# OPERATING MANUAL

# IFB-51 & IFB-52

July, 2008
# 7002661

## PACKAGING

Inspect all shipping containers for signs of damage which may have been caused by rough handling in transit. If damage exists, immediately contact the shipping agent.

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call Techne Customer Service Department at (609) 589-2560.

Retain the cartons in which the bath was received until the unit is tested and found to be in good condition.

## ELECTRICAL

Check that the voltage and current rating on the serial number plate near the power cord are correct.

## WARRANTY

The bath is guaranteed against all defects, including materials and workmanship, under normal use for a period of six (6) months. To validate the warranty, complete and return the warranty card immediately. If no warranty card is enclosed, please contact Techne.

## INTRODUCTION

Our equipment, as described in the manual, has been designed for use by properly trained personnel. It is important that all relevant information, relating to our equipment, be distributed to employees who may handle or come into contact with it. In particular, we would stress the importance of standard, commonsense rules and adherence to normal, safety standards and procedures. (For example, any covers or enclosures should only be removed by trained personnel.) Please ensure that all those involved in the operation of this equipment are knowledgeable of the design criteria and that it is used in accordance with the instructions and recommendations contained in this manual. **If there is any doubt whatsoever relating to the proper use of this equipment, we'll be pleased to assist you with technical data, etc.**

The fluidized bed is housed in a circular container manufactured from 0.075" (14 gage) stainless steel. This container is surrounded by electrical heating elements and housed in a square insulated case. The temperature of the fluidized bed is set and maintained by digital PID temperature controller, which is governed by the electrical signal from a type "K" (chrome/alumel) thermocouple placed along the fluidized bath container inner wall. Current to the heating elements is switched on and off by means of solid state relay actuated by the temperature controller. The controller has a resolution of 1º and can be switched between ºC and ºF.

The IFB-51 and IFB-52 are supplied with an internal contactor that disables power to the heaters in the event that one of the following conditions occur; thermocouple failure, loss of power to or controller fault and/or exceeding the factory set high temperature limit of 605°C(1121°F). The controller will flash a message when one of these conditions has occurred and can be reset for operation once the situation is corrected. See page 5 for more details on the PID temperature controller.

The air supply to the bed must be clean and dry. An air filter and pressure regulator can be supplied as optional equipment (Techne # 6035915).

The Techne Industrial Fluidized Bath has been specially designed for removing plastic residue from extruder and molding machine tools, paint build up and carry out various heat treatment processes. When used for burning plastic residues, the "IFB's" should be installed with an adequate fume extraction system. A fan and fume extraction collar can be provided, along with other fume cleaning equipment.

**FUME CLEANING**

When the Industrial Fludized Bath is installed with a fan and exhaust ducting system, fumes will be removed from the top of the fluidized bed.

A number of fume cleaning options are provided by Techne for the purpose of pollution abatement. Techne will be pleased to provide further information and to advise on our customers' particular requirements.

References should be made to the attached schematic of the entire fume cleaning system, which consists of the following items:

a) CN-100 Cyclone
b) SR-100 Scrubber
c) AB-100 Afterburner

CN-100 Cyclone-
A highly efficient in-line unit for removing aluminum oxide media from the exhaust fumes for recirculation.

SR-100 Scrubber-
A compact unit for removing soluble acid mists from the exhaust gas. This is particularly recommended for PVC burn off.

AB-100 Afterburner-
An effective solution to the problem of visible smoke emission.

## TECHNICAL SPECIFICATIONS – IFB-51

| | |
|---|---|
| Overall external dimensions: | length: 518 mm (20.4")<br>width: 518 mm (20.4")<br>height: 675 mm (26.6") |
| Bath internal dimensions: | 255 mm (10.1") diameter<br>405 mm (16") deep |
| Working volume: | 255 mm (10.1") diameter (8.37" diameter when using parts basket)<br>305 mm (12") deep |
| Temperature range: | 50°C to 600°C (122°F to 1112°F) |
| Temperature stability: | ±1.0º C (8" immersion depth, with lid on after 2 hours controlling at setpoint ) |
| Display accuracy: | ±10.0º C (8" immersion depth, with lid on after 2 hours controlling at setpoint ) |
| Heat up time*: | Ambient to 300°C -- .8 hrs<br>Ambient to 450°C – 1.75 hrs<br>Ambient to 600°C - 2.5 hrs |
| Air supply: | Clean, dry and oil free air, at a constant pressure of 30 psi, using a **minimum** ID air line of ½ inch.<br>(Air flow adjustment is necessary when changing temperatures.) |
| Fluidizing bed medium: | Aluminum oxide 120 mesh 85 lbs. |
| Electrical requirements: | 240V, 1 phase, 60Hz, 4kW |
| Exhaust fan requirements: | 7125 1/min. (250 $ft^3$ /min.) at 5 in W.G. |
| Gross weight: | 215 lb. |
| Net weight: | IFB-51 - 130 lbs.<br>Alum Oxide - 85 lbs. |

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* Indicated heat up time applies for a well fluidized bed with a lid on and extraction fan off.

## TECHNICAL SPECIFICATION – IFB-52

| | |
|---|---|
| Overall external dimensions: | length: 518 mm (20.4")<br>width: 602 mm (23.7")<br>height: 1049 mm (41.3") |
| Bath internal dimensions: | 255 mm (10.1") diameter<br>762 mm (30") deep |
| Working volume: | 255 mm (10.1") diameter (8.37" diameter when using parts basket)<br>660 mm (26") deep |
| Temperature range: | 50°C to 600°C (122°F to 1112°F) |
| Temperature stability: | ±1.0° C (18" immersion depth, with lid on after 2 hours controlling at setpoint ) |
| Display accuracy: | ±10.0° C (18" immersion depth, with lid on after 2 hours controlling at setpoint ) |
| Heat up time*: | Ambient to 300°C - 2 hrs<br>Ambient to 450°C - 3.5 hrs<br>Ambient to 600°C - 5 hrs |
| Air supply: | Clean, dry and oil free air, at a constant pressure of 30 psi, using a **minimum** ID air line of ½ inch. (Air flow adjustment is necessary when changing temperatures.) |
| Fluidizing bed medium: | Aluminum oxide 120 mesh 160 lbs. |
| Electrical requirements: | 240V, 1 phase, 60Hz, 6kW |
| Exhaust fan requirements: | 7125 1/min. (250 $ft^3$ /min.) at 5 in W.G. |
| Gross weight: | 345 lb. |
| Net weight: | IFB-52 - 185 lbs.<br>Alum Oxide - 160 lbs. |

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* Indicated heat up time applies for a well fluidized bed with a lid on and extraction fan off.

## INSTALLATION

Check that the isolation resistance between the heater and earth is at least 2.5 Megohms. Connect the supply lead to a 220 to 240 volt fused electrical supply.
Fill the bath with aluminum oxide to a level that, when fluidized, is two to four inches below the top plate. Ensure that the unit is properly leveled by placing shims under the feet as necessary. An unlevel unit could lead to non-uniform temperatures, premature heater failure and possible damage to parts.
Connect the air inlet to a clean, constant pressure air supply, by means of an air hose having an ID of 5/8 of an inch.

## AIR ADJUSTMENT

Set the inlet air pressure to a value of 30 psi. Use the factory default air flow settings below as viewed on the air flow meter to obtain optimum bath results. Note that the air flow must be adjusted while cooling the bath also as indicated.

| Indicated bath temperature | Flow setting – CFM |
|---|---|
| Ambient to 50°C (122°F) | 4.0 |
| 50°C (122°F) to 100°C (212°F) | 3.5 |
| 100°C (212°F) to 200°C (392°F) | 3.0 |
| 200°C (392°F) to 300°C (572°F) | 2.2 |
| 300°C (572°F) to 400°C (752°F) | 1.9 |
| 400°C (752°F) to 500°C (932°F) | 1.7 |
| 500°C (932°F) to 600°C (1112°F) | 1.4 |

## BATH TEMPERATURE

The bath should allowed to stabilize for 1 hours after the controller has reached the setpoint temperature before placing parts to be cleaned into the bath. An initial temperature drop or quenching of the bath can occur after inserting a workpiece to be cleaned. This temperature drop depends on the size of the immersed object, but is generally in the order of 77°F (25°C). Carbon is burned to carbon dioxide quickly above 752°F (400°C). It may be found desirable to pre-heat the bath to as high as 1020°F (550°C) in order to obtain quick results, but caution should be exercised not to damage tools by overheating.

**PID TEMPERATURE CONTROLLER**

The control parameters in the PID temperature controller have been optimized by the factory during manufacture to give the best results for most applications. Per the image below use the scroll button to navigate to the menu for changing display units. The up/down buttons are used to set the bath setpoint temperature. If an alarm indicates an overtemperature condition or thermocouple failure the two buttons labeled as ACK need to be depressed together after the alarm condition is corrected.


**OPERATION**

The industrial fluidized baths detailed in this booklet were designed specifically for "burning off" residue from plastic machinery tools. However the IFB baths are also a good choice for many heat treatment, reactive chemistry and exothermic reaction type of applications.
Our systems are effective on the full range of plastics, including polyethylene, polypropylene, PVC, nylon, polyester, polycarbonates, acrylic, polystyrene and acetyl. In addition, they are effective with rubber, EPR, epoxy resins and acrylic paints. They provide a safe, dry and fast means of removing all plastic residue with a minimum amount of effort and physical contact with the tools. The "burning off" operation is controlled at a uniform temperature so that distortion is avoided. Furthermore, as the fluidized bath is non-abrasive, physical damage to parts is minimal. Each of these factors extends tool life.
The cleaning process itself is very simple using the heat transferred from the fluidized bath to the tools to degrade the plastic residue. Objects to be cleaned, supported in a wire basket for ease of handling, are placed in the fluidized bath, operating at a temperature between 842°F (450°C) and 1020°F (550°C) depending on the polymer, for approximately 20 to 30 minutes. Actual burn off times and temperatures vary depending upon the weight, complexity and material composition of the item to be cleaned, in addition to the quantity of residue to be removed. Our technical staff will always advise on specific applications.

The line diagram below illustrates the cleaning process.

FUMES $CO_2$

Plastic----------Tar----------Carbon
Mix
Time----------2/3----------1/3----------

°C----------842°F----------1020°F-----
(450°C) (550°C)

The first two thirds, of the total time required, sees the plastic reduced to a tar mix state. In this phase, all the initially combustible products of the plastic leave the bath through an appropriate fume extraction system. In the last third of the immersion time, the tar mix state is reduced to carbon which either burns away or remains loosely bound to the tool. In the latter case, it can be blown away or brushed off without causing damage, after the part is removed from the fluidized bath.

The clean item can then be put to one side, preferably on a steel plate, to cool before refitting on a machine or returned to the tool store. In some cases, particularly with dies from blow molding machines using PVC, a further operation of polishing with a soft cloth may be required.

The aluminum oxide fluidizing medium is not degradable but will need to be replenished due to loss from spillage or extracted in the exhaust. In the particular case of PVC, chlorinated hydrocarbons remain in the fluidized bath after burn off which dictates special maintenance procedures.

**CAUTION**

Care should be taken when handling hot parts which have been removed from a fluidized bath. We recommend that protective clothing (safety glasses, etc.) be worn when working with fluidized baths and that the installation and maintenance procedures outlined in this booklet be followed explicitly.

**MAINTENANCE**

The aluminum oxide, not being degradable, will only require replacement when losses occur due to attrition, spillage or contamination with inert pigments, filler or acidic by-products from the burn-off process. Note that the aluminum oxide pulled out of the bath through the exhaust duct can be captured for reuse by the incorporation of a "cyclone" option (Techne Model CN-100).

On at least daily intervals, the bed should be cleaned of floating residues by means of a wire mesh hand scoop. This procedure removes carbon char which impairs fluidization and acts as an absorbent. More importantly, it can also remove uncharred plastic and so reduce the quantity of fumes produced and the time of processing.
The optional air-line filter into the bed is self-draining. However, it should be kept in good condition by inspection at two week intervals and by cleaning the bowl and washing or replacing the filter element as necessary. With exceptionally dirty or wet air supplies this frequency may have to be increased. Fe water or water vapor in the air supply is a notorious source for the production of hydrochloric acid in the bed when PVC is burned off. In addition, oil vapors in the air supply which reach the fluidizing plate are carbonized within the pores of the plate, quickly causing blockage and consequent poor fluidization.

All articles should be completely cleaned and removed from the bed before shut down. Corrosion of processed parts could be seriously increased if they are left immersed overnight. Furthermore, residual plastic, instead of being burned off in a fluidized state, could perculate down through a static bed and settle on the porous plate causing blockage and poor fluidization.
When parts are removed from the bed, they should be allowed to cool in the air and, while still warm, wiped with on oily cloth to prevent rusting.If the bath is left unused for long periods of time, empty the aluminum oxide and store it in a separate container. Keep the inside of the bath clean and dry.

## SPECIAL MAINTENANCE PROCEDURES FOR TECHNE INDUSTRIAL FLUIDIZED BATHS WHEN BURNING OFF PVC OR OTHER HALOGENATED POLYMERS

Burning off PVC (polyvinyl chloride) in a fluidized bath offers one of the most severe conditions of operation. Hydrogen chloride (HCl) liberated on the breakdown of PVC is absorbed by the bed medium creating an acidic environment within the bed. This happens especially when the bed also absorbs water from the atmosphere or when the fluidizing air is cold. HCl is extremely corrosive, especially when it is aerated and wet. In addition, in water it produces chloride ions which, even in neutral or alkaline solutions, promote corrosion and rusting in steel. Witness, for example, the corrosive nature of sea water and calcium chloride road de-icer.

Consequently, fluidizing beds used for burning off PVC require strict supervision to minimize corrosion of the bed itself and of parts cleaned in it, especially if these are of un-coated steel. The purpose of most of the recommended maintenance procedures is aimed at keeping the bed medium clean, free-flowing, free of gums, acids, agglomerates, partly decomposed plastic, char and larger particles. These cleaning processes have the additional benefit of ensuring good fluidization and thus good heat transfer throughout the bed and through immersed parts. This, in turn, reduces burn-off time, uneven heating of parts and thus distortion, increases heater life by eliminating localized hotspots and makes cleaning easier on a regular basis.

The following procedures are essential when PVC is burned off on a regular basis, but they can also be followed profitably by users of other plastics.

The bed should be completely emptied at monthly intervals and visually inspected for signs of corrosion. Examination should include the walls of the inner cylinder, the porous fluidizing plate, the thermocouple sheath and the loading baskets with particular emphasis on exposed weld lines. Serious corrosion should be dealt with immediately by improving maintenance procedures or by replacing the inner container before holes appear and cause failure of the heating element and corrosion in more inaccessible parts.

The fluidizing media should be screened by passing through a 50 to 70 mesh sieve on at least monthly intervals to remove foreign bodies, agglomerated gummy material and, periodically, be completely changed for a new charge of aluminum oxide.

During shutdown overnight or over the weekend, the temperature should be reduced to 212°F (100°C) to ensure that the moisture from the atmosphere is not condensed into the bed to create a hydrochloric acid solution. Fluidizing air may be turned off in these circumstances but it is better that it should be continued when it is practical to do so. For extended shutdowns exceeding two days, the medium should be removed and the inside of the bath wiped out with a rag wetted with a 5% washing soda solution (sodium carbonate).

## FAULT FINDING

If the heater indicator fails to go off, the unit fails to reach its operating temperature or heat up rate decreases, check:

1) Fluidization – remove aluminum oxide from bath leaving approximately 2 inches in the bottom. If an area ¼ or more is not bubbling then most likely the porous plate is blocked and should be replaced. Check that the porous plate is not blocked with plastic residue or other material.
2) Heater - Empty medium from the bed and disconnect the main supply. Turn the unit upside down and check the resistance of the heater. If one or more heater windings are faulty, replace the heater. Reassemble in the reverse order.
3) Thermocouple – check with an instrument that can measure and simulate thermocouple signals to verify its operation.
4) Controller and/or SSR – the controller will output a DC signal to the SSR when heat is called for. If the SSR is receiving a DC control signal but not passing power to the heaters then it should be replaced. Alternatively a problem may exist with the controller.

If the fluidization deteriorates, check the air filter assembly for clogging of the filter element; if necessary, replace the element. If the fault remains, run your bath at 1100°F (600°C) for a period of one hour to allow any accumulated residue in the bath to burn off. If the fault still remains, empty the medium from the bed, check the stainless steel porous plate for damage due to clogging by plastic residue, distortion of the plate or corrosion.

## FACTORY PID PARAMETERS (For IFB51 S/N: 451 & higher, IFB52 S/N: 214 & higher)

| Parameter | IFB51 | IFB52 |
|---|---|---|
| Pb | 15 | 12 |
| Ti | 450 | 480 |
| Td | 75 | 80 |
| 1PLS | 5.0 | 5.0 |
| CBHI | 25 | 21 |
| CHLO | 25 | 25 |

## SERVICING and TECHNICAL ADVICE

Technical Sales Staff is always available to discuss particular applications or service inquiries. Complete servicing and repair of all Techne products is available at Techne.

CONTACT:

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E-Mail: techsupport@techneusa.com
industrialproducts@techneusa.com

## SPARE PARTS

A list of spare parts is provided below, all of which are available. Less commonly used parts, which are not listed, are also available upon request. For clear identification, please refer to the part number as well as the item description.

| IFB-51 Part # | Description | IFB-52 Part # |
|---|---|---|
| 7030464 | Aluminum Oxide (100 lb. drum) | 7030464 |
| 6002437 | Gate Valve | 6002437 |
| 7032619 | 1/32 DIN PID temperature Controller[1] | 7032619 |
| 7002694 | 1/16 DIN PID Controller[3] | 7002694 |
| 7001149 | Inner Container Assembly | 7001642 |
| 7001072 | Heater, 240V, 1ph, 2kW (2 each) | 7001667 |
| n/a | Heater, 240V, 1ph, 1kW (2 each) | 7001657 |
| 7001157 | Porous Plate/Air Chamber Assembly | 7001157 |
| 7002849 | Thermocouple | 7002850 |
| 7001574 | Single Pole Relay (IFB-51's prior to S#388) | n/a |
| 7032434 | Solid State Relay (IFB-51's S#388 and after) | 7032434 |
| 7032588 | O/T Contactor[2] | 7032588 |
| 7001560 | Fuse – 25 amp (IFB51), 30 amp (IFB52) | 7001665 |
| 7002870 | Acrylic flow meter 4 CFM [4] | 7002870 |

1. IFB-51's with S# 388 and higher; IFB-52's with S#189 and higher. For IFB-52's prior to S#189, order 808 controller part #7032433.

2. IFB-51's with S# 397 and higher; IFB-52's with S#172 and higher.

3. IFB-51's with S# 451 and higher; IFB-52's with S# 214 and higher.

4. IFB-51's with S# 457 and higher, IFB-52's with S# 219 and higher.

## ACCESSORIES

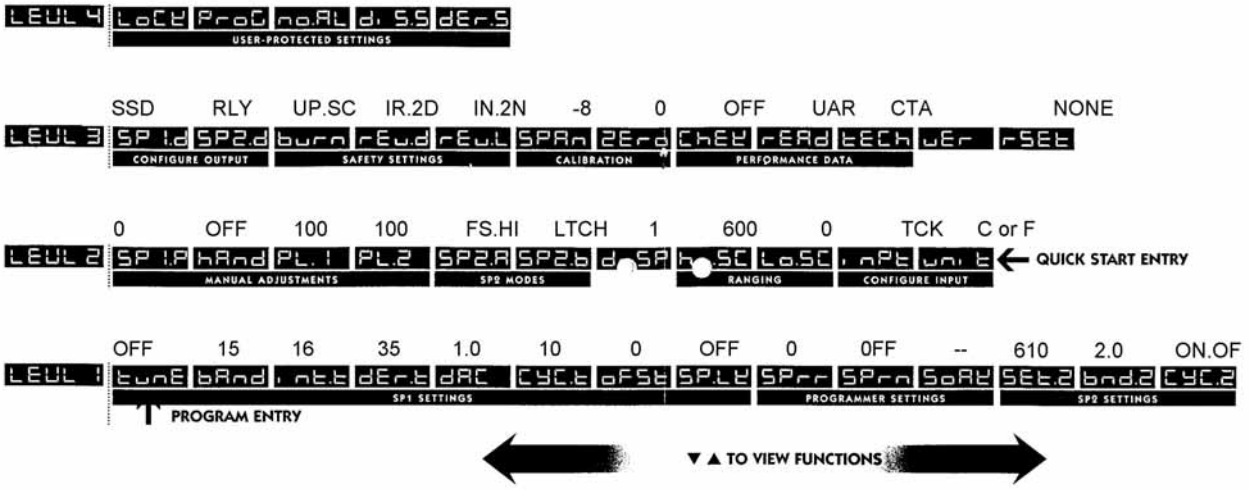
| IFB-51 Part # | Description | IFB-52 Part # |
|---|---|---|
| 6035915 | Pressure Regulator and Filter | 6035915 |
| 7031103 | Basket (standard) | 7031658 |
| 7031102 | Basket (long) | 7031659 |
| 6036157 | Extraction Collar | 6036157 |
| 6036156 | Lid Assembly | 6036156 |
| 3031500 | Cyclone CN-100 | 3031500 |
| 3031200 | Afterburner AB-100 | 3031200 |
| 3031300 | Scrubber SR-100 | 3031300 |

# Default Factory Controller parameters

**IFB 51 before s/n: 451 and IFB52 before s/n: 214**

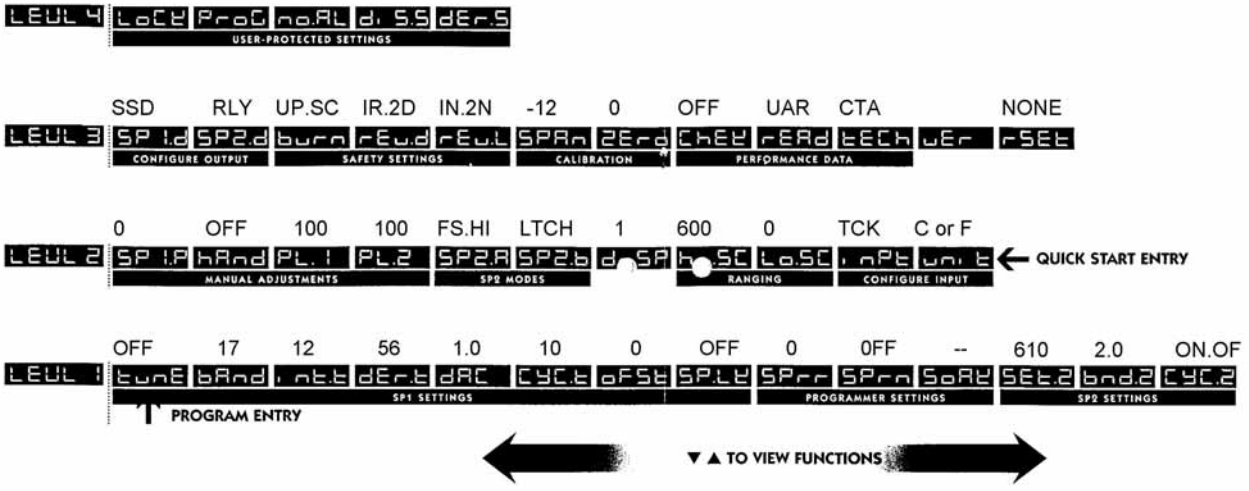
Functions Menu

## IFB51 Controller Parameters



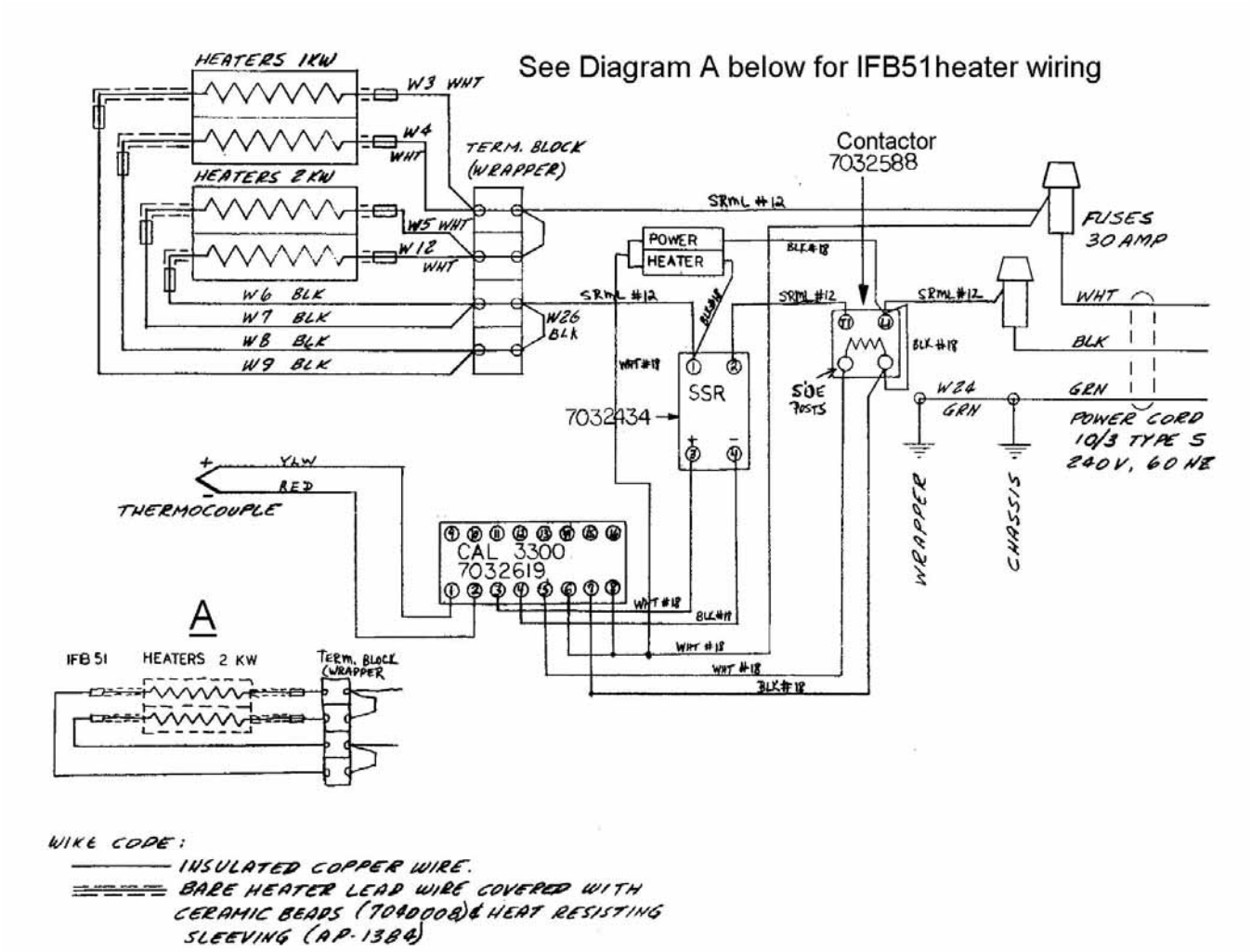

Functions Menu

## IFB52 Controller Parameters



# IFB51 & IFB52 Wiring Diagram

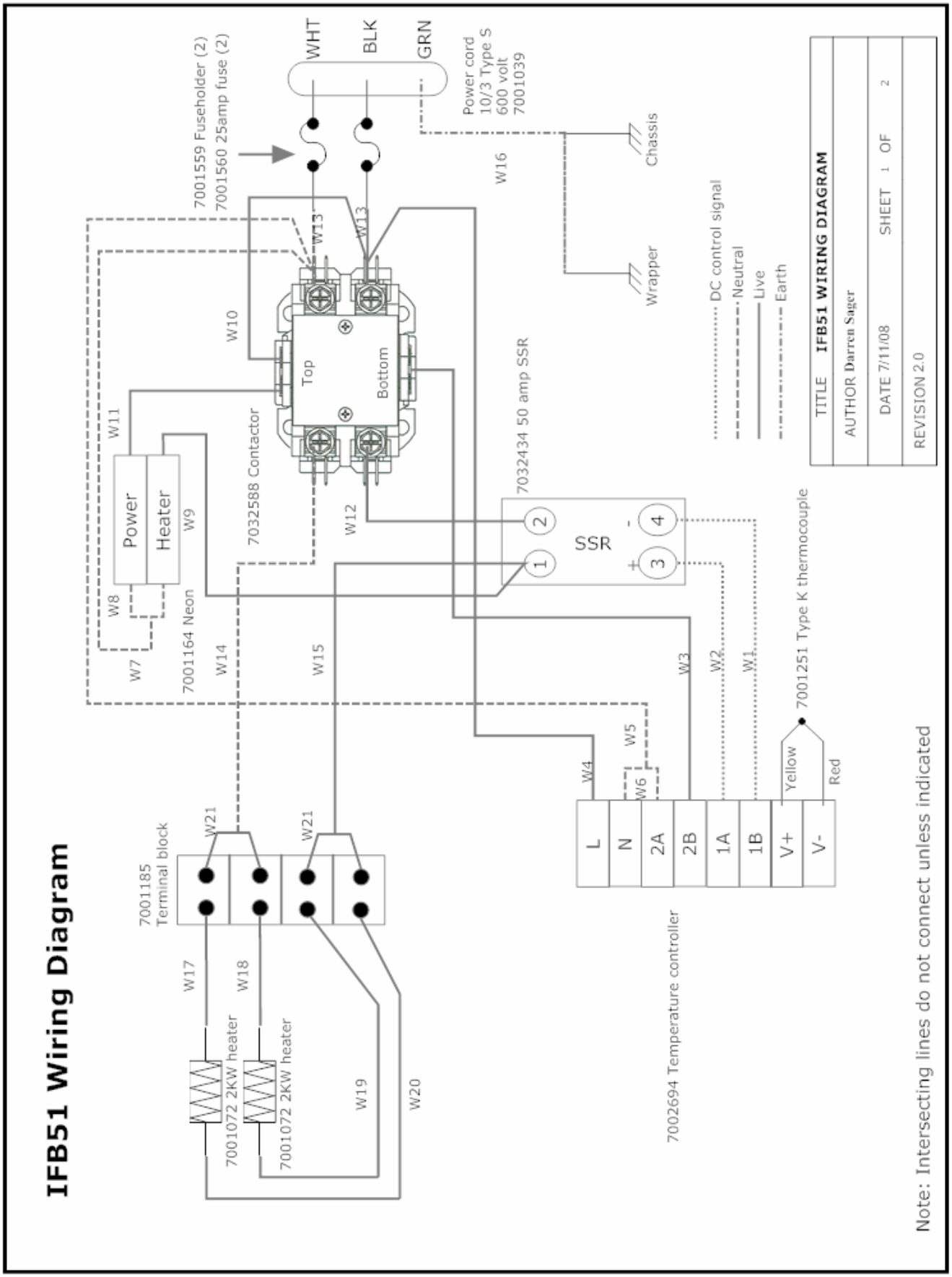
**IFB51 up to S/N: 450 & IFB52 up to S/N: 213**






## IFB51 Wiring diagram

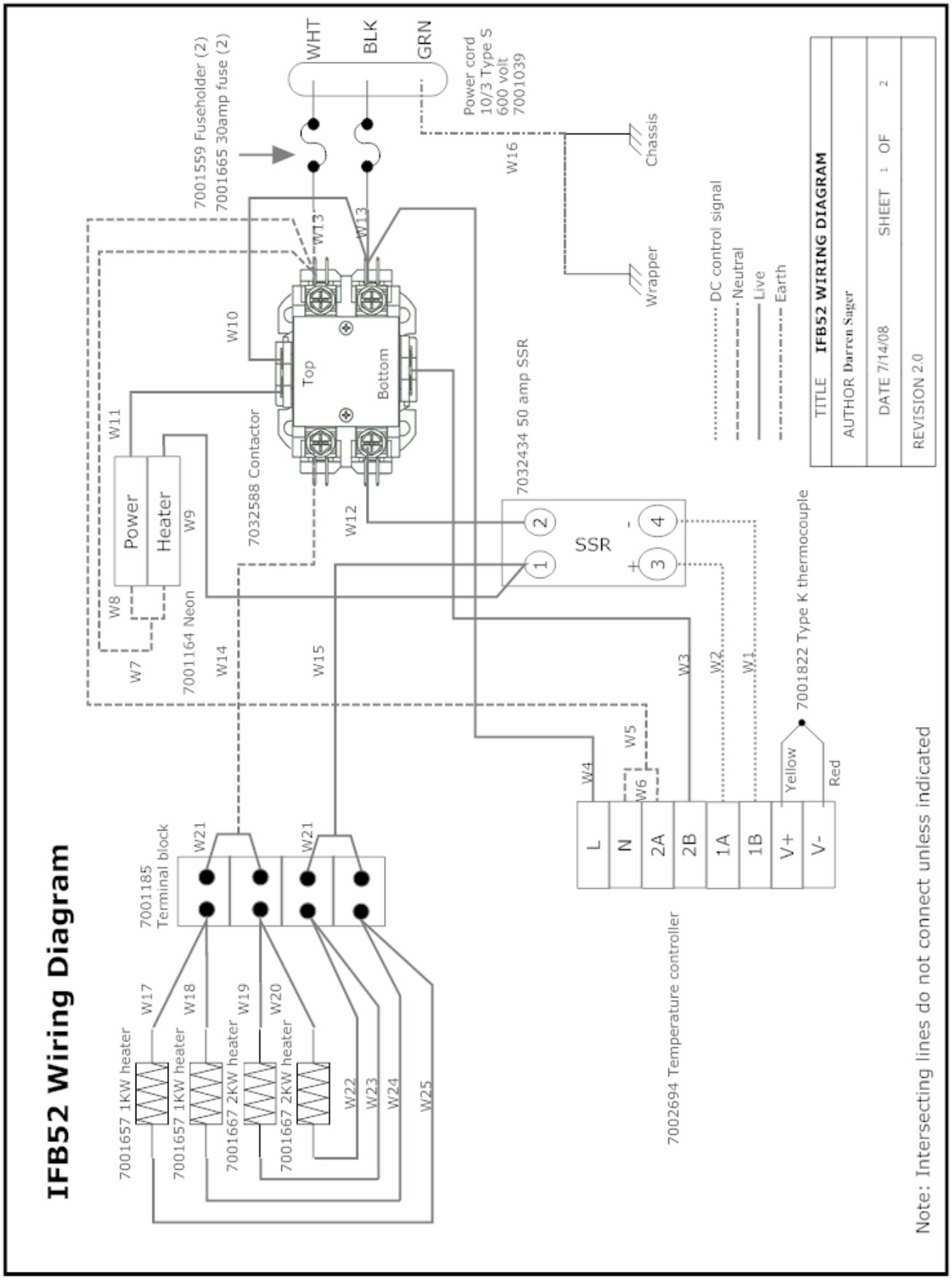
**Serial number: 451 & higher**

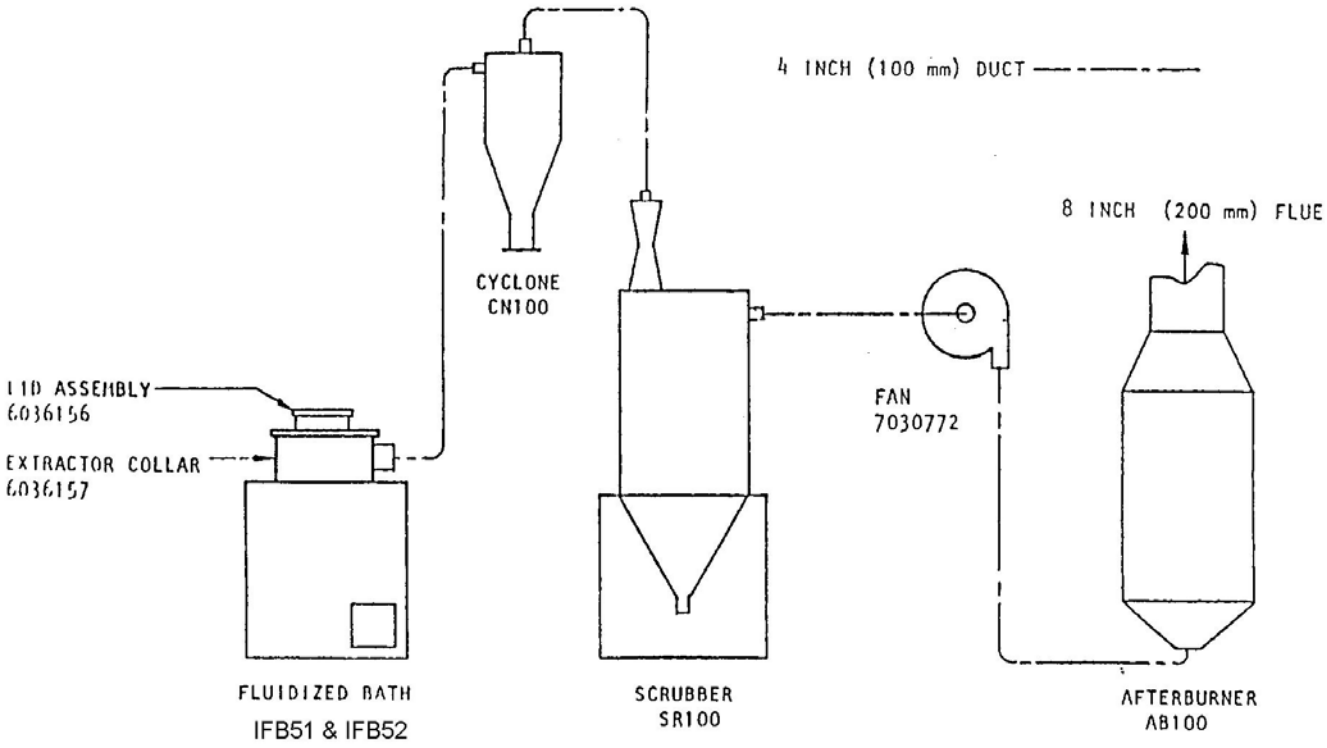





# IFB52 Wiring diagram

**Serial number: 214 & higher)**






INDUSTRIAL FLUIDIZED BATH FUME REMOVAL SYSTEM