

**STANDARD BULK TRUCK SYSTEM
OWNER'S MANUAL
ADDENDUM
Calibration (Prover Mode) Procedures**

LectroCount³ On-Board Truck Computer



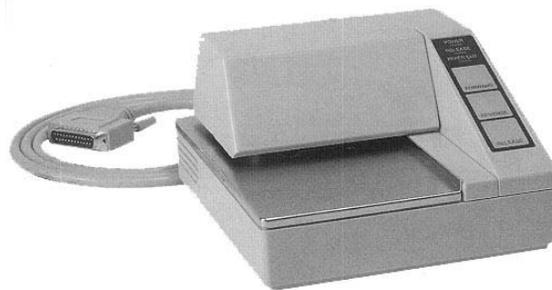
Model E4030-1 Lap Pad



Model E2530-1 Supervisory Control Module



Model E-2404-41 Remote Electronic Counter and Remote Supervisory Control Box



Model E4900-1 Printer

This addendum supplements the Standard Bulk Truck System Owner's Manual 49145E

CALIBRATION MODE (PROVER MODE)

CAUTION

All of the calibration mode screens must be properly setup in order for the meter to operate properly. Incorrect settings can result in inaccurate measurements, lost product, unexpected operation and damage to equipment or property. Setup and calibration should be performed ONLY by trained and authorized personnel. If you have any questions contact your Authorized Liquid Controls Distributor or Liquid Controls Customer Service at 1-800-458-5262.

CALIBRATION PROCEDURE

PROVER MODE is used for meter calibration. When proving the LectroCount³ System, follow pre-test and inspection procedures established by Weights and Measures authorities. The primary indicating and recording element on a vehicle mounted LectroCount³ is located on the Lap Pad in the truck cab. A remote 6-digit (meter mounted) liquid crystal display is provided for operator convenience and consumer verification.

Weights and Measures inspectors are responsible for determining if the truck metering and recording elements of the system are in tolerance. To make this determination, the system should be tested under normal operating conditions.

After the initial calibration, access to the calibration mode is required only if the system is in excess of established tolerances or the W & M inspector elects to run special tests (i.e., establishing the accuracy of both the measuring element and the compensating elements of the system).

Refer to Page 5 of the Owner's Manual 49145E for information on how to operate the Lap Pad. In general, data input is performed by pressing the numerical keys on the key pad, followed by pressing the **ENTER** key.

1. First select the product to be proved. If the unit is equipped with 8 Product Software, enter Mode 1 by pushing **M1** on the Lap Pad. Scroll down to PRODUCT CODE and enter the code for the product being calibrated. Each product needs to be calibrated separately in the prover mode. See Mode 17 on Page 11 of the owners manual for product set-up.

If the unit is equipped with 24 product software, enter Mode 21 by pushing **M#**, 2 1. Enter and select one of the four possible calibrations. Each calibration needs to be done separately in the prover mode.

2. Remove the lead seal and wire assembly from the Remote Supervisory Control Box.
3. Remove the four (4) fillister head screws securing the name plate of the red selector switch located on the Remote Supervisory Control Box.
4. Enter the calibration mode by turning the red switch to the PROVER position, full counterclockwise (6:00 o'clock position). The prover mode is used to change the calibration of the meter, electronic temperature compensator or both. When the switch is in the prover position, the prompting display will read: [INSERT TICKET AND PUSH ENTER OR PUSH STOP]. Insert a ticket and push **ENTER** to print the initial prover ticket. The prompting display will again read: [INSERT TICKET AND PUSH ENTER OR PUSH STOP]. Insert a second ticket and prepare to prove the system.

NOTE: When proving a truck meter, the truck compartment should be at least 70% full to avoid metering hot, foamy product and to ensure accurate proving.

5. If this is a new installation, a value for PULSES/UNIT VOLUME must be entered. Scroll through the prover mode screens using the **↓** key until you reach the PULSES/UNIT VOLUME screen. Refer to Table B and choose a value based on the type, make and model of the meter. Type in the value and press the **ENTER** key.
6. If proving a temperature compensated meter and register, the meter should first be tested for accuracy without using the temperature compensation feature. Scroll through the prover mode screens to the TEMP COEF or DENSITY or ENABLE VCF TABLE screen. Write down the value that appears here and then enter 0.00 to defeat temperature compensation.

7. Push **START** and deliver a known volume to a reliable, accurate prover, weight scale or master meter.
8. Push **STOP**. The prompting display will indicate GROSS VOLUME that the meter measured.
9. Scroll through the prover mode screens using the **↓** key until you reach the GROSS VOLUME GALLONS (or LITRES) screen. ENTER THE VOLUME READING SHOWN ON THE PROVER*. Never enter zero. The register will automatically adjust the pulses/unit to correct for any inaccuracy.
10. Scroll through the prover mode screens using the **↓** key until you reach the Pulses/Litre (Pulses/Gallon) value. Write it down on a piece of paper.
11. Repeat steps 7 through 10 two more times in order to stabilize the system temperature and wet the prover walls.
12. Using a calculator, divide the last Pulses/Litre (Pulses/Gallon) value by the value on the previous cycle. If the answer is NOT between 0.9975 and 1.0025, repeat steps 7 through 10 until it is.
Example: This Prover Run = 2231 pulses/gallon
Previous Prover Run = 2229 pulses/gallon
 $2231/2229 = 1.000897$ (Which is in the acceptable range)

With the meter itself proved, the next step is to adjust the temperature compensation if necessary. Net volume is calculated from gross volume by considering the effects of temperature variations on the product.

13. Enable the temperature compensation once more. Scroll through the prover mode screens to the TEMP COEF or DENSITY or ENABLE VCF TABLE screen. If your system has an ENABLE VCF TABLE screen, enter 1 to enable temperature compensation. If your system has a TEMP COEF or DENSITY screen, enter the temperature coefficient for the fluid or the standard density recorded in Step 6, or refer to TABLE A for assistance in selecting the correct value. If the unit has DENSITY software the LectroCount³ will calculate a correction table. During the calculations the unit may be disabled for about 5 minutes.
 14. If the unit has TEMP COEF or DENSITY software, scroll through the prover mode screens to the BASE TEMP screen and enter the proper value (usually 60°F or 15°C). Refer to Table A for the correct base temperature.
 15. Deliver enough product to the prover to stabilize the liquid system temperature.
 16. Push **START** and deliver a known volume to a reliable, accurate prover, weight scale or master meter.
 17. Push **STOP**.
 18. Scroll down through the prover mode screens to the TEMP THIS DEL F (C) screen, and compare the value shown with the Weights and Measures thermometer reading. If there is a discrepancy scroll down to the CALIBRATED PROBE TEMPERATURE screen. Enter the Weights and Measures thermometer reading. The register will automatically calculate a new TEMP OFFSET – DEG F (C), resulting in a change in the net volume delivered on the NEXT prover run.
 19. Repeat Steps 1 through 18 for all remaining Product Codes or all remaining Product Calibrations (as described in Step 1) used on this register.
 20. Calibration is not complete until all of the settings and measurements have been properly made, the red switch is returned to the STOP position, the switch plate and screws are replaced and a seal wire is affixed. A final prover ticket will automatically be printed upon exiting prover mode. NOTE: For the calibration changes to be saved a final prover ticket must be printed. CAUTION: If power is lost for any reason while in prover mode, all calibration changes will be lost.
- * The prover reading is gross value, but many jurisdictions also require you to include the prover's correction factor. This correction factor takes into account the change in prover volume with product temperature. When proving at temperatures less than 15°C, the prover tank shrinks and the correction factor is a negative value (Example: -.25 litres). When proving at temperatures above 15°C, the prover tank expands and the correction factor is a positive value (Example: +.30 litres). The prover readings for Gross Volume plus the correction factor is entered into the Lap Pad's display of Gross Volume Litres (Gallons). The computer automatically recalculates Pulse/Litre.

CALIBRATION MODE (PROVER MODE)

Compensation Types and Parameters							
Product	VCF Type	Scale	Parameter	Range	Tbase	Tmin	Tmax
General (USA)	Linear	°F	Linear	0.01 to 0 ** Aviation Fuel – 0.00052 Diesel Fuel, #2 and Home Heating Oil – 0.0005 Gasoline - 0.0007 LPG – 0.0016 Lube Oils – 0.0004 Methanol - .00066 NH3 – 0.0013	60	-40	+95
General	Linear	°C	Linear	0.01 to 0	15	-40	+95
LPG (Canada)	API Table 54	°C	Density Kg/l	Fixed 0.510	15	-46	+60
Refined Petroleum Products (Canada)	API Table 54B	°C	Density Kg/m ³	653 to 1075 *** Gasoline – 730 Aviation Fuel – 800 Diesel Fuel – 840	15	-40	+95
Ammonia (NH3) (Canada)	NH3	°C	N/A	N/A	15	-30	+40
Methanol	API Table 54C	°C	N/A	N/A	15	-30	+40

Table A

** The actual linear correction value for your measured fluid should be used. This value can usually be obtained through your supplier.

*** The actual density value for your measured fluid should be used. This value can usually be obtained through your supplier.

Initial Calibration Factors (K-Factors) for selected meters			
For internal encoders with 1:1 packing glands or POD pulsers			
Note: Values are approximate. Calibration is ALWAYS required.			
Manufacturer	Model Number	Pulses / Gallon	Pulses / Litre
Liquid Controls	M-4, M-5, MA5	1632	431
	M-7, MA-7, MS-7, M-10	2222	587
	M-15, MA-15, MS-15, M-25, MS-25	823	217
	M-30, MS-30, M40, MS-40	297	78
Neptune	1 ½" and 2"	370	98
Brooks	All truck mounted meters	400	106
A.O. Smith	T-11	1200	317
	T-20	675	178

Table B

HOW TEMPERATURE COMPENSATION CALCULATIONS ARE MADE

EXAMPLE: Using a 1,000 gallon gross quantity:

Base temperature = 60° F

Temperature coefficient = 0.00045000000

Temperature this delivery = 65° F

Gross volume gallons = 1,000 gallons

The volume correction factor (VCF) is calculated by taking the temperature deviation multiplied by the temperature coefficient and subtracting from 1.

$$VCF = 1 - (\text{Temp Dev} \times \text{Temp Coef})$$

$$VCF = 1 - (5 \times 0.00045) = 0.99775$$

Temperature deviation is calculated by subtracting the base temperature from the temperature this delivery.

$$\text{Temp Dev} = \text{Temp This Del} - \text{Base Temp}$$

Since the product temperature is higher than the base temperature, the amount of product delivered is slightly less than it would be at the base temperature. The net volume is the gross volume times the volume correction factor.

$$\text{Net volume} = \text{gross volume} \times \text{volume correction factor (VCF)}$$

$$\text{Net volume} = 1,000 \times 0.99775 = 997.75$$

CALIBRATION MODE (PROVER MODE) SCREENS

Due to the numerous variations in operating software for the LectroCount3, each of the screens that follows may or may not apply to your particular software. The screen text from the lap pad is shown in a box, followed by an explanation of the screen function and settings. Numerical information that may appear in the screen box is an EXAMPLE ONLY and DOES NOT apply to any particular system.

GROSS VOLUME GALLONS (or Litres) CALIBRATION MODE	0.0
--	-----

This is the primary proving display, which shows the amount of Gross (uncompensated) fluid delivered. This may be in Gallons or in Litres depending upon the particular software used in the system. The actual delivered volume as measured by the prover should be entered here as instructed in the Calibration Procedure on Page 2 and 3.

NET VOLUME GALLONS (or Litres) CALIBRATION MODE	0.0
--	-----

(Temperature compensated systems only). This display shows the amount of Net (compensated) fluid delivered. The compensation amount is based upon the Gross volume as well as the compensation type and compensation parameters described below. This may be in Gallons or in Litres depending upon the particular software used in the system.

PRODUCT CODE CALIBRATION MODE	1
----------------------------------	---

(8 Product Systems Only). This value indicates the product code that is currently being proved. This is for display only and cannot be changed within Calibration Mode. It must be selected before entering Calibration Mode (see instructions above).

CALIBRATION NUMBER CALIBRATION MODE	1
--	---

(24 Product Systems Only). On systems with 24 product software, each product must use one of four possible calibration numbers (or factors). This value (1 through 4) indicates which calibration number is currently being proved.

PRODUCT CLASS ENTER 1 TO CHANGE PRODUCT CLASS	GASOLINE
--	----------

(24 Product Systems Only). On systems with 24 product software, the product class is a label that is permanently tied to this calibration number and will print on all subsequent delivery tickets. You may select from the following: GASOLINE, DISTILLATE, AVIATION, METHANOL, AMMONIA, LPG. The UNIDENTIFIED label can be typed over to create product classes other than those listed.

TEMP COEFFICIENT *F (or *C) CALIBRATION MODE	.000000000
---	------------

(Temperature Compensated systems only. Typically US and Mexico.) On temperature compensated systems with linear type compensation, a temperature coefficient is required to properly correct the volume. The temperature coefficient may be either for Degrees F or for degrees C depending on the specific software used. Refer to Table A to assist you in selecting the correct temperature coefficient for the fluid being measured. NOTE: ENTERING A VALUE OF "0" WILL DEFEAT THE TEMPERATURE COMPENSATION. ENTERING THE INCORRECT VALUE CAN RESULT IN INACCURATE MEASUREMENTS AND UNEXPECTED OPERATION. IF YOU HAVE ANY QUESTIONS, OR ARE UNSURE OF THE PROPER VALUE TO USE, CONTACT AN AUTHORIZED LIQUID CONTROLS REPRESENTATIVE FOR ASSISTANCE.

DENSITY AT 15 C CALIBRATION MODE	0.00
-------------------------------------	------

(Temperature Compensated systems only. Typically Canadian Refined Fuels.) On temperature compensated systems with density based compensation (table 54B), a product density value at standard temperature (15 degrees C) is required to properly correct the volume. The density value must be entered in units of kg/m³. Refer to Table A to assist you in selecting the correct density value for the fluid being measured.

If the density initially entered is 730 GASOLINE, 800 AVIATION or 840 DIESEL it will take about 10 seconds to calculate the table. All other densities will initially take about 4 minutes and will display --- VCF CALCULATION ACTIVE --- until the table is calculated. On 8 product software, the density entered will determine the product class that is printed on the delivery tickets (ie. GASOLINE, AVIATION, DISTILLATE ...).

NOTE: ENTERING A VALUE OF "0" WILL DEFEAT THE TEMPERATURE COMPENSATION. ENTERING THE INCORRECT VALUE CAN RESULT IN INACCURATE MEASUREMENTS AND UNEXPECTED OPERATION. IF YOU HAVE ANY QUESTIONS, OR ARE UNSURE OF THE PROPER VALUE TO USE, CONTACT AN AUTHORIZED LIQUID CONTROLS REPRESENTATIVE FOR ASSISTANCE.

CALIBRATION MODE (PROVER MODE)

CALIBRATION MODE (PROVER MODE) SCREENS (CONTINUED)

ENABLE LPG VCF TABLE CALIBRATION MODE	1
--	---

(Temperature Compensated systems only. Typically Canadian LPG.) On Canadian LPG systems with Table 54 based compensation, a hard coded product density value of 0.510 kg/l is used to properly correct the volume. Entering a value of "1" will enable temperature compensation. NOTE: ENTERING A VALUE OF "0" WILL DEFEAT THE TEMPERATURE COMPENSATION.

ENABLE NH3 VCF TABLE CALIBRATION MODE	1
--	---

(Temperature Compensated systems only. Typically Canadian NH3.) On Canadian NH3 systems with temperature compensation, a hard coded compensation table is used to properly correct the volume. Entering a value of "1" will enable temperature compensation. NOTE: ENTERING A VALUE OF "0" WILL DEFEAT THE TEMPERATURE COMPENSATION.

MEAN VCF CALIBRATION MODE	0.000000000
------------------------------	-------------

(Temperature Compensated systems only). The mean Volume Correction Factor (VCF) is displayed for reference. The Net volume is calculated by multiplying the Gross volume by the VCF. The VCF is calculated by the LectroCount3 based upon the type of compensation used in the version of software installed.

BASE TEMPERATURE *F (or *C) CALIBRATION MODE	60
---	----

(Temperature Compensated systems only). The base temperature is both entered and displayed here, and is typically 60 degrees Fahrenheit for US systems and 15 degrees Celsius for Canadian and other systems. Refer to Table A for the correct value to use. The difference between the Base temperature and the actual Product temperature is used, in part, to calculate the VCF. NOTE: ENTERING THE INCORRECT VALUE CAN RESULT IN INACCURATE MEASUREMENTS AND UNEXPECTED OPERATION.

TEMP. THIS DELIVERY *C (or *F) CALIBRATION MODE	10.9
--	------

(Temperature Compensated systems only. Some versions of software do not display this value.) The actual product temperature for this delivery is displayed for reference only and is in degrees Fahrenheit for US systems and in degrees Celsius for Canadian and other systems. The difference between the Base temperature and the actual Product temperature is used, in part, to calculate the VCF.

UNCALIBRATED PROBE TEMPERATURE *C CALIBRATION MODE	10.90
---	-------

(Temperature Compensated systems only). The actual, uncalibrated (or raw) probe temperature is displayed for reference only and is in degrees Fahrenheit for US systems and in degrees Celsius for Canadian and other systems. The calibrated temperature is the uncalibrated temperature minus the temperature offset.

CALIBRATED PROBE TEMPERATURE *C(F) CALIBRATION MODE	10.89
--	-------

(Temperature Compensated systems only). The calibrated (or adjusted) probe temperature is both entered and displayed here. The calibrated temperature is in degrees Fahrenheit for US systems and in degrees Celsius for Canadian and other systems. During a proving run, the temperature as measured by the Weights and Measures thermometer is entered here. The register then calculates a new Temp. Offset-Deg (see below). The calibrated temperature is the uncalibrated temperature minus the temperature offset.

TEMP. OFFSET-DEG *C(F) CALIBRATION MODE	0.01
--	------

(Temperature Compensated systems only). The temperature offset is both entered and displayed here and is in degrees Fahrenheit for US systems and in degrees Celsius for Canadian and other systems. The temperature offset is the measured difference between the Uncalibrated probe temperature and the actual temperature as measured by the Weights and Measures inspector. While the temperature offset can be entered directly into this screen, it is recommended that the actual temperature be entered into the Calibrated Probe Temperature Screen instead.

UNIT ID NUMBER 1.
CALIBRATION MODE

The Unit ID Number is a number generated by the owner to uniquely identify this register from others. Since the register is calibrated to a specific meter, the register serial number is typically entered here. The Unit ID number can be viewed or changed from this screen. This number will be printed on calibration and diagnostic tickets for reference.

METER NUMBER 1.
CALIBRATION MODE

The Meter Number is a number generated by the owner to uniquely identify the meter used with this register from others. Since the register is calibrated to a specific meter, the meter serial number is typically entered here. The meter number can be viewed or changed from this screen. This number will be printed on calibration and diagnostic tickets for reference.

TRUCK NUMBER 1.
CALIBRATION MODE

The Truck Number is a number generated by the owner to uniquely identify this truck (if used) from others. The Truck Number can be viewed or changed from this screen. This number will be printed on calibration and diagnostic tickets for reference.

MAX FLOW RATE EVER 87.3
CALIBRATION MODE

(Not on all versions of software). Reference only. This screen shows the maximum flow rate ever measured on this register. The units are the primary units of measure for this register (typically Gallons or Litres) PER MINUTE. This value can be reset by entering a "0" on this screen.

MAX FLOW RATE LAST DELIVERY 46.5
CALIBRATION MODE

(Not on all versions of software). Reference only. This screen shows the maximum flow rate measured on the last delivery. The units are the primary units of measure for this register (typically Gallons or Litres) PER MINUTE. This value is reset on each delivery.

The following screens are related to valve setup. For definitions, refer to MODE 4 information on pages 6 and 7 of the Owner's Manual 49145E.

- | | |
|---------------------------|--------------------------------------|
| MAX PRESET VOLUME | VALVE TYPE, DIDDLE=1, 1 OR 2 STAGE=0 |
| FIRST STAGE CLOSURE | HIGH FLOW (UNITS/MIN) |
| THROTTLE CONTROL VOLUME | LOW FLOW (UNITS/MIN) |
| MAX PULSER REVERSALS | VALVE OPENING DELAY |
| ACTUAL PULSER REVERSALS | VALVE CLOSING DELAY |
| NO FLOW TIMEOUT (.1 SEC) | SOLENOID OPEN TIME |
| VALVE CLOSE TIME (.1 SEC) | SOLENOID CLOSE TIME |
| | DEAD BAND |
| | BYPASS PULSE (8X mSEC) |

ENTER SYSTEM SETUP MODE 0
CALIBRATION MODE

The system setup mode screens are defined on Page 15 of the Owner's Manual 49145E.

METER FACTOR 0.9987
CALIBRATION MODE

(Reference Only). The meter factor is a ratio between the original pulses/unit and the current pulses/unit value. This value can provide an indication of the percentage change in meter calibration. This reverts to 1.0000 whenever a 5% (2% in Canadian software) change or greater in pulses/unit is entered. NOTE: When proving, NEVER use the METER FACTOR as a calibration value.

PULSES/LITRE (PULSES/GALLON) 975.
CALIBRATION MODE

This value, also known as the Calibration Factor or K-factor, is the number of meter pulses per unit of measure (typically Litres or Gallons). This value will change automatically when the system is calibrated using the procedure shown on page 2 and 3. A calibration factor can be entered directly, but it is not recommended. This value will print on all Calibration and Diagnostic tickets.

SOLD AND SERVICED BY A NETWORK OF HIGHLY TRAINED FULL SERVICE DISTRIBUTORS



Backed By Our Worldwide Reputation For Quality, Accuracy and Advanced Design.

Warranty:

Liquid Controls, L.L.C. ("Seller") products are warranted against defects in materials or workmanship for a period of one (1) year from date of installation, provided that the warranty shall not extend beyond twenty-four (24) months from the date of original shipment from seller. Seller's obligations, set forth below, shall apply only to failure(s) to meet the foregoing obligations provided that seller is given written notice within (30) days of any occurrence from which a claim of defect arises. If a warranty dispute occurs, the purchaser shall be required to provide Seller with proof of date of sale. The minimum requirement to establish date of sale shall be a copy of the Seller's invoice. In the event that a factory inspection by Seller or its designee(s) supports the validity of a claim, at the discretion of Seller, repair, replacement or refund shall be sole remedy for defect

and shall be made, free of charge, ex-works factory. In no event shall Seller be liable for any special, consequential, incidental, indirect or exemplary damages arising out of warranty, contract, tort, (including negligence) or otherwise, including but not limited to, loss of profit or revenue, loss of use of the product or any associated products and/or equipment, cost of substitute goods or services, downtime costs or claims of or by Purchaser's clients or customers. In any event, the total liability of Seller for any and all claims arising out of or resulting from the performance, non-performance or use of the product shall not exceed the purchase price of the individual product giving rise to the claim. All other guaranties, warranties, conditions and representations, either express or implied, whether arising under any statute, common law, commercial usage or otherwise are excluded. Electronic Products require

Installation, start-up and servicing by local factory-trained service representatives. In the absence of installation, start-up and servicing of Electronic Products by Seller trained service representatives, this warranty is null and void. Seller's obligations as set forth above shall not apply to any product, or, or any component part thereof, which is not properly installed, used, maintained or repaired, or which is modified other than pursuant to Seller's instructions or approval. NOTE: The above warranty applies only to products manufactured by Liquid Controls, Lake Bluff, Illinois. Private label, OEM, and/or products manufactured by Liquid Controls licensee(s) are specifically excluded from the above warranty. Consult the factory for all non-Liquid Controls manufacturers' warranties. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY.



Liquid
CONTROLS, LLC

105 Albrecht Drive
Lake Bluff, IL 60044-2242
Telephone: (847) 295-1050
FAX: (847) 295-1057
Website: www.lcmeter.com

Distributed By:

ISO 9001



DNV

CERTIFICATED FIRM
Certificate No. 97-HDU-AQ-8732