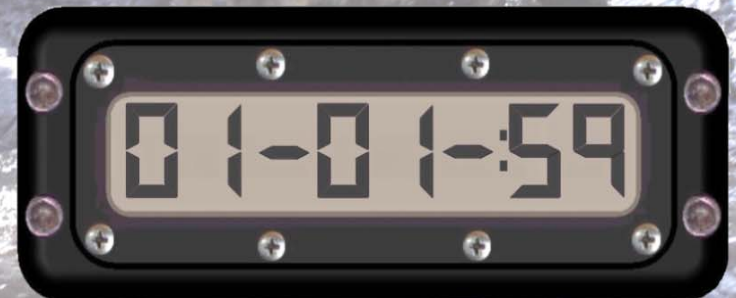


A photograph of a motorcyclist wearing a full racing suit and helmet, riding a motorcycle through a wooded area. The motorcycle's headlight is on. The background shows trees and foliage.

# WATCHDOG ENDURO COMPUTER

with Dual Sport and GNCC modes



Owners Manual Rev 11.2

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## Specifications

Operating Temp Range	20-120 deg F
Clock Accuracy	+/- 2sec/10hrs @ 70 deg
Differential Time Accuracy	+/- 0.003 sec @ 24mph
Odometer Accuracy	+/- 0.0001 miles/100 miles
Odometer Range (enduro)	0 - 255.99 miles (unlimited w/ resets to zero)
Speedometer Accuracy	+/-1% @ 30mph no acceleration
Speedometer Range	0 - 150mph
Battery Type	Sealed no maintenance
Battery life	>5000 hrs
Maximum Row # (minute)	254
Maximum # of Resets	63
Maximum # of Speed changes/layovers	55
Weight	16 oz
Overall Dimensions	0.8 x 1.8 x 4.7 in
Display Type	LCD, 1/2" digits
Material	Anodized aluminum
Sensor Type	Sealed magnetic switch 8x1.25 thread
Sensor Magnet	3/16" dia x 1/16" thick RE

**Sensor Check Mode**

You can check to see if the sensor is working by entering a tiresize of zero (000.00). This will not be stored in memory. The display will show you the software revision level on the left and a hit count on the right, ie "11.1 000". As you rotate your tire, the count will increment every time the magnet goes by the sensor. If the count does not increment, check both the sensor wiring and the distance between the sensor and the magnet. The magnet should be about 1/16" from the sensor as it passes by. You can check intermittent problems by holding the magnet on the sensor and wiggling the wires at the connectors.

**Instant Race Mode**

For recreational or practice riding (or panic race starts) you can instantly enter Race Mode by entering a keytime of zero (00:00:00). All the functions of Race Mode are enabled.

**Software Reset**

In the event that you find a way to "hang" the software, there is an escape sequence built in to the **WatchDog**. If your computer does not seem to be responding to switch input, press and hold the **MAIN** button for 15 seconds. The software will reset itself and return to the battery check. No programming information will be lost.

**Removeable Lens**

Your WD has a removeable lens. Replacement lenses are available if it becomes scratched up. Should you ever get condensation under the lens, remove the 8 screws holding the bezel and carefully remove the lens and allow it to dry out. To assemble, make sure the o-ring is seated in the groove and replace then lens. Set the bezel over the lens and replace the 8 screws. Be careful to not cross thread screws when reassembling. Screws should thread in **very** easily. If you encounter any resistance at all remove and try again. Evenly snug up all 8 screws. Do not overtighten.

Need help? Comments? Please, don't hesitate to call or email us.

**DUGAS ENGINEERING**

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**About this Manual**

The following conventions are used in this manual:

- Quoted capital letters indicate what you will see on the **WatchDog** display. The actual display may use both capitals and lowercase letters. For example, "SEE SPDS" indicates the following will be shown on the **WatchDog** display.

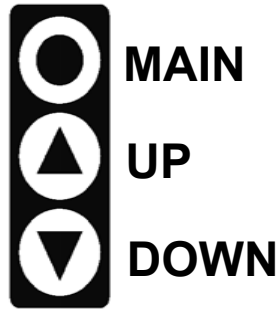


Some letters cannot be displayed in their true form. For instance, K's cannot be formed, so K's will look like capital H's. Therefore H's are always represented in lowercase on the display. Also, an "m" requires two digit fields to represent it in the display. For example, "KEYTIME" on the display looks like:



## Tiresize Measurement

- The button functions: **UP**, **DOWN** and **MAIN** are always in bold type. These refer to the buttons on the thumb switch, as shown below.



### Measuring Tire Circumference

In order for the computer to accurately track your mileage you must enter the circumference of the front tire. The computer then knows how far you travel each time the tire rotates. The accuracy of your odometer depends on the accuracy of this measurement. The caveat to this is that you will probably need to adjust it again once on the trail to match the odometer of whoever laid out the course.

There are several ways to measure this. The most accurate is to put some paint on one of the center knobies of the front tire and move the bike through two tire rotations. Measure the distance between the first and third knobby print and divide this distance by two. This is the value you enter using the TIRESIZE function.

You can also mark the tire with a piece of tape. Rotate the tire so the tape is at dead bottom. Mark the ground then move the bike through two rotation and mark the ground again. Make the measurement as described above.

### Miles and MPH Display

If you want the computer to display distances in miles and speed in miles per hour, measure and enter the tire size in inches and hundredths of inches. Any value less than 150 is assumed to be in inches. When you view your tiresize you will see "IN 084.88" indicating the size is in inches.

### Kilometers and Km/h Display

If you want to display distances in kilometers and speed in kilometers per hour, measure and enter your tiresize in centimeters. When you enter a value over 149.99 for tiresize, the computer assumes that the value is in centimeters. When you view your tiresize you will see "CE 214.43" indicating the size is in centimeters.

- For reference, typical route sheet entries are shown below:

4.20	<b>SPEED 30</b>	9:12:00
4.30	<b>R TAR</b>	9:12:12
.	.	.
14.40	<b>RESET TO</b>	9:39:20
17.00	<b>R TR</b>	10:07:30
.	.	.
96.20	<b>END</b>	13:40:00

Annotations for the table:

- "This is the SPD for a speed change" points to the **SPEED 30** entry.
- "This is the AT mileage" points to the 4.20 entry.
- "for a speed change or reset" points to the 14.40 entry.
- "This is the TO mileage for a reset" points to the 17.00 entry.
- "Last mileage" points to the 96.20 entry.
- "Keytime" points to the 13:40:00 entry.

## GNCC mode

### GNCCs and other multiple lap events

In this mode the WatchDog will keep track of your speed average in 0.2 mile segments. After the first lap, you can see how well you are doing relative to the previous laps. The display shows you mileage on the left and your early/late minutes and seconds on the right. If you are going slower than previous laps there is a minus sign (dash) before the early/late indicator. If you are going faster the dash goes away.

### Setup

Very little setup is required. If desired you can set the computer to start after a certain distance. When you first enter **GNCC** mode "DELAY 00" is displayed. The delay is measured in wheel rotations. You can adjust it manually with the **UP/DOWN** buttons or you can pre-ride the desired delay. Once the delay is set, press **MAIN** and "RDY 23" is displayed (23 being the entered delay). When you start rolling the delay will count down and begin the 1st lap when it reaches 00. If the delay was set to 00, pressing **MAIN** starts the 1st lap immediately.

The 1st lap is compared to a 16mph speed average to derive the early/late status for each segment. Subsequent laps use the fastest average for each 0.2 mile segment. (Note: the actual first lap segment averages always replace the 16 mph averages). At the end of a loop press **MAIN**, "END LOOP" is displayed. Leave the display here and it will timeout after 5 seconds and start a new lap. To cancel the new loop hit any button before the 5 second timeout ends. That's all there is to it. Just press **MAIN** at the end of each loop.

Note: Any time you stop for more than 5 seconds the calculations are suspended. So gas stops and loop ends will not affect the speed average.

To exit **GNCC** mode press and hold the **MAIN** button until the screen goes blank.

## What's included and how to turn it on

Your **WatchDog** comes complete with everything you will need to start racing right away. Your kit should include the following items:

- **WatchDog** with remote thumb switch.
- Sensor assembly.
- Nickel plated rare earth magnet.
- Two mounting brackets.
- Six bolts and four nuts.
- Thumb switch clamp.
- This manual.

Your **WatchDog** comes ready to use. The maintenance free, permanently sealed battery will provide more than 5000 hrs of "on time". The auto-off feature will turn the computer off after 4 hrs of no switch activity and no sensor activity.

### Turn it ON

To turn on the computer, press and hold the **MAIN** button until "ON" is displayed. Release the button and the remaining battery hours will be displayed. Press any button to enter the mode selection menu. "ENDURO" is displayed first. Use the **UP/DOWN** buttons to scroll through the three modes (Enduro/Dual sport/**GNCC**). Select the desired mode by pressing the **MAIN** button.

## CHAPTER 2

# Installation

### Tools needed for Installation

Your **WatchDog** is very easy to install. A typical installation will require:

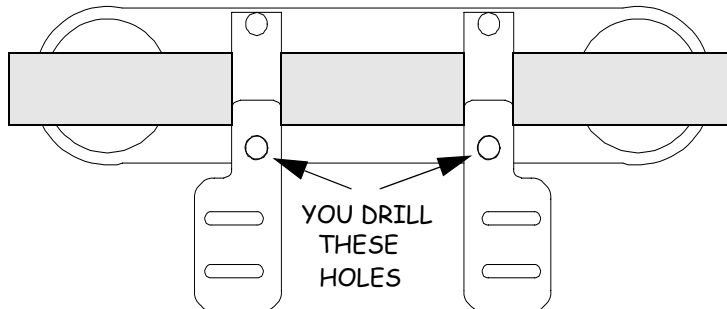
- 9/64" hex key wrench
- 3/16" and 17/64" drill bit and 8 x 1.25 tap
- a drill bit, sized to clear your handle bar clamp bolts.

Other tools may be needed depending on your specific installation.

### Mounting the WatchDog

Your **WatchDog** comes with two brackets for mounting your computer to the handle bar clamps. The brackets can accommodate a wide range of center-to-center clamp distances.

With the tabs facing out the brackets accommodate clamps up to 4" apart. By flipping the bracket over so the tabs face inward, the center-to-center distance is increased to 5". The brackets are shipped w/o holes for the handlebar bolts. This way you can customize the brackets so that your **WatchDog** clears other accessories, such as steering dampers. The brackets can be mounted on the front or back handlebar clamp bolts, facing forward or backwards. If you want the **WatchDog** to sit directly above the handlebar, mount the brackets to the front clamp bolts with the slots towards the rear. Brackets can be angled in or out also.



speed, your average over time, or your average over distance. This is selected by which speed you have showing when you leave the **SPEEDS** display. If you exit the **SPEEDS** display (by pressing the **MAIN** button) while all averages are showing, your current speed is displayed in the **RALLY** mode. If you exit while the average over time (A/T) is displayed you will see your average speed over time in the **RALLY** mode. Likewise for the average over distance (A/D).

**SPEEDS.** Use **DOWN** to scroll through speed displays. You can see all averages at once or each average independently.

"12 34 23"	all averages (A/T current A/D)
"A/T 12.34"	average over time
"A/D 23.45"	average over distance (when speed not zero)
"HI SPD 55"	view highest speed.

While viewing individual averages press **UP** to see the mileage and time associated with that average. Press and hold **UP** to clear the mileage and time for that average. For example, while viewing "A/T 12.34", pressing **UP** will display something like "38.00 3:05" indicating you have travelled 38.00 miles in 3 hours and 5 minutes, for an average of 12.34 m/h.

**CLOCKS.** Use **DOWN** to scroll through elapsed (E), riding (R), time of day (C), stopwatch (S), and suspend. Leave it on "SUSPEND" to immediately turn off computer and retain all averages and trips. When you turn it back on you will go directly to the riding displays. While viewing the stopwatch, press **UP** to enable or disable. A decimal point next to S indicates it is enabled. Press and hold **UP** to clear the stopwatch. You can also clear the elapsed and riding time by pressing and holding **UP**.

**TRIPS.** This is a general purpose trip and clock good for measuring short distances and times. It is not associated with the trips in the setup mode. The odo range is 99.99 miles and the clock range is 19 hours and 59 minutes. When you first view this display you can clear the mileage by pressing and holding the **UP** button or clear the clock by pressing and holding the **DOWN** button. If you simply press and release the **UP** or **DOWN** button you will adjust the trip mileage. Then, to clear the trips you must leave the **TRIPS** display then return to it and clear them as described above.

**RETURN TO SETUP OR TURN OFF.** To return to the setup mode, press and hold **MAIN** until "SETUP" is displayed then release **MAIN**. Continue to hold **MAIN** until "OFF" is displayed and then until the screen goes blank if you want to turn it off.



## CHAPTER 5

### Dual Sport Mode

To enter the dual sport mode use the **MAIN** button to turn on the WD. Use the **UP/DOWN** buttons to scroll to "DUALSPRT" in the mode selection menu, press **MAIN** to select. "START" is displayed.

#### Dual Sport Setup

From "START" use the **UP** or **DOWN** buttons to scroll through the setup function menu. Press **MAIN** to implement a setup function.

"START"	goto riding displays
"TIRESIZE"	change tiresize
"SETCLOC"	set time of day clock
"SEE TRIPS"	see trips: odo, oil and 3 general purpose

**START.** Press **MAIN** to view the riding displays as described below.

**TIRESIZE.** Press **MAIN** to adjust tiresize. USE the **U/D** buttons to change and then **MAIN** to exit.

**SETCLOCK.** Use **MAIN** to enter this function, then **UP** or **DOWN** to set the hours. Press **MAIN** to accept the hours value and to adjust the minute. Use **UP** or **DOWN** to set minutes and then **MAIN** to accept the minute value and exit.

**SEE TRIPS.** There are 5 trips which can track mileage up to 65000 miles. Each can be enabled, disabled and cleared. Trips are named "ODO", "OIL", "T1", "T2", and "T3". The ODO trip is what you see while riding. To scroll through the trips use the **DOWN** button. To enable or disable the trip press the **UP** button. You will see a decimal point next to the trip name when it is enabled. To clear a trip press and hold **UP** until the mileage clears. Trips are active even when racing in the enduro mode.

#### Dual Sport Riding

Use the **MAIN** button to select the desired display. The display name is displayed briefly each time you press **MAIN** and then the relevant information is shown. The display names are as follows:

"RALLY"	odometer and speedometer
"SPEEDS"	average/time, current speed, average /distance
"CLOCS"	elapsed time, riding time, time of day, stopwatch
"TRIPS"	general purpose resetable odo and clock

**RALLY.** Shows odo and speedo. Use **UP** or **DOWN** to adjust mileage. The speed that is displayed can be either your current

Use spacers between the bracket and clamp so that you have access to the bottom of the bracket for the nuts. Always drill the hole in the bracket tab as near as possible to the computer. Cut or grind off any unused portion of the bracket tab if necessary.

Locate the brackets by loosely assembling the **WatchDog** to the brackets using the four cap screws and nuts provided. Position the **WatchDog** where you want it. Adjust the brackets and mark the position of the holes in the brackets. Drill the holes and mount the brackets to the handle bar clamps. You may have to use longer handlebar clamp bolts if you use spacers below the brackets.

Tighten the **WatchDog** to the brackets. Once the **WatchDog** is mounted, run the switch wire along the handle bar and secure with zip ties. Mount the switch next to the left grip. Adjust the position of the switches so they are comfortable to access. If necessary, move the kill switch so that the kill switch wire does not run near the thumbswitch or sensor wire.

#### Connecting the Sensor Wire



The sensor is threaded for a 8 x 1.25 thread. The best way to mount the sensor is to drill and tap a hole in the caliper carrier. If you use this method, locate a spot for the magnet first. Find a location on the front disk that passes by the caliper carrier but does not interfere with the pads and mark it with tape or ink. Locate a spot on the caliper carrier by which this mark will pass. Drill a 3/16" hole thru the carrier and into the disk where you marked it (just spot drill the disk for now). Rotate the disk and drill the hole about 1/64" deep in the disk and epoxy the magnet in the hole. Drill out the hole in the carrier to 17/64ths and tap it with the 8 x 1.25 tap. Gently thread the sensor into the caliper carrier until the sensor is about 1/8 of an inch from the magnet as it goes by. **DO NOT FORCE SENSOR. IF TIGHT, RECUT THREADS AND USE OIL.** Run the sensor wire up along the brake line securing with ties or tape. Run the sensor cable all the way to the brake master cylinder. **DO NOT** route the wire from the brake line directly across to the computer as this will quickly destroy the wires when the forks compress. By running the wire all the way to the master cylinder there is no stress on the wire as the forks and brake line move. Connect the sensor to the computer. Neatly bundle up the slack in the cable and secure it and the connector with ties to the handlebars. When done, the connector should not move at all when forks are compressed. Visit the website at [DugasEngineering.com](http://DugasEngineering.com) for more information on routing the sensor.

**Note:** Some of the newer bikes provide the tapped hole in the caliper carrier. Do not use jam nuts when mounting the sensor in a threaded hole.

## Enduro Racing

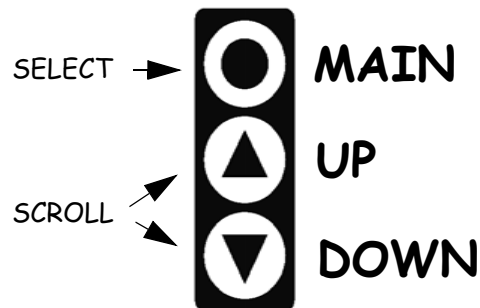
### Programming Details

This section describes and illustrates how to use the three buttons of the thumb switch to program your enduro race data. Once you are comfortable with entering data and understand their functions, proceed to the QuickStart chapter to program the **WatchDog** for a race.

Press the **MAIN** button to turn on the WatchDog. Press any button to exit the battery check display. Scroll through the race modes (Enduro/Dual sport/ GNCC) using the **UP/DOWN** buttons. Select the Enduro mode with the **MAIN** button.

### Programming Your WatchDog

In general, when programming the **WatchDog**, the **MAIN** button (top) is used to select functions or values while the **UP/DOWN** buttons are used to scroll through the functions or values.



### Enduro Display Configuration

The configuration function allows you to enable and disable certain displays in the enduro race mode. Normally, the **MAIN** button will scroll the following displays: **MinuteMinder**, check sync, odo/speedo, and keytime. You can configure the computer to disable some of these displays. For example, you can disable the odo/speedo and keytime displays so that **MAIN** will select only **MinuteMinder** and check sync displays. **MinuteMinder** mode cannot be disabled.

One other configuration feature allows you to select what you see when you adjust your mileage. Normally, in **MinuteMinder** when you hit the **UP** or **DOWN** button to adjust your mileage the display will change to the **MileMinder** display, showing you the full mileage and your diff time. You can configure it such that when you are in **MinuteMinder** and you adjust your mileage, the two digits representing keytime seconds change to represent hundredths of miles. This allows you to always see the distance to the next possible as well as your diff time while adjusting your mileage. After 4 seconds of no button activity the keytime seconds will reappear.

**NOTE:** This is effective only when you initiate the mileage adjust with the **UP** button. If you initiate it with the **DOWN** button, the display will change to the **MileMinder** as usual and stay there until you hit **MAIN**.

To enter the configuration menu enter a tiresize of 000.01 . You will see 4 selection one at a time. At each selection use the **UP/DOWN** button to toggle the display enable. A "1" is enabled and a "0" is disabled. Press **MAIN** to accept and go to next configuration select.

**NOTE:** A "1" for all selections is the factory default.

Selection are as follows:

"ODOADJ"

1 Display switches to **MileMinder** when adjusting mileage.

0 Keytime seconds is replaced with hundredths of miles.

"CHCSNC"

1 Enable check sync display

0 Disable check sync display

"ODOSPD"

1 Enable odo and speedo display

0 Disable odo and speedo display

"CLOCK"

1 Enable full keytime display

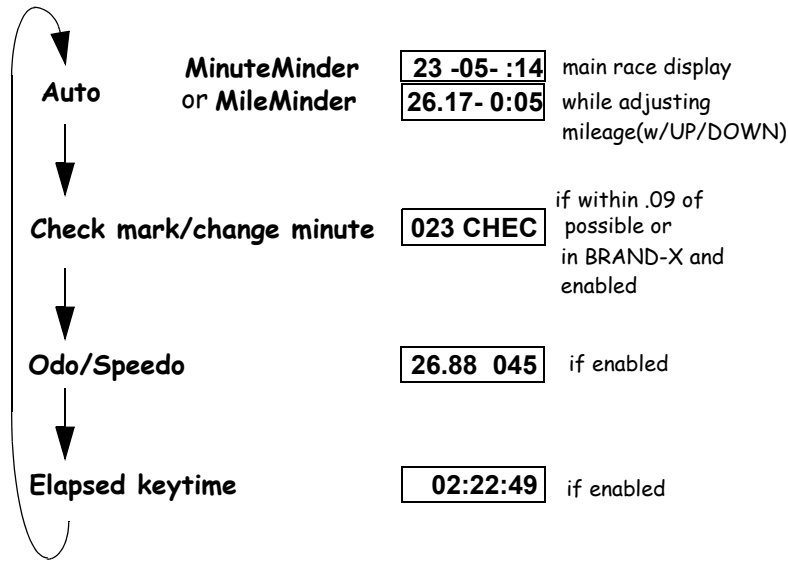
0 Disable full keytime display

"DONE"

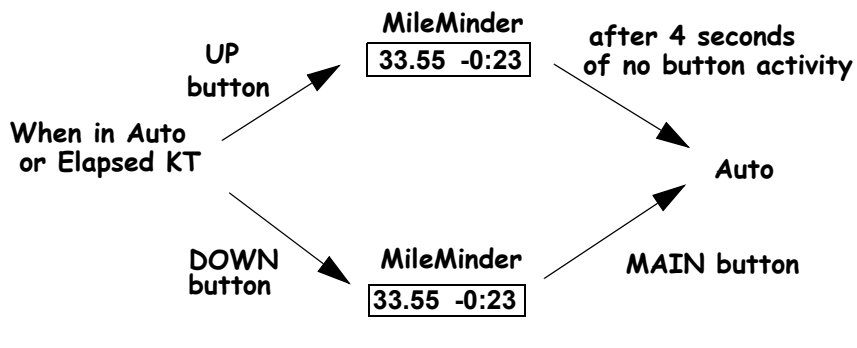
Press **MAIN** to exit the configuration utility and turn off computer or press **UP** or **DOWN** to go to ODOADJ again.



**Race mode displays using MAIN button to select**



**Race mode displays using UP/DOWN button to select**



**Race mode displays holding MAIN button (release MAIN when desired function is displayed)**

- Hold for 2 seconds "TIRESIZE" to change tire size
- Hold for 3 seconds " CLOCK " to adjust elapsed time
- Hold for 4 seconds " ICD " to enter ICD mode

**Menu**

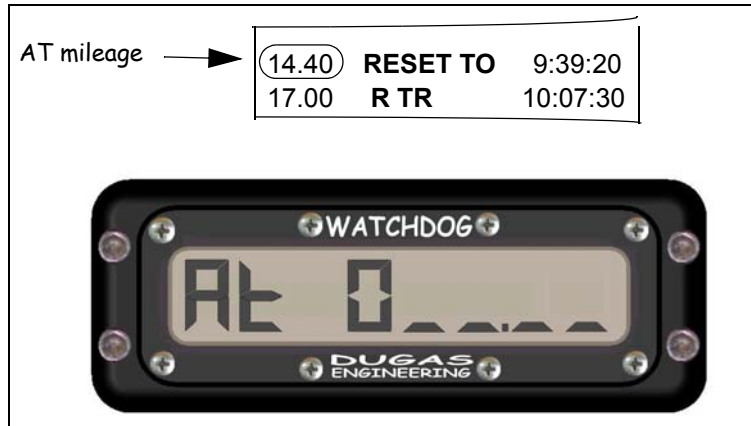
Use the **UP/DOWN** buttons to quickly scroll through the programming functions. These functions are:

Function	What you see in the Display	What it says
Enter a reset	rESEt	RESET
Enter a free zone	FrEE	FREE
Enter a spd change	SPd Ch	SPD CH
See resets	SEE rStS	SEE RSTS
See speeds	SEE SPdS	SEE SPDS
Enter tiresize	tirESiZE	TIRESIZE
Enter minute	minutE	MINUTE
Enter race start time	Strt tm	STRT TM
See race information	rACEinFo	RACEINFO
Verify programming	vEriFYto	VERIFYTO
Enter keytime	HEYtimE	KEYTIME
Clear resets	CLr rStS	CLR RSTS
Clear speed changes	CLr SPdS	CLR SPDS

The table above reflects the order in which you would typically enter data prior to a race. The **MAIN** button is used to select the function, the **UP** and **DOWN** buttons are used to scroll through values of that function. The same procedure is used to enter values for all the functions. For instance, to enter a reset, do the following:

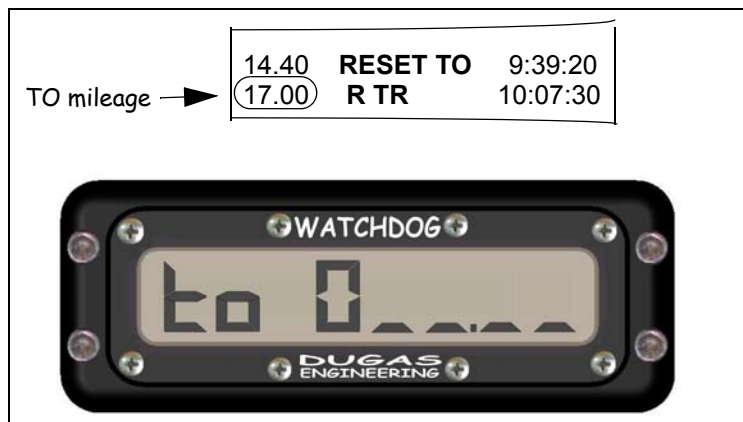
Use the **UP/DOWN** buttons to scroll to "RESET". Select the reset function by hitting **MAIN**. The display will read "AT 0\_ \_ . \_ \_", prompting you for the AT mileage of the reset. The zero indicates the current digit being edited. Use the **UP/DOWN** buttons to scroll through the numbers 0-9. Hit **MAIN** to select the currently

displayed value for that digit field. The current digit will be accepted and the cursor will move to the next digit field. Continue entering the values for the remainder of the digit fields. When the last digit is entered, the display will change to "TO 0 \_ \_ \_ \_",



prompting you for the TO mileage of the reset. Enter the TO mileage in the same manner. After entering the last digit the values are stored in memory and the reset function will be displayed again. To continue entering resets hit **MAIN** and repeat.

At any point while entering the reset you can exit back to the start of the function by holding the **MAIN** button until "OFF" is displayed and then releasing. This will take you back to the beginning of the current function.



For example, set it to the mileage at the start of the next section (ie. known control mileage). Then as you ride around you will not affect the remaining duration of the gas stop. **Caution!! Don't forget to get out of ICD when you get to the known control!** To exit ICD hold **MAIN** until "ICD OFF" is displayed, then release.

### Race Recovery

In the unlikely event that the computer unexpectedly resets, (EMI noise etc) **WatchDog** will either recover automatically or prompt you to enter the keytime ("KEYTIME"). If the computer determines that no information has been corrupted it will recover automatically. During this time the computer will display "HOLD ON" while it returns to the current mileage and keytime in the race. If your **WatchDog** has determined that data has been corrupted it will prompt you to enter the current keytime. Using your back-up watch (which you should always have), enter the current un-adjusted keytime (the posted keytime). You will then be prompted for an AT mileage ("AT 0 \_ \_ \_ \_"). Enter the mileage to which you want to advance. To enter a mileage past a reset to zero, you must enter the total accumulative mileage to that point. For example, if the reset to zero is at 30.00 miles and you want to advance to mile 10.00 of the 2nd loop, enter 40.00 miles at the prompt. If you make a mistake entering either value, hold **MAIN** until "OFF" is displayed. You will be prompted for the keytime again. **WatchDog** will enter race mode and advance to the entered keytime and mileage. Once back in race mode, adjust your minute if necessary. While recovering, "HOLD ON" is displayed, during which you DO NOT need to wait...GO!!

This feature can be used at any time to enter or re-enter race mode. Anytime you enter a post race-start keytime (race start time plus your minute) you will always be prompted for a mileage. For example, if you are in a race and realize that you programmed something wrong, simply turn the computer off, fix the program, then use race recovery to re-enter the race. To do this, scroll down to "KEYTIME" and enter the current unadjusted keytime. At the "AT 0 \_ \_ \_ \_" prompt enter the current mileage. The computer will advance to that point in the race.

seconds turn to 00, increment the clock minute. Make sure they match then hit **MAIN** to return to race the displays. Adjust your minute if necessary.

Note: In Brand-X the keytime you see once back in race mode is adjusted for your current minute. You can compare this directly to your route sheet.

### Adjusting Tire Size

At any time, to adjust your tire size, hold down the **MAIN** button until "TIRESIZE" is displayed. Release the button. Now use the **UP/DOWN** buttons to adjust your tire size in increments of 0.01 inches. Hit the **MAIN** button to return to **MinuteMinder**.

**Tip:** If your mileage is off by one one-hundredth (1/100) of a mile over the course of a mile, adjust your tire size by about 0.80 inch.

### Interactive Calculated Distance Mode (ICD)

In the event your magnet gets sheared off (or anytime), you can still use the **WatchDog** to display your differential time and calculated mileage. To enter ICD mode, press and hold **MAIN** button until " ICD ON " is displayed. Calculated distance will be displayed on the left, and differential minutes and seconds will be displayed on the right. You will immediately see the mileage change until the diff time is zero. The diff time will remain 0:00 until you adjust the mileage. When you adjust the mileage at a trail marker, the diff time will reflect your early or late status. If you are late, after a short delay the displayed mileage will return to the calculated mileage for the current keytime, and the diff time will return to 0:00. If you are early, the displayed mileage will remain as is until the diff time reaches 0:00. At which time the calculated distance will begin to increment again and the diff time will remain at 0:00.

Since the mileage is automatically incremented in this mode, you should not have to adjust the mileage too much at the trail markers. With a quick mileage adjustment you can determine your diff time and either take off again or wait.

Another use for ICD is during a gas stop or layover when you want to monitor your remaining time but dont want the mileage to increment (while driving around the pits for example). When you get to the gas stop, enter ICD and set the odo to the desired mileage.

### Function Prompts

The following sections illustrate the prompts you will see for each of the other functions. Enter the values for each function as described in the previous section for entering resets. Parenthesis indicate valid value range.

#### Free Territory (FREE)

1. hit **MAIN**
2. prompt is "AT 0 \_\_\_\_", enter the five digits indicating the mileage at which the free territory begins (000.00 - 254.00) hitting **MAIN** after each.
3. prompt is "TO 0 \_\_\_\_", enter the 5 digits of the mileage at which the free territory ends, hitting **MAIN** after each.
4. after entering the last digit of the TO mileage, the values are stored and "FREE" is displayed again. Hit **MAIN** to enter another free territory.

**Note:** Use this function to program for known controls. ie. If there is a known control at 45.00 miles, program a free territory from 42.00 to 45.00. Free territories are stored and sorted with the resets. Do not use this function for entering free **time!** For free time use the layover function below.

#### Speed Changes and Layovers (SPD CH)

1. hit **MAIN**
2. prompt is "AT 0 \_\_\_\_", enter the five digits indicating the AT mileage, (000.00 - 254.00) hitting **MAIN** after each.
3. prompt is "SPD 0\_\_", enter the three digits for the speed (001 - 254), hitting **MAIN** after each.
4. after entering the last digit of the speed, the values are stored and "SPD CH" is displayed again. Hit **MAIN** to enter another speed change.

To enter a layover (aka WAITS and PAUSES) enter a speed of 000 when prompted for the speed in step 3 above. The following will be displayed "FOR 0\_\_" prompting you for the duration in minutes. Enter the duration and hit **MAIN**.

**Note:** Layovers are stored as speed changes, with the speed = 0 mph. They are sorted just as other speed changes are. When viewing speeds they appear as "SPD 0 - XXX" where XXX is the duration in minutes.

**Note:** If a dash appears next to RESET, FREE or SPD CH (ie "RESET -") this indicates that the resets contain a jump (reset to 000.00) and that the entries will not be sorted by mileage.

### See Resets (SEE RSTS)

1. hit **MAIN**, "RESET XX" is briefly displayed (XX is entry #)
2. display will alternate between the AT and TO mileage for the first reset. Hit **MAIN** to display each of the remaining resets.
3. to delete the currently displayed reset, press **MAIN** until "OFF" is displayed. Release **MAIN** to delete the entry.
4. Hit **DOWN** to exit

**Note:** this function will also display/delete free territories. A dot next to the AT or TO indicates its a free territory. ie "AT. 23.45".

### See Speeds (SEE SPDS)

1. hit **MAIN**, "SPEED XX" is briefly displayed, then
2. display will alternate between the AT mileage ("AT 000.00") and the speed ("SPD 024") for the first speed or between the AT mileage and "SPD 0-XXX" for a layover, where 0 indicates 0 mph and XXX is the length of the layover in minutes. Hit **MAIN** to display each of the remaining speeds.
3. to delete the currently displayed speed, press **MAIN** until "OFF" is displayed. Release **MAIN** to delete the entry.
4. hit **DOWN** to exit

### Tire Size (TIRESIZE)

1. hit **MAIN**. Current tire size is displayed (ie "IN 083.65" or "CE 213.88"). If OK hit **DOWN** to advance to "MINUTE". To change tire size hit **MAIN**.
2. prompt is "IN 0 \_ \_ \_ \_", enter the five digits for tire circumference in either inches or centimeters, (001.00 - 254.00), hitting **MAIN** after each. (See Chapter 7 on how to measure tire size.) A value over 149.99 is assumed to be in centimeters.

### Minute (MINUTE)

1. hit **MAIN**, current rules and minute are displayed (ie "AMA 021"). If OK hit **DOWN** to advance to "STRT TM". To change hit **MAIN**.
2. prompt is "AMA ", hit **MAIN** to select AMA rules, or
3. hit **UP/DOWN** to toggle rules to "NEI ", hit **MAIN** to select NEI rules.
4. prompt is "AMA 0\_\_" or "NEI 0\_\_", enter the three digits for your minute, (001 - 254) hitting **MAIN** after each.

### Start Time (STRT TM)

1. hit **MAIN**. Current race start time is displayed (ie "ST 09:00"). If OK hit **DOWN** to advance to "RACEINFO". To change, hit **MAIN**.
2. prompt is "ST 0 : \_ \_ \_", enter the four digits for the race start time, (00:00 - 99:59) hitting **MAIN** after each.

mileage will not be changed. There is no need to wait for any of this to happen. Simply, press the **MAIN** button once (make sure "12.34 CHEC" is displayed) and take off. The mileage will be accumulated in the background.

In Brand-X you can enter this mode at any time so that you can change your minute. As in AMA rules, press **MAIN** once from **MinuteMinder**. The display will show "023 CHEC", where 023 is your minute. You can change your minute by using the **UP/DOWN** buttons. If your odo is within 0.09 miles of a check the odo will sync to the checkpoint mileage. However, the countdown will not be set to 3.00 miles. Again, there is no need to wait, simply adjust your minute and take off. The display will return to **MinuteMinder** after a few seconds. Setting CHCSNC to "0" in the configuration function will disable this display.

### View Odometer and Speedometer

You can view your odometer and speedometer by pressing **MAIN** twice if all displays are enabled. The speed is a 3 second running average. Setting ODOSPD to "0" in the configuration function will disable this display.

### View/Adjust Keytime

From **MinuteMinder**, you can view the current keytime by pushing **MAIN** three times if all displays are enabled. Setting CLOCK to "0" in the configuration function will disable this display.

You cannot change the keytime from this display. If you need to change keytime, press and hold the **MAIN** button until "CLOCK" appears on the display. Release the button. A "C" will be displayed on the left indicating keytime can be adjusted. Adjust the keytime in increments of minutes using the **UP/DOWN** buttons. The seconds are reset to zero each time you change the minute. Hit the **MAIN** button to return to **MinuteMinder**.

When you adjust your keytime in this mode you need to enter the elapsed keytime since leaving the gate. If your backup watch displays elapsed time then you can use this time directly. If it shows the actual posted keytime you must subtract your minute before using it. For AMA events, simply enter the time directly from your backup watch. When running Brand-X, first set your minute to your original minute, then adjust the clock to match your backup watch. After adjusting the clock set your minute to your current minute. Whichever rule you are running, adjust the clock so that the full minutes match the backup watch. For example, if the backup shows 1:23:35, set the computer clock to 1:23:00. When the backup

initially hit the **DOWN** button the display will remain in **MileMinder** until you hit the **MAIN** button.

When you hit the **UP** or **DOWN** button the displayed mileage stops incrementing except for when you adjust it. If you are still moving, the mileage is accumulated in the background. A few seconds after you are done adjusting your mileage the accumulated mileage is added to the displayed mileage. This allows you to adjust your mileage to match a trail marker even though you are still moving forward. Just make sure that you begin adjusting your mileage when you are next to the trail marker.

**Tip:** Use the **UP** button to quickly view your mileage and adjust if necessary. Use the **DOWN** button on road sections or fast sections when you stay within your minute and want a constant display of your mileage.

**Tip:** The longer you hold the **UP/DOWN** button the faster the mileage will scroll.

If in the configuration utility you set **ODOADJ** to a "0", instead of changing to the **MileMinder** when you press the **UP** button, the keytime seconds in **MinuteMinder** will change to display hundredths of miles with a decimal point to the left, ie, "24 1:2 .16". Adjust your mileage if necessary and the display will change back to keytime seconds after a few seconds. This allows you to monitor your diff time and distance to next possible as you adjust your mileage. The **DOWN** button functions as above.

### Marking a Check and Changing your Minute (Brand-X)

In **AMA** rules you can mark a check by pressing the **MAIN** button once from **MinuteMinder**. If your **odo** is within 0.09 miles of the correct checkpoint mileage when you press **MAIN** the display will show "12.34 **CHEC**" (where 12.34 is your **odo** and is adjustable and **CHEC** will flash). If you leave the display here for ten seconds several things will happen. First, your **odometer** will be synchronized to the correct mileage for the checkpoint. For example, if the check point mileage is 24.40 and your **odo** is between 24.31 and 24.49 your **odo** will jump to 24.40. Then, the next possible countdown will be set to 3.00 miles. If your **odo** is not within 0.09 miles of the actual mileage "12.34 **CHEC**" will not be displayed when you hit the **MAIN** button. Instead, the **odometer** will be displayed. You must first adjust your mileage then mark the check by hitting **MAIN** until you see "12.34 **CHEC**" again. After ten seconds on "12.34 **CHEC**" the display will return to **MinuteMinder**. If you change the display (by pressing **MAIN**) before the ten seconds is up the check will not be marked and your

### Race Info (RACEINFO)

1. hit **MAIN**, total ground miles from last race will be displayed (ie "TD 087.33"). Hit **MAIN**, highest speed from last race will be displayed (ie "HISP 067"). Hit **MAIN** to repeat or **DOWN** to exit and advance to "VERIFYTO".

### Verify To (VERIFYTO)

1. hit **MAIN**
2. prompt is "VE 0 \_\_. \_\_", enter the five digits, hitting **MAIN** after each, for the mileage to which you want to verify the programming.
3. display is "HOLD ON", then display will return with calculated time for the selected mileage.
4. Hit **MAIN** to enter the next mileage and repeat step 3 for successive mileages, or **UP/DOWN** to advance to "KEYTIME".

**Note:** When multiple loops are programmed, you must verify to the end of each loop in order. For example, if there are resets to zero at 45.00 and then 35.00 miles, first verify to 45.00 miles. Then hit **MAIN** again to enter and verify to 35.00 miles.

This incremental verification can be used with all programs (to help find programming errors, for example).

To abort a verify calculation simply hit **MAIN**.

### Keytime (KEYTIME)

1. hit **MAIN**
2. prompt is "KTO\_:\_:\_:\_", enter the six digits, hitting **MAIN** after each of the digits, for the advanced posted keytime. Wait on hitting **MAIN** for the last digit until the posted keytime equals the entered keytime. Running keytime is displayed.
3. Hit **DOWN** to display countdown to race time.

### Clear Resets (CLR RSTS)

1. hit **MAIN**, a confirmation prompt is displayed "CLR RS ?"
2. to clear resets hit **MAIN**, or hit **UP/DOWN** to escape. Display is "HOLD ON", while reset (and free territory) memory is being cleared, then display will return with "CLR SPDS". The reset and speed change sorting feature will be enabled. "

### Clear Speeds (CLR SPDS)

1. hit **MAIN**, a confirmation prompt is displayed "CLR SP ?"
2. to clear speeds hit **MAIN**, or hit **UP/DOWN** to escape. Display is "HOLD ON", while speed memory is being cleared, then display will return with "RESET". This also clears all layovers.  
**Default speed at 000.00 miles will be 24mph.**

## Programming for Multiple Loop Races

For multiple loop races where the mileage is reset to zero at the start of each loop you must enter the resets and speeds in the order in which they occur. Always do the resets before the speeds and enter a reset to zero at the end mileage of each loop. Once you enter a reset to zero the sorting feature is disabled and all subsequent resets (and speeds) are stored in the order in which they are entered. If you did the speeds first they would be sorted by mileage. A dash next to the function ("RESET -") indicates sorting is disabled. For example, if the first loop is 40 miles long, enter a reset AT 40.00 TO 000.00. Then, a reset in the second loop is entered after the reset to zero:

```
AT 034.00 TO 034.50
AT 040.00 TO 000.00 (end of 1st loop/start of 2nd)
AT 010.20 TO 012.00
```

After the resets are entered, enter all the speed changes in the order in which they occur. If there is a speed change at the start of the next loop (at mile 000.00), you can enter that speed change at the same mileage at which you entered the reset to zero or you can enter it at 000.00. (where it occurs looks more obvious as you view your speeds if its at the reset mileage). For example you can enter it as follows:

```
AT 000.00 SPD 024 (start of first loop)
AT 024.00 SPD 036
AT 040.00 SPD 018 (end of first loop)
AT 018.00 SPD 024
```

or

```
AT 000.00 SPD 024 (start of first loop)
AT 024.00 SPD 036
AT 000.00 SPD 018 (start of second loop)
AT 018.00 SPD 024
```

You can have multiple speed changes at the same mileage. For example, if there was also a layover at 040.00, you could enter it at 000.00 or at 040.00 and you could enter it before or after the speed change if the speed change is at the same mileage. Or you could put the speed change at 040.00 and the layover at 000.00.....etc.

**Caution:** Do not enter a layover for the second loop AT 000.00 if there are no speed changes in the first loop (other than the first AT 000.00). If you do, it will be implemented as soon as you enter

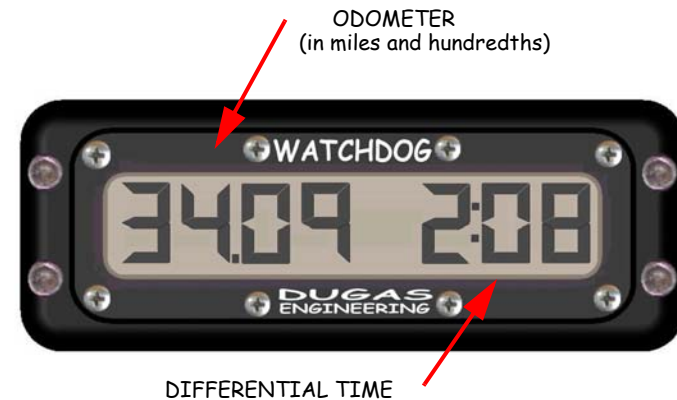
**Note:** When you reach a programmed free territory the possible count down will indicate the distance to the next possible including the free territory.

The two center digits indicate your early/late status. Use this as the main indicator of how you are doing. Always use this in conjunction with the keytime seconds (right most field) when approaching checkpoints. If you are late the minus "-" sign appears around the differential time (DT) If you are early the DT flashes. If you are less than a minute early or late the DT is displayed as second, ie "23 -45- :21", indicating 45 second late. If you are more than a minute early or late the DT is displayed as minutes and tenths of seconds, ie "12 1:2 :44", indicating one minute and twenty something seconds early. Above 10 minutes early or late and it is displayed with a decimal point to the right, ie "12 13. :44" indicating 13+ minutes early.

The right most digits display the keytime seconds. This is used as a final check before entering checkpoints. A DT equal to 00 should not be used alone as an indicator of when to enter a check, since this is dependent on the accuracy of your odometer. Always use the keytime seconds as the last indicator of when to enter the checkpoint. Enter as the seconds roll over to zero, or at 30 seconds for an emergency check.

## Adjusting Mileage

In **MinuteMinder** there are two ways to view and/or adjust your mileage. To view or adjust the mileage hit either the **UP** or **DOWN** button. The display switches to **MileMinder** as shown below. Then use the **UP/DOWN** buttons to adjust your mileage. If you initially hit the **UP** button to enter **MileMinder**, the display will return to **MinuteMinder** after 4 seconds of no button activity. If you





## Countdown and Race Displays

Once keytime is set, use the **DOWN** button to view your countdown ("CD 01:25:46"). When the countdown to when your row leaves reaches 00:00:00, the **WatchDog** will automatically enter race mode. The **MinuteMinder** is the main display you will see while you are racing. You can also easily adjust your mileage, your minute (in Brand-X), mark a check, or view your odo/speedo and full keytime. A configuration utility allows you to selectively enable or disable certain displays for viewing. You can also use Interactive Calculated Distance (ICD) mode if you damage your sensor.

### MinuteMinder

The **MinuteMinder** displays three fields of information. The two left digit fields indicate the countdown distance to the next possible checkpoint. If the distance is less than one mile it is displayed in hundredths, ie "88 -45- :23", indicating 0.88 miles or 88 hundredths. If the distance is more than one mile it is displayed as miles and tenths of miles, ie. "1.3 -44- :52", indicating 1.3+ miles. The initial countdown value is dependant on the currently programmed speed average, for example, at 24mph it will count down from 40 to 00, then start at 40 again; at 18mph it will count from 30, etc. Use this information wisely to get a early jump into sections. As long as the count is high you can ride hot into the section. As the countdown gets close to zero, be careful. If the count will reach zero around the next blind corner don't be early!!! If you are early, wait until the differential time is close to 00, then proceed carefully. Don't burn a check!! If the count is low but you can see ahead enough, it is safe to keep going until the count down approaches zero again (don't forget to adjust your mileage at the markers).



race mode. Instead, enter it at the reset to zero mileage. For example, enter it AT 040.00 in the previous example. Or if you want, add another speed change AT 000.00 to the same speed as in the first loop. Then you can put the layover AT 000.00 after the speed change.

Once the resets, speed changes and layovers are programmed, they can be easily viewed, checked and edited by selecting SEE RSTS and SEE SPDS.

**Note:** If the first speed of the first loop is not 24mph (default speed after clearing speed changes) you will have to delete this speed change manually before (or after) programming your speeds.

### Editing Race Data

#### Data Entry Errors

If you make a mistake while entering resets, speed changes, tire-size, keytime, verify mileage, start time, or your minute, simply press and hold the **MAIN** button until "OFF " is displayed then release **MAIN**. This will bring you back to the start of the current function. No data will be saved.

#### Adding Resets and Speed Changes

For single loop races (no resets to zero) you can add resets/free territories and speed changes to your program by simply using the RESET and SPD CH functions. The reset and speed changes are sorted by mileage and can be entered in any order.

If there is a reset to zero in your program you can insert resets, frees, and speed changes using the SEE RSTS and SEE SPDS functions. To insert a reset or free, select the SEE RSTS function and hit **MAIN** until you see the reset or free before which you want to insert a new one. Hit the **UP** button and "INSERT ?" will be displayed. Hit **MAIN** then **UP** or **DOWN** to select either reset or free. Once selected, hit **MAIN** and enter the reset/free as usual. At "INSERT?", hit **UP** or **DOWN** to cancel. Follow the same procedure using SEE SPDS to insert a speed change.

#### Deleting Resets and Speed Changes

You can delete speed changes and resets using the SEE SPDS and SEE RSTS functions. Select the desired function and use **MAIN** to view the entry you want to delete. While you are viewing it press and hold **MAIN** until "OFF" is displayed, then release **MAIN**. "DELETED" will be displayed briefly and then the next entry will be displayed as usual.



## WatchDog Enduro QuickStart

The **WatchDog** was designed to simplify timekeeping before and during a race. To start a new race with the **WatchDog**, use the following QuickStart procedure.

### 1. Power On Battery Check

Press and hold **MAIN** button until "ON" is displayed, release **MAIN**. The remaining battery hours is displayed. Press **MAIN** twice to enter the enduro mode.

### 2. Program Resets, Free Territories and Speed Changes

Clear old resets and speed changes by scrolling down to the CLR RST/CLR SPDS functions. Hit **MAIN** at each function to clear the resets and speed changes. Enter all the resets, free territories, speed changes, layovers, and jumps as outlined on your route sheet. **If the first speed is not 24mph you must enter a new speed for 000.00 miles.** Speed changes and resets can be entered in any order. **WatchDog** will sort them by mileage. Error checking disallows certain invalid entries. For instance, you can't enter a reset from 11.50 miles to 10.50 miles.

Use the FREE function to program in any zones that are known to be check free. For example, if there is a known control at 45.00 miles, you may program a free territory from 42.00 to 45.00. If you want, you could enter another free territory from 45.00 to 48.00 since there cannot be another check for 3.0 miles after the known, or you could mark the known as usual when you get there.

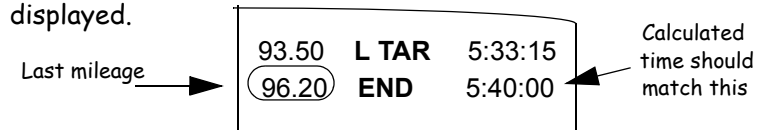
### 3. Enter Tiresize, Minute and Race Start time

Use the TIRESIZE, MINUTE, and STRT TM functions to enter your tire size, your start minute, and the race start time (i.e., 9:00).

### 4. Verify Programming

Scroll down, using the **DOWN** button to "VERIFYTO" and enter the last mileage indicated on your route sheet. See below. Hit the **MAIN** button. "HOLD ON" will appear on your display. When done (usually about 1sec/3miles) the **WatchDog** will display the calculated time for the entered mileage. It should match your route sheet. If not, make sure the speed changes match the route sheet. For multiple loops you must verify to the end of each loop in order.

For example, if you have a reset to zero at 45.00 miles, first verify to 45.00. Then hit **MAIN** and enter the mileage at the end of the next loop, etc. This routine does not check the resets so you need to make sure they are correct as you view them. To abort a verify calculation hit **MAIN** while "HOLD ON" is displayed.



### 5. Enter Keytime

Once all the data has been entered correctly, scroll down to "KEYTIME", hit **MAIN**. Enter a time 10 or 15 seconds ahead of the posted keytime (this provides ample time to synchronize the **WatchDog** with keytime). When the posted keytime reaches the entered value hit the **MAIN** button. After you press **MAIN** the display will continue to show the running keytime and the **WatchDog** will begin the countdown to your race time. Press the **DOWN** button to view the countdown time. You can scroll through the menu as usual after entering keytime. However, The "KEYTIME" display is replaced with "KEYSET X" where X is a 4 second count down. When the count reaches 0 the actual running keytime is displayed. You can reenter the keytime by hitting **MAIN** before the 4 seconds are up (you can also reenter it by pressing **MAIN** twice while the running keytime is being displayed). Also, once keytime is entered, the CLR RSTS, CLR SPDS, and VERIFY TO functions are disabled and are not displayed and the countdown display is enabled, ie. ("CD 01:25:46"). You can re-enabled those functions and stop the countdown by resetting your minute, the start time, or by turning off the computer and then turning it on again.

**Remember:** Always enter the posted keytime directly. Your **WatchDog** will adjust for your minute and the race start time when displaying the countdown.