



***Fleet*LINK[®]**

Fuel Control System

For use with Petro Vend System2[®] Fuel Management Systems

**Vehicle Information Unit (VIU)
Programming Manual**

OPW Fuel Management Systems - System and Replacement Parts Warranty Statement

Effective September 1, 2002

System and Replacement Parts Warranty

OPW Fuel Management Systems warrants that all OPW Tank Gauge and Petro Vend Fuel Control systems supplied by OPW Fuel Management Systems to the Original Purchaser will be free from defects in material and/or workmanship under normal use and service for a period of 12 months from the date of installation or 15 months from the date of shipment. Additionally, OPW Fuel Management Systems warrants that all upgrades and replacement parts (new and remanufactured) supplied by OPW Fuel Management Systems will be free from defects in material and workmanship under normal use and service for a period of 90 days from the date of installation or for the remainder of the system's original warranty, whichever is greater, as set forth in the first sentence of this statement. The foregoing warranties will not extend to goods subjected to misuse, neglect, accident, or improper installation or maintenance or which have been altered or repaired by anyone other than OPW Fuel Management Systems or its authorized representative.

The buyer's acceptance of delivery of the goods constitutes acceptance of the foregoing warranties and remedies, and all conditions and limitations thereof.

If a claim is made within the warranted time period that any equipment and/or remanufactured part is defective in material or workmanship under normal use and service, such equipment and/or remanufactured part shall be returned to OPW Fuel Management Systems, freight prepaid. If such equipment or remanufactured part is found by OPW Fuel Management Systems in its sole judgment, to be defective in material or workmanship under normal use and service, OPW Fuel Management Systems, shall, at its sole option, repair or replace such equipment and/or remanufactured part (excluding, in all instances, fuses, ink cartridges, batteries, other consumable items, etc.)

The warranties, as set forth above, are made expressly in lieu of all other warranties, either expressed or implied, including, without limitation, warranties of merchantability and fitness for any particular purpose and of all other obligations or liabilities on OPW Fuel Management Systems part. Further, OPW Fuel Management Systems neither assumes, nor authorizes any other person to assume for it, any other liability in connection with the sale of the systems, or any new/replacement part that has been subject to any damage from any act of nature or any *force majeure*.

The term "Original Purchaser" as used in these warranties shall be deemed to mean the authorized OPW Fuel Management Systems distributor to which the system or any new/replacement part was originally sold. These warranties may be assigned by the original purchaser to any of its customers who purchase any OPW Fuel Management Systems systems or new/replacement parts.

The sole liability of OPW Fuel Management Systems, for any breach of warranty, shall be as set forth above. OPW Fuel Management Systems does not warrant against damage caused by accident, abuse, faulty or improper installation or operation. In no event shall manufacturer's liability on any claim for damages arising out of the manufacture, sale, delivery or use of the goods exceed the original purchase price of the goods. In no event shall OPW Fuel Management Systems be liable for any direct, indirect, incidental or consequential damage or loss of product.

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Warnings



Read these and all warnings and instructions carefully. They are included to help you operate the *Fleet LINK* equipment safely in the highly flammable environment of a fueling station.

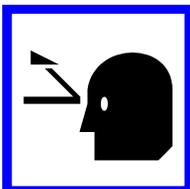


Disregarding these warnings and instructions might lead to death, serious injury and property loss or damage, to you and others. It is YOUR responsibility to install, operate and maintain the equipment according to the instructions appearing in this manual and to conform to all applicable codes, regulations and safety measures. Failure to do so could void all your warranties connected with this equipment.

Explosion Hazard



- All aspects of FleetLINK equipment must comply with the relevant requirements of the National Fire Protection Association NFPA-30 “Flammable and Combustible Liquids Code”, NFPA-30A Automotive and Marine Service Station Code, federal, state and local codes and any other applicable codes or regulations.



- Do not smoke!
- The VIU Programmer IS NOT intrinsically safe! Do NOT use the VIU Programmer within three (3) feet of the vehicle fuel filler pipe.



- If performing work in the engine compartment, STOP THE VEHICLE ENGINE to prevent severe injury or death. Make sure no one will start engine if working under hood. Remove the ignition keys if possible.



- Vent exhaust from enclosed areas.

What's In This Book

This manual provides installation, operating, maintenance and troubleshooting instructions for the FleetLINK Vehicle Information Unit sub-system (VIU).

This manual is composed of the following sections:

- **About FleetLINK** is a brief description of the FleetLINK and its vehicle sub-system components.
- **Hand-Held Programmer** provides hook-up instructions, a wiring diagram, electrical connection information, and vehicle controller programming procedures.
- **VIU Maintenance and Service** provides instructions for periodic inspection of vehicle sub-system, and for the troubleshooting and repair of this sub-system.
- **Appendices** -- This contains vehicle calibration factors and blank worksheets.

FleetLINK equipment is also supported by the following manuals:

- The *System2/FleetLINK Integration Installation Manual* (Petro Vend part number M05-01.01A) covers the installation of the System2 components - FIT, FSC and PCTs. An Appendix in this book contains special installation instructions for FleetLINK.
- The *System2 For FleetLINK Operator's Guide* (Petro Vend part number M41-21.03X) explains programming and operation of the System2 FIT
- The *FleetLINK Vehicle Information Unit (VIT) Installation & Service Manual* (Petro Vend part number M00-017.00) covers the installation, maintenance and troubleshooting of the FleetLINK vehicle sub-system.

About FleetLINK

FleetLINK is an automated vehicle refueling system for organizations with vehicle fleets that have their own refueling facilities, and for fleet servicing stations. FleetLINK controls and monitors 24-hour refueling of authorized vehicles simply and efficiently, without attendants and without driver intervention.

Optionally, FleetLINK can give both odometer reading and engine-hours reading information whenever a vehicle is refueled.

The FleetLINK system consists of two main sub-systems, the Vehicle Information Unit (VIU) subsystem, and the Vehicle Identification Terminal (VIT) subsystem. The System2 FSC (inside the site office) is the data processing device attached to the VIT. Figure 1 shows the two main FleetLINK subsystems and their basic components.

Note

Figure 1 does NOT show the System2 portions of the installation. The System2 FIT would be mounted near the fuel dispenser, and the System2 FSC would be inside the building.

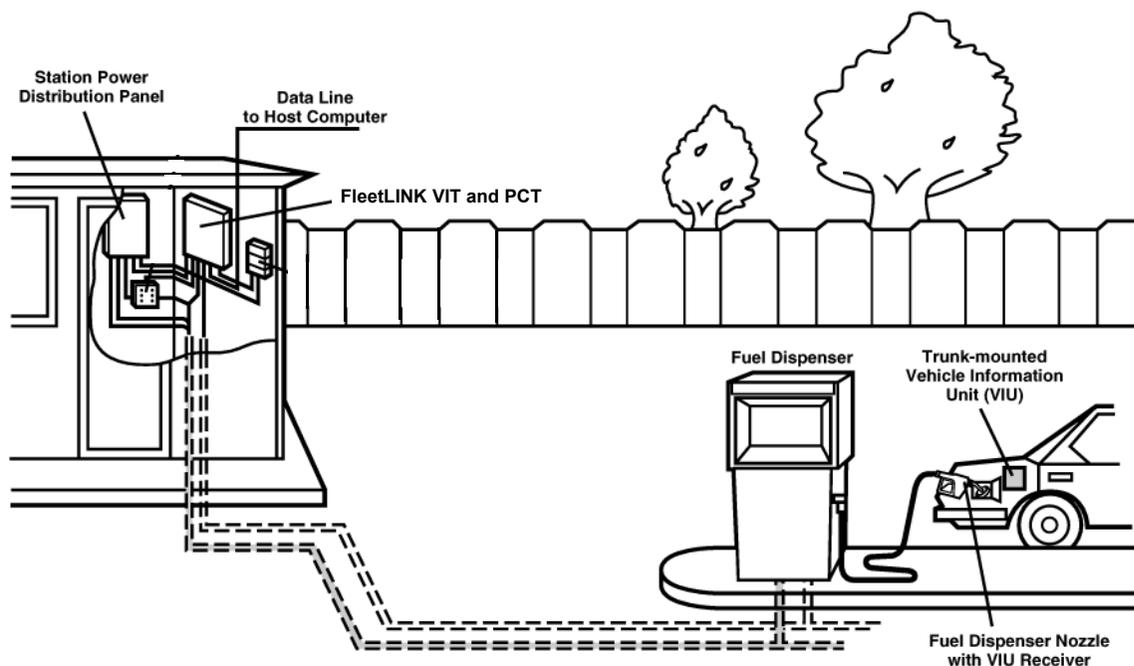


Figure 1: Overall FleetLINK System

About the Vehicle Information Unit (VIU)

Note

Installation of the VIU is explained fully in the Vehicle Installation & Service Guide.

Overview

The VIU is a small vehicle-mounted device, which provides information on vehicle identity, fuel type and grade, vehicle engine-hours and odometer reading (optional). Information is transmitted from an antenna coil installed on the fuel tank inlet to a receiving antenna on the pump nozzle.

When Do I Need to Program the VIU?

Programming is required whenever a VIU is installed in a vehicle. The programming is done with a small hand-held Programmer, see *Figure 2* on *page 9*

The programmer attaches to the VIU transceiver loop during programming. The information fed to the VIU includes:

- Vehicle identification (maximum nine digits)
- System user identification (four digits)
- Fleet code (four digits)
- Fuel type and grade (one digit)
- Vehicle activity mode: odometer (distance traveled) and engine hours (one digit)
- Initial odometer reading (seven digits)
- Calibration factor (5 digits), for conversion of transducer pulses to distance traveled. This factor is equal to the number of pulses provided by the transducer for each mile traveled. This "pulses-per-mile" (PPM) figure is provided by the vehicle manufacturer, since it depends on the vehicle's gear ratio. The maximum value (without using a pulse divider, see *page 16*) is 20,000 PPM.

The information is entered on a small keyboard, and verified on a two-line LCD display. The information is stored in the memory of the VIU, and is preserved for up to 10 years even when the VIU is disconnected from a power source (e.g. when VIU or vehicle battery are removed during vehicle repair, etc.).

Checking VIU Information With the Programmer

The hand-held programmer can also be used to check the information transmitted by the VIU, via the transceiver loop. The transceiver loop is connected to the programmer, and when positioned over vehicle transceiver loop, couples the transmitted information to the programmer. The programmer then displays the information on its LCD display.

This function can be used to confirm proper programming, test VIU function or perform periodic inspections.

Vehicle Identification Terminal (VIT)

The VIT is installed in the System2 FIT pedestal or PCT cabinet, up to 500 feet from the fuel dispensers. It contains a powerful microcomputer with a ROM-based control program that communicates with the System2 FSC.

Each VIT controls as many as 16 fuel dispensers; control up to 32 dispensers by using two VITs. Through a radio link, the VIT receives vehicle information from a VIU receiver installed on the dispenser nozzle, as that nozzle is inserted into the vehicle fuel tank inlet. The VIT and the System2 FSC communicate two ways - after verifying vehicle identity and authorization, the FSC commands the fuel dispenser via the VIT to supply the required amount of fuel.

FleetLINK works with most types of approved mechanical or electromechanical fuel dispensers.

Note

Electronic dispensers with universal pump controllers - UPCs - do not work with FleetLINK.

Manual Authorization

Fuel station operators can also manually activate a dispenser to supply fuel to vehicles without a FleetLINK VIU unit. The operator uses the SET PUMP ON command to the FSC to do this. This option should be used only under strict management control. After receiving this manual authorization, the VIT activates the fuel dispenser in the normal manner. Dispensers can also be activated with the handheld manual authorizer (20-4316).

Recording transactions

The System2 FSC records each refueling transaction, together with relevant information (vehicle identity or manual authorization, system user, station code, date and time of filling, type and grade of fuel, and optionally - vehicle engine-hours or odometer reading).

Hand-Held Programmer

This section explains the use of the hand-held programmer and provides step-by-step instructions. This section must be read to assure accurate operation of your system.

Overview

The VIU programmer (*Figure 2*) is a hand-held battery powered terminal for programming the FleetLINK VIU. The programmer has a full-function keyboard with keys for digits, upper-case letters, and several symbols and special functions. Entered characters appear on a two-row LCD display with 16 characters per row. However, each row can contain up to 40 characters, displayed by scrolling.

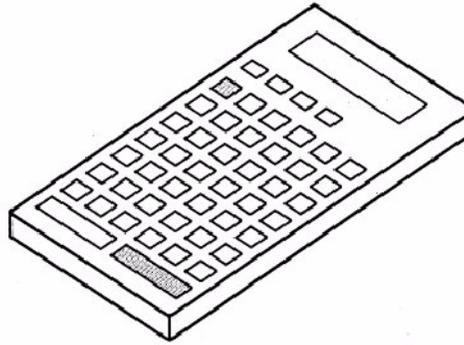


Figure 2: VIU Programmer

Use the keyboard to enter information. At the end of the message, press the *e* key. The keyboard has a standard SHIFT key, labeled (SFT). Press to select the character at the bottom right of each key.

If the entered information extends beyond 16 characters, the display scrolls automatically, to show the additional characters. You can scroll manually by pressing (SFT) and either of the two scroll keys, (7) or (6).

Preparing the Programmer for Use

1. Insert a 9V battery in the battery compartment of the programmer. Always use a high-quality alkaline battery.
2. Connect the transceiver controller loop to the programmer if not already attached.

The programmer is now ready for use.

3. To turn the programmer on, press the (ON/OFF) key at the top left corner of the keyboard. The LCD display turns on and a sign on message is displayed. To turn the programmer off, press (ON/OFF) again.

To conserve battery power, the programmer goes off automatically if no entries are made within one minute. To renew the display, press (ON/OFF) again.

Attaching the Programmer to the Vehicle

Programming is required whenever a VIU is installed in a vehicle. The programming is done with a small hand-held Programmer (*Figure 2 on page 9*).

See *Figure 3*. The programmer attaches to the VIU transceiver loop during programming. See *When Do I Need to Program the VIU?* on page 6..

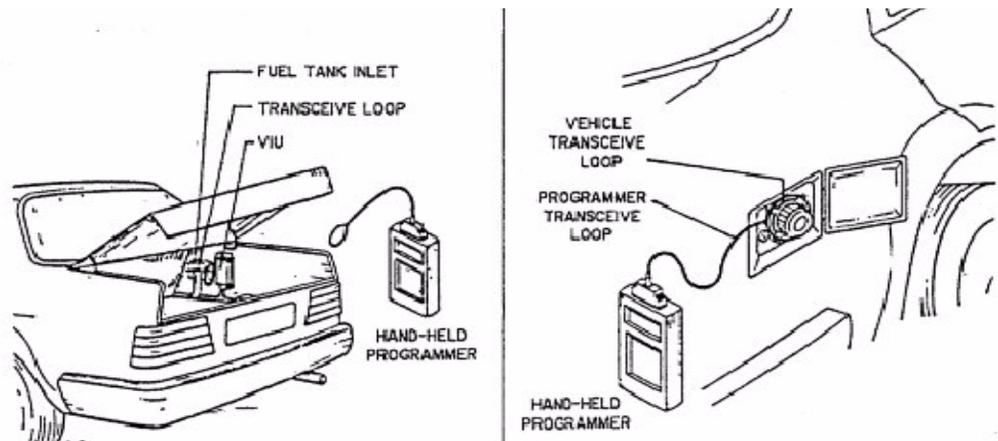


Figure 3: Where to Attach the VIU Programmer

Selecting a Function

To select a pre-programmed function press the (FNC) key repeatedly until the description and key code of the desired function is displayed. Press (ENTER) or the key code for the command.

Couple the programmer to the VIU by holding it in close proximity and activate one of the commands from the list of commands in *Table 1 on page 11*. Faulty communication between the programmer and the vehicle unit produces the following message:

COMM. FAIL
A-bort/ENT-retry

Press the (A/!) key to terminate the command. Press (ENTER) to retry.

Command List

Specialized System2 FSC commands are in an Appendix in the System2 Operator Manual)

Table 1: VIU Programmer Command List

Key Code	Legend	Command Description
1	Set Odometer	Set initial odometer reading
2	Set Factor	Set odometer transducer pulses per unit of distance travelled
3	Read Factor	Read the factor from the car unit
4	Read VIU FSK	Read the data transmitted by the car unit
5	Set Polarity	Set the polarity of engine ON signal in engine hours mode, or reverse signal in reverse mode
6	Set Fuel Type	Set the fuel type assignment of the car unit
7	Odometer mode	Set odometer or engine hours mode the the car unit
8	Set Car/Truck Number	Enter the car or truck identification to the car unit
9	Set User Number	Enter the user identification to the car unit
A	Read VIU ASK	Read the data transmitted by the ASK car unit
B	Serial Terminal	Enter the serial terminal mode
C	Set Sensitivity	Set VIT reception sensitivity
D	Set Fleet code	Set Fleet number of the car unit.
F	Set Pulse Level	Set odometer pulse level
G	Set Timer II	Set initial 2nd timer reading
H	Read Timer II	Read and display 2nd timer
I	Identify VIU	Display VIU version no.
R	Reverse Mode	Set reverse mode of the car unit

Step-by-Step Programming

The following is a step-by-step vehicle programming sequence.

Table 2: Step-by-Step Programming

Enter Key Code	To Begin This Command:	Next, do this:	You Should See <i>This</i> on the LCD Display
D	Set Fleet Code	Enter a 4 digit Fleet Code	- DONE OK
9	Set User Num	OPTIONAL. Enter a 4 digit User Code	- DONE OK
8	Set Car Num	Enter up to 9 characters	- DONE OK
7	Odometer mode	Enter: 0 = No odometer 1 = Odometer only 2 = Engine hours only 4 = Engine hours only on timer II 5 = Odometer and engine hours 6 = Both timers count engine hours (2 independent timers)	- DONE OK
1	Set odometer	Enter initial odometer reading (only for mode 1, 5 - for mode 2 enter initial engine hours)	- DONE OK
G	Set Timer II (optional)	Enter initial timer II reading (only for modes 4,5,6)	- DONE OK
2	Set FACTOR	Enter 5 digit mileage FACTOR. See <i>Programming an Odometer Factor</i> on page 14.	- DONE OK
F	Set Pulse Level	Set odometer pulse level in mV. See <i>Electronic Speedometers</i> on page 15.	- DONE OK
6	Set Fuel Type	Enter Fuel type code	- DONE OK
R	Reverse Mode	Enter: 0 = disable 1 = enable	
5	Set Polarity (for pulse triggering)	For engine hours - Polarity Timer I Timer II Reverse +V 1,1,+ 1, 2,+ 2+ 1,1,- 1, 2, - 2,-	
I	Identify VIU	Displays VIU version number: ID string is the current VIU version, for example: VIU 1.00	IDENTIFICATION: ID STRING

Table 2: Step-by-Step Programming (Continued)

R	Reverse Mode	<ul style="list-style-type: none"> • This command selects the operation mode of the odometer in the reverse position. • Press 0 and then e to disable odometer counting in the reverse position. • Press 1 and then e to enable the odometer count back in the reverse position. • Message confirms entry is complete and command accepted. • To disable the reverse function: (1) Set reverse polarity to (+) and (2) Disconnect the reverse signal (yellow wire on harness) wire or connect it to ground. 	- DONE OK
4	Read VIU	<ul style="list-style-type: none"> • Verify data e 	
3	<u>Read FACTOR</u>	Verify factor	
H	Read Timer II	If using timer II	

In Case of Programming Problems

In case of problems during programming, try some of the following suggestions:

- Check that a good VIU fuse is installed in the fuse holder
- Check cable connections on the programmer and VIU
- Replace programmer batteries with a fresh set. A good sign that programmer batteries are weak is low display contrast
- *Check programmer operation on another vehicle. If the programmer works, the trouble is with the VIU of the first vehicle. If it does not work, replace the programmer.*

Programming an Odometer Factor

Calculating an Initial Odometer Factor

Obtaining accurate odometer tracking requires at least two calibration steps: Initial Factor Programming, and at least one recalibration at a later date.

Mechanical Speedometers

Most mechanical speedometers use 1000 revolutions of the flexible speedometer cable in order to increment the odometer by one mile. Depending on the transducer, multiply the number of pulses per revolution of the transducer (commonly, this is eight) by 1000 to get the number of pulses per mile (8000 in this case). Then program this number as the initial odometer factor.

Note

The maximum pulses per mile is 20,000. If your setup produces more than this, you must use a pulse divider. See page 16

Electronic Speedometers

On vehicles with electronic dashboards, the transducer is built into the speedometer. Different vehicle manufacturers use a different number of pulses per mile.

If you do not know pulses per mile, do the following to determine the factor.

- Program an initial factor of "0" into the VIU.
- Zero the VIU odometer reading using a programmer.
- Drive the vehicle slowly for one mile.
- Take the odometer reading from the VIU using the programmer. This reading is the approximate pulse factor.

Note

*If you cannot obtain a count, you might have to program a different pulse level into the VIU using **Option F** to set the proper pulse level. Measure the incoming pulses at low speed using an oscilloscope. Set the VIU pulse level to one-half the peak pulse amplitude, for example, if the peak pulse amplitude is 1V, set the "F" pulse level to 500(mV).*

Follow-Up Calibration

In order to obtain close odometer tracking to the vehicles built-in odometer, the initially programmed factor must be recalculated. The exact number depends on such variables as transmission ratio, tire size, tire wave, etc.

You must allow at least 1000 miles of driving before performing this procedure. The further you drive the vehicle before recalibration, the more accurate will be the new calculated factor. After reading the new VIU odometer reading the new FACTOR can be calculated using the following formula:

$$NEWf = OLDf \times \frac{NEWv - OLDv}{NEWd - OLDD}$$

Where "f" is odometer *factor*, "v" is *VIU odometer* reading and "d" is the vehicle's *dashboard odometer* reading.

Pulse Frequency Divider (If Needed)

Note

If your new odometer factor is greater than 20,000, you must install a pulse frequency divider.

The pulse frequency divider takes the signal from the vehicle speed sensor and divides it by 2 or 1, producing a conditioned square wave pulse between one of the output wires and ground.

1. Connect the positive (RED) lead of the FPD to an always-ON voltage source (if the ignition switch, to the *ignition* side of the switch, NOT the accessory side).
 2. Connect the negative (BLACK) lead to a good, solid ground.
 3. Solder all connections if possible, or use solidly-crimped connectors.
- Make sure no corrosion exists on any connection.
 - The FPD is protected against accidental reversed polarity connection.
 - Some internal transient protection is built in, but it is good practice to run the positive and negative leads close together to prevent any induced transients.

Complete instructions are printed on the pulse divider itself.

VIU Maintenance and Service

Periodic Inspection

Note

Make sure the battery in the hand-held programmer is good before using the programmer.

To quickly “self-test” the vehicle information unit sub-system, do the following:

1. Attach the connector end of the transceiver cable to the hand-held programmer. Place the loop end of the transceiver cable near (2 in./5 cm) the transceiver loop or over the fuel tank inlet. This couples the programmer to the transceiver loop of the VIU.
2. Check programmed parameters (Code 4). Check that the following readings are correct:
 - Displayed vehicle identity to its nameplate
 - Displayed fleet code/user identity against prescribed parameters
 - Displayed fuel type and grade against vehicle manual
 - When the Odometer Reading option is used, check displayed value against vehicle mileage
 - When Odometer Reading is used, compare displayed calibration factor with value prescribed for this type of vehicle
3. Repeat Steps 1 and 2 above for any additional transceiver loops on the vehicle. Parameters should be identical to those read by positioning programmer loop near or over the first VIU loop.

Troubleshooting

Odometer Reading Does Not Change

Use Code 4 in the hand-held programmer to monitor odometer reading. Use the appropriate section: Transducer Included in Installation or No Transducer in Installation.

Transducer Included in Installation

Electronic Transducers

1. If the electronic transducer has three or four leads, measure the voltage between pin 2 and pin 6 of the 6-pin VIU-2 connector. Correct value is $+5V \pm 0.5V$. *Replace the VIU if voltage is outside this range.*

2. Remove transducer to gain access to both ends of its shaft. Ask someone to rotate the transducer shaft by hand. Check for large voltage changes (up to +5V) between pins 1 (positive) and 5 (negative) of the 6-pin connector while transducer shaft is rotated.
 - *If there is no change, check the wiring to the transducer, and the connections on the transducer. If wiring is good, replace transducer.*
3. Use the hand-held programmer to change the calibration factor to zero. **Zero** instructs the VIU that **one pulse = one mile**.
4. Most transducers generate eight pulses per revolution. While counting, rotate the transducer shaft a certain number of revolutions.
5. Multiply the number of times you turned the shaft by eight, and write down the result.
6. Use the Hand-Held Programmer to read the VIU odometer reading. The reading should have increased by the result you calculated in Step 5. *The Hand-Held Programmer reading will NOT increment as you turn the transducer shaft.*

Magnetic Transducers

Note

For magnetic transducers, set the pulse level to 1500 mV.

1. If there is no odometer change, check the wiring to the transducer, and the connections on the transducer. ALSO -- Check if the sensor is too far from the gear teeth to get a good reading.
2. If these steps fail to remedy the problem, check the transducer with a scope as follows:
 - Attach the scope leads to the transducer output wires.
 - Set VOLTS/DIV to 2V/division.
 - With driving wheels off the ground, and your foot on the brake, start the vehicle and put it in gear.
 - Release the brake slowly. You should see a low-voltage sine wave on the scope (about 2V p-p).

If you determine the transducer is defective, replace it with a known good unit. IF you STILL don't get good results, replace the VIU.

Installations Without a Transducer

1. Check that the signal at the dashboard connection points is correct, according to vehicle manufacturer specification
2. Re calibrate pulse level using the (F) function button.

3. Check harness connections
4. If all else fails, replace VIU unit.

Engine-Hours Reading Does Not Change

1. Use the hand-held programmer to monitor engine-hours reading, using Code H (parameter checking). Confirm the odometer code is not 0 (zero).
2. Start, then stop the vehicle engine. Look for a large voltage difference (up to +5V) between pins 1 and 5 of the 6-pin connector between when the engine is started and stopped.
 - *For first-time installations, make sure wiring is correct (see the Vehicle Service & Installation Manual). If wiring is good, the problem is in the vehicle equipment.*
3. Note the voltage measured between when the engine runs and when it is stopped.
 - If the voltage is *lower* when the engine is running, reprogram the Vehicle Timer Polarity Statistics (Code 5) to **0**.
 - If the voltage is *higher* when the engine is running, reprogram the Vehicle Timer Polarity Statistics to **1**.
4. If after this procedure the engine hours reading does not increase by one approximately every six minutes, replace the VIU unit.

Odometer Reading Doesn't Match Registered Mileage

Typically, this appears as an increase from fueling to fueling, and could be caused by several factors:

Calibration Factors

Reprogram with values specified for this vehicle. Refer to Appendix A for vehicle model calibration factor, and to Page for proper calibration.

Transmission

Take into consideration any optional or custom-made transmission gear box that could be installed in this vehicle model.

Loose or Defective Transducer

Inspect and tighten transducer and mounting.

Defective Vehicle Equipment

Check programmer operation on another vehicle. If the programmer works, the trouble is with the VIU of the first vehicle. Otherwise, replace the programmer.

VIU Cannot be Programmed

The programmer, the VIU OR something in the vehicle could be preventing programming from taking place:

- **Fuse.** Check that a good VIU fuse is installed in the fuse holder.
- **Programmer Batteries.** Replace with a fresh set (a good sign that programmer batteries are weak is low display contrast).
- **Cable Connections.** Check connections to programmer and to VIU.
- **Vehicle Battery Voltage** across VIU pins 3 (+) and 6 (-). It should be 10-14VDC. If not, check fuse and troubleshoot the wiring to the pin connector.

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OPW Fuel Management Systems
6900 Santa Fe Drive
Hodgkins, IL 60525
708-485-4200