EPA
United States
Environmental Protection
Agency

Region 7

AUTOMATIC TANK MONITORING & LINE LEAK DETECTION

REFERENCE MANUAL

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

KWA

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)*

a. Depress **FUNCTION** until desired function
b. Depress **TANK** until desired tank

2. *Print Inventory Information (NORMAL MODE)*

a. 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
```

3. *Leak or Sensor Monitor Report* (NORMAL MODE)

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

```
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:

                  0.20
                 GAL/HR
TANK   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
```

SAMPLE REPORTS
TLS 250
(cont)

4. *Alarm History Report* (DIAGNOSTIC MODE)

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

```
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
```

5. *Inventory Increase Report* (NORMAL MODE)

a. Depress **FUNCTION** until "Delivery Volume"
b. 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
```

TLS-350

Automatic Tank Gauging & Electronic Line Leak Detection System

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

Evaluator: MRI - 03/14/95 & 06/10/96 (CSLD)

System Description: *The TLS-350 and the TLS-350R (business inventory reconciliation) are monitoring systems that can be upgraded to provide continuous statistical leak detection (**CSLD**) and line leak detection if the appropriate options are added to the console. The **CSLD** option provides continuous tank leak detection without operational shut down. The system can also operate on various software, depending on the UST system. The TLS-350R is able to automatically gather inventory information and reconcile totals at the end of each shift, day and period. Without the **CSLD** option, the TLS-350 can detect a leak of 0.1 gph; however, the UST system must be idle during the test. With the **CSLD** option, it is certified at 0.2 gph and can be used to test manifolded systems. Three line leak detection options are available:*

Volumetric Line Leak Detection (VLLD)
Pressurized Line Leak Detection (PLLD) &
Wireless Pressurized Line Leak Detection (WPLLD);

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

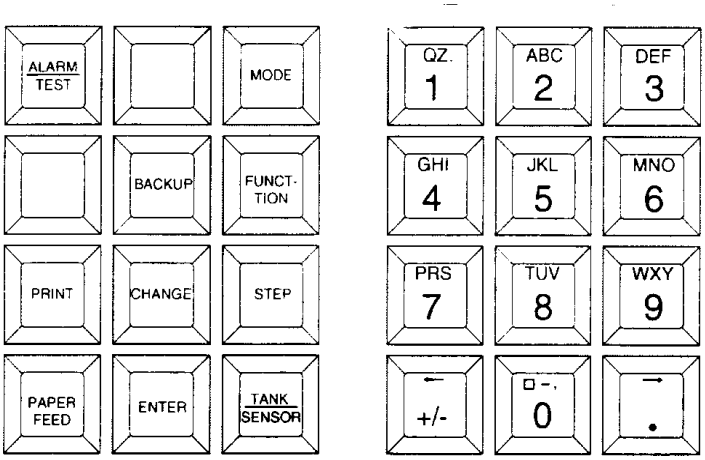
Limitations: ***W/O CSLD option***

- 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

```
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
```

2. Print Inventory Information

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

```
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
```

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

SAMPLE REPORTS
TLS-350
(cont)

4. Tank Leak Test Results

a. Press **FUNCTION** until "In-Tank Test Results"
b. 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

a. Press **FUNCTION** until "CSLD Test Results"
b. 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)

a. Press **FUNCTION** until "Pressure Line Results"
b. 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

a. Press **FUNCTION** until "Pressure Line Results"
b. Press **STEP** until "Press Print for History"
c. 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:

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
```

8. Wireless Pressurized Line Leak Detection Tests (WPLLD)

a. Press **FUNCTION** until "WPLLD Line Results"
b. 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

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

a. Press **FUNCTION** until "WPLLD Line Results"
b. Press **STEP** until "Press Print for History Report"
c. 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)

a. Press **FUNCTION** until "Line Leak Detect Results"
b. 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

a. Press **FUNCTION** until "Liquid Status"
b. Press **PRINT** for report for up to 64 sensors
c. Press **TANK/SENSOR** for other sensors in system
d. 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

a. Press **FUNCTION** until "Vapor Status"
b. Press **PRINT** for report for up to 40 sensors
c. Press **TANK/SENSOR** for other sensors in system
d. 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

a. Press **FUNCTION** until "Groundwater Status"
b. Press **PRINT** for report for up to 40 sensors
c. Press **TANK/SENSOR** for other sensors in system
d. 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

a. Press **MODE** until "Diagnostic"
b. Press **FUNCTION** until "Alarm History Report"
c. Press **STEP** until desired report
d. Press **PRINT** for tank/sensor displayed
e. Press **TANK/SENSOR** to access other tanks/sensors

SAMPLE REPORTS
TLS-350
(Cont)

15. Leak History Report

a. Press **MODE** until "Diagnostic"
b. Press **FUNCTION** until "In-Tank Leak Result"
c. Press **STEP** until "Print Leak History"
d. 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 =   62.3
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

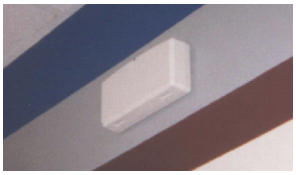
WILCO

Fuel Management and

Compliance Service

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

Receiver



Keypad/Display Unit

ATG Probe/Transmitter

Evaluator: S.S.G. Associates - 10/28/95

System Description: *The **Wilco** system employs radio and modem communications technology to connect on-site monitoring equipment to the Simmons Cental 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 **overfill** alarms.*

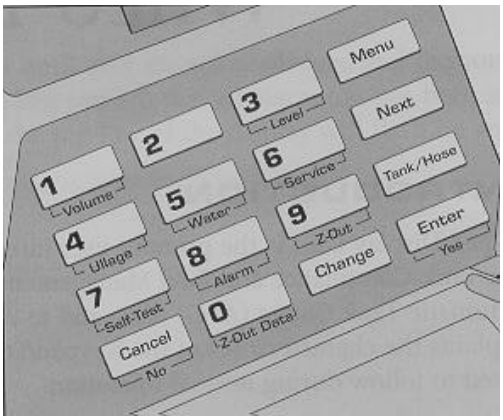
Certification: SIR 5.7 L.M. version; 0.2 & 0.1 GPH with PD = 99% & PFA = 1%

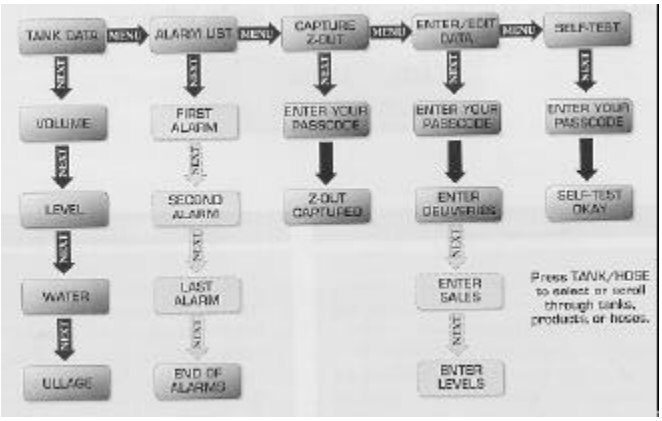
Tank Capacity: 45,000 gal.; 2, 3 or 4 tank manifolded systems

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.*

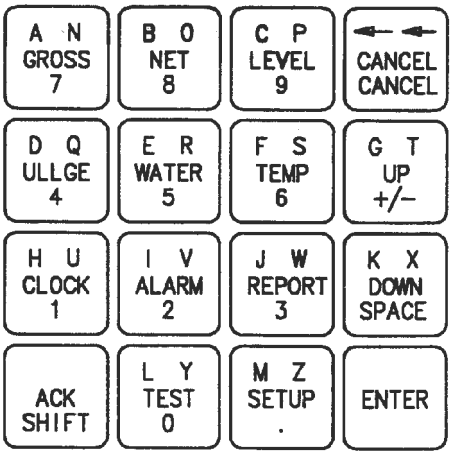
Certification: ***TANK GAUGING***
0.2 gph with PD = 99.9% and PFA = 0.1%
LINE TEST
3, 0.2 & 0.1 gph with PD = 100% and PFA = 0%

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



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

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

```
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    5903.8 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 5875.68
 1:59 AM 68.219 5875.72

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       8000 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      6722.8 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       8000 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      6722.8 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        6:13 AM
BEGIN DATE     08/24/1990
BEGIN GROSS    1657.8 GAL
BEGIN NET      1658.0 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.*

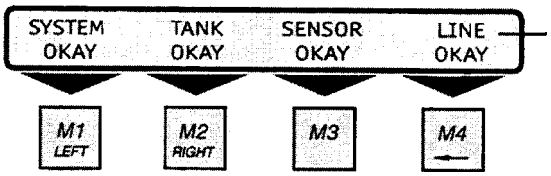
Certification: **TANK GAUGING**
0.2 & 0.1 gph with PD = 99.9% and PFA = 0.1%
0.2 gph with (LL2 probe)

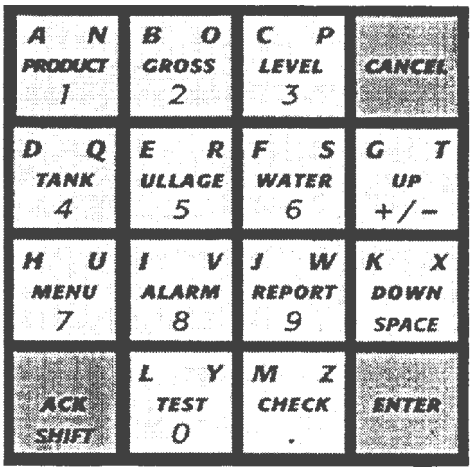
Tank Capacity: Max. 15,000 gal (30,000 gal with LL2 probe)

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





Console Keypad

1. *To Print Desired Report*

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

```
          INCON
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*

a. Press **REPORT** key
b. Press **M 1**
c. Press **M 4**
d. Press enter to print

3. *To Print Inventory Summary Report*

a. Press **REPORT** key
b. Press **M 1**
c. Press **M 2**
d. Press enter to print

```
          INCON
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         4897.6 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**

```
            INCON
 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**

```
            INCON
 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

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

```
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

      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)

a. Press **RPRT** key
b. Press **UP** or **DN** key till "Leak Est"
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        12:02 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

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

8. Alarm Status Report (current alarms)

a. Press **RPRT** key
b. Press **UP** or **DN** key till "Alarm Stat"
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        12:05 AM
 ALARM STATUS REPORT

TANK NO. 1          GAL


      HIGH LIMIT
        ACTIVE
HIGH LIMIT      0.000 IN

      LOW LIMIT
       CLEARED
LOW LIMIT        0.0 GAL

     WATER LIMIT
        ACTIVE
WATER LIMIT     0.000 IN

         LEAK
LEAK LIMIT       2.0 G/H

        THEFT
THEFT LIMIT     10.0 GAL
```

9. System Setup Report

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

10. Tank Setup Report

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

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***

ST 1400/1800

Automatic Tank Gauging & Electronic Line Leak Detection System

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

Evaluator: ADA Technologies, Inc. - 09/30/92

System Description: *The ST1400/1800 controllers are electronic tank gauging devices used for leak detection and inventory management. The controllers can collect level and density data from 4 (ST1400) or 8 (ST1800) ultrasonic inventory sensors and compute various volumetric quantities, correcting all volumes for temperature. The systems have programmable alarm thresholds to alert the operator of various alarm conditions. The system is also capable of storing at least the last 33 events of any particular report. The ADD (accumulative data diagnostics) option adds the capability of continuous leak detection (not 3rd partied). The ST1401/1801 systems add sensor monitoring for interstitial areas, wells and sumps. The ST1400L/1800L add the capability of line leak detection with positive pump shut down.*

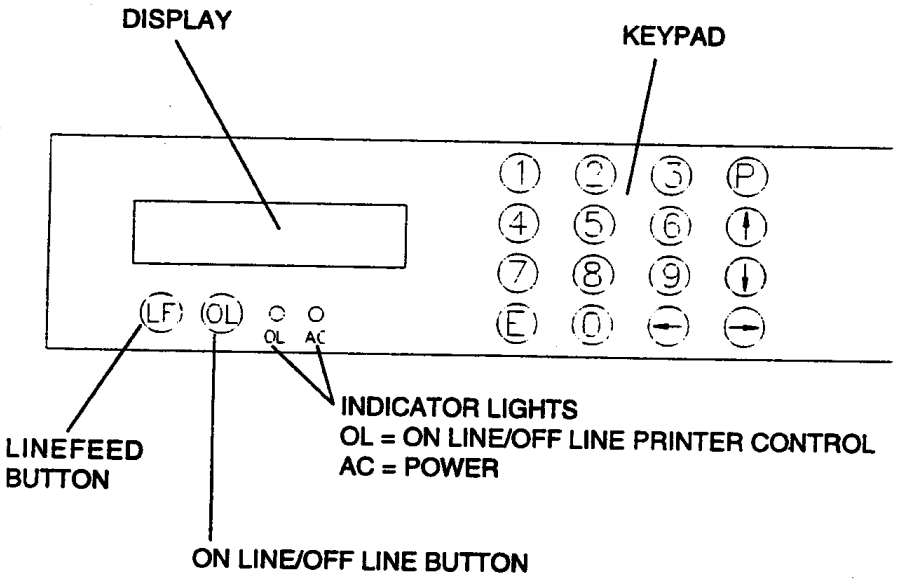
Certification: **TANKS:** 0.2 & 0.1 gph **PIPING:** 3, 0.2 & 0.1 gph

Capacity: **TANKS:** Max. 18,000 gal **PIPING**: Max. 55.1 gal

Test Period: Min. 2.5 hrs with tank 50 - 95% full (0.2 gph)
(W/o ADD) 95 - 100% full (0.1 gph)

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 16:31:46
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
AUTO∫STIK

1. Printing Reports

a. Depress **PRINT REPORTS**
b. Depress desired report or **MORE**
c. Continue to press **MORE** until desired report
d. Depress desired report
e. Depress **ALL** or enter desired tank # (**01**, **02**, etc.)
f. Depress **PRINT**

2. Print Inventory Information (Status Report)

a. Depress **PRINT REPORTS**
b. Depress **STATUS REPORT**
c. Depress **ALL** or enter desired tank # (**01**, **02**, etc.)
e. Depress **PRINT**

3. Print Leak Report

a. Depress **PRINT REPORTS**
b. Depress **MORE**
c. Depress **LEAK REPORT**
d. Depress **ALL** or enter desired tank # (**01**, **02**, etc.)
e. 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

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

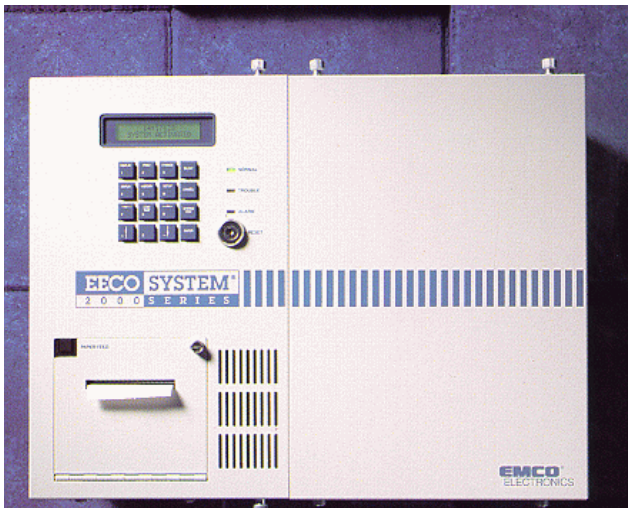
Tank Capacity: Max. 15,000 gal

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 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 disabled 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)

a. Press **DISPLAY**
b. Press **STATUS**, **HISTORY** or **LEAK TEST**
c. Press **ENTER**
e. Press ↓ to scroll thru menu selection
f. Press **ENTER** when desired menu
g. Continue to press ↓ for desired submenu
h. Press **ENTER** when desired submenu
i. Press **CANCEL** to exit menu level

2. *Print Inventory Status*

a. 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*

a. 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*

a. 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

Access #'s for Reports

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

Console Keypad

ALL REPORTS ARE OBTAINED IN THE FOLLOWING MANNER:

1. ***Printing Reports***

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

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

   a. Press **ACCESS**
   b. Press **ENTER**
   c. Press **PRINT**
   d. Press **ENTER**

3. ***Abort Command***

   a. Press **CANCEL**
   b. Press **ACCESS**

SAMPLE REPORTS
PETROSONIC III

```
** P E T R O S O N I C  I I I  **
        TANK GAUGE SYSTEMS.
         BY PETRO VEND INC.

            STATUS
      12:07 PM TUE NOV 13,1990
              --------- TANK ---------
      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
ACCNTING 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)**

```
** P E T R O S O N I C  I I I  **
        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

```
** P E T R O S O N I C  I I I **
        TANK GAUGE SYSTEMS.
         BY PETRO VEND INC.

           MESSAGES
      12:24 PM WED NOV 14,1990

DELIVERY
======= TANK 4  DIESEL
          D E L I V E R Y
          D E L I V E R Y
  S T A R T   M E A S U R E M E N T
      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.
      E N D   M E A S U R E M E N T
        10:43 AM WED NOV 14,1990
*         O V E R F L O W          *
*       H I G H   W A T E R        *
 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.
       D E L I V E R Y   V O L U M E
 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

```
 * * P E T R O S O N I C   I I I  * *
          TANK GAUGE SYSTEMS.
          BY PETRO VEND, INC.

             MESSAGES
     12:24 PM  THU NOV 15, 1990

 TIMED LEAK TEST
 ======== TANK 4  DIESEL
       T I M E D   L E A K   T E S T
      S T A R T   M E A S U R E M E N T
         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
        E N D   M E A S U R E M E N T
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
           L E A K   R A T E
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

```
 * *  P E T R O S O N I C   I I I  * *
          TANK GAUGE SYSTEMS.
           BY PETRO VEND INC.

             MESSAGES
          1:06 PM TUE NOV 13,1990
ALARMS
======== TANK 4  DIESEL
         W O R S T   C A S E
*          O V E R F L O W          *
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.
          H I G H   W A T E R
START 10:22 AM TUE NOV 13,1990
END   11:14 AM TUE NOV 13,1990
         W O R S T   C A S E
*        H I G H   W A T E R        *
 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.
*     L E A K   I N D I C A T E D     *
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
         M I S S E D   M E A S
 START  POWER UP
   END  IN PROGRESS
 MISSED 528 MEASUREMENTS
======== SYSTEM
       P O W E R   F A I L U R E
              POWER FAILURE
 START   9:22 AM THU NOV  1,1990
   END  11:14 AM THU NOV  1,1990
   P R I N T E R   F A I L U R E
              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

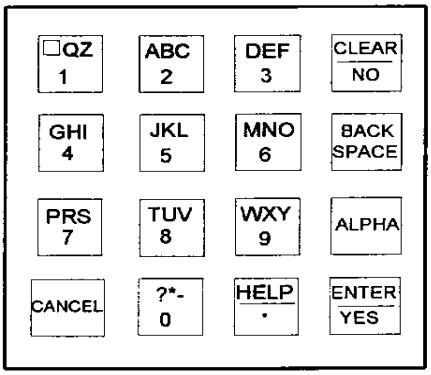
Limitations:
- No dispensing or delivery during test
- Not evaluated using manifolded tanks
- Not capable of monitoring product lines
- Not capable of continuous monitoring

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
```



Main Menu Display

1. Go to Main Menu

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

2. If password is necessary

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

3. Tank Inventory Report

a. Press **2**
b. Press **0** to print report on all tanks

4. Alarms in Progress

a. Press **3** then **6**
b. Press **0** to print current alarms

Console Keypad

5. Alarm History

a. Press **3** then **7**
b. Press **0** to print alarm history

6. Leak Test Report

a. Press **3** then **10** then **8**
b. Press **0** to print

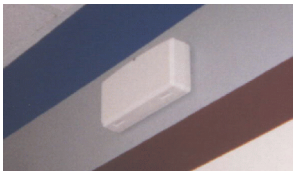
WILCO

Fuel Management and

Compliance Service

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

Receiver



Keypad/Display Unit

ATG Probe/Transmitter

Evaluator: S.S.G. Associates - 10/28/95

System Description: *The **Wilco** system employs radio and modem communications technology to connect on-site monitoring equipment to the Simmons Cental 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 **overfill** alarms.*

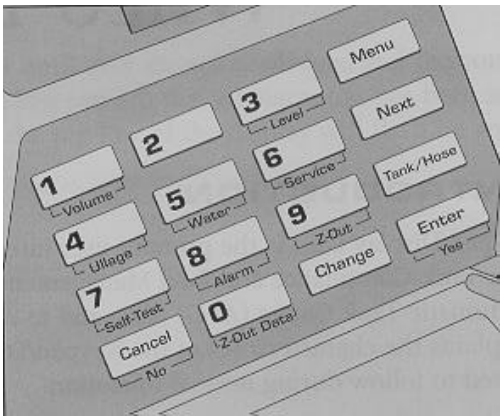
Certification: SIR 5.7 L.M. version; 0.2 & 0.1 GPH with PD = 99% & PFA = 1%

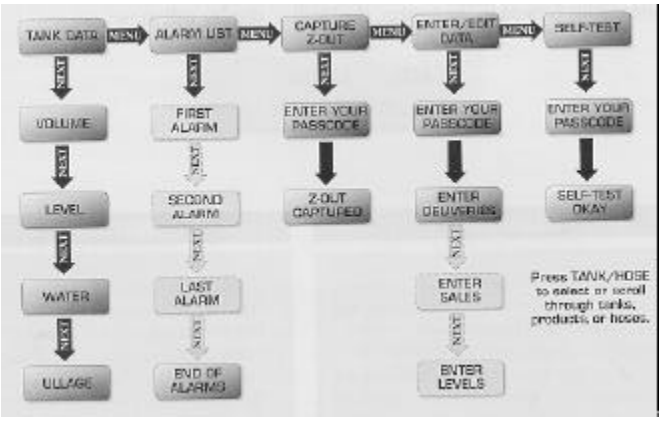
Tank Capacity: 45,000 gal.; 2, 3 or 4 tank manifolded systems

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.*

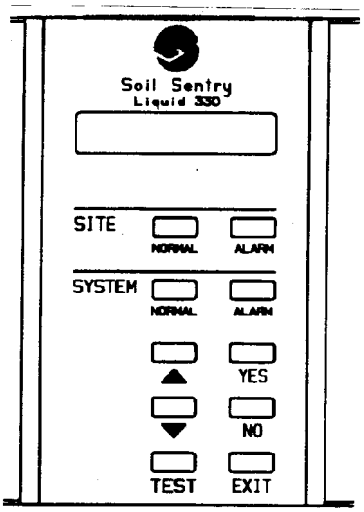
Detector:

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.*

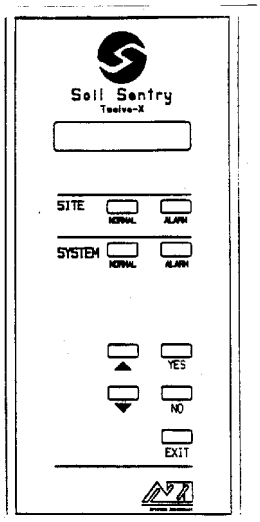
Detector:

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?*

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.H20)	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

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

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

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

09-MAR-90 00:00

Well	Vapor(ppm)	Press(In.H20)
00	0010	-049
00	0010	-049
00	0010	-049

09-MAR-90 08:00

Well	Vapor(ppm)	Press(In.H20)
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.H20)
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

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.*

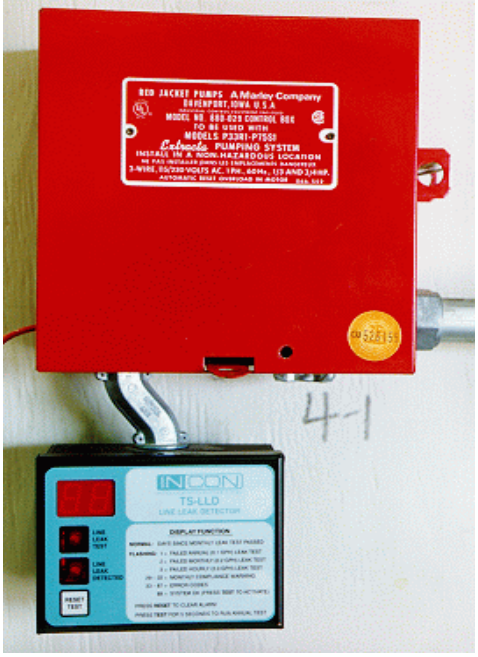
Certification: 3, 0.2, 0.1 gph with PD = 100% and PFA = 0%

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 quite 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.

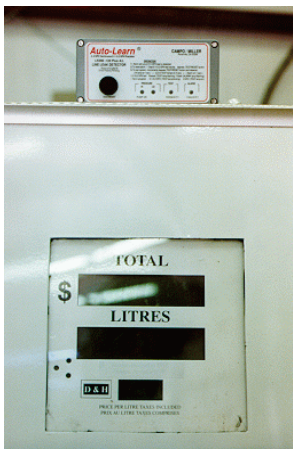
Flashing Display - Alarm and Error Codes

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; 0.1gph 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 *2 FLASHES*)
G	⊗	⊗	⊗	☀		**0.2 GPH PRECISION TEST FAILED** (0.1 GPH TEST FAILED *2 FLASHES*)
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** UNIT CAN NOT DETECT LEAKS

● 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

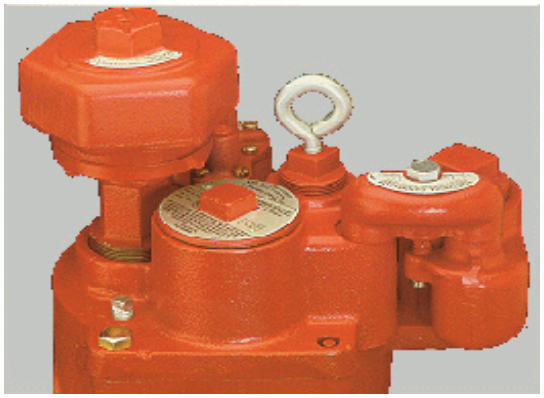
```
FUNCTION #16
    ----------------------------------------
HISTORY REPORT
07/24/97   14:11

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
    ----------------------------------------
```

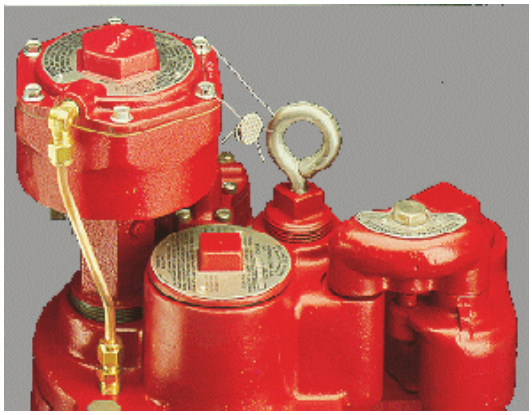
3. *Audible Alarm Test*

a. Press **FUNCTION** then 15

RED JACKET
Mechanical Line Leak Detectors



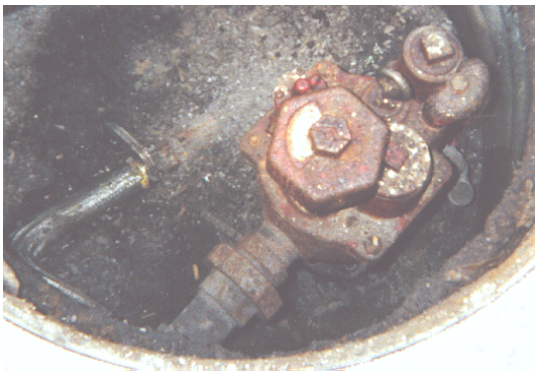
Diaphragm Leak Detector (**DLD**)



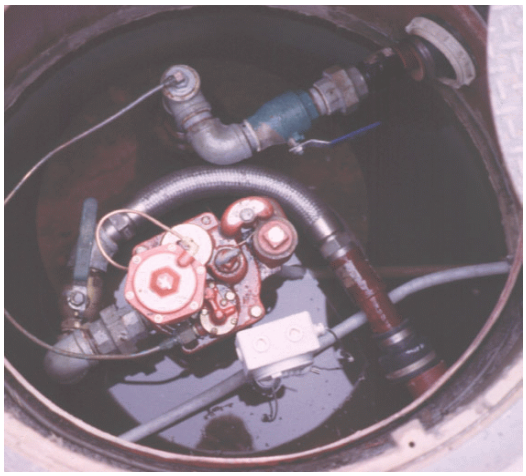
Piston Leak Detector (**PLD**)
(Not 3rd party certified)

Extended Life Diaphragm (**XLD**)

Extended Life Piston (**XLP**)



DLD



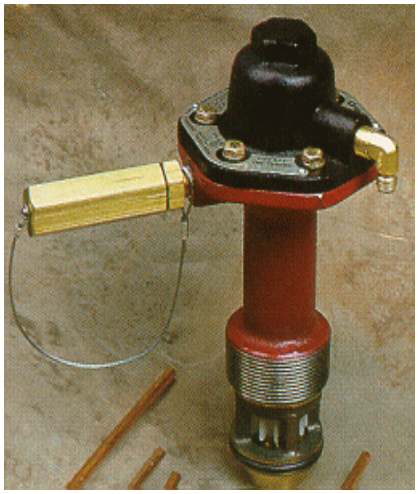
XLP

RED JACKET

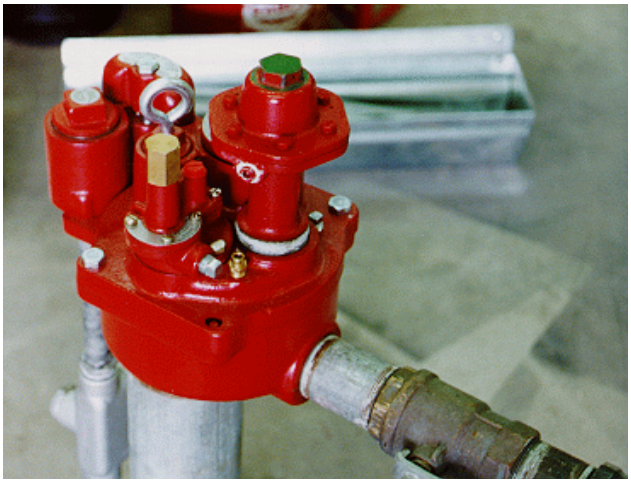
Mechanical Line Leak Detectors

FX1V

FXV Series



FX2V

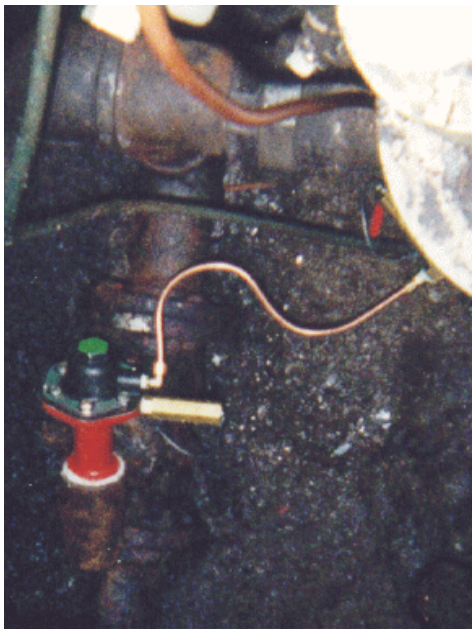


FX Model

FX Model

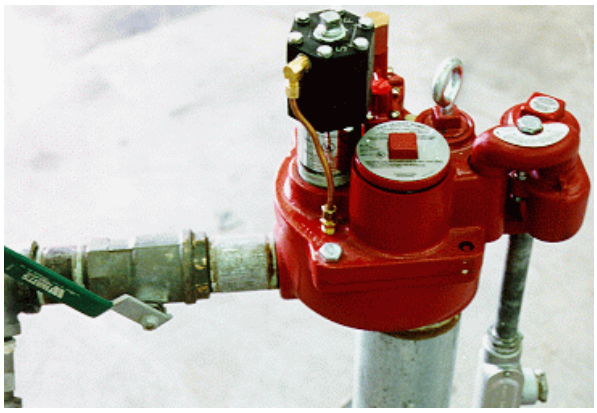
FX1V

FX2V

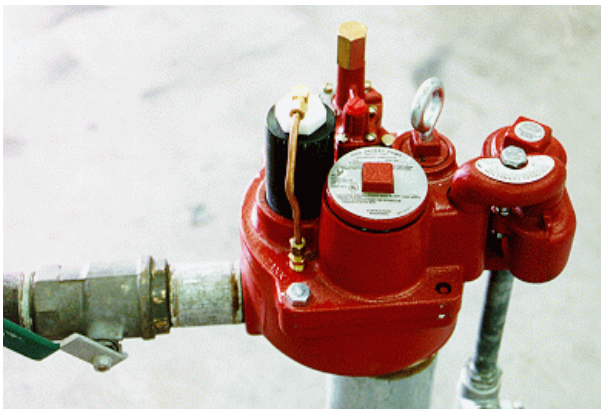


VAPORLESS

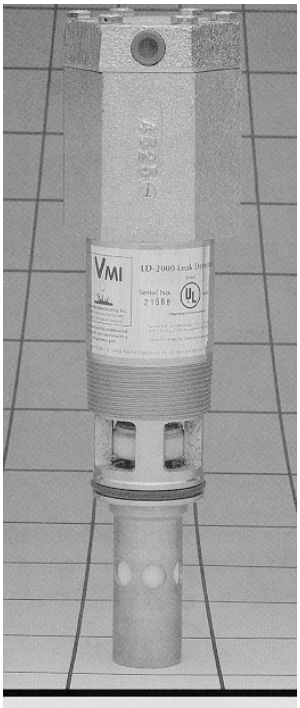
Mechanical Line Leak Detectors



LD-2000



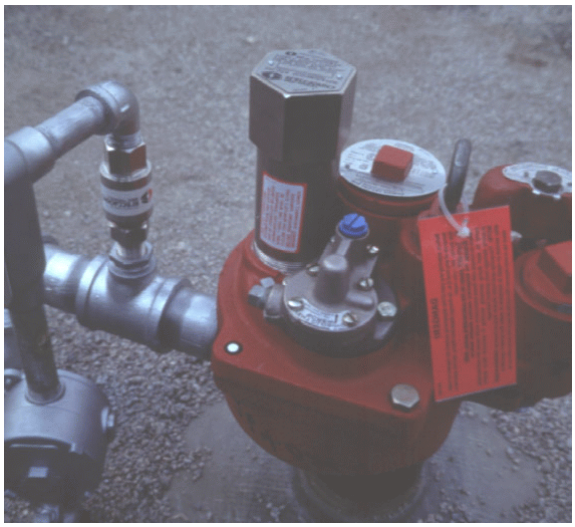
LD-2200/SCOUT



LD-2000-E
(for Enviroflex
piping)

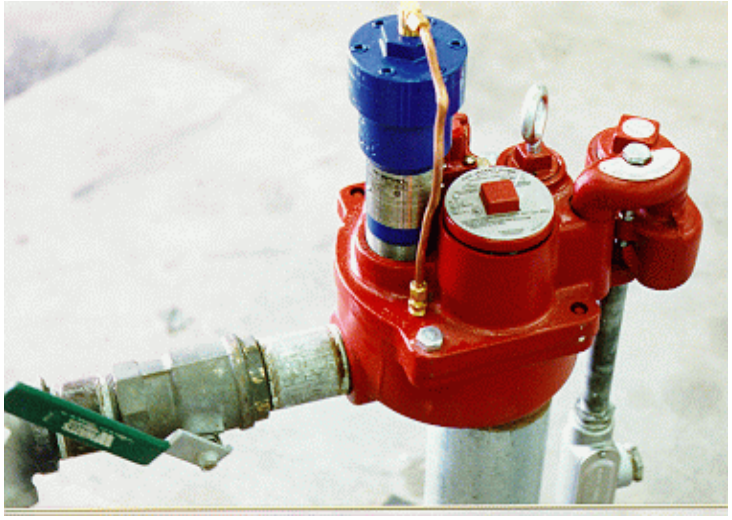
LD-2000-S (electronically
assisted pump shut down)

LD-2000-T
(for Tokheim
pumps)

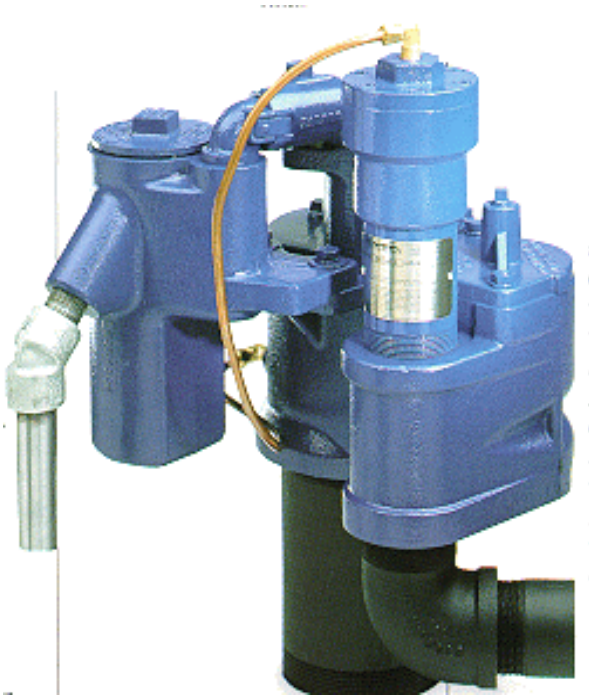


LD Accumulator

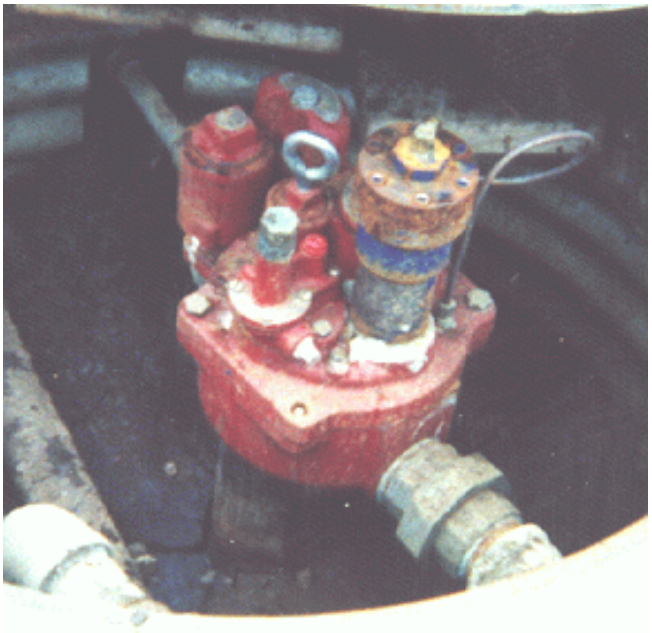
FE PETRO
Mechanical Line Leak Detector



RJ PUMP w/ FE PETRO MLLD



FE PETRO PUMP & MLLD

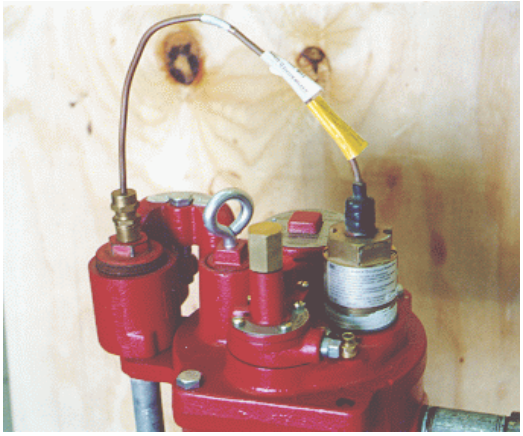


RJ PUMP w/ FE PETRO MLLD

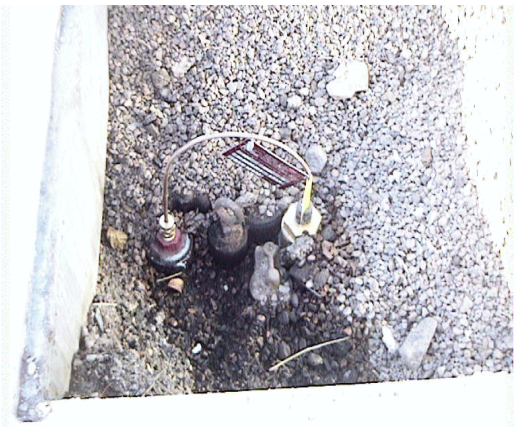
ELECTRONIC

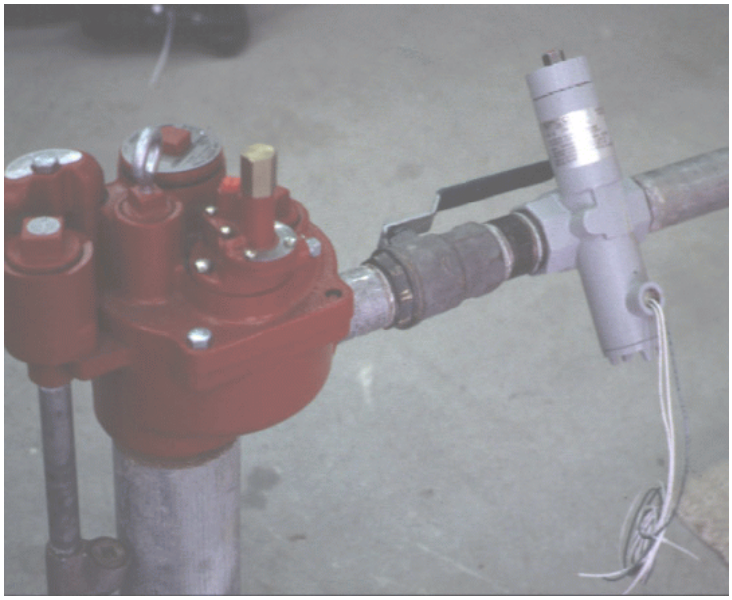
Line Leak Detectors

EBW (Compo Miller)

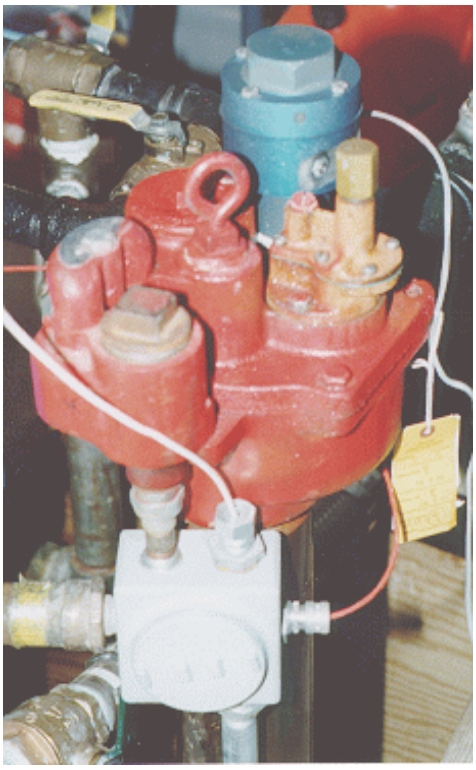


INCON TS-LLD
(wireless)





EECO-LLD

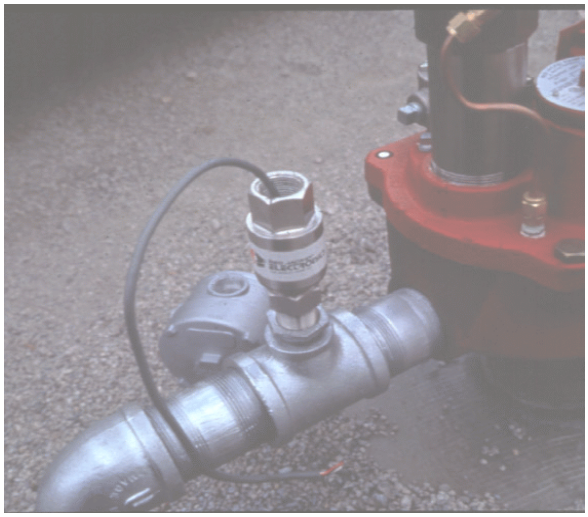


Hasstech w/RJ Pump

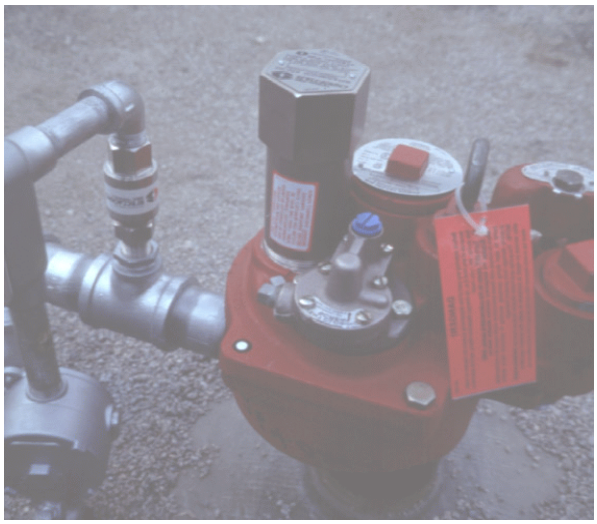
RED JACKET ELECTRONIC

Line Leak Detectors

for PPM4000, RLM9000 & ST1400/1800



(older model)



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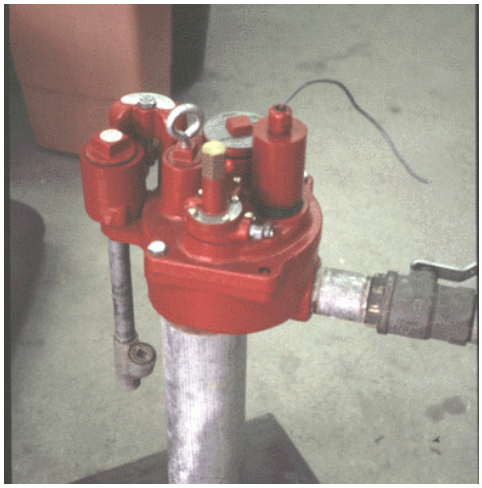
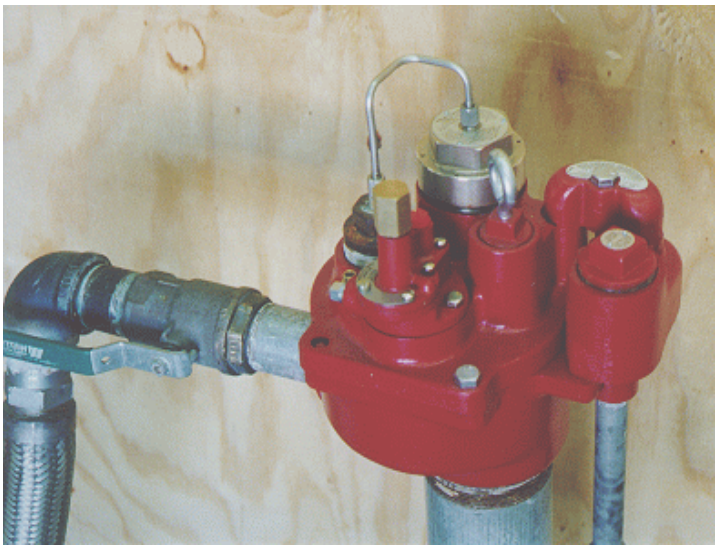


new model

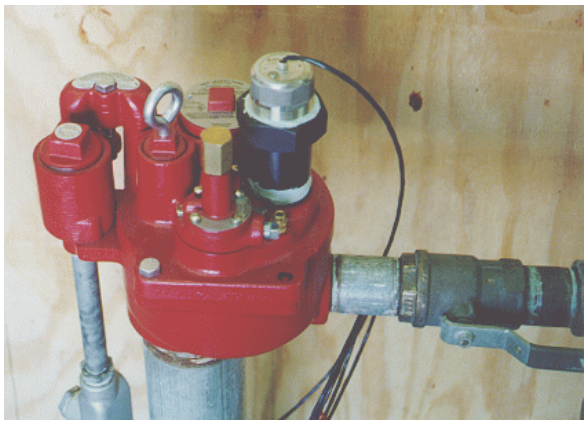
← →

Veeder Root Electronic
Line Leak Detectors

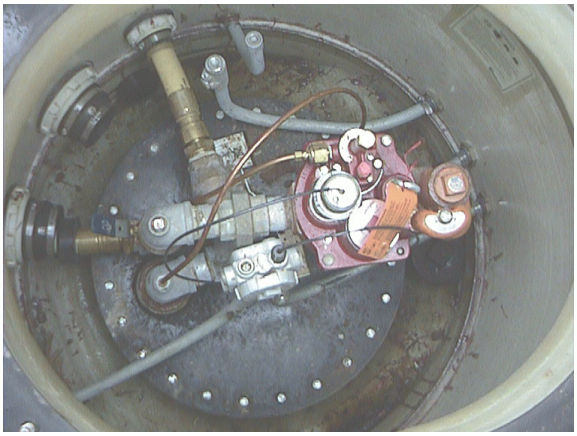
Wireless LLD



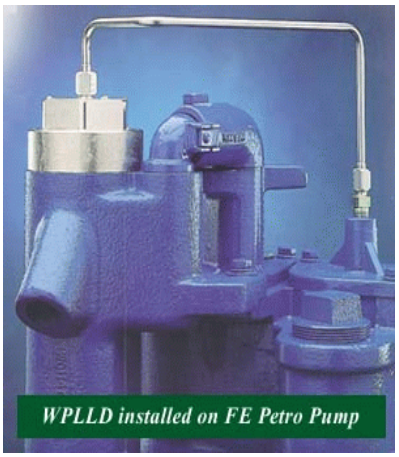
Wireless LLD w/Red Jacket pump



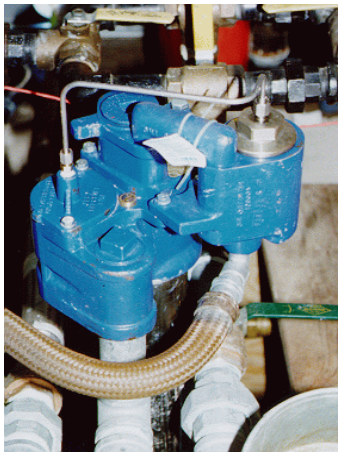
Pressure LLD (wire)



Pressure LLD (field)



Wireless LLD w/FE Petro pump



Wireless LLD