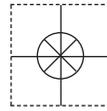


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WARRANTY

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# **Ω OMEGA®** **User's Guide**



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## **FFB51 and FFB52** **Industrial Fluidized Bath**



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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, human applications.

# **OPERATING MANUAL**

**FFB51 & FFB52**

## 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.

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.

## 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 1° and can be switched between °C and °F.

The FFB51 and FFB52 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 620°C(1148°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 6 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 (Omega Part No. 6035915).

The Omega 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 “FFB’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 Fluidized Bath is installed with a fan and exhaust ducting system, fumes will be removed from the top of the fluidized bed.

## TECHNICAL SPECIFICATIONS – FFB51

Overall external dimensions:	length: 518 mm (20.4") width: 518 mm (20.4") height: 675 mm (26.6")
Bath internal dimensions:	255 mm (10.1") diameter 405 mm (16") deep
Working volume:	255 mm (10.1") diameter (8.4" diameter when using parts basket) 305 mm (12") deep
Temperature range:	50°C to 600°C (122°F to 1112°F)
Temperature stability:	±1.0° C (8" immersion depth, with lid on after 2 hours controlling at setpoint )
Display accuracy:	±10.0° C (8" immersion depth, with lid on after 2 hours controlling at setpoint )
Heat up time*:	Ambient to 300°C -- .8 hrs Ambient to 450°C – 1.75 hrs Ambient to 600°C - 2.5 hrs
Air supply:	Clean, dry and oil free air, at a constant pressure of 30 psi, using a <b>minimum</b> ID air line of ½ inch. (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 <sup>3</sup> /min.) at 5 in W.G.
Gross weight:	215 lb.
Net weight:	IFB-51 - 130 lbs. 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 – FFB52

Overall external dimensions:	length: 518 mm (20.4") width: 602 mm (23.7") height: 1049 mm (41.3")
Bath internal dimensions:	255 mm (10.1") diameter 762 mm (30") deep
Working volume:	255 mm (10.1") diameter (8.4" diameter when using parts basket) 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 Ambient to 450°C - 3.5 hrs Ambient to 600°C - 5 hrs
Air supply:	Clean, dry and oil free air, at a constant pressure of 30 psi, using a <b>minimum</b> 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 l/min. (250 ft <sup>3</sup> /min.) at 5 in W.G.
Gross weight:	345 lb.
Net weight:	IFB-52 - 185 lbs. Alum Oxide - 160 lbs.

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

## INSTALLATION & SETUP

- 1) The bath should be placed in a location that is level and dry.
- 2) Connect a 30 PSI air supply to the input that is capable of delivering 5 CFM maximum flow. The supply should be dry and free of particulate. A 6' length of tubing should be used to connect the air supply to the bath. The tubing and any fittings should not be less than 1/2" ID at any one point or bath performance may be reduced.
- 3) Wire up the bath to your 220 to 240 volt single phase power supply. A 208 volt supply is too low and should be boosted to 230 volts with a boost transformer. The catalog number for the boost transformer that has a rating of 7200VA for use with the FFB51 and FFB52 is 7032838.
- 4) Fill the bath with Aluminum oxide sand to within 3 or 4 inches of the top. Fill with sand before placing the extraction collar into the bath.
- 5) Turn on power and air to the unit. Set the air flow per the front label to 4 CFM when at ambient temperature. When Fluidized and bubbling make sure the Aluminum oxide sand level is still within 3 or 4 inches of the top.
- 6) Place the extraction collar (if purchased) into the bath and place the lid on. Set the controller to your operating temperature.
- 7) **Important;** as the bath heats up you will need to adjust the air down based on the front label chart settings or the heat up time will greatly increase. The reverse needs to happen when cooling down.
- 8) Once the controller has reached your set point allow 1 hour for the bath to fully stabilize before attempting to use it. **(IF YOU ARE NOT CLEANING TOOLING JUMP TO LINE 13)**
- 9) With your first tool cleaning start with a smaller number of tools and at a lower temperature. Adjust the bath set temperature and the number of tools cleaned based on your expected results and the amount of time required. It is always a good idea to clean at the lowest possible temperature.
- 10) **Extraction Air setup;** if you use an exhaust hood for ventilation this step doesn't apply to you.
  - a. Make sure the exhaust system is plumbed according to our recommendation in the manual.
  - b. With the exhaust fan on, close the damper so there is no extraction to the bath
  - c. Put parts in basket and lower into the bath
  - d. Place lid on the bath
  - e. When smoke and fumes start to come up and around the lid slowly open the damper just to the point where they are pulled back into the bath and no longer entering the room, then stop adjusting.
  - f. This setting will give good results with minimal heat and sand loss.
- 11) After repeated tool cleanings heavier clumps and larger particulate should be sieved from the sand.
- 12) In time the sand may become dense and fluidize poorly at which point it should be replaced.
- 13) The bath air supply and power can be turned off after the temperature has cooled to 200°C/400°F Alternatively if used daily reduce the overnight temperature to 300°C for quicker startup

## 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

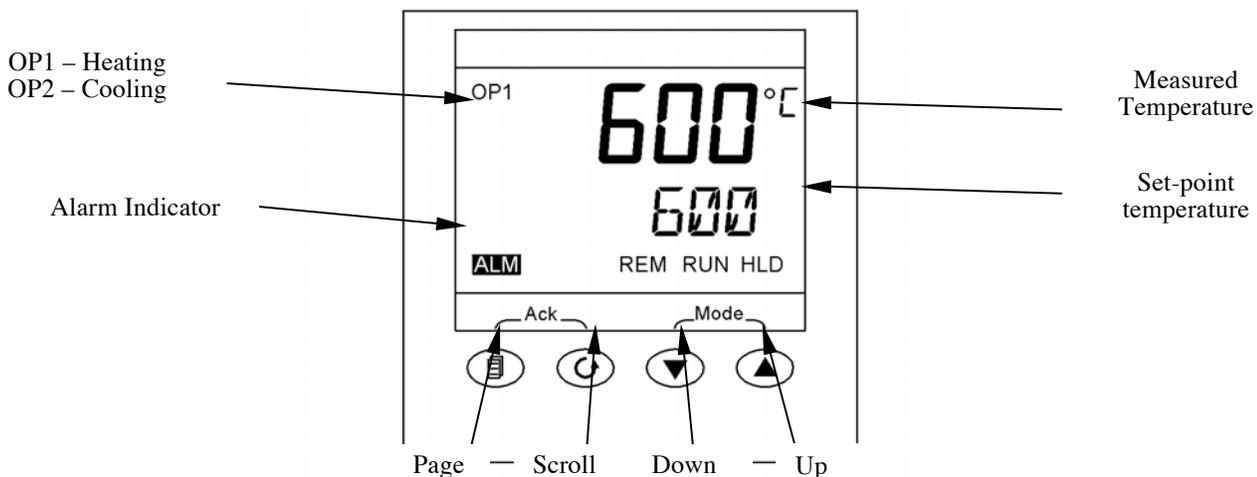
## BATH TEMPERATURE

The bath should be allowed to stabilize for at least 1 hour 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 option UNITS for changing display from °C to °F and vice versa.

Two setpoints can be entered for future recall, press the “scroll” button to access SP1 and SP2. Set a different setpoint in each of these. Then “Scroll” to SP.SEL to select either setpoint SP1 or SP2. 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. If the alarm cannot be cleared please contact the factory for support.



## **OPERATION**

The industrial fluidized baths detailed in this booklet were designed specifically for "burning off" residue from plastic machinery tools. However the FFB 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 CLEANING PROCESS**

The first two thirds, of the total time required for tool cleaning, 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.

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 percolate 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 an 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 OMEGA 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  $\frac{1}{4}$  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 FFB51 S/N: 451 & higher, FFB52 S/N: 214 & higher)

<u>Parameter</u>	<u>FFB51</u>	<u>FFB52</u>
Pb	15	12
Ti	450	480
Td	75	80
1PLS	5.0	5.0

## 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.

<u>FFB51 Part #</u>	<u>Description</u>	<u>FFB52 Part #</u>
7030464	Aluminum Oxide (100 lb. drum)	7030464
6002437	Gate Valve	6002437
7032619	1/32 DIN PID temperature Controller <sup>1</sup>	7032619
7002694	1/16 DIN PID Controller <sup>3</sup>	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 (FFB51's prior to S#388)	n/a
7032434	Solid State Relay (FFB51's S#388 and after)	7032434
7032588	O/T Contactor <sup>2</sup>	7032588
7001560	Fuse – 25 amp (FFB51), 30 amp (FFB52)	7001665
7002870	Acrylic flow meter 4 CFM <sup>4</sup>	7002870

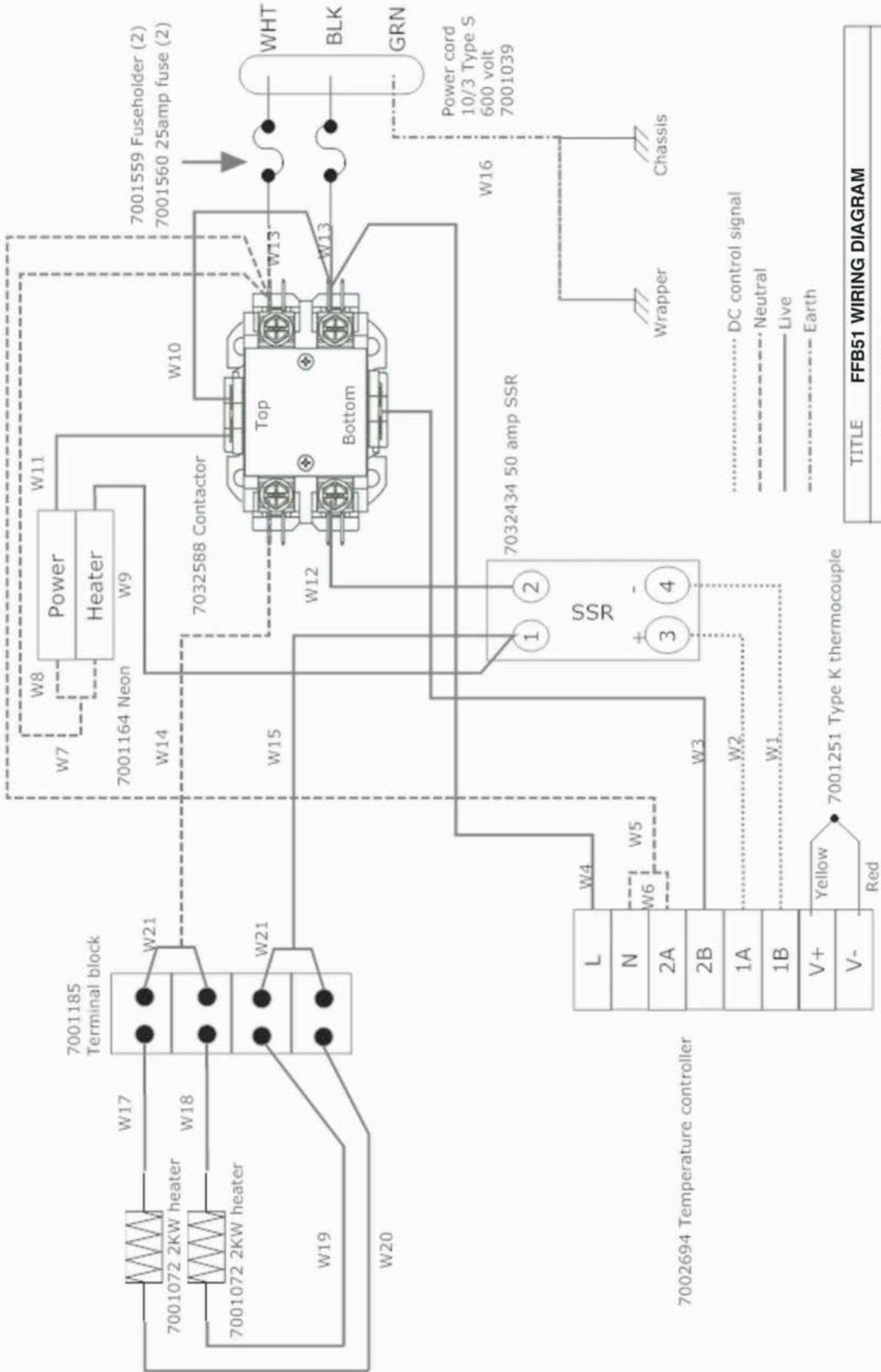
1. FFB51's with S# 388 to 451; FFB52's with S#189 to 213. For FFB52's prior to S#189, order 808 controller part #7032433.
2. FFB51's with S# 397 and higher; FFB52's with S#172 and higher.
3. FFB51's with S# 452 and higher; FFB52's with S# 214 and higher.
4. FFB51's with S# 457 and higher; FFB52's with S# 219 and higher.

## ACCESSORIES

<u>FFB51 Part #</u>	<u>Description</u>	<u>FFB52 Part #</u>
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
7032838	7200 VA Boost transformer, 208 to 230V	7032838

# FFB51 Wiring diagram

## FFW51 Wiring Diagram



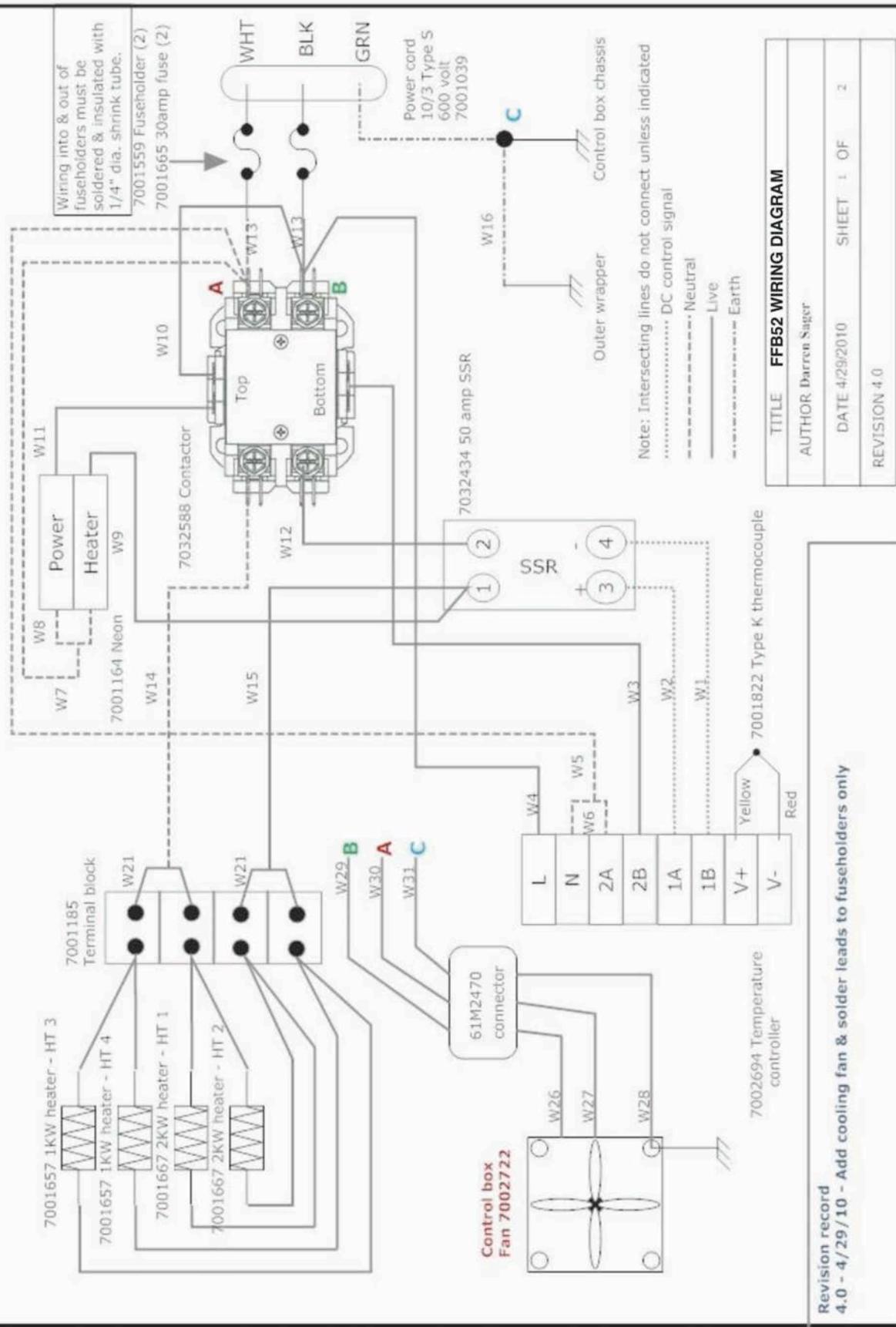
..... DC control signal  
 - - - - - Neutral  
 \_\_\_\_\_ Live  
 - - - - - Earth

TITLE	FFB51 WIRING DIAGRAM
AUTHOR	Darren Sager
DATE	7/11/08
SHEET	1 OF 2
REVISION	2.0

Note: Intersecting lines do not connect unless indicated

# FFB52 Wiring diagram

## FFBW52 Wiring Diagram

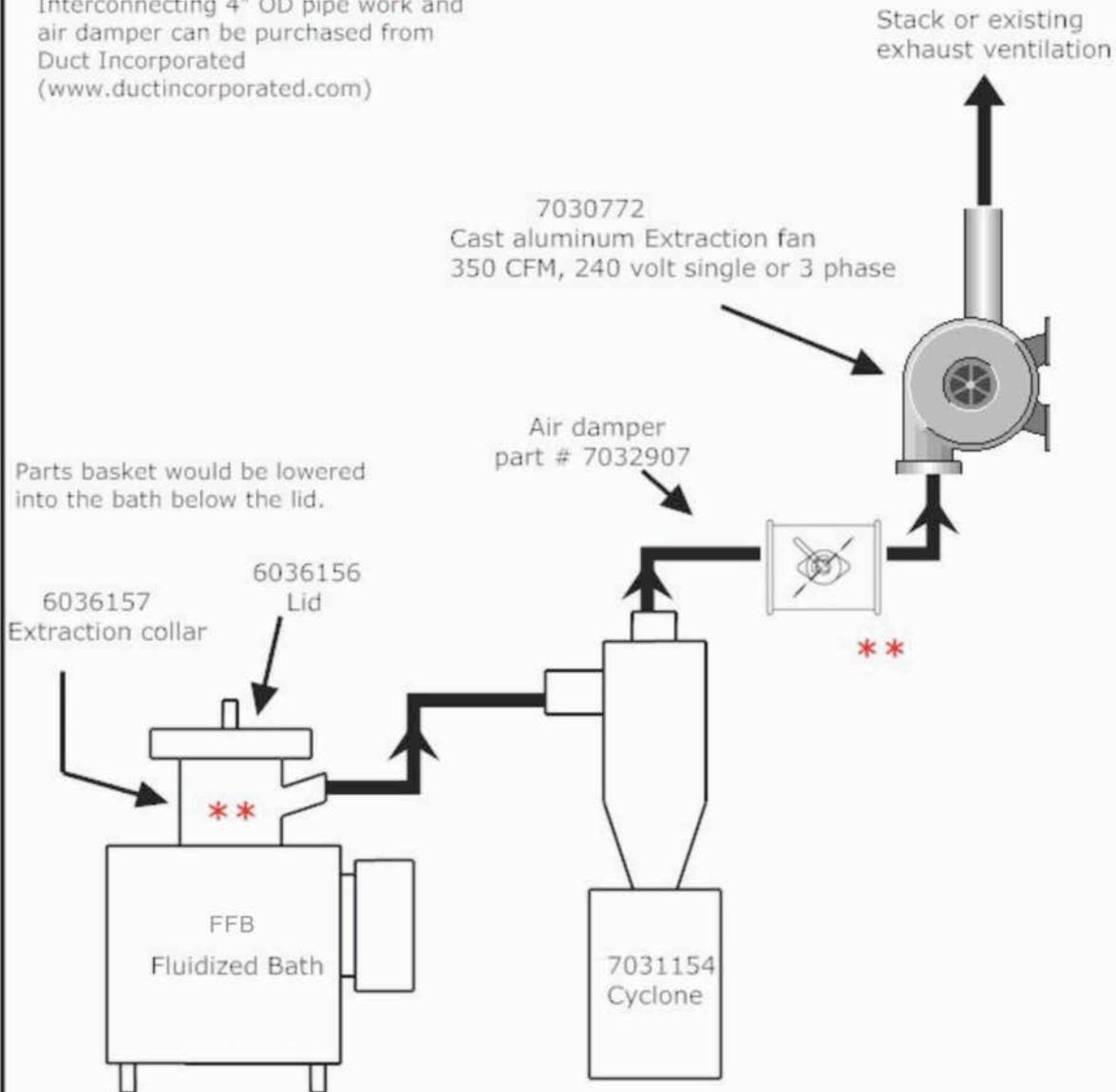


TITLE	<b>FFB52 WIRING DIAGRAM</b>
AUTHOR	Darren Sager
DATE	4/29/2010
SHEET	1 OF 2
REVISION	4.0

Revision record  
4.0 - 4/29/10 - Add cooling fan & solder leads to fuseholders only

## Omega Industrial Fluidized bath basic system layout

Interconnecting 4" OD pipe work and air damper can be purchased from Duct Incorporated ([www.ductincorporated.com](http://www.ductincorporated.com))



- \*\* With parts in the bath and lid on, the damper would be adjusted so fumes and smoke are pulled away from the bath and into the exhaust system. If the damper is open too much it would create a negative pressure in the bath working area resulting in significant heat and sand loss. The purpose of the Cyclone is to recover any sand pulled out and heavier deposits which can be sieved and reused.



## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

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## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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