1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for Calibrating the Analog Output of BadgerMeter Magnetoflow Mag Meter with Model Primo 3.1 electronics package at the Zero flow point, (4.0 mA).

1.2 Scope

This procedure involves Magnetoflow Mag Meter with Model Primo 3.1 electronics package.

2.0 INFORMATION

2.1 General Information

To perform a complete calibration (4 to 20 mA), a calibrated volume catch tank of approximately 400 gallons or a calibrated flowmeter installed in the same test line is required.

At present, neither piece of equipment is available, therefore only a Zero point calibration (4 mA) can be performed.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 If working around live circuits, extreme caution should be used. Failure to follow electrical safety practices as outlined in DOE–0359, Hanford Site Electrical Safety Program could result in serious injury or death.

3.1.2 Failure to use protective equipment when working on or near energized systems could result in serious injury. Job specific protective equipment requirements should be addressed during the pre-job brief and be in accordance with TFC-ESHQ-S_IS-C-02.

3.2 Equipment Safety

CAUTION - To prevent damage to Primo® 3.1 electronics package, power should be disconnected prior to lifting or landing any leads or service to the unit.

3.3 Radiation and Contamination Control

Work in radiological areas will be performed using a Radiological Work Permit following review by Radiological Control per the ALARA Work Planning procedure TFC-ESHQ-RP_RWP-C-03.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:

- DMM
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:


4.3 Field Preparation

4.3.1 REQUEST Operations remove Badger flowmeter from service.
5.0 PROCEDURE

Special Instruction

If performance of any steps in this procedure is not required for procedure completion, steps not performed are to be marked, "N/A" in appropriate Data Sheet signoff space, and explained in comments/remarks section of Data Sheet.

5.1 Obtain As-Found Values

CAUTION
To prevent damage to Primo® 3.1 electronics package, power should be disconnected prior to lifting or landing any leads or service to the unit.

5.1.1 REMOVE power to Badger Meter prior to lifting leads for test equipment hook-up.

5.1.2 ENSURE power is removed from Badger flowmeter.

5.1.3 CONNECT DMM in series with Analog common (-) terminal 1, minding polarity (reference Figure 1.)

5.1.4 TURN power on to Badger flowmeter AND ALLOW unit to stabilize.

5.1.5 ENSURE a No flow condition is established AND RECORD the following As-Found values on Data Sheet.

- As-Found GPM (gallons per minute)
- Milliamp output value.

5.1.6 IF As-Found values are not within specified tolerance per Data Sheet, GO TO Calibration Section 5.2,

OR

IF As-Found values are within specified tolerance, but deemed marginal, and optimization is desired, GO TO Calibration Section 5.2,

OR

IF As-Found values are within specified tolerance, RECORD As-Found values in As-Left column of Data Sheet AND

GO TO Restoration, Section 5.3.
5.2 Calibration

NOTE - Refer to Figure 1 for programming keys used to navigate through the system.
- Badger Flowmeter is programmed in “Uni-Directional Mode”.

5.2.1 AT main display screen (Uni-Directional mode), PRESS E Key (ENTER).

<table>
<thead>
<tr>
<th>RATE</th>
<th>0.0000 GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOT1</td>
<td>1000 G</td>
</tr>
<tr>
<td>TOT2</td>
<td>1000 G</td>
</tr>
<tr>
<td>V3.10Ues</td>
<td></td>
</tr>
</tbody>
</table>

NOTE - There are 3 main submenus: factors, output/totals and measurement.

5.2.2 USE the ↑ key to position the > arrow next to “output/totals” AND PRESS → for the next screen

factors
>output/totals
measurement
Back E=End

5.2.3 FOLLOW on-line menu AND GO TO the Analog Outputs screen.

analog outputs
>change
next parameter
Back E=end

5.2.4 USE the ↑ key to position the > arrow next to “change” AND PRESS → for the next screen
5.2 Calibration (Cont.)

5.2.5 PRESS ↑ or → keys to scroll to the 4 — 20 mA output.

```
<table>
<thead>
<tr>
<th>analog outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 — 20 mA</td>
</tr>
<tr>
<td>^ up &gt; down</td>
</tr>
<tr>
<td>E Enter</td>
</tr>
</tbody>
</table>
```

5.2.6 AFTER the 4 — 20 mA Screen appears, PRESS ENTER to go to the calibration screen.

5.2.7 WHEN the Calib Output screen appears, PRESS ENTER.

```
<table>
<thead>
<tr>
<th>calib output ?</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
</tr>
<tr>
<td>^ up &gt; down</td>
</tr>
<tr>
<td>E Enter</td>
</tr>
</tbody>
</table>
```

NOTE - The following menu box is an important reminder to make sure that if the meter is part of a closed loop system, you must put the system in manual operations while performing the calibration process.

- This is not a closed loop system, so the menu box is not applicable.

5.2.8 WHEN the following menu box appears, PRESS the → key to continue.

```
| Outputs will not equal flow if you continue! |
| ->continue          | E=End          |
```
5.2 Calibration (Cont.)

5.2.9 WHEN the following LRV calibration box appears, USE the ↑ and → keys to calibrate the 4 mA signal per Data Sheet.

Offset:  4.000 mA
Signal = 0%
^ up > down
E continue

5.2.9.1 IF 4 mA value cannot be brought into tolerance, NOTIFY FWS for resolution AND

STOP WORK until further directed.

5.2.10 AFTER calibration is complete, PRESS → key to go to next parameter.

5.2.11 USE the programming keys as necessary to return to Main Menu, THEN

GO TO Restoration, Section 5.3
5.3 Restoration

5.3.1 **ENSURE** power is removed from Badger flowmeter.

5.3.2 **DISCONNECT AND REMOVE** Test Equipment AND **RECONNECT** the, Analog common (-) wire to terminal 1.

5.3.3 **TURN** power on to Badger flowmeter AND **ALLOW** unit to stabilize.

5.3.4 **RETURN** Badger flowmeter to the main display screen, Uni-directional mode.

5.3.5 **CONFIRM** equipment system restoration by observing indications are consistent with expected conditions.

5.3.6 **ENSURE** Test Equipment information and calibration status are recorded on Data Sheet.

5.3.7 **IF** any problems were encountered with calibration, **INFORM** FWS.

5.3.8 **NOTIFY** Operations that testing is complete and system may be returned to desired configuration.

5.4 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.
5.5 Review

5.5.1 INFORM FWS test is complete.

5.5.2 FWS REVIEW AND ENSURE the following:
- Completed Data Sheets meet the acceptance criteria.
- Comments sections are filled out appropriately.
- Work requests needed as a result of this procedure are identified and generated.
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the Data Sheet, as applicable.

5.6 Records

The performance of this procedure generates no records. However, PM Data Sheets associated with the procedure, are records and are maintained in the work package as record material.

The record custodian identified in the Company-level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 1 – Magnetoflow Primo 3.1 Electronics and Programming Keys