

**TECHNICAL MANUAL**

**OPERATOR'S, UNIT AND  
DIRECT SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)  
FOR**

**PRECISION GENERAL PURPOSE OVENS  
Model TS-31 477 AU-2**

**NSN 6640-00-359-9880**

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and the content requirements normally associated with Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.

**Approved for public release; distribution is unlimited.**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY  
28 SEPTEMBER 1990**



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## **SUPPLEMENTARY INTRODUCTORY MATERIAL**

### **1-1. Maintenance Forms and Records.**

Department of the Army forms and Procedures used for equipment maintenance will be those described by DA Pam 738-750, The Army Maintenance Management System.

### **1-2. Reporting Errors and Recommending Improvements.**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letters, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2" located in the back of this manual, directly to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

### **1-3. Destruction of Army Material to Prevent Enemy Use.**

Refer to TM 750-244-3 for instructions covering the destruction of Army Material to prevent enemy use.

### **1-4. Administrative Storage of Equipment.**

a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period appropriate maintenance records will be kept.

b. Before placing equipment in administrative storage, current preventive maintenance checks and services should be completed. Shortcomings and deficiencies should be corrected, and all modification work orders (MWO'S) should be applied.

c. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers and other containers may be used.



ADDENDUM TO: INSTRUCTION MANUAL  
TS-31477 AU-2 GENERAL PURPOSE OVENS

The following corrections are made to the parts list, page 19.

Item 7 - Dual Pilot (White & Red): Change part numbers 247148 to 234148

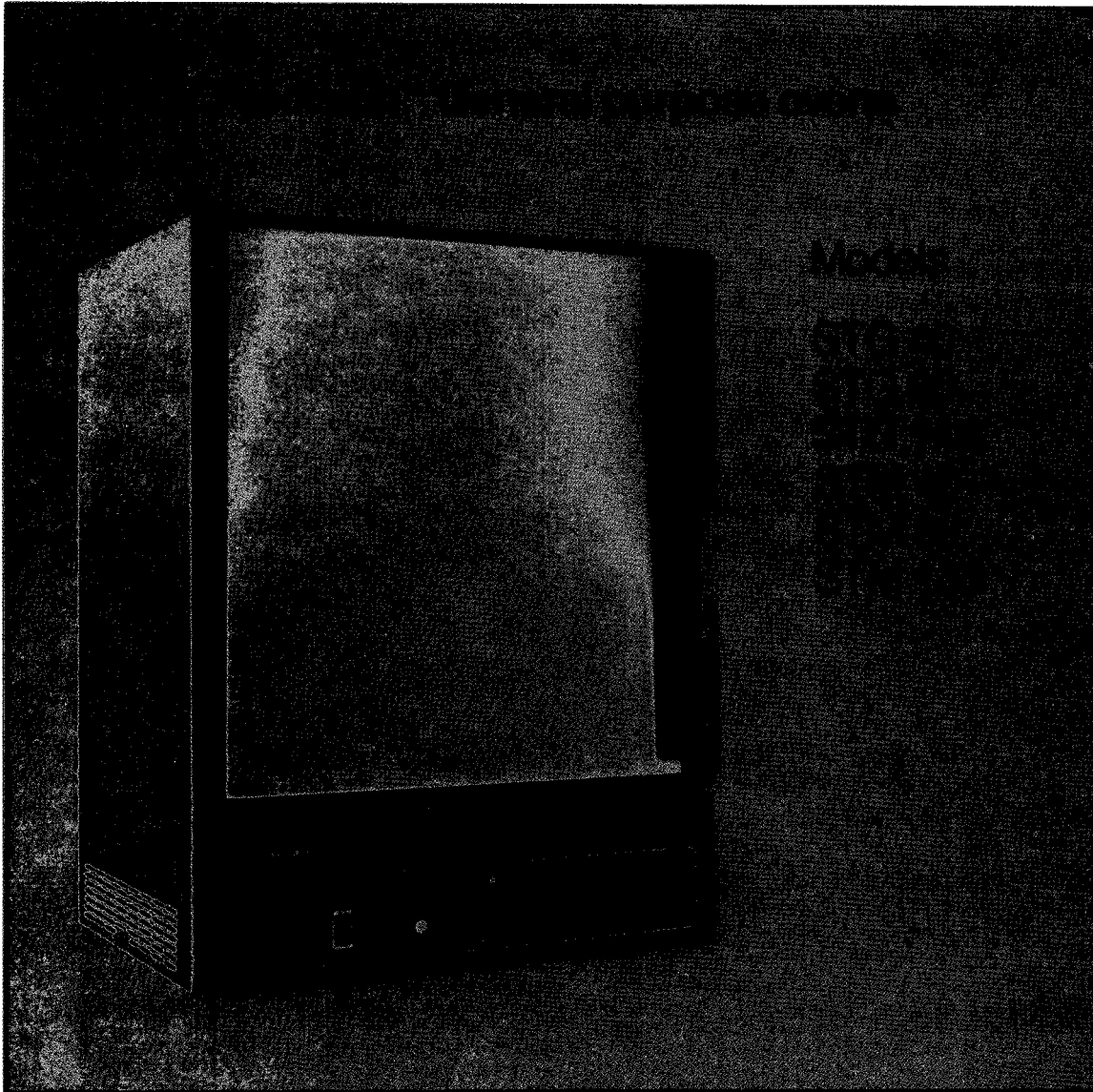
Item 8 - Sensor, Temperature: For STM 135 only. Change part number 00870601 to 00870602

Item 18 - Blower, Wheel: Change part numbers 257024 to 275024.



# Precision <sup>®</sup>

## Instruction Manual TS-31477 AU-2



### Precision Scientific





## General purpose ovens

Catalog No's 31477, 31478, 31540, 31541, 31542,  
31551, 31552, 31553, 31554, 31555, 31556, & 31557.

### Introduction

Your satisfaction and safety are important to PRECISION SCIENTIFIC and a complete understanding of this unit is necessary to attain these objectives.

As the ultimate user of this apparatus, it is your responsibility to understand its proper function and operational characteristics. This instruction manual should be thoroughly read and all operators given adequate training before attempting to place this unit in service. Awareness of the stated cautions and warnings, and compliance with recommended operating parameters--together with maintenance requirements--are important for safe and satisfactory operation. The unit should be used for its intended application; alterations or modifications will void the Warranty.

**WARNING: As a routine laboratory precaution, always wear safety glasses when working with this apparatus.**

This product is not intended, nor can it be used, as a sterile or patient connected device. In addition, this apparatus is not designed for use in Class I, II, or III locations as defined by the National Electrical Code..

### Unpacking and damage

Save all packing material if apparatus is received damaged. This merchandise was carefully packed and thoroughly inspected before leaving our factory.

Responsibility for its safe delivery was assumed by the carrier upon acceptance of the shipment; therefore, claims for loss or damage sustained in transit must be made upon the carrier by the recipient as follows:

Visible Loss or Damage: Note any external evidence of loss or damage on the freight bill, or express receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor your damage claim. The form required to file such a claim will be supplied by the carrier.

Concealed Loss or Damage: Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked and inspected. Should either occur, make a written request for inspection by the carrier's agent within 15 days of the delivery date; then file a claim with the carrier since the damage is the carrier's responsibility.

By following these instructions carefully, we guarantee our full support of your claim to be compensated for loss from concealed damage.

DO NOT -- FOR ANY REASON -- RETURN THIS UNIT WITHOUT FIRST OBTAINING AUTHORIZATION. In any correspondence to PRECISION SCIENTIFIC please supply the nameplate data, including catalog number and serial number.

## General information

This instruction manual encompasses the following models and their specific electrical characteristics.

Catalog Number	Model	Electrical Data			
		Volts	Hz	Watts	Amps
31477	STG40	120	50/60	820	6.8
31555		230		750	3.3
31478	STG80	120	50/60	1420	11.8
31556		230		1300	5.7
31542	STG145	120	50/60	1690	14.1
31557		230		1550	6.7
31540	STM40	120	50/60	1190	9.9
31541		230		1090	4.7
31551	STM80	120	50/60	1460	12.2
31552		230		1340	5.8
31553	STM135	120	50/60	1735	14.5
31554		230		1590	6.9

The six models available differ as follows;

Models STG 40. STG 80. STG 145 employ gravity convection as a method of heat transfer within their respective chambers. Gravity convection is defined as the natural tendency for heated air to rise due to its change in density and mass.

Air is drawn into the chamber through openings in the bottom of the oven then heated as it passes over the heating coils and up through the openings in the diffuser panel located on the bottom of the chamber. A limited amount of the heated air is exhausted out of the chamber through the openings in the vent cap located on top of the oven and the remaining air recirculates within the chamber.

Gravity convection ovens are ideal where forced air circulation cannot be tolerated and for situations demanding gentle curing, or for long term sample storage under closely controlled conditions.

Some gravity convection applications are: drying powders, curing of facial cosmetic prosthetics, preparation of

soil samples, semi-conductor aging, and drying materials for chemical analysis.

All of the Model STG gravity convection ovens and the Model STM 40 mechanical convection oven use two highly accurate hydraulic thermostats--one control and one high limit safety--from a single control. This provides a sensitivity to  $\pm 0.25^{\circ}\text{C}$ .

Models STM 40. STM 80 & STM 135 ovens use mechanical convection as a method of heat transfer. Mechanical convection can be defined as a positive and planned directional air flow or forced air circulation within their respective chambers.

Air is drawn into the chamber through the meter shaft opening located in the bottom of the oven and is heated as it passes over the heating coils. The air is blown through the duct network and forced into the chamber through calculated openings in the side diffuser walls.

A limited amount of the heated air is exhausted out of the chamber through the openings in the vent cap located on top of the oven and the remaining air recirculates within the chamber.

Mechanical convection ovens provide the most efficient means of heat transfer as well as the most reproducible test conditions for successive operations. They provide rapid heat-up time for high density loads, shortened recovery period in production operations where the door is frequently opened and the finer uniformity for extremely heat sensitive materials.

Precise temperature control and uniformity are ideal for many and varied applications: moisture analysis, oyster condition index evaluation, electronics testing, determination of total and suspended solids in sewage, sample imbedding for electron microscopy, moisture

vapor susceptibility testing, of electrical components at elevated temperature, protein bound iodine analysis, accelerating shelf life for cosmetics and aromatics, drying of vital cathode powders curing of acrylics and epoxy resins, determination of milk solids, determination of shrinkage resistance, paraffin imbedding, determining the potential reactivity of materials, accelerated storage and measurement of suspended sediment particles.

In addition to providing mechanical convection heat transfer the Models STM 80 and STM 135 are supplied with solid state controllers. These controllers cycle heat in split-second intervals based on input from a platinum probe having a  $\pm 0.01^\circ\text{C}$  sensitivity. When this type of control is combined with the circular pattern of heat flow inside the chamber, precise temperature control from ambient  $+5^\circ\text{C}$  to  $250^\circ\text{C}$  is achieved.

An LED display indicates temperature and a thumbwheel digital control permits temperature setpoint selection to  $1.0^\circ\text{C}$ . The power supply for the LED digital display is energized with 120 VAC, which in turn, supplies 9 VDC to the temperature readout PC board.

A pulsing green light indicates when the temperature stabilizes at the setpoint. For safety, a separate adjustable high limit control turns off the heater if the selected limit is attained. A blinking red light will indicate this condition.

Recorder jacks are provided on the front panel to chart the temperature cycle and maintain permanent records. The recorder jacks supply an output of  $20\text{ mV}/^\circ\text{C}$  and the recorder, selected, should have a range of 0 to 5 volts (0 volts corresponds to  $0^\circ\text{C}$ , 1 megohm impedance).

### Technical specifications

Model	Heat Transfer Method	Temperature			Guaranteed Temp. Uniformity ( $\pm^\circ\text{C}$ )		Sensitivity ( $\pm^\circ\text{C}$ )	Recovery Time to $100^\circ\text{C}$ in minutes	Maximum Air Changes per Hour	Chamber				Exterior Dimensions wxdxh inches (cm)
		Min. $^\circ\text{C}$	Max. $^\circ\text{C}$	Time to Reach Max. Rated $^\circ\text{C}$ in minutes	100 $^\circ\text{C}$	200 $^\circ\text{C}$				Dimensions wxdxh inches (cm)	Volume $\text{ft}^3$ (liters)	Shelves		
												No. Supplied	Total Area $\text{ft}^2$ ( $\text{m}^2$ )	
STG40	Gravity	65	225	65	1.5	1.8	0.25	12	23	13x14x14 (33x36x36)	1.5 (42)	2	2.4 (0.22)	19x18x26 (48x46x66)
STG80	Gravity	65	225	60	1.3	1.6	0.25	15	19	19x14x19 (48x36x48)	2.9 (83)	2	3.3 (0.31)	24x18x32 (61x46x81)
STG145	Gravity	65	225	72	1.5	1.9	0.25	30	20	25x19x19 (64x48x48)	5.2 (148)	2	6.1 (0.57)	30x24x32 (76x61x81)
STM40	Mechanical	40	225	60	1.2	1.5	0.25	8	85	13x14x13 (33x36x33)	1.4 (39)	2	2.2 (0.20)	19x18x26 (48x46x66)
STM80	Mechanical	ambient +5	225	55	1.0	1.3	0.01	10	72	18x14x19 (46x36x48)	2.8 (78)	2	3.2 (0.30)	24x18x32 (61x46x81)
STM135	Mechanical	ambient +5	225	75	1.1	1.4	0.01	12	60	23x19x19 (58x48x48)	4.8 (136)	2	5.6 (0.52)	30x24x32 (76x61x81)

\*Door opened for 30 seconds.

**Installation**

**WARNING:** Installation should be completed by qualified instrument personnel, ONLY.

**Location:** The most uniform operating conditions and results will be obtained by placing the oven in an area remote from drafts, ventilating outlets, radiators, and other rapidly changing ambient conditions.

To assure proper ventilation, allow a minimum of 4 inches of clearance between the rear top, and sides of oven and adjacent walls. If two or more ovens are positioned side by side, allow a minimum of 8 inches between cabinets. The chosen site should be as free as possible from dust to eliminate maintenance and at the same time extend life of the controls.

All four legs provided on the bottom of the oven are adjustable to compensate for installation sites that are not level.

**Electrical Connections:** Important  
(Please Read Carefully)

**CAUTION:** Be sure that the power supply is of the same voltage as specified on the nameplate.

The following ovens are supplied with a cord and plug:

- Models STG 40
- STG 80
- STM 40
- STM 80

The power cord of these instruments is equipped with a three-prong (grounding) plug which mates with a standard three-prong (grounding) wall receptacle to minimize the possibility of electric shock hazard from this apparatus. The user should have the wall receptacle and circuit checked by a qualified

electrician to make sure the receptacle is properly wired.

**WARNING:** DO NOT, under any circumstance, cut or remove the third (ground) prong from the power cord. DO NOT use a two-prong adapter plug.

The Models STG 145 & STM 135 are furnished with an electrical junction box located on the rear of the oven.

In accordance with the National Electrical Code, power must be supplied by permanently wired connections. A line cord is not supplied. This unit should be wired by a qualified electrician so that proper fusing and service wires are installed. Ground the oven electrically between the mounting screw located inside the conduit box and a water pipe, or well grounded conduit system.

**WARNING:** For personal safety, this apparatus must be properly grounded.

Determine the total amount of current presently being used by other apparatus connected to the circuit that will be used for this unit. It is critical that the added current demand and other equipment on the circuit not exceed the rating of the fuse or circuit breaker, in use.

Explanation of controls

The controls supplied on the Models STG 40, STG 80, STG 145, and STM 40 are as follows:

**"ON - OFF" SWITCH:** Controls all power to the oven. The blower motor on mechanical convection ovens will always be in operation when the switch is in the "ON" position.

**Dual Thermostat Control Knob:** Controls the operating temperature of the chamber

and the safety thermostat. The factory set temperature differential between the dual thermostats is about 8°C.

**"CONTROL/SAFETY" Pilot Lamp:** The left lamp (white) when "ON" indicates heater operation. The right lamp (red) when "ON" indicates the controlling thermostat has failed and the safety thermostat has taken control.

The **Models STM 80 and STM 135** contain the following controls;

**"ON - OFF, LINE" Switch:** Controls all power to the oven and the blower motor will always be in operation when the switch is in the the "ON" position.

**"HIGH LIMIT" Thermostat:** A separate adjustable high limit control turn off the heater if the selected limit is attained. A pulsing red light, located above the thermostat, will indicate this condition.

**"SET POINT °C", ThumbWheel Digital Control:** Allows the operator to select the desired set point chamber temperature by manipulating the levers of the thumbwheels. A pulsing green light, located above the thumbwheel, indicates when the temperature stabilizes at the setpoint.

**"RECORDER", jacks :** These jacks are provided to maintain a permanent record of the chamber temperature cycle. The recorder jacks supply an output of 20 mv/°C and the recorder, selected, should have a range of 0 to 5 volts (0 volts corresponds to 0°C), 1 megohm impedance.

### Operation

Fully open the exhaust vent shutter cap on top of the cabinet and keep it open at all times. However, when operating at maximum rated temperature, it may be necessary to turn the shutter cap towards the closed position. This will eliminate chamber heat loss.

Insert the shelf supports into holes provided in the shelf support retainers that are fastened to the side walls of the inner chamber. Insert the shelves into the shelf supports and the shelves should be positioned so they can be withdrawn more than half way out without falling.

A mercury-in-glass thermometer, temperature range of 0 to 250°C, is provided for the following models;

STG 40, STG 80  
STG 145, and STM 40

and should be inserted through the hole located in the top of the vent shutter cap. The cap contains 3 tabs that may have to be bent inwards to secure the thermometer and maintain it in a vertical position.

A **certified** thermometer (not Included) may be inserted into the shutter cap, as explained above, on the models STM 80 & STM 135 to determine chamber temperature and/or to be used later for calibration.

### **MODELS STG 40, STG 80, STG 145 & STM 40. only.**

1. Depress the "ON - OFF" switch to the "ON" position.
2. Rotate the thermostat control knob clockwise (clockwise rotation increases chamber temperature) to an arbitrary setting.
3. Allow the chamber to heat up until steady readings are observed on the thermometer. The chamber temperature has stabilized when there is uniform cycling of the control pilot light.
4. A desired operating chamber temperature as indicated on the thermometer, and obtained at a particular thermostat control knob setting, should be recorded for future reference.

Before moving from a higher setting to a lower setting, the thermostat control knob should be turned all the way back to the "Zero" position. The new temperature setting should be approached in a clockwise direction.

NOTE 1: When moving from a higher setting to a lower one, the safety pilot light may glow faintly for a short time. This is inconsequential and will disappear as soon as the new lower temperature is stabilized.

NOTE 2: Slight vapor discharge may occur on the initial heat up. This is the dissipation of the protective coatings that have been added to the cabinet. Allow for complete dissipation of the vapors before placing samples in the chamber.

MODELS STM 80, and STM 135, only.

1. Depress the "LINE" switch to the "ON" position.
2. Rotate the "HIGH LIMIT" thermostat knob fully clockwise.
3. Select the desired operating temperature by manipulating the levers on the thumbwheel digital control ("SET POINT "C").

NOTE : The thumbwheel digital control can be turned to as high as 299°C; however, the rated controllable operating range of the oven is 70°C to 225°C.

4. Allow the chamber to heat up until steady readings are observed on the LED temperature display. The chamber temperature has stabilized when there is uniform cycling of the green control pilot light.

NOTE : A slight vapor discharge may occur on the initial heat

5. Before setting the "HIGH LIMIT" thermostat, the chamber temperature must be allowed to stabilize. Depending on the temperature desired, stabilization will require from 15 to 60 minutes, maximum.
6. Set the "HIGH LIMIT" thermostat (which should be at its maximum setting now fully clockwise), by rotating the knob counterclockwise until the red pilot light turns "ON". It indicates that the "HIGH LIMIT" thermostat has taken control and that the heater has been de-energized. Once this occurs, turn the knob forward (clockwise) at least one to two divisions.

NOTE : This adjustment for the "HIGH LIMIT" thermostat should be done only when the chamber temperature is stabilized (green pilot light uniformly cycling).

Loading: Although the gravity and mechanical convection ovens rely on different methods of air circulation, general loading procedures are applicable to both types and must be followed. To insure that the circulation of heated air is not restricted in the chamber.

1. At least 1" should be left between objects placed on the shelves.

NOTE: With the mechanical convection cabinets, objects should not be placed on the shelves in such a manner as to block the movement of heated air into the chamber from the side diffuser panels.

2. The bottom of the chamber must be kept free and clear of objects.
3. At no time should solid shelves be substituted for the shelves that are provided.

After loading, the time required for the chamber to recover to the original stabilized temperature will be directly related to the mass of the load.

**WARNING: SAFETY PRECAUTIONS**

1. DO NOT place any explosive, combustible, or flammable materials in the chamber.
2. DO NOT place sealed containers in the chamber. Sealed containers, filled with materials, do not provide room for expansion and can develop dangerous vapor pressure as the temperature increases.
3. Avoid spillage of liquids.
4. DO NOT evaporate noxious fumes.

**CAUTION:** DO NOT store containers filled with acidic or caustic solutions, as vapors from these materials will attack the chamber interior and electrical components, thus voiding the warranty.

**Servicing**

**Troubleshooting:**

**WARNING:** Service should be performed by qualified service personnel. Disconnect the unit from its electrical source. Remove the shelves and thermometer, if supplied. Disconnecting any component from the circuit without prior removal of the power source may cause damage to other circuit components.

**Temperature Variance or Fluctuation:**

1. Make sure the vent shutter cap is not closed. Open to maximum.
2. Test unit when empty; if results are satisfactory, the chamber was improperly loaded. Redistribute the load.

3. Be sure to allow ample time for an empty chamber to stabilize at a temperature setting. It could take over one hour to equilibrate, depending upon the difference between ambient and operating temperatures. The mass of the load can also affect stabilization time.
4. Make certain that severe line voltage fluctuations are not occurring.
5. Make certain that all wire terminal connections are secure.
6. Make certain that an intermittent failure of the switch, thermostat, or wiring has not occurred. Isolate the cause; repair or replace.

**Heat Loss:** Inspect door gasket to make certain it fits firmly against cabinet at all points. Replace if damaged, or adjust the door catch plate. (See Improper Door Closure).

**Improper Door Closure:** The plate on the door which engages the magnetic catch on the cabinet is adjustable. Either loosen or tighten it to ensure proper door closure.

**No Heat:** If the chamber does not heat, first check the line voltage, circuit breaker and/or fuses, and all electrical connections.

**Heater Resistance Test Procedure:**

**WARNING :** Disconnect the oven from its power source.

Refer to the appropriate wiring diagram and the Heater Data Table for resistance values at room temperature. Resistance is measured between terminals 1 and 2 located on the terminal block.

Be sure to disconnect at least one heater lead from the terminal block before taking an ohmmeter reading. If the heater is open (infinite resistance), it should be replaced.

Heater Data Table

Catalog No.	Model	Heater Wattage	Voltage	Resistance Between Heater Leads (ohms)
31477	STG 40	820	120	17.5
31555			230	70.0
31478	STG 80	1420	120	10.0
31556			230	40.0
31542	STG 145	1620	120	8.5
31557			230	34.0
31540	STM 40	1150	120	12.5
31542			230	50.0
31551	STM 80	1420	120	10.0
31552			230	40.0
31553	STM 135	1690	120	8.5
31554			230	34.0

Models STM 80 and STM 135 Only

**Overheating:** If the heater is "ON" continuously and the green light is not uniformly cycling, the temperature continuously increases after it has exceeded the set temperature:

The "HIGH LIMIT" thermostat will control the oven temperature. When the red light appears, the heater is "OFF". The temperature will decrease and thermostat will turn the heater back on (green light "ON"). The temperature will increase until the thermostat de-energizes the heater again (red light "ON", green light "OFF").

If this is the case, replace the temperature control PCB on the unit. If the green light is "ON" continuously, check:

1. Sensor (it may not be hooked up).
2. Triac assembly (it may be shorted).
3. PC Board.
4. Thumbwheel switch.

Sensor Specifications

- a. Resistance of sensor:  
100.ohms  $\pm$  2 ohm @ 0°C  
138.50 ohms  $\pm$  0.3 ohm @ 100°C
- b. Operating temperature range: -20°C to +250°C
- c. Thermal time constant @ 2 ft./sec.:  
2.5 sec. Max.
- d. Maximum operating current: 20 mA
- e. Resistance between leads and S.S. tubing: 100 megohms or greater

Sensor Resistance Test and/or Replacement:

**CAUTION:** To prevent P.C. board component damage, the instrument must be disconnected from its electrical source before disconnecting the sensor from the P.C board.

1. Remove 4 screws that fasten the control panel to the front of the oven to gain access to the temperature control PCB, (A100).



2. Disconnect the sensor plug (J-102) from the PCB.

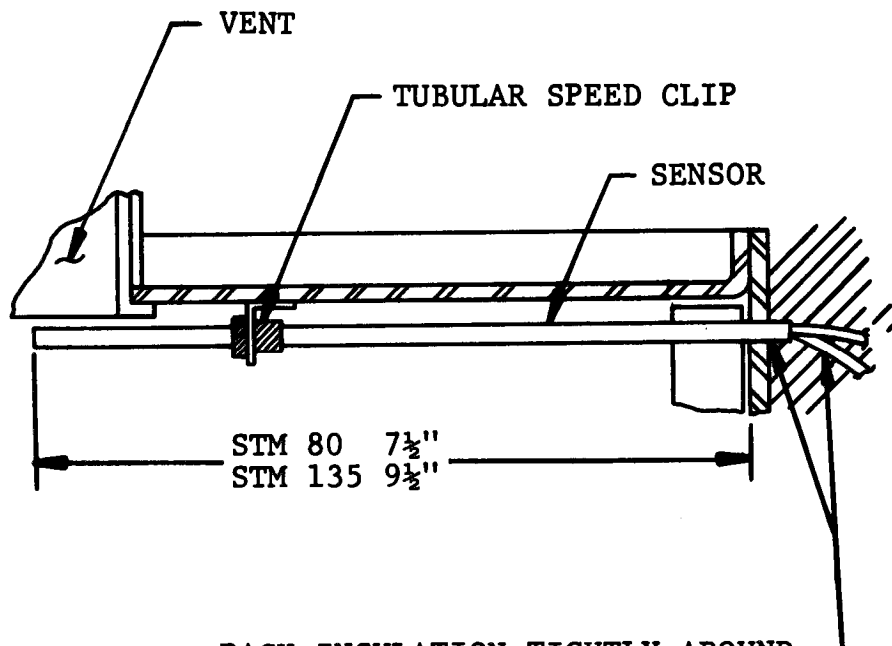
Test Resistance of Sensor:  
 100.0 ohms ±0.2 ohm at 0°C  
 138.5 ohms ±0.3 ohm at 100°C

3. If sensor replacement is necessary, remove all screws that fasten the rear panel to the back of the oven to gain access to the sensor leads.

4. Remove the sensor from the clip located at the top of the inner chamber then slip the sensor through the bottom of the oven.

- 5\* Replace the sensor reversing the steps shown above. See figure below for proper sensor location.

6. See page 12 for recalibration procedure.



PACK INSULATION TIGHTLY AROUND  
 LEADS TO PROBES TO PREVENT HEAT LOSS

**Triac Test and/or Replacment:**

WARNING : Triac testing and/or replacement should be completed by a qualified electronic serviceperson and extreme caution should be exercised during triac testing as line voltage is present in the control compartment.

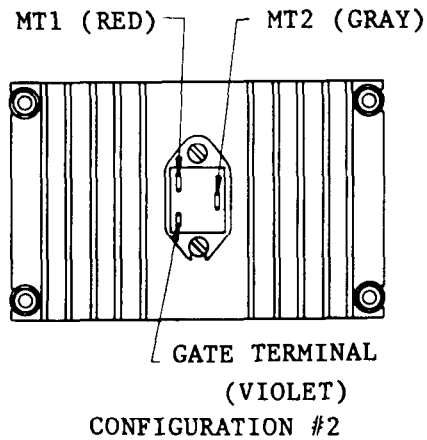
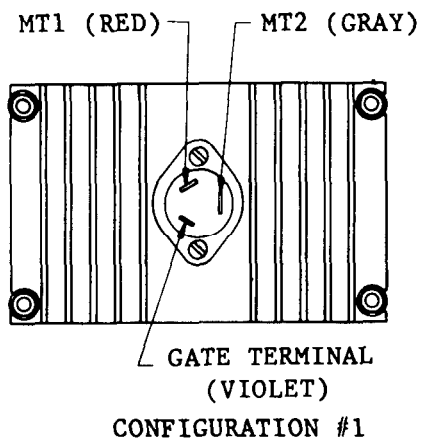
If there is no heat when "SET POINT °C" thumbwheel is set at 35°C or higher, or if there is constant heat even when the "SET POINT °C" thumbwheel is dialed below room temperature, there is a possibility that the triac has malfunctioned. When the triac is energized, it will read an output of 1 volt across MT1 and MT2. If the triac is de-energized, it reads 115 volts across MT1 and MT2.

To gain access to the triac it will be necessary to lay the oven on its door and remove the sheet metal panel which is fastened to the bottom of the oven.

Install triac assembly such that gate terminal (smallest tab) is in the lower left-hand corner and is connected to the violet wire. The MT1 connection should be hooked up to the red lead wire, and the MT2 connection should be hooked up to the grey lead wire.

NOTE: The triac in each unit may differ as shown in configuration #1 or #2

**TRIAC ASSEMBLY**



NOTE: Install triac so that gate terminal is in the lower left corner of the base.

Thumbwheel Switch Test and/or Replacement:

(Models STM 80 and STM 135)

**WARNING :** Disconnect the oven from its power source.

1. Remove 4 screws that fasten the control panel to the front of the oven to gain access to the rear of the switch.
2. The thumbwheel switch is fastened to the rear of the panel by 4 spring tabs and is connected to the control PCB by means of a ribbon cable.
3. Remove the ribbon cable from the Switch .
4. Check continuity between common (C) and pin 1, 2, 4, or 8 for each module (3 modules/switch) using the Truth Table shown below:

Ten Position, binary coded decimal

DIAL	COMMON C CONN TO TERMINALS			
	1	2	4	8
0				
1	o			
2		o		
3	o	o		
4			o	
5	o		o	
6		o	o	
7	o	o	o	
8				o
9	o			o

Example: Temperature setting on switch , "Set Point °C;

127

Continuity should be between common and pin 1 (1st Module - dial setting of 1)

Continuity should be between common and pin 2 (2nd Module - dial setting of 2)

Continuity should be between common and pins 1, 2, and 4 (3rd Module - dial setting of 7)

Temperature Readout PCB (A200) Malfunctioning.

Symptom 1. Digits do not register.



Remedy 1. Measure voltage supply between (J217) and (J218, J213 both grounded together). Voltage should be 4.8 to 5.1 VDC and if voltmeter reading is zero, check connections between Temperature Control PCB and Temperature Readout PCB. If reading is correct replace Temperature Readout PCB.

Symptom 2. One segment of each LED is not lit.



or

If one segment on one LED is not lit.



Remedy 2. Replace Temperature Readout PCB .

Temperature Control PCB (A100)  
Replacement:

1. Disconnect the oven from its power source.
2. Remove 4 screws that fasten the control panel to the front of the oven to gain access to the electrical components.
3. Pinch the 4 plastic tabs on each corner of the PCB and carefully lift the board straight up.
4. Replace the PCB using extreme care not to break the electrical connections or plastic prongs.
5. See below for recalibration procedures.

Temperature Readout PCB (A200)  
Replacement:

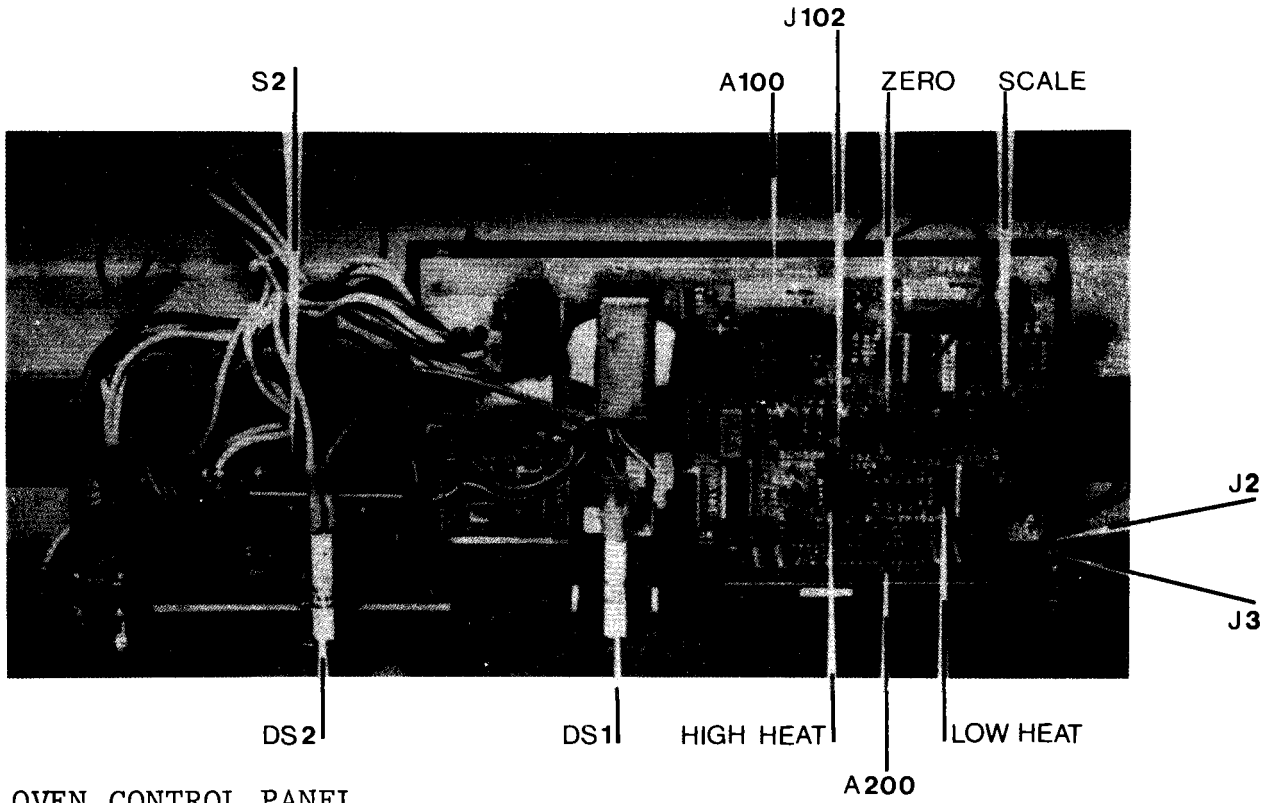
1. Disconnect the oven from its power source.
2. Remove 4 screws that fasten the control panel to the front of the oven to gain access to the electrical components.
3. Carefully remove the PCB by lifting straight up and out of the Temperature Control PCB.

CALIBRATION OF TEMPERATURE CONTROLLER PCB (A100) AND TEMPERATURE READOUT PCB (A200)

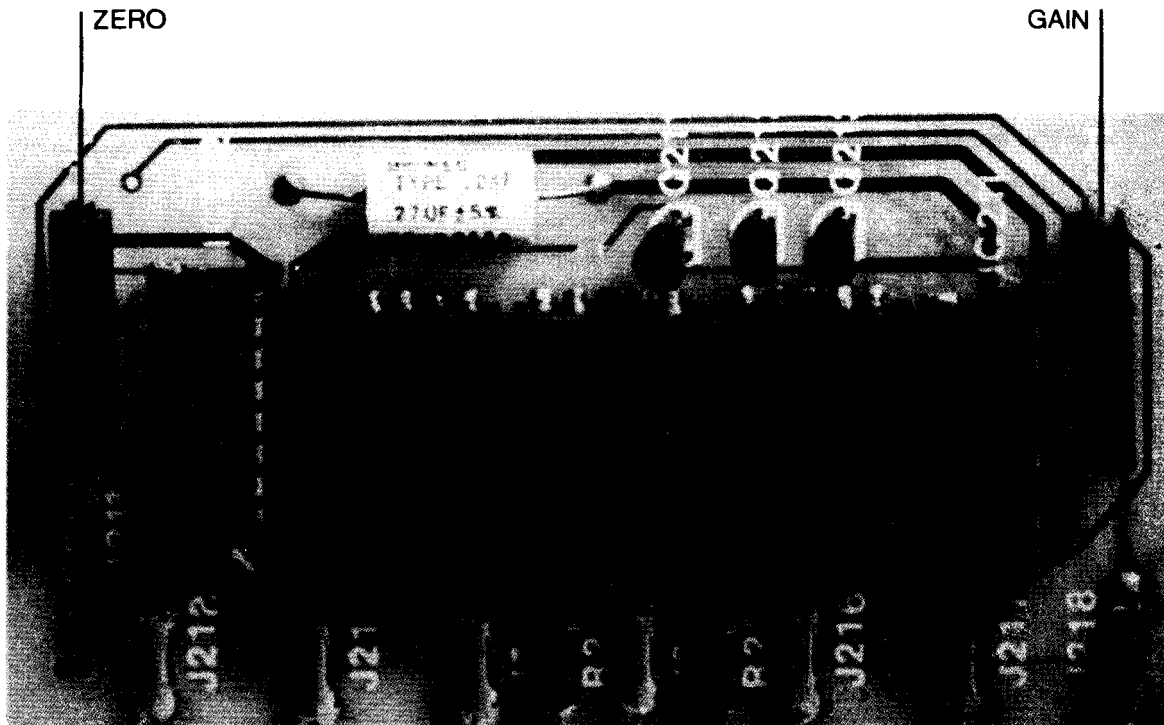
**WARNING :** PCB calibration should be completed by a qualified electronic service person and extreme caution should be exercised during temperature calibration as line voltage is present in the control compartment.

1. Immerse a certified thermometer (not supplied) into a container filled with glycol and place the container in approximately the center of the chamber.
2. Open the air exhaust cap.
3. Remove 4 screws that fasten the control panel to the front of the oven to gain access to the electrical components.
4. Replace the RTD sensor with a decade resistor box.
5. Rotate the "High Limit" thermostat knob fully clockwise.
6. Connect a voltmeter with a range of 0 to 5000 mv to the "Recorder" jacks
7. Dial 000 on the "Set Point°C" thumbwheel digital control.
8. Dial 100.00 ohms on the decade resistor box.
9. Adjust the "ZERO" trimpot on the Temperature Control PCB until the volt meter reads 0.0 mv  $\pm$ 4 mv.
10. The temperature display should read 000; if not, adjust the "ZERO" trimpot on the Temperature Readout PCB.
11. Adjust the "LOW HEAT" trimpot, on the Temperature Controller PCB, for minimum heat output. (green pilot lamp should be "off" 80% of the time.)
12. Dial 225°C on the "Set Point °C" thumbwheel digital control.
13. Dial 185.03 ohms on the decade resistor box.
14. Adjust the "HIGH HEAT" trimpot, on the Temperature Control PCB, until the heat out put is on more than 50% (green pilot lamp should be "on" more than 50% of the time).

15. The voltmeter connected to the "Recorder" jacks should read  $4500 \pm 4$  mv; if not, adjust the "Scale" trimpot on the Temperature Controller PCB.
16. The temperature display should indicate 225; if no, adjust the "GAIN" trimpot on the Temperature Readout PCB.
17. Remove the decade resistor box connections and replace the RTD sensor.
18. Continue to operate the oven at 225°C. After the oven temperature has stabilized, for 30 minutes, adjust the "HIGH HEAT" trimpot, if necessary, to read exactly 225°C on the temperature display.
19. The "Recorder" jacks output should be 4.50 volts. If not, adjust the "SCALE" trimpot on the Temperature Controller PCB.
20. The temperature display should indicate 225°C. If not, adjust the "GAIN" trimpot on the Temperature Readout PCB.
21. Reset 100°C on the thumbwheel digital control. The indicated temperature display should be  $100 \pm 1^\circ\text{C}$ .



DIGITAL DISPLAY BOARD A200



**MODELS STG 40, STG 80, STG 145, AND STM 40, ONLY.**

Loss of Heat Control: If at any time the safety thermostat assumes control of the chamber temperature, replace the thermostat.

**WARNING:** Replacement of the following components should be completed by a qualified electronic service person, and the oven should be disconnected from its electrical power source.

**"ON - OFF" Switch Replacement:**

1. Remove 4 screws that fasten the control panel to the oven to gain access to the electrical components.
2. Tag and identify the lead wires with respect to their relative positions for ease of replacement.
3. Remove the wire leads from the switch .
4. Compress the spring clips that fasten the switch to the panel and push the switch outward from the back of the panel.
5. Press the replacement switch into the panel and connect the wire leads.

**Pilot Lamp Replacement:**

1. Remove 4 screws that fasten the control panel to the oven to gain access to the electrical components.
2. Tag and identify the lead wires with respect to their relative positions for the ease of replacement.
3. Remove the wire leads from the pilot lamp .
4. The pilot lamps on the Models STM 80 & 135 are fastened to the rear of the panel, with a speed nut that must be removed before the lamp can be removed.

5. Push the pilot lamp outward from the back of the panel.
6. Press the replacement lamp into the opening and replace speed nut, if supplied. On units with dual pilot lamps, the red portion should be on the right.
7. Attach the appropriate wires to the pilot lamp.

**Dual Thermostat Assembly Replacement:**

Gravity Convection Ovens  
(Models STG 40, STG 80 & STG 145)

1. Remove 2 screws that fasten the thermostat bulbs and bulb retainer to the diffuser panel. Bend the thermostat capillaries towards the top of the chamber.
2. Remove 2 screws that fasten the diffuser panel brackets to the sidewalls. Remove the diffuser panel from the bottom chamber and carefully slide the bulbs through the holes in the diffuser panel.
3. Loosen the set screws that fasten the control knob to the shaft of the thermostat, then remove the knob.
4. Remove 4 screws that fasten the control panel to the oven to gain access to the electrical components.
5. Tag and identify the lead wires with respect to their relative positions for the ease of replacement.
6. Disconnect the wire leads from the thermostat.
7. Guide the thermostat bulbs out of the chamber and out through the bottom of the oven.
8. Replace the thermostat, reversing the above procedure.

**CAUTION:** Do Not crimp or sharply bend the capillaries as this will obstruct the flow of the hydraulic operating media causing erroneous thermostat control and shorten the life of the thermostat.

**CAUTION:** Do Not crimp or sharply bend the capillaries as this will obstruct the flow of the hydraulic operating media causing erroneous thermostat control and shorten the life of the thermostat. Also, be sure there is no contact between the capillaries and heater.

**Mechanical Convection Ovens  
(Model STM 40, Only)**

1. To gain access to the thermostat bulbs, remove 2 screws that fasten the diffuser panel brackets to the side walls then remove the diffuser panel from the bottom of the chamber.
2. Disconnect the heater assembly from the bus bars and lift it out of the chamber.
3. Loosen the set screws that fasten the control knob to the shaft of the thermostat, then remove the knob.
4. Remove 4 screws that fasten the control panel to the oven to gain access to the electrical components.
5. Tag and identify the lead wires with respect to their relative positions for the ease of replacement.
6. Disconnect the wire leads from the thermostat.
7. Remove the thermostat sensing bulbs from the retaining clips and guide the bulbs out of the chamber.
8. Replace the thermostat reversing the above procedure.

**Heater Replacement:**

1. On the gravity convection ovens (Models STG 40, STG 80, & STG 145), remove 2 screws that fasten both thermostat bulbs and the retaining clips to the bottom diffuser panel in the chamber.

**NOTE:** On the mechanical convection ovens (Models STM 40, STM 80, & STM 135) the thermostat bulbs are beneath the bottom diffuser panel and will not have to be removed.

2. Remove the bottom diffuser panel by removing its retaining screws. Work the thermostat bulbs (gravity ovens only) upright and lift the panel out of the chamber, carefully sliding the bulbs through it, while noting the hole through which the bulbs were originally placed.

**CAUTION:** Do Not crimp or sharply bend the thermostat capillaries as it will obstruct the flow of the hydraulic operating media causing erroneous thermostat control and shorten the life of the thermostat.

3. Disconnect the heater from the bus bars. (Do not allow the bus bars to slip down through the porcelain insulators or it will be necessary to remove the control panel to push them back.) Lift the heater from the chamber. Install the new heater and reconnect the bus bars.



4. Work the two thermostat bulbs (gravity ovens only) through the hole in the bottom diffuser panel. Replace the panel and secure it.
5. Carefully work the bulbs back into place and secure them with the retaining clips.

**Motor Replacement (Models STM 40, STM 80, & STM 135):**

1. Remove 2 screws that fasten the diffuser panel to the side walls then remove the panel.
2. Disconnect the heater from the bus bars. (Do not allow the bus bars to slip down through the porcelain insulators or it will be necessary to remove the control panel to push them back.) Lift the heater from the chamber.
3. Remove the blower scroll assembly by removing screws that fasten it in place.
4. Loosen the set screw that fasten the blower wheel to the motor shaft then remove the blower.
5. Lay the cabinet on its back. Be sure the line cord, if supplied, can hang free and is not pinched against the back of the cabinet and that the doors are closed.
6. Remove perforated panel on the bottom of the cabinet. Disconnect wire leads of the motor.
7. Remove the motor mounting screws and remove the motor.
8. Install the new motor so that its shaft engages the blower wheel. Make sure that the set screw that locks the blower wheel to the flat on the motor shaft is fastened securely.

**NOTE:** Be sure that when the blower wheel is secured to the motor shaft, the wheel is centered vertically between the panels. This will assure its "free spin". If not centered, the wheel may touch the panels and not rotate freely.

Proceed in reassembling the unit by performing the reverse of the above steps.

**"High Limit Thermostat Replacement:**  
(Models STM 80 & STM 135)

1. Loosen the set screw that fasten the control knob to the thermostat shift and then remove the knob.
2. Remove 2 flat head screws, located behind the control knob (removed).
3. Remove 4 screws that fasten the control panel to the front of the oven to gain access to the "High Limit" thermostat.
4. To gain access to the thermostat bulb and heater, remove the diffuser panel which is fastened with 2 screws to the side walls.
5. Disconnect the heater assembly from the bus bars and lift it out of the chamber.
6. Remove the screws that fasten the blower scroll to the bottom of the chamber and remove the scroll.
7. Disconnect the electrical leads from the thermostat and remove the thermostat bulb from the retaining clips. (The clips may have to be slightly twisted.) Guide the thermostat out of the bottom of the oven.
8. Install the new thermostat, reversing the above procedure.

**CAUTION:** Do Not crimp or sharply bend the capillary as this will obstruct the flow of the hydraulic operating media causing erroneous thermostat control and shorten the life of the thermostat. Also, be sure there is no contact between the capillaries and heater.

bicarbonate of soda (1 tbsp/gallon of water) is recommended.

**WARNING:** Disconnect the oven from its electrical power source.

## Maintenance (All Models):

### Cleaning Exterior and Interior:

A mild solution of soap and water or

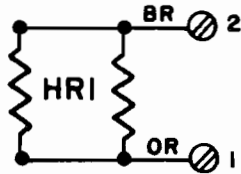
### Motor Lubrication:

(On the mechanical convection ovens) A ball bearing fan-cooled permanently lubricated motor is used. Lubrication should not be necessary for the life of the motor.

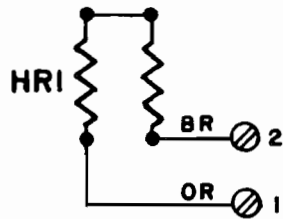
## PRECISION INSTRUCTION MANUAL

ITEM	SYMBOL	MOD. NO. CAT. NO. DESCRIPTION	PART LIST							
			STG 40 31477   31555	STG 80 31478   31556 PART NUMBER	STG 145 31542   31557	STM 40 31540   31541	STM 80 31551   31552	STM 135 31553   31554		
1	A100	PCB, TEMPERATURE CONTROL	N/A	N/A	N/A	N/A	00803601   00803602	00803601   00803602		
2	A200	PCB, TEMPERATURE READOUT	N/A	N/A	N/A	N/A	00803901	00803901		
3	A10	TRIAC ASSEMBLY	N/A	N/A	N/A	N/A	00870301	00870301		
4	DS1	LAMP, PILOT (GREEN)	N/A	N/A	N/A	N/A	234190   234189	234190   234189		
5		BARRIER (FISH PAPER)	N/A	N/A	N/A	N/A	00843701	00843701		
6	DS2	LAMP, PILOT (RED)	N/A	N/A	N/A	N/A	234174   234175	234174   234175		
7	DS3	LAMP, DUAL PILOT (WHITE & RED)	234147   247148	234147   247148	234147   247148	247147   247148	N/A	N/A		
8	RTD1	SENSOR, TEMPERATURE	N/A	N/A	N/A	N/A	00870601	00870601		
9	HR1	HEATER	247274	247275	247277	247279	247276	247278		
10	S1	SWITCH, LINE	240304	240304	240304	240304	240304	240304		
11	S2	THERMOSTAT, SAFETY	N/A	N/A	N/A	N/A	239091	239091		
12		KNOB, SAFETY THERMOSTAT (0-9)	N/A	N/A	N/A	N/A	220159	220159		
13	S3	SWITCH, THUMBWHEEL	N/A	N/A	N/A	N/A	00878701	00878701		
14		BEZEL AND FILTER ASSEMBLY	N/A	N/A	N/A	N/A	539817	539817		
15	S4	THERMOSTAT, DUAL	239097	239097	239097	239097	N/A	N/A		
16		KNOB, DUAL THERMOSTAT	220097	220097	220097	220097	N/A	N/A		
17	B1	MOTOR, BLOWER	N/A	N/A	N/A	538997   538998	538997   538998	538997   538998		
18		BLOWER, WHEEL	N/A	N/A	N/A	257024	257024	257024		
19	J2	JACK, RECORDER (BLACK)	N/A	N/A	N/A	N/A	236165	236165		
20	J3	JACK, RECORDER (RED)	N/A	N/A	N/A	N/A	236164	236164		
21		INSULATOR, POERCELAIN (BUS BAR)	250087	250087	250162	250161	250161	250161		
22		SHELF (2 SUPPLIED)	535093	535096	535098	535092	535095	535097		
23		SUPPORT, SHELF (4 SUPPLIED)	536796	536796	536798	536796	536796	536798		
24		LEVELLER SCREW (4 SUPPLIED)	241048	241048	241048	241048	241048	241048		
25		CAP, LEVELLER (4 SUPPLIED)	241047	241047	241047	241047	241047	241047		
26		CAP SHUTTER VENT	535187	535187	535187	535187	535187	535187		
27		THERMOMETER	307055	307055	307055	307055	N/A	N/A		
28		CATCH, MAGNETIC (MID. ON CABINET)	270052	270052	270052	270052	270052	270052		
29		LEAF, TOP HINGE (MID. ON CABINET)	535085	535085	535085	535085	535085	535085		
30		LEAF, BOTTOM HINGE (MID. ON CABINET)	535088	535088	535088	535088	535088	535088		
31		DOOR ASSEMBLY	00441801	00441802	00441803	00441801	00441805	00441806		
32		HINGE PIN (2 REQ.)	535086	535086	535086	535086	535086	835086		
33		SPRING (2 REQ.)	535180	535180	535180	535180	535180	535180		
34		STRIKE PLATE	535450	535450	535450	535450	535450	535450		
35		GASKET, SILICONE	167319 (5 FT)	167319 (6-3/4 FT)	167319 (5 FT)	167319 (6-3/4 FT)	167319 (7-3/4)			
36		HANDLE	00450701	00450702	00450702	00450701	00450702	00450702		
37		CORD AND PLUG	333015   353017	353015   353017	N/A	353015   353017	353015   353017	N/A		

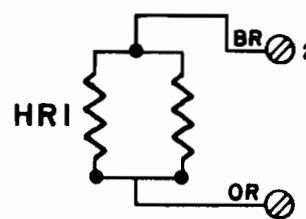
MODELS  
STG 40 & 80  
120V.



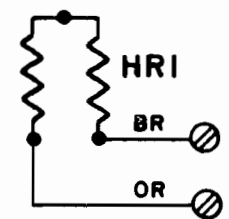
MODELS  
STG 40 & 80  
230V.



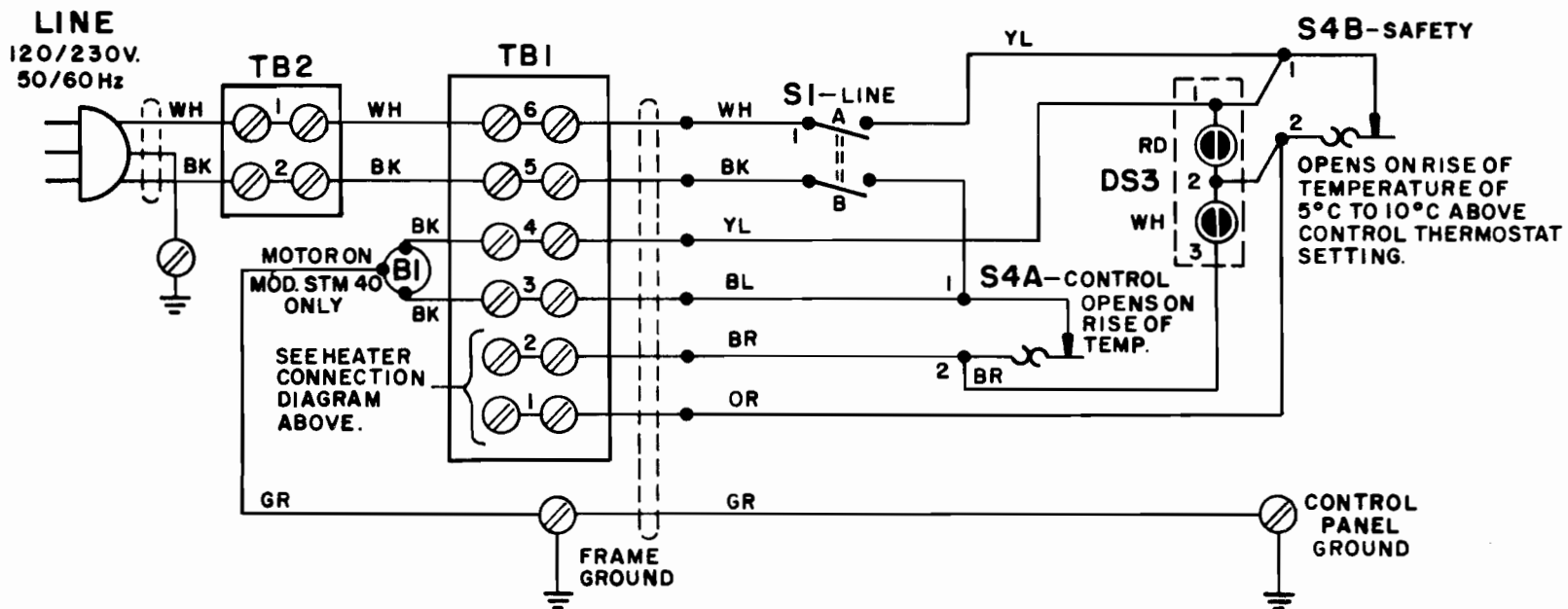
MODEL  
STM 40  
120V.



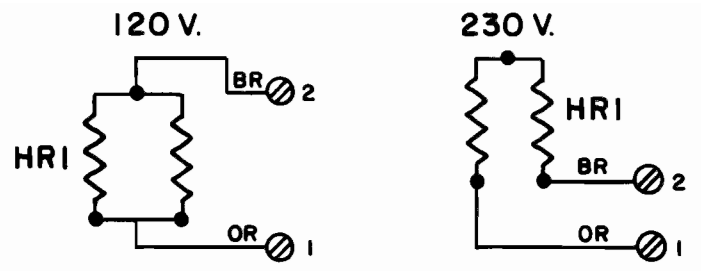
MODEL  
STM 40  
230V.



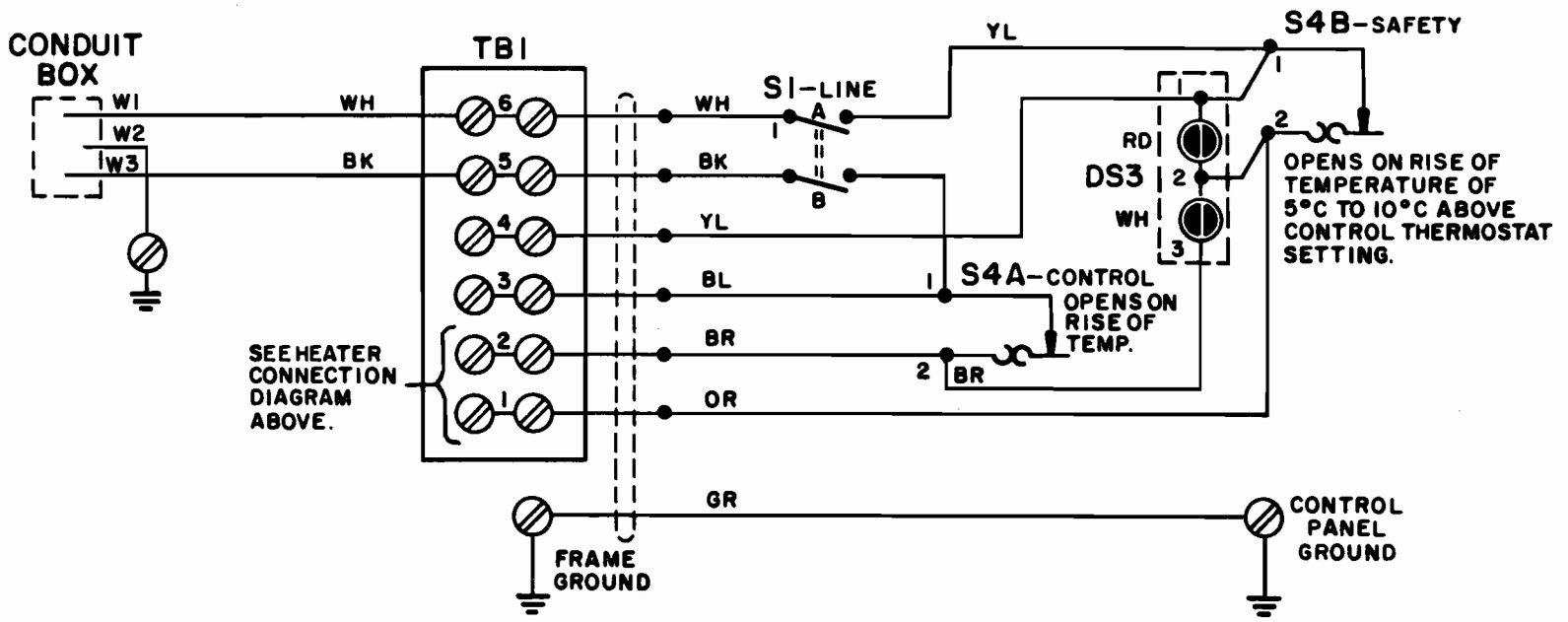
**HEATER CONNECTIONS**



**WIRING DIAGRAM FOR  
MODELS STG 40, STG 80  
AND STM 40**

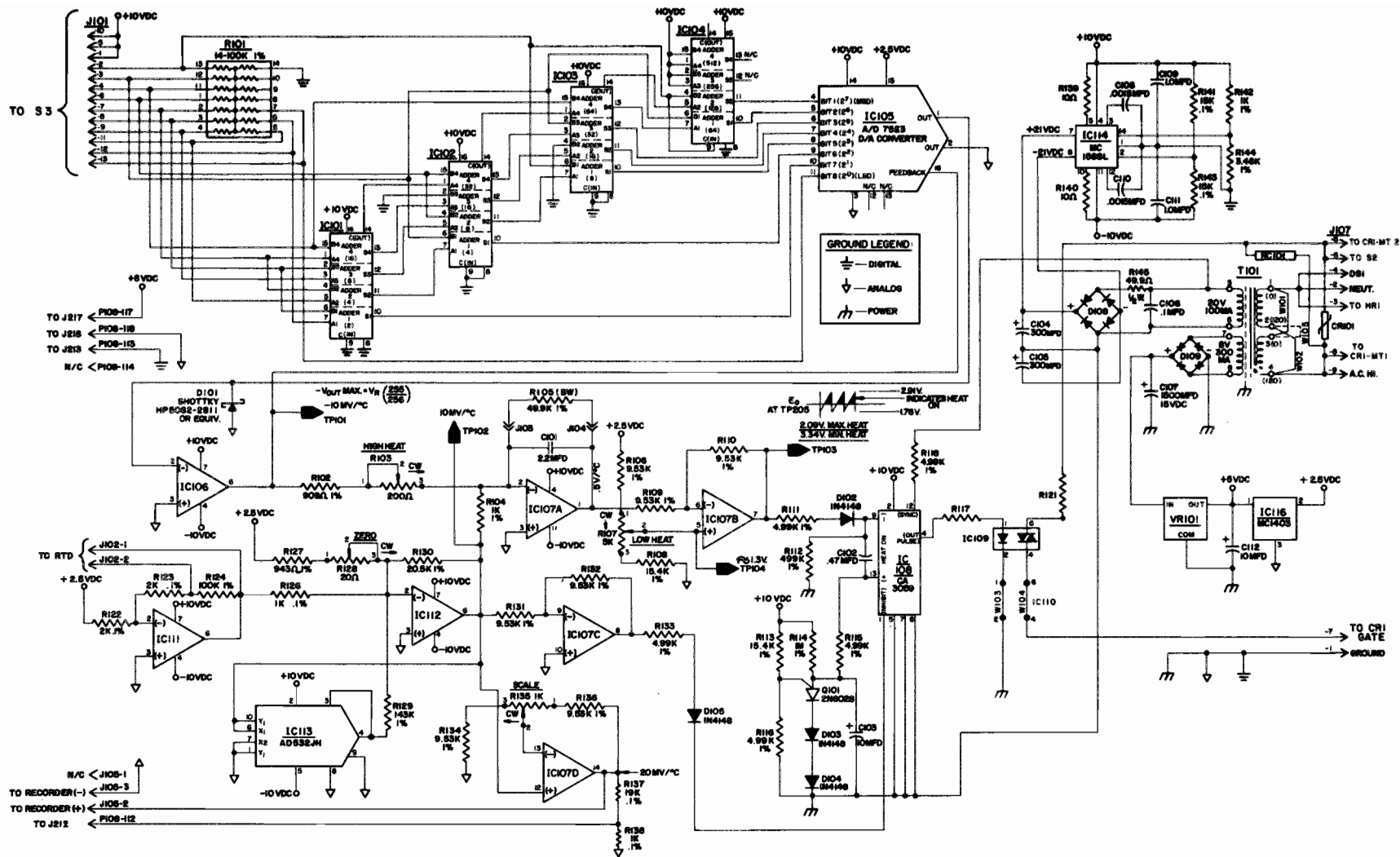


**HEATER CONNECTIONS**

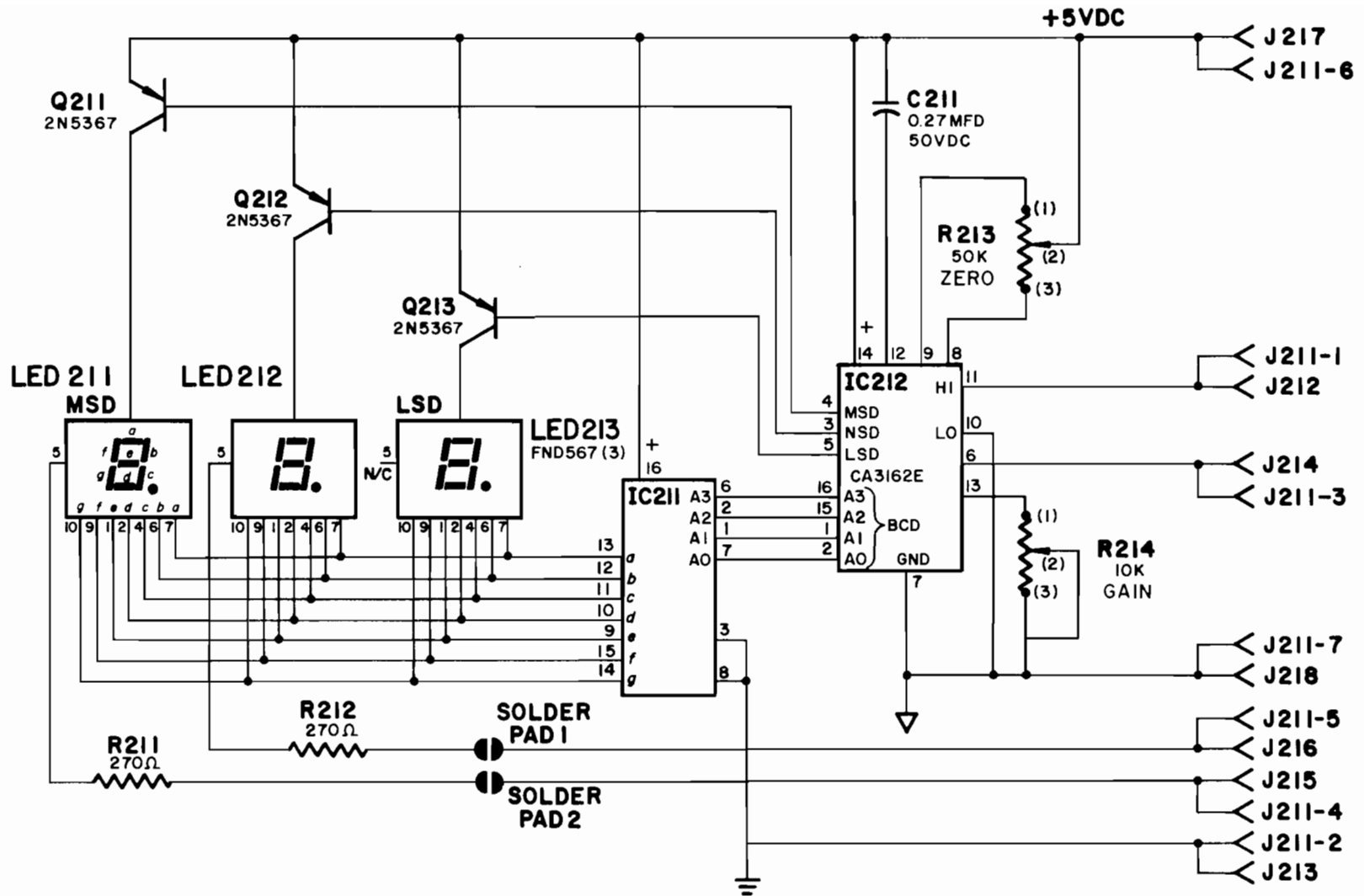


**WIRING DIAGRAM FOR MODEL STG 145**





TEMPERATURE CONTROLLER PCB (A100)



NO. OF DECIMAL PLACES	BRIDGE SOLDER PAD 1	BRIDGE SOLDER PAD 2
NONE	NO	NO
ONE	YES	NO
TWO	NO	YES

SYMBOL	DESCRIPTION	CAT. NO.
IC211	I. C. DECODER & DRIVER	296184
IC212	I. C. A/D CONVERTER	296185

TEMPERATURE READOUT PCB (A200)



### **Exclusive Precision Warranty**

PRECISION SCIENTIFIC warrants its products against defects in material or in workmanship, when used under appropriate conditions and in accordance with appropriate operating instructions for a period of no less than one (1) year from the date of delivery of the products.

Sole obligation of PRECISION SCIENTIFIC shall be to repair or replace at our option, FOB factory or locally, without charge, any part(s) that prove defective within the warranty period, provided the customer notifies PRECISION SCIENTIFIC promptly and in writing of any such defect. Compensation for labor by other than PRECISION SCIENTIFIC employees will not be our obligation. Part(s) replacement does not constitute an extension of the original warranty period.

**PRECISION SCIENTIFIC MAKES NO WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, AS TO THE DESIGN, SALE, INSTALLATION, OR USE OF ITS PRODUCTS, AND SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS.**

PRECISION SCIENTIFIC will not assume responsibility for unauthorized repairs or failure as a result of unauthorized product modifications, or for repairs, replacements, or modifications negligently or otherwise improperly made or performed by persons other than PRECISION SCIENTIFIC employees or authorized representatives.

While our personnel are available to advise customers concerning general applications of all manufactured products, oral representations are not warranties with respect to particular applications and should not be relied upon if inconsistent with product specifications or the terms stated herein.

In any event, the terms and conditions contained in PRECISION SCIENTIFIC formal sales contracts shall be controlling; and any changes must be in writing and signed by an authorized executive of PRECISION SCIENTIFIC.

All defective components will be replaced without charge one (1) year from the date of delivery. There will be no charge for labor if the apparatus is returned to the factory prepaid.

Conditions and qualifications of the warranty statement shall prevail at all times.



**APPENDIX A**  
**REFERENCES**

**A-1. Scope.** This appendix contains all forms, pamphlets and technical manuals referenced in both the Air mobile and Semitrailer mounted Laboratories.

**A-2. Forms.**

Recommended Changes to Publications .....	DA Form 2028 DA Form 2028-2
Quality Deficiency Report .....	SF 368
Equipment Inspection and Maintenance Work Sheet .....	DA Form 2404
Hand Receipts .....	DA Form 2062

**A-3. Field Manuals.**

Petroleum Testing Facilities:	
Laboratories and Kits .....	FM 10-72
Inspecting and Testing Petroleum Products .....	FM 10-70
ASTM Test Method Supplement to .....	FM 10-92C1/C2

**A-4. Technical Manuals.**

Atlas-Copco Compressor .....	TM 10-4310-392-13&P
Alcor Jet Fuel Thermal Oxidation Tester Operating and Maintenance Manual .....	TM 10-6635-210-13&P
Bacharach Gas Alarm and Calibration Data .....	TM 10-6665-297-13&P
Brother Portable Typewriter .....	TM 10-7430-218-13&P
Chemtrix Field Ph Meter .....	TM 10-6630-237-13&P
Elkay Manufacturing 30 GPH Cooler .....	TM 10-4130-240-13&P
Emcee MicroSeparometer .....	TM 10-6640-222-13&P
Foxboro Pressure Recording Gauge .....	TM 10-6685-365-13&P
Gammon Aqua Glo Water Detector .....	TM 10-6640-221-13&P
Gammon Mini Monitor Fuel Sampling Kit .....	TM 10-6630-230-13&P
Jelrus Burn-Out Furnace .....	TM 10-6640-231-13&P
Koehler Cleveland Open Tester .....	TM 10-6630-236-13&P
Koehler Cloud and Pow Point Chamber .....	TM 10-6630-238-13&P
Koehler Copper Strip Corrosion Bomb Bath .....	TM 10-6640-220-13&P
Koeller Distillation Apparatus .....	TM 10-6630-233-13&P
Koeller Dropping Point Apparatus .....	TM 10-6635-211-13&P
Koehler Electric Pensky-Matiins Tester .....	TM 10-6630-231-13&P
Koehler Foaming Characteristics Determination Apparatus .....	TM 10-6640-228-13&P
Koehler Kinematic Viscosity Bath .....	TM 10-6630-239-13&P
Koehler Tag Closed Cup Flash Tester .....	TM 10-6630-235-13&P
LabLine Explosion Proof Refrigerator .....	TM 10-6640-219-13&P
Lily Freezer .....	TM 10-6640-234-13&P
Millipore Old 39 Filter Holder .....	TM 10-6640-225-13&P
Millipore Vacuum Pump .....	TM 10-6640-217-13&P
Ohaus Harvard Trip Balance .....	TM 10-6670-278-13&P
Precision Gas-Oil Distillation Test Equipment .....	TM 10-6630-219-13&P
Precision General Purpose Water Bath .....	TM 10-6640-229-13&P

**TM 10-6640-218-13&P**

Precision High Temperature Bronze Block Gum Bath ..... TM 10-6630-234-13&P  
Precision General Purpose Ovens ..... TM 10-6640-218-13&P  
Precision Heater Instruction Manual and Parts List ..... TM 10-6640-223-13&P  
Precision Oxidation Stability Bath ..... TM 10-6640-232-13&P  
Precision Pensky–Martens Flash Testers ..... TM 10-6630-231-13&P  
Precision Reid Vapor Pressure Bath ..... TM 10-6640-226-13&P  
Precision Slo–Speed Stirrer ..... TM 10-6640-224-13&P  
Precision Universal Centrifuge ..... TM 10-6640-230-13&P  
precision universal Penetrometer ..... TM 10-6640-228 -13&P  
Sargent–Welch Vacuum Pump ..... TM 10-4310-391-13&P  
Sartorius Analytical Balance ..... TM 10-6670-277-13&P  
Scotsman Cuber ..... TM 10-6640-227-13&P  
Soltec VOM–Multimeter ..... TM 10-6625-3127-13&P  
Teel Self–Priming Centrifugal Pump ..... TM 10-6640-217-13&P  
Teel Submersible Pump ..... TM 10-4320–320–13&P  
Texas instrument TI–5030II Calculator ..... TM 10-7420-210-13&P

**A–5. Pamphlets.**

The Army Maintenance Management System (TAMMS) ..... DA Pam 738–750

**A-6. Miscellaneous Publications.**

The Army integrated Publishing and Printing Program ..... AR25-30  
Laboratory, Airmobile, Aviation Fuel ..... MIL-L-52733A(ME)  
Apparatus, Instruments, Chemicals, Furniture, and Supplies for Industrial,  
Clinical, College and Government Laboratories ..... Fisher Scientific Laboratories Catalog  
Petroleum–Petrochemical Testing Equipment ..... Precision Scientific Catalog

## APPENDIX B

### MAINTENANCE ALLOCATION CHART

#### Section I. INTRODUCTION

##### B-1. General.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

**B-2. Maintenance Functions.** Maintenance functions will be limited to and defined as follows:

a. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. **Service.** Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.

f. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of knob accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. **Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. **Replace.** To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

**i. Repair.** The application of maintenance services,<sup>1</sup>including fault location/troubleshooting,<sup>2</sup> removal/installation, and disassembly/assembly procedures<sup>3</sup>and maintenance actions<sup>4</sup>to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

**j. Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e, DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like–new condition.

**k. Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like–new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

### **B-3. Explanation Of Columns In The MAC, Section II.**

**a. Column 1. Group Number.** Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be “00.”

**b. Column 2. Component/Assembly.** Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

**c. Column 3. Maintenance Function.** Column 3 lists the functions to be performed on the item listed in column 2. (For a detailed explanation of these functions, see paragraph B–2.)

**d. Column 4. Maintenance Category.** Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

- 
- <sup>1</sup> *Services – inspect, test, service, adjust, align, calibrate, and/or replace.*
  - <sup>2</sup> *Fault locate/troubleshoot – the process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).*
  - <sup>3</sup> *Disassemble/assemble – encompasses the step–by–step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.*
  - <sup>4</sup> *Actions – welding, grinding, riveting, straightening, facing, remachining, and/or resurfacing.*

- C ..... Operator/Crew
- O ..... Unit Maintenance
- F ..... Direct Support Maintenance
- H ..... General Support Maintenance
- D ..... Depot Maintenance

e. **Column 5. Tools and Equipment.** Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. **Column 6. Remarks.** This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in section IV.

**B-4. Explanation Of Columns In Tool And Test Equipment Requirements, Section III.**

a. **Column 1. Reference Code.** The tool and test equipment reference code correlates with a code used in the MAC, section II, column 5.

b. **Column 2. Maintenance Category.** The lowest category of maintenance authorized to use the tool or test equipment.

c. **Column 3. Nomenclature.** Name or identification of the tool or test equipment.

d. **Column 4. National Stock Number.** The National stock number of the tool or test equipment.

e. **Column 5. Tool Number.** The manufacturer's part number.

**B-5. Explanation Of Columns In Remarks, Section IV.**

a. **Column 1. Reference Code.** The code recorded in column 6, Section II.

b. **Column 2. Remarks.** This column lists information pertinent to the maintenance function being performed as indicated in the MAC, section II.

**Section II. MAINTENANCE ALLOCATION CHART**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT	DS	GS	DEPOT			
			C	O	F	H	D		
01	OVEN, GENERAL PURPOSE	INSPECT TEST REPLACE REPAIR	0.1 0.3	0.3	1.0			1 1	

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS  
FOR

MAINTENANCE ALLOCATION CHART

(1) TOOL/TEST EQUIP. REF CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NSN	(5) TOOL NUMBER
1	O,F	TOOL KIT, GENERAL AUTOMOTIVE	5180-00-177-7033	(50980) SC 5180-90- CL-N26

SECTION IV.REMARKS

NOT APPLICABLE



## APPENDIX C

## COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

## Section I. INTRODUCTION

**C-1. Scope.**

This appendix lists components of end item and basic issue items for the General Purpose Oven to help you inventory items required for safe and efficient operation.

**C-2. General.**

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

**a. Section II. Components of End Item.** This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

**b. Section III. Basic Issue Items.** These are the minimum essential items required to place the General Purpose Oven in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the shelter during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

**C-3. Explanation of Columns.**

The following provides an explanation of columns found in the tabular listings:

**a. Column (1) - Illustration Number (Illus Number).** This column indicates the number of the illustration in which the item is shown.

**b. Column (2) - National Stock Number.** Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

**c. Column (3) - Description.** Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGEC (in parentheses) followed by the part number.

**d. Column (4) - Unit of Measure (U/M).** Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

**e. Column (5) - Quantity required (QTY RQR).** Indicates the quantity of the item authorized to be used with/on the equipment.

(1)	SECTION II. COMPONENTS OF END ITEM	(3)	(4)	(5)
ILLUS	NATIONAL NUMBER	DESCRIPTION CAGEC AND PART NUMBER	USABLE ON CODE U/M	QTY.
	6640-00-299-8689	DISH, CULTURE, PETRI: TOP AND BOTTOM COMPLETE: U/W BACTERIAL FILTERING DISK; DISPOSABLE; 100'S; FOR ASTM 2276; MIL-D-36425	PG	1

SECTION III. BASIC ISSUE ITEMS  
NOT APPLICABLE

**APPENDIX D**  
**ADDITIONAL AUTHORIZATION LIST**

**NOT APPLICABLE**



**APPENDIX E**

**EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST**

**Section I. INTRODUCTION**

**E-1. Scope.** This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (except medical, class V, repair parts, and heraldic items).

**E-2. Explanation of Columns.**

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., Use cleaning compound, item 5, appendix C).

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

- C - Operator/Crew
- O - Unit Maintenance
- F - Direct Support Maintenance
- H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

**Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST**

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
	C	6640-00-985-2099	DISK, FILTERING, MICROPOROUS: AEROSOL AND HYDROSOL; 25 MM DIA; 100'S; FOR ASTM TEST D-2276 (08071) HAWP-025-00	HD



**By Order of the Secretary of the Army:**

**CARL E. VUONO**  
*General, United States Army*  
Chief of Staff

**Official:**

**THOMAS F. SIKORA**  
*Brigadier General, United States Army*  
The Adjutant General

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THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

PFC JOHN DOE  
COA, 3d ENGINEER BN  
FT. LEANARDWOOD, MO. 63108

DATE SENT

PUBLICATION NUMBER

TM 10-6640-218-13&P

PUBLICATION DATE

28 Sep 1990

PUBLICATION TITLE Precision General Purpose Ovens

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a skin - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2 910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

JOHN DOE, PFC (268) 317-7111

SIGN HERE

JOHN DOE

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FILL IN YOUR  
UNIT'S ADDRESS



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ST. LOUIS, MO 63120-1798

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TEAR ALONG PERFORATED LINE







# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

## Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
----	------------------------	----------------------------	---------------------	----



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