Fisher Scientific

Isotemp® Muffle Furnace 550 Series

Instruction Manual

Model 14
Catalog No. 10-550-14 & 14A

Model 58
Catalog No. 10-550-58

Model 126
Catalog No. 10-550-126

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Safety Information

Alert Signals

Warning
Warnings alert you to a possibility of personal injury.

Caution
Cautions alert you to a possibility of damage to the equipment.

Note
Notes alert you to pertinent facts and conditions.

Hot Surface
Hot surfaces alert you to a possibility of personal injury if you come in contact with a surface during use or for a period of time after use.

Your Fisher Isotemp® Programmable Muffle Furnace has been designed with function, reliability, and safety in mind. It is your responsibility to install it in conformance with local electrical codes. It is most important that the user follow installation instructions exactly as written. Failure to do so is likely to lead to improper operation, erroneous calibrations and possible damage to the equipment. Do not attempt operation without this information.

When operating the furnace, always observe the following Safety Precautions:

- Wear insulating gloves.
- Use tongs.
- Use safety goggles.
- Never stand in front of an open furnace.
- Use the supplied hearth plate on the chamber bottom

Introduction

Fisher Isotemp 550 Series Muffle Furnaces are available in three sizes: small (Model 14), medium (Model 58) and large (Model 126). All models provide PID microprocessor temperature control at operating temperatures from 50 to 1125°C (90 to 2057°F).

Furnace chambers are molded from alumina silicate ceramic fibers. Use of this material provides low thermal mass for fast heat-up and cool-down, as well as an unusually low exterior furnace temperature for safe operation. The furnace is heated by electric resistance elements embedded in easily removable side and base panels. The heating elements are designed to ensure extended service life, even in atmospheres characteristic of high-sulfur coal and coke samples.

Temperature readout can be easily viewed on the 7-segment display. A heater LED located to the left of the temperature display indicates when the heater is being energized.

For operation with chamber atmospheres other than air (N2, C02, etc), external gas supplies connect easily through a provided 3/8-inch port. An Injection Port Kit (10-550P) connected to the exhaust port allows convenient venting of the chamber.

Isotemp furnaces incorporate a variety of safety features. When the furnace door is opened, power is automatically cut to the chamber heating elements. The heater power is also cut out when the chamber temperature exceeds the set temperature by 100°C or more. The alarm condition is indicated by a flashing “HIGH” on the display. A ventilated base design prevents damage to the bench or countertop.

A three button control provides simple operation. Arrow keys service to increase or decrease the furnace temperature set point. A front panel Mode key allows the user to toggle the display between set point temperature or actual furnace temperature.

Installation

Caution
Do not install closer than 6 inches to a wall of combustible material.

Selecting a Location

Choose a location for the furnace, which will provide an area of approximately four square feet (2 ft x 2 ft). The bench or table selected must be capable of supporting at least 60lbs for the Model 14, 90lbs for the Model 58 or 110lbs for the Model 126. Appropriate electrical power must be available. Locate the furnace within three feet of the power outlet so that no extension cord is required.

It is recommended that the site have facilities for venting an accessory Exhaust Tube Assembly (Cat. No.10-490-10) which is available for use with the furnace. Alternatively, the furnace may be located in a fume hood if samples are expected to produce toxic volatiles.

Caution
Remove packing materials inside chamber before operating.

Unpacking

Fisher Isotemp Muffle Furnaces are shipped in a single carton. After unpacking, locate each item shown in the list below. Report any missing items, by name and part number, to your Fisher branch or representative. In the event of shipping damage, retain the carton and packing material and file a claim with the final carrier.

Item

Furnace Assembly

Model 14	120 V, 50/60 Hz
Model 14A	208/240V, 50/60 Hz
Model 58	208/240 V, 50/60 Hz
Model 126	208/240 V, 50/60 Hz

Hearth Plate

Shelf (Model 126 Only)

Instruction Manual

Warranty Card

Warning
Isotemp Muffle Furnace chambers contain alumina silicate ceramic fibers. With continued use at temperatures above 1000°C (1832 °F), these materials slowly convert to crystalline silica (cristobalite). Long-term exposure to airborne cristobalite may result in severe respiratory diseases in humans. Tests with laboratory animals suggest that cristobalite is a possible carcinogen. Short-term effects may include irritation to skin, eyes and the respiratory tract. Please consult the Material Safety Data Sheet (MSDS) provided by Fisher Scientific for further information.

Warning
This unit is not explosion proof. Do not use in the presence of flammable or combustible materials; fire or explosion may result. Unit contains components that may ignite such materials.

Preparing the Furnace

To prepare the muffle furnace for operation, perform the following procedures:

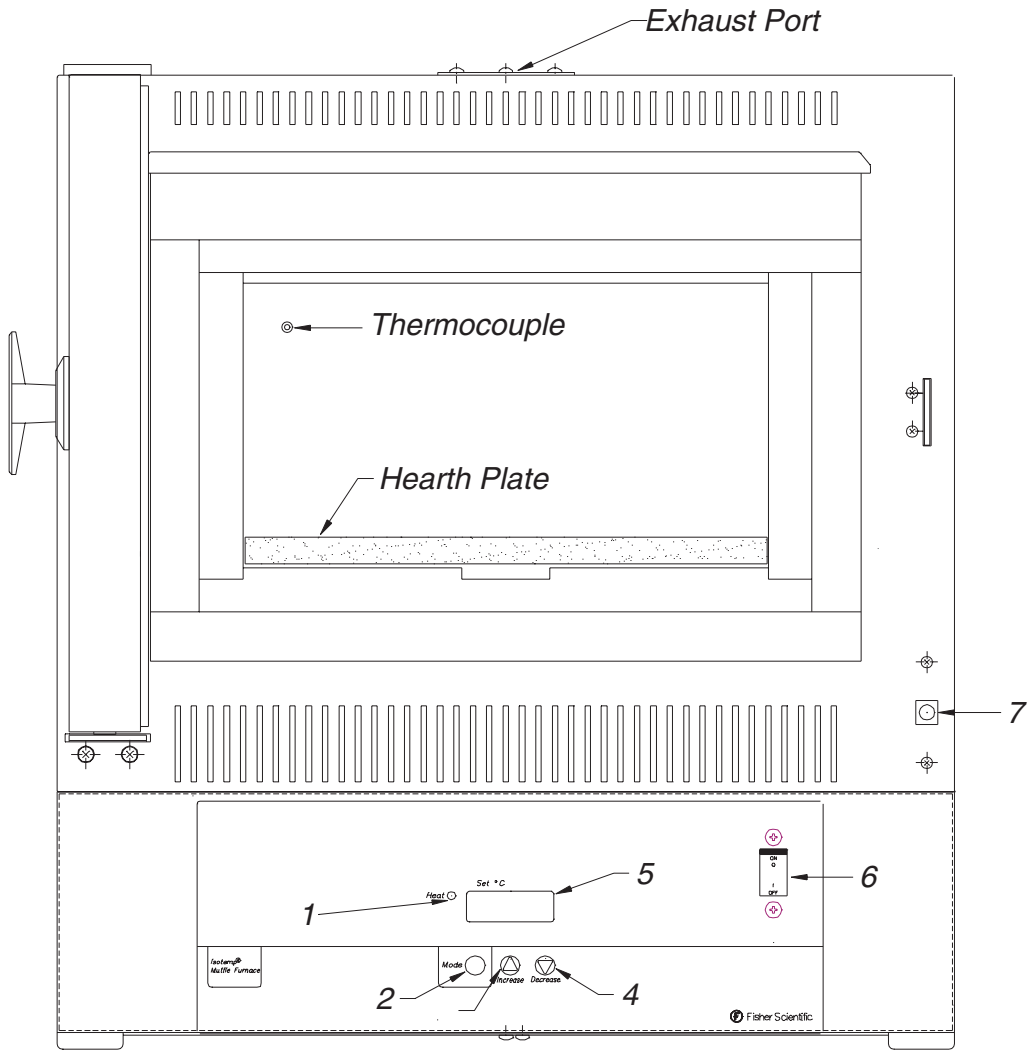
1. **Make certain all packing material is removed from furnace chamber.**

2. Place hearth plate on the bottom of the chamber. Orient hearth plate such that smooth surface faces upward. See Fig. 1.

3. *With the Model 126*, the supplied shelf may be used. If desired, install shelf by sliding it onto top of ledge protruding from each side of the inner chamber walls.

4. *If installing the accessory Exhaust Tube Assembly,* first locate exhaust port at top of furnace (see Fig 1). Use three screws to secure the port flange to the exhaust port. Attach tubing to port flange using a hose clamp (provided). Finally, route free end of tube to fume hood or other outside vent. If desired, exhaust tube may be cut to length using a hacksaw.

Figure 1 – Furnace Layout



1 Heater Indicator LED
2 Mode Key
3 Increase Key
4 Decrease Key
5 Temperature Display Window
6 ON/OFF Power Switch
7 Door Switch

See the following pages for keypad/display descriptions.

Operation

Power on Reset

When power is initially turned on to the furnace, the display will show “InIt” followed by the current furnace temperature reading. The control display window shows furncace temperature in °C.

Entering a Set Temperature

To enter a temperature setpoint, perform the following steps:

Note
If no keypad activity occurs within 3 seconds, the display will return to the temperature display mode.

1. With the power switch in the ON position, press the Mode keypad. The display shows the latest temperature setpoint.

2. In order to change the temperature setpoint, press the UP arrow key to increase or the DOWN arrow key to decrease. Once either keypad is pressed the decimal point will illuminate to indicate a change in setpoint. Hold the UP/DOWN keypad in until the desired setpoint is reached.

3. Press the MODE keypad again or don’t press any keypad for 3 seconds and the setpoint will update with the setpoint indicated on the display.

Once the desired setpoint is entered, the heater indicator LED will light and the chamber will begin to heat towards the setpoint.

Setting the Display Offset

Isotemp Muffle Furnaces permit the user to calibrate the temperature display and control point to a reference standard set up to read the interior furnace temperature at any given point. With a display offset entered, the temperature shown on the display will be actual furnace temperature *plus* or *minus* the display offset selected.
To enter a display offset, carry out the following steps:

1. Place power switch in the OFF position.

2. While pressing the MODE keypad, place the power switch in the ON position. The display now shows the current offset value. The display offset values are limited to a range of ±30°C.

3. Press and hold the UP arrow keypad to increase or the Down arrow keypad to decrease the offset value.

4. Press the MODE keypad again to enter the new offset value or wait 3 seconds and the new value will automatically be entered.

Note
If no keypad activity occurs within 3 seconds, the display will return to the temperature display mode.

When finished, the temperature display will be updated based on the offset value entered. For example:

Example Offset

A desired setpoint of 450°C. is entered and the furnace is allowed 1 hour to stabilize to the setpoint. A reference temperature is then measured inside the chamber to be 455°C. In order to match the temperature display to the reference thermometer, a display offset of 5 is entered. The temperature display is then increased by 5°C and the display is in agreement with the reference standard. The control will then cut the heater ON time down so that the chamber cools by 5°C, thus matching the desired setpoint.

Open Thermocouple

In the event the thermocouple becomes detached or broken, the display will indicate so by showing "**otc**" (open thermocouple). When this condition is encountered, the heaters are held off. Repair or replace the thermocouple connection as needed to clear the display.

Over Temperature Indicator

If the temperature in the chamber exceeds the setpoint by 100 C, the display will warn the user by flashing "**HIGH**" along with the current chamber temperature. Also, the safety relay will cut the heater circuit out and de-energize the heater.

Note
This condition can also be created by decreasing the setpoint 100 C lower than the current chamber temperature.

Allow the unit to cool and the "**HIGH**" temperature alarm will turn off when it falls to within 25°C of the setpoint. The controller will then resume normal heater control.

Service

Caution
Only qualified personnel should conduct service to the furnace.

WARNING
Always disconnect power cord from the power supply before servicing instrument.

Note
Allow chamber to cool to ambient temperature before attempting repair.

Caution
Heater panel material is fragile. Exercise care when inserting replacement panels into the furnace chamber. Likewise, bend or flex the heater leads gently when necessary.

All Fisher Isotemp 550 Series Muffle Furnaces use wall heaters. The Model 550-58 and 550-126 also incorporates a floor heater to maintain uniform heating. The following sections describe procedures for replacing a heater or the control thermocouple.

Replacing a Heater

To replace a defective heater, proceed as follows:

1. Disconnect power cord from the electrical out let.
2. Open chamber door and allow door to remain open throughout heater replacement.
3. Remove the screws that secure the perforated metal back panel of the furnace main chassis. Remove the panel and set it aside.
4. Loosen two heater terminal screws located on the terminal barrier strip. Straighten the lead screws.
5. Carefully withdraw the defective heater from the chamber. Ceramic wool insulated surrounding heater wires will fall into the furnace chamber. Remove it and set it aside for later use.
6. Carefully install the replacement heater be reserving the procedure in step 5 above.
7. Carefully re-attach the heater terminals by reversing step 4. Then refill the holes around heater leads with ceramic wool preserved from step 5.
8. Re-install perforated metal back panel of the furnace.
9. When the above steps are complete, return the power cord to the electrical outlet.

Replacing the Thermocouple

To replace a defective thermocouple, perform the following steps:

1. Perform steps 1 through 3 in Replacing a Heater.
2. Gently remove the thermocouple from inside the chamber by pulling it though the back wall of the furnace.
3. Gently lie the furnace on its side so as to expose the bottom perforated screen.
4. Remove the screen and locate the thermocouple connection on the back of the control board.
5. Using a small flat blake screwdriver, unscrew the terminals holding the thermocouple wire to the board.
6. Remove the thermocouple from the unit.
7. Install the replacement thermocouple by reversing the above procedure.

Note

Verify the red thermocouple wire is connected to the negative (-) control board terminal and the orange is connected to the positive (+) terminal.

Troubleshooting

This table is intended to assist in resolving user-correctable furnace problems by relating symptoms to their likely causes. If service beyond the scope of this table is required, contact Fisher Technical Support at 1-800-926-0505.

Symptom	**Probable Cause**	**Action**
Furnace won't power up.	Circuit breaker tripped.	Check circuit breaker supplying furnace.
	Power switch in OFF position.	Throw power switch to ON position.
Furnace controls between 25 and 100°C above setpoint.	Faulty solid-state relay (SSR 1).	Replace SSR 1
Heater LED on but furnace won't heat.	Setpoint too low.	Adjust setpoint above current chamber temp.
	Door switch circuit not functioning.	Close door. If problem persists, check door switch.
	Bad safety relay.	Replace safety relay (K1).
	Bad solid-state relay (SSR1).	Replace defective SSR1.
	Defective heater element(s).	Replace heater element(s).
Setpoint is higher than chamber temperature and Heater LED doesn't come on	Defective controller.	Replace temperature controller.
Otc error	Open thermocouple	Check thermocouple connection, replace if faulty.

Replacement Parts

Replacements for muffle furnace parts serviceable by the user may be ordered, by part number, from Fisher Scientific Co.

Item		Part Number
Line Cord and Plug		
Model 550-14,	(120V)	SPN103011
	(208/240V)	SPN95774
Model 550-58	(208/240V)	SPN95774
Models 550-126	(208/240V)	SPN83910
Temperature Controller		
120V		SPN103002
240V		SPN103041
Cooling Fan		
120VAC		SPN83915
240VAC		SPN83916
Thermocouple Assembly		SPN103058
Solid State Relay (SSR)		SPN83917
Safety Relay (SR)		SPN102260
Rocker Switch (ON/OFF), Circuit Breaker		
120V		SPN95499
208V/240V		SPN83914
Door Switch		SPN83926
Shelf (Model 550-126 Only)		
For Loads < 3 lbs (supplied)		10-750S
For Loads > 3 lbs (accessory)		SPN83893
Hearth Plate		
Model 550-14		SPN83890
Model 550-58		SPN83891
Model 550-126		SPN83891
Side Heaters		
Model 550-14 (two required)		SPN83636
Model 550-58 (two required)		SPN83633
(floor heater)		SPN83638

Accessories and Supplies

Item	Part Number
Ceramic Wool (1 inch wide strip)	SPN40885
Ledge (Model 126 Only)	SPN83985

A variety of accessories and supplies suitable for use with the Isotemp Muffle Furnaces are available from Fisher. Catalog numbers of commonly used items are listed below for convenience.

Item	Catalog Number
Crucibles, Fused Quartz w/lid (set of 4)	10-490-4
Crucible, Porcelain, 10 ml	07-965C
Crucible, Porcelain, 15ml	07-965D
Exhaust Tube Assembly	10-490-10
Gloves	19-062-844
Grinding Mill	08-415
High Temperature Markers	13-382-16
Jumbo Crucible Tongs, Stainless	15-207
Crucible Rack Handle	10-490-17
Free Standing Shelf	10-651S
Crucible Racks (for Fused Quartz Crucibles)	
Model 650-14, 750-14	10-490-6
Model 650-58, 750-58	10-497-5
Model 650-126, 750-126	10-497-5
Crucible Racks (for Porcelain Crucibles)	
Model 650-14, 750-14	10-490-5
Model 650-58, 750-58	10-497-10
Model 650-126, 750-126	10-497-10
Injection Port Kit	10-550P

Performance Characteristics

Operating Range	50°C to 1125°C (90°F to 2025°F)
Average Temperature Uniformity	
Model 14	±5°C (±9°F)
Model 58	±8°C (±14.4°F)
Model 126	±10°C (±18°F)
Average Temperature Stability	±1°C (±2°F)
Set Point Repeatability	±1°C (±2°F)
Set Point Accuracy	
Model 14	±5°C (±9°F)
Model 58	±10°C (±18°F)
Model 125	±15°C (±27°F)
Rise Time	
Model 14	15 minutes
Model 58 & 126	25 minutes
Recovery Time	10 minutes
Cool Down Time (Door opened)	
(1125°C to 200°C)	25 minutes

Specifications

Electrical Requirements

Model 14		
	Cat. No. 10-550-14	120VAC, 50/60 Hz
	Cat. No. 10-550-14A	208/240VAC, 50/60 Hz
Model 58		
	Cat. No. 10-550-58	208/240VAC, 50/60 Hz
Model 126		
	Cat. No. 10-550-126	208/240VAC, 50/60 Hz

Power Requirements

Model 14	1200 Watts
Model 58	3000 Watts
Model 126	4600 Watts

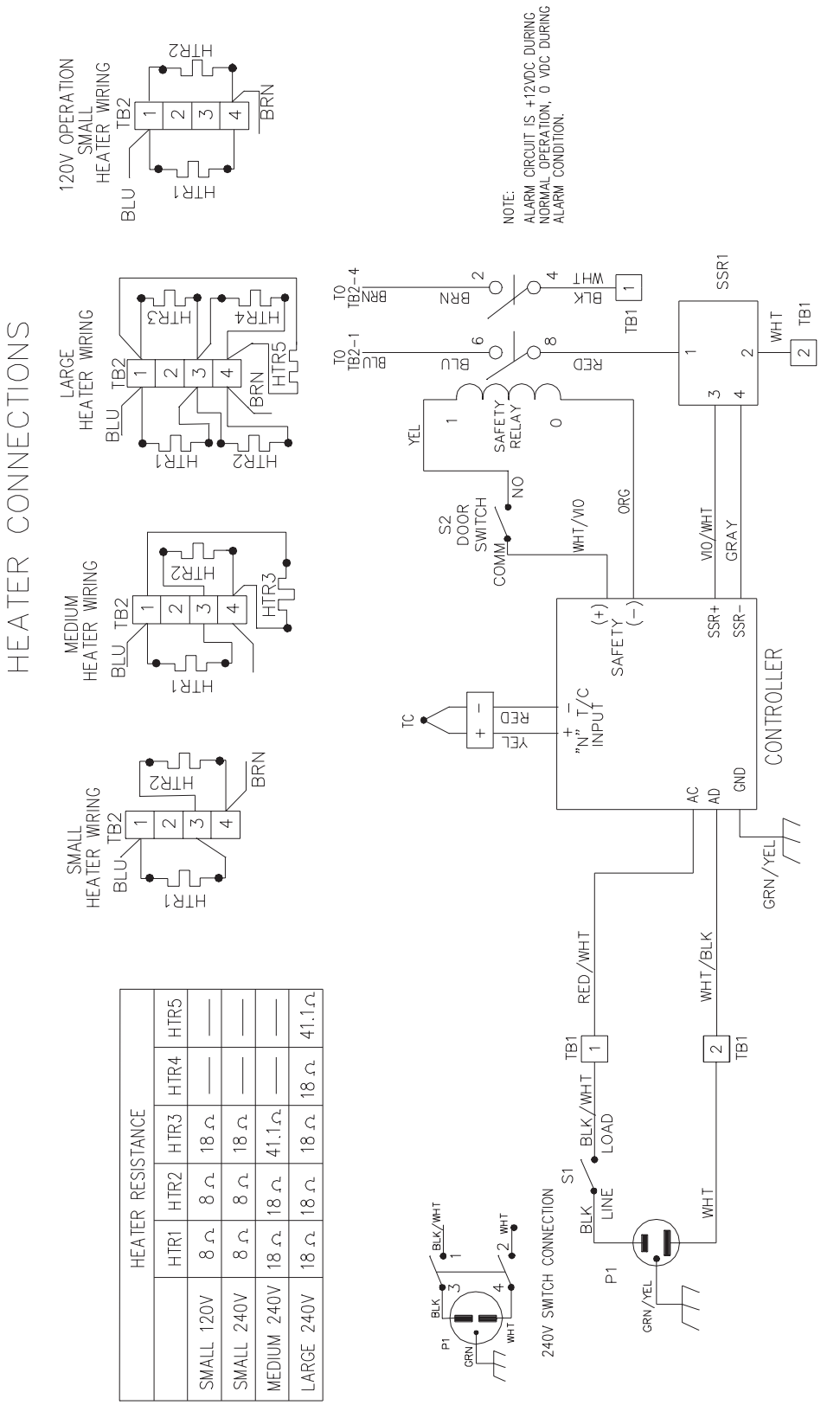
Chamber Volumes

Model 14	0.14 cu ft
Model 58	0.58 cu ft
Model 126	1.26 cu ft

Chamber Dimensions

Model 14	6 x 10 x 4 inches
Model 58	12 x 14 x 6 inches
Model 126	12 x 14 x 13 inches

Wiring Diagram



HEATER RESISTANCE						
	HTR1	HTR2	HTR3	HTR4	HTR5
SMALL 120V	8 Ω	8 Ω	18 Ω	—	—
SMALL 240V	8 Ω	8 Ω	18 Ω	—	—
MEDIUM 240V	18 Ω	18 Ω	41.1Ω	—	—
LARGE 240V	18 Ω	18 Ω	18 Ω	18 Ω	41.1Ω

Warranty

Laboratory instruments and equipment manufactured by Fisher Scientific Company L.L.C. – Laboratory Equipment Division (hereinafter called “the Company”) are warranted only as stated below.

Subject to the exceptions and upon the conditions specified below, the Company agrees, at its election, to correct by repair, by replacement, or by credit to the purchaser, any defect of materials or workmanship which develops within one year (13 months for refrigerator and freezer products) from the date of purchase by the original purchaser by the Company or by an authorized dealer of the Company provided that investigation or factory inspection by the Company discloses that such defect developed under normal and proper use

The exceptions and conditions mentioned above are the following:

a. The Company makes no warranty concerning components or accessories not manufactured by it, such as tubes, batteries, etc. However, in the event of the failure of any component or accessory not manufactured by the Company, the Company will give reasonable assistance to the purchaser in obtaining from the respective manufacturer whatever adjustment is reasonable in the light of the manufacturer’s own warranty.

b. The Company shall be released from all obligations under its warranty in the event repairs or modifications are made by persons other than its own service personnel or authorized dealer personnel unless such repairs by others are made with the written consent of the Company.

c. THE COMPANY MAKES NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, EITHER IN FACT OF BY OPERATION OF LAW,…STATUTORY OR OTHERWISE.

d. The above warranty and the above obligations to repair, replace, or credit are complete and exclusive and the Company expressly disclaims liability for lost profits or for special, indirect, incidental, consequential, or exemplary damages of any nature whether attributable to contract, warranty, negligence, strict liability, or otherwise even if the Company has been advised of the possibility of such damages.

e. Representations and warranties made by any person, including dealers and representatives of the Company, which are inconsistent or in conflict with the foregoing warranty shall not be binding upon the Company unless reduced to writing and signed by an officer of the Company.

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