Garland™®

Service Manual

Master Gas Production Griddles

models
CG-24, CG-36, CG-48, CG-60, CG-72

CSA DESIGN CERTIFIED   CSA CERTIFIED   NSF®

FOR YOUR SAFETY:
DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS OR LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE

WARNING:
IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE PROPERTY DAMAGE, INJURY, OR DEATH. READ THE INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS THOROUGHLY BEFORE INSTALLING OR SERVICING THIS EQUIPMENT

PLEASE READ ALL SECTIONS OF THIS MANUAL AND RETAIN FOR FUTURE REFERENCE.

THIS PRODUCT HAS BEEN CERTIFIED AS COMMERCIAL COOKING EQUIPMENT AND MUST BE INSTALLED BY PROFESSIONAL PERSONNEL AS SPECIFIED.

IN THE COMMONWEALTH OF MASSACHUSETTS THIS PRODUCT MUST BE INSTALLED BY A LICENSED PLUMBER OR GAS FITTER. APPROVAL NUMBER: G-1-07-05-28

For Your Safety:
Post in a prominent location, instructions to be followed in the event the user smells gas. This information shall be obtained by consulting your local gas supplier.

IMPORTANT INFORMATION

WARNING:
This product contains chemicals known to the state of California to cause cancer and/or birth defects or other reproductive harm. Installation and servicing of this product could expose you to airborne particles of glass wool/ceramic fibers. Inhalation of airborne particles of glass wool/ceramic fibers is known to the state of California to cause cancer. Operation of this product could expose you to carbon monoxide if not adjusted properly. Inhalation of carbon monoxide is known to the state of California to cause birth defects or other reproductive harm.
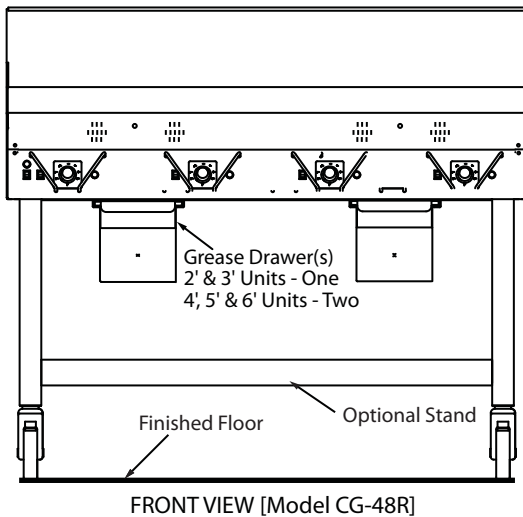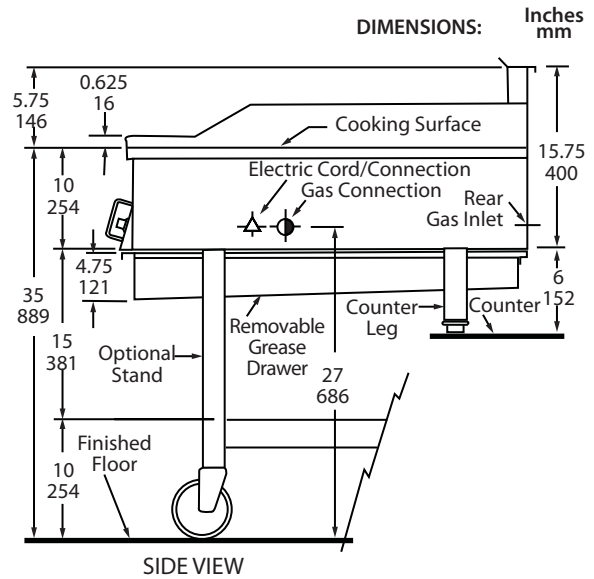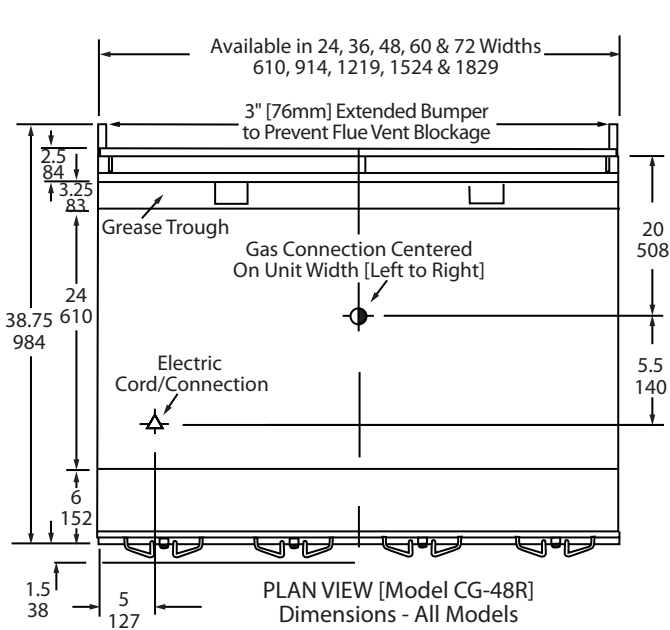
Keep appliance area free and clear of combustibles.

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DIMENSIONS AND SPECIFICATIONS

Combustible Wall Clearances

Sides: 6" (152mm)

Back: 6" (152mm)

IMPORTANT:

Unit must be installed on legs for proper air circulation.

Ventilation

Commercial cooking equipment requires an adequate ventilation system.

Refer to the National Fire Protection Association's standard NFPA96.

Manifold Pressure Required After Built-in Regulator

Natural: 3.5" W.C. (8.75mbar)	**Propane**: 10" W.C. (25mbar)
Minimum Supply Pressure Required:	
Natural: 7" W.C. (17.4mbar)	**Propane**: 11" W.C. (27.4mbar)

NOTE

Gas Input Ratings shown are for installations up to 2,000 feet (610mm) above sea level.

BTU input ratings must be derated for high altitude installations.

Electrical Requirements

Specifications:

120 V, Single Phase, 60Hz, 1 A
6' (1829mm) power supply cord provided.

NOTE: No cord and plug on export units
Direct connection on junction box.

Export Voltages:

NOTE: Export voltages are available on request.
220-240 V, 50 Hz, 0.4 A, Single Phase.

DIMENSIONS: Inches mm

Available in 24, 36, 48, 60 & 72 Widths
610, 914, 1219, 1524 & 1829

3" [76mm] Extended Bumper to Prevent Flue Vent Blockage

Grease Trough

Gas Connection Centered On Unit Width [Left to Right]

Electric Cord/Connection

PLAN VIEW [Model CG-48R]
Dimensions - All Models

Cooking Surface

Electric Cord/Connection
Gas Connection
Rear Gas Inlet

Counter Leg
Counter

Removable Grease Drawer

Optional Stand

Finished Floor

SIDE VIEW

Grease Drawer(s)
2' & 3' Units - One
4', 5' & 6' Units - Two

Finished Floor
Optional Stand

FRONT VIEW [Model CG-48R]

INPUT CHART - Natural Or Propane Gas				
Model Number	**BTU/ hour**	**kW**	**Gas Inlet**	**Shipping Weight**
				lb./kg.
CG-24R	60,000	17.60	3/4"	335/152
CG-36R	90,000	26.40	3/4"	485/220
CG-48R	120,000	35.00	3/4"	625/284
CG-60R	150,000	44.00	3/4"	765/348
CG-72R	180,000	52.70	1"	995/411

Commercial chain restaurants impose strict food procedures on franchise owners and operators to guarantee the quality and consistency of the product. Beef burgers, hamburgers, french fries, onion rings, fried chicken and tortillas for example, must meet rigid standards of quality involving the ingredients used, the recipes followed, storage and, not least, the cooking temperature and time of cooking.

Accuracy of temperature control and the heating stability of the cooking surface are essential in maintaining consistent quality in the product. Control and stability are the two primary features in the new chain griddle. As compared with previous gas griddles of the same kind, temperature control of heating zones in the chain griddle is far tighter and more precise.

Two features provide precision control. One feature is a burner for every foot of griddle surface. The other is that each burner is electronically monitored for temperature control. As a result, at 30,000 BTU using natural gas, there is excellent energy management and power recovery.

Temperature sensors are embedded in the griddle plate. Each sensor is close to the plate surface where the load is. The effect of this arrangement is to achieve an even temperature gradient across the plate. Thanks to the electronic monitoring feature, a much faster response to changes in surface temperature is achievable in the chain griddle than in previous units.

The smoother temperature gradient per unit surface area and accurate temperature control has made the chain griddle an instant success. This simple explanation of the two main features of the unit is what makes it so special. Without fast response and a smooth gradient, the chain griddle would be just another design among many.

Explaining why the unit is special is one thing and understanding how it works in another. Service technicians need to know this to have complete confidence when servicing the unit. We describe how it works in the next part of this section.

Figure 1 -Front view of counter-top chain griddle
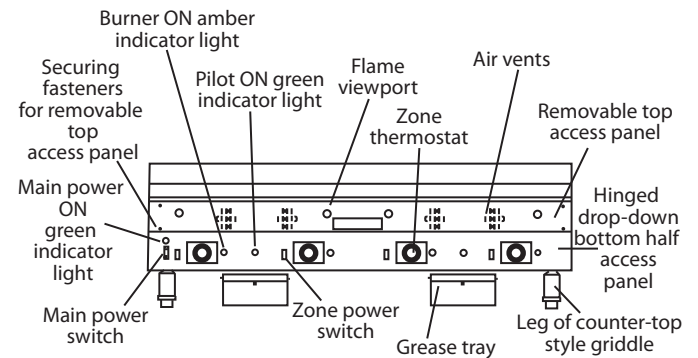
How Does it work?

When the main power switch is turned on, the power indicating lamp is illuminated and power is applied to the thermostat input of the ignition modules. This will initiate the pilot ignition sequence. The ignition module supplies a spark ignition at the pilot burner and will energize the pilot solenoid valve for a maximum trail period of 50 seconds.

If the pilot flame ignites and is sensed within the 50 second period, the main burner output of the ignition module will be energized. The pilot indicating lamp will illuminate. The main burner solenoid valves are then controlled by the thermostats. As a thermostat calls for heat, it will energize its output and the main burner valve along with the burner indicating lamp will energize. The main burner will cycle with the thermostat.

There is only one trial for ignition. If the pilot flame is not sensed during the trail period, the ignition module will lock out. All ignition module outputs will be de-energized. To reset the ignition module the main power switch must be turned off for a period of 30 seconds.

WHAT IS A CHAIN GRIDDLE continued

During normal operation, the pilot flame is continually monitored. The flame current signal must maintain 0.15 microamps minimum. Flame failure response time is 0.8 seconds maximum. If at any time the ignition module does not detect a pilot flame, it will repeat the ignition process by allowing a 50 second trial of ignition.

Figure 2 illustrates this sequence of operation.

Figure 2 – Sequence of Operation
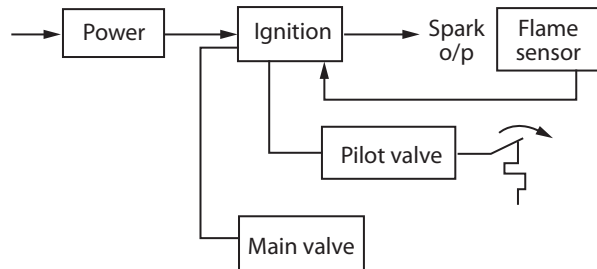
INSTALLATION

The instructions given for installation form part of the delivery package. Anyone installing a chain griddle should follow a strict procedure to make sure installation and commission are safe, efficient and complies with the applicable local codes. Here is a check list of things to do in the order we recommend.

Mechanical

•   Uncrate and check for shipping damage both obvious and hidden. Write a damage report and report immediately to the carrier.

•   Check the serial plate behind the front panel. To do this, remove the front panel by unscrewing the two screws in the upper right and left corners. Next unscrew the two fasteners securing the hinged lower font panel in place. Note the burner inputs shown on the serial number plate. It may be necessary to refer to these later. You also need to be certain of the type of gas to which the unit is connected. The serial plate also specifies the type of gas required for the unit. Also, check that the electrical connections are in good order.

NOTE : The chain griddle is certified for installation on a combustible base with minimum clearance of 6" (152mm) back and 6" (152mm) sides from combustible walls.

•   Every unit is fitted with a readily accessible shut-off valve at the main manifold. Use a minimum of 3/4" NPT pipe to connect the incoming gas supply.

CAUTION : Check the pipe capacity tables given in the installation code. When a long supply pipe run is necessary, you may have to install a supply line lager than 3/4"

•   Have a qualified gas technician check the gas supply to make sure it will deliver the BTUs of gas the unit requires to operate with no more than 1/2" water pressure drop. Also when making this check be certain that all equipment on the gas line is turned to the ON position.

•   If you are installing the unit using a new gas installation, make sure the supply lines have been cleaned and purged of piping compound, chips and other debris.

WARNING : Use soap solution if you have to check the gas lines for leaks.

•   Place and install the unit on the legs or caters provided, and make sure there is a minimum of 4" (102mm) air space below the unit for adequate air flow to the burners.

CAUTION: Check for obstructions or objects that could restrict the air flow to the burners.

•   Using a spirit level variously across the front, rear and sides of the unit, level it by adjusting the leveling legs.

Gas Supply

NOTE : For efficient operation, the griddle plate must be level.

INSTALLATION continued

- Each thermostat controls one zone burner though a dual solenoid-pressure regulator valve complete with a pressure test spigot. Check the manifold gas pressure on each combination valve to make sure it is the same as that shown on the serial plate. The gas pressure should be 3.5"WC for natural gas and 10.0" for propane gas.

- For access to the pressure test spigots, turn the main power switch and all zone power switches to the OFF position and lower the front panel on its hinge. This is a safety precaution. The test spigots are at the rear of the rear of the combination regulator valves.

- Connect your manometer to the first valve for test and turn the manual shut-off valve to the ON position.

NOTE : The shut off valve is under the unit. When it is ON and in the open position, the valve position is in line with the piping. Also, see the electrical procedure below for notes on the status indictor lights and setting the thermostats.

- Turn the main power switch and the zone power switches to the ON position.

- Set all the thermostat dials to 350°F. When all the burners are operating, check and record the manometer reading, which should be the same manifold pressure as that specified on the serial plate (3.5"WC for natural gas and 10.0" for propane gas). Adjust the regulator to obtain the pressure rate specified.

- When satisfied with the reading obtained, turn the main power switch OFF. Remove the manometer test tube and re-cap the test spigot.

- Repeat this operation on each combination regulator valve to correctly set it. Then turn each thermostat, zone and main power switch OFF.

Electrical Power, Lighting & Control

WARNING : Do not work on ungrounded equipment. It is dangerous.

- National and local electrical codes require that all devices of this type be electrically grounded. Check to make sure the unit is grounded.

CAUTION : Make sure the electrical connections enclosed by the panels are in good order and undamaged before closing and securing the front panels.

NOTE : This griddle is equipped with a 3-pronged plug cord set to fit any 120V AC3-prong, 15 amp-rated, grounded receptacle.

- To check the unit lighting, turn the main power switch of the unit to the ON position. The green light of the power switch and the green indictor of the gas pilot of each section of the griddle should illuminate.

CAUTION : If after two minutes the pilot ignition fails, turn the main power switch OFF. Wait five minutes and switch the main power ON again.

- When the green indicator for each zone is illuminated, turn the zone power switch for each zone ON. The thermostats can now be set to the desired temperature.

- The amber light burner indicator cycles with the operation of the thermostat.

Ventilation

For efficient operation this unit requires a minimum ventilation air supply of 50frm. The ideal method of ventilation is a well-designed canopy of hood that exceeds 6" (152mm) beyond all sides of the unit. Ideally, the bottom of the hood should be set 6'6" (1981mm) from the floor.

Gas burners and pilot devices need a sufficient air supply to operate efficiently, so do not place large objects anywhere near them to restrict or in any way limit the air flow.

In most operations, the chain griddle will be used in conjunction with other kitchen equipment. The need for the ingress of air to the kitchen area must be sufficient to compensate for the air the ventilation system abstracts. Unless the air flow is sufficient a subnormal, and probable negative, atmospheric pressure will result, which will adversely affect the operation of the equipment and make work in the kitchen area unpleasant.

Start-Up

When the chain griddle is used for the first time, the griddle top requires seasoning. To season a griddle surface, follow this procedure.

1. Wash the griddle surface with a hot, mild detergent or soap solution, then rinse and dry thoroughly.

2. Set the thermostat to 175°F for 30 minutes, then apply a film of cooking oil to the cooking surface and wipe away the excess.

3. After (5) five minutes, wipe the griddle plate clean.

INSTALLATION continued

4. Re-set the thermostat to 275°F and apply a second film of oil. After (5) five minutes, wipe off the excess oil.

5. Reset the thermostat to the cooking temperature and apply a final film of oil. After (3) minutes, wipe off the excess oil. The griddle is now seasoned and ready for use.

NOTE : We recommend reseasoning the griddle before each day's operations begin. Franchise operators who follow explicit operating procedures should be made aware of this recommendation.

OPERATION & MAINTENANCE

During idle periods, reduce the thermostat settings to conserve energy. A setting of 175°F to 200°F is enough to keep the plate warm. Reducing the temperature also reduces the load on the thermostat.

1. At then end of the operations, turn the power and zone switches OFF. There is no need to change the thermostat settings when the unit is not in use.

2. Don't overheat the griddle. Excessive heat causes grease to carbonize and makes the surfaces hard to clean.

3. Empty the grease trays often to avoid spillovers.

4. For extended shutdown or major maintenance, turn the power and zone switches OFF, close the manual shut-off gas valve, and unplug the electrical power cord.

Cleaning

1. At the end of the cooking operations, wipe and clean the unit while it is still warm. Use a spatula to remove food residue and burnt grease.

2. When the plate is cool, wash it with a mild detergent, dry it, and wipe it with a slightly oiled cloth.

3. For a more thorough cleaning, use Garland Ranges F69 fryer and griddle cleaner. Polish the plate to a bright finish, then wash, rinse and thoroughly dry it.

4. Follow the procedure specified (see Start-Up) to reseason the cooking surface.

5. To clean the exterior surface of a chain griddle, clean the stainless steel with a hot detergent or soap solution. Remove baked on grease by applying the cleanser in the direction of the polishing lines of the stainless steel surface.

CAUTION : Do not rub stainless steel in a circular motion. This destroys the finished surface of the metal and detracts from its appearance.

If it is necessary to remove hard and burnt on deposits from high quality surfaces, use SCOTCH-BRITE or STAINLESS scouring pads by running with the grain of the finished steel. Remove heat tint the same way, using if necessary a non-abrasive powered cleanser with the SCOTCH-BRITE or STAINLESS pad. On no account use ordinary steel wool, it will damage the finished surface.

Many factors affect the serviceability of equipment. In the chain griddle, there are more components to service than in older models. The new griddle is a compact design. Access to the temperature control circuitry and ignition units is easy. Service techniques for the thermocouple will vary depending on the model type.

They unit is available with a 6" (152mm) leg which means that under the griddle plate there is only 6" (152mm) of working room. To replace a thermocouple it is difficult to lift the griddle plate, firmly secured to the support frame. To replace a thermocouple requires bottom access because the plate is securely fixed (see Figure 3).

With this introduction to serviceability, and apart from the features that make the chain griddle superior to more conventional units, many of the servicing tasks are standard; the adjustments likewise. The procedures that follow are a plain guide to servicing, beginning with adjustments to various components.

Have The Right Tools And Instruments

In addition to a service technician's normal hand tools, for servicing this chain griddle we recommend:

1. A manometer or other suitable instrument for measuring gas pressure

2. A multimeter

3. A digital read-out temperature meter

4 A micro-ammeter

CAUTION : In this chain griddle we use a J-type thermocouple, which requires a meter with a J-type connection for checking. Most meters have K-type connections.

Adjustments

Every griddle is inspected and tested before it leaves the factory. Adjustments to the unit during installation and servicing are the responsibility of the field operator and are not considered to be defects in material or workmanship. For this reason, adjustments are not covered under the equipment warranty.

Pilot Flame Adjustment

A pilot adjustment valve is in the line form each pilot combination valve and access to it is behind the lower front panel.

1. To remove the upper front and lower front panels, refer to the installation procedure given earlier.

2. To reduce the volume of gas feed to the pilot, turn the small screw in the pilot adjusting valve clockwise.

3. To increase the gas feed to the pilot, turn the same screw counter-clockwise.

NOTE : Adjust the gas feed to produce a 7/16" (11mm) long flame to make sure the flame envelopes the top of the flame sensor.

Burner Air

Make sure a burner is warm before adjusting the air shutters and follow this procedure.

1. First, loosen the screw along the side of the burner near the orifice.

2. A burner flame that gets too much air appears to lift above the burner as though separated from it. This means the shutter needs throttling back to a more closed position.

3. A yellow tip on the flame is a sign that the shutter is not passing enough air to feed the flame. In this case, it necessary to open the shutter.

4. When the shutter adjustment is complete, tighten the screw to lock the shutter setting in the adjusted position.

5. Re-close the upper and lower front panels and replace the fasteners.

Removing the Griddle Plate

If it is necessary to remove the griddle top, follow this procedure:

1. Disconnect the power supply.

2. Remove the upper control panel.

3. Open the lower control panel.

4. Disconnect all thermocouple sensors and shield bayonet adapters. (To reassemble, see the Thermocouple section.)

5. Remove the griddle top retaining bolts (both left and right).

6. Remove the back flue.

7. The griddle top is now easily removed.

SERVICING continued

Thermostat

Make sure the thermostat knob is correctly aligned with the dial indicator. To align the knob with the graduated dial correctly, follow this procedure.

1. Turn the knob and shaft fully counter-clockwise. Loosen the set screw in the knob and align the pointer with the first line of the scale at the lower left position.

NOTE : When the knob is fully rotated clockwise, the pointer should align with the last line of the scale.

2. Set the dial to 350˚F. Wait at least three cycles before monitoring the temperature.

3. Use a surface temperature probe disc positioned on the center line with the thermostat knob and centered front to back on the griddle plate.

The thermostat will overshoot and undershoot as caused by the lag time in the thermal response of the heat source-to-plate and plate-to-sensor. The calibration temperature will be the mid-point between the minimum and maximum readings. Other than the alignment of the knob pointer, there is no means to calibrate the thermostat. It has been precisely calibrated by the manufacturer.

Thermocouple

If the temperature is incorrect check the thermocouple. The thermocouple in this unit is a Type J, which requires the use of a J-type temperature meter for checking. For a complete understanding of the thermocouple used in the chain griddle see the GCR Service Bulletin #95-5 entitled "Thermocouples".

A thermocouple is an accurate temperature measuring device that consists of two dissimilar conductors joined together at their ends. It works on a simple principle, which is that the thermoelectric voltage between the two junctions is proportional to the temperature difference between them. This principle is applied to measure the temperature at one of the junctions when the other is held at a fixed known temperature. The technology is not new, but its use in GCR griddles is recent.

The thermocouple probe is embedded in the griddle plate and accurately registers the surface temperature. It is a reliable device, but can cause problems when it fails for any reason. In addition to deterioration from aging, it can fail in two ways: one from an open-circuit (that is, a break in one of its wired); the other when it short-circuits.

If a thermocouple open circuits, the thermostat will shut off and prevent the gas valve from opening, which means the burner will not function.

If a unit short circuits somewhere behind the junction, it creates a new junction and because the circuit cannot detect the existence of a short circuit fault, there is a dramatic increase in temperature. The thermocouple detects changes in temperature, but because of the short circuit it may fail to register the set temperature at the thermostat. This means the burner may not shut off. At the other extreme, the short circuit may occur in a place not shielded from the flue gases, which means the burner may shut off prematurely. These are the two conditions to look for in a shorted thermocouple.

Deterioration from aging and from welding dissimilar metals together to for a junction introduces a contaminant that causes mechanical stress. Over time, five to ten years, metal fatigue from aging is certain. As a result, the temperature curve will vary.

How To Replace A Thermocouple

A heat shield protects the thermocouple from the burner flames and flue gases. Without the shield, the thermocouple would register flame heat to the thermostat instead of sensing the temperature of the griddle plate.

To replace a thermocouple (refer to Figure 3), following this procedure:

1. Open the front panel to get access to the terminal board.

2. To withdraw the thermocouple, first remove the heat shield. It is held in place by two combination Philip and Robinson-heat size number 10 sheet metal screws. Remove the heat shield by sliding it down the wire.

3. A bayonet connector secures the thermocouple in place. Reach inside the hole and push and twist the bayonet connector a quarter turn.

4. Remove the connection to the terminal board and feed these wires through the heat shield. The thermocouple is now removed.

5. Connect the wires of the replacement thermocouple, but make sure the polarity is correct. Connect the negative red wires to terminal 7 on the thermostat and the positive white wire to terminal 8. (See schematic diagram).

6. Thread the thermocouple through the heat shield and into the plate cavity.

SERVICING continued

Figure 3 – Replacing a thermocouple

Adjust to about 4.5" before installing

Bayonet adapter

About 1" before compression

Griddle plate

Probe heat shield assembly
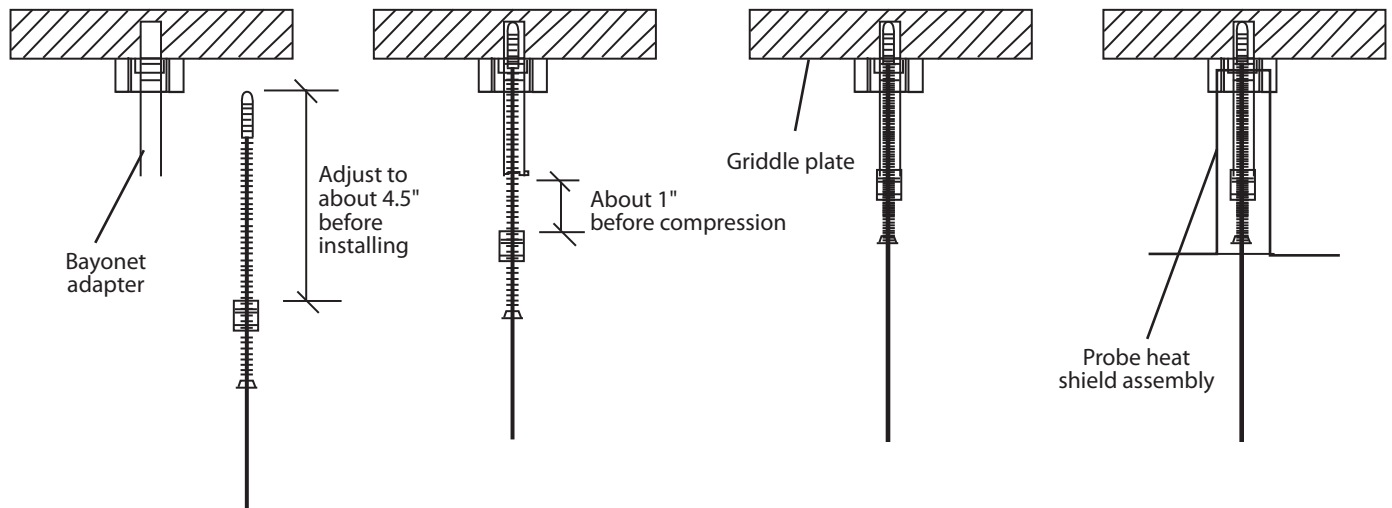
7. The bayonet connector is spring loaded. Turn the connector so that it makes good contact with its seat on the plate, and adjust the spring so that at least 1" (25mm) of spring is available to push home. This is, it is loaded 1" (25mm) from the bayonet adapter.

8. Once this adjustment is made, remove the thermocouple from its cavity, pry the old heat sink material from the cavity and apply fresh heat sink compound (Garland Commercial Ranges part #77024).

9. Re-assemble the unit.

Incandescent Lamps

These lamps, similar in construction if not in shape to ordinary incandescent light bulbs, sometimes fail because of metallurgical breakdown of the light filament material. The green status light (PL1) should illuminate when the main switch SW1 is closed.

• If PL1 doesn't illuminate when SW1 is closed, replace it.

• Failure of the amber lights (PL3, PL4, etc.) monitoring the zones cycle with the thermostat is not easy to detect. When on, an amber zone light is working. If it does not appear to light as part of the 'burner on' cycle, check. If the thermostat cycles the burner to be on, the PL amber light should illuminate.

Pilot Ignition Control (Control Module)

The Johnson G770 pilot ignition unit will lock out if the pilot flame is not sensed before the end of the ignition trial period and has to be reset.

• To reset the ignition control, turn off the thermostat for a minimum of 30 seconds.

SERVICING continued

Gas Valve Regulator

The gas valve regulator (See fig 4) used on the griddle is AGA and CGA approved. The direction of gas flow is at right angles, right and left viewing the inlet. For setting the regulator:

- For natural gas, Part #240510 regulator, set at 3.5" W.C. at 22 CFH air each side at 7" W.C. inlet pressure. Regulator adjustment range is 2.8" to 4.0" WC.

- From propane, part # 245101 regulator, set at 10.0" W.C.

Figure 4 – Gas Valve Regulator

Flow

Flow

Pressure setting screw

Turn counter-clockwise to increas the pressure setting

Turn clockwise to decrease the pressure

Inlet
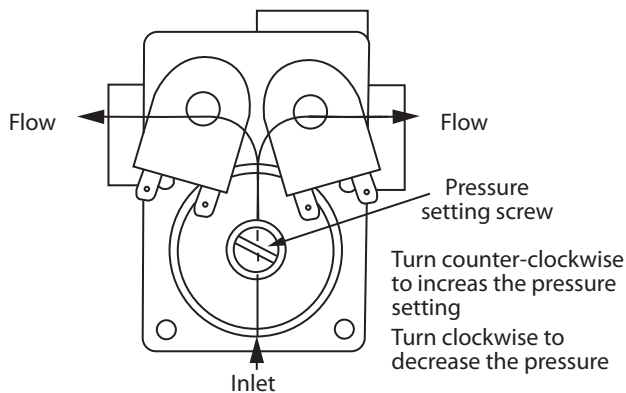
Power Switches

Dust caps fitted on the main power switch and zone switches protect them from dust and the corrosive effect of cooking fumes. If the dust caps are removed, or not replaced following servicing, the switches will deteriorate and have reduced life expectancy. Replace the dust caps following servicing.

Control Circuit

Figure 4 shows the control schematic for the GC-48 unit, which has two zones. The ignition and temperature controls for each zone are identical.

CONTROL PANEL SCHEMATIC DIAGRAM

Figure 4 – Control schematic for a Model CG-48 Chain Griddle

SERVICE BULLETIN #95-5

FROM – National Service Department

TO – National Service Binder Holders

Subject: **Subject: Thermocouples used in the Chain Griddle Models CG-36, CG-48, CG-60 & CG-72**

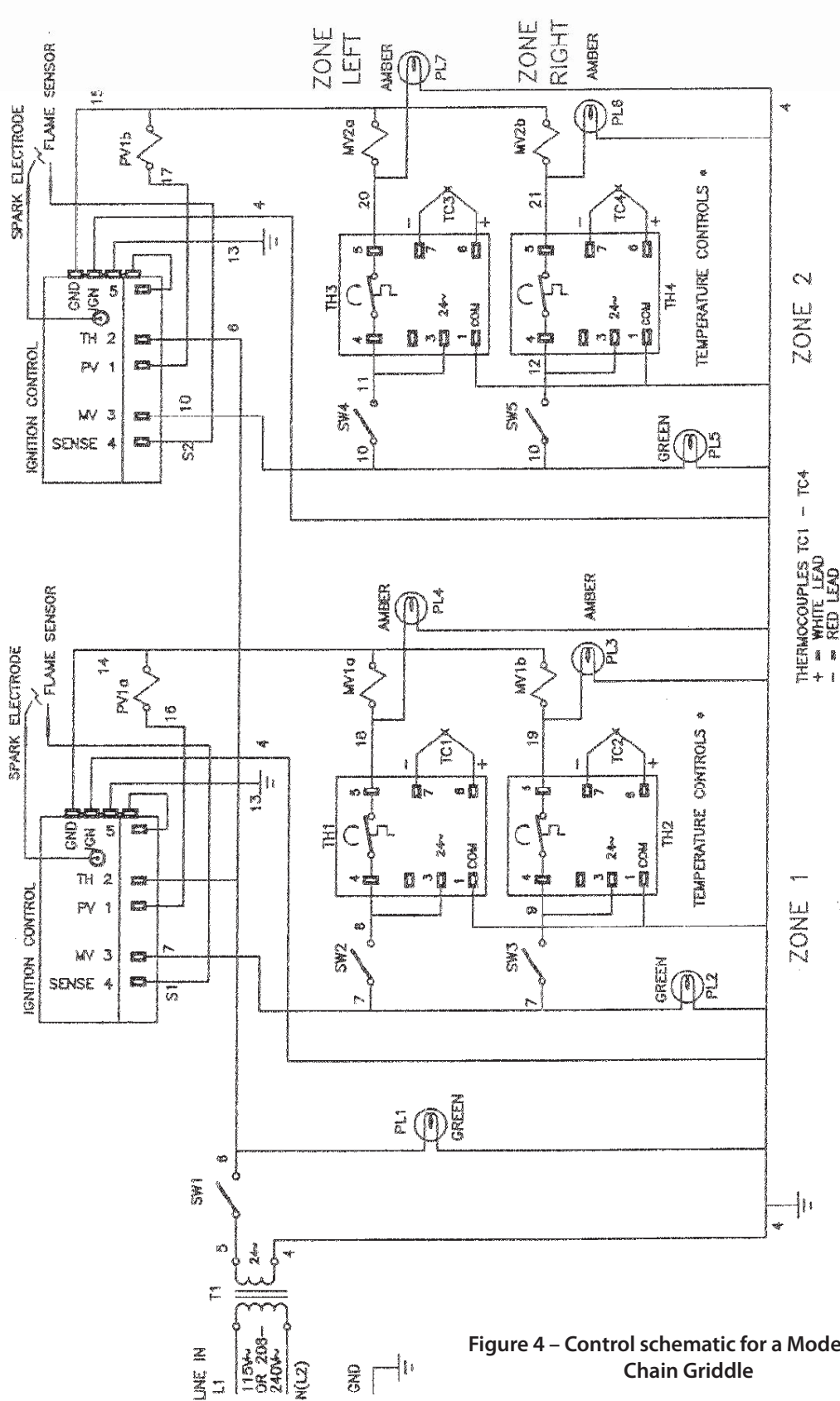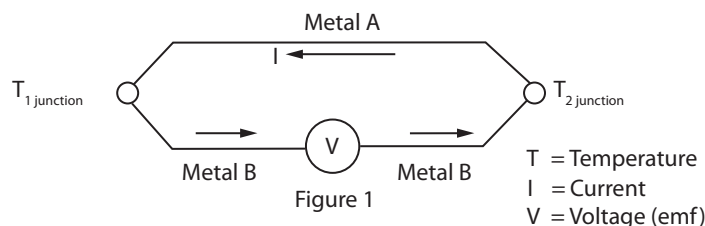This bulletin supplements the chain Griddle Service Manual with a description of the basics of thermocouple theory and how to use the degree/millivolt tables issued as part of this bulletin. This bulletin deals with the thermocouple only and how it registers temperature changes.

The type J thermocouple on the new Chain Griddle measures the plate temperature within a range of accuracy of 2°F to 4°F. The J designation refers to the conductors used and, therefore, the thermoelectric characteristics of the conductors that form the thermocouple. In the Type J unit, the conductors are iron and the alloy constantan. Constantan is an alloy of copper and nickel. Thermocouple technology for sensing temperature has been in use for a long time but the Type J thermocouple is new to Garland Commercial Ranges Limited applications.

To dissimilar metals joined together, as in Figure 1, cause a thermoelectric current to flow in the circuit formed when the junctions are at different temperatures. The current will continue to flow as along as the junctions (T1 and T2) remain at different temperatures. Thermoelectricity is the direct conversion of heat into electricity and vice versa. The electric motive force (emf) producing the current is called the "Seebeck Thermal Emf" (Seebeck after the discoverer), and is proportional to the temperature difference between the two junctions.

Three laws govern the way thermocouples work: the law of homogeneous circuits, the law of intermediate metals and the law of successive or intermediate temperatures. The first law is that a thermocouple circuit must use different metals; the second is that a third metal introduced will not affect the couple provided it is maintained at the same temperature along its entire length; the third provides a means of relating the emf generated to a standardized constant temperature. Refer to a textbook about thermocouples for a fuller explanation of these laws.

Figure 1

$T_{1\,junction}$

$T_{2\,junction}$

Metal A

I

V

Metal B

Metal B

T = Temperature
I = Current
V = Voltage (emf)

If the cold junction is at a known or reference temperature it is a simple matter to compare this with the hot junction at the probe of the thermocouple to obtain an accurate measure of the hot junction temperature. In practice, the cold junction is eliminated by the use of electrical or hardware compensating methods.

Tables of millivolt values for degrees Fahrenheit (at reference junction temperature 32˚) and Centigrade (at reference junction temperature 0˚) have been written and extracts from these tables form part of this bulletin. These are required if service technicians need to check a thermocouple without a J calibrated temperature meter.

Check the thermocouple if you find the temperature variation of the thermostat is more than ± 5˚F from the set point. To check a thermocouple, follow this procedure:

> **Note:** The Type J thermocouple requires the use of a Type J temperature meter. If a type J meter is not available use a millivolt meter and refer to the tables of degrees/millvolt values following, to calculate the cold junction compensation.

Remember that the accuracy of you measurements can be no more accurate than your instruments. Thermocouples generate very small voltages. Many voltmeters cannot read millivoltages accurately.

Set all control thermostats to the same temperature (350˚F). Allow the griddle plate to saturate and achieve a steady temperature.

Place a surface temperature probe on the griddle surface about the thermocouple you want to check. The surface must be cleaned before this procedure. If there is any grease residue on the probe or griddle plate, it will introduce an error in your reading.

Take the temperature reading of the plate above the controlling thermocouple.

Disconnect the thermocouple from the temperature and, either connect it to a J type calibrated temperature meter to measure the temperature output directly or, do the following: measure and record the millivolts generated by the thermocouple. Measure the ambient temperature. Refer to the table and add the corresponding millvoltage for the ambient temperature to the value measured from the thermocouple. Find the corresponding temperature in the chart for millvoltge result.

> **Example:** if the ambient room temperature is 20˚ C add the millvolt value of 20˚C (1.019mV) from the chart to the millvolt reading of the meter and find the temperature value in the chart. The temperature should match the reading on the surface of the plate.

Type J - Thermocouples (0° to 440°F)
EMF In Millivolts - Reference Junction 0°F

°F	0	1	2	3	4	5	6	7	8	9	10
0	-0.885	-0.868	-0.831	-0.803	-0.776	-0.748	-0.721	-0.694	-0.666	-0.639	-0.611
10	-0.611	-0.583	-0.556	-0.528	-0.501	-0.473	-0.445	-0.418	-0.390	-0.362	-0.334
20	-0.334	-0.307	-0.279	-0.251	-0.223	-0.195	-0.168	-0.140	-0.112	-0.084	-0.058
30	-0.058	-0.028	0.000	0.028	0.056	0.084	0.112	0.140	0.168	0.196	0.224
40	0.224	0.253	0.281	0.309	0.337	0.365	0.394	0.422	0.450	0.478	0.507
50	0.507	0.535	0.563	0.592	0.620	0.648	0.677	0.705	0.734	0.762	0.791
60	0.791	0.891	0.848	0.876	0.905	0.933	0.962	0.990	1.019	1.048	1.076
70	1.076	1.105	1.134	1.262	1.191	1.220	1.248	1.277	1.396	1.335	1.363
80	1.363	1.392	1.421	1.450	1.479	1.507	1.536	1.565	1.594	1.623	1.652
90	1.652	1.681	1.710	1.739	1.768	1.797	1.826	1.855	1.884	1.913	1.942
100	1.942	1.971	2.000	2.029	2.058	2.088	2.117	2.146	2.175	2.204	2.233
110	2.233	2.263	2.292	2.321	2.350	2.380	2.409	2.438	2.467	2.497	2.526
120	2.526	2.555	2.585	2.614	2.644	2.673	2.702	2.732	2.761	2.791	2.820
130	2.820	2.849	2.879	2.908	2.938	2.967	2.997	3.026	3.056	3.085	3.115
140	3.115	3.145	3.174	3.204	3.233	3.263	3.293	3.323	3.352	3.381	3.411
150	3.411	3.441	3.470	3.500	3.530	3.560	3.589	3.619	3.649	3.678	3.708
160	3.708	3.738	3.768	3.798	3.827	3.857	3.887	3.917	3.947	3.976	4.006
170	4.006	4.036	4.066	4.096	4.126	4.156	4.186	4.216	4.245	4.275	4.305
180	4.305	4.335	4.365	4.395	4.425	4.455	4.485	4.515	4.545	4.575	4.605
190	4.605	4.635	4.665	4.695	4.725	4.755	4.786	4.816	4.846	4.876	4.906
200	4.906	4.936	4.966	4.996	5.026	5.057	5.087	5.117	5.147	5.177	5.207
210	5.207	5.238	5.268	5.298	5.328	5.358	5.389	5.419	5.449	5.479	5.509
220	5.509	5.540	5.570	5.600	5.630	5.661	5.691	5.721	5.752	5.782	5.812
230	5.812	5.843	5.873	5.903	5.934	5.964	5.994	6.025	6.055	6.085	6.116
240	6.116	6.146	6.176	6.207	6.237	6.268	6.298	6.328	6.359	6.389	6.420
250	6.420	6.450	6.481	6.511	6.541	6.572	6.602	6.633	6.663	6.694	6.724
260	6.724	6.755	6.785	6.816	6.846	6.877	6.907	6.938	6.968	6.999	7.029
270	7.029	7.060	7.090	7.121	7.151	7.182	7.212	7.243	7.274	7.304	7.335
280	7.335	7.365	7.396	7.426	7.457	7.488	7.518	7.549	7.579	7.610	7.641
290	7.641	7.671	7.702	7.732	7.763	7.794	7.824	7.855	7.885	7.914	7.947
300	7.947	7.977	8.008	8.039	8.069	8.100	8.131	8.161	8.192	8.223	8.253
310	8.253	8.284	8.315	8.345	8.376	8.407	8.437	8.468	8.499	8.530	8.560
320	8.560	8.591	8.622	8.652	8.683	8.714	8.745	8.775	8.806	8.837	8.867
330	8.867	8.898	8.929	8.960	8.990	9.021	9.052	9.083	9.113	9.144	9.175
340	9.175	9.206	9.236	9.267	9.298	9.329	9.359	9.390	9.421	9.452	9.483
350	9.483	9.513	9.544	9.575	9.606	9.636	9.667	9.698	9.729	9.760	9.790
360	9.790	9.821	9.852	9.883	9.914	9.994	9.975	10.006	10.037	10.068	10.098
370	10.098	10.129	10.160	10.191	10.222	10.252	10.283	10.314	10.345	10.376	10.407
380	10.407	10.437	10.468	10.499	10.530	10.561	10.592	10.622	10.653	10.684	10.715
390	10.715	10.746	10.777	10.807	10.838	10.869	10.900	10.931	10.962	10.992	11.023
400	11.023	11.054	11.085	11.116	11.147	11.177	11.208	11.239	11.270	11.301	11.332
410	11.332	11.363	11.292	11.424	11.455	11.486	11.517	11.548	11.578	11.609	11.640
420	11.640	11.671	11.702	11.733	11.764	11.794	11.825	11.856	11.887	11.918	11.949
430	11.949	11.980	12.010	12.041	12.072	12.103	12.134	12.165	12.196	12.226	12.257
440	12.257	12.288	12.319	12.350	12.381	12.411	12.442	12.473	12.504	12.535	12.566
450	12.566	12.597	12.627	12.658	12.689	12.820	12.751	12.782	12.813	12.843	12.875

Type J - Thermocouples (0° to 240°C)

EMF In Millivolts - Reference Junction 0°C

°C	0	1	2	3	4	5	6	7	8	9	10
0	0.000	0.050	0.101	0.151	0.202	0.253	0.303	0.354	0.405	0.456	0.507
10	0.507	0.550	0.609	0.660	0.711	0.762	0.813	0.865	0.916	0.967	1.019
20	1.019	1.070	1.112	1.174	1.115	1.277	1.329	1.381	1.432	1.484	1.536
30	1.536	1.588	1.640	1.693	1.745	1.797	1.849	1.901	1.954	2.006	2.058
40	2.058	2.111	2.163	2.216	2.260	2.321	2.374	2.426	2.479	2.532	2.585
50	2.585	2.639	2.691	2.743	2.796	2.849	2.902	2.956	3.009	3.062	3.115
60	3.115	3.168	3.221	3.775	3.328	3.381	3.435	3.488	3.542	3.595	3.649
70	3.649	3.702	3.756	3.809	3.863	3.917	3.971	4.024	4.078	4.132	4.186
80	4.186	4.239	4.293	4.347	4.401	4.455	4.509	4.563	4.617	4.671	4.724
90	4.725	4.780	4.834	4.868	4.942	4.996	5.050	5.105	5.159	5.213	5.268
100	5.268	5.322	5.376	5.431	5.485	5.540	5.594	5.649	5.703	5.758	5.813
110	5.812	5.867	5.921	5.976	6.031	6.085	6.140	6.195	6.249	6.304	6.359
120	6.359	6.414	6.468	6.523	6.578	6.633	6.688	6.742	6.797	6.852	6.907
130	6.907	6.962	7.017	7.072	7.127	7.182	7.237	7.292	7.237	7.402	7.457
140	7.457	7.512	7.567	7.622	7.677	7.732	7.787	7.843	7.898	7.953	8.008
150	8.008	8.063	8.118	8.174	8.229	8.284	8.339	8.394	8.450	8.505	8.560
160	8.560	8.616	8.671	8.726	8.788	8.837	8.892	8.947	9.003	9.058	9.113
170	9.113	9.169	9.224	9.279	9.335	9.390	9.446	9.501	9.556	9.612	9.667
180	9.667	9.723	9.778	9.834	9.889	9.944	10.000	10.055	10.111	10.166	10.222
190	10.222	10.277	10.333	10.388	10.444	10.499	10.555	10.610	10.666	10.721	10.777
200	10.777	10.832	10.888	10.943	10.999	11.054	11.110	11.165	11.221	11.276	11.332
210	11.332	11.387	11.443	11.498	11.554	11.609	11.665	11.720	11.776	11.831	11.887
220	11.887	11.943	11.998	12.054	12.109	12.165	12.220	12.276	12.331	12.387	12.442
230	12.442	12.498	12.553	12.609	12.664	12.720	12.776	12.831	12.887	12.942	12.998
240	12.998	13.503	13.109	13.164	13.220	13.275	13.331	13.386	14.442	13.497	13.553

Revision History (CG Griddles)

PAGE#	SECTION	NOTES	DATE
4	Dimensions and Specifications	Missing manifold pressure info. Copied from latest Spec Sheet dated 11/13/12. Revised operating pressure data for LP, 27.4 mbar. Was 24.4 mbar.	MAR 19/13
1		Modified footer info.	

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