

24. (2)

**JUN 22 1999 ENGINEERING DATA TRANSMITTAL**

|   |  |  |  |   |  |
|---|--|--|--|---|--|
| 2. To: (Receiving Organization)<br>Distribution   |  | 3. From: (Originating Organization)<br>COGEMA Engineering                                    |  | 4. Related EDT No.:<br>140134             |  |
| 5. Proj./Prog./Dept./Div.:<br>SY Farm Annulus Leak Detector   |  | 6. Design Authority/Design Agent/Cog. Engr.:<br>RW REED / SG SMITH / JH HUBER                |  | 7. Purchase Order No.:<br>N/A             |  |
| 8. Originator Remarks:<br>The EDT releases the shop ATP for the Enraf 854 ATG with SPU_II card. The Enraf will be used as a leak detector in the annulus of waste tanks on the Hanford Reservation. |  |  |  | 9. Equip./Component No.:<br>N/A           |  |
|   |  |  |  | 10. System/Bldg./Facility:<br>241-SY      |  |
|   |  |  |  | 12. Major Assm. Dwg. No.:<br>N/A          |  |
|   |  |  |  | 13. Permit/Permit Application No.:<br>N/A |  |
| 11. Receiver Remarks:   |  | 11A. Design Baseline Document? <input type="radio"/> Yes <input checked="" type="radio"/> No |  | 14. Required Response Date:<br>N/A        |  |

| 15. DATA TRANSMITTED |                          |               |              |   | (F)                 | (G)                    | (H)                    | (I)                  |
|----------------------|--------------------------|---------------|--------------|---|---------------------|------------------------|------------------------|----------------------|
| (A) Item No.         | (B) Document/Drawing No. | (C) Sheet No. | (D) Rev. No. | (E) Title or Description of Data Transmitted  | Approval Designator | Reason for Transmittal | Originator Disposition | Receiver Disposition |
| 1                    | HNF-4546                 | -             | 0            | ENRAF SERIES 854 ADVANCED TECHNOLOGY GAUGE (ATG) WITH SPU II CARD FOR LEAK DETECTOR USE ACCEPTANCE TEST | Q                   | 1                      | 1                      |                      |
|                      |                          |               |              |   |                     |                        |                        |                      |
|                      |                          |               |              |   |                     |                        |                        |                      |
|                      |                          |               |              |   |                     |                        |                        |                      |
|                      |                          |               |              |   |                     |                        |                        |                      |
|                      |                          |               |              |   |                     |                        |                        |                      |
|                      |                          |               |              |   |                     |                        |                        |                      |

| 16. KEY  |   |  |
|--|---|--|
| Approval Designator (F)                          | Reason for Transmittal (G)  | Disposition (H) & (I)  |
| E, S, Q, D OR N/A<br>(See WHC-CM-3-5, Sec. 12.7) | 1. Approval<br>2. Release<br>3. Information<br>4. Review<br>5. Post-Review<br>6. Dist. (Receipt Acknow. Required) | 1. Approved<br>2. Approved w/comment<br>3. Disapproved w/comment<br>4. Reviewed no/comment<br>5. Reviewed w/comment<br>6. Receipt acknowledged |

| 17. SIGNATURE/DISTRIBUTION<br>(See Approval Designator for required signatures) |           |                       |                  |          |          |            |           |                   |                   |          |          |
|---|-----------|-----------------------|------------------|----------|----------|------------|-----------|-------------------|-------------------|----------|----------|
| (G) Reason  | (H) Disp. | (J) Name              | (K) Signature    | (L) Date | (M) MSIN | (G) Reason | (H) Disp. | (J) Name          | (K) Signature     | (L) Date | (M) MSIN |
|   |           | Design Authority      |                  |          |          | 1          | 1         | WE WILLINGHAM JR. | <i>Willingham</i> | 6/21/99  |          |
| 1   | 1         | Design Agent SG SMITH | <i>SG Smith</i>  | 6-21-99  |          |            |           |                   |                   |          |          |
| 1   | 1         | Cog. Eng. JH HUBER    | <i>JH Huber</i>  | 6-21-99  |          |            |           |                   |                   |          |          |
| 1   | 1         | Cog. Mgr. RE LARSON   | <i>RE Larson</i> | 6/22/99  | 74-07    |            |           |                   |                   |          |          |
| 1   | 1         | QA RR TRUE            | <i>RR True</i>   | 6-21-99  |          |            |           |                   |                   |          |          |
|   |           | Safety                |                  |          |          |            |           |                   |                   |          |          |
|   |           | Env.                  |                  |          |          |            |           |                   |                   |          |          |

|  |  |  |  |  |  |   |  |
|--|--|--|--|--|--|---|--|
| 18. Signature of EDT Originator<br><i>SG Smith</i> 6-21-99 |  | 19. Authorized Representative for Receiving Organization<br><i>RE Larson</i> 6/22/99 |  | 20. Design Authority/Cognizant Manager<br><i>RE Larson</i> 6/22/99 |  | 21. DOE APPROVAL (if required)<br>Ctrl No. _____<br><input type="radio"/> Approved<br><input type="radio"/> Approved w/comments<br><input type="radio"/> Disapproved w/comments |  |
|--|--|--|--|--|--|---|--|

S

# ENRAF SERIES 854 ADVANCED TECHNOLOGY GAUGE (ATG) WITH SPU\_II CARD FOR LEAK DETECTOR USE ACCEPTANCE TEST PROCEDURE

Sean G. Smith  
COGEMA Engineering Corporation  
Richland, WA 99352  
U.S. Department of Energy Contract DE-AC06-96RL13200

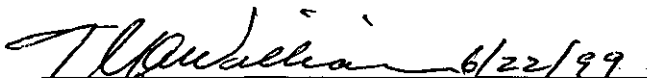
EDT/ECN: 140134 UC: 2000  
Org Code: S1700 Charge Code: 106773  
B&R Code: N/A Total Pages: 32 30  
06/22/99

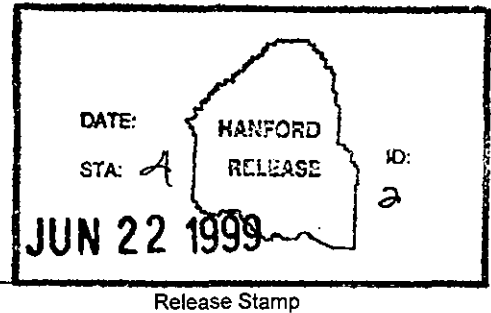
Key Words: Enraf, ATG Series 854, SPU\_II Card, Level Gauge, LIT, Indicating Transmitter, Leak Detector

Abstract: The following Acceptance Test Procedure was written to test the Enraf Series 854 ATG with SPU\_II card prior to installation in the Tank Farms. The procedure sets various parameters and verifies the gauge and the alarms functionality.

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Printed in the United States of America. To obtain copies of this document, contact: Document Control Services, P.O. Box 950, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.

  
Release Approval Date



Approved For Public Release

TABLE OF CONTENTS

1.0 INSTRUCTIONS ..... 3

1.1 PURPOSE ..... 3

1.2 SCOPE ..... 3

1.3 REFERENCES ..... 3

1.4 RESPONSIBILITIES ..... 4

1.5 DESCRIPTION OF THE SYSTEM ..... 4

1.6 TEST CONDITIONS AND EQUIPMENT REQUIRED ..... 5

1.7 CRITERIA ..... 5

2.0 TEST EXECUTION ..... 6

2.1 INITIALIZING THE GAUGE ..... 7

2.2 CHECKING FOR ERROR CODES ..... 8

2.3 TESTING THE LEVEL GAUGE OPERABILITY ..... 8

2.4 DRUM CIRCUMFERENCE VERIFICATION ..... 10

2.5 DISPLACER WEIGHT VERIFICATION ..... 11

2.6 SETTING PARAMETERS FOR THE SPU\_II CARD ..... 12

2.7 CONNECTING INSTRUMENTATION TO ALARM OUTPUTS ..... 12

2.8 ENTERING PARAMETERS FOR ALARM TESTING ..... 13

2.9 CERTIFYING ALARM ACTIVATION FOR ALARMS ..... 14

2.10 TRANSPORTING THE LEVEL GAUGE ..... 16

2.11 DATA ..... 17

3.0 EXCEPTIONS TO ACCEPTANCE TEST ..... 17

4.0 TEST DATA MANAGEMENT ..... 18

4.1 ACCEPTANCE TEST REPORT GUIDANCE ..... 18

TEST EXECUTION DATA SHEET ..... 19

EXCEPTIONS DATA SHEET ..... 20

FIGURE 1 – TEST SETUP ..... 21

APPENDIX A – COMPUTER SETUP GUIDANCE ..... A-1

APPENDIX B – DRUM BEARING REMOVAL/CONDITIONING ..... B-1

APPENDIX C – FORCE TRANSDUCER CALIBRATION ..... C-1

## ENRAF SERIES 854 ADVANCED TECHNOLOGY GAUGE (ATG) WITH SPU\_II CARD FOR LEAK DETECTOR USE ACCEPTANCE TEST PROCEDURE

### 1.0 INSTRUCTIONS

#### 1.1 PURPOSE

This procedure checks the Enraf gauge received at Hanford is completely functional and has received no shipping damage. This procedure does not certify the gauge operation. The manufacturer certifies gauge operation.

#### 1.2 SCOPE

This procedure provides acceptance testing for Enraf Series 854 level gauges used to detect leaks in Hanford Waste Storage Tank annuli. The test will verify that the gauge functions according to the manufacturer's instructions and specifications and is properly setup prior to being delivered to the tank farm area. This ATP does not set up the gauge for any specific tank, but is generalized to permit testing the gauge prior to installation package preparation.

#### 1.3 REFERENCES

- Instruction Manual Series 854 ATG Level Gauge, Enraf Inc., Part No. 4416.220, Version 2.2 (See CV-31560, vendor information file).
- Instruction Manual SPU II Hard alarm output contacts, Enraf B.V., Part No. 4416.223, Version 1.1, May 1993
- Enraf Series 854 Advanced Technology Gauge (ATG) Acceptance Test Procedure, Lockheed Martin Hanford Company, HNF-SD-WM-ATP-077, Rev. 7
- Test Report for ENRAF Annulus Leak Detector Development, Lockheed Martin Hanford Company, HNF-4328, Rev. 0.

## 1.4 RESPONSIBILITIES

- 1.4.1 The Supervisor/Lead is responsible for coordinating the level gauge testing.
- 1.4.2 Instrument Craft is responsible for performing the testing and recording the test results.
- 1.4.3 Quality Control is responsible for witnessing the tests, signing the data sheets when testing is completed and placing a "green tag" on the gauge after successful completion of the test.

## 1.5 DESCRIPTION OF THE SYSTEM

Enraf Series 854 level gauges are certified by Factory Mutual (FM) for National Fire Protectional Association (NFPA 70) hazardous Class I, Division 1, Groups B, C, and D Locations. Its level measuring principle is based on the detection of variations in the weight of a displacer suspended in the process fluid. The displacer is connected to a wire wound on a precision measuring drum. A level change causes a change in the weight of the displacer that will be detected by the force transducer. Electronics within the gauge cause a servomotor to adjust the position of the displacer and compute the tank level based on the new position of the displacer drum. The gauge displays the level in decimal inches.

The type of displacer to be used is the ALD Displacer Assembly. The ALD Displacer Assembly is found on drawing H-2-817634, Part #89 (added by ECN-649073).

The following ATP is valid for only those 854 ATG that have the SPU\_II card (hard alarm output option) installed.

## 1.6 TEST CONDITIONS AND EQUIPMENT REQUIRED

The equipment listed below is required to perform this procedure.

- Portable Enraf Terminal (PET) Model No. 847
- Enraf Test Weights (Enraf PN 1854-061)
- Reamer (Enraf PN 4563.030) or #31 drill
- Enraf Extraction Tool (optional)
- Clear Container, 18 inches deep minimum
- Measuring device capable of measuring length in mm.
- Ohmmeter with two pair of test leads (calibration not required)
- Method of removing water (pipet or baster)
- Hard surface capable of covering top of container
- Calculator

## 1.7 CRITERIA

- 1.7.1 The gauge must accept all commands. If a command is not accepted as described by vendor documentation, the condition must be resolved adequately on the Exceptions Data Sheet.
- 1.7.2 The force transducer must accept calibration. If the force transducer is found to be in need of calibration then a force transducer calibration as performed per Appendix C. The force transducer within the gauge is the primary component important to gauge operability. Should the force transducer be out of calibration, the gauge will not weigh the displacer properly, causing the gauge to report erroneous levels if at all. In the case of a Level Gauge ATP, the force transducer must report a displacer weight within 3 grams of the actual weight inscribed or marked on the displacer. Document the force transducer calibration or other problems as an exception on the Exceptions Data Sheet.
- 1.7.3 All error codes must be clearable. All operations or activities performed by the gauge must be carried out as expected or described in the test or vendor documentation. If any operation returns an error code, recovery must be possible within a reasonable amount of time and effort. If an error code does not clear within a reasonable amount of time, document as an exception on the Exceptions Data Sheet.

## 2.0 TEST EXECUTION

### NOTE:

The commands typed on the PET or computer are shown in square brackets "[]" (The square brackets are NOT to be typed as part of the command). Included is any additional information the command requires.

After typing the text within the square brackets, press the ENTER key. If an error is made during the typing of the command, use the backspace (BS) key to delete the error.

After entering a command, the PET or computer will give one of two responses: The first response will show the entered command with an "&" character at the end (i.e. "TG&"). This response tells the user that the gauge accepted the command. The second response will show the two digit command (i.e. TG) followed by a "!" and a three digit error code (i.e. "TG!053"). This command tells the user that the gauge did not accept the command. For a list of error codes, see the Enraf 854 ATG Level Gauge Instruction Manual, section 12.4.

### PROCEDURE NOTE

In the following steps, if values are requested, the values shall be recorded in the Test Execution Data Sheet (located at the end of this procedure) for the appropriate step number in the Value column. If verification is requested, write "Accepts" in the accept/reject column in the Test Execution Data Sheet for the appropriate step number.

If an error occurs in any step, an exception will be entered in the Exceptions Data Sheet listing the step where the error occurred, and a general description of the error. Corrective actions shall be in accordance with section 3.0. A force transducer calibration may be performed at any time at the Supervisor / Lead's discretion.

## 2.1 INITIALIZING THE GAUGE

### INFORMATION

**This section prepares the gauge for testing. It connects power and unlocks the servomotor.**

- 2.1.1 Mount the gauge per the 854 ATG Level gauge Instruction Manual. Provide electrical connections to the gauge per the 854 ATG Level Gauge Instruction Manual, the National Fire Protection Association (NFPA 70) National Electrical Code.
- 2.1.2 Install the drum and displacer per the Enraf Series 854 ATG Level Gauge Instruction Manual, Section 8.4.
- 2.1.3 Unlock the servo motor prior to connecting power per the 854 ATG Level Gauge Instruction Manual, Section 8.5.
- 2.1.4 Connect the PET to the optical port located on the side of the gauge housing.
- 2.1.5 Connect the gauge to a 120 Vac (+/- 5 Vac) power source, per the 854 ATG Level Gauge Instruction Manual, Section 4.3.1. The display screen on the gauge will show one dark line. After approximately 20 seconds, the display will show the gauge initializing.
- 2.1.6 Configure the gauge per Appendix A Section COMPUTER SETUP GUIDANCE and Figure 1.
- 2.1.7 In the Logger program, select SEND ITEMS and Ensure F5 equals 1B/2B; IF NOT, THEN <F5>, 1B<ENTER>, 2B <ENTER>.



## 2.2 CHECKING FOR ERROR CODES

### INFORMATION

Record any errors on the data sheet. Correct the errors, or enter it as an exception. For a list of error codes, see the Enraf 854 ATG Level Gauge Instruction Manual.

- 2.2.1 Enter Command [EP] = "XPU error code". Verify that EP000 is displayed. **RECORD VERIFICATION** in the data sheet.
- 2.2.2 Enter Command [ES] = "SPU error code". Verify that ES0000 is displayed. **RECORD VERIFICATION** in the data sheet.

## 2.3 TESTING THE LEVEL GAUGE OPERABILITY

### INFORMATION

This section enters data into the memory of the level gauge. These values place the gauge into generic configuration for use in any tank.

- 2.3.1 Enter Command [UN]. This command unlocks the gauge and allows the displacer to move downward to the floor or other hard surface.

**NOTE:**

If the displacer does not move downward, check to make sure that the drum moves freely on the bearings. If the drum does not move freely, perform the drum bearing removal/reconditioning procedure in Appendix B. If the drum does move freely, re-calibrate the force transducer using the procedure in Appendix C. After drum bearing reconditioning or force transducer re-calibration, perform step 2.3.1 again. Document the drum bearing reconditioning or force transducer re-calibration as an exception.

- 2.3.2 Enter Command [W2=ENRAF2]. This command enters protection level 2.
- 2.3.3 Enter the following parameters into the gauge. **VERIFY** proper parameter entry and **RECORD VERIFICATION** that all parameters were entered correctly:
- [TT=+00900.00] ("TANK TOP" parameter)
  - [UR=+00900.00] ("UPPER REFERENCE" parameter)
  - [MH=+00890.00] ("MOTOR HIGH" parameter)
  - [MZ=+00880.00] ("LOCK TEST LIMIT" parameter)
  - [HH=+00870.00] ("HIGH HIGH ALARM" parameter)
  - [HA=+00860.00] ("HIGH ALARM" parameter)
  - [LA=+00006.00] ("LOW ALARM" parameter)
  - [LL=+00003.00] ("LOW LOW ALARM" parameter)
  - [ML=+00001.00] ("MOTOR LIMIT SWITCH LOW" parameter)
  - [RL=+00850.00] ("REFERENCE LEVEL" parameter)
- 2.3.4 Enter command [AR]. This command directs the gauge to accept the current value for "RL".
- 2.3.5 Enter command [EX].

**NOTE:**

**Prior to executing step 2.3.6, verify that the opening to the gauge flange is blocked so that the displacer cannot be raised up into the drum housing.**

- 2.3.6 Enter Command [CA]. This command raises the displacer. Verify that the displacer raises up to the gauge flange and stops. **RECORD VERIFICATION** in the data sheet.
- 2.3.7 Enter Command [UN].
- 2.3.8 After the gauge stabilizes, verify that the level reading in the gauge LCD display is reading within 0.10 inches of the RL value programmed in step 2.3.3. **RECORD VERIFICATION** in the data sheet.
- 2.3.9 Enter command [TG]. This command tests the gauge.
- 2.3.10 Verify that the displacer rises a couple of inches and then goes back down to the RL. **RECORD VERIFICATION** in the data sheet.

**2.4 DRUM CIRCUMFERENCE VERIFICATION**

- 2.4.1 Enter Command [DC]. This command displays the preprogrammed drum circumference.
- 2.4.2 Verify that the drum circumference value displayed (DC) is the same as the value for the Drum circumference found engraved on the wire drum. **RECORD** the value in the data sheet. **If** the Drum Circumference value engraved on the wire drum does not exactly match the preprogrammed Drum Circumference (DC) value, **perform** steps 2.4.3 through 2.4.5, **otherwise** go to step 2.5. Note that display on computer is in meters, and engraved value is in millimeters.

**NOTE:**

**This value is displayed in scientific notation.**

**The value will look like "DC=+.33000000E+00".**

- 2.4.3 Enter Command [W2=ENRAF2].
- 2.4.4 Enter Command [DC=+.XXXXXXXXXE+00]. The value for XXXXXXXX is the Drum Circumference value engraved on the wire drum. **RECORD** the value in the data sheet.
- 2.4.5 Enter command [EX].

**2.5 DISPLACER WEIGHT VERIFICATION**

- 2.5.1 Enter command [CA].
- 2.5.2 After the displacer rises a few inches, enter command [FR]. This command stops the displacer.
- 2.5.3 Enter command [MF]. This command measures the motor frequency.
- 2.5.4 After "FR" appears in the gauge's LCD display, PET display or computer display, enter command [WQ]. This command measures the weight of the displacer. **RECORD** the WQ value in the data sheet.

**NOTE:**

**This value is displayed in scientific notation.**

**The value will look like "WQ=+.22300000E+03".**

- 2.5.5 Verify that the WQ value is within 3 grams of the weight engraved on the displacer. **RECORD** the verification on the data sheet.

- 2.5.6 If the value for WQ is **not** within 3 grams (.00300000E+03) of the weight engraved on the displacer, **calibrate** the force transducer per the force transducer calibration procedure found in Appendix C. **Document** this calibration as an exception. After force transducer calibration, perform steps 2.5.3-2.5.5 again, then **continue** with step 2.5.7.
- 2.5.7 If force transducer could not be calibrated to within 3 grams, contact cognizant engineer for assistance and proceed as directed.

## 2.6 SETTING PARAMETERS FOR THE SPU\_II CARD

- 2.6.1 Enter Command [RY=HATLAT]. This will set relay 1 to be used for a HIGH ALARM and relay 2 to be used for a LOW ALARM. **RECORD** the verification on the data sheet.
- 2.6.2 Enter Command [W1=ENRAF1]. Accesses Protection level 1
- 2.6.3 Enter Command [RZ=DEDE]. This will set both relay 1 and relay 2 to be energized in case of alarm situation and in case of 854 ATG failure. **RECORD** the verification on the data sheet
- 2.6.4 Enter Command [EX]. Command returns unit to operation mode.

## 2.7 CONNECTING INSTRUMENTATION TO ALARM OUTPUTS

The following process will connect the two alarm relays provided by the SPU\_II card to an ohmmeter for testing of alarm activation.

The default configuration sets the first relay to indicate a High Alarm (HA). The second relay indicates a Low Alarm (LA).

- 2.7.1 Disconnect the power supply.
- 2.7.2 Remove the terminal compartment cover.
- 2.7.3 Connect gray terminals 5 and 6 to a set of leads for the ohmmeter. Mark leads as RELAY 1.

2.7.4 Connect gray terminals 7 and 8 to a set of leads for the ohmmeter. Mark leads as RELAY 2.

2.7.5 Replace the terminal compartment cover.

2.7.6 Reconnect the power supply

## 2.8 ENTERING PARAMETERS FOR ALARM TESTING

2.8.1 Secure ENRAF above container.

2.8.2 Place hard surface over top of container (piece of cardboard or wood).

2.8.3 Enter Command [UN]. Command unlocks the gauge and allows displacer to move downward to container.

2.8.4 Once displacer is seated on the hard surface above container, enter Command [W2=ENRAF2]. Command enters protection level 2.

2.8.5 Enter command: [RL=+00200.00] ("REFERENCE LEVEL" parameter)

2.8.6 Enter command [AR]. Command directs the gauge to accept the current value for "RL".

2.8.7 Enter command [EX]. Returns gauge to operational mode.

2.8.8 Remove the hard surface from the top of the container.

2.8.9 Measure the thickness of the hard surface.  
Record the value as (a) \_\_\_\_\_ inches

2.8.10 Place the rule vertically alongside of the clear container.

2.8.11 Fill the container with approximately 1.5 inches of water.

2.8.12 Enter Command [UN]. Command unlocks the gauge and allows displacer to move downward.

2.8.13 Once the displacer is floating in the water, add or remove water until the water level in the container is 2 inches.  
**RECORD** the verification on the data sheet.

- 2.8.14 Measure the distance from the top of the container to the water level. Record the value as (b) \_\_\_\_\_ inches.
- 2.8.15 Add the values from (a) + (b). Record the value as (c) \_\_\_\_\_ inches.
- 2.8.16 Subtract 0.25 from the value (c). ( $c - 0.25$ ) Value will be used for the High Alarm [HA]. Record the value as (d) \_\_\_\_\_ inches.
- 2.8.17 Add 0.25 to the value (c). ( $c + 0.25$ ) Value will be used for the Low Alarm [LA]. Record the value as (e) \_\_\_\_\_ inches.
- 2.8.18 Enter Command [W2=ENRAF2]. Command enters protection level 2.
- 2.8.19 Enter the following parameters into the gauge. Verify proper entry and **RECORD VERIFICATION** that all parameters were entered correctly.
- [TT=+00900.00] ("TANK TOP" parameter)
  - [UR=+00900.00] ("UPPER REFERENCE" parameter)
  - [MH=+00890.00] ("MOTOR HIGH" parameter)
  - [MZ=+00880.00] ("LOCK TEST LIMIT" parameter)
  - [HH=+00870.00] ("HIGH HIGH ALARM" parameter)
  - [HA=(+Value d)] ("HIGH ALARM" parameter)
  - [LA=(+Value e)] ("LOW ALARM" parameter)
  - [LL=+00001.00] ("LOW LOW ALARM" parameter)
  - [ML=+00001.00] ("MOTOR LIMIT SWITCH LOW" parameter)
  - [AH=+00000.02] ("ALARM HYSTERESIS" parameter)
- 2.8.20 Enter command [EX]. Returns gauge to operational mode.

## 2.9 CERTIFYING ALARM ACTIVATION FOR ALARMS

### 2.9.1 HIGH ALARM ACTIVATION

- 2.9.1.1 Connect the leads marked RELAY 1 to the ohmmeter.
- 2.9.1.2 Slowly fill the container with water until the ohmmeter displays a low resistance (NOT INFINITY). (NOTE: Water level should be approximately 2.25 inches)

- 2.9.1.3 Measure the distance from the bottom of the container to the water level. Verify the distance is 2.25 inches +/- 0.04 inches. **RECORD** the verification on the data sheet.
- 2.9.1.4 Enter the command [RX]. This command will give the relay status. Once the command is entered a two digit letter combination (B0,B1) should appear. B0 gives status of relay 1 and B1 gives status of relay 2. Below are the possible results:

| B0 or B1 | Status of relay                        |
|----------|--|
| K        | Acknowledged alarm                     |
| D        | De-activated relay                     |
| A        | Activated relay                        |
| T        | Relay is active with time setting      |
| F        | Fail (Default)                         |
| N        | Relay is not mounted (and not checked) |

Verify the status of relay 1 (B0) is A, **RECORD** the verification on the data sheet.

- 2.9.1.5 Disconnect the leads marked RELAY1 from the ohmmeter.

## 2.9.2 LOW ALARM ACTIVATION

- 2.9.2.1 Connect the leads marked RELAY 2 to the ohmmeter
- 2.9.2.2 Using a pipet (or other method of water removal), remove water until the ohmmeter reads a low resistance (NOT INFINITY).
- 2.9.2.3 Measure the level of water from the bottom of the container to the water level. Verify the distance is 1.75 inches +/- 0.04 inches. **RECORD** the verification on the data sheet.
- 2.9.2.4 Enter the command [RX]. Command will give the relay status. Once the command is entered a two digit letter combination (B0,B1) will appear. B0 gives status of relay 1 and B1 gives status of relay 2.

Verify the status of relay 2 (B1) to be A, the relay was activated. **RECORD** the verification on the data sheet.



- 2.9.2.5 Disconnect the leads marked RELAY 2 from the ohmmeter.
- 2.9.2.6 Enter command [CA] to raise the displacer. Once the displacer is clear of the container enter command [FR] to stop the displacer before it reaches the drum housing. **NOTE: IT IS VERY IMPORTANT THAT THE DISPLACER DOES NOT BECOME JAMMED INSIDE THE DRUM HOUSING.**
- 2.9.2.7 Remove excess water from the bottom of the displacer.
- 2.9.2.8 Remove all of the water from the container.
- 2.9.2.9 Repeat steps 2.3.2 – 2.3.5 to reset the default values. **VERIFY** proper parameter entry and **RECORD VERIFICATION** that all parameters were entered correctly:
- 2.9.2.10 Disconnect the power supply.
- 2.9.2.11 Remove the terminal compartment cover.
- 2.9.2.12 Disconnect leads from gray terminals 5 and 6.
- 2.9.2.13 Disconnect leads from gray terminals 7 and 8.
- 2.9.2.14 Replace the terminal compartment cover.

## 2.10 TRANSPORTING THE LEVEL GAUGE

### CAUTION

**This section prepares the gauge for transport. The motor must be locked to prevent possible damage to the force transducer.**

- 2.10.1 If the level gauge display is not in FORMAT B (see the 854 ATG Level Gauge Instruction Manual, Figure 7.3), enter command [W1=ENRAF1]. Once in Protection Level 1, enter command [DF=B] (this command switches the gauge to display format B). Enter command [EX].

- 2.10.2 If using a computer for the testing, log the gauge data onto the computer (see Appendix A, Section LOGGING GAUGE DATA ONTO COMPUTER).
- 2.10.3 Disconnect the gauge from the power source.
- 2.10.4 "Lock" the servomotor, per the 854 ATG Level Gauge Instruction Manual, Section 8.5, prior to transporting the gauge. **RECORD VERIFICATION** motor is locked.
- 2.10.5 Remove the drum and displacer, per the 854 ATG Level Gauge Instruction Manual, Section 8.4, prior to transporting the gauge.

## 2.11 DATA

- 2.11.1 Mail a copy of the completed data sheets, vendor information, and electronic copy of the log file to J. H. Huber at T4-07.

## 3.0 EXCEPTIONS TO ACCEPTANCE TEST

Exceptions to the test are dispositioned and agreed to by all witnesses. Actions taken regarding disposition are noted on the "Exceptions Data Sheet". Typical dispositions are:

- Test approved with exception (i.e., rerun of the acceptance test unnecessary).
- Entire acceptance test to be repeated after the discrepancy has been corrected.
- ATP step(s) affected to be repeated after the discrepancy has been corrected.

#### **4.0 TEST DATA MANAGEMENT**

The test data shall be entered on the attached data sheets. Witness signatures at the bottom of the data sheet indicates that the witness agrees to the accuracy of the data recorded and comparisons made.

Upon successful completion of testing activities, the Test Witnesses will sign the master copy of the DATA SHEETS. An appropriate "Acceptance Test Report" shall be generated to publish the results of testing activities.

#### **4.1 ACCEPTANCE TEST REPORT GUIDANCE**

The data sheets, which are completed during the testing activities, will be included in the Acceptance Test Report. If additional gauges are tested using this procedure, a different data sheet will be used for each gauge and added to the ATR as a revision.

| TEST EXECUTION DATA SHEET |                 |                       | Page 1 of 1    |         |
|---------------------------|-----------------|-----------------------|----------------|---------|
| Date:                     |                 | Tank Number:          |                |         |
| Gauge Serial Number:      |                 | Test Performed by:    |                |         |
| Reference Sequence        | Attribute       | Value                 | Accept /Reject | Comment |
| 2.2.1                     | EP              |                       |                |         |
| 2.2.2                     | ES              |                       |                |         |
| 2.3.3                     | PARAMETERS      | Entered Correctly     |                |         |
| 2.3.6                     | CA              |                       |                |         |
| 2.3.8                     | RL              |                       |                |         |
| 2.3.10                    | RL              |                       |                |         |
| 2.4.2                     | DC              |                       |                |         |
| 2.4.4                     | DC              |                       |                |         |
| 2.5.4                     | WQ              |                       |                |         |
| 2.5.5                     | WQ              |                       |                |         |
| 2.6.1                     | RY              | HATLAT                |                |         |
| 2.6.3                     | RZ              | DEDE                  |                |         |
| 2.8.13                    | WATER LEVEL     | 2 inches              |                |         |
| 2.8.19                    | PARAMETERS      | Entered Correctly     |                |         |
| 2.9.1.3                   | [HA] Activation | Alarm Activated       |                |         |
| 2.9.1.4                   | RX              |                       |                |         |
| 2.9.2.3                   | [LA] Activation | Alarm Activated       |                |         |
| 2.9.2.4                   | RX              |                       |                |         |
| 2.9.2.9                   | PARAMETERS      | All Entered Correctly |                |         |
| 2.10.4                    | MOTOR LOCK      |                       |                |         |

Test Witnesses:

\_\_\_\_\_  
Supervisor/Lead\_\_\_\_\_  
Date\_\_\_\_\_  
Quality Control\_\_\_\_\_  
Date\_\_\_\_\_  
Instrument Tech.\_\_\_\_\_  
Date

**EXCEPTIONS DATA SHEET**

Gauge Serial Number: \_\_\_\_\_

Page \_\_\_ of \_\_\_

| Paragraph No.  | Description/Disposition                        |  |  |              |              |                            |                            |                      |                      |                       |                       |
|--|--|--|--|--------------|--------------|----------------------------|----------------------------|----------------------|----------------------|-----------------------|-----------------------|
| <table border="1"><thead><tr><th data-bbox="159 1203 810 1367"><b><u>TEST APPROVED - NO EXCEPTIONS:</u></b></th><th data-bbox="810 1203 1382 1367"><b><u>TEST APPROVED - WITH EXCEPTIONS:</u></b></th></tr></thead><tbody><tr><td data-bbox="159 1367 810 1429">_____<br/>PIC</td><td data-bbox="810 1367 1382 1429">_____<br/>PIC</td></tr><tr><td data-bbox="159 1429 810 1491">_____<br/>Quality Assurance</td><td data-bbox="810 1429 1382 1491">_____<br/>Quality Assurance</td></tr><tr><td data-bbox="159 1491 810 1554">_____<br/>Maintenance</td><td data-bbox="810 1491 1382 1554">_____<br/>Maintenance</td></tr><tr><td data-bbox="159 1554 810 1699">_____<br/>Cog Engineer</td><td data-bbox="810 1554 1382 1699">_____<br/>Cog Engineer</td></tr></tbody></table> |  | <b><u>TEST APPROVED - NO EXCEPTIONS:</u></b> | <b><u>TEST APPROVED - WITH EXCEPTIONS:</u></b> | _____<br>PIC | _____<br>PIC | _____<br>Quality Assurance | _____<br>Quality Assurance | _____<br>Maintenance | _____<br>Maintenance | _____<br>Cog Engineer | _____<br>Cog Engineer |
| <b><u>TEST APPROVED - NO EXCEPTIONS:</u></b>   | <b><u>TEST APPROVED - WITH EXCEPTIONS:</u></b> |  |  |              |              |                            |                            |                      |                      |                       |                       |
| _____<br>PIC   | _____<br>PIC                                   |  |  |              |              |                            |                            |                      |                      |                       |                       |
| _____<br>Quality Assurance   | _____<br>Quality Assurance                     |  |  |              |              |                            |                            |                      |                      |                       |                       |
| _____<br>Maintenance   | _____<br>Maintenance                           |  |  |              |              |                            |                            |                      |                      |                       |                       |
| _____<br>Cog Engineer  | _____<br>Cog Engineer                          |  |  |              |              |                            |                            |                      |                      |                       |                       |

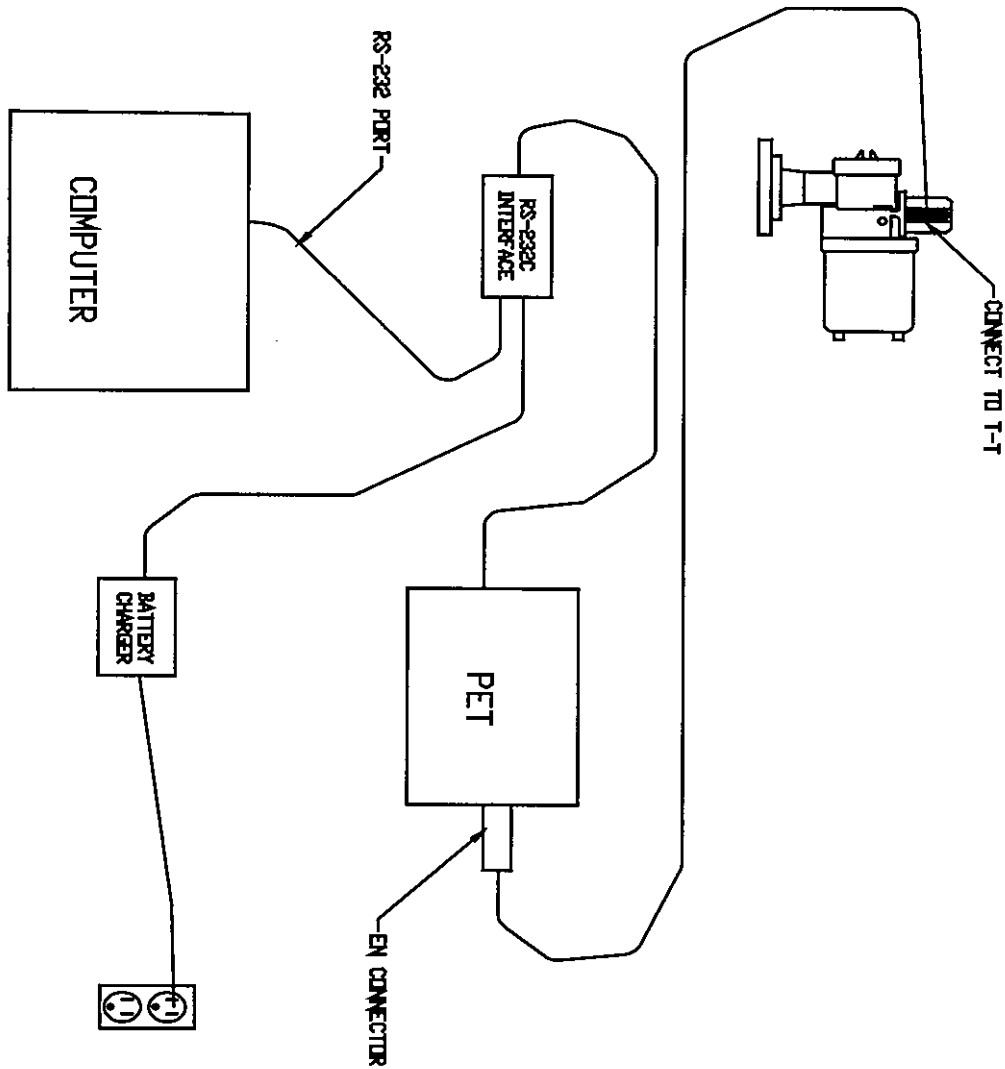


FIGURE 1

HNF-4546  
Rev. 0

## **APPENDIX A**

**Computer Setup Guidance  
Changing Level Dimensions  
Logging Gauge Data onto Computer**

## COMPUTER SETUP GUIDANCE:

1. Turn PET ON.
2. Enter the TA command, note the gauge address displayed in the PET display, (i.e. TA05). TURN PET OFF.
3. Disconnect the infrared connector, and connect the computer and PET to the gauge per Figure A-1. Power up PET/gauge as required.
4. Place the PET in SETUP MODE by pressing keys control-esc at the same time.
5. Press the down arrow on the PET keyboard until MODE is displayed at the top of the PET display.
6. Press the right arrow until the cursor is underneath RS232.
7. Press the down arrow until the display on the PET reads "RS-232 Baudrate".
8. Verify (and if necessary correct) the cursor is underneath 1200, each time a 1200 baudrate selection appears.
9. Press the down arrow until the PET display reads SETUP MODE, and then press, control-esc at the same time.
10. Turn on the computer.
11. If in MS-DOS mode, at the c:\> prompt on the computer display, access the logger directory by typing, cd\logger
12. Start the logger program by typing, LOGV18 or selecting the Logger icon in Windows95.
13. Use the computer arrow keys and highlight item #1, "Setup system", then press the enterkey.
14. Highlight item #4, "Gauge address" and press enter.
15. Enter the gauge address noted from step #2 (note the flashing cursor), then press enter.



16. Verify that the other parameters shown in the "SETUP MENU" display match the parameters shown below. If the parameters don't match, change them using the procedure in steps 14 and 15.

---

 SETUP MENU
 

---

|   |                       |
|---|-----------------------|
| 1 ) RS232C port & Baudrate                    | (port 1 @ 1200 Baud.) |
| 2 ) Add header to every file                  | (N)                   |
| 3 ) Ciu address                               | ()                    |
| *4 ) Gauge Address                            | (XX)                  |
| 5 ) Max. number of records in file LOGV17.CYC | (100)                 |
| 6 ) Name cyclusfile                           | (LOGV17.CYC)          |
| 7 ) Max. number of retries per CIU request    | (3)                   |
| 8 ) Timeout CIU                               | (.9 sec.)             |
| 9 ) Turn_around delay                         | (0 sec.)              |
| A ) ITEM directory                            | (C:\LOGGER\ITEMS\)    |
| B ) CYC_file directory                        | (C:\LOGGER\CYC\)      |
| C ) LOG_file directory                        | (C:\LOGGER\LOG\)      |
| D ) file_to_Field_file directory              | (C:\LOGGER\FTF\)      |
| E ) Library_directory                         | (C:\LOGGER\LIB\)      |
| F ) RAM disk                                  | (\)                   |
| G ) Return to main menu                       |                       |

\*XX is obtained from gauge parameter [TA]

---

17. Highlight item #G, "Return to main menu", press enter key.
18. A prompt will ask, "Save new setup on disk (y,n)?, type, y for a yes response.
19. Highlight item #2, "Send items", press enter key.
20. Return to section 2.1.7.

.CHANGING LEVEL DIMENSIONS:

1. <ESC> from LOGGER'S "MAIN MENU", enter the "SPECIAL MENU".
2. Enter the "CHANGE DIMENSIONS" menu.

3. Enter the gauge's "TRANSMISSION ADDRESS" (TA).
4. Enter "1) LEVEL DIMENSION (XXXXXX)"
5. Enter "TO INCHES"
6. Return to the "MAIN MENU"
7. Return to "SEND ITEMS"

LOGGING GAUGE DATA ONTO COMPUTER:

1. From LOGGER'S "MAIN MENU", enter the "SPECIAL MENU".
2. Enter "1) GAUGE LOGGING ON DISK".
3. Enter the gauge's "TRANSMISSION ADDRESS" (TA).

HNF-4546  
Rev. 0

## **APPENDIX B**

### **Drum Bearing Removal/Conditioning**

## DRUM BEARING REMOVAL/RECONDITIONING

1. Disconnect the gauge from the power source. Use a PLD to lock out power.
2. "Lock" the servo motor, per the 854 ATG Level Gauge Instruction Manual, Section 8.5.
3. Remove the drum and displacer per the 854 ATG Level Gauge Instruction Manual, Section 8.4.
4. Remove the drum shaft bushing from the gauge per the 854 ATG Level Gauge Instruction Manual, Figure 9.3.
5. Remove the bearings (2 black disks on each end of the bushing) from the drum shaft bushing per the 854 ATG Level Gauge Instruction Manual, Figure 9.3.
6. Use the reamer or the #31 drill to ream out both bearings.
7. Reinstall the reconditioned drum bearings into the drum shaft bushing.
8. Reinstall the drum shaft bushing into the gauge.
9. Reinstall the drum and displacer, per the 854 ATG Level Gauge Instruction Manual, Section 8.4.
10. "Unlock" the servo motor, per the 854 ATG Level Gauge Instruction Manual, Section 8.5.
11. Connect the gauge to the power source.

HNF-4546  
Rev. 0

**APPENDIX C**  
**Force Transducer Calibration**

## FORCE TRANSDUCER CALIBRATION

1. Raise the displacer to approximately 6" below the gauge flange by entering command [CA]. To stop the displacer, enter command [FR].
2. Enter command [W2=ENRAF2].
3. Enter command [WT=DDD]. This command disables the "wire-rupture" protection.
4. Remove the displacer from the measuring wire.
5. Attached the 25 gram weight to the measuring wire loop. The 25 gram weight is the smallest of weights in the set and has two hooks.
6. Enter command [BT]. This command activates a BALANCE TEST. The BALANCE TEST will take approximately five minutes to complete.
7. After "FR" appears in the gauge's LCD display, PET display or computer display, enter command [BF]. This command will display the frequency measured during the BALANCE TEST. Record this frequency (F0) below:

F0=\_\_\_\_\_

8. Attach the 75 gram weight to the 25 gram weight. The 75 gram weight is the third smallest in the set. Note: If there is insufficient room for the test weights to move downward (approximately 12"), perform step 1 to raise the test weights.
9. Repeat steps 6 and 7. Record the frequency (F1) below:

F1=\_\_\_\_\_

10. Remove the 75 gram weight and attach the 150 gram weight to the 25 gram weight. The 150 gram weight is the second largest weight in the set. Note: If there is insufficient room for the test weights to move downward (approximately 12"), perform step 1 to raise the test weights.
11. Repeat steps 6 and 7. Record the frequency (F2) below:

F2=\_\_\_\_\_

12. Remove the 150 gram weight and attach the 225 gram weight to the 25 gram weight. The 225 gram weight is the largest weight in the set. Note: If there is insufficient room for the test weights to move downward (approximately 12"), perform step 1 to raise the test weights.

13. Repeat steps 6 and 7. Record the frequency (F3) below:

F3=\_\_\_\_\_

14. Enter command [W2=ENRAF2].
15. Enter command [F0=+.XXXXXXXXXE+XX]. This command re-programs frequency 0. The value of F0 is the value obtained in step 7.
16. Repeat step 15 for frequencies F1, F2 and F3. The values for F1, F2 and F3 are the values obtained in steps 9, 11 and 13 respectively.
17. Enter command [WT=EDE]. This command enables the "wire-rupture" protection.
18. Enter command [EX].
19. Remove weights and install displacer.
20. Return to section 2.5.

# DISTRIBUTION SHEET

|                    |                  |             |
|--------------------|------------------|-------------|
| To<br>Distribution | From<br>SG SMITH | Page 1 of 1 |
|--------------------|------------------|-------------|

|                          |                    |
|--------------------------|--------------------|
| Project Title/Work Order | Date June 21, 1999 |
|--------------------------|--------------------|

|   |                |
|---|----------------|
| ENRAF SERIES 854 ADVANCED TECHNOLOGY GAUGE (ATG) WITH SPU_II CARD FOR LEAK DETECTOR USE ACCEPTANCE TEST PROCEDURE | EDT No. 140134 |
|   | ECN No. N/A    |

| Name               | MSIN  | Text With All Attach. | Text Only | Attach./Appendix Only | EDT/ECN Only |
|--------------------|-------|-----------------------|-----------|-----------------------|--------------|
| ABUNDO, R          | L6-38 | X                     |           |                       |              |
| HUBER, JH          | T4-07 | X                     |           |                       |              |
| LARSON, RE         | T4-07 | X                     |           |                       |              |
| RICKENBACH, MD     | H1-19 | X                     |           |                       |              |
| SCAIEF III, CC     | R1-56 | X                     |           |                       |              |
| SMITH, SG          | H1-19 | X                     |           |                       |              |
| THORNE, JD         | S0-09 | X                     |           |                       |              |
| TRUE, RR           | T4-07 | X                     |           |                       |              |
| WILLINGHAM JR., WE | L6-37 | X                     |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |
|                    |       |                       |           |                       |              |