Technical Procedure:

Troubleshooting Gas Stoves

1.0 Purpose: To determine and troubleshoot common failure modes in order to provide technical support to customers and meet necessary quality standards for successful operation of Gas Stoves.

2.0 Procedure:

1. Firstly, it is critical to determine the type of stove the customer has. Since Savage Bros. manufactures both gas and electric stoves, by obtaining the customer's serial number and model number, you will be able to locate the type of stove they have. Please see the below chart for a list of our various Gas Stove Model Numbers/Part Numbers:

Gas Stoves and Cookers	***Model Number/Part Number***
# 10 Natural Gas Stove *(OSBOLETE)*	0210
# 10 Liquid Propane Gas Stove *(OBSOLETE)*	0211
# 20 CSA Certified Natural Gas Stove	0220
# 20 Liquid Propane Gas Stove	0221
# 33 Natural Gas Stove	0230
# 33 Liquid Propane Gas Cooker	0251
# 33 Liquid Propane Gas Cooker *(NG Burner, SS Base, Arms & Column)*	0251 SS
# 33 Liquid Propane Gas Cooker *(LP Burner, SS Base, Arms & Column)*	0251-80 SS

2. ***Determine the Common Failure Mode:***

Failure Mode # 1 – *Exterior Corrosion*
Failure Mode # 2 – *Exterior Heat Tint*
Failure Mode # 3 – *Pilot flame burns yellow*
Failure Mode # 4 – *Wide variation in the color of the flame from the jets*
Failure Mode # 5 – *Sensor error on Omron Digital Controller*
Failure Mode # 6 – *Error message "S.Err" appears on the Omron Digital Controller*
Failure Mode # 7 – *Temperature reading appears to be incorrect*
Failure Mode # 8 – *Burner will not light*
Failure Mode # 9 – *Flame lights but will not stay lit*
Failure Mode # 10 – *Red Temperature Display is not accurate*

Please Note:

- It is strongly recommended that a qualified electrician perform all electrical work. Maintenance should be performed only when the machine is properly locked out.
- Before performing any maintenance or troubleshooting, always be sure to follow all safety procedures by disconnecting the power source and turning off the manual gas valve on the gas supply input pipe.
- Use proper tools for the inspection and/or maintenance required, as it is extremely dangerous to use broken tools or tools designed for another purpose.

3. **Failure Mode # 1 –** *Exterior Corrosion*

Possible Root Cause: Marred surfaces from baked on grease, food splatters and/or condensed vapors can cause an increased possibility or likelihood of corrosion.

Initial Troubleshooting Key Points:

- To remove dirt, clean exterior parts with ordinary soap and water (with or without detergent) applied with a cloth or sponge. Be sure to dry thoroughly with a clean cloth.
- To remove baked on grease, food splatters and/or condensed vapors, apply a cleanser to a damp cloth or sponge. Be sure to rub the cleanser on the metal *in the direction of the polish lines*, as gently as possible. Be mindful *not* to rub in a circular motion, as this could result in further marring of the finish.
- If the above solutions do not work, rub the surface with a **3M SCOTCH-BRITE** Heavy Duty Scour Pad or Stainless-Steel Scrubbers. Be mindful *not* to use ordinary steel wool.

4. **Failure Mode # 2 –** *Exterior Heat Tint*

Possible Root Cause: At times darkened areas may appear on Stainless-Steel due to the area(s) being subjected to excessive heat.

Initial Troubleshooting Key Points:

- First, try using the above cleaning processes for **Failure Mode # 1**.

- If these do not produce the desired results, you may need to use a **3M SCOTCH-BRITE** Heavy Duty Scour Pad *or* Stainless-Steel Scrubbers, *in conjunction with* a powdered cleanser, such as Bar Keepers Friend. Again, it's important to vigorously scour *in the direction of the polish lines*.

<u>Preventative Measures to Take</u>: Heat Tint may be lessened by reducing the amount of heat *or* by not applying heat to the equipment during scheduled downtime or slack periods.

5. **<u>Failure Mode # 3</u> –** *Pilot flame burns yellow*

   <u>Possible Root Cause</u>: Dirt or lint may have covered the lower portion of the pilot burner.

   <u>Initial Troubleshooting Key Points</u>:

   - Remove any dirt or lint by vacuuming or using a soft brush to allow the flame to surround the thermocouple tip for ~1/2 inch.
   - Perform routine cleaning in order to keep the Thermocouple lead connection to the safety pilot valve tight, clean, and free of any grease.

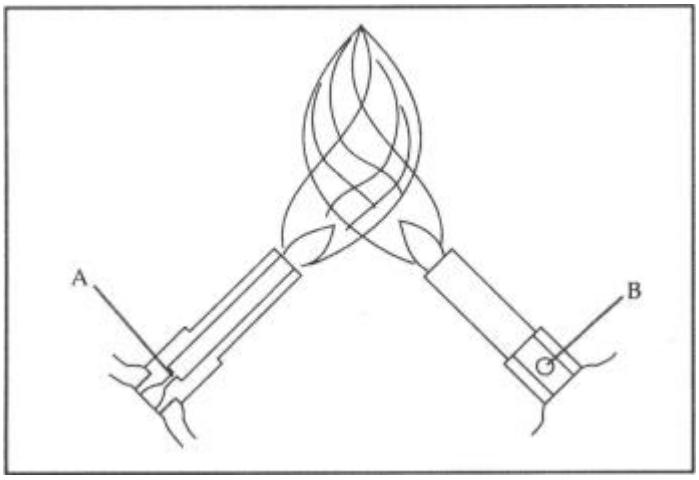
6. **<u>Failure Mode # 4</u> –** *Wide variation in the color of the flame from the jets*

   <u>Possible Root Cause</u>: Lack of proper routine cleaning and maintenance.

Initial Troubleshooting Key Points:

- Be mindful that natural gas flames are high in blue color concentration and liquid propane flames are high in yellow color concentration.
- Regularly schedule a service company or qualified installer to perform Preventative Maintenance (PM) to remove and clean the jets, in order to maintain burner efficiency.

Please Note:
Burner Efficiency is dependent on the jets remaining clean. Each jet burner is made up of many pairs of jets. As you can see in the diagram below, Orifices **(A)** and airports **(B)** are drilled to the exact and proper gas-air proportions to allow for the proper mixture of each particular gas. This action of the two flames impinging on each other forces the gas and air molecules into an agitated and intimate mixture. This produces an intensely hot flame (1900 ° F) just above the jet tips, where the complete combustion takes place.

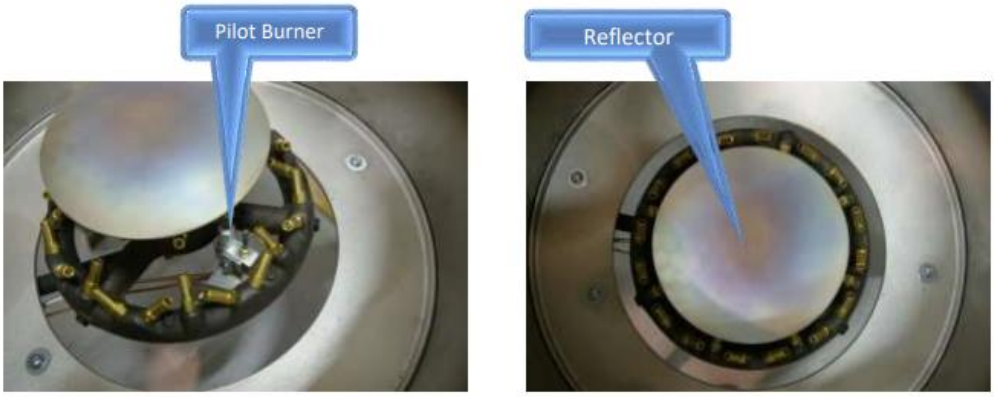


- In order to thoroughly clean the jets, you will need a drill bit (the drill bit size will depend on the type of gas), to push through each orifice. By using the appropriate drill bit size, this will lessen the ability to cause any damage to the opening.

Please refer to the below for appropriate drill bit sizes:

- For Natural Gas (NG) jet, use a **#65 drill bit** *(.035" or .889mm)*
- For Liquid Propane Gas in North America (LPG), use a **#74 drill bit** *(.0225" or .5715mm)*
- For Propane/Butane mixture gas outside of North America, use a **#78 drill bit** *(.016" or .4064mm)*

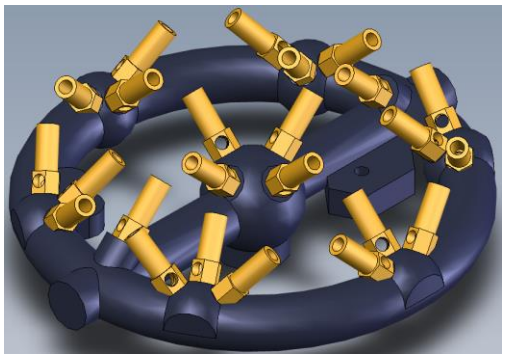
- Be sure *not* to remove the reflector on top of the burner. This component is critical for assuring that the burner will light immediately when gas flows through the manifold and out of the jets, allowing for proper distribution of heat in a uniform manner around the kettle.



- Check the stoves on a regular basis to keep the jets consistently clean, allowing for proper air flow (optimal air/gas integration).
- If the jets need to be replaced, the replacement part number will depend on the size of the stove:

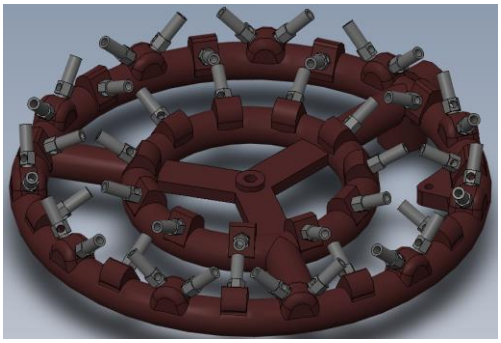
P/N 0213 – *#10 / 20 JET BURNER - NG #65*

P/N 0214 – *#10 / 20 JET BURNER - LP #74*



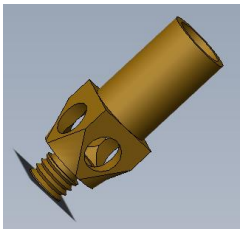
P/N 0233 – *#33 / FM 44 JET BURNER – NG #65*

P/N 0234 – *#33 / FM 44 JET BURNER – LP #74*



Please Note:

1. For any 'High Altitude' Large jets, you will need a different part number:
   P/N 0264 – *Jet Large High-Altitude NG #65 - larger air vents, gas orifice .035" / .889mm*



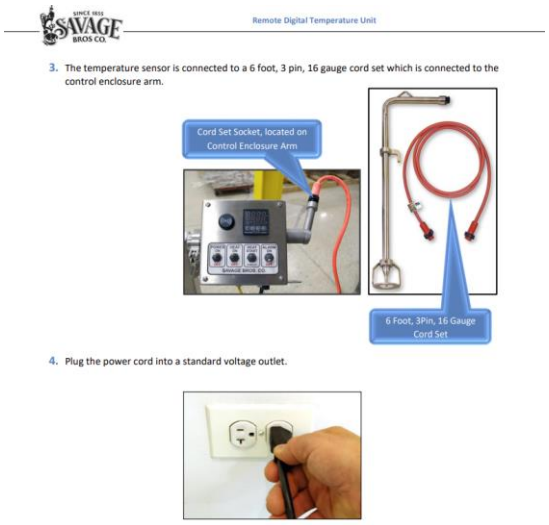
2. All 11 jets will need to be replaced on the inner ring that faces outward, and all 11 jets will need to be replaced on the outer ring that faces inward, towards the center.

7. **Failure Mode # 5 –** *Sensor error on Omron Digital Controller*

   Possible Root Cause: The temperature sensor is not properly plugged in.

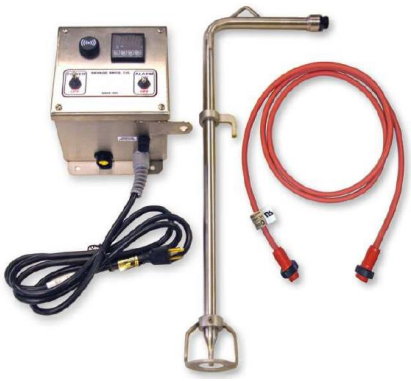
   Initial Troubleshooting Key Points:

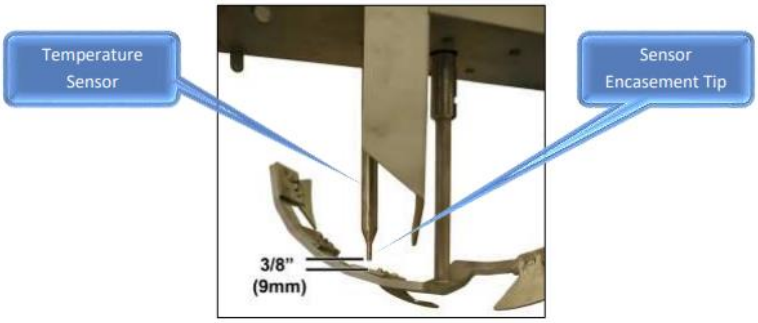
   - Check whether the cord set is plugged in correctly on the temperature sensor side and the control enclosure side. For guidance, please see the below excerpt from p. 7 of the PDF Document Remote Digital Temperature Unit – Email Ready:



8. **<u>Failure Mode # 6</u>** – *Error message "S.Err" appears on the Omron Digital Controller*

   <u>Possible Root Cause</u>: 1. The tip of the temperature sensor may be damaged, 2. There may be a loose or bad electrical connection to the temperature sensor, 3. Moisture may have collected inside the temperature controller.





<u>Initial Troubleshooting Key Points</u>:

- Check for any dents or bends on the tip. If damaged, the customer will need to replace their sensor with ***P/N 1100-14-209 –*** *SENSOR ASSY WALL TO KETTLE*
- Check the sensor lead wires that connect to the terminals behind the temperature controller by grasping the controller face and pulling the controller out of the box. From there, tighten all terminal connections.

- Moisture can collect over time due to careless wash downs of the machine or a high humidity environment. Follow the steps below to resolve and prevent this issue from occurring in the future:
    - ❖ Grasp the controller face and pull the controller out of the box.
    - ❖ Allow for time to air dry or use a hair dryer to fully dry the components.
    - ❖ If large volumes of steam are coming off the batch, use a fan to push the steam away from the control panel.
    - ❖ Cover the control panel with a plastic bag during cooking and cleaning.
    - ❖ If the machine is older, contact production for a possible upgrade to a more moisture resistant controller.

9. **Failure Mode # 7 –** *Temperature reading appears to be incorrect*

Possible Root Cause: The temperature sensor is not properly calibrated.

Initial Troubleshooting Key Points:

- Remember, the temperature sensor settings are factory adjusted, thus, various programming functions have been "locked out" at the factory.
- If an incorrect product temperature reading is suspected, you will need to measure the product temperature by using an accurate certified thermometer.
- Immerse the thermometer into at least 3 inches of the product.
- Do *not* use a laser thermometer, as this will cause an incorrect reading for the application.
- Accuracy of the temperature can be determined by placing the thermometer in boiling water.
- Since water boils at 212 °F (100 °C) at sea level, you will need to determine the elevation of their location in order to determine the proper boiling point.
- This can be located by using an online search engine and typing in the zip code of the location along with the word elevation. As an example, Chicago's elevation is 660 ft., and the boiling temperature is 210.9 °F (99.39 °C).

10. **<u>Failure Mode # 8</u> –** *Burner will not light*

<u>Possible Root Cause</u>: Lack of routine cleaning and proper maintenance.

<u>Initial Troubleshooting Key Points</u>:

- If the stove is either natural gas or liquid propane, check the gas supply valve(s). Ensure that all hand operated valves are open.

- Check the pilot burner to see if it is lit. If not, re-light the pilot burner.
- Check to see if the burner jets are clean and dry. If not, clear away any material that may have spilled on them.
- Check that the **HEAT** button is energized. Turn the heat ***"ON"*** by pulling the **HEAT** button out (the probe anchor needs to be in the ***UP*** position).

<u>Electro Stove</u>: ***<u>Gas Stove/Cooker</u>***: ***<u>Probe Anchor ('UP' position):</u>***

Preventative Measures to Take:

- Perform daily cleaning of the Stove Top section to remove spillovers, grease, etc. using burlap or another grease absorbing material.

11. **Failure Mode # 9 –** *Flame lights but will not stay lit*

Possible Root Cause: Moisture or condensation may have collected inside the burner. This can result from careless wash downs of the machine or a high humidity environment. It is vital that water, food, or products do not fall onto the heater elements, as this will severely shorten the lifespan of the element.

Please Note: Any heater failure determined to be the result of improper usage, such as water, food, or product spill, will *not* be covered under warranty.

Initial Troubleshooting Key Points:

- Check for moisture or condensation inside the burner.
- As the burner gets hot, any water droplets inside the burner tube will begin to boil which will cause a pressure surge to close off the check valve in the gas supply.
- The thermocouple will then detect a failure and shut off the gas.
- If the amount of moisture inside the burner tube is minor, reset the flame failure lockout by turning the **HEAT** button ***"OFF"*** and then back ***"ON"*** to try again.
- Grasp the face of the controller and pull the controller out of the box. Allow adequate time to air dry, or carefully use a hair dryer in order to dry the moist components.
- If you see large volumes of steam coming off the batch, use a fan to push away the steam from the control panel.

Preventative Measures to Take:

- *Never* hose down the stove.
- Once the heating element is cool, cover the heating element to prevent any cleaning agents from penetrating.

- Do *not* allow water to enter into the jets while cleaning the burner assembly.
- Use a damp soapy rag or cloth and a brush in order to clean the outside of the stove.
- Be sure to cover the control panel with a plastic bag during cooking and cleaning to prevent any water, food, or products from penetrating.

12. **Failure Mode # 10** – *Red Temperature Display is inaccurate*

Possible Root Cause: The tip of the temperature probe may not be making continuous contact with the cooking product. The "Input Shift" offset value may need to be changed.

Please Note: The method for changing the accuracy of the RED Temperature display value is by changing the "Input Shift" offset value. For example, if you need to raise the red display value by +1.4 degrees, and the current value in the input shift register is -0.3, then you will need to add the two numbers to get the new input shift value of +1.1.

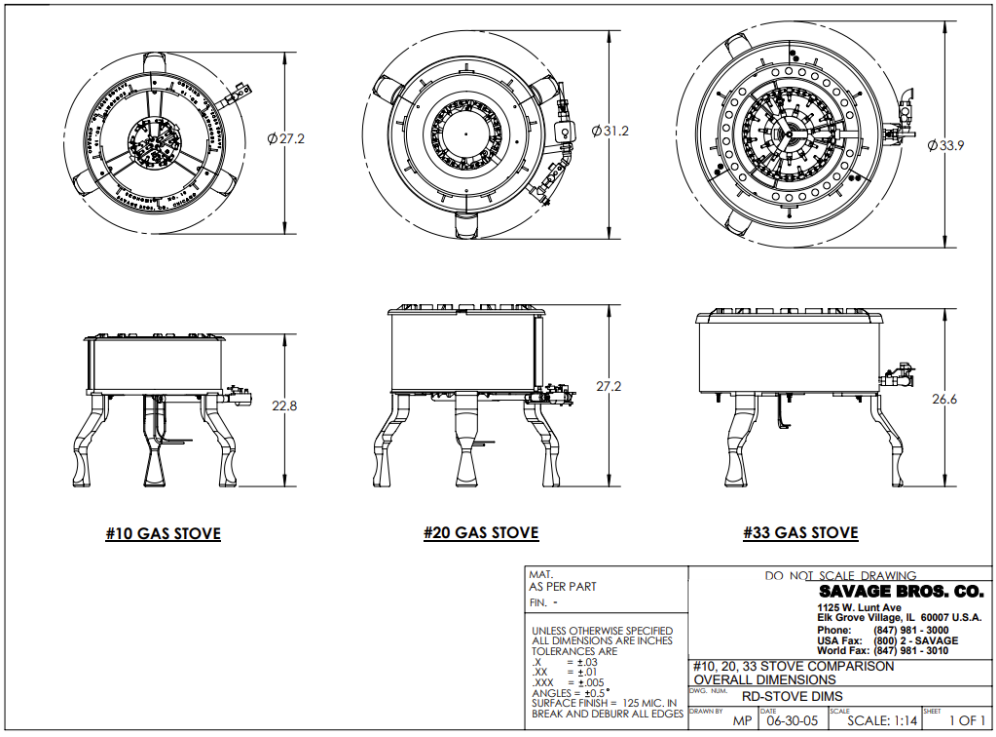
Initial Troubleshooting Key Points:

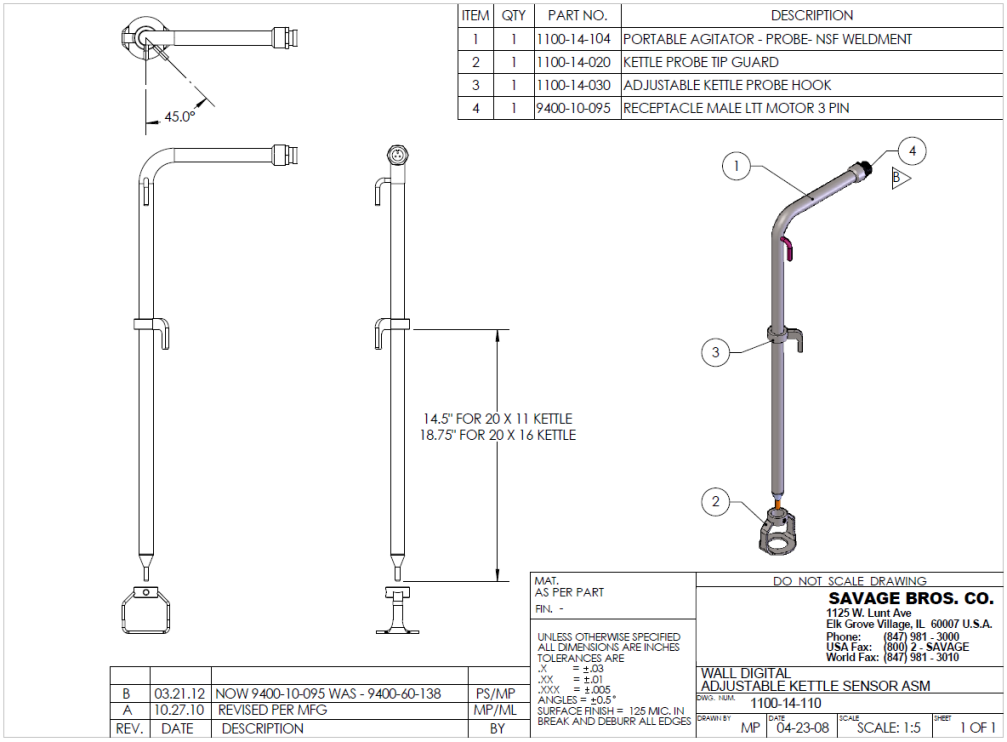
- Check the tip of the temperature probe to see if it is making continuous contact with the cooking product.
- Check that the product is moving *around* the temperature probe.
- Check the "Input Shift" setting of the temperature controller to see if it has been accidentally changed.
- In order to check the "Input Shift" setting: Press the "CYCLE ARROW" button twice  . The RED display should show a message that looks like "Cn—5." This is the setting for the "Input Shift." The offset temperature is displayed with green numbers. Generally, the shift value is between a minus 2 and a plus 2. If the "Input Shift" setting is *not* between plus and minus two, it will need to be set to zero. To do so, you will need to follow the steps below:

  - Press the "CYCLE ARROW" button  again and check the temperature on the RED display.
  - Determine the difference between the temperature at the tip of the probe and the temperature that is indicated on the RED display.
  - Add the difference to the current "Input Shift" offset to get the new "Input Shift" offset.
  - Press the "CYCLE ARROW" button  twice to get back to the "Cn—5" or "Input Shift" offset.

- Press the “CYCLE ARROW” button twice to get back to the “Cn—5” or “Input Shift” display mode.
- Press the “UP” key to make the offset more positive or press the “DOWN” key to make the offset more negative.
- Press the “CYCLE ARROW” button again and check the temperature on the RED display.
- Repeat the procedure, if necessary.

3.0 Reference Diagrams & Drawings:





ITEM	QTY	PART NO.	DESCRIPTION
1	1	1100-14-104	PORTABLE AGITATOR - PROBE- NSF WELDMENT
2	1	1100-14-020	KETTLE PROBE TIP GUARD
3	1	1100-14-030	ADJUSTABLE KETTLE PROBE HOOK
4	1	9400-10-095	RECEPTACLE MALE LTT MOTOR 3 PIN

REV.	DATE	DESCRIPTION	BY
B	03.21.12	NOW 9400-10-095 WAS - 9400-60-138	PS/MP
A	10.27.10	REVISED PER MFG	MP/ML

MAT.
AS PER PART
FIN. -

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE INCHES
TOLERANCES ARE
.X = ±.03
.XX = ±.01
.XXX = ±.005
ANGLES = ±0.5°
SURFACE FINISH = 125 MIC. IN
BREAK AND DEBURR ALL EDGES

DO NOT SCALE DRAWING

SAVAGE BROS. CO.
1125 W. Lunt Ave
Elk Grove Village, IL 60007 U.S.A.
Phone: (847) 981 - 3000
USA Fax: (800) 2 - SAVAGE
World Fax: (847) 981 - 3010

WALL DIGITAL
ADJUSTABLE KETTLE SENSOR ASM
DWG. NUM. 1100-14-110

DRAWN BY	DATE	SCALE	SHEET
MP	04-23-08	SCALE: 1:5	1 OF 1

Natural Gas Stove w/Copper Kettle, Agitator & Stand Mount Thermometer

(90,000 to 110,000 BTU)

Digital Probe Thermometer w/Stand

(120V)

4.0 Revisions:

Revision	Description	Date	Approved By:
A	Website Version	8/9/2024	BB