## FCC REGULATIONS

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this device without the express approval of SmarTire Systems Inc. may void the user's authority to use this device.

3.98/050.0000.om-rev1

## WARNINGS

### The SmarTire™ System and Tire Maintenance

This system is a sensing device designed to identify and display tire operating data and activate an alert or warning when pressure or temperature irregularities are detected. **It is the responsibility of the driver to react promptly and with discretion to alerts and warnings.** Abnormal tire inflation pressures should be corrected at the earliest opportunity. As a part of regular tire maintenance, use the Display Module's required pressure to set tire pressure inflation levels.

### System Installation and Usage

Use of the SmarTire™ system requires that it has been properly installed and programmed by qualified personnel according to SmarTire Systems Inc. documentation. This includes the Owner's Manual and any supplementary installation instructions included with system components.

THIS SYSTEM IS SUITABLE FOR USE IN PASSENGER AND LIGHT TRUCK TIRES UP TO LOAD RANGE C (MAXIMUM COLD INFLATION PRESSURE 50 PSI).

### Use of Chemicals

Temporary resealing or reinflation products containing internal sealers or propellants in any tire/wheel assembly may adversely affect the operation of Sensor Modules. **Use of these chemicals can damage the pressure sensor and will nullify any manufacturer's warranty, express or implied.**

### Power Connection

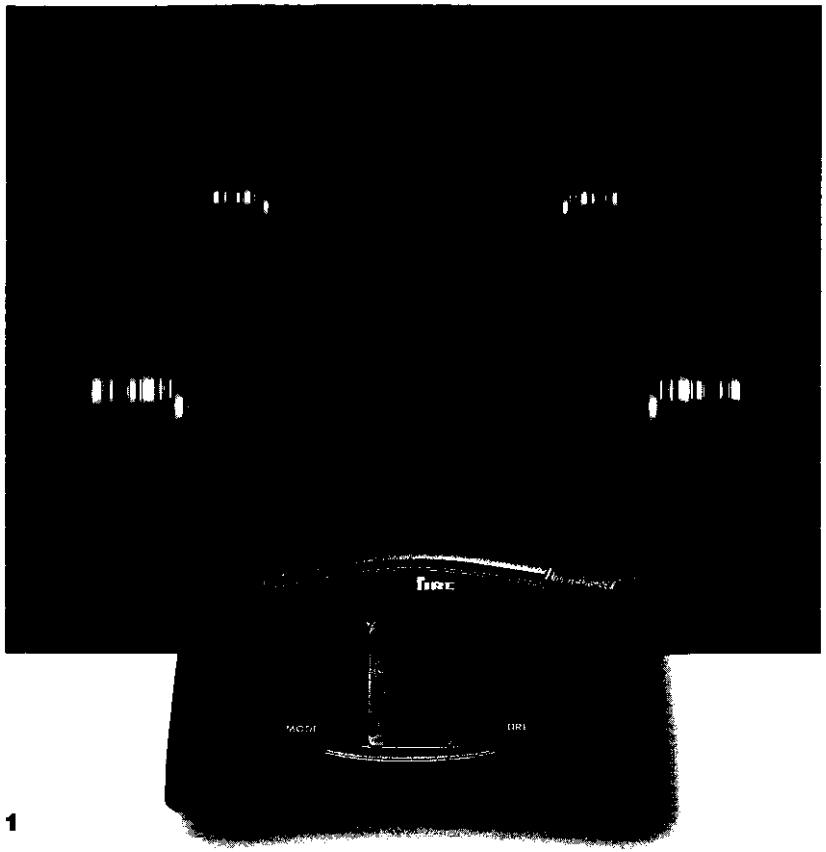
If your Display Module is connected to an unkeyed cigarette lighter socket unplug it before you park the vehicle for extended periods of time (more than three days) to avoid draining the battery (on a keyed circuit you will see the key lights turn off and the information screen clear when the ignition switch is turned off).

# Table of Contents

# The SmarTire™ System

Congratulations! As the owner of this state-of-the-art wireless tire pressure monitor system, you will enjoy the improved convenience and benefits of having tire pressure and temperature information automatically monitored while you are driving.

The SmarTire™ System provides full-time awareness of tire operating data and alerts you of any irregularities.





## Components

A tire information Display Module is conveniently mounted within your view and reach. A Sensor Module mounted inside each tire/wheel assembly measures its contained air pressure and temperature and transmits this data to the Display Module. The Display Module analyzes the received data and issues a visual and/or audible alert for any irregular tire pressure or temperature.

## Ease of Use

The Display Module turns on with the vehicle ignition switch. The tire indicators turn on when transmissions are received from the individual Sensor Modules (activated by vehicle motion of 10 mph or greater). With all the indicators on and no alert light, you can be confident that all your tire pressures are normal.

## Benefits

Continuous tire monitoring:

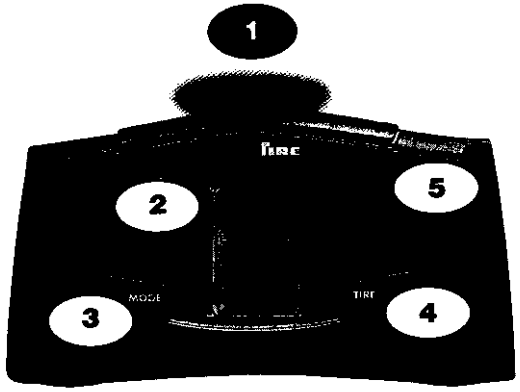
- Automates pressure maintenance awareness
- Provides increased security from unexpected tire pressure loss
- Improves the possibility of tire repair

Maintaining correct tire pressure:

- Improves fuel economy
- Increases tire tread life
- Optimizes vehicle handling

## Display Module

1. Alert light
2. Information screen
3. MODE key (tire data)
4. TIRE Key (tire location)
5. Warning beeper




### SmarTire™ System Features

Viewable tire data:

- Actual pressure
- Temperature
- Required pressure
- Pressure status

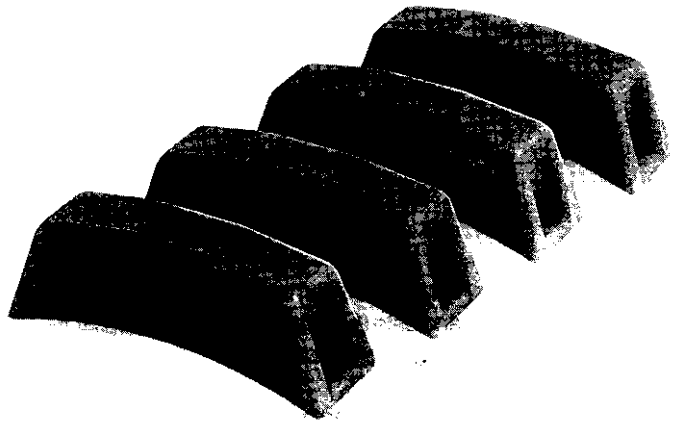
Alerts and warnings:

- Pressure status alert
- Low pressure alert
- Low pressure warning
- High temperature warning
- Sensor Module diagnostic
- Display Module diagnostic



| INFORMATION SCREEN | | |
|---|---|---|
| STATUS | Displays tire pressure status | FRONT |
| REQ-P | Displays required tire pressure | |
| ACT-P | Displays actual tire pressure | |
| TEMP | Displays tire air temperature | |
| + | Overinflation | |
| - | Underinflation | |
| ▮ | Tire indicators (ie. front left, right rear) | REAR |

## Sensor Modules



- Pressure sensor
- Temperature sensor
- Motion sensor
- Radio transmitter
- Unique ID coding
- Battery operated

# Using The SmarTire™ System

## Display Module Modes

**Startup**

On startup, the Display Module performs a self-test of all the lights, beeper and information screen. After the test, it enters the Standby mode.

**Standby**

The Display Module monitors transmissions from the Sensor Module. Data is received after the vehicle has reached a speed of 10mph or more.

**View Tire Data**

Enter View Tire Data mode from Standby mode by pressing either MODE or TIRE key.

Press TIRE key to select a tire. Press MODE key to select tire data.

To return to Standby mode, press both TIRE and MODE keys simultaneously.

**Alert/Warning**

Any alert or warning is activated automatically and sets the Display Module to display the affected tire location.

**Programming**

Enter Programming Function mode by pressing and holding both TIRE and MODE keys for 3 seconds from View Tire Data mode .



## Startup to Standby Mode Sequence

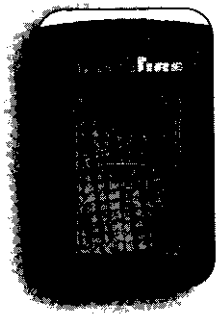
**1** **Startup self-test**

**2** **Standby mode**
Wait for Sensor Module data

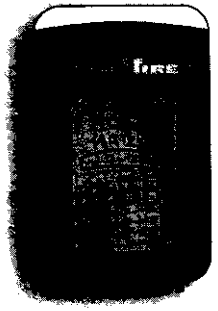
**3** **Standby mode**
Sensor Module data received

# View Tire Data

From Standby mode press either MODE or TIRE key to display the actual pressure (ACT-P) for the right front tire. The tire data viewing mode is characterized by display of one tire indicator, one of the tire data indicators, STATUS, REQ-P, ACT-P or TEMP and its value on the information screen. The red alert light turns on for any tire that has a pressure or temperature irregularity.



Press TIRE key to view the data and alert condition of other tires.



Press MODE key to view other data.

The explanations on pages 9 and 10 for viewing tire data are based on the factory settings of the Display Module. Your display may differ if your settings have been programmed differently *(see the programming section).*



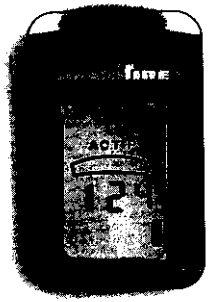
## No Data Display

After the Display Module is first turned on, attempts to view tire data will display "--" until the respective data is received. The required pressure (REQ-P) and pressure status (STATUS) can be displayed only after the first temperature reading is obtained (1 to 5 minutes).

## US/Metric Display

The SmarTire™ system can be programmed for display in either US or Metric units. The default is US and the examples used in this manual use the US system of degrees Fahrenheit (°F) and pounds per square inch (psi). The metric system uses kilopascals (kPa) for pressure and degrees Celsius (°C) for temperature *(see the Programming section for the units conversion function Un).*

**EXAMPLE** a US tire pressure of 18 psi will read 124 kPa when the Display Module is set to display metric units.



## Actual Pressure (ACT-P)

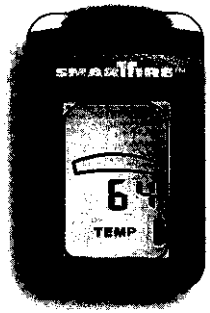
The actual pressure of a tire is displayed when you press a key in Standby mode or after a pressure alert or warning has been activated. In the photo (right) the right front tire shows an actual pressure of 29 psi.

Press TIRE key to view the actual pressure of other tires.

**EXAMPLE** the photo (right) shows the right rear tire with an actual pressure of 24 psi. Since the required pressure is 30 psi and the pressure STATUS setting is ±5 psi (*see page 10*), this pressure level has already activated a pressure STATUS alert and the alert light will turn on.

## Temperature (TEMP)

Displays the contained air temperature of the selected tire. If a warning has previously been activated for that particular tire the alert light also turns on *(see page 16 for the temperature warning).*






## Required Pressure (REQ-P)

The required pressure is the pressure to which a tire should be inflated at a given temperature. The cold inflation pressure is the required pressure at 64° F.

As the contained air temperature changes due to vehicle operation or ambient conditions, the Display Module recalculates the required pressure for changes in temperature. In the photo (right) an alert has been activated for the right rear tire so the alert light will also be on.

## Pressure Status (STATUS)

Displays the difference between required and actual pressure for the selected tire. If the difference is such as to activate the pressure status alert, the alert light will also turn on.

In the photo (right) the pressure status for the right rear tire is -6 or 6 psi less than the required pressure.

**NOTE** if the tire were over inflated +6 would mean that the actual pressure was 6 psi higher than the required pressure. In either case, with the pressure status alert set to 5, the pressure status alert will also be activated.

# Alerts and Warnings

**Automatic Activation**

A SmarTire™ alert or warning is automatically activated when a pressure or temperature irregularity is detected in a tire. The Display Module is in Standby mode and displaying all tire indicators when all Sensor Modules have transmitted data and no alerts are activated.

**Alert/Warning Stages**

The initial alert stage is the pressure status alert that turns on the alert light, displays the pressure difference and STATUS indicator. A continued decreasing pressure level will next activate low pressure alert with the alert light, display of the actual pressure and ACT-P indicator. If pressure loss reaches the low pressure warning setting, the beeper is activated. The alert light, pressure value and ACT-P flashes.

**Diagnostic Alerts**

Two component diagnostics, Sensor Module and Display Module will activate the alert light and beeper when certain problems are detected.

**Canceling the Warning**

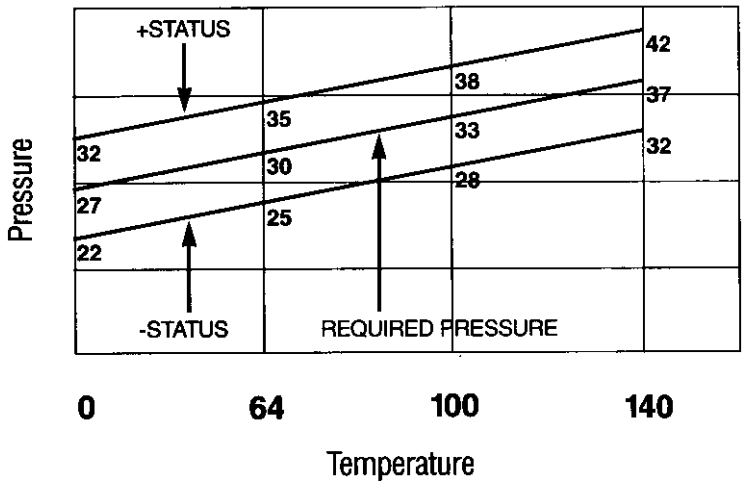
Cancel the warning beeper by pressing either MODE or TIRE key (the alert light and actual pressure or temperature value that caused the warning continue to be displayed).



## Pressure/Temperature Relationship

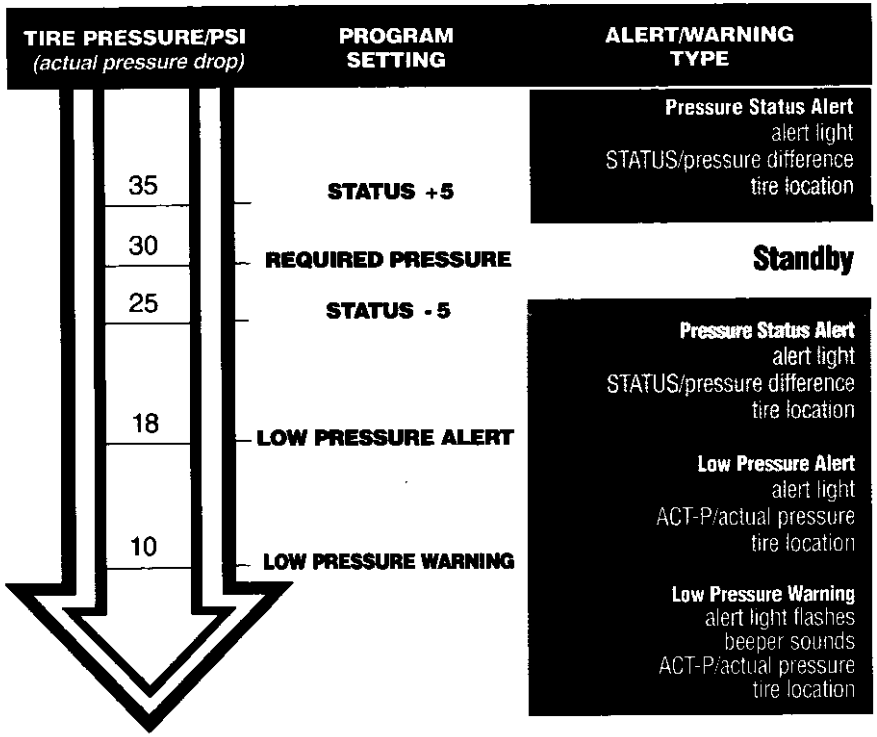
This graph illustrates the relationship of tire inflation pressure to contained air temperature.

When the tire is inflated to its initial cold pressure, the required pressure is the same as the cold pressure, for example 30 psi. When the car is driven and the tire heats up, its actual and required pressure will both increase. For properly inflated tires, the pressure status (STATUS) will be ± 2 psi over all operating temperatures.



## Relationship of Tire Pressures to Alerts and Warnings

If your tire pressure drops from the required pressure, the alerts and warnings would be activated in the sequence shown below. They are described in the following sections (factory settings are assumed).






## Pressure Status Alert

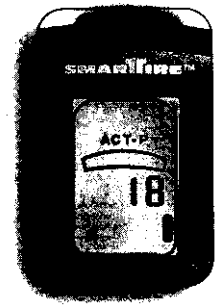
**(Factory setting at ± 5 psi)**

A pressure drop of 5 psi or more turns the alert light on and displays the difference from the required pressure (STATUS). Here the right rear tire pressure has dropped 6 psi below the required pressure. As it continues to drop due to a slow leak, the screen updates with -7, -8 etc. until it is low enough to activate the low pressure alert.

**CAUTION** A TIRE THAT IS LOSING PRESSURE SHOULD BE INSPECTED BY A QUALIFIED TECHNICIAN AT THE EARLIEST OPPORTUNITY IN ORDER TO DETERMINE THE CAUSE OF THE DEFLATION. CORRECT IF NECESSARY PRIOR TO INFLATING TIRE TO THE REQUIRED PRESSURE.

## Low Pressure Alert

**(Factory setting at 18 psi)**

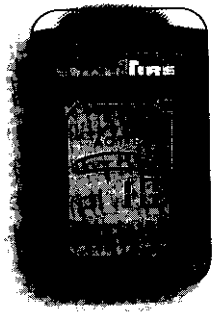



The low pressure alert activates when the actual pressure drops to the setting for this alert. The screen changes from STATUS to ACT-P, and the actual pressure value is shown. The red alert light is on (not flashing).

**CAUTION** THIS ALERT LEVEL, OCCURRING SHORTLY AFTER A PRESSURE STATUS ALERT INDICATES A RAPID LOSS OF TIRE PRESSURE IS TAKING PLACE. YOU SHOULD REDUCE THE VEHICLE SPEED TO AN APPROPRIATE SAFE LEVEL AND PROCEED TO A SAFE STOPPING LOCATION OR FACILITY WHERE THE TIRE CAN BE INSPECTED AND SERVICED.

## Low Pressure Warning

**(Factory setting at 10 psi)**



This warning activates when the actual pressure drops to the setting for this warning. The red alert light, tire indicator and actual pressure (ACT-P) flash.

The warning signal beeps and prevents warning activation from any other tire.

Cancel warning by pressing either MODE or TIRE key. The tire location and data continues to be displayed.

**CAUTION** THE LOW PRESSURE WARNING SHOULD BE SET TO A TIRE PRESSURE VALUE THAT IS CONSIDERED CRITICAL TO THE TIRE'S ABILITY TO SUPPORT AND/OR PROVIDE DIRECTIONAL CONTROL TO THE VEHICLE. WHEN THE ACTUAL TIRE PRESSURE DROPS TO THIS LEVEL YOU MUST REDUCE THE VEHICLE SPEED TO AN APPROPRIATE SAFE LEVEL AND PROCEED TO A SAFE STOPPING LOCATION OR FACILITY WHERE THE TIRE CAN BE SERVICED.



## High Temperature Warning

**(Factory setting at 140° F)**

This warning is activated when the contained air temperature exceeds the programmed setting. The red alert light, tire indicator and temperature (TEMP) flash.

The warning signal beeps and prevents warning activation from any other tire.

Cancel warning by pressing either MODE or TIRE key. The tire location and data continues to be displayed.

**CAUTION** THIS TEMPERATURE IS THE SELECTED MAXIMUM CONTAINED AIR TEMPERATURE. A TIRE TEMPERATURE BUILDUP CAN BE CAUSED BY A NUMBER OF FACTORS INCLUDING SEVERE UNDER INFLATION, HARD SUSTAINED BRAKING, VEHICLE OVERLOAD AND SUSTAINED HIGH SPEEDS. YOU SHOULD CORRECT THE CAUSE OF EXCESSIVE HEAT. REDUCE SPEED TO AN APPROPRIATE SAFE LEVEL AND PROCEED TO A SAFE STOPPING LOCATION OR SERVICE FACILITY.

## Sensor Module Diagnostic

This diagnostic function activates when no data has been received from any Sensor Module(s) for two ignition cycles. It flashes the alert light and tire indicator alternating with the code SA. The beeper turns on.

Cancel warning by pressing either MODE or TIRE key.

**NOTE** The absence of tire indicators on the screen while the vehicle is in motion will usually precede this alert.

**CAUTION** IN THE EVENT OF A DIAGNOSTIC ALERT, YOU SHOULD GO TO AN AUTHORIZED SMARTIRE™ DEALER TO IDENTIFY AND CORRECT THE PROBLEM.



## Display Module Diagnostic

This diagnostic activates when no data was received from any Sensor Module for eight ignition cycles. It flashes the alert light and tire indicators alternating with the code dt. The beeper turns on.

Cancel warning by pressing either MODE or TIRE key.

**CAUTION** IN THE EVENT OF A DIAGNOSTIC ALERT, YOU SHOULD GO TO AN AUTHORIZED SMARTIRE™ DEALER TO IDENTIFY AND CORRECT THE PROBLEM.

# Installation

## Procedure

**1** **Install Display Module**

Install the Display Module first so that it can be used to confirm Sensor Module operation before the wheel is mounted onto the vehicle. The Sensor Modules will transmit when vigorously shaken by hand or when the tire is being spin balanced.

**2** **Program the Display Module**

The SmarTire™ system is preprogrammed with factory settings for use with a specific tire and vehicle configuration. In cases where these settings are not suitable, they can be changed as described in the programming section.

**3** **Install the Sensor Modules**

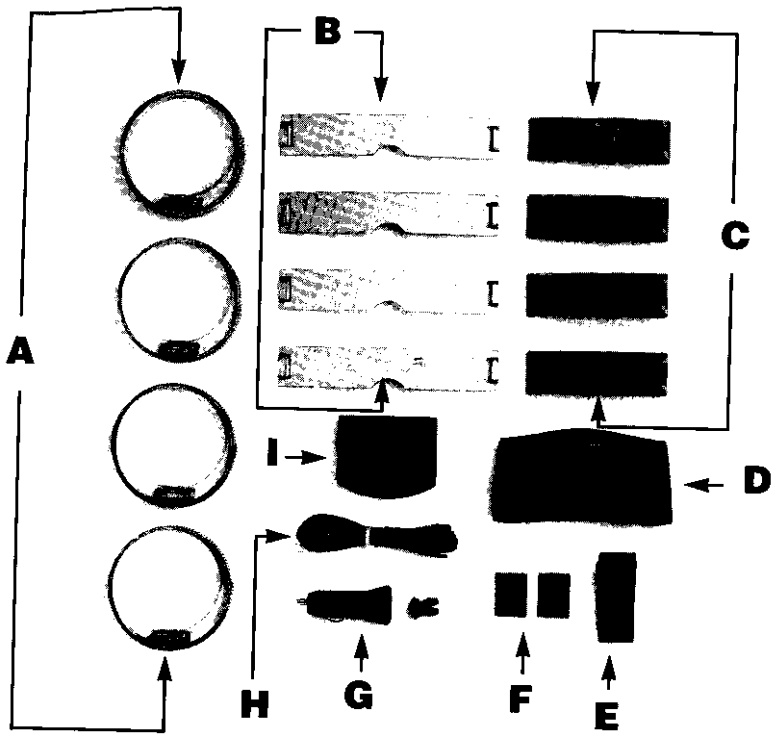
Follow the procedure outlined to install the Sensor Modules. After installation a 6 minute test drive will verify SmarTire™ operation.



# Components in Kit

| Qty | Description | 355 Mhz | 433 Mhz |
|---|---|---|---|
| 1 | Sensor Module ID=1 (right rear ORANGE) | 200.0031.01 | 200.0051.01 |
| 1 | Sensor Module ID=2 (left rear YELLOW) | 200.0031.02 | 200.0051.02 |
| 1 | Sensor Module ID=3 (left front GREEN) | 200.0031.03 | 200.0051.03 |
| 1 | Sensor Module ID=4 (right front BLUE) | 200.0031.04 | 200.0051.04 |
| 4 | Sensor Module Mounting Bands | 264.0070 | |
| 4 | Sensor Module Counterweights | 264.0064 | |
| 1 | Sensor Module Locator Labels (not shown) | 269.0043 | |
| 1 | Display Module | 200.0035 | 200.0050 |
| 1 | Display Module Power Socket Cover * | 264.0073 | |
| 1 | Power Cable | 210.0113 | |
| 1 | Display Module Visor Clip | 264.0074 | |
| 1 | Display Module Mounting Stand | 264.0075 | |
| 1 | Display Module Velcro® Strip Set | 264.0077 | |
| 1 | Owner's Manual * | 050.0000.om | |
| - | Tire Monitor Kit | 050.0200 | 050.0250 |

Velcro® is a registered trademark of the Velcro Companies
* Not shown in kit photo




| | | | |
|---|---|---|---|
| **A** | WHEEL BANDS | **F** | VELCRO® STRIPS |
| **B** | COUNTERWEIGHTS | **G** | POWER ADAPTER |
| **C** | SENSOR MODULES | **H** | POWER CORD |
| **D** | DISPLAY MODULE | **I** | MOUNTING STAND |
| **E** | VISOR CLIP | | |



## Mounting the Display Module

The Display Module can be positioned in any convenient location within sight and reach of the vehicle operator using the mounting stand or visor clip.

**NOTE** Do not install or leave the Display Module in direct sunlight that will expose it to excessive temperatures. Use a mild soap and water solution and a soft cloth to clean the surface.

## Power Supply Connection

For universal vehicle installations, the Display Module can be plugged into a utility power outlet or cigarette lighter socket using the supplied power cable.

For permanent connection to vehicle's power supply the Display Module should be hardwired to a keyed power circuit. Only personnel trained in adapting wiring systems should attempt this installation.

# Display Module Programming

Enter the programming mode by pressing and holding both keys for 3 seconds when the Display Module is in view mode. The function code CP (Cold Pressure) always comes up first. Other functions are selected by pressing the MODE key until the desired function code is displayed.

**NOTE** Stored tire data in the Display Module will not be valid for any new program settings until new data from the tires is received. This takes 1 to 5 minutes of driving at speeds greater than 10mph. Avoid this problem by resetting the Display Module first (turn it off and on).

## Typical System Settings

| SETTING | CONTINUED MOBILITY | STANDARD TUBELESS | FACTORY SETTING |
|---|---|---|---|
| (CP) Cold Pressure | as req'd | as req'd | 30 psi |
| (Pd) Pressure Status Alert | +/- 5 psi | +/- 5 psi | +/- 5 psi |
| (PA) Low Pressure Alert | 18 psi | +2 above LP | 18 psi |
| (LP) Low Pressure Warning | 10 psi | as desired | 10 psi |
| (tA) High Temperature Warning | 140° F | 140° F | 140° F |
| (SL) Pressure/Temperature Correlation | 44 | 44 | 44 |

**Check card supplied with the display module for actual default settings.*



# Restore Factory Settings

## Enter Programming Mode

Press and hold TIRE and MODE keys simultaneously until CP appears on the screen.

## Select CU/FA

Press and hold TIRE and MODE keys simultaneously for 5 seconds until CU or FA appears on screen.

Press MODE key to select FA (Factory Settings) to force factory settings or CU (Custom Settings) to keep current user settings.

**NOTE** Selection of FA erases the user settings (similar to restarting a computer)

## Save and Exit

Press TIRE and MODE keys to store settings.

## Exit Programming Mode

Press TIRE and MODE keys simultaneously.

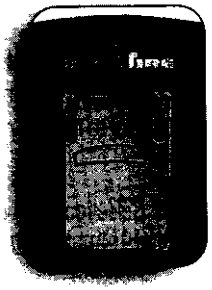
# Set Cold Inflation Pressure (CP)

## Enter Programming Mode

Press and hold both MODE and TIRE keys simultaneously until the code CP appears on the screen.

## Axle Selection

Press TIRE key. The tire indicators of the front axle are selected. To toggle between the front and rear axle press TIRE key.





## Set Cold Inflation Pressure

Press MODE key to display the current cold pressure of the selected axle.

Press MODE key to decrease, or TIRE key to increase value to desired setting. It ranges from 5 to 50 psi.

## Save and Exit

Press both MODE and TIRE keys simultaneously. The CP code appears on the screen.

## Program Another Axle

Repeat above procedure from Axle Selection.

## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

# Tire Rotation (tr)*

## Enter Programming Mode

Press and hold both MODE and TIRE keys simultaneously until CP appears on the screen.

## Select tr

Press MODE key to select tr.

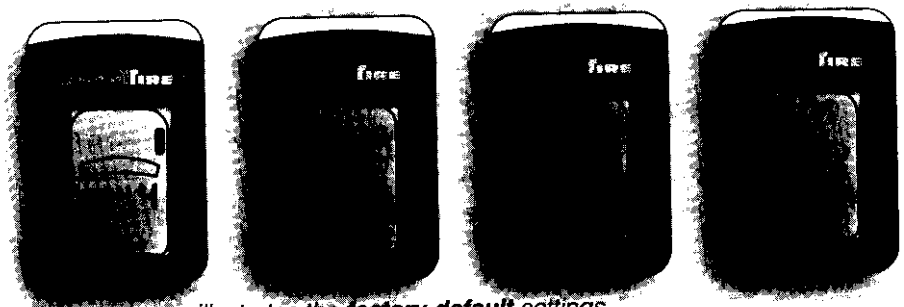
## Set ID

Press TIRE key to display the right front tire and its current ID.

Press MODE key to select the desired ID.

To scroll to the next tire location press TIRE key. Repeat this process to set ID for all tire locations until all are programmed.





*This sequence illustrates the **factory default** settings*

## Save and Exit

Press both MODE and TIRE keys. The tr code appears on screen.

The Display Module checks that each of the sensor numbers has been assigned once and only once. If there is an error, the screen will momentarily display Er and revert to the last tire location. Repeat the above procedure to correct the ID error.

## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

*THE TIRE ID LABELS IDENTIFY THE SENSOR MODULE AT EACH WHEEL LOCATION. IF LABELS ARE MISSING, USE FUNCTION tr TO CHECK THE EXISTING ID NUMBERS. MARK THE ID ON THE TIRES TEMPORARILY (IE. WITH WHITE CHALK) PRIOR TO REMOVING THEM FROM THE VEHICLE. AFTER ROTATING THE TIRES REPROGRAM THE DISPLAY MODULE FOR THE NEW LOCATIONS.

# Set Low Pressure Warning (LP)

## Enter Programming Mode

Press and hold both MODE and TIRE keys simultaneously until CP appears on the screen.

## Select LP

Press MODE key successively to select LP.

Press TIRE key to display the current low pressure warning setting (factory setting is 10 psi).



## Set Low Pressure Warning

Press MODE key to decrease, or TIRE key to increase value to desired setting. It ranges from 5 psi up to the low pressure alert.

To disable low pressure warning decrease the value to 0F.

## Save and Exit

Press both MODE and TIRE keys. The LP code appears on the screen.

## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

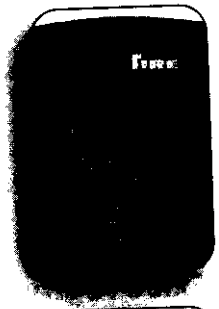
# Set Low Pressure Alert (PA)

## Enter Programming Mode

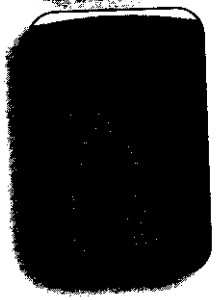
Press and hold both MODE and TIRE keys simultaneously until CP appears on the screen.

## Select PA

Press MODE key successively to select PA.



Press TIRE Key to display the current low pressure alert setting (factory setting is 18 psi).





## Set Low Pressure Alert

Press MODE key to decrease, or TIRE key to increase value to the desired setting. It ranges from the low pressure warning setting up to 65 psi.

To disable low pressure alert decrease the value to 0F.

## Save and Exit

Press both MODE and TIRE keys. The PA code appears on the screen.

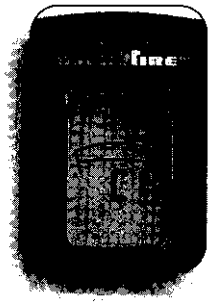
## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

# Set Pressure Status Alert (Pd)

## Enter Programming Mode

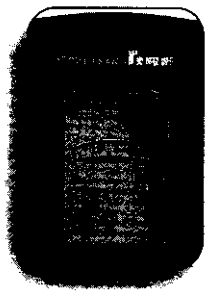
Press and hold both MODE and TIRE keys simultaneously until CP appears on the screen.



## Select Pd

Press MODE key successively to select Pd.

Press TIRE key to display the current pressure status alert setting (factory setting is ± 5 psi).





## Set Pressure Status Alert

Press MODE key to decrease, or TIRE key to increase the value to the desired setting. It ranges from 2 to 20 psi.

To disable pressure status alert decrease the value to OF.

## Save and Exit

Press both MODE and TIRE keys. The Pd code appears on the screen.

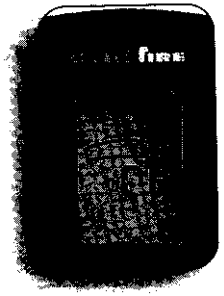
## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

# Set High Temperature Warning (tA)

## Enter Programming Mode

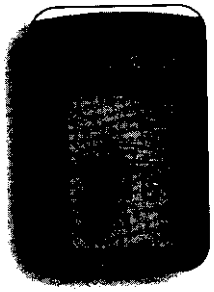
Press and hold both MODE and TIRE keys simultaneously until CP appears on the screen.



## Select tA

Press MODE key successively to select tA.

Press TIRE key to display the current high temperature warning setting (factory setting is 140° F).



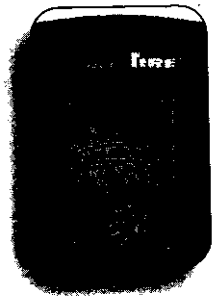


## Set High Temperature Warning

Press MODE key to decrease, or TIRE key to increase value to desired setting. It ranges from 86° F to 208° F (in 4° F increments).

## Save and Exit

Press both MODE and TIRE keys. The tA code appears on the screen.



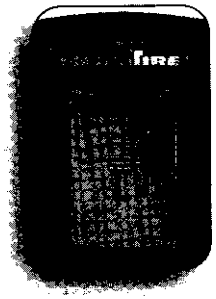
## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

# US/Metric Conversion (Un)

## Enter Programming Mode

Press and hold both MODE and TIRE keys simultaneously until CP appears on the screen.



## Select Un

Press MODE key successively to select Un.



## Set Units

Press TIRE key to display the current units setting (factory setting is IU).

Press TIRE key to toggle between SI (metric) and IU (US units).

## Save and Exit

Press both MODE and TIRE keys. The Un code appears on the screen

## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

# Set Pressure / Temperature Correlation Value (SL)*

## Enter Programming Mode

Press and hold both MODE and TIRE keys simultaneously until CP appears on the screen.

## Select SL

Press MODE key successively to select SL.

Press TIRE key to display the current setting (factory setting is 44).

*see Appendix A



## Set SL

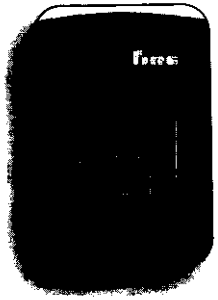
Press MODE key to decrease, or TIRE key to increase the value to the desired setting.

It ranges from 20 to 100.

## Save and Exit

Press both MODE and TIRE keys.

The SL code appears on the screen.



## Exit Programming Mode

Press MODE and TIRE keys simultaneously.

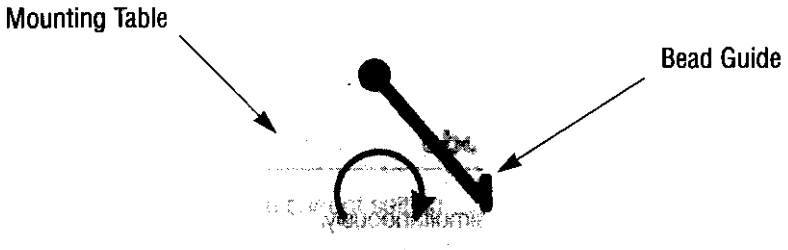
# Sensor Module Installation

CAUTION QUALIFIED PERSONNEL MUST PERFORM THE FOLLOWING INSTALLATION PROCEDURES THAT HIGHLIGHT THE STEPS REQUIRED TO ENSURE THAT THE SENSOR MODULES ARE PROPERLY INSTALLED AND UNDAMAGED. IT DOES NOT INCLUDE ANY STANDARD PROCEDURES NORMALLY REQUIRED IN THE PROCESS OF REPLACING A TIRE (IE. LUBRICATION, PROPER INFLATION AND DEFLATION PROCEDURES AND ANY OTHER PROCEDURES DEEMED NECESSARY BY THE TIRE MANUFACTURER OR DEALER). **THE EQUIPMENT AND DIAGRAMS IN THIS MANUAL USE ONE MANUFACTURER'S TIRE CHANGER AND MAY NOT APPLY TO YOU.**

## Tools Required

- Tire changing equipment and tools
- Tire balancing equipment (optional)
- Hexagon socket & driver (5/16 inch )
- Metal cutter
- Torque wrench *(optional)*

## Tire Mounting Equipment Position Guide




**Operator's Position**



## Installing Sensor Modules on a Wheel

**1** Shorten the mounting bands by cutting to the appropriate length for the wheel diameter used (see chart on right). Remove burrs from band ends.

| Wheel Diameter | Cut-off Length |
|---|---|
| 13 | 16" |
| 14 | 13" |
| 15 | 10" |
| 16 | 7" |
| 17 | 3" |
| 18 | N/A |

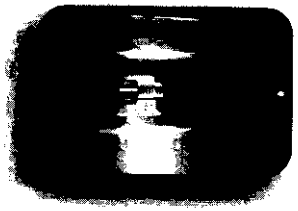
**2** Select Sensor Module for a corresponding wheel location (check the default location and tire ID number on label). Pass band through counterweight and then Sensor Module as shown.

**3** Position Sensor Module in the lowest area of drop center well and attach band end into clamp by advancing wormgear with a screwdriver/socketdriver. The base of drop center well of the wheel must be flat and wide enough to allow the Sensor Module to contact rim over its complete width.

4 Position counterweight with its notch fitting around the valve stem as shown (right).

5 Position Sensor Module exactly 180° opposite the counterweight to minimize imbalance. Tighten clamp until counter weight is completely pulled down against the surface of the rim and the Sensor Module is secure (to 30 inch pounds).

6 Cut off excess band length to approximately one inch from wormgear assembly.

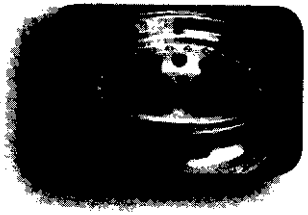


7 Clean the rim surface and remove any rust, dirt, oil or lubricating fluid. Affix the appropriate locator ID label near the Sensor Module as shown. The label is used to identify the position of the sensor for subsequent servicing of the tires or SmarTire™ system.



# Mounting Tire with Sensor Module on Wheel

1 To protect the Sensor Module during tire mounting, position the wheel with Sensor Module located 3" to the left of bead guide.



2 The bead guide is positioned in different locations for different manufacturers and (as wheel turns clockwise) guides the bottom bead over wheel flange. Mount bottom bead.

3 Return wheel to original position with Sensor Module 3" to the left of bead guiding shoe. Mount top bead.

4 Inflate tire to manufacturer's recommended cold inflation pressure.

# De-mounting the Tire with Sensor Module Installed

1. Remove tire/wheel assemblies from vehicle and deflate completely.
2. Loosen both beads with bead loosener shoe near valve stem (away from Sensor Module which is mounted on the opposite side).
3. Verify Sensor Module position.
4. Orient wheel to place sensor 3" to the left of bead guiding shoe. When lifting the top bead the tire must be clear of Sensor Module. Remove top bead.
5. Set wheel once more with Sensor Module 3" to the left of guiding shoe and remove bottom bead. This will expose Sensor Module, which should be checked for correct positioning and a properly snug fit.
6. Install new tire *(follow steps on page 44)*.



# Technical Specifications

## Display Module

| | |
|---|---|
| Power Consumption | 4 watts maximum during alert |
| Operating Temperature Range | -20° F to 185° F (-22° C to 85°C) |
| Storage Temperature Range | -40° F to 185° F (-40° C to 85° C) |
| Operating Humidity | 100 % non condensing |
| Weight | 3 oz (85 gm) |
| Size | 3" H x .75" D x 5.5" W<br>(20 x 75 x 137 mm) |
| Frequency | 355 or 433 Mhz |

## Sensor Module

| | |
|---|---|
| Battery Life (Projected) | > 7 Years<br>(normal passenger vehicle use) |
| Operating Temperature Range | -40° F to 185° F (-40° C to 85° C) |
| Storage Temperature Range | -40° F to 185° F (-40° C to 85° C) |
| Operating Humidity | 100% |
| Data Transmission Rate | Every 30 or 60 seconds |
| Weight | 3 oz (85 gm) |
| Size | 1.25" H x 1.4" D x 4.3" W<br>(32 x 36 x 110 mm) |
| Frequency | 355 or 433 Mhz |
| Accuracy | +/- 1 psi @ 77° F (25° C) |

# Troubleshooting

| Symptom | Possible Causes | Possible Solutions |
|---|---|---|
| **No tire indicator** | • Sensor Module not installed<br>• Sensor Module malfunction | • Install correct Sensor Module<br>• Replace Sensor Module |
| **Alert activated but no problem with that tire** | • Sensor Module located at another wheel position | • Check pressure in other tires and if necessary reprogram tire location in Display Module |
| **Display Module will not turn on** | • Power cable damaged<br>• Power cable not plugged in<br>• No power to Display Module | • Replace power cable<br>• Plug cable in properly<br>• Check fuse and check wire for damage if fuse is blown |

| Error Code | Possible Causes | Possible Solutions |
|---|---|---|
| **dt** | • Display Module reception diagnostic<br>• Display Module malfunction | • Reposition Display Module<br>• Replace Display Module |
| **EE** | • Memory failure | • Replace Display Module |
| **SA** | • Sensor Module diagnostic | • Replace Sensor Module |



# Appendix A

### What is the Pressure/Temperature Correlation?

The Pressure/Temperature Correlation value is a factor that relates a change in inflation pressure to a change in contained air temperature.

If this setting is correct the pressure status of a tire will be within +/- 2 psi over its full operating temperature range provided that it does not have a slow leak and was properly inflated at 64° F.

### How to Determine Pressure/Temperature Correlation

1. Inflate the tires to the recommended cold pressure value when they are cold (ie. at a temperature of 64° F).
2. Program the Display Module to the same cold pressure value used in step 1, the pressure/temperature correlation value to 44 and the pressure status to 5.
3. Drive the vehicle for half an hour and check the STATUS of each tire. Since SL is set for all tires, the results may vary slightly from tire to tire. If values are in the range of +/- 2 the pressure/ temperature correlation does not need to be changed. If all the tires show a value of 3 or greater, the correlation value needs to be changed. If the STATUS is positive, increase SL by 5. If it is negative, decrease SL by 5.
4. After reprogramming, verify that the STATUS is within the range of +/- 2 by driving for 10 more minutes.

# Glossary

**Actual Pressure (ACT-P)** — The value of tire air pressure measured by the Sensor Module and transmitted to Display Module. This value is compared to the required pressure to activate an alert or warning if needed.

**Alert** — A Display Module indication of a pressure irregularity, either the Pressure Status Alert or Low Pressure Alert.

**Cold Pressure (CP)** — The recommended inflation pressure of a tire at ambient temperature (64° F).

**Counterweight** — A metal plate positioned on the side opposite the Sensor Module to balance its weight.

**Display Module** — The programmable electronic module that receives signals from the Sensor Module and displays values and provides an alert or warning to the driver.

**Display Module Diagnostic (dt)** — A Display Module diagnostic alert indicating that no reception has been received from any of the wheel Sensor Modules for 8 ignition cycles.

**Ignition Cycle** — The interval from vehicle ignition on to off.

**Low Pressure Alert (PA)** — The Display Module alert activated when the tire Actual Pressure drops to the programmed setting PA.

**Low Pressure Warning (LP)** — The Display Module warning activated when the tire's Actual Pressure drops to the value set by the programmed setting LP.

**MODE** — The Display Module key used to view the data of a tire and used with the TIRE key to reprogram the Display Module.

**Pressure Status Alert (Pd)** — A Display Module alert activated when the actual pressure deviates from the required pressure by the value set by the programmed setting Pd.

**Pressure/Temperature Correlation (SL)** — The Display Module programmed value that identifies the rate of change of contained air pressure due to the contained air temperature of a tire.

**Required Pressure** — The Display Module calculated pressure value, based on Temperature, Cold Pressure and Pressure/Temperature Correlation and used as the reference to determine if the Actual Pressure of a tire is within normal operating range.

**Sensor Module** — A wheel mounted radio transmitter module that identifies tire pressure and temperature and sends data to Display Module.

**Sensor Module Diagnostic (SA)** — A Display Module diagnostic function that activates when receptions from any Sensor Module has been 50% less than from the others for 2 ignition cycles.

**STATUS** — The Display Module function that displays the difference between Actual Pressure and Required Pressure. If this value is outside the Pressure Status setting, a Pressure Status Alert is activated.

**Temperature (TEMP)** — The value of a tire's contained air temperature measured by a Sensor Module and transmitted to the Display Module for display and calculation of required pressure.

**Temperature Warning (tA)** — A Display Module warning activated when the contained air temperature of a particular tire exceeds the setting of function tA.

**TIRE** — The Display Module key used to select a tire to view data and used with MODE key to reprogram the Display Module.

**Tire ID** — The unique sensor identification number transmitted as part of the Sensor Module's data, to distinguish one tire location from the others. It can be changed for each location with the Tire Rotation function.

**Tire Rotation (tr)** — The Display Module function to reprogram a Sensor Module ID in the Display Module memory. It allows tires to be relocated without re-installing the Sensor Modules.

**Unit Conversion** — The display module capability to display in either US or Metric units.

**Warning** — A Display Module indication of a serious pressure or temperature irregularity, conveyed by a flashing display and audible beep.