next figure. The scanner can be mounted with the lens assembly on either side of the tree – there is no "top" to the unit. The 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 (4) fresh "D" call alkaline batteries. If operating in cold weather (freezing) use carbon zinc batteries.

Interacting with the TTC-4430 is a simple process using two magnetic touch points.
The Yellow dot is located next to the data port.
The Red dot is located on the opposite side of the display.

The Yellow dot is used to wake up the display, to step through recorded intervals and to change menus when the unit is being configured.

The Red dot can also be used to wake up the display (similar to initial power on), to start the reset process, and to change configuration options.

Initial power on for units that are running in **Classic Mode**:

```
*** TTC-443x ***
V1.02    11/04/19
```

The display will show the model & firmware version numbers and the firmware release date.

```
TTC-443x Serial
#: Pre-0001
```

Next the unit serial number is briefly displayed.

```
Data storage is
Stopped.
```

A reminder that the 4430 is not collecting data at this point. Expect to see this message whenever power is removed or when batteries are changed.

```
There is no data
in memory.
```

When the Trail counter is powered on for the first time or after a reset has been preformed, the counter will not have any data in memory to report on.

```
Memory has xx
hours of data
```

When there is data in memory, the counter will show this message to indicate how many hours of data is available.

This screen shows you the first hour and the count during that hour. Swipe the magnet across the Yellow dot to step through each of the recorded intervals.

```
Total Hour #1
Count: 0
```

If the Trail Counter does not receive magnetic touches it will advance to the next screen.

```
Total: 0
Hour : Stop! no
```

This screen will provide you with a total and the record interval duration. Stop! Indicates that the unit is not recording any data. 'no' indicates that the unit is not receiving the IR signal being generated (missing or blocked reflector).

Initial power on for units that are running in **Enhanced Mode**:

```
*** TTC-443x ***
V1.02    11/04/19
```

The display will show the model & firmware version numbers and the firmware release date.

```
TTC-443x Serial
#: Pre-0001
```

Next the unit serial number is briefly displayed.

```
Data storage is
Stopped.
```

A reminder that the 4430 is not collecting data at this point. Expect to see this message whenever power is removed or when batteries are changed.

```
There is no data
in memory.
```

When the Trail counter is powered on for the first time or after a reset has been preformed, the counter will not have any data in memory to report on.

```
Memory has xx
hours of data
```

Should there be data in memory the counter will show this message to indciate how many hours of data is available.

```
17:00 03/02/20
Count: 0
```

This screen shows you the time and date of the first interval in memory. Activate the Yellow dot to step through the recorded data.

```
Total: 0
Hour : Stop! no
```

This screen will provide you with a total and the record interval duration. 'Hour' indicates the selected interval duration, this text will be updated when the record interval has been changed. 'Stop!' indicates that the unit is not recording any data. 'no' indicates that the unit is not receiving the IR signal that is being generated (missing or blocked reflector).

Classic Mode unit Reset:

If the display is not active, swipe the Yellow dot. Next swipe the Red dot.

```
ACTIVATE DISPLAY
TO CLEAR MEMORY!
```

If you want to cancle the unit reset, swipe the Red Dot. If you want to reset the unit and to clear memory, swipe the Yellow dot.

```
Clearing Memory
& Starting New..
```

After swiping the Yellow dot, the unit will display this screen. Once the memory has been cleared the screen will enter into the beam alignment process

```
Beam Align: NO!
Test Count: 0
```

This screen will show the beam alignment percentage. Ideally the operator should adjust the alignmnet so that the value displayed is between 80 & 100 percent.

Refer to page 10 for a detailed alignment process.

```
Beam Align: 98%
Test Count: 25
```

Once a good beam alignment has been achieved, activate the Yellow dot to continue.

```
RECORD #PRE-0001
START TIME&DATE!
```

On a deployment sheet or notebook, record the unit Serial Number along with the Date and Time to the nearest hour. Once this information has been recorded, activate the Yellow dot.

```
Total: 0
Hour : Stop!  no
```

The unit is now in a record mode. If the beam is broken, the tone heard during alignment will be silent.

Enhanced Mode unit Reset:

If the display is not active, swipe the Yellow dot. Next swipe the Red dot.

```
ACTIVATE DISPLAY
TO CLEAR MEMORY!
```

If you want to cancel the unit reset, swipe the Red Dot. If you want to reset the unit and to clear memory, swipe the Yellow dot.

```
Clearing Memory
& Starting New..
```

After swiping the Yellow dot, the unit will display this screen. Once the memory has been cleared the screen will enter into the beam alignment process

```
Beam Align: NO!
Test Count: 0
```

This screen will show the beam alignment percentage. Ideally the operator should adjust the alignmnet so that the value displayed is between 80 & 100 percent.

Refer to page 10 for a detailed alignment process.

```
Beam Align: 98%
Test Count: 25
```

Once a good beam alignment has been achieved, activate the Yellow dot to continue.

```
Record Interval:
  1 hour   (SYNC)
```

'(SYNC)' indicates that the record interval will align with the Clock's time. If the selected interval does not show '(SYNC)', the interval will start with the completion of the setup process.

Possible record interval options are:
1, 5, 15, 30 Minutes; 1, 2, 3, 6, 12, 24 Hours

```
Study Length:
  1 Hour
```

This screen allows you to select the desired Study Length. Selectable options are: 1, 2, 3, 4, 5, 6 days; 1, 2 weeks; 30 days; or Continuous

Detailed alignment process:

Beam alignment is typically accomplished during initial counter setup or when a reflector needs to be replaced.

The use of a light weight string can aid in locating the beam path and reduce the amount of time needed to finish alignment. Backout one of the lens hood screws far enough so that a loop tied on the string can be secured. Stretch the string across the hiking path to an opposite tree. The string should lightly touch the outside edge of the lens hood.

1 Alignment with a single person:
   a) Touch magnet to Yellow Dot, wait for total count screen. Retrieve any needed data from the unit before continuing.
   b) Touch magnet to the Red dot.
   c) Then touch the magnet to the Yellow dot to ERASE DATA and start beam alignment.

   Alignment with two people:
      One person should monitor the counter's display noting the alignment value (AL), the higher this value the better, helping guide the second with reflector placement. While the second person moves the reflector to obtain an alignment at the opposite tree.

   Once the TTC-4430 is recording data, the sonalert will be silent at all times.

2 Hold the reflector in the beam and gradually move toward the desired reflector location. (Note: the sonalert generally cannot be canceled when the reflector is held closer than about 2 feet from the scanner.)

3 As the light beam leaves the scanner it spreads out in the shape of a cone. At the approximate reflector location, move the reflector slowly to find the outside edges of the cone. Then using the outside edges, place the reflector in the center and secure the reflector.

MOVE REFLECTOR
SLOWLY
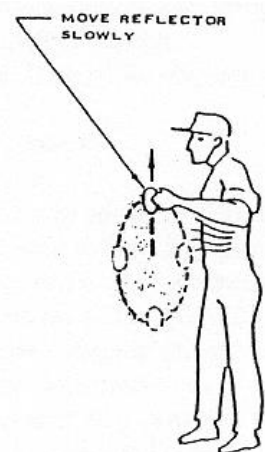
4 Adjust the position of the scanner by means of the two nuts on each side of the three mounting bolts until the center of the beam is at the desired place on the reflector tree (or post). Permanently fasten the reflector in the center of the four boundaries, using a wood screw of sufficient length.

5 Cover the installed reflector with your hand, and using a spare reflector verify that the beam is centered on the installed reflector. In other words, find the top, bottom, right & left edges of the beam. Adjust the scanner as necessary and tighten the nuts. Test by walking through the beam several times. Note: If the unit is in operation mode, but has lost beam alignment, no sound will be heard and the unit will not count.

Data Retrieval

Data can be retrieved from the TTC-4430 either by a manual or electronic process. The use of a direct serial connection between the TTC-4430 and a computer running our Centurion software will require the counter to be running in the Enhanced mode. Direct serial communication is not possible running in Classic mode.

1 **Manual**

To manually retrieve data from the TTC-4430, you will need something to record the data with (pen & paper, or other method). Use the included keychain & magnet to activate the Yellow dot to activate the display.

```
Total: 25
3hrs : 2          AL
```

This will display the grand total since the unit was last reset. Each additional touch of the Yellow dot will step forward from the time the counter was deployed. The number of activations needed to step from deployment date & time to the present will be dependent upon how the counter was configured. The counter can hold 30,000 intervals and will continue to store new activations while you are manually retrieving data

2 **Electronic**

Data Hog:

Connect Diamond Traffic Products' Data Hog to the counters serial port via the data cable and turn the unit on. Watch the LEDs on the Data Hog, when they stop blinking and become steady, power off the Data Hog and disconnect. Refer to the Data Hog Users's Manual for information on how to retrieve data with Centurion.

To use the Data Hog requires V3.0 or newer firmware to be running on the Data Hog before it can be used with the TTC-4430.

Direct Serial:

Connect a Serial-9 data cable between your computer and the TTC-4430 running in Enhanced mode and start Centurion. Centurion will connect to the counter and download the recorded data and begin the import process. Reports can then be generated and/or the data can be exported as needed. An example of a grand total screen

```
Total: 0
Hour : Stop!  no
```

Note: The number zero "0" on the top line is the total number of activation 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 nor storing any data into memory. The "no" is the beam alignment indicator. ("no" means not in alignment). This changes to "AL" when the beam is aligned. You will see this change between "no" and "AL" as people cross the beam.

The "Total" value will continue to count, even if data collection has stopped.

REMINDER: When the Trail Counter is operating in Classic mode, it does not know the correct time nor date. You must keep a record of the time and date you started the Trail Counter. If you are using Enhanced mode, the trail counter will keep track of the date and time along with the recorded data.

If neither Yellow or Red dots are activated for 10 minutes, the screen is put into sleep mode, to wake up the display simply swipe a magnet across the Yellow dot.

If you see "Low Bat" on the display, this indicates that the battery pack voltage has dropped below 1.5volts (0.75 volts per battery). Data collection and recording will cease. Should the batteries die completely, data held in memory will not be lost. Install new batteries to retrieve data.

Should you need to store your Trail Counter for more than two weeks, we recommend removing the four (4) "D" cell batteries from the battery pack.

Repairs and Refurbishing
From time to time, specific repairs or general refurbishing of trail counters may become necessary. The manufacturer maintains a facility for this purpose. Should you need these services, contact Diamond Traffic at 866-782-3093 for return instructions.

After we have evaluated your unit(s), we will contact you with an estimate of repair. We will need authorization prior to proceeding with repairs.

Warranty:

Diamond units are warranted against defective material and workmanship for a period of one year from the date of purchase. In the event of unit failure, contact Diamond Traffic Products at 866-782-3903 for return instructions.

If our inspection shows that a 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.