



Region 7

AUTOMATIC

TANK

MONITORING

&

LINE LEAK

DETECTION

REFERENCE

MANUAL

Author: Bjorn Brinkman, Environmental Engineer
EPA, Region 7, 913-551-7761



TLS-250

Automatic Tank Gauging System

VEEDER-ROOT

125 Powder Forest Dr.
Simsbury, CT 06070
Tel: (203) 651-2700



Evaluator: MRI - 05/14/93

System Description: The *TLS-250* is capable of sensing product loss as small as 0.2 gph. The leak detect routine is conducted while no fueling is taking place and no bulk deliveries are being made. The leak detection mode can be operated manually or set automatically for times when the facility is closed. It can be set to test a single tank or all tanks in a system. The *TLS* also checks itself and the fuel prior to and during a test for nine separate conditions including low inventory, recent bulk delivery and equipment problems which could cause a false test failure. The *TLS* system is capable of handling 8 probes. The *TLS-250 Plus!* uses different probes and can detect a leak of 0.1 gph. The *TLS-250i* uses sensors to monitor interstitial areas.

Certification: 0.2 gph with PD = 99% and PFA = 0.1%
0.1 gph with *Plus!* system

Tank Capacity: Max. 15,000 gal

Test Period: Min. 2 hrs with tank 50 - 95% full
Min. 3 hrs with *Plus!* system

Limitations:

- No dispensing or delivery during test
- Not evaluated using manifold tanks
- Not capable of continuous monitoring
- Not equipped to monitor product lines

SAMPLE REPORTS

TLS-250

1. Display Inventory Information (NORMAL MODE)

- Depress **FUNCTION** until desired function
- Depress **TANK** until desired tank

2. Print Inventory Information (NORMAL MODE)

- Depress **PRINT**; information for all tanks in system.

Station Name
Street Name
City, State, Zip
Telephone Number

INVENTORY REPORT
FEB 6, 1987
6:30 AM

TANK 1
PREMIUM UNLEADED
1676 GALLONS FUEL
8324 GALS ULLAGE
21.75 INCHES FUEL
0.0 INCHES WATER
55.3 DEGREES F

TANK 2
REGULAR UNLEADED
3731 GALLONS FUEL
6269 GALS ULLAGE
38.37 INCHES FUEL
0.0 INCHES WATER
56.7 DEGREES F

LEAK MONITOR REPORT

TEST START TIME:
FEB 6, 1987
11:00 PM

TEST HOURS 1 - 6

TNK1	TNK2	TNK3	TNK4
DEGREES F			
60.2	56.6	55.9	55.4

GALLONS			
0.0	0.0	-0.3	0.0
0.3	0.0	-2.1	0.1
0.7	0.0	-4.0	0.1
1.2	0.1	-5.6	0.0
1.5	0.0	-7.1	0.0
1.8	0.0	-9.3	0.1

DEGREES F			
55.3	56.4	55.6	55.3

FINAL LEAK RATES:

TANK	GAL/HR	0.20 GAL/HR TEST
1	0.30	INVALID
2	0.00	PASSED
3	-1.55	FAILED
4	0.01	PASSED

TANK 1
PREMIUM UNLEADED

SEG 1 TEST MIX ERR
SEG 2 TEST MIX ERR

SEG 1 DLVY MIX ERR
SEG 2 DLVY MIX ERR

TEMP CHANGE ERROR
RECENT DELIVERY

TEST ENDING TIME:
FEB 7, 1987
6:00 AM

3. Leak or Sensor Monitor Report (NORMAL MODE)

- Depress **FUNCTION** until "Leak Rate (gal/hr)"
- Depress **PRINT**; information for all tanks in system

SAMPLE REPORTS

TLS 250

(cont)

4. Alarm History Report (DIAGNOSTIC MODE)

- Depress **FUNCTION** until diagnostic code "8"
- Depress **PRINT**, shows the last three occurrences of each type of alarm for this tank

5. Inventory Increase Report (NORMAL MODE)

- Depress **FUNCTION** until "Delivery Volume"
- Depress **PRINT**; shows last delivery

```
TANK 1
PREMIUM UNLEADED
INVENTORY INCREASE

FEB 6, 1987
3:38 PM
    709 GALLONS FUEL
    56.7 DEGREES F

FEB 6, 1987
3:59 PM
    5685 GALLONS FUEL
    60.4 DEGREES F

    4976 NET INCREASE
```

```
ALARM HISTORY REPORT
-- EXT. INPUT ON ---

MAR 13, 1987
  9:09 PM

MAR 9, 1987
  4:25 PM

MAR 6, 1987
10:25 AM
-- EXT. INPUT OFF --

MAR 13, 1987
  9:09 PM

MAR 9, 1987
  4:25 PM

MAR 6, 1987
10:35 AM

TANK 5
PRODUCT 5
----- LEAK -----

MAR 13, 1987
  1:10 AM

MAR 3, 1987
  2:15 AM

MAR 1, 1987
  4:15 AM

---- HIGH WATER ----

MAR 13, 1987
  9:06 PM

----- OVERFILL -----

FEB 23, 1987
  4:07 PM

---- LOW LIMIT ----

FEB 23, 1987
  9:04 AM

----- THEFT -----

FEB 10, 1987
12:11 AM
```

*all can detect 3, 0.2 and 0.1 gph. The **TLS-350** is also capable of monitoring groundwater and vapor sensors. The console features a built-in beeper and warning lights for alarm conditions and can be programmed to shut down pumps. **You can verify which options are included in the system by scrolling thru the functions listed on the console display.***

TLS-350

(CONT)



Certification: *TANK GAUGING*

0.1 gph with PD = 99% and PFA = 1%

With CSLD

0.2 gph with PD = 100% and PFA = 0%

LINE TEST

3, 0.2 & 0.1 gph with PD = 100% and PFA = 0%

Tank Capacity: Max. 15,000 gal
Max. 38,170 gal for all manifolded tanks with CSLD

Test Period: *TANK GAUGING*

Min. 3 hrs with tank 95% full for 0.1 gph test

Min. 2 hrs with tank 50 - 95% full for 0.2 gph test

With CSLD

No down time

LINE TEST (Depends on probe series)

3.0 gph - 14 sec to 1 min

0.2 gph - 6 to 45 min

0.1 gph - 14 to 45 min

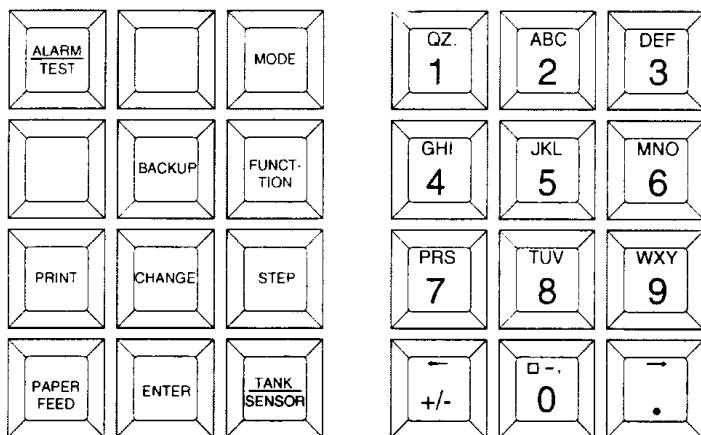
Limitations: *W/O CSLD option*

- No dispensing or delivery during test
- Not evaluated using manifolded tanks

W/O LLD option

- Not equipped to monitor product lines

SAMPLE REPORTS TLS-350



Console Keypad

1. View Inventory Information

- a. Press **FUNCTION** until "In-Tank Inventory"
- b. Press **STEP** to view inventory in first tank
- c. Continue to press **STEP** for all other inventory information
- d. Press **TANK** for inventory in next tank

2. Print Inventory Information

- a. Find "All Functions Normal" on display
- b. Press **PRINT**; information for all tanks in system.

3. Delivery Increase Amount

- a. Press **FUNCTION** until "In-Tank Inventory"
- b. Press **STEP** until "Delivery ="
- c. Press **TANK** for inventory in next tank
- d. Press **PRINT** for delivery in tank

MMM DD, YYYY HH:MM XM

INVENTORY REPORT

T 1: UNLEADED GASOLINE
 VOLUME = 8518 GALS
 ULLAGE = 1482 GALS
 90% ULLAGE = 482 GALS
 TC VOLUME = 8492 GALS
 HEIGHT = 76.26 INCHES
 WATER VOL = 0 GALS
 WATER = 0.00 INCHES
 TEMP = 64.6 DEG F

T 2: SUPER UNLEADED
 VOLUME = 7545 GALS
 ULLAGE = 2455 GALS
 90% ULLAGE = 1455 GALS
 TC VOLUME = 7569 GALS
 HEIGHT = 67.76 INCHES
 WATER VOL = 0 GALS
 WATER = 0.00 INCHES

MMM DD, YYYY HH:MM XM

T 1: REGULAR UNLEADED INVENTORY INCREASE

INCREASE START
 MMM DD, YYYY HH:MM XM

VOLUME = 5146 GALS
 HEIGHT = 44 INCHES
 WATER = 0.00 INCHES
 TEMP = 46.8 DEG F

INCREASE END
 MMM DD, YYYY HH:MM XM

VOLUME = 8104 GALS
 HEIGHT = 84 INCHES
 WATER = 0.00 INCHES
 TEMP = 47.2 DEG F

GROSS INCREASE = 2958
 TC NET INCREASE = 2983

SAMPLE REPORTS

TLS-350

(cont)

4. Tank Leak Test Results

- Press **FUNCTION** until "In-Tank Test Results"
- Press **PRINT** for all tank leak tests

```
MMM DD, YYYY HH:MM XM
LEAK TEST REPORT
T 1:REGULAR UNLEADED
PROBE SERIAL NUM 105792

TEST STARTING TIME:
MMM DD, YYYY HH:MM XM

TEST LENGTH = 4.3 HRS
STRT VOLUME = 3725 GALS

LEAK TEST RESULTS
0.2 GAL/HR TEST PASS
```

5. CSLD Test Results

- Press **FUNCTION** until "CSLD Test Results"
- Press **PRINT** for CSLD results in all tanks

```
CSLD TEST RESULTS
- - - - -
DD-MM-YY HH:MM XM

T 2: SUPER UNLEADED
PROBE SERIAL NUM 123002
0.2 GAL/HR TEST
PER: DD-MM-YY PASS
```

6. Pressurized Line Leak Detection Tests (PLLD)

- Press **FUNCTION** until "Pressure Line Results"
- Press **PRINT** for results in all lines

```
MMM DD, YYYY HH:MM XM
PRESSURE LINE LEAK TEST
RESULTS

Q 1: UNLEADED REG LINE
3.0 GAL/HR RESULTS:

LAST TEST:
MMM DD, YYYY HH:MM XM PASS

NUMBER OF TESTS PASSED
PREV 24 HOURS : 123
SINCE MIDNIGHT : 81

0.20 GAL/HR RESULTS:

MMM DD, YYYY HH:MM XM PASS
MMM DD, YYYY HH:MM XM PASS

0.10 GAL/HR RESULTS:

MMM DD, YYYY HH:MM XM PASS
MMM DD, YYYY HH:MM XM PASS
```


SAMPLE REPORTS

TLS-350

(Cont)

7. PLLD History Reports

- Press **FUNCTION** until "Pressure Line Results"
- Press **STEP** until "Press Print for History"
- Press **PRINT** for history; last 3 gph, first 0.2 gph & first 0.1 gph results for each month

```
MMM DD, YYYY HH:MM XM
PRESSURE LINE LEAK TEST
HISTORY
Q 1: UNLEADED REG LINE
LAST 3.0 GAL/HR PASS:
MMM DD, YYYY HH:MM XM
FIRST 0.20 GAL/HR PASS
EACH MONTH:
```

8. Wireless Pressurized Line Leak Detection Tests (WPLLD)

- Press **FUNCTION** until "WPLLD Line Results"
- Press **PRINT** for results of all lines

```
MMM DD, YYYY HH:MM XM
WPLLD LINE LEAK TEST
RESULTS
W 1: UNLEADED REG LINE
3.0 GAL/HR RESULTS:
LAST TEST:
MMM DD, YYYY HH:MM XM PASS
NUMBER OF TESTS PASSED
PREV 24 HOURS : 123
SINCE MIDNIGHT : 81
0.20 GAL/HR RESULTS:
MMM DD, YYYY HH:MM XM PASS
MMM DD, YYYY HH:MM XM PASS
0.10 GAL/HR RESULTS:
MMM DD, YYYY HH:MM XM PASS
MMM DD, YYYY HH:MM XM PASS
```

```
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
FIRST 0.10 GAL/HR PASS
EACH MONTH:
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
```

```
MMM DD, YYYY HH:MM XM
WPLLD LINE LEAK TEST
HISTORY
W 1: UNLEADED REG LINE
LAST 3.0 GAL/HR PASS:
MMM DD, YYYY HH:MM XM
FIRST 0.20 GAL/HR PASS
EACH MONTH:
```

```
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
FIRST 0.10 GAL/HR PASS
EACH MONTH:
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
MMM DD, YYYY HH:MM XM
```

9. WPLLD History Reports

- Press **FUNCTION** until "WPLLD Line Results"
- Press **STEP** until "Press Print for History Report"
- Press **PRINT** for history; last 3 gph, first 0.2 gph & first 0.1 gph results for each month

SAMPLE REPORTS

TLS-350

(Cont)

10. Volumetric Line Leak Detection Tests (VLLD)

(TLS-350R Only)

- Press **FUNCTION** until "Line Leak Detect Results"
- Press **PRINT** for history results of all lines

```
LIQUID STATUS
-----
MMM DD,YYYY HH:MM XM
```

```
L 1 : UNLEADED ANNULAR
      SENSOR NORMAL

L 2 : SUPER ANNULAR
      SENSOR NORMAL
```

11. Liquid Status Reports

- Press **FUNCTION** until "Liquid Status"
- Press **PRINT** for report for up to 64 sensors
- Press **TANK/SENSOR** for other sensors in system
- Press **PRINT** for report of sensor status

```
VAPOR STATUS
-----
MMM DD,YYYY HH:MM XM
```

```
V 1 : NORTHWEST WELL
      SENSOR NORMAL

V 2 : MAIN STREET WELL
      SENSOR NORMAL
```

12. Vapor Status Reports

- Press **FUNCTION** until "Vapor Status"
- Press **PRINT** for report for up to 40 sensors
- Press **TANK/SENSOR** for other sensors in system
- Press **PRINT** for report of sensor status.

```
GROUNDWATER STATUS
-----
MMM DD,YYYY HH:MM XM
```

```
G 1 : GROUND WATER #1
      SENSOR NORMAL

G 2 : GROUND WATER #2
      SENSOR NORMAL
```

13. Groundwater Sensor Status

- Press **FUNCTION** until "Groundwater Status"
- Press **PRINT** for report for up to 40 sensors
- Press **TANK/SENSOR** for other sensors in system
- Press **PRINT** for report of sensor status

```
LINE LEAK ALARM
SENSOR NUMBER 1
LINE LEAK TEST FAIL
P2:UNLEADED REGULAR
MMM DD, YYYY HH:MM XM
```

```
LINE LEAK ALARM
SENSOR NUMBER 1
LINE LEAK SHUTDOWN
P1:UNLEADED REGULAR
MMM DD, YYYY HH:MM XM
```

```
SUBMERSIBLE PUMP 1
DISABLED
MMM DD, YYYY HH:MM XM
```

14. Alarm History Report

- Press **MODE** until "Diagnostic"
- Press **FUNCTION** until "Alarm History Report"
- Press **STEP** until desired report
- Press **PRINT** for tank/sensor displayed
- Press **TANK/SENSOR** to access other tanks/sensors

SAMPLE REPORTS

TLS-350

(Cont)

15. Leak History Report

- Press **MODE** until "Diagnostic"
- Press **FUNCTION** until "In-Tank Leak Result"
- Press **STEP** until "Print Leak History"
- Press **PRINT**

TANK LEAK TEST HISTORY

T 1:Unleaded

LAST GROSS TEST PASSED:
NOV 4. 1996 12:01 AM
STARTING VOLUME= 17559
PERCENT VOLUME = 89.1
TEST TYPE = STANDARD

LAST ANNUAL TEST PASSED:

NO TEST PASSED

FULLEST ANNUAL TEST PASS

NO TEST PASSED

LAST PERIODIC TEST PASS:
SEP 29. 1998 2:54 AM
TEST LENGTH 17 HOURS
STARTING VOLUME= 11434
PERCENT VOLUME = 58.0
TEST TYPE = CSLD

FULLEST PERIODIC TEST
PASSED EACH MONTH:

JAN 31. 1998 3:19 AM
TEST LENGTH 18 HOURS
STARTING VOLUME= 12276
PERCENT VOLUME = 52.3
TEST TYPE = CSLD

FEB 28. 1998 4:29 AM
TEST LENGTH 19 HOURS
STARTING VOLUME= 14183
PERCENT VOLUME = 72.0
TEST TYPE = CSLD

MAR 31. 1998 3:37 AM
TEST LENGTH 19 HOURS
STARTING VOLUME= 14377
PERCENT VOLUME = 73.0
TEST TYPE = CSLD

APR 30. 1998 4:05 AM
TEST LENGTH 19 HOURS
STARTING VOLUME= 13792
PERCENT VOLUME = 70.0
TEST TYPE = CSLD

MAY 31. 1998 4:00 AM
TEST LENGTH 20 HOURS
STARTING VOLUME= 11188
PERCENT VOLUME = 56.8
TEST TYPE = CSLD

JUN 29. 1998 4:10 AM
TEST LENGTH 21 HOURS
STARTING VOLUME= 10282
PERCENT VOLUME = 52.2
TEST TYPE = CSLD

JUL 31. 1998 4:50 AM
TEST LENGTH 19 HOURS
STARTING VOLUME= 16397
PERCENT VOLUME = 83.2
TEST TYPE = CSLD

AUG 30. 1998 4:42 AM
TEST LENGTH 21 HOURS
STARTING VOLUME= 11794
PERCENT VOLUME = 59.9
TEST TYPE = CSLD

SEP 29. 1998 2:54 AM
TEST LENGTH 17 HOURS
STARTING VOLUME= 11434
PERCENT VOLUME = 58.0
TEST TYPE = CSLD

OCT 31. 1997 4:39 AM
TEST LENGTH 18 HOURS
STARTING VOLUME= 11434
PERCENT VOLUME = 58.0
TEST TYPE = CSLD

NOV 4. 1996 12:01 AM
TEST LENGTH 2 HOURS
STARTING VOLUME= 17559
PERCENT VOLUME = 89.1
TEST TYPE = STANDARD

DEC 1. 1996 11:56 AM
TEST LENGTH 128 HOURS
STARTING VOLUME= 17543
PERCENT VOLUME = 89.0
TEST TYPE = CSLD

EMC ENVIRONMENTAL MANAGEMENT CONSOLE

Automatic Tank Gauging & Electronic Line Leak Detection System

GILBARCO

7300 West Friendly
Greensboro, NC 27420
Tel: (910) 547-5000



Evaluator: MRI - 05/14/93

System Description: *The EMC is manufactured by the same company that manufactures the TLS-350. It operates and looks similar to the TLS-350. Refer to the TLS-350 information sheets for system description and instructions for obtaining reports.*

Certification: **TANK GAUGING**

0.1 gph with PD = 99% and PFA = 1%

With CSLD

0.2 gph with PD = 100% and PFA = 0%

LINE TEST

3, 0.2 & 0.1 gph with PD = 100% and PFA = 0%

Tank Capacity: Max. 15,000 gal
Max. 38,170 gal for all manifolded tanks with CSLD

Test Period: **TANK GAUGING**

Min. 3 hrs with tank 95% full for 0.1 gph test

Min. 2 hrs with tank 50 - 95% full for 0.2 gph test

With CSLD

No down time

WILCO

Fuel Management and

Compliance Service

Receiver

SIMMONS

106 East Main Street
Richardson, TX 75081
Tel: (800) 848-8378



Keypad/Display Unit



Evaluator: S.S.G.

Associates - 10/28/95

ATG Probe/Transmitter

System Description: The **Wilco** system employs radio and modem communications technology to connect on-site monitoring equipment to the Simmons Central Monitoring Center. Technicians collect and process data, monitor and respond to alarms and generate compliance reports. The **Wilco** ATG probe uses micro-impulse radar technology to measure tank levels and then transmits data via radio signal to a remote receiver linked to the **Wilco** Control Panel. The **Wilco** control panel with user keypad and display unit then sends data between the business and Simmons central monitoring center via existing telephone lines. Inventory, sales and delivery data are then used to produce SIR results. Sales and deliveries must be entered manually thru the keypad. **Options** include **leak detection sensor** and **overflow** alarms.

Certification: SIR 5.7 L.M. version; 0.2 & 0.1 GPH
with PD = 99% & PFA = 1%

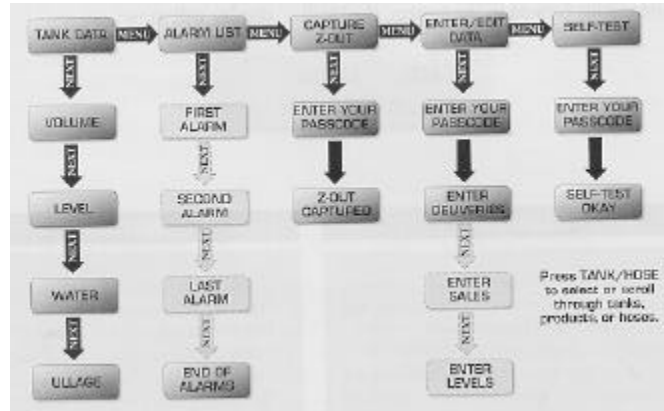
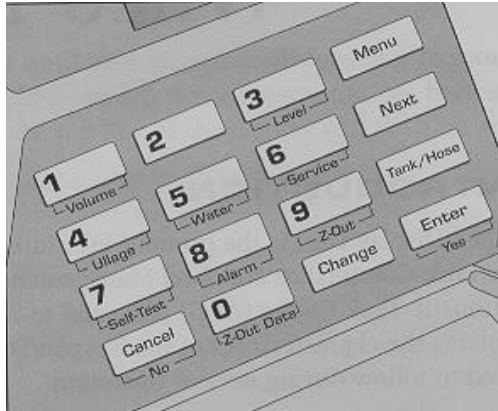
Tank Capacity: 45,000 gal.; 2, 3 or 4 tank manifolded systems

Test Period: Min. 26 days

Limitations: Data collection **only**

WILCO

Keypad Operation



Keypad/Display Unit

Flowchart of Wilco Menu

1. Tank Inventory

- a. Press **“Menu”** until Tank Data
- b. Press **“Next”** for Volume, Level, Water or Ullage
- c. Press **“Tank/Hose”** for different tanks in system

2. Alarm List

- a. Press **“Menu”** until Alarm List
- b. Press **“Next”** for each alarm
 - i. alarm description will flash on and off to indicate alarm has not been acknowledged
 - ii. if alarm status is still present, second line will indicate **“ACTIVE”**
 - iii. if alarm status is not present, second line will indicate **“CLEARED”**

3. Self-Test (system functioning properly)

- a. Press **“Menu”** until **Self-Test**
- b. Press **“Next”**; enter passcode (1234)
 - i. Display will show **SELFTEST OK** if functioning properly
 - ii. Display will show **SELFTEST FAIL** or **PRESS SERVICE** if not functioning properly

4. Overfill Alarm Check

- a. Initiate **Self-Test**, alarm should sound; **if not**, no overfill alarm
- b. Press **“Cancel”** to silence alarm

TS-1000 & 2000

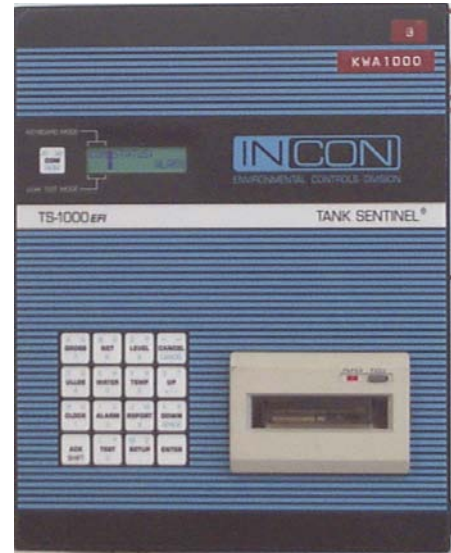
Automatic Tank Gauging & Electronic Line Leak Detection System

INCON

P.O.Box 638

Saco, ME 04072

Tel: (207) 283-0156



Evaluator: Ken Wilcox Associates - 08/05/92

System Description: The *TS-1000/2000* is a monitoring system that can test and gauge 2 or 4 tank systems. In addition, the *TS-1000/2000* can be *optionally* equipped with up to 8 leak detection sensors to support interstitial, sump, vapor and groundwater monitoring. Alarms can be setup to sound audibly or control relay contacts for high product levels, high water levels and tank leaks. An *optional* relay output *BriteBox* accessory unit may be configured to shut-off product dispenser pumps or to turn on/off other devices. The system can also be equipped with *optional* *TS-LLD* line leak detection software. Reports are obtained in the same manner as the *RLM 5000*.

Certification: **TANK GAUGING**

0.2 gph with PD = 99.9% and PFA = 0.1%

LINE TEST

3, 0.2 & 0.1 gph with PD = 100% and PFA = 0%

Tank Capacity: Max. 15,000 gal

Test Period: Min. 5 hrs with tank 50 - 95% full (*TS-1000*)
Min. 3 hrs with tank 50 - 95% full (*TS-2000*)

Limitations:

- No dispensing or delivery during test
- Not evaluated using manifolded tanks

SAMPLE REPORTS TS-1000

A N GROSS 7	B O NET 8	C P LEVEL 9	← → CANCEL CANCEL
D Q ULLGE 4	E R WATER 5	F S TEMP 6	G T UP +/-
H U CLOCK 1	I V ALARM 2	J W REPORT 3	K X DOWN SPACE
ACK SHIFT	L Y TEST 0	M Z SETUP .	ENTER

Reports Available

- | | |
|--------------|-----------------------|
| 1. Inventory | 2. Reconciliation |
| 3. Delivery | 4. Delivery History |
| 5. Leak Test | 6. Leak Time Estimate |
| 7. Alarm | 8. Alarm History |
| 9. Line Test | 10. Line Test History |
-
- | |
|------------------------------------|
| 11. Alarm Status and Configuration |
| 12. System Configuration |
| 13. Tank Configuration |

Console Keypad

1. To Print Desired Report

- a. Press **REPORT** key
- b. Press **UP** or **DOWN** until desired report
- c. Press **ENTER**
- d. If prompted, enter tank number or **0** for all tanks
- e. Press **ENTER** to print report

```

JOHNS GAS STOP
111 OAK ST.
BIDDEFORD, ME 04005
SITE # 001

7/25/1990      02:09 PM
INVENTORY REPORT

TANK NO. 1      8000 GAL
UNLEADED REG

GROSS          5051.7 GAL
NET             5024.7 GAL
PROD LEVEL     57.918 IN
ULLAGE         2963.4 GAL
TEMPERATURE    67.606 F
WATER LEVEL    0.584 IN
WATER VOL      6.4 GAL
    
```

Inventory Report

```

JOHNS GAS STOP
111 OAK ST.
BIDDEFORD, ME 04005
SITE # 001

7/25/1990      02:11 PM
LEAK TEST REPORT

TANK NO. 1      8000 GAL
UNLEADED REG

THRESHOLD      0.20 GAL/HR
CONFIDENCE LEVEL 95.0%
TEST STARTED   12:00 AM
TEST STARTED   07/25/1990
LAST DELIVERY   6:15 AM
LAST DELIVERY  07/24/1990
% GROSS CAPACITY 73.60
BEGIN GROSS     5903.4 GAL
BEGIN NET       5869.2 GAL
BEGIN LEVEL     66.311 IN
BEGIN TEMP      68.334 F
BEGIN WATER     6.5 GAL
BEGIN WATER     0.584 IN
END TIME        1:59 AM
END DATE        07/25/1990
END GROSS       5903.4 GAL
END NET         5869.3 GAL
END LEVEL       66.307 IN
END TEMP        68.219 F
END WATER       6.5 GAL
END WATER       0.584 IN

HOURLY DATA

TIME           DEG F   GAL
1:00 AM 68.276 5075.68
1:59 AM 68.219 5075.72

SLOPE          0.04 GAL/HR
SLOPE LOW      0.04 GAL/HR
SLOPE HIGH     0.04 GAL/HR
TEST RESULTS    PASSED
    
```

Leak Test Report

SAMPLE REPORTS

TS-1000

(cont)

JOHNS GAS STOP
111 OAK ST.
BIDDEFORD, ME 04005
SITE # 001

7/24/1990 04:39 AM
ALARM REPORT

7/24/1990 04:38 AM
THEFT
TANK NO. 1

Alarm Report

JOHNS GAS STOP
111 OAK ST.
BIDDEFORD, ME 04005
SITE # 001

7/25/1990 02:12 PM
ALARM HISTORY REPORT

7/11/1990 05:40 PM
POWER UP

7/11/1990 05:40 PM
OVERFILL
TANK NO. 1

7/23/1990 03:30 PM
POWER UP

7/23/1990 06:17 PM
LOW LIMIT
TANK NO. 1

7/25/1990 05:51 AM
THEFT
TANK NO. 1

Alarm History Report

JOHNS GAS STOP
111 OAK ST.
BIDDEFORD, ME 04005
SITE # 001

7/25/1990 02:10 PM
DELIVERY REPORT

TANK NO. 1 0000 GAL
UNLEADED REG

BEGIN TIME 6:15 AM
BEGIN DATE 07/24/1990
BEGIN GROSS 799.3 GAL
BEGIN NET 796.7 GAL
BEGIN LEVEL 15.065 IN
BEGIN WATER 0.571 IN
BEGIN WATER 6.2 GAL
BEGIN TEMP 64.601 F
END TIME 6:37 AM
END DATE 07/24/1990
END GROSS 6722.0 GAL
END NET 6676.5 GAL
END LEVEL 75.066 IN
END WATER 0.581 IN
END WATER 6.4 GAL
END TEMP 69.788 F
GROSS DEL 5923.5 GAL
NET DEL 5879.8 GAL

Delivery Report

JOHNS GAS STOP
111 OAK ST.
BIDDEFORD, ME 04005
SITE # 001

7/25/1990 02:14 PM
DELIVERY HISTORY REPORT

TANK NO. 1 0000 GAL
UNLEADED REG

BEGIN TIME 6:15 AM
BEGIN DATE 07/24/1990
BEGIN GROSS 799.3 GAL
BEGIN NET 796.7 GAL
BEGIN LEVEL 15.065 IN
BEGIN WATER 0.571 IN
BEGIN WATER 6.2 GAL
BEGIN TEMP 64.601 F
END TIME 6:37 AM
END DATE 07/24/1990
END GROSS 6722.0 GAL
END NET 6676.5 GAL
END LEVEL 75.066 IN
END WATER 0.581 IN
END WATER 6.4 GAL
END TEMP 69.788 F
GROSS DEL 5923.5 GAL
NET DEL 5879.8 GAL

BEGIN TIME 6:15 AM
BEGIN DATE 08/24/1990
BEGIN GROSS 1657.0 GAL
BEGIN NET 1650.0 GAL
BEGIN LEVEL 24.952 IN
BEGIN WATER 0.054 IN
BEGIN WATER 0.0 GAL
BEGIN TEMP 66.753 F
END TIME 6:21 AM
END DATE 08/24/1990
END GROSS 3190.3 GAL
END NET 3171.5 GAL
END LEVEL 48.026 IN
END WATER 0.058 IN
END WATER 0.0 GAL
END TEMP 68.417 F
GROSS DEL 1532.4 GAL
NET DEL 1521.5 GAL

Delivery History Report

TS-1001

Automatic Tank Gauging & Electronic Line Leak Detection System

INCON

P.O.Box 638

Saco, ME 04072

Tel: (207) 283-0156



Evaluator: Ken Wilcox Associates - 09/05/97

System Description: The *TS-1001* can monitor product in up to **4** tanks and also monitor up to **12** leak detection sensors internally. In addition, the *TS-1001* can be **optionally** equipped with 1 or 2 external sensor expansion modules for an additional 8 or 16 sensor inputs capable of monitoring double walled tanks, containment sumps, dispenser pans, and vapor or groundwater monitoring wells. Alarms can be setup to sound audibly or control relay contacts for high product levels, high water levels and tank leaks. The console may also be configured to shut-off product dispenser pumps or to turn on/off other devices. **Optional** equipment includes overfill alarms, interface with line leak detection (*TS-LLD*) and *SCALD* (Statistical and Continuous Automatic Leak Detection; **not 3rd party certified**) software. (See *TS-2001* for sample reports)

Certification: TANK GAUGING

0.2 & 0.1 gph with PD = 99.9% and PFA = 0.1%
0.2 gph with (LL2 probe)

Tank Capacity: Max. 15,000 gal (30,000 gal with LL2 probe)

Test Period: Min. 5 hrs (average time to collect quality data)
Can be tested at less than 50% capacity

Limitations:

- No dispensing or delivery during test
- Not evaluated using manifolded tanks

TS-2001

Automatic Tank Gauging & Electronic Line Leak Detection System

INCON

P.O.Box 638

Saco, ME 04072

Tel: (207) 283-0156



Evaluator: Ken Wilcox Associates - 09/05/97

System Description: The *TS-2001* can monitor product in up to 8 tanks and also monitor up to 24 leak detection sensors internally. In addition, the *TS-2001* can be **optionally** equipped with 1 or 2 external sensor expansion modules for an additional 8 or 16 sensor inputs capable of monitoring double walled tanks, containment sumps, dispenser pans, and vapor or groundwater monitoring wells. Alarms can be setup to sound audibly or control relay contacts for high product levels, high water levels and tank leaks. The console may also be configured to shut-off product dispenser pumps or to turn on/off other devices. **Optional** equipment includes overfill alarms, interface with line leak detection (*TS-LLD*) and *SCALD* (Statistical and Continuous Automatic Leak Detection; **not 3rd party certified**) software.

Certification: TANK GAUGING

0.2 & 0.1 gph with PD = 99.9% and PFA = 0.1%
0.2 gph with (LL2 probe)

Tank Capacity: Max. 15,000 gal (30,000 gal with LL2 probe)

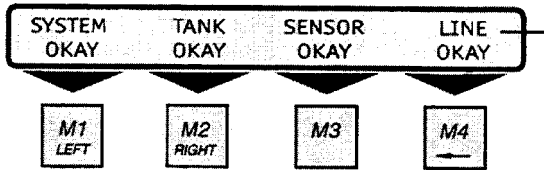
Test Period: Min. 5 hrs (average time to collect quality data)
Can be tested at less than 50% capacity

Limitations:

- No dispensing or delivery during test
- Not evaluated using manifolded tanks

SAMPLE REPORTS

TS-1001/2001



A N PRODUCT 1	B O GROSS 2	C P LEVEL 3	CANCEL
D Q TANK 4	E R ULLAGE 5	F S WATER 6	G T UP +/-
H U MENU 7	I V ALARM 8	J W REPORT 9	K X DOWN SPACE
ACK SHIFT	L Y TEST 0	M Z CHECK .	ENTER

Console Keypad

1. To Print Desired Report

- Press **REPORT** key
- Press **DOWN/SPACE** for more options
- Press menu keys (**M1 - M4**) to make selection
- Press enter to print

INCOM INTELLIGENT CONTROLS INC P. O. BOX 638 SACO ME 04072 1-800-984-6266	
08/13/1998	9:46 AM
TANK INVENTORY DETAIL	
TANK 1	
TANK NO. 1	11882.3 GAL
PRODUCT	UNLD REG
GROSS	7143.7 GAL
NET	7085.2 GAL
PROD LEVEL	54.003 IN
GROSS CAPACITY	60.2%
ULLAGE	4131.7 GAL
TEMPERATURE	71.621 F
WATER LEVEL	0.686 IN
WATER VOLUME	12.8 GAL
TANK 2	
TANK NO. 2	5092.7 GAL
PRODUCT	UNLD PLUS
GROSS	2037.9 GAL
NET	2020.5 GAL
PROD LEVEL	40.441 IN
GROSS CAPACITY	40.0%
ULLAGE	2800.1 GAL
TEMPERATURE	72.235 F
WATER LEVEL	0.000 IN
WATER VOLUME	0.0 GAL

2. To Print Inventory Report

- Press **REPORT** key
- Press **M 1**
- Press **M 4**
- Press enter to print

3. To Print Inventory Summary Report

- Press **REPORT** key
- Press **M 1**
- Press **M 2**
- Press enter to print

INCOM INTELLIGENT CONTROLS INC P. O. BOX 638 SACO ME 04072 1-800-984-6266	
08/11/1998	7:26 PM
TANK INVENTORY SUMMARY	
(GROSS VOLUME)	
TANK 1	11498.6 GAL
TANK 2	4097.6 GAL
TANK 3	4016.5 GAL

SAMPLE REPORTS

TS-1001/2001

(cont)

4. To Print Leak Test Report

- a. Press **REPORT** key
- b. Press **M 4**
- c. Press **M 2**
- d. Press **M 2** (**M 3** for history report)
- e. Press **M 1**

```

INCOM
INTELLIGENT CONTROLS INC
P. O. BOX 638
SACO ME 04072
1-800-984-6266

10/18/1997      02:42

LEAK TEST REPORT

PLUS 2          5014.3 GAL
PLUS

LEAK TEST      0.100 G/H
LEAK THRESHOLD 0.050 G/H
CONFIDENCE LEVEL 99.0%
TEST STARTED   21:45
TEST STARTED   10/17/1997
GROSS CAPACITY 56.12%
BEGIN GROSS    2814.2 GAL
BEGIN NET      2808.8 GAL
BEGIN LEVEL    52.630 IN
BEGIN TEMP     62.720 F
BEGIN WATER    0.4 GAL
BEGIN WATER    0.130 IN
END TIME       2:39
END DATE       10/18/1997
END GROSS      2814.3 GAL
END NET        2808.6 GAL
END LEVEL      52.632 IN
END TEMP       62.878 F
END WATER      0.4 GAL
END WATER      0.131 IN

HOURLY DATA

TIME    DEG F    GAL
22:44   62.721   2809.23
23:44   62.751   2808.78
0:44    62.885   2809.07
1:44    62.883   2809.09

SLOPE      -0.04 GAL/HR
SLOPE LOW  -0.04 GAL/HR
SLOPE HIGH -0.04 GAL/HR
TEST RESULTS PASSED
SLOPE EQUALS CALCULATED
LEAK RATE

```

5. To Print SCALD Test Report

- a. Press **REPORT** key
- b. Press **M 4**
- c. Press **M 3**
- d. Press desired **M**

```

INCOM
INTELLIGENT CONTROLS INC
P. O. BOX 638
SACO ME 04072
1-800-984-6266

08/13/1998      9:56 AM

SCALD TEST REPORT

TANK 1          11882.3 GAL
UNLD REG

LEAK TEST      0.200 GPH
LEAK THRESHOLD 0.100 GPH
EXTENT         18.0 HRS
VOL QUALIFY    0.0%
TEST STARTED   12:22 PM
TEST STARTED   08/07/1998
SALES RATE     54.731 GPH
EVAPORATED     1.781 GAL
LOST           0.327 GAL
DUTY FACTOR    0.31
UPDATED        12:40 AM
UPDATED        08/10/1998

SLOPE          -0.002 GAL/HR
TEST RESULT    PASSED
SLOPE EQUALS CALCULATED
LEAK RATE

TANK 2          5092.7 GAL
UNLD PLUS

LEAK TEST      0.200 GPH
LEAK THRESHOLD 0.100 GPH
EXTENT         18.0 HRS
VOL QUALIFY    0.0%
TEST STARTED   9:41 PM
TEST STARTED   08/09/1998
SALES RATE     8.096 GPH
EVAPORATED     0.050 GAL
LOST           -0.090 GAL
DUTY FACTOR    0.79
UPDATED        1:42 AM
UPDATED        08/11/1998

SLOPE          -0.053 GAL/HR
TEST RESULT    PASSED
SLOPE EQUALS CALCULATED
LEAK RATE

```

SAMPLE REPORTS

TS-1001/2001

(cont)

6. To Print Line Compliance Report

- a. Press **REPORT** key
- b. Press **M 3**
- c. Press **M 1** (**M 3** for history report)
- d. Press **M 1**

```

INCON
INTELLIGENT CONTROLS INC
P. O. BOX 638
SACO ME 04072
1-800-984-6266

08/12/1998      10:26 AM

LINE COMPLIANCE REPORT

LINE NO. 1      REGULAR

PASSED MONTHLY TESTS

TEST TIME      1:42 AM
TEST DATE      08/12/1998
LINE TEST      0.20 GPH
LEAK RATE      0.00 GPH

TEST TIME      11:12 PM
TEST DATE      07/14/1998
LINE TEST      0.20 GPH
LEAK RATE      0.00 GPH

LINE NO. 2      MID GRAD

PASSED MONTHLY TESTS

TEST TIME      8:15 PM
TEST DATE      08/11/1998
LINE TEST      0.20 GPH
LEAK RATE      0.00 GPH

TEST TIME      4:41 PM
TEST DATE      07/14/1998
LINE TEST      0.20 GPH
LEAK RATE      0.00 GPH

LINE NO. 3      SUPER

PASSED MONTHLY TESTS

TEST TIME      9:33 AM
TEST DATE      08/12/1998
LINE TEST      0.20 GPH
LEAK RATE      0.00 GPH

TEST TIME      12:13 AM
TEST DATE      08/05/1998
LINE TEST      0.20 GPH
LEAK RATE      0.00 GPH
    
```

7. To Print Alarm/Sensor Reports

- a. Press **REPORT** key
- b. Press **DOWN/SPACE** key
- c. Press **M 2** (**M1** for sensors)
- d. Press desired **M** key report

```

INCON
INTELLIGENT CONTROLS INC
P. O. BOX 638
SACO ME 04072
1-800-984-6266

08/12/1998      9:51 AM

ALARM HISTORY

08/11/1998      5:49 PM
LOW LOW PRODUCT LIMIT
TANK NO. 1

08/11/1998      2:34 PM
LOW PRODUCT LIMIT
TANK NO. 1

08/09/1998      8:46 AM
POWER UP

08/09/1998      8:46 AM
POWER DOWN

08/05/1998      10:08 AM
POWER UP

08/05/1998      10:08 AM
POWER DOWN

08/06/1998      1:48 PM
0.1GPH LINE TEST ABORTED
REGULAR
LINE NO. 1

08/06/1998      1:47 PM
0.1GPH LINE TEST ABORTED
REGULAR
LINE NO. 1

08/06/1998      1:19 PM
POWER UP

08/06/1998      1:18 PM
CONTROL UNIT COMM FAIL
SUPER
LINE NO. 3

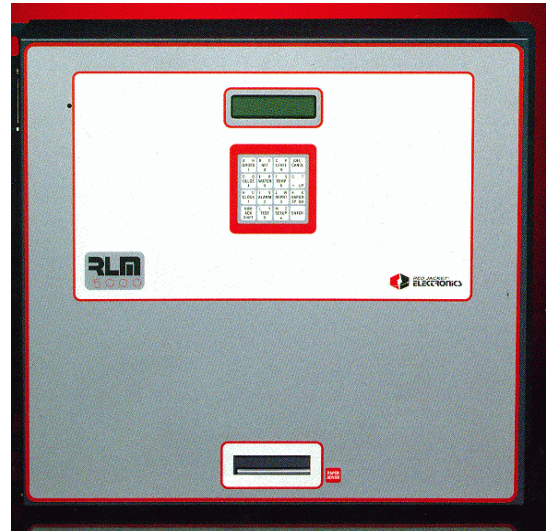
08/06/1998      1:18 PM
CONTROL UNIT COMM FAIL
MID GRAD
LINE NO. 2
    
```


RLM 5000

Automatic Tank Gauging System

Red Jacket

Marley Pump Co.
9650 Alden Rd.
Lenexa, KS 66215
Tel: 913 541-2985



Evaluator: KWA - 04/02/91

System Description: *The RLM 5000 operates as the central processing unit and data collection center for leak detection and inventory management. It collects level and temperature data from up to eight magnetostrictive level probes and computes various volumetric quantities, correcting all volumes for temperature. The operator may choose from among various reports as well as generate a complete set of inventory, operation and leak detection reports. These reports may be printed on demand or prescheduled. All alarms generate reports immediately and may be programmed to activate one of the two relay outputs. The RLM 5001 adds the feature of vapor and liquid detection sensors.*

Certification: 0.2 gph with PD = 100% and PFA = 0%

Tank Capacity: Max. 15,000 gal

Test Period: Min. 3 hrs with tank 50 - 95% full

Limitations:

- No dispensing or delivery during test
- Not evaluated using manifolded tanks
- Not capable of monitoring product lines
- Not capable of continuous monitoring

SAMPLE REPORTS

RLM 5000

1. Inventory Report (non-temp comp)

- a. Press **RPRT** key
- b. Press **UP** or **DN** key till "Inventory"
- c. Press **ENTER** key
- d. Press **1 - 8** for desired tank or **0** for all tanks
- e. Press **ENTER** key

```

RED JACKET TECH LINE
1-800-468-7867
MISSION, KS
SITE #

1/1/1964      12:14 AM
INVENTORY REPORT

TANK NO. 1      GAL
  
```

```

GROSS      2285.3 GAL
NET        2259.9 GAL
PROD LEVEL 36.821 IN
ULLAGE     3682.6 GAL
TEMPERATURE 75.737 F
WATER LEVEL 1.963 IN
WATER VOL  45.0 GAL
  
```

2. Reconciliation Report (temp comp)

- a. Press **RPRT** key
- b. Press **UP** or **DN** key till "Reconcil"
- c. Press **ENTER** key
- d. Press **1 - 8** for desired tank or **0** for all tanks
- e. Press **ENTER** key

```

RED JACKET TECH LINE
1-800-468-7867
MISSION, KS
SITE #
  
```

```

1/7/1964      10:50 PM
LEAK TEST REPORT
  
```

```

TANK NO. 1      GAL
  
```

```

THRESHOLD  0.20 GAL/HR
CONFIDENCE LEVEL 95.0%
TEST STARTED 3:42 AM
TEST STARTED 01/03/1964
% GROSS CAPACITY 39.90
BEGIN GROSS 2399.4 GAL
BEGIN NET 2371.2 GAL
BEGIN LEVEL 37.802 IN
BEGIN TEMP 76.640 F
BEGIN WATER 16.1 GAL
BEGIN WATER 0.738 IN
END TIME 5:22 AM
END DATE 01/03/1964
END GROSS 2399.4 GAL
END NET 2372.0 GAL
END LEVEL 37.802 IN
END TEMP 76.209 F
END WATER 16.1 GAL
END WATER 0.738 IN
  
```

3. Delivery Report

- a. Press **RPRT** key
- b. Press **UP** or **DN** key till "Delivery"
- c. Press **ENTER** key
- d. Press **1 - 8** for desired tank or **0** for all tanks
- e. Press **ENTER** key

4. Delivery History Report (if programmed)

- a. Press **RPRT** key
- b. Press **UP** or **DN** key till "Del Hist"
- c. Press **ENTER** key
- d. Press **1 - 8** for desired tank or **0** for all tanks
- e. Press **ENTER** key

5. Leak Test Report

- a. Press **RPRT** key
- b. Press **UP** or **DN** key till "Leak"
- c. Press **ENTER** key
- d. Press **1 - 8** for desired tank or **0** for all tanks
- e. Press **ENTER** key

HOURLY DATA

```

TIME      DEG F  GAL
4:42 AM  76.350  2387.88
  
```

```

SLOPE      0.54 GAL/HR
SLOPE LOW  0.54 GAL/HR
SLOPE HIGH 0.55 GAL/HR
TEST RESULTS      PASSED
  
```


SAMPLE REPORTS

RLM 5000

(Cont)

6. Leak Estimate Report (length of test)

- Press **RPRT** key
- Press **UP** or **DN** key till "Leak Est"
- Press **ENTER** key
- Press **1 - 8** for desired tank or **0** for all tanks
- Press **ENTER** key

RED JACKET TECH LINE
1-800-468-7867
MISSION, KS
SITE #

1/1/1964 12:02 AM
LEAK ESTIMATE REPORT

TANK NO. 1 GAL

THRESHOLD 0.10 GAL/HR
CONFIDENCE LEVEL 97.5%
PERCENT CAPACITY 38.75
GROSS 2285.3 GAL
NET 2259.7 GAL
LEVEL 36.821 IN
TEMP 75.867 F
WATER VOL 45.0 GAL
WATER LEVEL 1.964 IN
EST TIME 3 HRS 20 MIN

7. Alarm History Report

- Press **RPRT** key
- Press **UP** or **DN** key till "Alarm Hist"
- Press **ENTER** key
- Press **1 - 8** for desired tank or **0** for all tanks
- Press **ENTER** key; last 50 alarms

8. Alarm Status Report (current alarms)

- Press **RPRT** key
- Press **UP** or **DN** key till "Alarm Stat"
- Press **ENTER** key
- Press **1 - 8** for desired tank or **0** for all tanks
- Press **ENTER** key

RED JACKET TECH LINE
1-800-468-7867
MISSION, KS
SITE #

1/1/1964 12:05 AM
ALARM STATUS REPORT

TANK NO. 1 GAL

9. System Setup Report

- Press **RPRT** key
- Press **UP** or **DN** key till "Setup"
- Press **ENTER** key
- Press **1 - 8** for desired tank or **0** for all tanks
- Press **ENTER** key

HIGH LIMIT
ACTIVE
HIGH LIMIT 0.000 IN

LOW LIMIT
CLEARED
LOW LIMIT 0.0 GAL

10. Tank Setup Report

- Press **RPRT** key
- Press **UP** or **DN** key till "Tank set up"
- Press **ENTER** key
- Press **1 - 8** for desired tank or **0** for all tanks
- Press **ENTER** key

WATER LIMIT
ACTIVE
WATER LIMIT 0.000 IN

LEAK
LEAK LIMIT 2.0 G/H

THEFT
THEFT LIMIT 10.0 GAL

RLM 9000

Automatic Tank Gauging & Electronic Line Leak Detection System

Red Jacket

Marley Pump Co.
9650 Alden Rd.
Lenexa, KS 66215
Tel: 913 541-2985



Evaluator: KWA - 04/02/91

System Description: *The **RLM 9000** is a single console unit that incorporates the operational properties of the **PPM 4000** and the **RLM 5000**. Refer to the individual information sheets for additional system description and sample reports.*

Certification: **TANK GAUGING**

0.2 gph with PD = 100% and PFA = 0%

LINE TEST

3, 0.2, 0.1 gph with PD = 100% and PFA = 0%

Test Period: **TANK GAUGING**

Min. 3 hrs with tank 50 - 95% full

LINE TEST

3 gph - 1 min

0.2 gph - 10 min

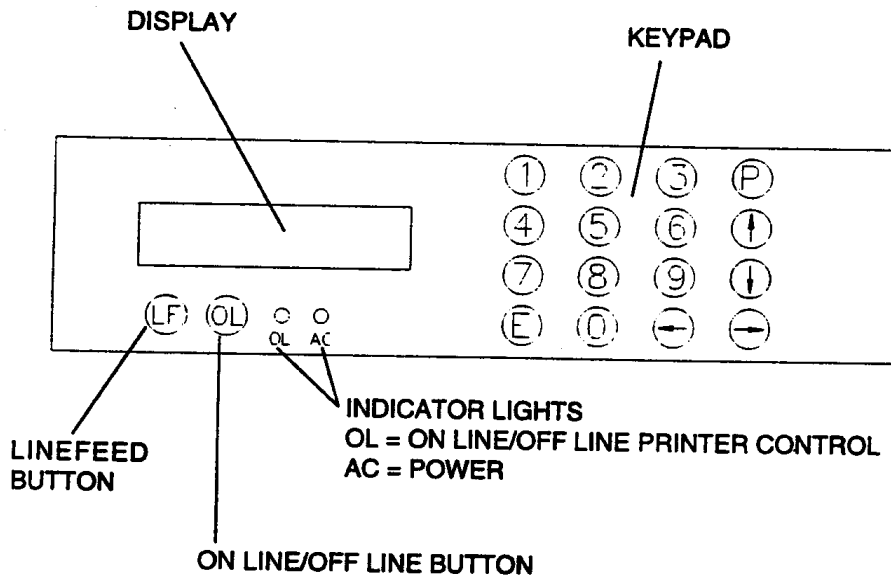
0.1 gph - 2.5 hrs

Limitations: *Refer to individual sheets for **PPM 4000** & **RLM 5000***

Limitations:

- No dispensing or delivery during test (w/o ADD)
- Not evaluated using manifolded tanks

SAMPLE REPORTS ST 1800



DISPLAY OPTIONS*

1. *Product Height*
2. *Gross Volume*
3. *Ullage*
4. *Water Height*
5. *Product Temperature*
6. *Report History*
7. *Product Dispensed*
8. *System Status*
9. *Leak Detection*

*Press "E" to get to
"SELECT DISPLAY"

CONSOLE DISPLAY

1. View Display Options (at SELECT DISPLAY)

- a. Press desired **display option** keypad #
- b. Press ↑ or ↓ key to view remaining tanks

2. View History Reports (including leak test)

- a. Press **6**
- b. Press → to scroll to desired report
- c. Press ↑ or ↓ key to scroll to "reserved report number"
- d. Press → or ← to view info

3. Print Inventory Report

(green 'OL' indicator light must be on)

- a. Press **P** key for all tanks
 - i. *For only one feature*, press desired option keypad #
 - ii. Press **P**

4. Print History Reports

(green 'OL' indicator light must be on)

- a. Press **6**
- b. Press → to scroll to desired report
- c. Press **P**
- d. Press ↑ or ↓ key to enter "beginning" date
- e. Press **E**
- f. Press ↑ or ↓ key to enter "ending" date
- e. Press **E** to begin printing

LINE LEAK TEST	08AUG94 12:08:32
LINE 01	
LINE LEAK START TIME	02AUG94 10:56:01
LINE LEAK END TIME	02AUG94 12:08:22
ENDING PRESSURE	9.3 PSI
T: 3599/0008	A01
AIR COUNTER	0
COMPLETE PRECISION TEST	
END OF REPORT	

RED JACKET LEAK DETECTION SYSTEMS
VERSION RJ1-12 020CT95

SHORT STOP
7647 LEAVENWORTH
KANSAS CITY, KS.
913-788-3091

LEAK TEST	
29MAY97	01:27:32
TANK 2 UNLEADED PREM -0.038 GAL/H FAIL	
ALARM LEAK RATE 0.050 GAL/H	
PROBABILITY OF DETECTION 99.9%	
PRODUCT HEIGHT	39.54 INCHES
PRODUCT VOLUME	4009.7 GALLONS
LEAK DET START TIME	28MAY97 22:15:59
LEAK DET END TIME	29MAY97 01:27:32
LEAK DET PERIOD	03 HRS 11 MINS
LEAK DET START WATER	0.00 INCHES
LEAK DET END WATER	0.00 INCHES
LAST DELIVERY	26MAY97 16:34:46
LEAK TEST NO	1935
END OF REPORT	

AUTO/STIK II & JR

Automatic Tank Gauging
& Electronic Line Leak
Detection System

EBW

2814 McCracken Ave.
Muskegon, MI 49441
Tel: 616 755-1671

Evaluator: Ken Wilcox Ass. - 08/20/93



System Description: The AUTO/STIK II and JR.

*series are electronic monitoring devices capable of tracking inventory, detecting leaks and providing alarm warnings. The systems can also be equipped with a continuous 24 hour leak detection **option**; however this option does not accumulate data during intermittent still times as most systems do, but continually starts a leak test at still times and ends the leak test only after a 30 minute still time. A leak rate for one test period is calculated by combining still period leak tests thru four consecutive days. The AUTO/STIK II can be equipped with the electronic line leak detection **option** which can monitor 1 to 8 pressurized lines. The ATUO/STIK II is capable of monitoring 1 to 16 tanks for leak detection, 1 to 64 liquid sensors and 1 to 56 relay outputs. The JR series are capable of handling the number of tanks indicated on the **model #** and are limited to the amount of sensors and relay outputs they provide.*

Certification: 0.1 gph with PD = 98.3% and PFA = 1.7%

Tank Capacity: Max. 15,000 gal

Test Period: Min. 4 hrs with tank 50 - 95% full

Limitations:

- No dispensing or delivery during test (even w/CLD)
- Not evaluated using manifolded tanks
- Not capable of monitoring product lines (JR series)

SAMPLE REPORTS AUTOJSTIK

1. Printing Reports

- Depress **PRINT REPORTS**
- Depress desired report or **MORE**
- Continue to press **MORE** until desired report
- Depress desired report
- Depress **ALL** or enter desired tank # (**01**, **02**, etc.)
- Depress **PRINT**

2. Print Inventory Information (Status Report)

- Depress **PRINT REPORTS**
- Depress **STATUS REPORT**
- Depress **ALL** or enter desired tank # (**01**, **02**, etc.)
- Depress **PRINT**

3. Print Leak Report

- Depress **PRINT REPORTS**
- Depress **MORE**
- Depress **LEAK REPORT**
- Depress **ALL** or enter desired tank # (**01**, **02**, etc.)
- Depress **PRINT**

----- LINE LEAK REPORT -----

WED MAY 22,96 5:48:19 PM

STATION NAME:
GENES SERVICE
SHERMAN
MUSKEGON MI

LINE 1

CURRENT STATUS: NO ERRORS

0.2 GPH MONTHLY PASS: YES

0.2 GPH TEST HISTORY:

APR:

MAR:

FEB:

JAN:

DEC:

NOV:

LAST 0.2 GPH TEST: PASS

TUE MAY 21,96 7:01:52 PM

LAST 0.1 GPH TEST: PASS

TUE MAY 21,96 10:04:07 PM

----- STATUS REPORT -----

WED MAY 22,96 9:49:46 AM

STATION NAME:

TANK 1 PRODUCT: LEAD FREE

CURRENT STATUS:

[CNT] | | | | |

GROSS: 615.161 gal

NET: 608.541 gal

FUEL LEVEL: 28.9232 in

WATER LEVEL: 0.6443 in

TEMP: 76.510 °F

GROSS VTF: 355.857 gal

GROSS ULLAGE: 95%=307.307 gal

----- AUTO LEAK TEST -----

WED MAY 22,96 5:47:21 PM

STATION NAME:

GENES SERVICE

SHERMAN

MUSKEGON MI

TANK 1 PRODUCT: DIESEL

LEAK RATE: 0.009 gal/hr

PASS 0.2 GPH TEST

PERCENT OF TANK TESTED: 41.1 %

START: SUN MAY 19,96 12:00:02 AM

BEG FUEL LEVEL: 51.5870 in

BEG WATER LEVEL: 0.0357 in

850.905 gal, 53.04 °F

850.917 gal, 53.02 °F

850.928 gal, 53.00 °F

850.936 gal, 52.98 °F

END: SUN MAY 19,96 4:09:01 AM

END FUEL LEVEL: 51.5870 in

END WATER LEVEL: 0.0352 in

4. Print Line Leak Report

- Depress **PRINT REPORTS**
- Depress **MORE - MORE - MORE -MORE**
- Depress **LINE LEAK REPORT**
- Depress **ALL** or enter desired tank # (**01**, **02**, etc.)
- Depress **PRINT**

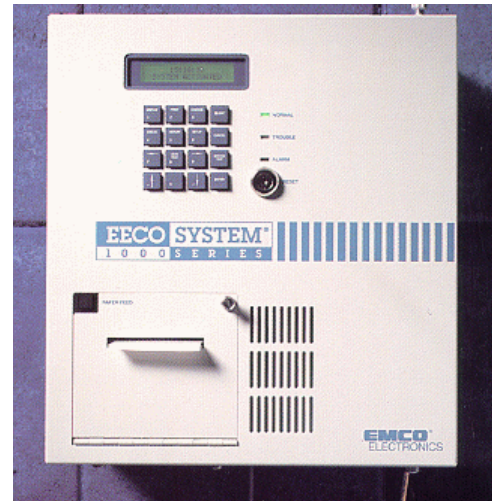
EECO SYSTEM

1000 SERIES

Automatic Tank Gauging

EMCO Electronics

114-300 Mackenan Dr
Cary, NC 27511
Ph# 919 460-6000



Evaluator: Midwest Research Institute - 04/29/94

System Description: *The EECO 1000 functions in the same manner as the EECO 2000 but does not monitor product lines or external sensors. It is strictly a tank management system designed to monitor up to eight tanks. Tank leak tests will start automatically after deliveries or can be programmed to start at a selected time daily, weekly or monthly. A segmented leak detection (SLD) **option** is available to provide continuous tank leak detection; however, it is **not** 3rd party certified.*

Refer to the EECO 2000 information sheets for additional system description and instructions to obtain reports.

Certification: 3.0, 0.2 & 0.1 gph

Tank Capacity: Max. 15,000 gal

Test Period: Min. 1 hrs with tank 50 - 95% full

Limitations:

- Not evaluated using manifolded tanks
- No dispensing or delivery during test
- Does not monitor product lines
- Does not monitor external sensors

EECO SYSTEM

1500 SERIES

Automatic Tank Gauging & Sensor Detection System

EMCO Electronics

114-300 Mackenan Dr
Cary, NC 27511
Ph# 919 460-6000



Evaluator: Midwest Research Institute - 04/29/94

System Description: *The EECO 1500 functions in the same manner as the EECO 2000 but does not monitor product lines electronically. The EECO 1500 system is able to monitor product lines by the use of interstitial sensors. Monitoring sensors can also be used for dispenser pans, sumps and liquid/vapor wells. The EECO 1500 management system is designed to monitor two and four tank systems. Tank leak tests will start automatically after deliveries or can be programmed to start at a selected time daily, weekly or monthly. A segmented leak detection (SLD) **option** is available to provide continuous tank leak detection; however, it is **not** 3rd party certified.*

Refer to the EECO 2000 information sheets for additional system description and instructions to obtain reports.

Certification: 3.0, 0.2 & 0.1 gph

Tank Capacity: Max. 15,000 gal

Test Period: Min. 1 hrs with tank 50 - 95% full

Limitations:

- Not evaluated using manifolded tanks
- No dispensing or delivery during test

EECO SYSTEM

2000 SERIES

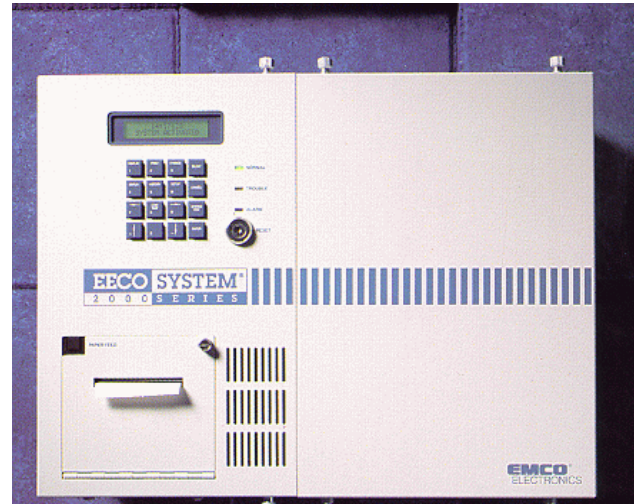
Automatic Tank Gauging & Electronic Line Leak Detection System

EMCO Electronics

114-300 Mackenan Dr

Cary, NC 27511

Ph# 919 460-6000



Evaluator: Midwest Research Institute - 04/29/94

System Description: *The EECO 2000 is designed to monitor up to eight tanks, 24 EECO Choice sensors and eight pressurized lines. Tank leak tests will start automatically after deliveries or can be programmed to start at a selected time daily, weekly or monthly. A segmented leak detection (SLD) **option** is available to provide continuous tank leak detection; however, it is **not** 3rd party certified. The sensors are designed to detect fuel and water in secondary containment vessels, sumps, dispenser pans, and monitoring wells. When alarm conditions occur, audible or display lights will be activated. The event is then written into the history log. The Line Leak Detector **option** provides product line leak detection at 3, 0.2 & 0.1 gph. Leaks exceeding the 'pump shutoff' threshold will disable submersible pumps. Product line leak tests can occur automatically or manually.*

Certification: **TANKS:** 0.2 & 0.1 gph **PIPING:** 3, 0.2 & 0.1 gph

Tank Capacity: Max. 15,000 gal

Test Period: Min. 1 hrs with tank 50 - 95% full

Limitations:

- Not evaluated using manifolded tanks
- No dispensing or delivery during test
- Must have LLD **option** for product line testing

SAMPLE REPORTS

ECCO 2000

1. View Display Functions

(to print reports; press **PRINT** prior to the following)

- Press **DISPLAY**
- Press **STATUS, HISTORY** or **LEAK TEST**
- Press **ENTER**
- Press **↓** to scroll thru menu selection
- Press **ENTER** when desired menu
- Continue to press **↓** for desired submenu
- Press **ENTER** when desired submenu
- Press **CANCEL** to exit menu level

2. Print Inventory Status

- Press [**PRINT**] [**STATUS**][**ENTER**]
[**ENTER**]

```
STATION NAME HERE
STREET ADDRESS
CITY, STATE, ZIP
PHONE NUMBER
V22.04

11-07-94    09:15:00

TLM INVENTORY STATUS REPORT:

TANK 1 REGULAR
PRODUCT LEVEL:      28.02  "
GROSS VOLUME:      2421.79  US GAL
NET VOLUME:        2411.64  US GAL
PRODUCT TEMP:       67.18  °F
ULLAGE (TO 95%):    6819.21  US GAL
WATER LEVEL:        0.06  "
WATER VOLUME:       0.18  US GAL

(repeats for each tank)
```

3. Print Event History

- Press [**PRINT**][**HISTORY**]
[**ENTER**] [**↓**] [**ENTER**]

```
STATION NAME HERE
STREET ADDRESS
CITY, STATE, ZIP
PHONE NUMBER
22.04

11-07-94    09:15:00

EVENT HISTORY
ALL EVENTS

LOCAL SETUP CHANGED
11-07-94    20:48:19

CH 1 REG NL SMP IMO
WATER
11-07-94    20:47:57

AC POWER ON
11-07-94    13:24:14
```

4. Print Tank Leak Test History

- Press [**PRINT**] [**LEAK TEST**][**↓**]
[**ENTER**][**↓**][**↓**][**↓**][**ENTER**]

```
STATION NAME HERE
STREET ADDRESS
CITY, STATE, ZIP
PHONE NUMBER
V22.04

11-07-94    09:15:00

CURRENT TLM LEAK TEST
STATUS:

TANK 1 REG. NL
NOT RUNNING

TANK 2 DIESEL
RUNNING

*****

LAST SUCCESSFUL TLM LEAK TEST:

TANK 1 REGULAR

0.2 GPH TEST
11-07-94    02:19:00
PRODUCT LEVEL:      34.63  "
% VOLUME:           42  %
PRODUCT TEMP:       76.97  °F
CALCULATED RATE OF CHANGE:
-0.001
(VOLUME IS INCREASING.)

*****

TLM LEAK TEST HISTORY:

TANK 1 REGULAR

PASSED 0.2 LEAK TESTS
11-07-94    15:20
11-01-94    14:33

*****
```

PETROSONIC III

Automatic Tank Gauging System

Petro Vend

6900 Santa Fe Drive
Hodgkins, IL 60525
Tel: (708) 485-4200



Evaluator: Underwriters Laboratories, Inc. - 11/04/94

System Description: *The **Petrosonic III** is a microprocessor-based system capable of monitoring up to eight probes. The controller interprets probe data, converts the product level measurements into volume measurements and produces reports. The controller records alarms, such as low product, high water, overfill and theft. The controller also functions as a leak indicator by continuously watching for extremely small changes in product level. This **is not** leak testing, but product variances. The **Petrosonic III** has alarm inputs you can connect to external devices such as hydrocarbon detectors or alarm bells. The system has three modes of operation; privileged, non-privileged and standby. If the system is in the privileged mode, you must have an access code. Default code is **HELLO**.*

Certification: 0.2 gph with PD = 99.07% and PFA = 0.93%

Tank Capacity: Max. 15,000 gal

Test Period: Min. 4 hrs with tank 50 - 95% full

Limitations:

- No dispensing or delivery during test
- Not evaluated using manifolded tanks
- Not capable of monitoring product lines
- Not capable of continuous monitoring

SAMPLE REPORTS PETROSONIC III

REPORT NAME	FUNCTION #
Status	1
Inventory	2
Deliverys	3
Variation	4
Alarms	7
Tank Info	8
Tank Leak Test	53

1	2	3	PR
4	5	6	TM
7	8	9	AC
CL	0	EN	CN

Access #'s for Reports

Console Keypad

ALL REPORTS ARE OBTAINED IN THE FOLLOWING MANNER:

1. *Printing Reports*

- Press **ACCESS**
- Press **ENTER**; console displays 'non-privileged'
followed by 'display command > 0'
- Enter **Access #** for desired report (above)
- Press **PRINT**
- Press **ENTER** for report on all tanks

2. *Print List of Keypad Commands (Help)*

- Press **ACCESS**
- Press **ENTER**
- Press **PRINT**
- Press **ENTER**

3. *Abort Command*

- Press **CANCEL**
- Press **ACCESS**

SAMPLE REPORTS PETROSONIC III

** PETROSONIC III **
TANK GAUGE SYSTEMS.
BY PETRO VEND INC.

STATUS
12:07 PM TUE NOV 13, 1990

	----- TANK -----							
	1	2	3	4	5	6	7	8
ALARM	1	2	3	4	5	6	7	8
OVERFLOW	2	2*	.	.	.	.	.	.
LOW PRODUCT	.	.	.	.	.	.	.	.
HIGH WATER	1*	1*	1*	.	.	.	.	.
TEMPERATURE	.	.	.	.	.	.	.	.
MISSED MEAS	1*	1*	.	.	.	.	.	.
LEAK INDICATED	1	.	.	.	.	.	.	.
THEFT	.	.	6	.	.	.	.	.
DELIVERY	1	2	1	.	.	.	.	.
SALE	2	.	1	.	.	.	.	.
ACCTING PERIOD	.	.	.	.	.	.	.	.
TIMED LEAK TEST	.	.	.	.	.	.	.	.
POWER FAILURE	5							
PRINTER FAILURE	1							
EXTERNAL	.							
SAVED INVENTORY	2							
SCHEDULE	3							

6 ACTIVE FLAGS, 34 STORED MESSAGES,
397 FREE BLOCKS, SYSTEM OPEN

Status Report

* Active Flag (alarm condition)

** PETROSONIC III **
TANK GAUGE SYSTEMS.
BY PETRO VEND INC.

INVENTORY
12:24 PM TUE NOV 13, 1990

===== TANK 4 DIESEL

8603.2 GL NET CORRECTED PRODUCT VOLUME.
8605.6 GL NET CORRECTED TANK VOLUME.
8586.9 GL GROSS MEASURED TANK VOLUME.
1413.1 GL VOLUME LEFT IN TANK.
76.90 IN PRODUCT LEVEL.
56.3 F AVERAGE FUEL LEVEL.
0.4 IN WATER LEVEL

Inventory Report

** PETROSONIC III **
TANK GAUGE SYSTEMS.
BY PETRO VEND INC.

MESSAGES
12:24 PM WED NOV 14, 1990

DELIVERY

===== TANK 4 DIESEL

DELIVERY
DELIVERY
START MEASUREMENT
10:17 AM WED NOV 14, 1990

5079.3 GL NET CORRECTED PRODUCT VOLUME.
5093.5 GL NET CORRECTED TANK VOLUME.
5083.6 GL GROSS MEASURED TANK VOLUME.
4916.4 GL VOLUME LEFT IN TANK.
48.63 IN PRODUCT LEVEL.
56.3 F AVERAGE FUEL TEMPERATURE.
0.9 IN WATER LEVEL.

END MEASUREMENT
10:43 AM WED NOV 14, 1990

* OVERFLOW *
* HIGH WATER *

9965.5 GL NET CORRECTED PRODUCT VOLUME.
9989.6 GL NET CORRECTED TANK VOLUME.
9974.3 GL GROSS MEASURED TANK VOLUME.
25.7 GL VOLUME LEFT IN TANK.
94.73 IN PRODUCT LEVEL.
57.1 F AVERAGE FUEL TEMPERATURE.
1.2 IN WATER LEVEL.

DELIVERY VOLUME
4896.1 GL NET CORRECTED TANK VOLUME.
4890.7 GL GROSS MEASURED TANK VOLUME.
57.9 F ESTIMATED DELIVERY TEMPERATURE.

Delivery Report

SAMPLE REPORTS PETROSONIC III

*** PETROSONIC III ***
TANK GAUGE SYSTEMS.
BY PETRO VEND, INC.

MESSAGES
12:24 PM THU NOV 15, 1990

TIMED LEAK TEST
===== TANK 4 DIESEL
TIMED LEAK TEST
START MEASUREMENT
12:00 AM THU NOV 15, 1990
5453.1 GL NET CORRECTED VOLUME.
5455.5 GL GROSS MEASURED VOLUME.
5446.6 GL VOLUME LEFT IN TANK.
51.37 IN PRODUCT LEVEL
56.9 F AVERAGE FUEL TEMPERATURE
0.4 IN WATER LEVEL
END MEASUREMENT
5453.2 GL NET CORRECTED VOLUME.
5455.6 GL GROSS MEASURED VOLUME.
4554.7 GL VOLUME LEFT IN TANK
51.36 IN PRODUCT LEVEL
56.0 F AVERAGE FUEL TEMPERATURE
0.4 IN WATER LEVEL
LEAK RATE
0.016 GL/HOUR NET CORRECTED LEAK RATE.
-0.9 F TEMPERATURE CHANGE
FOR 4.0 HOURS
THRESHOLD = 0.05 GL/HOUR
TEST PASSED

Leak Test Report

Leak Test Report is a subset of Messages Report

*** PETROSONIC III ***
TANK GAUGE SYSTEMS.
BY PETRO VEND INC.

MESSAGES
1:06 PM TUE NOV 13, 1990

ALARMS
===== TANK 4 DIESEL
WORST CASE
* OVERFLOW *
9965.5 GL NET CORRECTED PRODUCT VOLUME.
9989.6 GL NET CORRECTED TANK VOLUME.
9974.3 GL GROSSED MEASURED TANK VOLUME.
25.7 GL VOLUME LEFT IN TANK.
94.73 IN PRODUCT LEVEL.
57.1 F AVERAGE FUEL TEMPERATURE.
23.5 GL GROSS WATER VOLUME.
1.2 IN WATER LEVEL.
HIGH WATER
START 10:22 AM TUE NOV 13, 1990
END 11:14 AM TUE NOV 13, 1990
WORST CASE
* HIGH WATER *
6254.2 GL NET CORRECTED PRODUCT VOLUME.
6284.0 GL NET CORRECTED TANK VOLUME.
6275.1 GL GROSS MEASURED TANK VOLUME.
25.7 GL VOLUME LEFT IN TANK.
57.86 IN PRODUCT LEVEL.
57.3 F AVERAGE FUEL TEMPERATURE.
29.8 GL GROSS WATER VOLUME.
1.4 IN WATER LEVEL.
* LEAK INDICATED *
START 1:00 AM TUE NOV 13, 1990
END 2:00 AM TUE NOV 13, 1990
1.00 GAL PER HOUR AVERAGE LEAK RATE
===== TANK 5
MISSED MEAS
START POWER UP
END IN PROGRESS
MISSED 528 MEASUREMENTS
===== SYSTEM
POWER FAILURE
POWER FAILURE
START 9:22 AM THU NOV 1, 1990
END 11:14 AM THU NOV 1, 1990
PRINTER FAILURE
PAPER OUT
START 8:57 AM TUE NOV 13, 1990
END 9:01 AM TUE NOV 13, 1990

Alarms Report

SiteSentinel

Model II

Automatic Tank Gauging System

PETRO VEND

6900 Santa Fe Drive
Hodgkins, IL 60525
Ph# 708 485-4200



Evaluator: Underwriters Lab., Inc. - 11/04/94

System Description: *The **SiteSentinel** is a microprocessor-based system capable of monitoring probes and sensors. Each **SiteSentinel** system has one controller to manage operations and can be upgraded with modules to incorporate additional probe and sensor capability. Up to eight modules can be connected for a total of 128 probes and sensors. Inventory and system reports are available anytime and can be scheduled to print automatically. Built-in sound and light alarms can signal any system event. The **SiteSentinel** has three modes of operation: privileged, non-privileged and restricted. If the system is in the privileged mode, you must have the password. The default password is **HELLO**.*

Certification: 0.1 & 0.2 gph

Tank Capacity: Max. 15,000 gal

Test Period: Min. 2 hrs (0.2 gph) with tank 50 - 95% full
Min. 4 hrs (0.1 gph) with tank 90% full

Limitations:

- No dispensing or delivery during test
- Not evaluated using manifolded tanks
- Not capable of monitoring product lines
- Not capable of continuous monitoring

SAMPLE REPORTS

Site Sentinel

SITESENTINEL APR 29, 1996 8:36 AM
MAIN MENU

1. ENTER PASSWORD:
2. TANK INVENTORY REPORT
3. REPORTS
4. SYSTEM COMMANDS
5. SCHEDULE COMMANDS & REPORTS
6. SYSTEM SETUP
7. I/O AND SMART MODULE DATA
8. QUICK SALE REPORT (PRINTER REQUIRED)
9. QUICK DELIVERY REPORT (PRINTER REQD)

DIRECTIONS:

AT ANY MENU YOU MAY ENTER THE FOLLOWING:
OPTION # SELECTS OPTION
[C] OR [CANCEL] EXITS TO PREVIOUS MENU
[P] OR [0] PRINTS DATA FROM SCREEN

<input type="checkbox"/> QZ 1	ABC 2	DEF 3	CLEAR NO
GHI 4	JKL 5	MNO 6	BACK SPACE
PRS 7	TUV 8	WXY 9	ALPHA
CANCEL	?*- 0	HELP .	ENTER YES

Main Menu Display

Console Keypad

1. Go to Main Menu

- Press **CLEAR/NO** till Main Menu
- Press **CLEAR/NO** to scroll sub-menus

2. If password is necessary

- Press **1**
- Enter password with console letter or numbers. (Try **HELLO**)
- Press **ENTER**

3. Tank Inventory Report

- Press **2**
- Press **0** to print report on all tanks

4. Alarms in Progress

- Press **3** then **6**
- Press **0** to print current alarms

5. Alarm History

- Press **3** then **7**
- Press **0** to print alarm history

6. Leak Test Report

- Press **3** then **10** then **8**
- Press **0** to print

WILCO

Fuel Management and

Compliance Service

Receiver

SIMMONS

106 East Main Street
Richardson, TX 75081
Tel: (800) 848-8378



Keypad/Display Unit



Evaluator: S.S.G.

Associates - 10/28/95

ATG Probe/Transmitter

System Description: The **Wilco** system employs radio and modem communications technology to connect on-site monitoring equipment to the Simmons Central Monitoring Center. Technicians collect and process data, monitor and respond to alarms and generate compliance reports. The **Wilco** ATG probe uses micro-impulse radar technology to measure tank levels and then transmits data via radio signal to a remote receiver linked to the **Wilco** Control Panel. The **Wilco** control panel with user keypad and display unit then sends data between the business and Simmons central monitoring center via existing telephone lines. Inventory, sales and delivery data are then used to produce SIR results. Sales and deliveries must be entered manually thru the keypad. **Options** include **leak detection sensor** and **overflow** alarms.

Certification: SIR 5.7 L.M. version; 0.2 & 0.1 GPH
with PD = 99% & PFA = 1%

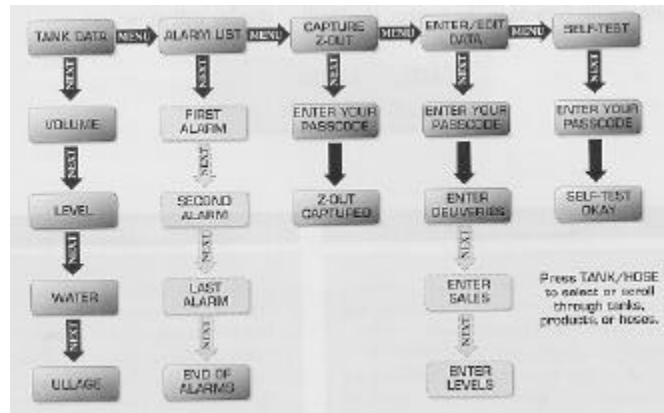
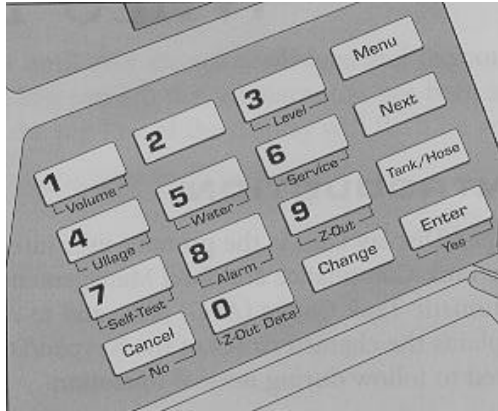
Tank Capacity: 45,000 gal.; 2, 3 or 4 tank manifolded systems

Test Period: Min. 26 days

Limitations: Data collection **only**

WILCO

Keypad Operation



Keypad/Display Unit

Flowchart of Wilco Menu

1. Tank Inventory

- a. Press **“Menu”** until Tank Data
- b. Press **“Next”** for Volume, Level, Water or Ullage
- c. Press **“Tank/Hose”** for different tanks in system

2. Alarm List

- a. Press **“Menu”** until Alarm List
- b. Press **“Next”** for each alarm
 - i. alarm description will flash on and off to indicate alarm has not been acknowledged
 - ii. if alarm status is still present, second line will indicate **“ACTIVE”**
 - iii. if alarm status is not present, second line will indicate **“CLEARED”**

3. Self-Test (system functioning properly)

- a. Press **“Menu”** until **Self-Test**
- b. Press **“Next”**; enter passcode (1234)
 - i. Display will show **SELFTEST OK** if functioning properly
 - ii. Display will show **SELFTEST FAIL** or **PRESS SERVICE** if not functioning properly

4. Overfill Alarm Check

- a. Initiate **Self-Test**, alarm should sound; **if not**, no overfill alarm
- b. Press **“Cancel”** to silence alarm

Soil Sentry

Liquid 330

Double-Walled UST Monitoring System

Arizona Instrument - A Z I

4114 E. Wood St.
Phoenix, AZ 85040
Tel: 602 731-3434



Evaluator: Ken Wilcox Ass. - 01/08/93

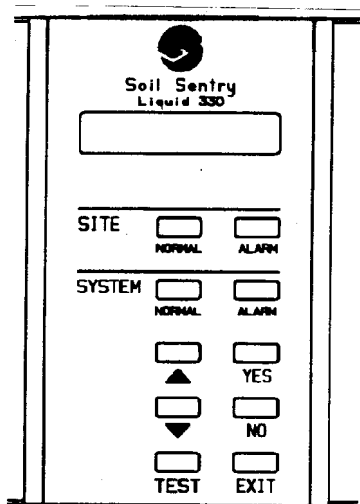
System Description: *The Soil Sentry **Liquid 330** uses optical sensing technology to monitor double-contained storage tanks and piping. The system utilizes up to 10 optical sensing probes which continuously monitor annular spaces in tanks and piping. Probes can also be installed in the tanks to provide high and low level alarms. The **Liquid 330** uses a **WET/DRY** probe to distinguish between normally **DRY** or **WET** conditions. A discriminating probe can be used to determine whether the liquid is water or product. All event conditions (alarms) are stored and can later be recalled. The system is capable of storing 350 lines of information.*

Detector:	Output type:	qualitative
	Sampling frequency:	continuous
	Operating principle:	refraction

Applicability: Unleaded and synthetic gas, diesel fuel, n-hexane, jet-A fuel, toluene, xylene(s) and water

SAMPLE REPORTS

Liquid 330



Display Options

1. View Menu Options?
2. View Current Status?
3. View Print Options?
4. Make Setup Changes?
5. Diagnostics Options?

Console

1. View or Print Current Status

- a. Press **YES** or **NO** until "View Current Status?"
- b. Press **↑** or **↓** until desired information
- c. Press **YES** to download information
- d. Press **EXIT** to leave routine

LIQUID 330 CURRENT STATUS
05-MAR-91 12:33

Site Name
Site Address
City, State, Zip
Site Comments

Controller: OK
Calibration: 2.54 Volts, OK

Probe 1: 2.64 Volts, Normal
Probe 2: Inactive
Probe 3: 2.64 Volts, Normal
Probe 4: Inactive
Probe 5: Inactive
Probe 6: 2.64 Volts, Normal
Probe 7: Inactive
Probe 8: Inactive
Probe 9: 2.64 Volts, Normal
Probe 10: Inactive

2. View or Print History

- a. Press **YES** or **NO** until "View Print Options?"
- b. Press **↑** or **↓** until "Print History?"
- c. Press **YES** to download information
- d. Press **EXIT** to leave routine

LIQUID 330 PAST SIGNIFICANT EVENTS
16-APR-91 13:53

16-04-91 13:37 Event: Operate/Setup
Power: ON
16-04-91 13:37 Event: Site Alarm
Probe 10 ALARM
16-04-91 13:38 Event: Operate/Setup
Site Alarm Cleared
16-04-91 13:50 Event: Operate/Setup
Setup Menu Entered
16-04-91 13:52 Event: Operate/Setup
Setup Menu Entered
16-04-91 13:52 Event: System Alarm
EVENT MEMORY
16-04-91 13:52 Event: Operate/Setup
System Alarm Cleared
End of Significant Events

Soil Sentry Twelve - X

Vapor Monitoring System

Arizona Instrument - AZI

4114 E. Wood St.
Phoenix, AZ 85040
Tel: 602 731-3434



Evaluator: Ken Wilcox Ass. - 04/17/91

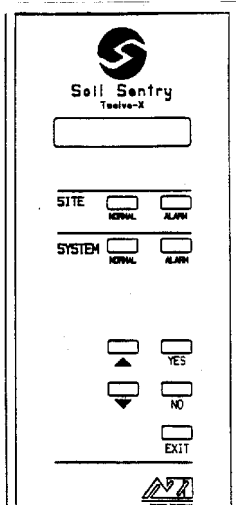
System Description: *The Soil Sentry Twelve-X is an “aspirated vapor” monitoring system. It’s designed to analyze the vapor concentration of Total Organic Hydrocarbons (TOH) found in the soil and backfill around motor fuel tanks. The system searches for leaks by drawing air samples from up to 12 underground locations and electronically analyzing those samples for the vapor of leaking hydrocarbon materials. The system sequentially draws air samples from each active vapor sampling point three times a day. If a vapor level above the adjustable alarm level is identified over three successive sampling cycles, or if a dangerously high vapor level is identified during any one cycle, the site alarm is triggered and a record is made of the day, cycle period, identification of the high vapor sampling point and the measured vapor level.*

Detector:	Output type:	quantitative
	Sampling frequency:	continuous
	Operating principle:	metal oxide semiconductor

Applicability: Unleaded and synthetic gas, diesel fuel, n-hexane, JP 4 & 5 jet fuel, toluene, xylene(s)

SAMPLE REPORTS

Twelve - X



Console

Display Options

1. View Menu Options?
2. System Status
3. View Site Levels?
4. View Print Options?
5. Operate/Setup Options?
6. Diagnostics Options?

3. View or Print Past Vapor Levels

- a. Press **YES** or **NO** until "View Print Options?"
- b. Press **↑** or **↓** until "Past Vapor/Pressure?"
- c. Press **YES** to download information
- d. Press **EXIT** to leave routine

1. View Site Levels

- a. Press **YES** or **NO** until "View Site Levels?"
- b. Press **↑** or **↓** until desired information
- c. Press **EXIT** to leave routine

Arizona Instrument Corp.
1100 E. University
Tempe, Arizona 85281

14-MAR-90 09:00
Well Vapor(ppm) Press(In.H2O) Alarm

00	1200	-052	3500 PPM
01	0010	-050	3500 PPM
02	0010	-050	3500 PPM
03	0010	-050	3500 PPM
04	0010	-050	3500 PPM
05	0010	-050	3500 PPM
06	0010	-050	3500 PPM
07	0010	-050	3500 PPM
08	0010	-050	3500 PPM
09	0010	-050	3500 PPM
10	0010	-050	3500 PPM
11	0010	-050	3500 PPM
12	0010	-050	3500 PPM

Arizona Instrument Corp.
1100 E. University
Tempe, Arizona 85281

09-MAR-90 00:00
Well Vapor(ppm) Press(In.H2O)

00	0010	-049
00	0010	-049
00	0010	-049

09-MAR-90 08:00
Well Vapor(ppm) Press(In.H2O)

00	0010	-050
01	0010	-050
02	0010	-049
03	0010	-049
04	0010	-049
05	0010	-049
06	0010	-049
07	0010	-049
08	0010	-049
09	0010	-049
10	0010	-049
11	0010	-049
12	0010	-049

09-MAR-90 16:00
Well Vapor(ppm) Press(In.H2O)

00	0010	-050
01	0010	-050
02	0010	-049
03	0010	-049
04	0010	-049
05	0010	-049
06	0010	-049
07	0010	-049
08	0010	-049
09	0010	-049
10	0010	-049
11	0010	-049
12	0010	-049

2. View or Print Alarm History

- a. Press **YES** or **NO** until "View Print Options?"
- b. Press **↑** or **↓** until "Past Signif(icant) Events?"
- c. Press **YES** to download information
- d. Press **EXIT** to leave routine

PPM 4000

Automatic Electronic Line Leak Detector

Red Jacket

Marley Pump Co.
9650 Alden Rd.
Lenexa, KS 66215
Tel: 913 541-2985

Evaluator: KWA - 04/94



System Description: The *PPM 4000* is a programmable line pressure and probe monitoring system utilizing eight independent channel control functions for use in detecting product discharges from UST's and supply lines. The line pressure monitoring system is capable of automatically testing at catastrophic (3gph), standard (0.2 gph) and precision (0.1 gph) levels. Tests begin after each operation of the submersible pump and every time the line pressure falls to 10 PSI or upon demand. Alarm and pump shutdown will occur if the system detects a leak of 3 or 0.2 gph. The *PPM 4000* is also capable of performing liquid and vapor monitoring. Eight additional channels can be monitored with the installation of the *PPM 4100*. To check most current information, continue to depress the **SCAN** key. Date and results of most recent line tests will appear.

Certification: 3, 0.2, 0.1 gph with PD = 100% and PFA = 0%

Pipeline Capacity: Max. 55.1 gal

Test Period: 3.0 gph - 1 min
0.2 gph - 10 min
0.1 gph - 2.5 hrs

TS-LLD

Electronic Line Leak Detection System

INCON

P.O. Box 638

Saco, ME 04072

Tel: 207 283-0156

Evaluator: KWA - 07/06/95



System Description: The INCON **TS-LLD** line leak detector has two major “system” components. The Leak Sensing Unit or **LSU** is installed into the line leak detector port at the submersible pump housing. The Control Unit or **CU** is installed above or to the side of the submersible pump relay box or motor starter enclosure. The **TS-LLD** system will automatically turn on the submersible pump during quiet periods to run pressurized line leak tests. A quiet period is required to complete all line leak tests. A 3.0 gph test will automatically run after every product dispense and takes 3 minutes to complete. The 0.2 gph test also runs automatically after product dispense and takes a minimum of 55 minutes to complete. The 0.1 gph test must be started manually. To conduct a 3.0 gph test, press the control unit reset/test button momentarily. The display should indicate an 88 while the button is held down. **Do not** hold the button for longer than four seconds or a 0.1 gph test will be started. Turn the dispenser lever on and then off to start 3 gph test. At the control unit, the Line Leak Test indicator will light. The attached page describes alarm and error codes.

Test Period: 3.0 gph - 3 minutes
0.2 gph - min. 55 minutes to max. 8 hrs
0.1 gph - 8 hrs quiet time; 40 minute test

Max. Pipeline Cap: **Rigid** - 163 gal
Flex - 49.6 gal

ALARM & ERROR CODES

TS-LLD

Display Code	Description
00 to 28	Not Flashing (No Alarm or Error) this is a normal display of the number of days since the last monthly line leak test passed.
88	Not Flashing (System OK) the control unit electronics and display is working correctly.

Flashing Display - Alarm and Error Codes

1	Failed Annual (0.1) GPH line leak test
2	Failed Monthly (0.2) GPH line leak test
3	Failed Hourly (3.0) GPH line leak test
29 - 32	Alarm - Over 28 days since the last Monthly line leak test passed. The number that is flashing is the number of days since the last monthly line leak test passed.
80	Annual leak test aborted.
81	Leak Sensing Unit is out of operating range.
82	Leak test aborted -- thermal instability
83	Leak Sensing Unit is not communicating.
84	Pressurized line is out of compliance.
85	Leak Sensing Unit requires cleaning.

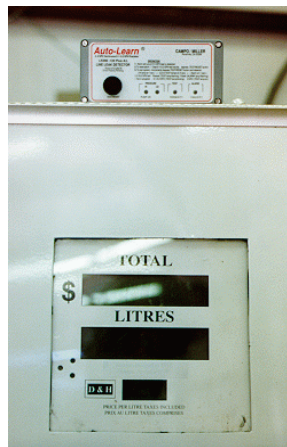
Auto-Learn

LS300-120 PLUS A/L, A/S & LSI

Electronic Line Leak Detection System

EBW

2814 McCracken Ave.
Muskegon, MI 49441
Tel: 616 755-1671



Evaluator: Jetronix Engr. Lab. - 06/01/91

System Description: The **EBW** Automatic Line Leak Detection system consists of a main logic control unit which is interfaced with the **Auto Stik** ATG console and the model **LS-300** pressure transducer located in the pipeline. The system uses a microprocessor with an algorithm based on time and line pressure to determine if a leak is present. Three gph leak tests are conducted every 45 minutes. In the event that a leak is detected by the system, the pump is activated and the line is repressurized. After 3 successive fails, the alarm is activated and the pump is shut down. Leak tests for 0.2 gph are automatically initiated after the pump has been still for 3 hours; 0.1 gph leak tests are initiated after a still time of 6 hours. If the system detects a leak, the same process occurs as in the 3.0 gph tests. Models that do not include the **A/L** series are only certified at 3 gph. This **EBW** system was previously owned by **Compo Miller**. You may still see this brand name.

Certification: 3, 0.2, & 0.1 gph

Pipe Capacity: 163 gal

Test Period: 3.0 gph - 10 minutes
0.2 gph - 25 minutes
0.1 gph - 34 minutes

LS300 PLUS A/L LSI Wireless

SIGNALING CODES FOR LAMPS

LEAK DETECTION MODE

	HI	LO	TEST	ALARM	HORN	CONDITIONS
A	●	⊗	●	●		3 GPH TEST IN PROGRESS PRESSURE WITHIN LIMITS
B	●	⊗	☀	●		PRECISION TEST IN PROG PRESSURE WITHIN LIMITS
C	●	●	●	☀	🔊	LEAK ALARM FAILED 3 GPH TEST
D	☀	●	●	☀	🔊	LEAK ALARM PRESSURE WITHIN LIMITS INSUFFICIENT PRESSURE TO CONDUCT TEST
E	●	☀	●	☀	🔊	LEAK ALARM PIPELINE FAILED TO CATCH PRESSURE
F	⊗	⊗	☒	⊗		0.2 GPH PRECISION TEST PASSED (0.1 GPH TEST PASSED <u>2 FLASHES</u>)
G	⊗	⊗	⊗	☒		0.2 GPH PRECISION TEST FAILED (0.1 GPH TEST FAILED <u>2 FLASHES</u>)
H	☒	●	⊗	⊗		WAITING TO TEST AGAIN LAST TEST FAILED
I	☒	●	⊗	⊗		WAITING TO TEST AGAIN LAST TEST PASSED
J						
K	☀	☀	●	☀	🔊	POSSIBLE TRANSDUCER/SENDER FAILURE SENDER NOT ANSWERING / TRANSDUCER READINGS ARE OFF SCALE (EITHER MAYBE DISCONNECTED)
L	⊗	●	⊗	⊗		PIPELINE PRESSURE IS BELOW 7.5 PSI
M	●	⊗	⊗	⊗		PUMP ON
N	☀	☀	☀	☀		AUTO LEARN NOT COMPLETED <u>UNIT CAN NOT DETECT LEAKS</u>

● OFF

● ON CONTINUOUSLY

⊗ MAY INDICATE OTHER CONDITIONS

☀ BLINK



(EQUAL ON & OFF 1 SEC)



FLASH
(QUICK)



FLASH EVERY 4 SECONDS

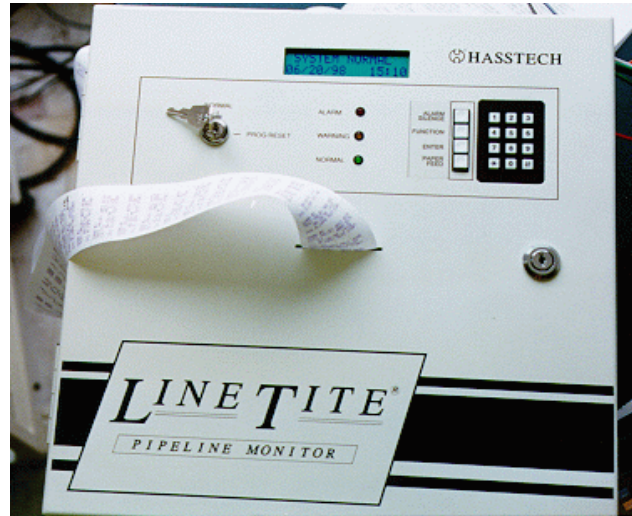
LINE TITE

PIPELINE MONITOR

Electronic Line Leak Detection System

Hasstech

6985 Flanders Dr.
San Diego, CA 92121
Tel: 619 457-5880



Evaluator: Ken Wilcox Ass. - 04/15/97

System Description: The *LineTite CPLD* (continuous pressure leak detector) system consists of a single control panel and a remote sensor for each product pipeline. The functions of four remote line monitor sensors can be upgraded with the addition of two *LineTine CPLD* expansion modules (4 sensors per module) allowing control of up to twelve lines per system. The control panel provides indicators to continuously show the current operating status of the system. The indicators will show a *NORMAL*, *WARNING* or *ALARM* condition. An LCD Display will also continuously indicate the status of the system as well as the exact cause of any system *WARNING* or *ALARM* conditions. In the event of a system error or failed test, an internal or optional external buzzer will sound to alert the station operator. System is also capable of dispenser shutdown.

Certification: 3 & 0.1 gph w/ PD = 100% & PFA = 0%

Test Period: 3.0 gph - 1 to 26 minutes (depending on sensor)
0.1 gph - 1.2 to 12.9 hrs

Pipe Capacity: 0.1 gph - 49.6 gal

SAMPLE REPORTS

Line Tite

1. *Print Daily Report*

- a. Press **FUNCTION** then 06

FUNCTION #06

DAILY REPORT

07/24/97 14:11

HASSTECH INC.

6985 FLANDERS DR

SAN DIEGO

CA 92121

619-457-5880

CHAN #1 PRODUCT #1

3GPH TESTS PASSED: 0003

3GPH TESTS FAILED: 0002

3GPH TESTS ERRORED: 0001

0.1 GPH TEST NOT RUN

CHAN #2 PRODUCT #2

3GPH TESTS PASSED: 0003

3GPH TESTS FAILED: 0002

3GPH TESTS ERRORED: 0001

0.1 GPH TEST NOT RUN

CHAN #3 PRODUCT #3

3GPH TESTS PASSED: 0000

3GPH TESTS FAILED: 0002

3GPH TESTS ERRORED: 0001

0.1 GPH TEST NOT RUN

CHAN #4 PRODUCT #4

3GPH TESTS PASSED: 0000

3GPH TESTS FAILED: 0000

3GPH TESTS ERRORED: 0000

0.1 GPH TEST NOT RUN

2. *Print History Report*

- a. Press **FUNCTION** then 16

FUNCTION #16

HISTORY REPORT

07/24/97 14:11

LAST 0.1 GPH TEST PASSED:

07/23/97 CH 1

07/23/97 CH 2

07/23/97 CH 3

07/23/97 CH 4

LAST 3 GPH TEST PASSED:

07/23/97 CH 1

07/23/97 CH 2

07/23/97 CH 3

07/23/97 CH 4

SYSTEM SETUP CHANGED:

07/24/97

3. *Audible Alarm Test*

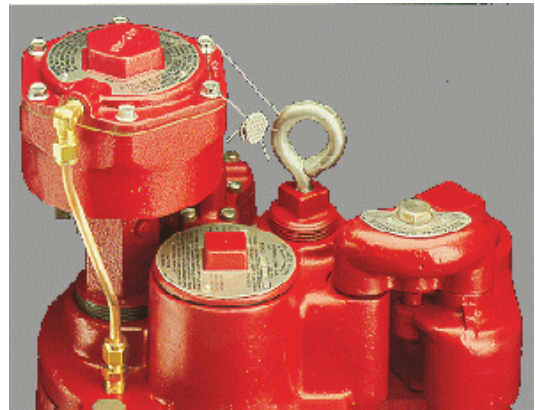
- a. Press **FUNCTION** then 15

RED JACKET

Mechanical Line Leak Detectors



Diaphragm Leak Detector (**DLD**)



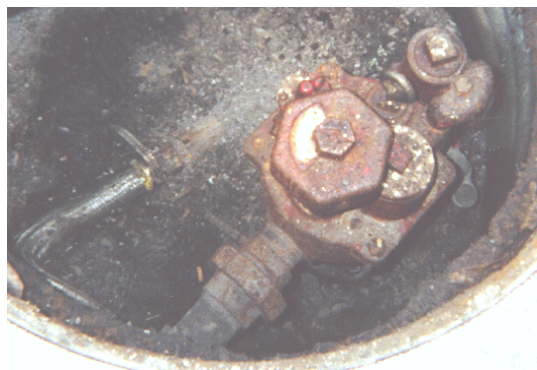
Piston Leak Detector (**PLD**)
(Not 3rd party certified)



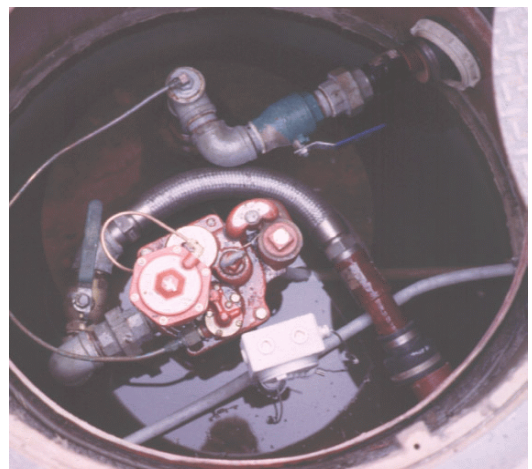
Extended Life Diaphragm (**XLD**)



Extended Life Piston (**XLP**)



DLD



XLP

RED JACKET

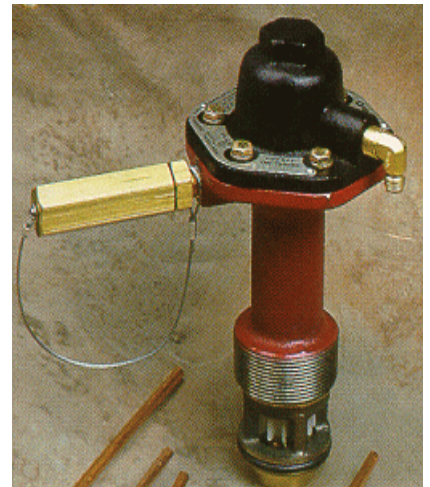
Mechanical Line Leak Detectors



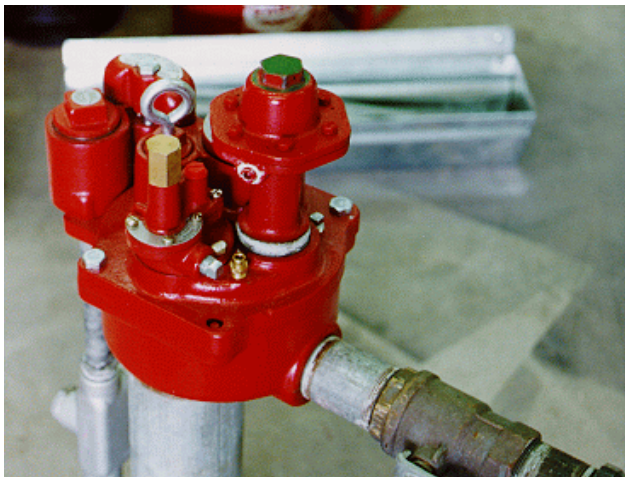
FX1V



FXV Series



FX2V



FX Model

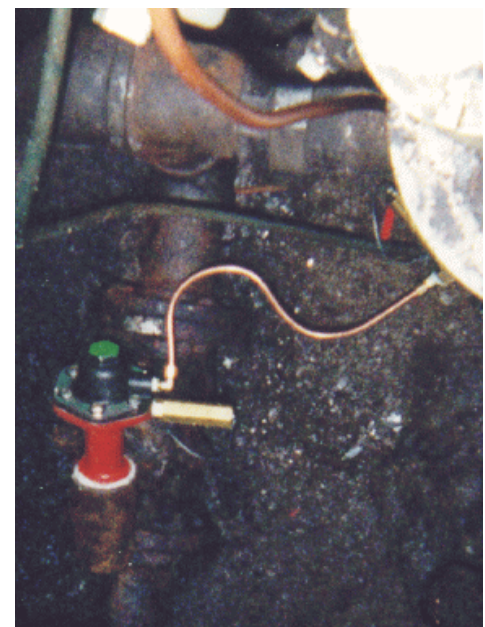


FX Model



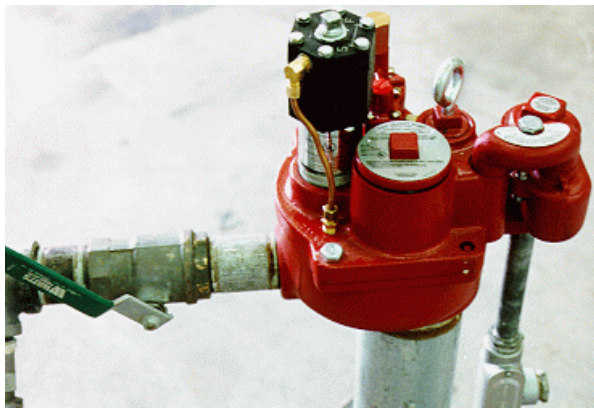
FX1V

FX2V

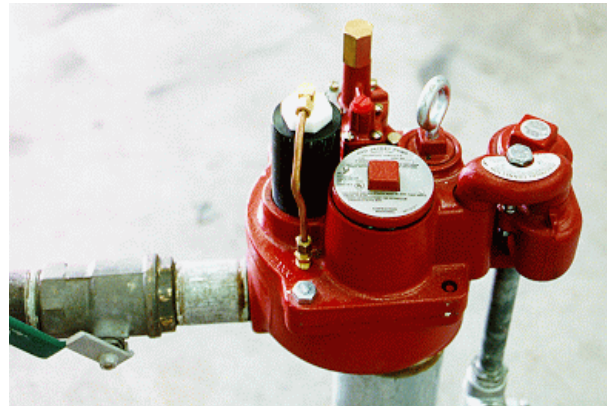


VAPORLESS

Mechanical Line Leak Detectors



LD-2000



LD-2200/SCOUT



LD-2000-E
(for Enviroflex
piping)



**LD-2000-S (electronically
assisted pump shut down)**



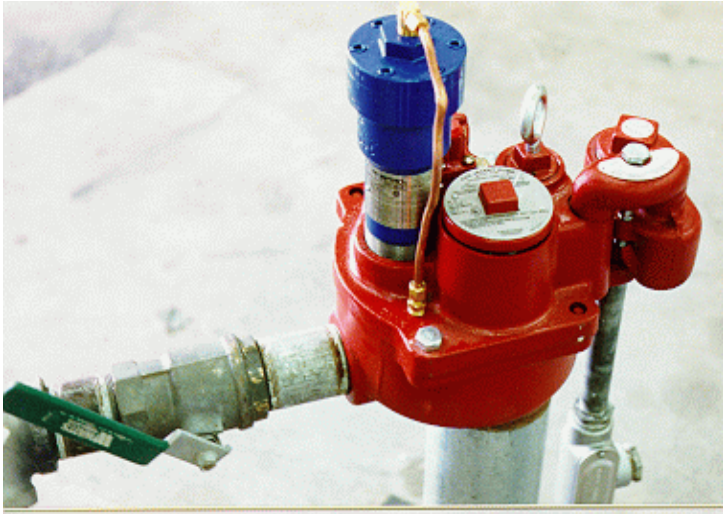
LD Accumulator



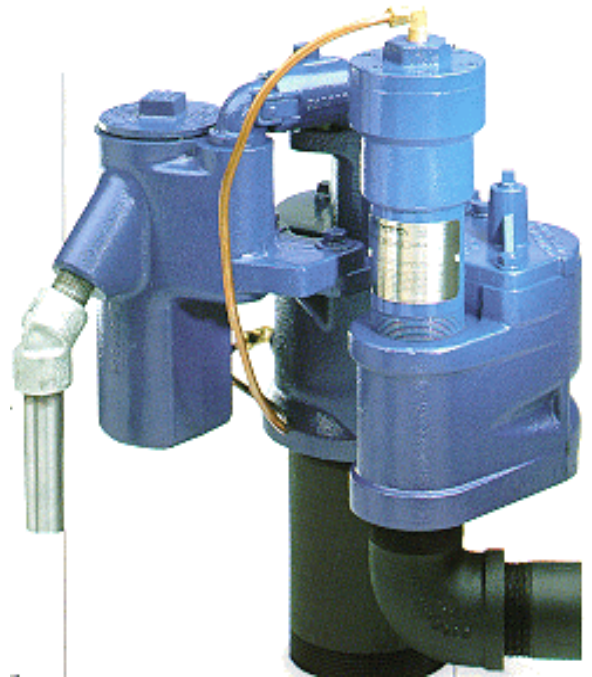
LD-2000-T
(for Tokheim
pumps)

FE PETRO

Mechanical Line Leak Detector



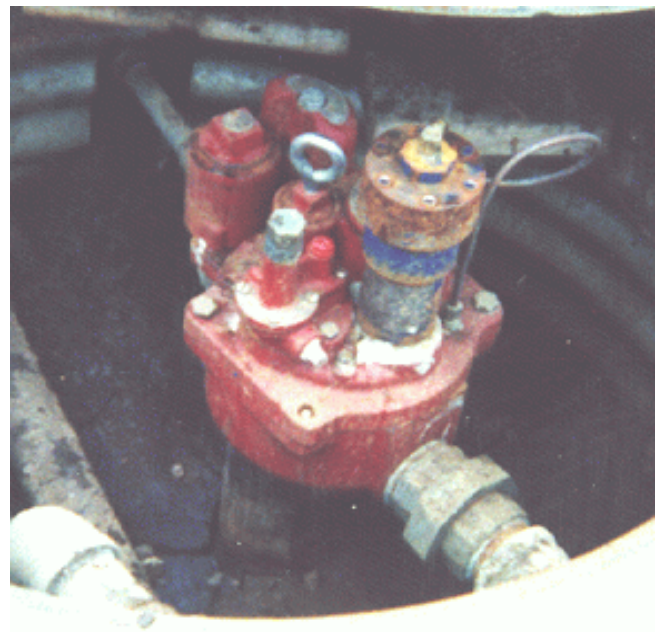
RJ PUMP w/ FE PETRO MLLD



FE PETRO PUMP & MLLD



RJ PUMP w/ FE PETRO MLLD

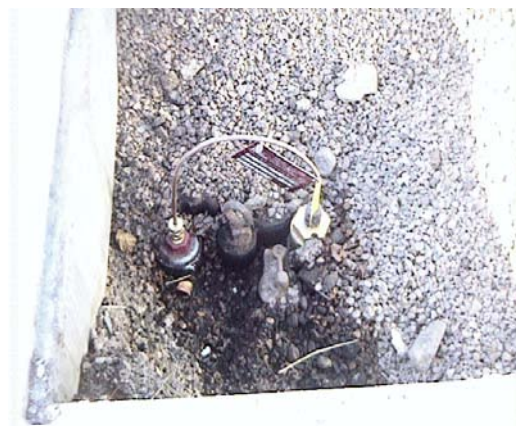
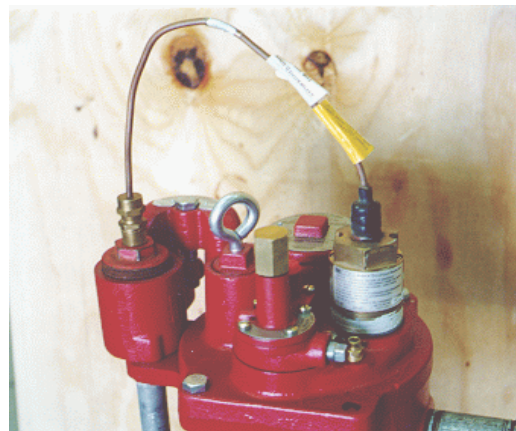


ELECTRONIC

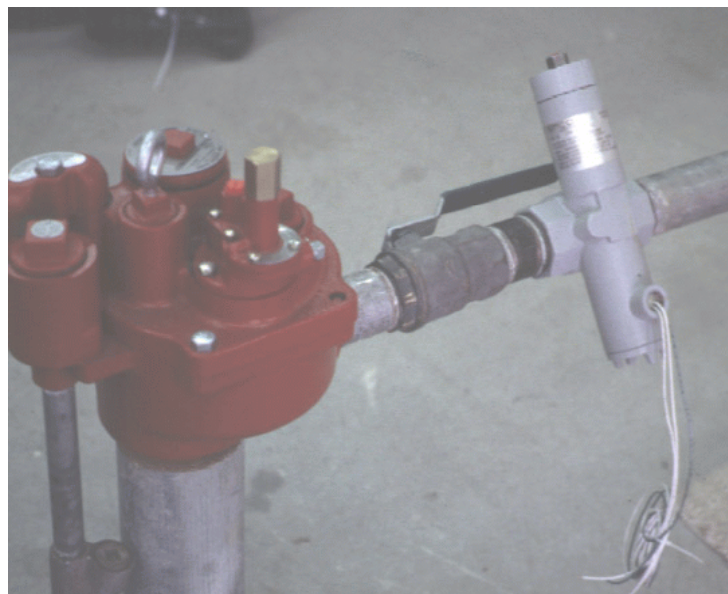
Line Leak Detectors



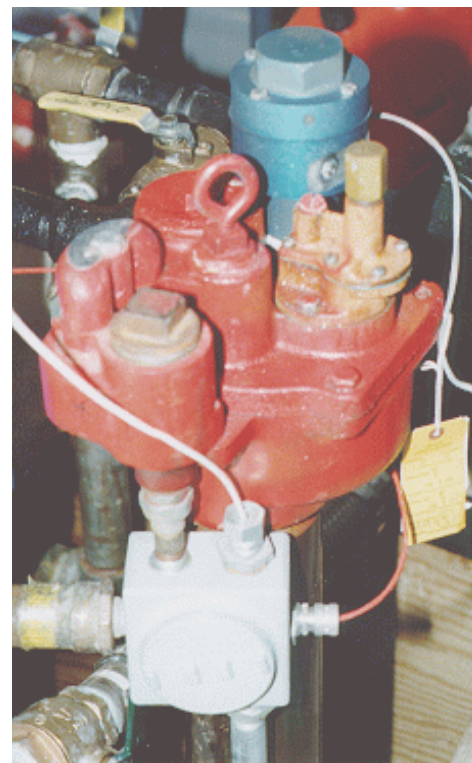
INCON TS-LLD
(wireless)



EBW (Compo Miller)



EECO-LLD

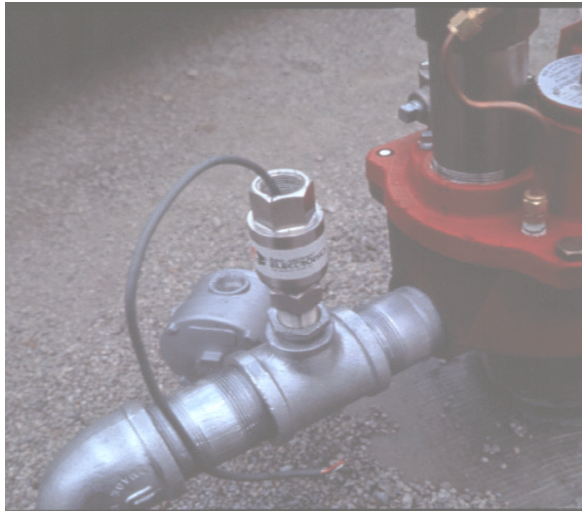


Hasstech w/RJ Pump

RED JACKET ELECTRONIC

Line Leak Detectors

for PPM4000, RLM9000 & ST1400/1800



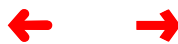
(older model)



(plumbed)



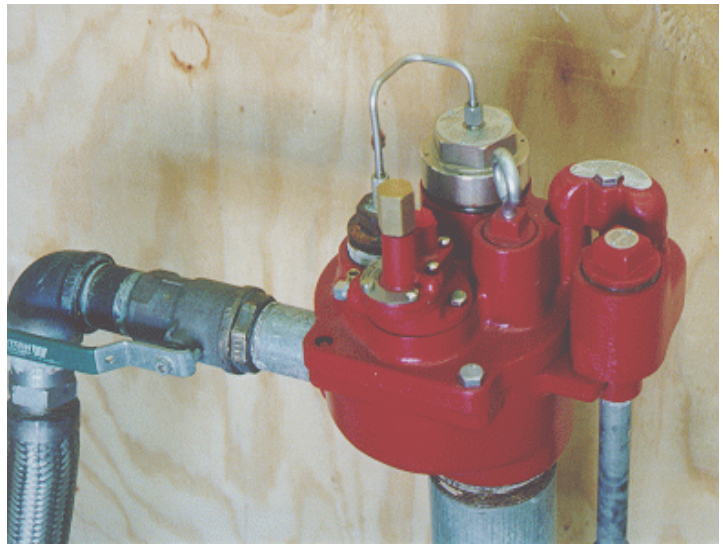
new model



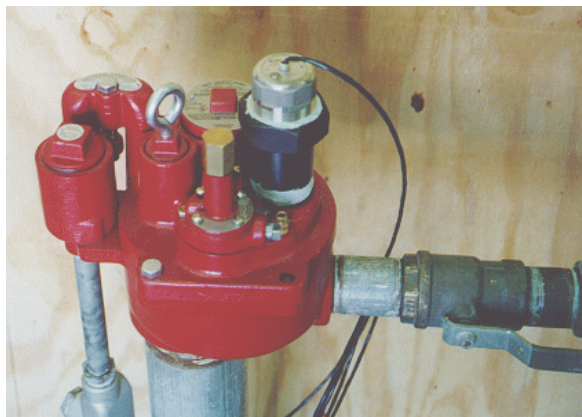
Veeder Root Electronic Line Leak Detectors



Wireless LLD



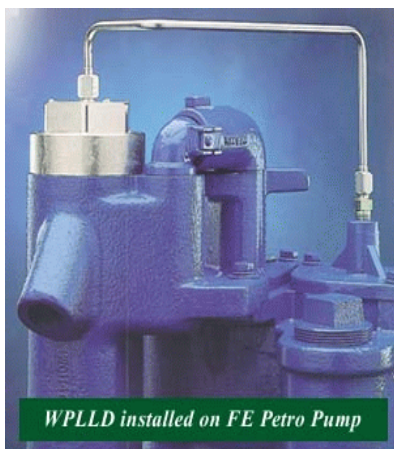
Wireless LLD w/Red Jacket pump



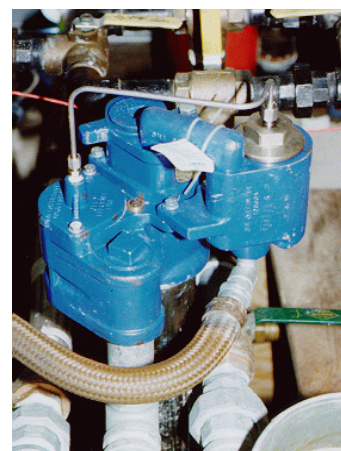
Pressure LLD (wire)



Pressure LLD (field)



Wireless LLD w/FE Petro pump



Wireless LLD