

The GearMaster II

“Making Shifting a Breeze”

Congratulations on your purchase of the GearMaster, **the world’s first and only Gear Availability and Synchronization Indicator!** You will find that the GearMaster will give you many years of easier, safer, and more comfortable driving.

This manual contains installation, calibration and other operational information about the GearMaster. We encourage you to become familiar with this information as you install and use this exciting new tool.

Operation of the GearMaster is controlled by three buttons located on the top of the display:

- The [SLEEP/WAKE] button – located at the far left side of the top of the unit
- The [SELECT] button – located at the far right side of the top of the unit
- The [SET] button – located next to the [SELECT] button

Brightness Settings

In normal operation (that is, when not in **SETUP** mode), **pressing the [SET] button toggles between the day and night brightness levels.** Each of these levels can be separately set as described in the “Brightness Settings” section on page 6 of these instructions.

Turning Display on or off

The GearMaster will normally “go to sleep” when the engine is turned off and will “wake up” when the engine is started. You may also manually put the unit to sleep or wake it up by pressing the [SLEEP/WAKE] button. **Pressing and holding the [SLEEP/WAKE] button for two seconds will put the GearMaster in “Deep Sleep.”** In this case it will not wake up when the engine is started but only when the [SLEEP/WAKE] button is pressed again. For more information, please refer to the “Sleep and Deep Sleep” section on page 6.

(Note: On some trucks, the power drain associated with starting the engine interferes with the GearMaster initialization sequence. If the unit fails to illuminate within a few seconds after starting the engine, simply unplug the unit for 1 or 2 seconds and then reconnect it.)

Menu and Calibration procedures

The [SELECT] button is used to enter the **SETUP** mode and to scroll through the calibration and menu sequences .

The [SET] button is used to lock in calibration settings and to enter other data as prompted by the menu.

Please refer to the “Menu/Calibration Sequence” chart on the last page of this manual to see how these buttons are used.

We hope you will feel free to contact us with any comments, suggestions or questions. Thank you for choosing the GearMaster II !

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Installation

To install the GearMaster, simply plug one end of the included cable into the truck's data port and the other end into the GearMaster. Put the GearMaster in place, usually on top of the dash, and you are ready to go! That sounds simple enough, but you should be aware of some additional considerations.

Location

You may wish to try various locations before permanently mounting the unit. Some drivers place the unit on a folded towel or clip it to a piece of cardboard to experiment with possible mounting locations before deciding on a final position. Most users prefer to put the GearMaster on top of the dashboard just to the right of the steering wheel. It should be located near your line-of-sight to the road but it should not block your view of the road.

If the GearMaster is to be used in a training situation, it should be located so that it is visible to the instructor as well as to the driver. Many schools also locate the GearMaster so that other students sitting in the rear can see it. Some instructors like to have a secondary location turned away from the driver but in view of the instructor and other students.

The GearMaster Cable

On most trucks, the data port is located either under the dashboard near the driver's left knee or at the rear of the driver's entry door just off the floor. The cable supplied with the GearMaster is long enough to reach from the middle of the dashboard to either location. If your data port is located under the dash, you will have extra cable which you can coil up and secure out of the way using the included wire ties.

If your data port is located at the rear of the driver's door, you can run the wire along the door's threshold or across the floor, past the gearshift lever and behind the driver's seat. Either way, we recommend that you secure the wire and insure that it does not become a tripping hazard. This can be done with duct tape and/or by running the wire underneath the door's threshold plate.

If you desire a more permanent installation, you may wish to run the cable through a hole in the dashboard to keep it out of sight and out of the way. You can also remove the data port plug from the cable and connect the wires in the cable directly to the truck wiring harness, thus bypassing the plug completely. We recommend that this be done only by a qualified technician.

Mounting the GearMaster

The GearMaster is supplied with strips of 3-M Dual Lock™ "Reclosable Fastening System." Dual Lock is similar in function to Velcro™ or other "hook and loop" type fasteners but is much more secure. To mount the GearMaster to the dash using the Dual Lock strips, simply peel the protective backing off the strips and press the strips into place on the dashboard and on the base of the GearMaster. It is recommended to mount the pad with the "fine" pattern to the GearMaster and the pad with the "coarse" pattern to the dashboard. Additional strips are available at no cost from GearMaster.

Hints for using Dual Lock:

- Be sure to clean dashboard thoroughly before mounting the strips. Any oil, dirt or other material on the surface of the dash will interfere with the ability of the Dual Lock to stick to the surface.
- It is usually best to mount the strips with some offset so that there is more sticking surface of the strips to the dash and to the GearMaster than interlocking surface between the strips. This will minimize the tendency for the strips to come loose from the dash or from the GearMaster when you want to remove the unit.

If a more permanent mounting is desired, the GearMaster can be bolted or screwed to the dashboard using the predrilled holes in the base plate. In this case, it will be necessary to remove the base plate from the GearMaster by unscrewing the swivel tightening knobs on each end and to then reassemble the GearMaster and washers to the base plate after the base plate has been fastened to the dashboard.

Calibration

The GearMaster will continuously read and display your engine RPM and your vehicle speed in MPH (or KPH, if selected). But to translate that data into meaningful gear availability and synchronization information, the GearMaster must “learn” some things about your truck and your driving preferences. This is a simple process similar to setting your favorite stations on your radio. It should take no more than a few minutes. (Note: You may be able to skip the Tachometer and Range Line Calibration steps. See the Quick Start notes in each section below.)

Tachometer Calibration

The first thing the GearMaster needs to know is the mid-point of your engine operating range. To give it this information:

- Calculate the mid-point by adding the idle speed of your engine and the maximum governed speed of your engine and dividing the total by two. For instance, if your engine idles at 600 RPM and your maximum engine speed is 1800 RPM, the mid-point would be 1200 RPM. (600 plus 1800 equals 2400; 2400 divided by two is 1200).
 - **Quick Start Note:** The GearMaster comes preset with the mid-point at 1300 RPM. If your calculated mid-point is close to that number (anywhere between 1200 and 1400 RPM, for instance), you may wish to skip the rest of this step.
- Put the GearMaster into the Tachometer Calibration Mode as follows (see Menu/Calibration Sequence Chart at the end of this manual):
 - Press and hold the [Select] button on the GearMaster until “Calibrate Tach, Range or Gears?” appears
 - Press the [Set] button to answer “YES.” The display will now show: “Calibrate Tach?”
 - Press the [Set] button to answer “YES.” The display will now show a “T” and an open box in the lower right corner.
- Now press on the throttle and bring the engine up to the calculated mid-point (1200 RPM in our example).
- With the engine at the mid-point, press the [SET] button. The “Tach-arrow” will move to the center of the screen and a check mark will appear next to the “T.” This means that you have calibrated the Tachometer. (Note: If you were not sure the engine was where you wanted it, you may press the [SET] button repeatedly. Each time, the arrow will move to the center.)
- When finished, Press [Select] once to exit the Tachometer Calibration Mode, and press [Select] again to move on to the next option.

Range Line Calibration

The next thing the GearMaster would like to know is the full operating range of your engine. Here’s how to give it that information:

- Put the GearMaster into the range line calibration mode by following the same sequence as above but answering “NO” to “Calibrate Tach?” and “YES” to “Set Range Lines?” The display will now show “R1HI” in the lower right hand corner. This means that you are ready to set the high end (“HI”) of the first range line (R1), also called the Operating Range Line.
- Using your throttle, bring your engine up to its maximum RPM and press the [SET] button on the GearMaster. The right end of the operating range line (R1HI) will now be at the position of the Tach Arrow. You may press [SET] repeatedly – each time the right end of the line will line up with wherever you have placed the arrow.

(Note: On some trucks the maximum RPM cannot be reached when the truck is not in gear or is not moving. If that is the case with your truck, you may reset R1HI later when you are on the road.)

- When you have finished setting the high end of the Operating Range Line (R1HI), you may press [Select] to set the low end of the line. “R1LO” will now appear in the lower right corner of the display.
- Remove your foot from the throttle and let the engine idle. Press the [SET] button. The low end of the Operating Range Line will now line up with the arrow. Again, you may press [SET] repeatedly – each time, the left end of the line will line up with wherever you have placed the arrow. (Note: Some engines idle at a higher RPM when cold than when warm. If your engine is cold when setting R1LO, you may have to reset it after the engine has warmed up.) When you are finished, press [SELECT] to move on to the next step.

Now, let’s tell the GearMaster where you like to shift. This could be what some drivers refer to as their “sweet spot”; it could be the same RPM range as the green arc on some tachometers; it could be the “peak torque” range as recommended by the engine manufacturer, or it could just be your personal preference. This is the second range line or R2. To set this range line, follow the same procedure as above, that is –

- With “R2HI” appearing in the lower right corner of the display, bring the engine RPM up to the high end of your shifting range. Press [SET] to align the right end of the line with the arrow. You may press [SET] repeatedly until you have it just where you want it. When finished, press [SELECT].
- With “R2LO” appearing in the lower right corner of the display, repeat the above process with the RPM at the low end of your desired shifting range. When finished, press [SELECT] to exit the range setting function and press [SELECT] again to move on to the next option.

Quick Start Note: The GearMaster comes from the factory with the Range Lines Set as follows:

Operating Range Line: R1HI=1900, R1LO=700
Preferred Shifting Range Line: R2HI=1500, R2LO=1100

If these values are close enough to the values for your truck, you may wish to skip this step. You can always go back and reset any of these values at any time.

By the way, you may wish to delete one or both of the range lines. To do so, simply try to set the high end of a line below the low end of the line or vice versa – try to set the low end of a line above the high end. Either of these actions will cause the line to disappear. To redisplay the line, reset the high end followed by the low end.

Gear Calibration – Gears 1 through 10

You are now ready to calibrate the gear ratios. This is simply a matter of driving for a short distance in each gear and telling the GearMaster what you are doing. It is possible for one person to do this but for safety reasons, we strongly recommend that you use two people – one to drive and one to set the GearMaster. Here’s how:

- After you have answered “NO” to “Set Range Lines” on the menu screen (see Menu/Calibration Sequence chart), the display will prompt: “Calibrate Gears 1-10?” Press [SET] to enter the Gear 1-10 calibration mode. The numeral “1” and an open box will appear in the lower right corner of the display. You are now ready to calibrate first gear.
- Put the truck into first gear and start driving. Accelerate in first gear until the engine is at least in the upper half of its operating range. Press [SET]. A numeral “1” will appear above the Tach Arrow and the open box will be replaced with a check mark. If the “1” is not aligned with the arrow, you may press [SET] again and as often as necessary. Generally, setting gears at higher RPM’s will improve accuracy. This is especially true in the lower gears.

- After you have calibrated first gear, press [SELECT]. The numeral “2” and an open box will appear in the lower right corner of the display. You are now ready to calibrate second gear.
- Shift the truck into second gear and accelerate until the engine is in the upper half of its operating range. Press [SET]. A numeral “2” will appear above the arrow and the open box will be replaced by a check mark. Again, you may repeatedly press “SET” if the number and the arrow do not line up at first.
- Repeat the above process for each gear, pressing [SELECT] to choose the gear, driving in that gear, and pressing [SET] to calibrate the gear. In the higher gears, it is not necessary to use the upper end of the RPM range.
- You do not have to calibrate every gear on the GearMaster. If, for example, you have an eight speed transmission, simply [SELECT] past gears 9 and 10 without setting them.
- After you have cycled through gears 1–10, the menu screen will again display “Calibrate Gears 1-10?” Press [SET] to go back to any or all of those gears, or [SELECT] to move on to the next option. Remember that you can exit the **SETUP** mode at any time by pressing [SELECT] and holding it for one second.

Calibrating Gears 1 ½ to 10 ½

Many transmissions are equipped with a “splitter” control which provides an overdrive gear above the primary gears. A typical “13 Speed” transmission provides these additional gears in the high range (gears 5 through 8). A typical “18 Speed” transmission provides these gears in both the low (gears 1 through 4) and the high (gears 5 through 8) ranges.

After you have answered “NO” to “Calibrate Gears 1-10, you will be prompted with “Calibrate Gears 1 ½ - 10 ½.” Press [SET] to calibrate any of these gears. Otherwise, press [SELECT].

Calibrating the GearMaster to these overdrive gears follows the same procedure as for the primary gears. During calibration, the display shows the equivalent “half gear” (e.g. 7 ½) to indicate which gear is to be calibrated. When the “Set” button is pressed, a short vertical line will appear above the arrow and to the left of the respective primary gear. This line is used in the same way as the numbered primary gear indicators.

Notes to Calibration:

1. The indicator for 10th gear is a “0.” This is to avoid the use of a double digit number which would be harder to line up with the arrow.
2. If you are not using all 10 (or 20) gears, simply [SELECT] past the unused gears.
3. An open square next to the gear number on the right side of the display indicates that the gear has not been set or reset. A check mark indicates that the calibration has taken place.
4. If the truck is accelerating or decelerating when [SET] is pressed, the Tach Arrow and the Gear Number may not be aligned. You may repeatedly press [SET] to improve the alignment.
5. To erase the calibration for any gear:
 - a. Bring the vehicle to a complete stop
 - b. In the calibration mode, [SELECT] the gear to be erased
 - c. Press the [SET] button
6. **Caution! Range Lines and Gears are calibrated in relationship to the initial Tachometer mid-point setting. Any range line and any gear can be recalibrated at any time with no effect on other settings. If the Tachometer setting is changed, however, it will be necessary to recalibrate all range lines and gears.**

Other Menu Options

Several additional features are incorporated into the GearMaster. These are menu driven and can be accessed as shown on the Menu/Calibration Sequence Chart on the last page. The additional features include the following:

Set Day and Night Brightness Levels

During normal operation (that is, when not in **SETUP** mode), momentarily pressing the [SET] button will toggle between two brightness levels for day or night operation. The brightness for each of these levels can be individually set as follows:

When prompted by the display with “CHANGE BRIGHTNESS LEVELS?” press the [SET] button. The words “DAY” (for day operation) and “NIGHT” (for night operation) will be displayed. The space following the word “DAY” will contain a number or a letter and will be highlighted. Press the [SET] button repeatedly to scroll through the levels of brightness (There are 16 dimming levels: F-E-D-C-B-A-9-8-7-6-5-4-3-2-1-0. “F” is the dimmest; “0” is the brightest). When the desired level is set, press the [SELECT] button to repeat the procedure for the “NIGHT” level.

Press [SELECT] again to move on to the next menu item.

Set Auto Shutoff time – “Sleep” and “Deep Sleep” modes

Most trucks supply constant power through the data port even when the engine is not running. Therefore, the GearMaster incorporates an Auto Shutoff feature which turns off the display after a predetermined number of seconds when the engine has stopped running. This is called the “sleep” mode. In this condition, the GearMaster is still on but the display will not illuminate until the engine is restarted. The “sleep” mode may also be entered by momentarily pressing the [SLEEP/WAKE] button. Pressing the [SLEEP/WAKE] button again will “wake up” the display. Pressing and holding the [SLEEP/WAKE] button for two seconds or more will put the GearMaster in the “Deep Sleep” mode. In “Deep Sleep” the GearMaster will not wake up when engine is restarted but only when the [SLEEP/WAKE] button is pressed again or when the unit is unplugged and then reconnected.

The number of seconds before the Auto Shutoff feature is activated can be set from 1 to 599 seconds (approximately 10 minutes). When prompted by “CHANGE AUTOSLEEP TIME?”, press the [SET] button. Three digits will appear in front of the word “SECONDS.” Press the [SET] button to scroll through the numbers for each digit. Press [SELECT] to move to the next digit and again to exit this option after the three digits have been set.

Setting AutoSleep time to “000” will disable the autosleep feature. The unit may still be put to sleep or awakened using the [SLEEP/WAKE] button, but it will not happen automatically.

Note: In “Sleep” or “Deep Sleep” mode, even though the display is blank, the GearMaster is on and is drawing a very small amount of power (about 10 mA). If the truck is not going to be used for a week or more, it is advisable to disconnect the power by unplugging the cable from the GearMaster or from the ECM Port.

Miles per Hour (MPH) vs. Kilometers per Hour (KPH) display.

The digital speedometer in the lower right corner of the GearMaster display can be shown in Miles per Hour or in Kilometers per hour. Pressing the [SET] button while in this menu item will toggle between MPH and KPH.

Show or Hide the Digital Tachometer and/or the Digital Speedometer

The digital tachometer and digital speedometer can be displayed or hidden. Pressing the [SET] button while in either of these menu items will toggle between showing and hiding the respective digital readout.

Advanced Menu Options

The synchronization and averaging menu options should be changed only by, or in consultation with, trained GearMaster personnel. The default values are given here so that they can be reset in case of inadvertent changes.

Synchronization Factor: Default = 06

Tach and Speed Averaging: Default = 8

For trucks without an Electronic Control Module (ECM), the GearMaster can be set to receive data directly from the pulse senders on the engine flywheel and on the output shaft of the transmission. A separate instructional supplement is available for non-ECM type installations. The “CHANGE INPUT MODE?” setup option toggles between the ECM and the PULSE input sources. The GearMaster will not operate if the input source does not match the input setting. **It is therefore not advisable to change this mode unless the input source is being changed.**

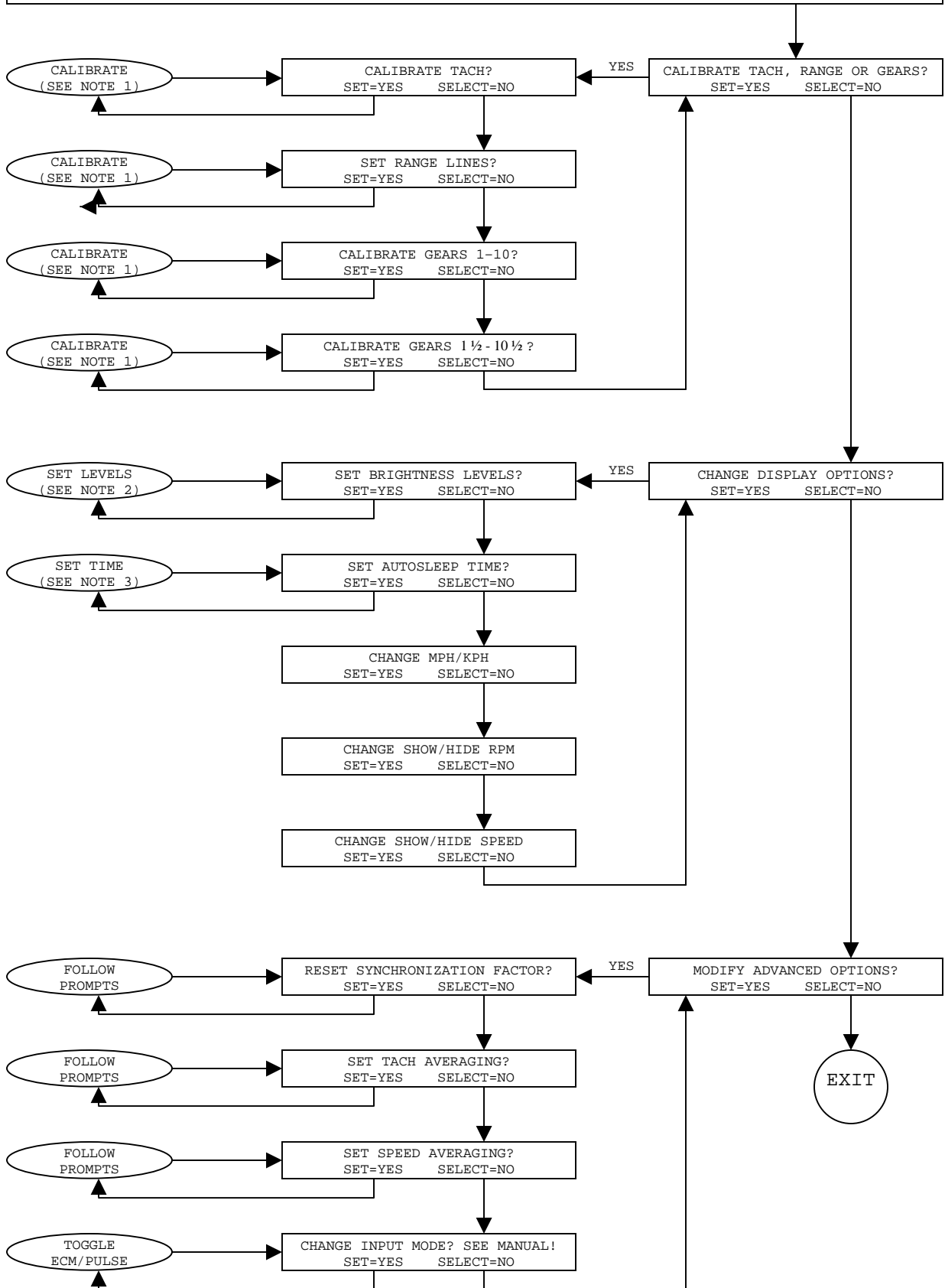
Note to Calibration Data and Menu Settings

At any time, the GearMaster may be unplugged or disconnected from the truck. All data and menu settings will be retained and will be activated again as soon as the unit is reconnected.

If the GearMaster is installed in a different truck, it will normally have to be recalibrated. If the new truck has the same engine, transmission and drive line ratios, however, the GearMaster may be moved back and forth with no need to recalibrate.

GearMaster II – Menu/Calibration Sequence (Rev. 2.8 – 3.22)

Enter or exit **SETUP** mode at any time by holding [SELECT] button down for 1 second.



Note 1 – When calibrating Tachometer, Range Lines or Gears , press [Select] to cycle through sequence. Press [Set] to calibrate displayed item.

Note 2 – When setting Brightness levels, press [Set] to change setting. Press [Select] to move to next step.

Note 3 – When setting Autosleep time, press [Set] to change numbers (0-9). Press [Select] to move to next digit or to next step.