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1. SYSTEM COMPONENTS
OPERATOR CONTROLS SUBSYSTEM

OVERVIEW
The Operator Control subsystem provides the interface between the operator and the computer. It consists of the following components:

• Touch Screen
• Jog Buttons
• Meter Clamp Buttons
• Emergency Stop Button

TOUCH SCREEN
The XGA LCD Flat Panel Color Touch Screen is located on the upper part of the prover frame. The power on/off switch (located on the lower back portion of the monitor) can be used to turn the monitor on and off without affecting the supply of power to the prover, which is controlled through the power switch located on the left side of the prover’s main enclosure. Contrast and brightness of the display can be adjusted using the On Screen Diagnostics (OSD) remote, located on the back of the monitor.

METER CLAMP BUTTONS – SERIES II AND III
These two buttons are located on either side of the table assembly. The operator presses these buttons when prompted by the computer. This will enable the meter clamps and begin the proving cycle. Both buttons must be pressed at the same time.

JOG BUTTONS – SERIES II AND III
These buttons are located on the right and left sides of the prover frame. The operator presses them during the adjustment cycle to jog the meter in small amounts. Both jog buttons must be pressed simultaneously.

Sprague meters only require use of the left jog button so the right hand may remain free to operate the adjustment tool.

EMERGENCY STOP – SERIES II AND III
This button, located on the left side of the prover frame, selectively disables power to the prover. It will disable power to the nozzle solenoids, the sensors and monitor but does not remove power from the computer. It will also release the air pressure that activates the clamps.

Figure 1: Operator Controls Subsystem
OVERVIEW
The Vacuum subsystem consists of the following major components:

- Meter Clamps
- Movable Table
- Nozzle Manifold
- Sonic Nozzles

Two air cylinders control the up and down motion of the meter inlet/outlet sealing clamps. The hand-hole sealing device is controlled by two air cylinders; one for the in/out motion and the other for the up/down motion required to seal the hand-hole during an adjustment proving cycle.

These clamps are driven by the compressed air subsystem. The inlet and outlet clamps move up to allow removal of the meter and down to seal the meter during testing. If the hand-hole cover plate is removed, the hand-hole clamp is used to seal the meter.

METER CLAMPS (ADJUSTABLE)
To allow the proving of meters with different center distances and hand-hole positions, the inlet and hand-hole clamps are adjustable.

The clamping mechanism provides an efficient way to adjust the prover for various meter types. A quick release mechanism is shown above.
MOVABLE TABLE

The movable table has a maximum travel of 8 inches. Meters with heights from 11 inches to 19 inches can be proved on a Series II.

Meters with heights from 11 inches to 23.25 inches can be proved on a Series III. A Series III will accommodate a meter up to 27 inches in height, provided the table actuator is disconnected from the bottom of the table and the table is allowed to rest on the frame.

The movement of the table is controlled by an electrically operated motor. The switch is located on the right side of the prover.

DANGER

Use care in operating. Damage or injury may result from improper use.

Figure 3: Movable Table
NOZZLE MANIFOLD

The nozzle manifold is used to hold the sonic nozzle assemblies. It is located under the table assembly, attached to the bottom of the prover frame. See Figure 4.

Figure 4: Nozzle Manifold and Large Meter Attachment

SONIC NOZZLES

The SNAP™ Series II Prover consists of FIVE sonic nozzles, providing 485 CFH and is used for testing residential meters up to class 500 size. The SNAP™ Series III Prover uses SIX sonic nozzles for a flow capacity of 1000 CFH, and can test residential to light commercial gas meters (up to class 1000). For the SNAP™ Series II Prover, there are 31 possible nozzle-flow combinations, producing a test range between 25 CFH to 485 CFH. The SNAP™ Series III Prover allows for 63 possible nozzle-flow combinations, which produces a flow range between 25 CFH to 1000 CFH. Each nozzle provides a specific airflow rate. By combining nozzles, other flow rates can be obtained.

Nozzle 6: 25 CFH
Nozzle 5: 35 CFH
Nozzle 4: 50 CFH (SNAP™ Series III only)
Nozzle 3: 125 CFH
Nozzle 2: 250 CFH
Nozzle 1: 515 CFH

All sonic nozzles are factory-calibrated against a certified Master Bell Prover. The calibrations of all nozzles, sensors, and the Master Bell Prover are traceable to NIST. Each sonic nozzle has its own “standard time constant” (seconds per cubic foot). On the SNAP Provers, probes are mounted at critical locations in accordance with ASME/ANSI standards to measure temperature, pressure, and relative humidity. The SNAP computer uses all sensor values to calculate nozzle volume and meter proof. In addition to temperature, pressure, and relative humidity, the prover needs two values...
to determine the correct volume of air flowing through the gas meter: sonic velocity of the air through the nozzles (computed from the temperature, pressure, and relative humidity readings, and nozzle calibration data in seconds per cubic foot) and time (in seconds) for a specified number of revolutions of the meter tangent mechanism. The proof of the meter is a function of the cubic foot per meter revolution and the parameters listed above.

When a flow rate is entered while setting meter test conditions, the computer determines which nozzle or nozzle combinations will produce the closest rate to the one selected. When two or more nozzles are selected, the resulting flow rate is the sum of all nozzles selected. For instance, NOZZLE 6 combines with NOZZLE 5 to provide a flow rate of 60 CFH (nominal). When a given flow rate is selected by the user, the computer activates the appropriate nozzle solenoid valve(s) to achieve the desired airflow rate.

Figure 5: Sonic Nozzle Cross Section
SYSTEM COMPONENTS
COMPUTER AND ELECTRONIC CONTROLS

OVERVIEW
The Computer and Electronic Controls subsystem consists of the following components:

• Computer
• Power Supplies
• Electronic Connectors
• Analog Devices
• Digital I/O Devices
• Transducers
  – Relative Humidity (RH)
  – Meter Outlet Temperature (Tm)
  – Nozzle Temperature (Tn)
  – Vacuum Pressure (VP)
  – Absolute Pressure (AP)
  – Differential Pressure (ΔP)
• Revolution Sensors
  – Optical Sensor
  – Magnetic Sensor
  – Differential Pressure Sensor

COMPUTER
The SNAP computer is an ISA/PCI Intel Celeron class machine with Windows 2000 Professional operating system. The standard configuration consists of a minimum of 128 MB RAM, 40 GB IDE hard disk drive, 10/100 Ethernet card, two serial ports, one parallel port, two USB ports, and a 1.44 MB 3.5 inch floppy disk drive. A USB CD-ROM drive is also provided.

Communication to other computers and networks may be established via the standard on-board 10/100 Base T Ethernet card, which supports a wide range of networking protocols. Substitute or additional networking devices may be added. Serial and parallel communications are also available.

POWER SUPPLIES
The prover main enclosure contains power supplies to power the actuator, solenoids, and sensors. The main power to the SNAP is supplied by an uninterruptible power supply (UPS). The UPS protects the electrical components against potentially harmful power surges and interference. The UPS contains a backup battery, suitable for powering the SNAP during short brown outs or power sags, **but is not meant to power the SNAP during power outages**. When a loss of line voltage to the UPS occurs, the UPS sounds an alarm consisting of a series of beeps.

The UPS unit is connected to the SNAP computer to protect the Windows 2000 Professional operating system. **The SNAP computer should never be turned off without first shutting down Windows.** If a power outage should occur, the UPS will shut down the SNAP application automatically, followed by Windows 2000. Depending on battery life, an automatic shutdown will occur within several minutes of a power loss. Once utility power has been restored, the SNAP may be turned on normally.
The main power switch is located on the front of the UPS unit. This switch controls all power to the SNAP. The control box power switch, located on the left side of the SNAP control box, serves as a switch to control power to the SNAP, excluding the computer. When this switch is off, the power supplies in the control box and the monitor are powered off. The control box power switch should be turned off during normal power down times (i.e. at the end of the work day). Turning off the control box power switch, while leaving the UPS power switch on, will leave the SNAP in a desirable power state, with the SNAP controls off and the computer on.

If the SNAP is not to be used for long periods of time, it is recommended that both the control box power switch and the main ups switch be turned off.

To power up the SNAP, make certain the control box power switch is in the down or off position. Press the main power button, located on the front of the UPS unit. Allow the UPS unit several seconds to perform a self-test and power on. The completion of the self-test is signaled when all lights of the UPS unit stop flashing and the green light is solid. The control box power switch may now be turned on.

**POWER DISTRIBUTION**

![Diagram]

**POWER REQUIREMENTS**

The SNAP prover must be powered by 120 VAC with a minimum of 10 Amp service.

**ANALOG DEVICES**

Analog signals go to modules (located on a circuit board) where they are conditioned. The computer then translates these signals into engineering units (° F, psi, inches Hg., or % RH).

**DIGITAL I/O DEVICES**

The computer supports status-based (on vs. off) and time-based digital input/output signals.
TRANSDUCERS
The SNAP prover contains six different transducers, which the computer uses to check conditions that affect the sonic air flow in the nozzles:

• Relative humidity in the system
• Temperature at the meter outlet
• Temperature at the nozzles
• Differential pressure, meter inlet to nozzle inlet
• Absolute pressure at the nozzle inlet
• Vacuum Pressure

REVOLUTION SENSORS
The SNAP Prover offers three alternate devices to detect meter tangent revolutions:

• Magnetic Sensor
• Optical Sensor
• Differential Pressure Sensor

MAGNETIC SENSOR
The prover uses a patented American Meter magnetic sensor. This sensor has four magnets and a Hall effect transducer to sense the flag rod movement inside the meter.

When testing small meters, the magnetic sensor is placed conveniently out of the way – behind the meter to be tested – to provide high repeatability, without the need for precise alignment. See Figure 6.

Series III provers are equipped with a large meter magnetic sensor for testing 650-1000 class diaphragm meters. The sensor is located on the front of the meter table and can be easily removed when testing small meters. See figure 6a.

Figure 6: Small Meter Magnetic Sensor
Figure 6a: Large Meter Magnetic Sensor
ADVANTAGES OF THE MAGNETIC SENSOR

• Located behind the meter, there is normally no need for adjustment. In some cases, adjustments must be made to accommodate meters made by different manufacturers, due to the configuration of these meters.
• There is no need to unscrew and remove the hand-hole cover to sense meter revolutions.
• Proving the meter may be accomplished with fewer revolutions than the standard optical index sensor. This leads to shorter proving cycles, without sacrificing accuracy.

NOTE

The magnetic sensor works with all aluminum case meters. For non-aluminum cases, the operator should select the optical sensor or differential pressure sensor.

OPTICAL SENSOR

The optical sensor can be adjusted vertically and horizontally for all meter styles and indexes.

Figure 7: Optical Sensor

METER DIFFERENTIAL PRESSURE SENSOR

Pulse Proving

The differential pressure transducer can be used to detect tangent revolutions of iron, tin, and aluminum case meters. This is an alternative to the optical index sensor. As with the magnetic sensor, the differential pressure transducer proves the meter using fewer meter revolutions than the optical index sensor, thus reducing test times. The overall accuracy of the meter test using the differential pressure transducer may not be as accurate as the magnetic or optical index sensor due to worn or dirty internal meter components.
The meter differential pressure sensor monitors the pressure across the meter during testing. The computer monitors the high set point, which corresponds to the user's maximum allowable meter differential pressure for the check test, (i.e. 1.5 inches W.C.). When the high point is exceeded an error message (Reject High Diff) is displayed on the screen to indicate that the differential test has failed.

Meter differential pressure limits can be accessed and/or changed through the SNAP software Setup file (see Chapter 5) Meter File section, or the Change Specs Screen accessed through the Select Meter Type Screen.
SYSTEM COMPONENTS
SHOP AIR SUBSYSTEM

OVERVIEW
The shop air subsystem includes the following components:
• Clamp Solenoid Valve Assembly
• Clamp Cylinder
• Regulator
• Dil-Fog Lubricator

CLAMP SOLENOID VALVE ASSEMBLY
The clamp solenoid valve assembly controls the clamping arms, the automated hand-hole cover (SNAP II only), and the inlet seal (SNAP III only).

CLAMP CYLINDER
The clamp cylinder controls the up and down motion of the clamping arms, when prompted by the clamp solenoid valve.

AIR PRESSURE REGULATOR
Filter/Regulator
The filter/regulator located on the left hand side of the prover performs two functions within the prover’s compressed air environment.
• It removes most solid and liquid particles from the air at the inlet.
• It maintains a nearly constant pressure at the outlet, regardless of the air pressure at the inlet and of flow change requirements downstream.

Air leaving the regulator goes through the filter element, where most fine solid particles are retained.

Ordinarily, shop air is delivered to the regulator at 100 PSI. The regulator is factory-set to regulate this pressure to approximately 30 PSI.

CAUTION
Pressure to the regulator should not exceed 150 PSI. If your shop air is likely to exceed this pressure, place a safety valve on the regulator.

The outlet pressure is adjusted by turning the knob at the top of the regulator. The knob is turned clockwise to increase the pressure, counterclockwise to decrease it. When the prover is delivered and installed, the regulator is factory calibrated and adjusted. It should require no further adjustment.

OIL-FOG LUBRICATOR
Next to the filter/regulator is an oil-fog lubricator. This device injects an oil fog into the flow of shop air to provide internal lubrication for the solenoid valves and meter clamp air cylinders. The manufacturer prelubricates the solenoid valves and meter clamp air cylinders. However, to provide for extended working life of these moving parts, AMCO recommends that a lubricant be used. Oil is injected only when air is flowing through the lubricator.

Figure 10: Regulator/Lubricator
The manufacturer suggested lubricant for the oil-fog lubricator is a lightweight misting oil rated at 150-200 SUS (Saybolt Universal Seconds). Examples of lubricants that meet these specifications are:

- Pennzmist 32
- Mobile DTE® Light
- Mobile DTE® Light
- Lubriplate Hydraulic HO-O
- Kendall Four Season AW-32

For shop air systems that normally have “wet” air, Mobile Alamo® 525 lubricant can be used. This lubricant has a SUS of 230, which is slightly higher than recommended. However, every effort should be made to supply dry air to the prover so that an oil with a lower SUS value be used.
2. OPERATION
OVERVIEW

This instruction is written on the assumption that the user’s proving room operation consists of a manager (here referred to as the “supervisor”) and one or more individuals who will actually prov meters (the “operators”).

The software and equipment are designed to permit the supervisor to enter test parameters into the computer. Only the supervisor is allowed to enter, modify, or delete test parameters. While the information entered by the supervisor may apply to an entire gas meter type, the items entered by the operator(s) are confined to each specific meter being proven (such as serial number and comments).

The system also allows the user to combine the supervisor and operator functions.

See Chapter 9 for Supervisor Set Up: Test Parameters

Calibration

**BASIC OPERATIONAL SCREEN STRUCTURE FOR PROVING**

*NOTE*

Each screen (except proof) has exit key to return to previous screen.
OPERATOR SEQUENCE OF OPERATION

OPERATOR STEP-BY-STEP SEQUENCE OF OPERATION OF THE SNAP PROVER

This guide will help you better understand the basics of normal operation and proving after your supervisor has installed the necessary test parameter input.

Do not hesitate to ask a question(s) if you do not understand a command or if you’re unfamiliar with the step segment.

Steps

• Make sure the immediate area around the prover is clear to allow you to load and unload meters from the prover table or to prove large meters adjacent to the meter stand.

• Make certain that the main enclosure power switch located to the left side of the main enclosure is in the down or off position. Press the main power button located on the UPS unit. Allow the UPS unit several seconds to perform a self-test and power on. The completion of the self-test power on phase is signaled when all lights on the UPS unit stop blinking and the green light is on solid. The main enclosure power switch may now be turned on.

• Wait until the Starting Screen appears and follow the directions that appear in the block in the lower right had corner, “Please enter employee number”. Enter your employee number using the numeric keypad on the right side of the screen.

Power off Procedure

The Windows 2000 operating system must be shut down properly before turning off the UPS unit. To properly shut Windows 2000 down, press the Shutdown key located on the starting screen. You will be prompted to continue the shutdown process. Press the yes key and Windows 2000 will begin the shutdown process. When a box appears saying “It is now OK to shut down your computer”, it is now safe to shut the UPS off. If the NO key is pressed during the Shutdown process, the shutdown Sequence will not activate.

OPERATION

![Starting Screen](image)
GENERAL
When the SNAP™ is powered on, this will be the first screen to appear. The concept is similar to a typical menu driven system, with this being the first menu.

The right hand side of the screen contains a numeric keypad similar to a touch-tone phone except for the addition of the Back Space, Enter, and Space Keys.

EMPLOYEE NO.
The operator must enter his I.D. via the numeric keypad to start a valid proving cycle. Touching the key will highlight it, and the I.D. is entered using the numeric keypad. The I.D. is then checked against a valid list that has been previously entered into a file.

Key Sequence Example -

```
   EMPLOYEE  1  7  9  6   ENTER
```

NOTE
An Operator number entry will automatically bring up the operator screen.

STANDARD DATA ENTRY
The key MUST BE TOUCHED and highlighted for data to be entered. At the completion of the entry, the ENTER key must be pressed. The key then un-highlights and the computer processes the input.

On the right hand side is the standard numeric keypad.

GENERAL
To enter data in these keys, just touch the key; it will highlight and show the prompt “################”. Numeric or alphanumeric data may be entered. The ENTER key must be touched to complete data entry.
A block showing the meter to be proved with its target proof and flow rates is also shown at the lower mid-section of the screen. This is the screen that appears during normal operation.

A description of the windows on the left side of the standard operator screen is as follows:

**Reason Removed No.**
This window and key is used to record the reason a meter is being tested. Example: #12 (Periodic Test)

**Your Utility Name or Number**
This window and key is used to enter your gas company meter serial number.

**Manufacturer Serial Number**
This window and key is used to enter the manufacturer number of the meter you are testing.

**AMR Number**
This window and key is used to enter in the serial number of the Automated Meter Reading (AMR) transponder. Some companies want to match the transponder serial number with the meter serial number.

**Index Reading**
This window and key is used to enter the beginning index reading of the meter you are testing.

---

**NOTE**
Numeric or Alpha characters may be entered at any time Touching the ALPHA key will display an alpha keyboard. On the alpha keyboard there is a key to allow you to toggle back to the main screen. The ENTER key must be touched to complete data entry.
Setting up the test: *(Reference: Standard Operating Screen on Page 2-8)*

<table>
<thead>
<tr>
<th>Alternating Keys</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REG/TC</td>
<td>This key toggles between REG (a regular meter) or TC (a temperature compensated meter). In the TC mode, the proof display is corrected to base temperature proof.</td>
</tr>
<tr>
<td>ENG/MET</td>
<td>ENG or MET may be selected for English or metric.</td>
</tr>
<tr>
<td>%PROOF/%ACCURACY/%ERROR</td>
<td>The display of the results can be shown as %PROOF, %ACCURACY, or %ERROR.</td>
</tr>
<tr>
<td>2-RATE/3-RATE</td>
<td>The 2-RATE is normally run at the open and check rate. With the 3-RATE option, another rate may be checked.</td>
</tr>
<tr>
<td>INTEST/OUTTEST HH ON/</td>
<td>This key indicates the type of test being made. If a meter is proved with INTEST or OUTTEST indicated, this information will be stored in the meter statistical file.</td>
</tr>
<tr>
<td>OUTTEST HH OFF</td>
<td></td>
</tr>
<tr>
<td>MAG/OPTIC/IX CHK/DIFF PRESS</td>
<td>This is a reference to the type of sensor used to detect meter rotation. The default is MAG, a patented device to detect motion of the diaphragm or rod. The OPTIC option will allow the use of the standard optical sensor to prove off the meter index. When the OPTIC option is selected, an index key appears on the operator screen. This key will toggle the different indexes (i.e. ¼, ½, 1, 2, 5, 10). IX CHK allows the operator to prove a meter using a magnetic sensor, while at the same time, using the optical sensor to verify that the index proving dial is turning. The DIFF PRESS option will detect meter revolutions from the differential pressure signature of the meter.</td>
</tr>
</tbody>
</table>

Standard Operator Screen
SELECT METER TYPE (SEE BOTTOM FIGURE ON PAGE 2-8)

This key moves you to the Meter Select Screen to select the type of meter to be proved. The various meters to be selected are in a file that can be easily changed by your supervisor.

IMPORTANT: Incorrect meter selection can cause the following problems: Erroneous %Proof, %Accuracy, or %Error readings.

The ?? Pulses ??message may also be caused by an incorrect meter selection.

On the left hand side of the screen are the various manufacturers names. Touching any of these will display all the meters the prover can prove from that manufacturer (a maximum of 18 per manufacturer).

NOTE

The initial display defaults to the first American meter in the meter file.

Touching the meter to be proved will bring up the block showing the meter type, Open, Check, or Other flow rates and target proofs. If this area is blank, a meter must be selected.

EXIT

The EXIT key will take the operator back to the standard operator screen to start proving the selected meter.

PROVING A METER

Once a meter type has been selected, press the EXIT key to return to the operator screen. Ensure that the six alternating default keys are adjusted to the proper values. Enter meter identification data such as utility meter number, manufacturer number, and index reading. Once the required meter identification data has been entered, the
“Press Clamp Buttons” Prompt will appear in the message center. Ensure the correct size meter connections are inserted into the clamp arms. Place the meter under the clamps and press the clamp buttons to start the test. A leak test will now be performed (see page 3-10). After the leak test completes, the proof screen will appear. No more operator intervention is necessary until the proving cycle is complete.

**LEAK TEST**

After the meter is clamped, the SNAP™ prover system undergoes a leak test for the entire system. The 125 cfh nozzle is opened to vacuum and then closed. The pressure in the system is monitored for a pre-determined length of time. A leaky system would cause an error in proof greater than 0.1 percent (See note below).

The following displays may appear in the message center if a leak occurs:

<table>
<thead>
<tr>
<th>Test</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak Test</td>
<td>When the leak test has begun, this message will be highlighted and will flash.</td>
</tr>
<tr>
<td>Leak Test - Nozzle Leak</td>
<td>A leak has occurred in the nozzle solenoid valves.</td>
</tr>
<tr>
<td>Leak Test - Very Big Leak</td>
<td>The most likely cause of this leak is a major problem with the inlet solenoid valve. Other likely sources are disconnected tubing, leaky adapters, and dirty meter connections. Make sure the vacuum pump filters are not dirty or clogged.</td>
</tr>
<tr>
<td>Leak Test - Big Leak</td>
<td>This leak is probably a medium sized leak that does not allow the leak test proceed because the proper amount of vacuum is not sustained. This could also be caused by a major system leak or vacuum pump failure.</td>
</tr>
<tr>
<td>Leak Test - Leak</td>
<td>A failure of this type indicates a possible leaky meter. This is a very small leak. Have the meter hydrotested.</td>
</tr>
</tbody>
</table>

A failure of this type indicates a possible leaky meter. This is a very small leak. Have the meter hydrotested.

### NOTE

The leak test is used for overall system integrity, NOT as a meter leak test.
If the leak test display indicates a system leak is present, consult the Maintenance section of the Users Manual for troubleshooting and repair information. The test may be prevented from running due to a leak in the meter or to an improper physical setup connection. If this is the case, the operator may do one of the following:

Press the REJECT key and enter the appropriate code to indicate that the meter has a leak. This clears all information for that meter and readies the prover to start a test on the next meter.

Press the ABORT key and the clamp buttons to unclamp the meter and return to the operator screen. This may display an indication that the meter connections selected were the wrong size and that the meter was connected incorrectly.

Press the RERUN key to run the leak test again. This might indicate that one of the hoses was not connected tightly or that the dust cap was missing and the operator was able to correct the problem. The meter test can then be rerun without reentering the meter information or reclamping the meter. The prover would resume the test beginning with the Preleak Cycle.

GENERAL
This is the main screen the operator interacts with during the proving cycle.

The status line displays the type of test, meter type, and results format (i.e. %PROOF, %ACCURACY, or %ERROR)

The message center is located on the lower right side of the screen and indicates information on the prover cycle (i.e. Leak Test, Open Test, Check Test, and the Operational Parameters).

NOTE
The flow rates are found in the center of the Open and Check columns at the top of the screen.
### Message Center Information

<table>
<thead>
<tr>
<th>Message Center Information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press Clamp Buttons</td>
<td>Index Pulse Not Detected</td>
</tr>
<tr>
<td>Press Clamps to Unclamp</td>
<td>Rev Sensor Signal not Detected</td>
</tr>
<tr>
<td>Exercise Test in Progress</td>
<td>Printer Off Line</td>
</tr>
<tr>
<td>Open Test In Progress</td>
<td>Rejected</td>
</tr>
<tr>
<td>Check Test in Progress</td>
<td>Running Leak Test</td>
</tr>
<tr>
<td>Other Test in Progress</td>
<td>Running Nozzle Leak Test</td>
</tr>
<tr>
<td>High Differential Pressure</td>
<td>Remote Access Startup Error</td>
</tr>
<tr>
<td>Transaction Complete</td>
<td>Big Leak</td>
</tr>
</tbody>
</table>

### BUTTON DEFINITIONS

**Repair Reject Retire**

Touching this key will take the operator to the “Reasons for Rejection, Repair Class, and Retire” screen. Once a reason is entered, the operator returns to the proof screen to unclamp the meter.

**Adjust**

When adjusting meters, use this key to make the clamp buttons raise the hand-hole seal so the meter may be adjusted. This key also activates the jog buttons for use in moving the meter tangent during adjustment.

**Accept**

Touching this key stores the test information for the meter being tested and makes the clamp buttons active to unclamp the meter.

**Rerun**

This key will rerun the meter under test with the same open/check revolutions and flow rate as the previous test.

**Abort**

This key aborts the test for any reason. The data collected during the test will not be retained. The prover will return to the operator screen after the meter is unclamped.
GENERAL
This screen appears if the operator has chosen to test at three flow rates rather than two. The screen displays the same functions as the screen for two flow rates, with the addition of a third flow rate. This third flow rate can be entered in the Change Specs screen. The Change Specs screen is available through the Select Meter Type screen.

NOTE
The Rev Sensor voltage graph and the Pulse Counter display will only display when a supervisor number is used. These are diagnostic tools and are generally not required for production testing.

If more than one proof run is taken on a meter, the results of the current run always appear on top. Previous run results move to the bottom. Proofs that do not meet specifications will blink. This feature is very useful during the meter adjustment phase.
GENERAL
This screen allows the operator to enter a reason for the rejection of a meter. The supervisor can customize these reasons.

The reason for rejection is entered using the numeric keypad.

EXIT
Touching this key takes the operator back to the proof screen to unclamp the meter and begin a new proving cycle.
3. **SNAP™ PROVER CARE AND MAINTENANCE**

**GENERAL CARE**

The cabinet door should be kept closed at all times to protect internal devices from unnecessary dust or other dirt. It is a good idea to prevent any dust or other foreign materials, such as grease, to accumulate on the cabinet and the various devices outside the cabinet (LCD monitor, keyboard, differential pressure gauge, clamps and seals, regulator and oiler, or meter stand).

Always use clean dry shop air in the high-pressure air supply. The recommended operating pressure on the outlet of the regulator is about 30 PSI. When the pressure is excessive, it could damage the valve assemblies. If pressure is too low, it can prevent the clamps from sealing properly.

---

**DANGER**

When the main enclosure is open, it is possible to be exposed to high voltages. Use caution.

**TOUCH SCREEN**

Clean the screen with glass cleaner or a damp cloth. Never use abrasive materials on the screen or bezel.

**FILTER/REGULATOR/OILER**

The oil-fog lubricator must be checked periodically to insure that the reservoir does not run dry. If oil is needed, refill with a misting type oil rated at 150-200 SUS at 100 °F. The filter needs to be visually inspected regularly, and if necessary, drained and cleaned.

**CONNECTION SEALS**

Replace meter connection seals when visually worn. Defective seals result in a system leak test failure even when the meter itself is not defective.

**PROBES**

The diagnostics program provides readings to check each of the probes. The supervisor may verify the readings against acceptable ranges. Probes can also be visually inspected for any accumulation of dirt or oil.

**CLEANING**

To protect the nozzles and valves against any accumulation of abrasive materials from the meter under test, a filter is placed before the nozzles. It is recommended that the filter be cleaned on a daily basis to prevent foreign particles from flowing into the system. It is also desirable to clean the solenoid valves due to foreign material buildup that may affect the test results. Generally, when a valve requires cleaning, it operates sluggishly and tends to be noisy. Sluggish valve closure may also indicate a need for lubrication.
4. TROUBLESHOOTING

DEVICE REPLACEMENT
Prover components are easy to replace. They do not require the cutting of any wires. To remove a component, disconnect the corresponding cable from the input/output panel, then unplug the component, often by simply loosening two to four screws.

If a transducer fails, simply unplug it, remove it, and plug in a new transducer. Recalibration of the transducer will be necessary.

The solenoid valves and the devices coming from the cabinet are connected using electrical connectors. When a solenoid valve fails, unplug the connector, remove it, replace it, and plug the connector back in.

See the Spare Parts List for replacement part numbers.

COMPONENT TESTING.
This section pertains to relays, probes, and valves.

WARNING
Before removing or installing a valve, make sure you disconnect the appropriate cable from the input/output panel.

SOLENOID VALVES
A leak or erratic operation can affect proving accuracy.
Nozzle solenoid valves should be cleaned when it is found that the voltage of the coil is correct (24 VDC) but:

• Valve operation is sluggish
• There is excessive leakage (see Leak Test in Chapter 3 for more information)
• The valve is very noisy

The diagnostics program provides a procedure to check the air actuated solenoid (MAC) valves:

• Press the meter clamp buttons (when instructed by the computer)
• This should activate one or more of the valves. When the valves are activated, the hand-hole cover and the slide should move. If the shop air is disconnected, the valves will click, but nothing will move. The solenoids should light on the valve assembly that is activated.
• If the valves are not activated, check each meter clamp button with a continuity tester or ohmmeter (meter clamp buttons are arranged serially in the circuit).

DISPLAY
• Check that the main power switch is on.
• If power is off, press the main power switch on the UPS.
• Check to see if the emergency stop switch is depressed.
• Check the power switch on the back of the LCD monitor
• If the computer is off, check that the prover power cord is plugged into the wall outlet.
• If the power outlet is “live”, check to see if the power cable is defective.
• Check and replace the main power switch if defective.

NOTE
All electrical work must be performed by a qualified technician
CLAMP CYLINDERS
• Shut off the shop air
• Remove one of the tubes connected to the clamp cylinder.
• Turn the air on and then off quickly to see if there is any air coming from the tube.

**WARNING**
Since shop air is fed into the regulator at high pressure, make sure the tube is held firmly. **DO NOT POINT IT AT ANY PERSON!**

• If there is air coming through the tube, the cylinder is jammed or the airflow control valve is defective.

**CAUTION**
The cylinder flow control valve is factory-adjusted and sealed. Do not modify.

SHOP AIR
• Regulator inlet requires a pressure of 60–65 psig. Turn shop air on.

SYSTEM LEAK TEST FAILS
• Check that the vacuum pump is on.
• Check that shop air is on.
• Check that shop air is above 30 psig at the regulator inlet.
• Check that the meter is properly positioned on the stand.
• Check that the clamps are snug against the meter inlet, outlet, and/or hand-hole when the clamps come down.
• Check that there are no cracks or burrs on the clamp seals.
• Check to ensure that the correct size meter connections are installed.

POWER SUPPLY FAILURE
There are three 24 VDC power supplies in the SNAP. One 7.5W power supply powers the sensors. Two 100W power supplies wired in parallel power the solenoid valves and the table actuator.

IMPROPER METER CLAMP BUTTON OPERATION
If the solenoid valves do not operate when these buttons are pressed, either the buttons are defective or there is a problem with the solenoid valves (such as a lack of air or power, etc.). Check the power and air supply.

THE EMERGENCY STOP BUTTON
The emergency stop button shuts down all electrical power, with the exception of the computer. It also releases the air pressure on all air cylinders.

This button can be checked at any time by pressing it.

SENSOR PROBES
The system provides readings for the probes. These readings should be examined for irregularities by the supervisor. (See page Z-2 under Sensor.)
5. SNAP SENSOR CALIBRATION PROCEDURE

GENERAL
The procedure for calibrating all of the sensors is essentially the same. The Calibration Screen is accessed through the Special Functions Screen, when in Supervisor Mode.

Two known conditions are sampled for each sensor, a low condition and a high condition. For both conditions, the sensor output is read by the computer system and the known reference value is the condition entered. The computer calculates the zero and span required to yield corrected values in other conditions.

TEMPERATURE PROBES
The temperature probes are the most critical sensors on the SNAP prover. Sonic velocity varies 0.1% for each degree Fahrenheit. A volume correction is also made for any difference in meter temperature and nozzle temperature.

Calibration requires a certified reference thermometer. A working thermometer that has been calibrated against a certified thermometer can also be used.

There are three temperature probes available on the SNAP. The large meter temperature probe is only used for the Bell Interface kit.

Temperature Probes
The meter outlet temperature (TM) probe may be removed by loosening the compression fitting nut and unplugging the top connector. To re-install, reverse the procedure.

Two well stirred water baths are needed, one at 40°F and one at 90°F. Before placing the temperature probe into the bath, ensure that the top connector is re-installed.

From the Special Functions Screen, press the Calibration key. Place the temperature probe and the calibrated reference thermometer into the low temperature bath and allow the readings to stabilize. The message box, in the lower right portion of the screen, prompts the user to “Select Sensor Channel to Calibrate.” Select Small Meter Temp. sensor by pressing the black box with the Small Meter Temp. value in green. The sensor value will turn red, and a Read Sensor key will appear. The message box prompts the user to “Input Low Condition.” Press the Read Sensor key and input value shown by the reference thermometer, i.e. 40°F. Then press the Enter key on the screen to store the value. The user is then prompted to “Input High Condition.” Follow the same procedure, placing the probe and the reference thermometer into the high temperature bath, and wait for the readings to stabilize. Again press Read Sensor, and input the high temperature condition, i.e. 90°F. Press the Enter button on the screen to store the values.

Upon entry of the high value for any sensor, press the Save key to save the new calibration values (low and high) to the Sensor file on the computer hard disk drive. Pressing the Cancel key cancels the sensor calibration.

IMPORTANT
When the calibration routine is complete, insert the configuration disk into the SNAP floppy drive and press the Download Setup Files Key. This will create a backup of all sensor calibration values.

CAUTION
The temperature probes must be thoroughly dried after calibration.

NOTE
Always recheck the calibrations to insure the calibration is correct.
Repeat the same procedure for the nozzle temperature (TN) probe, using the corresponding touch key on the calibration screen.

**RELATIVE HUMIDITY SENSOR**

The humidity sensor probe is mounted next to the temperature probe in the nozzle manifold. A compression fitting nut must be loosened to remove the sensor. Use caution, because permanently attached wires limit the movement of the sensing element.

Because relative humidity has a small effect on sonic velocity, a 10% change in humidity affects proof by less than 0.1%. A *commercial quality* calibration standard provides suitable accuracy. Certified standards are unnecessary.

One method of calibration involves the use of humidity salts. Mix the salts per the instructions provided by the manufacturer and proceed as follows.

---

**CAUTION**

Do not allow the probe to come into contact with the salts or liquid inside the bottle.

From the Calibration Screen, insert the humidity probe into the low humidity reference bottle and allow the reading to stabilize.

Press the Read Sensor key, then input the known humidity inscribed on the reference bottle. Press the Enter key on the screen. Insert the probe into the high humidity reference bottle and allow the readings to stabilize.

Press Read Sensor, and input the correct humidity. Press Enter.

Remember to press Save after inputting the high value to save the new calibrations (low and high) to the Sensor file on the computer hard disk drive. Pressing the Cancel key cancels the sensor calibration without saving the new values.

**METER TO NOZZLE DIFFERENTIAL PRESSURE TRANSDUCER**

The differential pressure transducer measures the pressure differential between the meter inlet and the nozzle inlet. The transducer is located within the main enclosure.

A commercial quality calibration standard provides suitable accuracy for testing the differential pressure transducer. One inch water column inaccuracy results in a 0.25% proving error. A standard U tube or well type manometer, or an electronic manometer can be used.

The high side of the transducer is connected to the inlet meter clamp. Connect the manometer to the hose leading from meter inlet clamp to the main enclosure. The low calibration condition should be one (1) inch water column and the high calibration condition should be nine (9) inches water column.

The same procedure for sensor calibration should be followed (wait for readings to stabilize, Read Sensor, input value).

Remember to press Save after inputting the high value to save the new calibrations (low and high) to the Sensor file on the computer hard disk drive. Pressing the Cancel key cancels the sensor calibration without saving the new values.

**ATMOSPHERIC PRESSURE**

The barometric pressure can be calibrated using the same manometer used in the differential pressure calibration. The barometric pressure is measured at the nozzle inlet located at the nozzle manifold. The transducer is located inside the main enclosure.
To perform this calibration, the local atmospheric pressure must be known. This can be obtained by a phone call to the local weather service or airport.

**NOTE**

The value obtained may be corrected to sea level. The user must make a correction for local altitude if the reading is given for sea level.

The high condition must be read with the hose from the nozzle block to the main enclosure disconnected and vented to atmosphere. The low condition is created by evacuating the hose to the nozzle block to approximately 40 inches water column and reading the exact pressure with a water manometer. The low is the atmospheric pressure minus the pressure indicated by the manometer.

\[
2.0360 \text{” HG @ 0°C} \\
1 \text{ psi=} \\
2.0418 \text{” HG @ 60°C} \\
27.707 \text{” WC @ 60°C}
\]

The same procedure for sensor calibration should be followed (wait for readings to stabilize, Read Sensor, input value).

Remember to press Save after inputting the high value to save the new calibrations (low and high) to the Sensor file on the computer hard disk drive. Pressing the Cancel key cancels the sensor calibration without saving the new values.

**NOTE**

If the user tries to calibrate on a day when the local weather is erratic and the atmospheric pressure is fluctuating or changing rapidly, consider calibrating on a calm day.

**VACUUM PRESSURE GAUGE**

The vacuum pressure gauge is used to ensure that sufficient vacuum is present to guarantee sonic flow in the nozzles. The actual calibration is critical to meter proof. A manometer or vacuum gauge with a range of zero to thirty inches of mercury vacuum and accurate to about 0.25 inches of mercury is satisfactory.

The low condition is created with the vacuum supply off or disconnected. The high condition is created with the vacuum source on. The manometer must be teed into the vacuum transducer hose, which runs from the solenoid manifold to the main enclosure.

The same procedure for sensor calibration should be followed (wait for readings to stabilize, Read Sensor, input value).

Remember to press Save after inputting the high value to save the new calibrations (low and high) to the Sensor file on the computer hard disk drive. Pressing the Cancel key cancels the sensor calibration without saving the new values.

**METER DIFFERENTIAL PRESSURE TRANSDUCER**

The meter differential pressure transducer measures the pressure differential between the meter inlet and the meter outlet. The transducer is located inside the right hand side of the prover’s frame.
A commercial quality calibration standard provides suitable accuracy for testing the differential pressure transducer. A standard U tube or well type manometer, or an electronic manometer can be used.

The high side of the transducer is connected to the inlet meter clamp. Connect the manometer to the hose leading from meter inlet clamp to the main enclosure. The low calibration condition should be 0.1 inch water column and the high calibration condition should be 2.5 inches water column.

The same procedure for sensor calibration should be followed (wait for readings to stabilize, Read Sensor, input value).

Remember to press Save after inputting the high value to save the new calibrations (low and high) to the Sensor file on the computer hard disk drive. Pressing the Cancel key cancels the sensor calibration without saving the new values.

⚠️ **WARNING**

Do not apply more than 10 inches of water column to the meter differential pressure transducer.
6. SNAP
SOFTWARE SETUP INSTRUCTIONS

GENERAL
The SNAP prover references several data files during normal operation. The file names are determined by the serial number of the prover, i.e. XU-3500.MET meter file. These files may be altered from within the SNAP software. These files are:

<table>
<thead>
<tr>
<th>File Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Parameters File</td>
<td>Contains SNAP default startup parameters</td>
</tr>
<tr>
<td>Employee Numbers File</td>
<td>Contains the Operator and Supervisor number used to gain access to the SNAP</td>
</tr>
<tr>
<td>Meter File</td>
<td>Contains specific definition data for each individual meter type</td>
</tr>
<tr>
<td>Reject Reasons File</td>
<td>Contains all reject reasons</td>
</tr>
<tr>
<td>Repair Class File</td>
<td>Contains all repair class information</td>
</tr>
</tbody>
</table>

INSTRUCTIONS FOR MODIFYING OR VIEWING SNAP CONFIGURATION FILES

Begin by entering a supervisor employee number and press the Special Functions key. Once inside the Special Functions screen, press the Edit Config Files key. Upon doing so, the Configuration Files screen will appear. The Configuration screen will display the Default Parameters screen, as well as keys to access Employee Numbers, Meter File, Reject Reasons, and Repair Class Screens.

NOTE
The information appearing on the screen within this manual is for instruction purposes. Your SNAP data files may contain different entries.
The SNAP default parameters consist of a group of user-defined options, which indicate to the prover the meter type, test units, display, # of tests, type of test, and revolution sensor type.

**DEFAULT PARAMETERS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test Type</strong></td>
<td>REG/TC</td>
</tr>
<tr>
<td><strong>Test Display</strong></td>
<td>%Proof/%Error/%Accy</td>
</tr>
<tr>
<td><strong>Test Mode</strong></td>
<td>INTEST/OUTTEST HH ON/OUTTEST HH OFF</td>
</tr>
<tr>
<td><strong>Sensor Type</strong></td>
<td>MAG/OPTIC/IX CHK/DIFF PRESS</td>
</tr>
<tr>
<td><strong># of Tests</strong></td>
<td>2-RATE/3-RATE</td>
</tr>
<tr>
<td><strong>Test Units</strong></td>
<td>ENG/METRIC</td>
</tr>
</tbody>
</table>

- **Test Type**: Choose TC for Temperature Compensated meters or REG for nontemperature compensated meters.
- **Test Display**: The display of the test results can be %Proof, %Error, or %Accuracy.
- **Test Mode**: The Intest mode is used for testing a meter with the hand-hole cover on the meter. The Outtest mode is used when testing a meter with or without the hand-hole cover. The Outtest HH On setting activates the automated hand-hole cover on the SNAP (Series II only).
- **Sensor Type**: Select between proving with the magnetic pickup sensor, optical index sensor, magnetic pickup sensor and the optical index sensor together where the optical sensor functions as an index checker, or differential pressure proving.
- **# of Tests**: Select between proving with two flow rates or three flow rates.
- **Test Units**: When the metric option is selected, the proof is calculated using a metric base temperature.
**Forced Entry Selections**

The Forced Entry options allow the supervisor to select which meter data keys require entry before testing can begin.

- **Forced Entry Gas Company Number** YES/NO
- **Forced Entry Manufacturing Number** YES/NO
- **Forced Entry Index Reading** YES/NO
- **Lotus File** YES/NO

When the Data Download function is used, the SNAP downloads a data file containing meter proof information in an ASCII text format to a floppy diskette. The meter proof information may also be downloaded in a format that is compatible with a spreadsheet program by selecting YES for this option. The ASCII text version is always downloaded, regardless of what option is selected.

**File Size** SMALL/LARGE

Select SMALL for the standard size output file or LARGE for the extended file, as defined on Pages Z-14 and Z-15 for more information.

- **Average Screen** YES/NO
  Selecting yes for this option will cause the SNAP to display the average of the open and check proofs on the screen.

- **Weighing Value** YES/NO
  This option is used in conjunction with the Average Screen option above and allows the user to select an average, which is calculated based upon the weighted percentage of the open proof from 0 to 99.9.

- **Hand-Hole Cover** YES/NO
  Select either YES or NO to signify the existence of the hand-hole clamp.

- **# of Nozzles** 5/6
  Determines the existence of either five or six nozzles.

**Customer Name**

Enter the customer name in the space provided. A maximum of 17 characters may be entered. The name entered will appear at the top of the supervisor screen as well as the company number key.
EMPLOYEE NUMBERS FILE

Employee numbers may be entered in two different categories. Numbers preceded by the letter “O” represent operator numbers and entries that begin with the letter “S” represent supervisor numbers. Supervisor numbers allow the user to access all of the screens, while operator numbers do not allow access to the calibration and special functions screens.

The column that contains the letters “R” and “L” represent left or tight orientation of the Index Reading when displayed on the operator screen.

NOTE

The Prover Serial Number should never have to be changed.

METER FILE

The Meter file screen displays the contents of the meter file. Entries are displayed by manufacturer class. There are five different manufacture categories: A – American Meter, B – Bell, O – Other, R – Rockwell, S – Sprague. Each manufacture category will hold up to 18 meter entries. The Manufacturer Type key toggles between the five different manufacturers. The default is “A” for American Meter. To access a different manufacturer, press the Manufacturer key until the desired letter appears.

Use the Next Meter key to toggle through the meter entries within a manufacture category. Each time this key is pressed, the next meter will be visible.

To add a new meter to a manufacture category, press the Add Meter key. When this key is pressed, all fields on the screen will contain blanks. Begin by entering the meter name and fill in all fields on the screen. Use the Save Specs key to save any changes or new entries.

The Delete Meter key will delete a meter entry from the meter file. The meter entry will not be Deleted unless the Save Specs key is pressed after pressing the Delete Meter.
REJECT REASONS SCREEN
To enter a reject reason, simply highlight the appropriate key by pressing one of the labeled fields. Each field is alphanumeric and will accept up to 18 characters. Use the Save Specs key to ensure any changes are saved to the file. Twenty different reasons may be entered into the Reject Reasons file. Use the More key to display the second screen of fields.

REPAIR CLASS CODES SCREEN
To enter a Repair Class Code, simply highlight the appropriate key by pressing one of the labeled fields. Each field is alphanumeric and will accept up to 18 characters. Use the Save Specs key to ensure any changes are saved to the file. Twenty different reasons may be entered into the Repair Class Codes file. Use the More key to display the second screen of fields.
7. SNAP
BELL INTERFACE

The Bell Interface option has been developed to verify the accuracy of the SNAP prover nozzles with its measurement sensors, by testing the SNAP directly against a Master Bell.

Prior to setup of the Bell Interface test, the Master Bell should have been recently strapped using certified equipment to determine the error in the Master Bell scale with precision.

Bottling the Bell will not reveal a scale error value; it will only show that the scale marks are accurate to within a certain percentage.

The verification of the sonic nozzles is accomplished by first connecting the Bell prover to the SNAP using a Bell Interface Kit. The Bell Interface Kit contains most of the hardware required to connect the SNAP prover to either a 2 Foot³ or 5 Foot³ Master Bell Prover.

During the SNAP – Bell Interface test, the SNAP tests the Bell exactly as if it were a meter, drawing air out of the raised Bell at rates set by the nozzles until the desired Bell volume has been withdrawn (2 cubic feet is recommended for both 2 Foot³ or 5 Foot³ Bell Provers). All five or six nozzles are tested using three proof runs per flow rate.

A fiber-optic sensor – reading the Master Bell scale graduations – starts and stops the test and provides a high degree of accuracy and repeatability. A one-minute pause between individual proof runs also contributes to maximum repeatability. This allows excess oil to drain from the Bell and provides time for the air temperature to stabilize within the Bell itself.

The Master Bell Proof is determined by comparing the Bell volume to the SNAP-calculated volume. If the Master Bell proof is within a pre-determined error limit (± 0.15%), the SNAP is ready to prove meters. A proof outside the acceptable range may require further action – such as checking the Bell prover strapping data, the overall Bell prover operation, the accuracy of the SNAP sensors, or the procedures used to calibrate the sonic nozzles.
8. SNAP

VACUUM SOURCE

ONE VACUUM PUMP FOR TWO SNAPS

The vacuum pump provided with this kit has a capacity of 1800 cfh, which is sufficient to operate two SNAPs simultaneously.

**NOTE**

When proving commercial meters, care must be taken to not exceed the capacity of the vacuum pump.

Before proceeding with these installation instructions, please check to be sure the following items are included in the kit. It is also important to read all vacuum pump operating instructions before using this equipment.

a. Vacuum Pump (Gast Model 6066-V107A-T339) which includes: motor, base, coupling, coupling guard, filter, muffler, and required fasteners. **Model 6066 is sufficient for use at all elevations (seen note on page D-3).**

b. Vacuum Relief Valve (Gast Model AA308)

c. Three Vacuum Pressure Gauges (Gast Model AA640)

d. PVC pipe, 1 ½” diameter and required fittings, not to exceed 100 feet in length. For maximum pump performance, good piping practices should be followed.

**NOTE**

PVC pipe is NOT supplied with this kit. PVC pipe must be supplied and installed by the customer.

e. One Check Valve (Gast Model AH326A)

f. Piping Connections:

   a. Two Swivel Connections AMCO No. 55405P002
   b. Five ¾” MNPT Nipples AMCO No. 93316P043
   c. One ¾” FNPT Cross AMCO No. 49366P010
   d. Two Flare Adapters AMCO No. 93305P015
   e. Flexible Hose, 1” OD AMCO No. 43594P045
   f. Two Tees, ¾” FNPT AMCO No. 49366P009
   g. Three ¾” MNPT x ¼” FNPT AMCO No. 13684P065 Reducer Bushings
   h. One 1” MNPT x ¾” MNPT AMCO No. 94353P016 Hex Reducing Nipple
   i. Two Ball Valves, ¾” FNPT AMCO No. 89884G002
INSTALLATION PROCEDURE

1. Refer to Drawing No. SK-4775 (Vacuum Source Option #3) during installation. The Gast Vacuum Pump will arrive fully assembled. The pump base should rest on a level floor in a room separate from the proving area, due to the considerable noise (approx. 90dB) generated by the vacuum pump during operation.

2. First, connect the pipe adapter, 1" MNPT x ¾" MNPT, to the 1" NPT intake port on the vacuum pump. Then, connect the check valve to the pipe adapter. Connect a nipple to the other end of the check valve. Then connect one cross to the other end of the ¾" NPT nipple.

3. At a right angle to the ¾" NPT nipple, connect a ¾" MNPT x ¼" MNPT reducer bushing. Then connect a vacuum pressure gauge to the reducer bushing.

4. Opposite the connection to the vacuum pump on the cross, connect the vacuum relief valve.

5. On the remaining cross outlet, connect the flexible tubing using a flare adapter and swivel coupling.

6. Connect the other end of the flexible hose to the PVC pipe using a flare adapter and swivel coupling.

7. Connect the second and third ¾" MNPT nipples to the other ends of the PVC pipe. Then, connect the ball valves to the other end of the nipples. Connect nipples 4 and five to the other end of the ball valves.

8. Connect the ¾" FNPT tees to the other end of the ¾" MNPT nipples.

9. At a right angle to the nipple connection on the tees, connect the second and third vacuum gauges, using the second and third ¾" MNPT x ¼" FNPT reducer bushings.

10. Finally, connect the vacuum hoses provided with the SNAP to the remaining connection on the tees.

NOTE

American Meter Company DOES NOT WARRANT vacuum system equipment (i.e., pumps, motors, valves, gauges, etc.). American Meter Company acts solely as a re-seller of the equipment. The pump, motor, and all associated equipment carries only the transferable warranty of the company that makes it. For vacuum pump technical assistance, service, or repair parts, contact your local Gast Distributor, contact Gast Manufacturing Corporation directly at 616-926-6171, or visit www.gastmfg.com for assistance.

ROTARY VANE VACUUM PUMPS

OILLESS OR LUBRICATED

Oilless vacuum pumps produce completely oil-free air. They require no oiling and can be mounted in inaccessible places where regular maintenance might be difficult. The self-sealing, compound carbon vanes self-adjust as they wear so your pump will perform with like-new efficiency throughout its service life.

Lubricated pumps generally have higher vacuum ratings than oilless pumps. For example, the Gast pump # 2565, a lubricated pump, is guaranteed to operate reliably up to 28" Hg (656 mbar), while its oilless counterpart, the 2567, operates up to 27" Hg (99mbar). The vanes inside are made of tough phenolic and random fiber or of woven mat. They are particularly resistant to foreign matter.

Siphon and wick-type lubricators are used for lighter-duty applications. Heavy-duty lubricators are available for harsh conditions or when the pump operates under continuous duty.
MOTOR-MOUNTED OR SEPARATE DRIVE
Models are available with or without motors. That way, if you have access to a separate drive source, you can save the cost of the motor.

EASY TO SERVICE
Oilless models have lubricated-for-life ball bearings. So, internal workings require virtually no maintenance at all.

The only servicing needed is the occasional replacement of vanes when they become worn. On motor-mounted units, simply remove several bolts and the end plate to expose rotor and vanes for inspection.

IMPORTANT INFORMATION ON GAST VACUUM PUMPS

INSTALLATION
It is important to include a vacuum gauge at the vacuum pump inlet in the air line within a few inches of the unit. Diagnosis of system problems is easier and more accurate with a gauge in this location. In reciprocating units, a “snubber” should be installed in the gauge connection to reduce pulsations that can damage the gauge.

The installation of a relief valve is equally important. Unit life is directly related to duty levels and most systems require only a fraction of a pumps advertised capacity to operate efficiently. The Gast (optional) relief valve makes it simple to “fine tune” the pump to minimum system needs, reducing electrical consumption and maximizing pump life.

ELECTRIC MOTORS
All electric motors supplied with Gast vacuum pumps are designed to operate at plus or minus 10% of the nameplate voltage. Motors to meet special requirements are available on request. Various brand-name motors are furnished on any model at the discretion of Gast.

LUBRICATION
Unless otherwise specified, every lubricated Gast unit is equipped with a standard lubrication system that automatically delivers the correct amount of oil to the pump. To provide correct lubrication, it is important to keep the oil reservoir filled.

In general, a reservoir holds enough oil for 25-50 hours of operation. Variables, such as duty level and ambient temperature, can cause significant variation from this range. However, an oil reservoir that needs refilling outside this range may indicate a malfunction in the lubrication system. Too much oil seldom does as much damage as insufficient lubrication.

The most serious consequences of too fast an oil rate are oil fog or heavy oil condensation at the exhaust. A likely consequence of too slow an oil feed is complete pump failure.

Consult the factory before attempting to alter the feed rates of a properly operating lubrication system.
UNIT LIFE EXPECTANCY

Many variables determine the life expectancy of a unit. Among them are:

1. Ambient temperature
2. Duty level
3. Operating cycle
4. Operating speed
5. Conditions of air handled:
   - Cleanliness
   - Humidity Heat
   - Chemical vapors present (corrosive, non-corrosive)
6. Unit Maintenance
   - Lubrication
   - Filter Maintenance
   - Muffler Maintenance

As an example of the effect environment can have on pumps, consider this: Some Gast units are rated for 25,000 or more operating hours under controlled conditions, as in the Gast Engineering Department Laboratory. The same model pumps, operating in the field under extreme adverse environmental conditions, have worn out in under 4,000 hours.

As a service to OEM customers, the Gast Engineering Department will predict the life expectancy of units used in OEM applications. Gast engineers will examine the units to predict life expectancy, after they have been used in the application for 4,000 hours.

Virtually all Gast units have lives much longer than 4,000 hours, a standard evaluation point for estimating total life expectancy. (D Motor Brush life is typically less than 4,000 hours. It is best to consult the factory for further information.)

AMBIENT TEMPERATURE

A not-to-be-forgotten condition in applying compressors and vacuum pumps is ambient temperature. To determine the ambient temperature reading of the air surrounding the unit, readings should be taken around the unit, approximately 4 inches away. Gast’s guarantee applies only to units operating within a temperature range of 32°F (0°C) to 100°F (38°C).

Low temperature affects the unit’s ability to start and high temperatures affect its life. Contact the factory for authorization of unusual ambient conditions.

This range is to be used as a guide and in no way means that things can’t be done to allow units to be applied outside this temperature range. For example, additional exterior cooling, change the duty cycle and duty, provide better lubrication, etc. The ambient temperature range is generally for continuous operation but should also be followed for intermittent applications if normal unit life is to be expected.

CONTINUOUS VS. INTERMITTENT OPERATION

- Rotary vane units will start under load. The vanes permit the internal chamber of the unit to bleed off during the cycle. At startup, the pump is not subjected to full load until enough centrifugal force has been attained to throw the vanes out against the body. By that time, the motor has gained enough momentum to continue its cycle without stress.

In systems where storage of built-up vacuum is important, check valves should be installed between the pump and the system.
• Blowers start up easily. Adequate internal clearances in Gast blowers make this possible.
• Oilless piston units will start under load as long as the top of the piston is not subjected to system vacuum. Under more complicated conditions, install a check valve next to the pump.
• Diaphragm units will not start under load because the surface area of the diaphragm is much larger than that of a piston pump. To start a diaphragm unit under load would require a motor much too powerful to be cost effective. Instead, a specific volume of air at zero pressure differential must be provided to start the system under load. (Specific volumes for different models are available from Gast.) Bleed orifices and dump valves are two common methods of supplying the correct zero pressure differential volume of air.
• Roc-R® rocking piston pumps use the same types of motors as diaphragm units and therefore the same conditions apply.

CATALOG PERFORMANCE SPECIFICATIONS

When looking at a Gast catalog performance chart, please remember that the specifications listed are that of a unit at sea level with an ambient temperature of 70°F (21°C), operating with normal electrical current conditions.

Performance shown in this catalog is the nominal to be expected from these models without accessories. Intake filters and exhaust mufflers, and the accumulation of contaminants in them during operation, will decrease the flow of air as well as the achievable vacuum by the vacuum pump.

DISTRIBUTORS AND REPRESENTATIVES

Distributor List / Territory Map

Please click the number on the map for the distributor location nearest you, or print out the complete list below.

LEGEND

A – Distributor/plant use sales only
B – Manufacturers Representative – OEM & plant-use sales
C – Gast warehouse & sales office – OEM & plant-use sales
D – Authorized Gast service center

1. (B) James E. Watson & Co.
3. (B) Franklin Electrofluid Co., Inc.  
(B) 3854 Watman Memphis, TN 38118  
Ph. 901/362-7504  
www.frankelectro.com  
(B) 8900 Crystal Hill Road North Little Rock, AR 72113 AR only 1-800-272-5665 Ph. 501/771-4170  
www.frankelectro.com  
(B) #1 Dutchmens Row Jackson, MS 39209 Ph. 601/969-7022  
(B) #1 Dutchmens Row Jackson, MS 39209 Ph. 601/969-7022  
(A) 5609 South 14th Street Ft. Smith, AR 72901  
Ph. 1-800-264-7406  
4. (B,D) Brenner-Fiedler & Assoc., Inc.  
13824 Bentley Place  
Cerritos, CA 90701  
Ph. 562/404-2721 & 714/521-6280  
Ph. 1-800-843-5558  
www.brenner-fiedler.com  
(B) San Diego, CA  
Ph. 619/232-9152  
Ph. 1-800-264-7406  
(B) 2117 South 48th Street #102  
Tempe, AZ 85282  
Ph. 1-800-638-0394  
5. (B) TECO Pneumatic, Inc.  
1069 Serpentine Lane  
Pleasanton, CA 94566  
Ph. 925/426-8500  
www.tecopneumatic.com  
6. (B) Fiero Fluid-Power, Inc.  
5280 Ward Road  
Arvada, CO 80002-1812  
Ph. 303/431-3600  
http://www.fierofp.com/  
(B) 8675 South 700 West  
Sandy, Utah 84070  
Ph. 801/567-1188  
Ph. 1-800-828-4252  
7. (B) Ohlheiser Corp.  
831 North Mountain Road  
Newington, CT 06111  
Ph. (CT only) 860/953-7632  
New England  
Ph. 1-800-858-9368  
www.ohlheiser.com  
(B) Boston, MA  
Ph. 1-800-858-9368  
8. (C,D) Gast Mfg. Inc.  
Eastern Sales Office  
505 Washington Ave.  
Carlstadt, NJ 07072  
Ph. 201/933-8484  
Ph. 212/563-1870 (NYC)  
www.gastmfg.com  
(C) Baltimore, MD  
Ph. 410/685-2341  
(A) RG Group  
650 N. State St.  
York, PA 17403  
Ph. 877-870-9629  
www.dieumatic.com  
(A) 119 Brown St.  
Pittston (Wilkes-Barre), PA 18640  
Ph. 570/883-1009  
Van-Air & Hydraulics, Inc.  
(A) 525 E. Woodlawn Ave. Maple Shade, NJ 08052 Ph. 856/779-7300  
www.vanaire.com  
(A) Pennsylvania & Delaware  
Ph. 1-800-526-2708  
9. (B) Gulf Controls Corp.  
5201 Tampa West Blvd.  
Tampa, FL 33634  
Ph. 813/884-0471  
Ph. 1-800-282-9125  
www.gulfcontrols.com  
10. (B)(C)(D)Gast Mfg., Inc.  
Ph. 630/963-7477  
Fax: 630/963-7444  
www.gastmfg.com  
11. (B) D & F Distributors  
(B) 914 Ulrich Avenue  
Louisville, KY 40219  
Ph. 502/968-0107  
Ph. 1-800-457-8677(45-PUMPS)  
www.dfdistri.com  
(B) 1144 Indy Court  
Evansville, IN 47725  
Ph. 812/867-2441  
Ph. 1-800-457-8677(45-PUMPS)  
12. (B) John Henry Foster Co., Inc.  
8700 Lebourget Drive  
St. Louis, MO 63134-0820  
Ph. 314/427-060  
Ph. 1-800-444-0522  
www.jhf.com  
13. (B) Isaacs Fluid Power Equipment  
6091 Commerce Ct.  
Mason, OH 45040  
Ph. 513/336-8500  
www.isaacsfluidpower.com  
(B) 1023 E. Fourth St.  
Dayton, OH 45402  
Ph. 937/228-7774  
(B) 929 Eastwind Drive, Suite 205  
Westerville, OH 43081  
Ph. 614/895-8540  
(B) 9362 Castlegate Drive  
Indianapolis, IN 46256  
Ph. 317/577-6920  
(B) 3020-C Congressional Parkway  
Ft. Wayne, IN  
Ph. 219/471-8999  
14. (B) Skarda Equipment Co., Inc.  
2563 Farnam  
Omaha, NE 68131  
Ph. 1-800-228-9750  
Ph. 402/422-0430  
www.skarda.com  
(B) 3545 Third Ave.  
Marion, IA 52302  
Ph. 1-800-228-9750  
Des Moines, IA  
Ph. 1-800-228-9750  
(B) 10139 Kaw Dr.  
Edwardsville, KS 66113  
Ph. 1-800-228-9750  
(B) 313 N. Mathewson  
Wichita, KS 67214  
Ph. 1-800-228-9750  
15. (B) D & L Pumps, Inc.  
2845 Sharon Street  
Kenner, LA 70062  
Ph. 504/467-2490  
www.dlpumps.com  
16. (B) R M Wright Company  
24047 Research Drive  
Farmington Hills, MI 48335  
Ph. 248/476-9800  
www.rmwrightco.com  
17. (B) Midwest Machine Tool Supply
19. (B) Kinequip, Inc.
   365 Old Niagara Falls Blvd.
   Buffalo, NY 14228-1636
   Ph. 716/694-5000
   Ph. 1-800-982-8894
   www.kinequip.com
   Johnstown, NY
   Ph. 1-800-982-8894
   (B) Rochester, NY
   Ph. 585/272-1590
   Ph. 1-800-982-8894
   (B) Syracuse, NY 13211
   Ph. 315/458-4115
   Ph. 1-800-982-8894

20. (B) Hydraulic & Pneumatic Sales
   11100 Park Charlotte Blvd.
   Charlotte, NC 28273
   Ph. 704/588-3234
   www.hpsalesinc.com

21. (B) RAF Fluid Power, Inc.
   6750 Arnold Miller Parkway
   Solon, OH 44139
   Ph. 440/498-8465
   www.raffluidpower.com
   (B) Toledo, OH
   Ph. 419/475-0052

22. (B) Southwestern Controls
   6720 Sands Point
   Houston, TX 77074
   Ph. 713/777-2626
   Ph. 1-800-444-9368
   www.swcontrols.com
   (B) 8808 Sovereign Row
   Dallas, TX 75247
   Ph. 214/638-4266
   Ph. 1-800-444-9367
   (B) 16845 Blanco Road
   San Antonio, TX 78232
   Ph. 210/340-4111
   Ph. 1-800-444-9368
   (B) 9912 B. East 45th Place
   Tulsa, OK 74146-4752
   Ph. 918/663-6777
   Ph. 1-800-658-1570

23. (B) Mesa Equipment & Supply Co.
   7100 Second Street N.W.
   Albuquerque, NM 87107
   Ph. 505/345-0284
   www.mesaequipment.com
   (B) 1342 Lomaland Drive
   El Paso, TX 79935
   Ph. 915/594-1414

24. (B) Allegheny Fluid Power, Inc.
   112 Douglas Road
   Sewickley, PA 15143
   Ph. 412/367-5894
   www.alleghenyfluidpower.com

25. (B) Mesa Equipment & Supply Co.
   7100 Second Street N.W.
   Albuquerque, NM 87107
   Ph. 505/345-0284
   www.mesaequipment.com
   (B) 1342 Lomaland Drive
   El Paso, TX 79935
   Ph. 915/594-1414

26. (B) C.A. Weaver Co., Inc.
   2420 Grenoble Road
   Richmond, VA 23294
   Ph. 804/672-6501
   www.weavercompany.com
   (B) 2430 Alabama Avenue
   Norfolk, VA 23513
   Ph. 757/857-8700

27. (B) Air-Oil Products Corp.
   301 30th Street NE 31, #112
   Auburn, WA 98002
   Ph. 253/735-5449
   Ph. 1-800-282-2672
   www.air-oil.com
   (B) 2400 E. Burnside St.
   Portland, OR 97214
   Ph. 503/234-0866
   Ph. 1-800-242-2672
   (B) 865 Conger Street
   Eugene, OR 97401
   Ph. 541/485-2022
   Ph. 1-800-322-2672

28. (B) Fluid System Components
   1700 Suburban Drive
   De Pere, WI 54115
   Ph. 920/337-0234
   www.fscinc.com
   (B) 2315 South 170th Street
   New Berlin, WI 53151-2701
   Ph. 262/827-2700

29. (B) J.E.M. Fluid Power, Inc.
   2182 Dam Rd.
   West Branch, MI 48661
   Ph. 989/345-1180
   www.jemfp.com

30. (C) (D) Gast Mfg. Inc.
   2300 Highway M-139
   Benton Harbor, MI 49023-0097
   Ph. 269/926-6171
   E-Mail: marketing.gast@idexcorp.com
   www.gastmfg.com

31. (A) C & F Machinery
   91-060 Hanua Street
   Kapolei, Hawaii 96707-1777
   Ph. 808/682-1541

32. (B) Garness Industries, Inc.
   6317 Nielson Way
   Anchorage, AK 99518
   Ph. 907/562-2933
9. SUPERVISOR SECTION
SNAP COMPUTER SYSTEM

WINDOWS 2000 PROFESSIONAL OPERATING SYSTEM
The SNAP computer has the Windows 2000 Professional operating system pre-installed. Each unit also contains the original OEM Windows CD package. It is the responsibility of the end user to register the software with Microsoft.

Windows 2000 is factory configured with two system accounts. The user account name is the serial number of the SNAP with the following format “XU-xxxx.” The prover serial number can be found on a tag on the right side of the prover frame. The default password for the user account is “snap” in lower case letters. The user account has administrative privileges over the local machine to allow him to start certain services for SNAP operation. Care must be taken when changing system parameters.

An auto login has been configured for the user account; therefore, no login prompt will appear during the system boot-up. The SNAP program will begin automatically after Windows has finished loading.

NETWORK
Each SNAP is equipped with a 10/100 Ethernet card. Windows default networking protocols are installed during system configuration. The end user is free to change any network settings.

APPLICATIONS
During system configuration, the following software is installed along with Windows:
• Symantec PCAnywhere – Remote Diagnostic Software
• Symantec Norton Antivirus – Virus Protection Software
• APC PowerChute – UPS Software
• American Meter SNAP Software – SNAP Application Software

The PCAnywhere remote diagnostics software is configured for a specific modem connection. Please do not change any of the modem settings. This could result in a loss of functionality.

The End user is responsible for registering all software.

Mouse and keyboards are not required for SNAP operation. If there is a need to use a keyboard or mouse, these connections must be made while power is off.

UNINTERRUPTIBLE POWER SUPPLY
The UPS unit is connected to the SNAP unit to protect the Windows operating system. The SNAP computer should never be turned off without first shutting down Windows. If a power loss occurs, the UPS will shut down the computer automatically. Once utility power has been restored, the SNAP may be turned on normally.

POWER DOWN PROCEDURE
The Windows 2000 operating system must be shut down properly before turning off the UPS unit. To properly shut down Windows, press the Shutdown key on the start screen. You will be prompted to continue the shutdown sequence. Press the Yes key and Windows will continue the shutdown process. When the screen reads “It is ok to shut down your computer”, turn the side switch off, and then turn the UPS off by pressing the main power switch.
SUPERVISOR TEST PARAMETER INPUT SCREEN STRUCTURE

OPERATION

Starting Screen
GENERAL
When the SNAP is powered on, this will be the first screen to appear. The concept is similar to a typical menu driven system, with this being the first menu.

The right hand side of the screen contains a numeric keypad similar to a touch-tone phone, except for the Backspace, Enter, and Space keys. This screen allows the supervisor to set the time and date, and access the Special Function Screen.

EMPLOYEE NO.
The supervisor must enter his I.D. via the numeric keypad to continue. Touching the key will highlight it; the id is entered via the numeric keypad. The I.D. is then checked against a valid list that had been previously entered into a file.

Key Sequence Example –
If the number entered is a valid supervisory number, he/she has access to the special functions, date, and time keys.

| Employee Number | 1 | 7 | 9 | 6 | Enter |

Note
- In the Employee number block, flashing ?????? will appear. The supervisor number must be entered before the PROVE METER, DATE, TIME, and SPECIAL FUNCTIONS keys will be active.
- Valid supervisor numbers are stored in a standard modifiable file named EMPNOS.txt.

STANDARD DATA ENTRY
The key MUST BE TOUCHED and highlighted for data to be entered. At the completion of the entry, the ENTER key must be touched. The key then un-highlights and the computer processes the input.

DATE
The current date stored in the computer is displayed in this key. To change the date shown, the date key is pressed. It becomes highlighted and allows the date to be entered via the numeric keypad.

Key Sequence Example – May 18, 1999

| Date | 0 | 5 | 1 | 8 | 1 | 9 | 9 | 9 | Enter |

Note
Leading 0’s must be entered.
TIME
The time key is similar to the date key.

NOTE
The time is based on a 24 hr clock (military time).

Key Sequence Example – 1:45:00 PM

TIME

PROVE METER
This key will take the operator to the screen to start a proving cycle

Special Functions Screen

NOTE
The BELL INTERFACE and CORRELATION FACTOR keys are options, which appear only if the appropriate software diskette has been placed in the floppy drive.

GENERAL
This screen provides access to any functions regarding setup, maintenance, calibration, data collection, and data printing. The supervisor number is necessary to enter this screen. Customized provers may have special functions for their operation.

DIAGNOSTICS (LOCAL)
To check out the prover or perform diagnostics on the sensors, control valves, and other operational aspects, this key will display the diagnostic menu. See Diagnostics Menu for more details.
**CALIBRATION**

Calibration of the two temperature sensors, absolute pressure transducer, two differential pressure transmitters, vacuum transducer, and relative humidity sensor is accessed through this key. See Calibration menu for details.

**DATA DOWNLOAD**

This key enables the supervisor to download data from the SNAP. Data to be downloaded is stored on the hard drive. These files are written to a standard floppy disk in standard MS-DOS™ formats.

**DIAGNOSTIC (REMOTE)**

This key places the SNAP into the Remote Diagnostics Ready mode. This function should be activated for factory remote diagnostics only, not for normal proving operations.

**ACTIVATE PRINTER**

The Activate Printer key on the Special Functions screen allows the user to print test data at the completion of a test (after the ACCEPT or REJECT key is pressed and the meter is unclamped). The information printed is the data in the Standard Output File. A parallel port is provided on the SNAP for the printer connection.

**UPLOAD SETUP FILES**

This key is used to load setup files, which have been modified using the SNAP configuration software. Place the SNAP setup diskette into the floppy disk drive and press the UPLOAD SETUP FILES key. The files will be copied from the diskette to the hard drive.

**EDIT CONFIG FILES**

The Edit Config Files key provides access to the Configuration screen for creating and editing SNAP configuration files. (see Chapter 6)
GENERAL

This screen is available from the Supervisor Menu and provides the supervisor with a diagnostic tool for manually setting control functions, as well as monitoring sensor values. The real-time sensor values are displayed on the left of the screen with the label “Analog Inputs”. The other three panels on the screen represent the Digital Input and Output control functions of the SNAP.

Nozzles may be manually opened and closed by pressing the “ON” or “OFF” buttons located adjacent to the nozzle label. To open the 25 CFH nozzle, press the “ON” button for label “Nozzle 6”. Pressing the “ON” button for label “Nozzle 5” will open the 35 CFH nozzle, and so on.

Clamping functions may also be controlled in a similar manner. The “I/O UP” and “I/O DOWN” keys are used to activate the meter clamping arms. On Series IIs only, the “H.H UP” and “H.H DOWN” keys control the movement of the hand-hole seal, and the “SLIDE IN” and “SLIDE OUT” keys control the in and out motion of the hand-hole seal.

To manually clamp a meter, two buttons must be activated. Since the clamp motion is from up to down, the “I/O UP” button must be off and the “I/O DOWN” button must be on. The clamp buttons on the table must be pressed to complete the manual clamping function. To unclamp the meter, change the “I/O UP” to on, and the “I/O DOWN” to off, then press the clamping buttons on the table.

Digital inputs may be monitored by examining the color state of the panel marked “Digital Inputs”, located on the right of the screen. When a control function is activated, the corresponding indicator will turn red. For example, pressing both clamping buttons will activate the Clamp Input light.

SCALED VALUES

The Scaled Values key is a toggle key that toggles between the real time sensor values and the raw voltage readings.

SENSOR TEST

The Sensor Test key allows a supervisor to test the functionality of the revolution sensor. This test may be performed on the large or small magnetic sensor, or the optical sensor. To perform a test, clamp a meter in place. Select the open flow rate of the meter under test by manually turning on the appropriate nozzles. Press the Sensor Test key. Once inside the Sensor Test screen, press the Start Test button. The test will take approximately 5 seconds to complete. At the completion of the test, the signal of the sensor will be displayed graphically on the screen, along with the time period and frequency of the signal. The plotted signal for the magnetic sensor should be similar in form to the graph on the left side of Page 3-14, with at least .1 VDC difference between the maximum and minimum voltages. The optical sensor will be similar to a square wave.

SET FLOW

The Set Flow key can be used to open a nozzle or a combination of nozzles to a desired flow rate. Upon pressing the Set Flow key, enter a desired flow rate in the Flow Selection display. The actual flow rate will be displayed in the display area below.
CLOSE NOZZLE

Touching the Close Nozzle key will close all open nozzle solenoid valves. All flow will be stopped.

Calibration Screen

GENERAL

This screen is available through the Special Functions screen. The left side of the screen shows the current real-time sensor readings.

TYPICAL CALIBRATION PROCEDURES (SEE CHAPTER 5 FOR MORE DETAILS)

To calibrate a sensor, touch the display area of the sensor to be calibrated. The color of the display area will change to red, and the name of the sensor being calibrated will be displayed at the top of the screen. For example, the figure above shows a calibration for the small meter temperature probe. Place the probe in the cold bath first. Allow some time for stabilization, then press the Read Sensor key and enter the actual value from the calibrating thermometer. Place the probe in the hot bath and repeat the process. Then press the Save key to complete the process.

NOTE

The Relative Humidity Sensor should not require calibration. Please consult a Metrology Engineer if problems are found with this sensor.

See Chapter 5 for more information. In addition, there is no need to calibrate the Revolution Sensor.
GENERAL
The Data Download Screen is used to save new calibration data or meter test data, i.e., meter proof results, to a floppy diskette for transfer to another computer for post-processing. The Data Download Screen can be accessed by touching the Data Download key on the Special Function Screen.

DOWNLOAD DAILY DATA
This key saves the current day’s test data to a disk in the floppy drive. If the LOTUS File option is enabled (see Chapter 6), the data will be in 2 files. If it is not enabled, there will only be one file. Both files can be opened in any standard text editor or word processing program. The (DATE).prn file is comma delimited and is suitable for importing into any spreadsheet program. See Page Z-14 for more details.

During the download process, the following messages appear:

“Saving File” – The prover is in the process of saving the file to the floppy disk. Do not remove the floppy disk until the process is complete.

“Transaction Complete” – The prover has finished saving the data to the floppy disk. When the green light on the floppy disk is off, the disk can be removed.

IMPORTANT
The name for each data file is based on the date. Therefore, the date and time displayed on the SUPERVISOR Screen should be set to reflect the correct date and time. A daily check of this should eliminate any problems.

HISTORY FILES
This key is used to access the History Files Screen. When the screen is initially entered, a wait message appears below History, indicating that the prover is searching for the information to display on the screen.
DOWNLOAD SETUP FILES
This key will copy all setup files from the SNAP hard drive to the SNAP setup diskette. Place the SNAP setup diskette in the floppy drive and press the Download Setup Files key. The same messages that appear for Download Daily Data will appear here.

NOTE
The Download Setup Files key should be used whenever sensor calibrations have been modified or when the meter file has been changed.

NOTE
If the supervisor presses one of the keys to save a file when there is no disk in the drive, the FLOPPY DISK? Warning appears. Insert a floppy disk to continue.

History Files Screen

GENERAL
The History Files Screen allows the supervisor to save the day’s data file or all data files stored on the prover to a floppy disk. The SNAP stores up to 30 working days of proving data, with a separate data file for each day. After the 30-day limit, the prover erases the oldest data file to make room for the new day’s data file.

DOWNLOAD-FILE NO.
This File Number key is used if the supervisor wishes to download a particular day’s data file to a floppy disk. The supervisor inserts the floppy disk, selects the number of the file to download, and the file is copied to the floppy.
**SAVE ALL**

This key sends all stored data files to a floppy disk.

---

**IMPORTANT**

If the data has been downloaded during the course of the day, this information is not removed from the prover. The prover continues to write testing data to that day’s file by appending the information to the end of the file. When the supervisor downloads the data at the end of the day, the entire day’s data will be included in that day’s file.

---

**SNAP SOFTWARE REVISION 6.X FILE FORMAT(S)**

Information that the SNAP prover saves to a floppy disk is stored, by default, in two files – (DATE).DAT and (DATE).PRN, where (DATE) indicates the month-day-year (for example, meter data collected on June 15, 2003 will be stored on the floppy disk as 06-15-03.DAT and 06-15-03.PRN). The (DATE).DAT file is an ASCII text file that can be opened with any text editor or word processor. The (DATE).PRN is comma delimited and can be easily imported into any spreadsheet program.

The standard output file contains data with the following formats. The leftmost column of the table represents the maximum number of characters per field.

<table>
<thead>
<tr>
<th>Maximum Number of Character</th>
<th>Field Description</th>
<th>Field Type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Reason Removed</td>
<td>String</td>
<td>04</td>
</tr>
<tr>
<td>2</td>
<td>Utility Meter Serial Number</td>
<td>String</td>
<td>1234567890</td>
</tr>
<tr>
<td>10</td>
<td>Manufacturer Serial</td>
<td>String</td>
<td>0123456789</td>
</tr>
<tr>
<td>10</td>
<td>Number</td>
<td>String</td>
<td>4567891230</td>
</tr>
<tr>
<td>10</td>
<td>AMR Number</td>
<td>Numeric</td>
<td>0000000000</td>
</tr>
<tr>
<td>8</td>
<td>Index Reading</td>
<td>Numeric</td>
<td>100.1</td>
</tr>
<tr>
<td>5</td>
<td>Open Proof First</td>
<td>Numeric</td>
<td>100.1</td>
</tr>
<tr>
<td>5</td>
<td>Check Proof First</td>
<td>Numeric</td>
<td>100.5</td>
</tr>
<tr>
<td>5</td>
<td>Average Proof First **</td>
<td>Numeric</td>
<td>100.6</td>
</tr>
<tr>
<td>5</td>
<td>Open Proof Last</td>
<td>Numeric</td>
<td>100.2</td>
</tr>
<tr>
<td>5</td>
<td>Check Proof Last</td>
<td>Numeric</td>
<td>100.5</td>
</tr>
<tr>
<td>5</td>
<td>Average Proof Last **</td>
<td>String</td>
<td>INTEST</td>
</tr>
<tr>
<td>6</td>
<td>Test Type</td>
<td>Numeric</td>
<td>03</td>
</tr>
<tr>
<td>2</td>
<td>Reject Code</td>
<td>String</td>
<td>AC-250</td>
</tr>
<tr>
<td>8</td>
<td>Meter Class</td>
<td>String</td>
<td>REG</td>
</tr>
<tr>
<td>3</td>
<td>Meter Type</td>
<td>String</td>
<td>474550</td>
</tr>
<tr>
<td>6</td>
<td>Operator Number</td>
<td>String</td>
<td>XU-3500</td>
</tr>
<tr>
<td>7</td>
<td>Prover Serial Number</td>
<td>Numeric</td>
<td>02</td>
</tr>
<tr>
<td>2</td>
<td>Number of Adjustments</td>
<td>String</td>
<td>11-04-03</td>
</tr>
<tr>
<td>10</td>
<td>Date Tested</td>
<td>String</td>
<td>08:34:02</td>
</tr>
<tr>
<td>8</td>
<td>Time Tested</td>
<td>Numeric</td>
<td>72.1</td>
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<td>5</td>
<td>Meter Temperature</td>
<td>String</td>
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<tr>
<td>2</td>
<td>Repair Class</td>
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</tr>
</tbody>
</table>

Figure 11

** These files will only appear if Average Proof is selected.
The optional Extended Data Output file contains all information found in the standard data file, in addition to the data below.

<table>
<thead>
<tr>
<th>Number of Characters</th>
<th>Field Description</th>
<th>Field Type</th>
</tr>
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<td>5</td>
<td>Open Target Proof</td>
<td>Numeric</td>
</tr>
<tr>
<td>5</td>
<td>Check Target Proof</td>
<td>Numeric</td>
</tr>
<tr>
<td>5</td>
<td>Other Target Proof</td>
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</tr>
<tr>
<td>5</td>
<td>Open Rate</td>
<td>Numeric</td>
</tr>
<tr>
<td>5</td>
<td>Check Rate</td>
<td>Numeric</td>
</tr>
<tr>
<td>5</td>
<td>Other Rate</td>
<td>Numeric</td>
</tr>
<tr>
<td>5</td>
<td>Other Proof First</td>
<td>Numeric</td>
</tr>
<tr>
<td>5</td>
<td>Other Proof Last</td>
<td>Numeric</td>
</tr>
<tr>
<td>5</td>
<td>Nozzle Temperature</td>
<td>Numeric</td>
</tr>
<tr>
<td>6</td>
<td>Pressure Drop</td>
<td>String</td>
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</tbody>
</table>

Figure 11 (Continued) On-Line Printer Data

The (DATE).prn file can be imported into a spreadsheet program, such as Excel, using the Open file command. The file type must be specified as a comma delimited text file. The (DATE).dat can be opened in any text editing program or word processor.

**PRINTER**

**GENERAL**

A parallel port is provided for a printer connection. This offers the ability to print test data at the completion of a test (After the ACCEPT or REJECT key is pressed and the meter is unclamped). As meter proofs are accepted, the information is continuously sent to the port. The supervisor can also choose to print an entire day’s data file. A compatible printer can be attached to the SNAP to record information as the prover is testing meters. The printer cable must be attached to J21A, which is the 25 pin connector on top of the enclosure.

Keep in mind when choosing a printer, that the printer must be able to withstand the proving room's harsh environment.

The printer first sends an escape sequence, telling the printer to use condensed type (18 characters per inch). Listed at the top of the page will be the date the meters were proved and the serial number of the prover.

The information printed is the data contained in the (DATE).DAT file. After a meter is proved, the operator presses either the ACCEPT or REJECT key. The data is sent when the operator presses the clamp buttons to unclamp the meter.

After 50 records are collected, an escape sequence is sent to the printer to perform a form feed. The column headings are reprinted on the new page and the prover will be ready to send information for the next batch of 50 meters before moving on to the next page. This is also true for printing a day’s data file.

To activate the printer, proceed with these steps:

1. Turn the printer on
2. Check the paper supply.
3. Ensure the printer is online.
4. Bring up the SPECIAL FUNCTION screen.
5. Press the ACTIVATE PRINTER button. The display should change from Status – ON to Status – OFF.
6. Return to the OPERATOR SCREEN and begin proving.
If the printer has been activated and the prover senses a problem, proceed with the troubleshooting steps below.

1. “? Printer Ready ?” - The power to the Printer may be off. Turn the printer on and press RETRY.

2. “? Printer Off-line or Cable Problem ?” - Ensure printer is online and check cable. Press RETRY

“? Printer Paper ?” – Reload Paper and press RETRY.
## SPARE
### PARTS LIST

AMCO stocks customer replaceable items. In stock items can be shipped from our factory within 24 hours.
To proceed to the parts, click on the links below, or scroll down.

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
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</thead>
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<tr>
<td>39610P184</td>
<td>Gasket, 5 LT Connection</td>
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<td>Gasket, 10 LT Connection</td>
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<tr>
<td>39610P186</td>
<td>Gasket, 20 LT Connection</td>
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<tr>
<td>39610P187</td>
<td>Gasket, 30 LT Connection</td>
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<tr>
<td>39610P188</td>
<td>Gasket, 45 LT Connection</td>
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<tr>
<td>39610P258</td>
<td>Gasket, #1 Sprague Connection</td>
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<tr>
<td>39610P281</td>
<td>Gasket, ¾ GMI Connection</td>
</tr>
<tr>
<td>39610P283</td>
<td>Gasket, #3–4 Sprague Connection</td>
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<td>39610P302</td>
<td>Gasket, 60 LT Connection</td>
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<td>39610P303</td>
<td>Gasket, 100 LT Connection</td>
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<td>39610P304</td>
<td>Gasket, #5 Sprague Connection</td>
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<td>O-Ring (2 per meter connection)</td>
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<td>80550G045</td>
<td>¾ GMI Meter Connection</td>
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<td>80550G047</td>
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<td>Temperature Probe Compression Fitting</td>
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<td>52239P008</td>
<td>Temperature Conditioning Module</td>
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<td>Meter Differential Pressure Transmitter</td>
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<td>52440P024</td>
<td>Absolute Pressure Transducer</td>
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<td>52648G003</td>
<td>Relative Humidity Sensor (Hygrometer)</td>
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<td>Air Temperature Probe</td>
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<td>Optical Index Sensor Assembly</td>
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<td>Serial Extension Cable</td>
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<td>93278G175</td>
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****SNAP II-E only