GUIDANT

Electronic Preset Delivery System

Smith Meter® AccuLoad®

Tank Proving Guide

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Bulletin MN06146

Caution

The default or operating values used in this manual and in the program of the AccuLoad III are for factory testing only and should not be construed as default or operating values for your metering system. Each metering system is unique and each program parameter must be reviewed and programmed for that specific metering system application.

Disclaimer

Guidant hereby disclaims any and all responsibility for damages, including but not limited to consequential damages, arising out of or related to the inputting of incorrect or improper program or default values entered in connection with the AccuLoad III.

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Introduction

The purpose of this document is to describe a method for proving an AccuLoad/meter system with a volumetric tank prover. Other methods may be appropriate under certain circumstances. It is not possible to discuss herein all of the procedures, standards, and knowledge required for meter proving. It is assumed that the individuals performing these calibration tests are qualified to do so and have particular familiarity with the following where applicable:

1. Operation of Smith Meter AccuLoad products, meters, and valves

2. API Manual of Petroleum Measurement, Chapter 4, Proving Systems

3. NCWM Handbook 44, Sections 1 and 3

4. Any additional local codes and standards, both governmental and private.

For the purpose of this document, the term "AccuLoad I" will refer to the original Smith Meter AccuLoad electronic preset, which was one electronic preset in one enclosure. The term "AccuLoad II" will refer to the electronic preset that was released in 1989 and was manufactured through 2001. The term "AccuLoad III" will refer to the electronic presets manufactured from 1999 to the present. The term "AccuLoad" will be used as a general term when referring to any of these systems.

The type of proving described will be "gross to gross"; that is, no temperature correction is made to the liquid. This is allowed because the temperature at the meter is considered the same as that in the tank prover; hence, the corrections for each would cancel each other. The temperature correction to be applied will be to the tank prover. It is a function of the tank material (usually carbon steel or stainless steel) and the temperature difference between the proving temperature and the prover's certified waterdraw calibration temperature (usually 60°F).

Note: *When using automated proving mode in AccuLoad III, the meter factors are calculated using temperature compensation as described in Section VI.*

AccuLoad I

AccuLoad I has the ability to automatically switch to a unique calibration factor for each of the four different flow rate ranges, thus linearizing the meter output. When initially proving an AccuLoad I system, "lock in" each flow rate and determine a calibration factor for each. These calibration factors are then programmed into the AccuLoad and typical flow runs are executed, including normal low flow start, high flow, and multi-step valve closure. The goal is to demonstrate satisfactory correlation between the displayed volume (AccuLoad register) and volume actually delivered (Tank Prover).

AccuLoad II and III

The proving procedure for the AccuLoad II and III systems is similar to that of AccuLoad I, except that

1. AccuLoad II and III use meter factors in lieu of calibration factors (see Section IV)

2. AccuLoad II and III continuously linearize the meter output by applying the meter factor at the flow rate the system is operating. They do not switch to the factor programmed, but calculate and use the meter factor for flow rates between those that are programmed.

The maximum allowable deviation between the AccuLoad register and the tank prover reading must be agreed upon and understood by all parties concerned before meter proving operations begin.

How to Use This Manual

This manual is to be used for reference when tank proving metering systems that contain the AccuLoad electronic preset.

This manual is divided into seven sections: Introduction, System Pressure Requirements, Flow Rate Selection, Factor Selection for Preliminary Proving, Factor Optimizing, AccuLoad III Automated Proving Mode, and Appendix.

"System Pressure Requirements" describes the back pressure requirements to prevent cavitation at the meter during the proving process.

"Flow Rate Selection" describes the flow rates that are typically used for proving a metering system.

"Factor Selection for Preliminary Proving" describes the formulas used to establish the preliminary factors for the AccuLoads. Examples are also provided for determining factors for turbine meters and positive displacement meters.

"Factor Optimizing" describes the steps required to optimize the preliminary factors into final factors that will be used for loading the product.

"AccuLoad III Automated Proving Mode" describes a feature which allows the operator to prove the meter on all four products, with four meter factors and associated flow rates for each product, without having to enter the program mode for each product and meter factor.

"Appendix" includes a Meter Proving Report form and a Tank Prover Steel Correction Factor for Temperature chart.

The examples presented in this manual are for clarity and convenience. The values will vary from one particular installation and/or operation to another.

Before Beginning to Prove

Be sure that the AccuLoad is functioning properly and that the operator has read and understands the instructions contained in this manual.

For accurate measurement, adequate back pressure at the meter is required to prevent cavitation. For a turbine meter at its maximum rated flow, this will be approximately 20 psi plus the vapor pressure of the product being metered (e.g., about 15-20 psig for gasoline). For a positive displacement meter, 5 psi plus vapor pressure (e.g., about 0-5 psig for gasoline) is sufficient. Back pressure may be a problem at the maximum flow rate if system pressure loss downstream of the meter is quite low. This is most likely to occur, particularly in a turbine meter system, if the set stop valve goes to a wide open position (i.e., is not controlling flow).

With a pressure gauge between the meter and valve, adequate meter back pressure during proving may be verified.

The flow rates typically selected for proving are the same as those used in the normal loading operation.

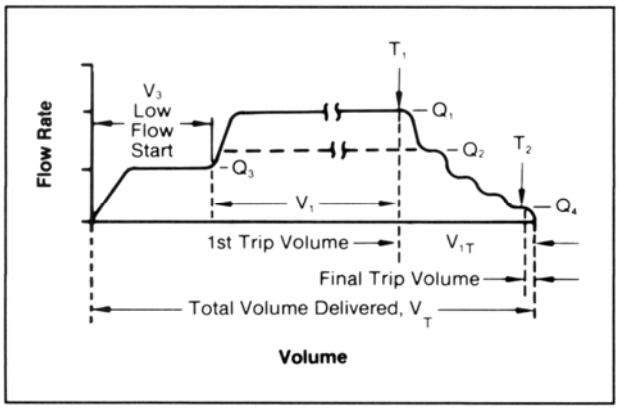
Q_1: First High Flow Rate – Maximum Rate

Q_2: Second High Flow Rate – Only used for loading smaller tanks where Q_1 would be too high a rate

Q_3: Low Flow Start Flow Rate – To minimize splashing and/or foaming within the truck tanks

Q_4: Minimum Flow Rate – Flow rate during the final stage of loading

To reduce proving time and still retain most of the improved accuracy obtainable with meter linearization, proving may be limited to just two flow rates: Q_1 and Q_3.



Before the actual calibration of the AccuLoad meter system begins, it is necessary to program into the instrument several parameters that apply uniquely to a given installation. The instructions on how to do this are contained in the AccuLoad manual that applies specifically to your instrument. Here, only those instructions that relate to proving the AccuLoad/meter system by use of a volumetric tank prover are addressed.

All meters used with an AccuLoad have to produce pulse outputs. Meters used are typically turbine meters or positive displacement meters equipped with pulse transmitters. The meters will not produce signals without having exactly a whole number of pulses per volume unit. A typical meter output might be 25.376 or 95.632 pulses per gallon. This precise pulse output depends on the meter size, meter type, type of transmitter, operating conditions, and manufacturing tolerances. The AccuLoad accepts this meter output and electronically converts it to engineering units, such as gallons, liters, etc. It is the purpose of meter proving to determine the precise relationship between meter pulse output and actual meter throughput. Once this relationship is determined, calibration factors or meter factors are programmed into the AccuLoad to achieve a readout in "exact" volumetric units.

Establishing Factor (New Meter)

Before proving a meter for the first time, for AccuLoad I, AccuLoad II, and AccuLoad III, start with the factor (pulses per unit volume) furnished by the meter manufacturer (e.g., 25.327 pulses per gallon). If only the nominal pulses per unit volume figure is known (e.g., 25), use this value for the Input Resolution Setting. Use 1.0000 for the Calibration Factor Setting (AccuLoad I) or for the Meter Factor (AccuLoad II and AccuLoad III).

AccuLoad I

The values programmed into an AccuLoad in order to "match" the AccuLoad to a particular meter, are of two types:

1. **Input Resolution:** This produces a "coarse" adjustment to incoming pulses. The setting range is 25 to 9,999 pulses per unit volume.

2. **Calibration Factor (CF):** This is a high resolution factor of five digits. The setting range is 0.0001 to 9.9999. Realistic calibration factors will be in the range of 0.85 to 1.25.

The effect of these factors is as follows:

$$\text{Calibration Factor (CF)} = \frac{\text{AccuLoad I Volume}}{\text{Tank Prover Volume}}$$

$$\text{Displayed Volume} = \frac{\text{Input Pulses}}{(\text{Input Res.}) \times (\text{CF})}$$

The AccuLoad I will accept up to four different calibration factor settings (but only one input resolution) as a function of flow rate, which allows "linearization" of a meter's calibration curve.

Example 1

Four-inch turbine meter with "K" factor of 25.327 pulses per gallon

1. Select the nearest whole number to 25.327, which is 25. This becomes the Input Resolution Setting.

2. Divide 25.327 by 25 to determine the Calibration Factor Setting.

$$\text{CF} = \frac{25.327}{25} = 1.01308$$

Round off to four places to the right of the decimal (because only five digits are allowed). The result is a Calibration Factor Setting of 1.0131.

Example 2

Six-inch positive displacement meter that generates 100.15 pulses per gallon from its transmitter

1. Set the Input Resolution Setting to 100 (the nearest whole number).

2. Divide 100.15 by 100 to determine the Calibration Factor Setting.

$$\text{CF} = \frac{100.15}{100} = 1.0015$$

Round off to four places to the right of the decimal (because only five digits are allowed). The result is a Calibration Factor Setting of 1.0015.

Remember the Rules

1. The maximum input frequency direct from the meter accepted by the AccuLoad I 2,000 Hz.

2. The range of allowable Input Resolution Settings is 25 to 9,999 pulses per whole unit of display on the AccuLoad (i.e., gallons, liters, etc.).

3. The range of allowable Calibration Factor Settings is 0.0001 to 9.9999. (Realistic calibration factors would be between 0.85 and 1.25.)

AccuLoad II and AccuLoad III

The values programmed into an AccuLoad in order to "match" the AccuLoad to a particular meter are also of two types:

1. **Input Resolution:** This produces a "coarse" adjustment to incoming pulses similar to AccuLoad I. The setting range is 0 to 9,999 pulses per unit volume for AccuLoad II and 0 to 9999.999 for AccuLoad III.

2. **Meter Factor (MF):** This is a high resolution factor of five digits. The setting range is 0.0001 to 9.9999 for AccuLoad II and 0.00001 to 9.99999 for AccuLoad III.

The effect of these factors is as follows:

$$\text{Meter Factor (MF)} = \frac{\text{Tank Prover Volume}}{\text{AccuLoad II Volume}}$$

$$\text{Displayed Volume} = \frac{\text{Input Pulses} \times \text{MF}}{(\text{Input Res.})}$$

The AccuLoad II and III will accept up to four different meter factors for each product (but only one input resolution setting) as a function of flow rate, which are used to "linearize" the meter's calibration curve.

Example 3 (AccuLoad II)

Four-inch turbine meter with a "K" factor of 25.327 pulses per gallon

1. Select the nearest whole number to 25.327, which is 25. This becomes the Input Resolution Setting.

2. Divide 25 by 25.327 to determine the Meter Factor Setting.

$$\text{MF} = \frac{25}{25.327} = 0.98708$$

Round off to four places to the right of the decimal (because only five digits are allowed). The result is a Meter Factor Setting of 0.9871.

Example 4 (AccuLoad II)

Six-inch positive displacement meter that generates 100.15 pulses per gallon from its transmitter

1. Set the Input Resolution Setting to 100 (the nearest whole number).

2. Divide 100.15 by 100 to determine the Meter Factor Setting.

$$\text{MF} = \frac{100}{100.15} = 0.99850$$

Round off to four places to the right of the decimal (because only five digits are allowed). The result is a Meter Factor Setting of 0.9985.

Example 5 (AccuLoad III)

Four-inch turbine meter with a "K" factor of 25.327 pulses per gallon

1. Set the input resolution of 25.327 into the "K" factor.

2. Enter 1.00000 as the meter factor.

Example 6 (AccuLoad III)

Six-inch positive displacement meter that generates 100.15 pulses per gallon from its transmitter

1. Set the input resolution of 100.15 into the "K" factor.

2. Enter 1.00000 as the meter factor.

Remember the Rules

1. The maximum input frequency accepted by AccuLoad II directly from the meter is 3,000 Hz. The maximum input frequency accepted by AccuLoad III directly from the meter is 10,000 Hz.

2. The range of allowable Input Resolution Settings is 0 to 9,999 pulses per whole unit of display (i.e., gallons, liters, etc.) on the AccuLoad II, and 0 to 99999.999 on the AccuLoad III.

3. The range of allowable Meter Factor Settings is 0.0001 to 9.9999 for the AccuLoad II and 0.00001 to 9.99999 for the AccuLoad III. Realistic Meter Factors would be between 0.85 and 1.25.

Reproving the Meter

If reproving the system, use the factors already set into the AccuLoad and proceed to the next section, Factor Optimizing.

Start at Q_1, the Maximum Flow Rate. Use the Input Resolution Setting and Factor Setting determined previously. Use Smith Form "Meter Proving Report," which is Appendix A of this manual, or an equivalent form to record all data.

Note: *The term "Factor" in this section refers to the Calibration Factor if used with an AccuLoad II or AccuLoad III.*

Step 1

Reprogram the AccuLoad as follows to obtain the factor at Q_1:

1. Set the Minimum Flow Rate.
2. Set the Low Flow Start to "yes."
3. Set the Low Flow Start Volume at about 5% of the tank prover volume (to reduce splashing on start-up).
4. Set the Low Flow Start Rate at about 0.5 times Q_1 value.
5. Set the High Flow Rate.
6. Check that the flow tolerance is in proper range, typically 5% to 9%.
7. Set the First Trip Volume at a minimum value, typically 5% to 8% of Q_1. Example: For Q_1 of 500 gpm, set at 25 to 40. Reset later to normal operation when final proving in Step 23.
8. Check the Final Trip Volume. Set to 1.5 (reset later when final proving in Step 23).
9. Set the Input Resolution to the Input Resolution Setting determined above.
10. Set Flow Rate Number 1 to zero (0000). Set Factor Number 1 to the Factor Setting previously determined.
11. Set Proving Mode Select to W&M Proving.

Step 2

Start proving runs.

1. Return to Run Mode.
2. If a First/Second High Flow Switch is used, make certain the switch is in First High Flow Position (Q_1).
3. Preset Tank Prover Volume.
4. Press "Start" to fill prover.

Step 3

Wet down the prover and stabilize the temperature of the meter/prover system. Fill and drain the prover once or twice until the measured liquid temperatures at meter and prover are equal within 1° to 2°F. Also, confirm that excessive splashing or foaming does not occur at this high flow rate. If it does, reduce the flow rate and/or increase the duration of the brief low flow start to the minimum amount needed to eliminate the problem.

Note: *Typically after each proving run, before closing the prover drain valve, allow the prover to drain down for exactly 30 seconds after solid flow has broken to maintain a consistent "clingage volume" in the prover.*

Step 4

Now start an additional proving run to determine the meter factor. Determine the meter factor (MF) at Q_1. The meter factor is determined from the actual tank prover reading and the AccuLoad volume registered.

$$MF = \frac{\text{Actual Tank Prover Volume}}{\text{Registered Volume}}$$

Example: 1,000 gallon tank prover
Actual Tank Reading: 999.65 gallons
AccuLoad Reading: 999.9 gallons

$$MF = \frac{999.65}{999.9} = 0.9997$$

Note: *Typically, tank provers read in ± cubic inches, one gallon = 231 cubic inches.*

Step 5

Check the repeatability of MF at Q_1. Make one to four repeat runs to determine:

1. Repeatability
2. Average Meter Factor (MF)

Example: MF = 0.9997
0.9998
0.9996
0.9997

Average MF = 0.9997

Step 6 (AccuLoad I Only)

Compute and enter the new Calibration Factor (CF) at Q_1:

$$\text{New CF} = \frac{\text{Original CF}}{\text{Average MF}}$$

Example: Original Calibration Factor = 1.0150
Meter Factor = 0.9997 (average)

$$\text{New CF} = \frac{1.0150}{0.9997} = 1.0153$$

Enter 1.0153 into the AccuLoad Calibration Factor Number 1 and record as Calibration Factor (CF) for Q_1.

Step 6 (AccuLoad II and III Only)

Compute and enter the new Calibration Factor (CF) at Q_1:

$$\text{New MF} = \text{Original MF} \times \text{Average MF}$$

Example: Original Calibration Factor = 0.9852
Meter Factor = 0.9997 (average)
New MF = 0.9852 x 0.9997 = 0.9849

Enter the new Meter Factor (MF) into the AccuLoad at Meter Factor Number 1 and record as Meter Factor (MF) for Q_1.

Step 7

Verify factor at Q_1. Make at least one additional run to verify accuracy.

Note: *Factors 2, 3, and 4 will all be determined using the low flow start rate as the proving run flow rate with Q_1 as the associated factor for all flow rates at which the meter is to be proved. After determining and recording all the factors, they will then be entered, along with their corresponding flow rates, into the proper AccuLoad entries for a typical delivery.*

Step 8

Reprogram the AccuLoad to obtain the factor at Q_2.

1. Set the Low Flow Start Volume at a value at least 5% greater than the tank prover volume.

2. Set the Low Flow Start Rate at the Q_2 flow rate. Leave the factor for Q_1 in Factor Number 1.

Step 9

Same as Step 4, except at Q_2.

Step 10

Same as Step 5, except at Q_2.

Step 11

Same as Step 6, except at Q_2.

Step 12

Same as Step 7, except at Q_2.

Step 13

Reprogram the AccuLoad to obtain the factor at Q_2. Set the Low Flow Start Rate at the Q_3 flow rate. Leave the factor for Q_2 in Factor Number 1.

Step 14

Same as Step 4, except at Q_3.

Step 15

Same as Step 5, except at Q_3.

Step 16

Same as Step 6, except at Q_3.

Step 17

Same as Step 7, except at Q_3.

Step 18

Reprogram the AccuLoad to obtain the factor at Q_4. Set the Low Flow Start Rate at the Q_4 flow rate. Leave the factor for Q3 in Factor Number 1.

Step 19

Same as Step 4, except at Q_4.

Step 20

Same as Step 5, except at Q_4.

Step 21

Same as Step 6, except at Q_4.

Step 22

Same as Step 7, except at Q_4.

Step 23

Linearization programming. Once the factors for Q_1, Q_2, Q_3, and Q_4 have been determined, the AccuLoad may now be set up for a typical delivery.

Example:
Maximum Delivery rate 700 gpm – Q_1
Second High Flow Rate 400 gpm – Q_2
Low Flow Start Rate 250 gpm – Q_3
Minimum Flow rate 140 gpm – Q_4

Program Values:

Minimum Flow Rate	140 gpm
Low Flow Start	1 (Low Flow Start – yes)
Low Flow Start Volume	100 gallons (whatever is standard)
Low Flow Start Rate	250 gpm, Q_3
First High Flow Rate	700 gpm, Q_1
Second High Flow Rate	Could be Q_2 if Second High Q is used. If not, leave zeros.
First Trip Volume	Could range from 8-20% of Q_1, depending on system response.
Final Trip Volume	Depends on system response.
Flow Rate #1	700 gpm, Q_1
Factor #1	Factor for Q_1
Flow Rate #2	400 gpm, Q_2
Factor #2	Factor for Q_2
Flow Rate #3	250 gpm, Q_3
Factor #3	Factor for Q_3
Flow rate #4	140 gpm, Q_4
Factor #4	Factor for Q_4
Proving Mode	Leave at W&M Proving

Step 24

Repeat Step 4, except for normal loading conditions.

Step 25

Record tank prover volume and the AccuLoad volume. Compare the deviation to the agreed upon standards.

Step 26

Make from one to four additional runs to check the repeatability.

Step 27

If there is a significant deviation between the average values of the AccuLoad volumes and the tank prover volumes recorded in Steps 25 and 26,

1. Verify that the factors that have been entered are correct.

2. Verify the proving procedures.

3. Adjust the factor for Q_1 the amount needed to obtain perfect agreement.

The factor for Q_1 obtained in Steps 1-7 is subject to a slight error due to the significant start-up and shutdown transients used therein; whereas, the factor values for Q_2, Q_3, and Q_4 should be very precise since the start-up and shutdown transients encountered there are negligible. Also, the volume delivered at flow Rates Q_2, Q_3, and Q_4 are relatively small compared to the volume delivered at the Q_1 Flow Rate.

The volume V_1, delivered at Q_1, equals the total volume delivered, V_t, minus the Low Flow Start Volume, V_3, minus the First Trip Volume, V_{1t}.

$$V_1 = V_t - V_3 - V_{1t}$$

For example, if: $V_1 = 1{,}000$
$V_3 = 150$
$V_{1t} = 50$
Then, V_1 equals
1,000 – 150 – 50 = 800
and $V_1/V_t = 800/1{,}000 = 0.80$

AccuLoad I

The amount to increase the factor for Q_1 to obtain perfect agreement between the AccuLoad I volume and the prover volume, equals the percent total over registration divided by the proportion of the total volume delivered at Q_1.

Example 1

Over Registration = 4%
Total Volume Delivered at Q_1 = 80%
Old Factor = 1.0153
New Factor = ???

$$\text{Factor Decrease} = \frac{0.04}{0.80} = 0.05\%$$

New Factor = Old Factor × 1.0005
New Factor = 1.0153 × 1.0005
New Factor = 1.0158

Example 2

Under Registration = 4%
Total Volume Delivered at Q_1 = 80%
Old Factor = 1.0153
New Factor = ???

$$\text{Factor Decrease} = \frac{0.04}{0.80} = 0.05\%$$

New Factor = Old Factor × 0.9995
New Factor = 1.0153 × 0.9995
New Factor = 1.0148

AccuLoad II

The amount to decrease the factor for Q_1 to obtain perfect agreement between the AccuLoad II volume and the prover volume equals the percent (%) total over registration divided by the proportion of the total volume delivered at Q_1.

Example 1

Over Registration = 4%
Total Volume Delivered at Q_1 = 80%
Old Factor = 0.9849
New Factor = ???

$$\text{Factor Decrease} = \frac{0.04}{0.80} = 0.05\%$$

$$\text{New Factor} = \frac{\text{Old Factor}}{1.0005}$$

$$\text{New Factor} = \frac{0.9849}{1.0005}$$

$$\text{New Factor} = 0.9844$$

Example 2

Over Registration = 4%
Total Volume Delivered at Q_1 = 80%
Old Factor = 0.9849
New Factor = ???

$$\text{Factor Decrease} = \frac{0.04}{0.80} = 0.05\%$$

$$\text{New Factor} = \frac{\text{Old Factor}}{0.9995}$$

$$\text{New Factor} = \frac{0.9849}{0.9995}$$

$$\text{New Factor} = 0.9854$$

Step 28

Repeat Steps 24, 25, 26 (and 27, if necessary) with the new factor value for Q_1 Flow Rate.

Step 29

Do **only** if Second High Flow Switch is used. Repeat Steps 24, 25, and 26, except set the switch for Second High Flow Rate.

Step 30

1. Return to Normal Run Mode (set Proving Mode to 0, “Not Proving”).

2. Record all data and notes while they are still fresh in your mind.

3. Be sure all Command Code settings and factors are recorded. Use the appropriate “Programming Workbook,” available for download at no cost at www.fmcmeasurementsolutions.com (AccuLoad I and II), or the AccuMate file for recording parameter values (AccuLoad III). File this information with the terminal manager. The terminal manager should also keep records of the proving data.

Automated Proving Mode

The AccuLoad III firmware provides an automated proving mode of operation. This feature allows the operator to prove the meter on all four products, and four meter factors and associated flow rates for each product without having to enter the program mode for each product and meter factor. When the automated proving mode is activated, the AccuLoad will calculate the meter factor for a proving run based on information that is obtained during the prove. The operator can select the flow rate and meter factor that is being proved through the keypad of the AccuLoad. After the prove is complete, the operator enters the prover volume and prover temperature and the AccuLoad calculates the new meter factor. The operator has the choice of accepting the new meter factor or ignoring it. The AccuLoad also has the capability of providing an average meter factor over a maximum of ten proves.

Entry to the Automated Proving Mode will require several conditions to be met.

1. The Automated Proving Mode must be enabled via System Code 321.

2. The programmed security must be met. Then when normal conditions are met for starting a transaction (pressing the "SET" key or receiving authorization via communications), the Automated Proving Mode will be activated.

3. To initiate the proving sequence, the AccuLoad will prompt for the prover coefficient of cubical expansion. Note that the most recent value for this entry will be displayed. If this value is acceptable, the operator need only press "ENTER."

```
        Enter Prover Coefficient

       ->  0.000186005

11/03/99                        12:24:36
```

4. The AccuLoad III will prompt for the low flow start volume. If low flow start is not desired, enter zero. Press "ENTER."

```
       Enter Low Flow Start Volume

       ->  100 Gal

11/03/99                        12:25:37
```

5. Next, the AccuLoad III will display the "Select Recipe" prompt. If in remote control communications mode, only those recipes allocated will be available for selection. Recipes must be selected before the meter factors, since the recipe determines the product being proved. Note that only recipes comprising 100% of a single product may be delivered when proving.

```
            Select Recipe

       ->  Recipe 1
           Recipe 2
           Press PRINT for help
```

Using the up and down arrow keys, select the required recipe.

6. The operator must next select the meter factor and associated flow rate for proving.

```
      Select Meter Factor to Prove

    -> #1  0.99850              600 GPM
       #2  0.99999              400 GPM
       #3  1.00000              200 GPM
       #4  1.00055              100 GPM
```

Move the up or down arrow keys to the meter factor associated flow rate that is required. Note that only those factors currently programmed will be offered as selections. Press ENTER after entering the selection.

7. Enter the batch amount desired.

```
            Recipe 1
        Enter Preset Volume

       ->  1000 GAL

         Press START when ready
```

8. Press "START" to begin flow. The flow rate associated with the selected meter factor will be used as the high flow rate. The batch will be delivered. The flow rate ramp-down from first trip to the end of the batch will be the same as if not proving.

If after the batch is completed the operator presses "PRINT," the display reverts to the Ready Mode display and will not go through the Auto Prove Sequence.

9. When the batch has completed, the AccuLoad will prompt for the actual prover volume. Enter the prover volume and press "ENTER."

```
Raw Meter Volume  1000.94 GAL

     Enter Prover Volume
 ->  1000
     Batch Complete
```

"Batch Complete" will flash with the time and date.

10. The AccuLoad III will prompt for the prover temperature. Press ENTER to have the meter factor calculated.

```
  Meter Temperature 60.0F
 Enter Prover Temperature

->  60.5F

      Batch Complete
```

11. The AccuLoad III will then calculate the meter factor. The new meter factor will be displayed.

```
#1          0.99850          600 GPM
      New Meter Factor       0.98375
      Average Flow Rate      500 GPM

    Press ENTER to continue
```

12. When the ENTER key is pressed, the AccuLoad III will display the following screen.

```
  New Meter Factor   0.98375

->  Reject
    Save
    Average
    Re-enter prove values
```

13. If "REJECT" or "SAVE" is selected, the AccuLoad III will return to the Run Mode display where the transaction can be ended. If "AVERAGE" is selected, the AccuLoad III will then average all meter factors in the buffer (up to ten of them). The average meter factor will be displayed. Select "SAVE" to store the average meter factor into the Program Mode.

```
  Average Meter Factor   0.98400

    ->  Continue
        Save
```

14. If "Save" is selected, the AccuLoad III will store the average meter factor and will return to the "RUN" mode display where the transaction can be ended or a new batch can be started. If "Continue" is selected, a new batch can be started allowing the AccuLoad III to continue proving at this rate. Note that if the AccuLoad III is in remote control mode, authorization is required for each batch.

15. Each time a transaction is ended and a new transaction is begun, the AccuLoad III will start a new prove with Step 1.

16. In the event that the meter factor is not successfully saved, the AccuLoad III will display a message indicating that the meter factor was rejected.

Appendix A

Meter Proving Report
Tank Prover

Page _____ of _____

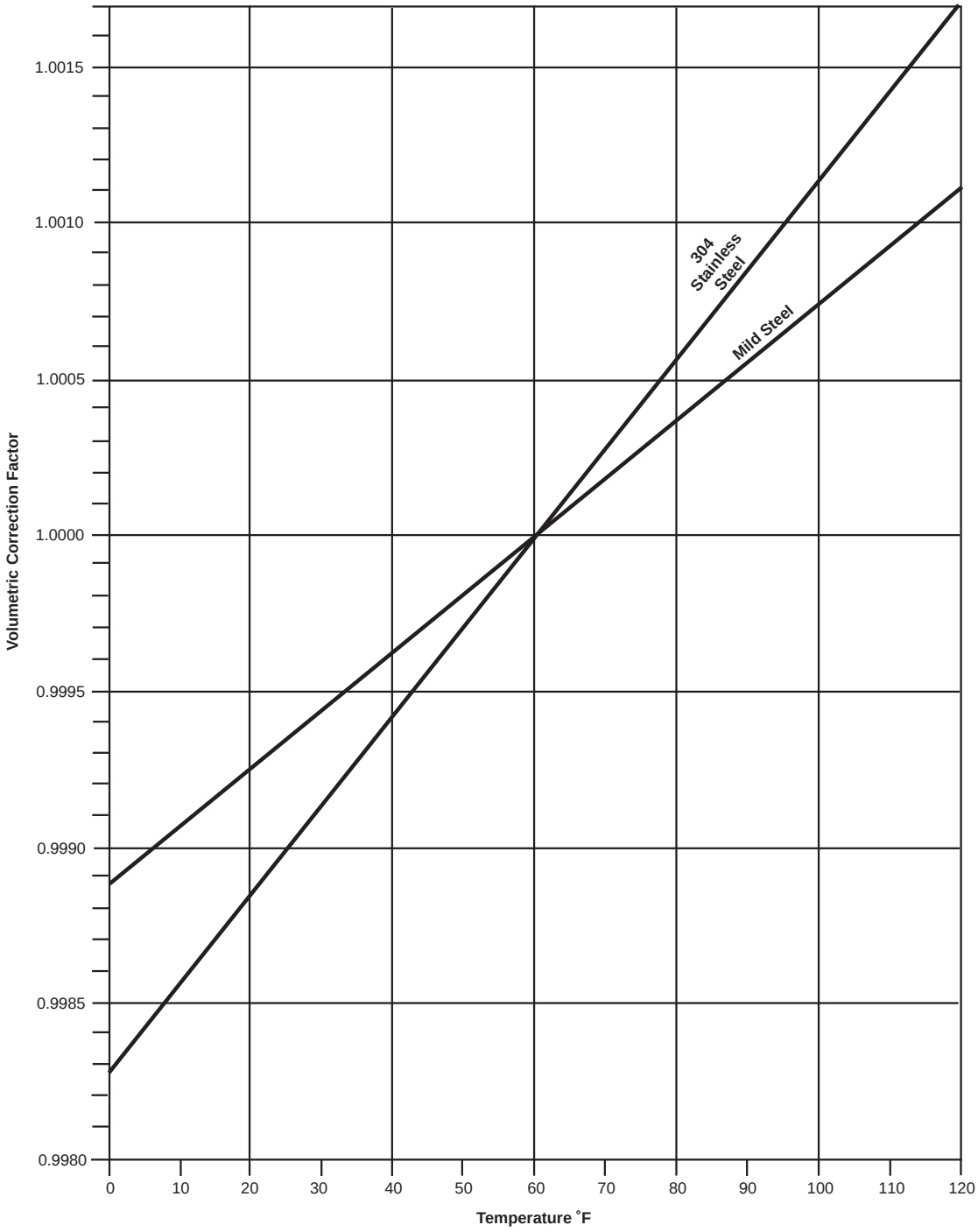
Customer _____ Location _____

Date _____	Prover Type _____	Meter Make _____ Model _____
Position _____	Base Volume _____	Size _____ Type _____
Ambient Temp. _____	Serial No. _____	Serial No. _____
Fluid _____	Certification Date _____	Nominal Output: Pulses per Unit Volume _____

1	2	3	4	5	6	7	8	9	10	11	12
Run No.	**Flow Rate ( )**	**Temp. ( )**	**Press ( )**	**AccuLoad Calibration or Meter Factor Entered**	**AccuLoad Registered Volume ( )**	**Prover Reading ( )**	**Uncorrected Prover Volume Delivered**	**Tank Correction Factor**	**Corrected Prover Volume**	**Calculated Meter factor**	**New AccuLoad Calibration or Meter Factor**

Notes:
"For "9", see chart, "Tank Prover - Steel Correction Factors for Temperature." "8" = Base Tank Volume + ("7" ÷ 231).
"9" = from Chart.
"10" = "8" x "9".
"11" = "10 ÷ "6".
"12" = "5 ÷ "11" (AccuLoad I).
"12" = "5 x "11" (AccuLoad II and III).
"1" through "7" are data entries. "8" through "12" are calculated entries.

Appendix B **Tank Prover Steel Correction Factor for Temperature**



Revisions included in MN06146 Issue/Rev. 0.1 (7/10):
Page 1: Note added.

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