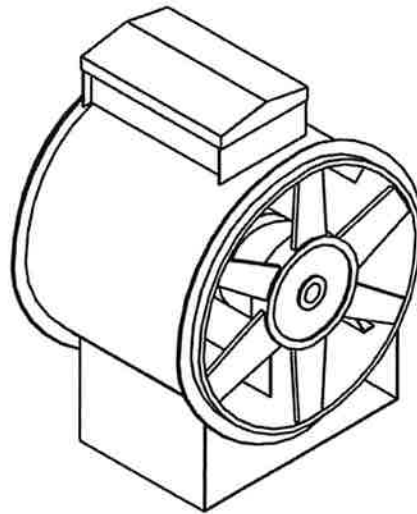


TURBO BOOSTER

**FOR
BLUE FLAME CROP DRYER**



Installation & Operating Instructions

For Models:

121A-001A -- 1 PHASE, 220V

121B-001A -- 3 PHASE, 220V

121C-001A -- 3 PHASE, 460V



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TABLE OF CONTENTS

	<u>PAGE</u>
INTRODUCTION	1
SAFETY INFORMATION	2-3
LOCATION OF SAFETY DECALS	4-5
IDENTIFICATION OF PARTS	6
MECHANICAL INSTALLATION	7
ELECTRICAL INSTALLATION	8-11
INCOMING POWER HOOKUP	8-9
CONTROL WIRING	9-11
INITIAL CHECKOUT	12
OPERATING INSTRUCTIONS	13
MAINTENANCE	14
TROUBLESHOOTING	15-16
SCHEMATICS	17-18

INTRODUCTION

COMPLETELY READ THIS MANUAL AND THE OPERATOR'S SAFETY MANUAL (P-10001), BEFORE INSTALLING OR USING THE TURBO BOOSTER.

The Turbo Booster uses a vane axial fan blade mounted on a 10-15 Hp, 3600 RPM, electric motor. It allows the Blue Flame crop dryer to operate in higher static pressure applications and will increase drying capacity. It can also be used as a stand alone aeration fan if ordered with a venturi and fan guard.

SAFETY INFORMATION

The operator of this machinery must assume the responsibility for his own safety, and that of those who are working with him. He must also make sure the equipment was installed properly. Factors that contribute to the overall safety of operation are: proper use, maintenance, and frequent inspection of the equipment. All of these are the operator's responsibility.

If any items covered in this manual are not completely understood, or there is a concern with the safety of the product, contact SHIVVERS Incorporated at the address shown on the front cover.

SHIVVERS is genuinely interested in providing the safest practical equipment to our customers. If you have a suggestion which you believe will enhance the safety of this product, please write us and let us know.



TAKE NOTE ANYTIME THIS SAFETY ALERT SYMBOL APPEARS. YOUR SAFETY, AND THAT OF PERSONS AROUND YOU IS AT STAKE.

The safety alert symbol will be accompanied by one of three signal words whose definitions are given as:

DANGER: Red and white. Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations, typically for machine components that, for functional purposes, cannot be guarded.

WARNING: Orange and black. Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION: Yellow and black. Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Be sure to observe these common sense rules when working with the dryer equipment:

- 1). All units must be equipped with a main power disconnect switch. This disconnect switch must shut power off to the complete drying system. It must have the capability of being locked into the OFF or OUT position. Disconnect and **LOCK OUT** this main power disconnect switch before conducting any inspection, maintenance, repair, adjustment, or cleaning of the drying system. When you must have the electrical power on to troubleshoot equipment, do it from a safe distance, and always from outside the bin.
- 2). Keep the bin entrances locked at all times. To unlock the bin, first lower the Level-Dry (if so equipped), then shut the main power disconnect off. Take the safety lock off the bin entrance and place it on the main power disconnect before opening the bin entrance. **Never enter the drying bin unless the Level-Dry (if so equipped), is completely lowered, and all power is disconnected and locked out.**
- 3). Always keep all shields and guards in place. If shields or guards must be removed for inspection or maintenance, replace them before unlocking and turning the power back on.
- 4). Be sure everyone is clear of all the drying and transferring equipment, and outside of all bins, before unlocking and turning the power on. Some equipment may run upon re-application of power.
- 5). Make sure that all decals are in place and are easy to read. Do not operate the equipment with missing or illegible decals. If replacements are needed, contact SHIVERS Incorporated or your dealer.
- 6). Prior to use, inspect all equipment to insure that it is in good operating condition. Do not operate with missing, damaged, or worn parts. Use only SHIVERS approved replacement parts.
- 7). Metal edges can be sharp. Wear protective clothing and handle equipment and parts with care.
- 8). Keep children and bystanders away from drying and transferring equipment at all times.
- 9). If going up the bin ladder and/or performing maintenance on the top of the bin, take precautions to prevent accidental falls. When on top of the bin, wear a safety harness or other safety device.
- 10). At least annually, review all operating and safety manuals with any personnel working with this equipment. Always train new employees before they operate the drying equipment. Insist that they read and understand the operating and safety manuals.

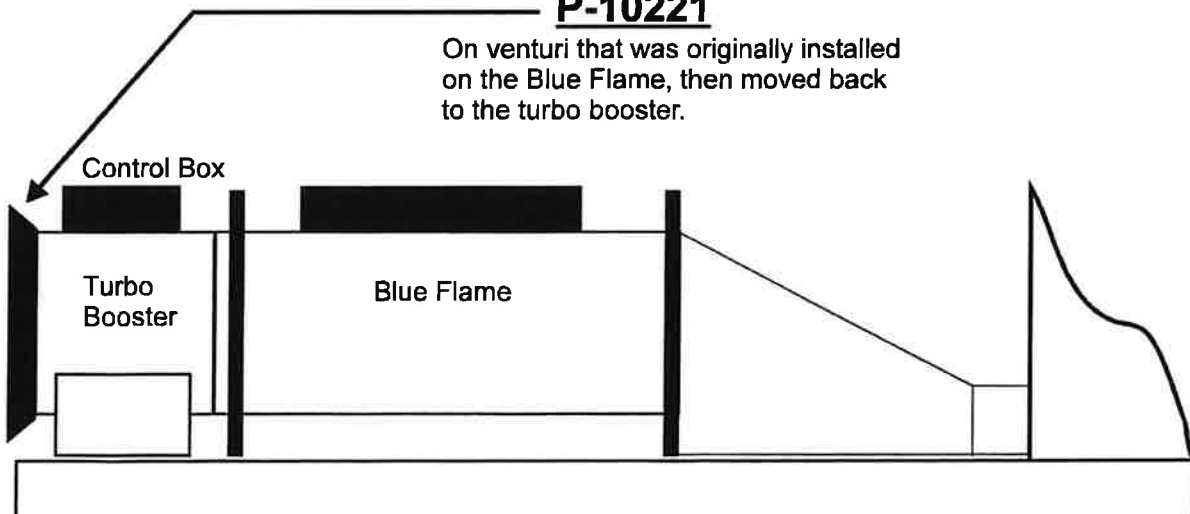
LOCATION OF SAFETY DECALS

This manual shows the location of safety decals that apply to the Turbo Booster. For complete instructions on where to find safety decals for other installed equipment consult your Operator's Safety Manual (P-10001).



P-10221

On venturi that was originally installed on the Blue Flame, then moved back to the turbo booster.



Location of safety decals, cont'd:



P-10367



P-11146

Both decals are located on top of the turbo booster control box.

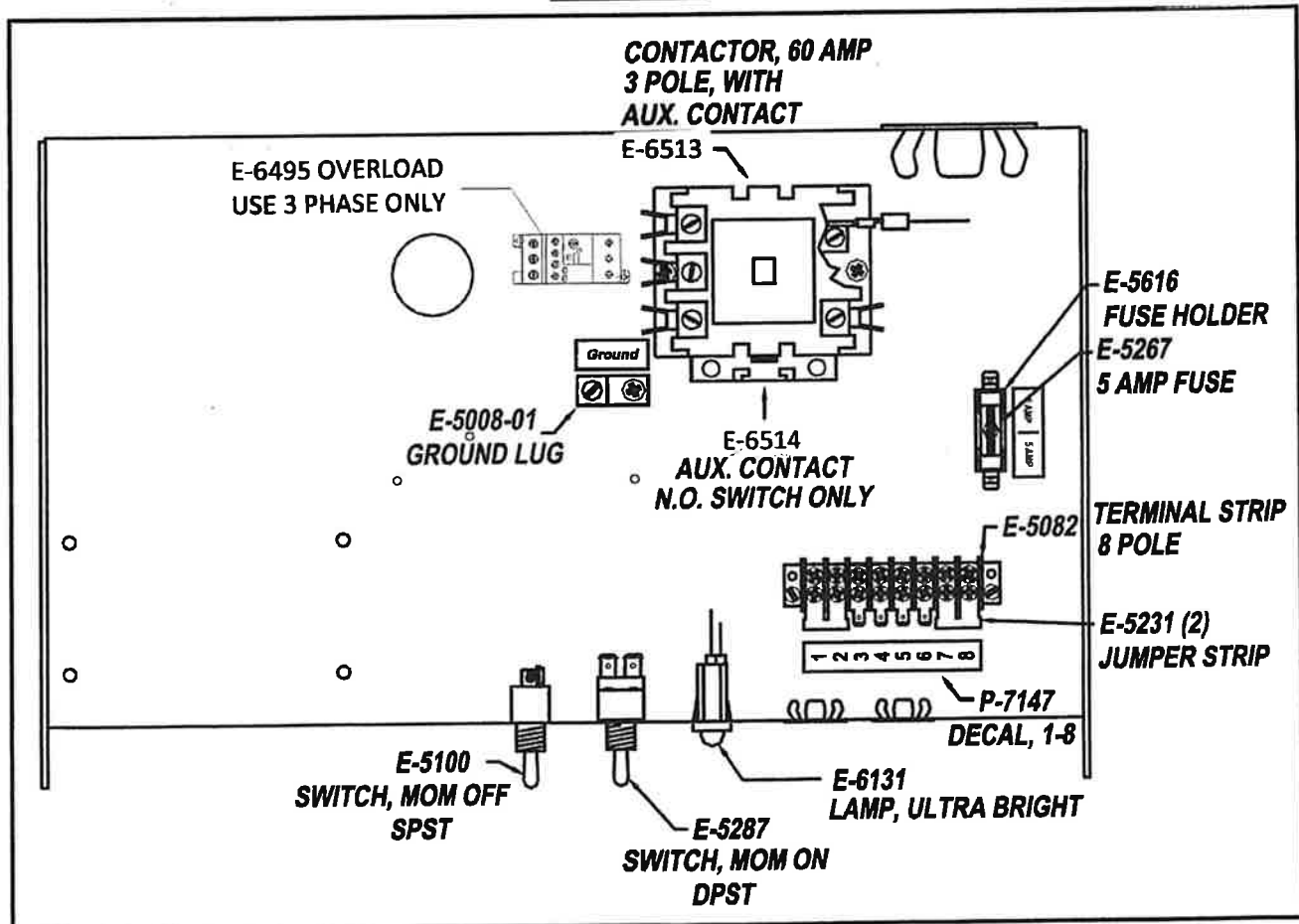
IDENTIFICATION OF PARTS

See the Operator's Safety Manual (P-10001) for definitions, proper use of safety locks and disconnects, and proper bin unloading procedures. Refer to other installed equipment manuals for a complete understanding of the total drying and grain handling system.

TURBO BOOSTER MECHANICAL PARTS

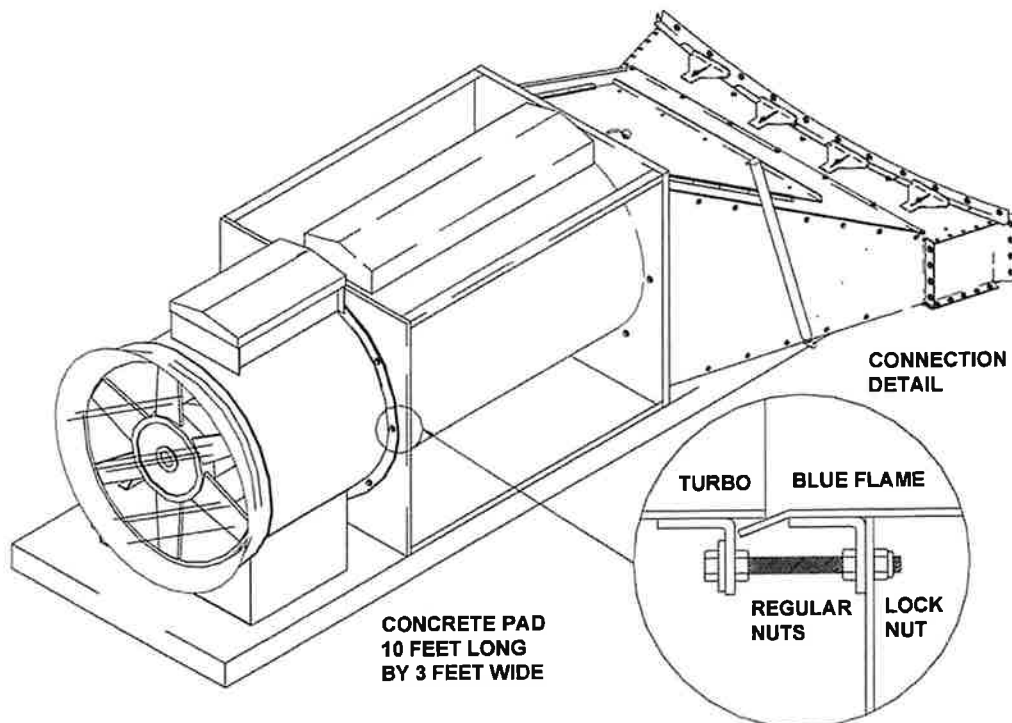
- Fan Motor, 1 Phase (M-5241)
- Fan Motor, 3 Phase (M-5242)
- Fan Blade, balanced, with trantorque bushing (423-324-001A)
- Control Box, 1 or 3 Phase (121-019A) (From January 2004 until present)
 - Control Box, 1 Phase (121A-005A) (Until January 2004)
 - Control Box, 3 Phase (121B-005A) (Until January 2004)
 - Control Box, 460 Volt (121C-005A) (Until January 2004)
- Fan Guard & Venturi Assembly (supplied with Blue Flame) (69-463A)

TURBO BOOSTER CONTROL BOX 121-019A



MECHANICAL INSTALLATION

- a). See the Blue Flame Instruction Manual for proper bin and fan locations.
- b). It is recommended to use only Shivers entrance collars and transitions. Follow instructions provided with transitions for their installation. For drying bins with more than one Blue Flame, air dampers are required to prevent reverse airflow.
- c). Concrete pads for Blue Flames with Turbo Boosters should be 10 feet long by 3 feet wide. Pads should be flush and level with the top of the bin concrete. Place footers under the pads and use re-rod to keep the pads from cracking and moving.
- d). Install the Blue Flame as per the Blue Flame Instruction Manual.
- e). Make sure all drying system power is off and locked out. Remove the fan guard and venturi ring assembly from the Blue Flame.
- f). Bolt the Turbo Booster to the Blue Flame as shown. Spin each fan blade by hand to make sure there isn't any interference with either blade. Shim housings or motor mounts as required.
- g). Install the fan guard and venturi ring assembly onto the Turbo Booster.
- h). Secure both the Blue Flame and the Turbo Booster to the concrete pad.



ELECTRICAL INSTALLATION

ALL ELECTRICAL WIRING SHALL BE INSTALLED IN COMPLIANCE WITH THE LATEST EDITION OF THE ANSI/NFPA STANDARD 70, NATIONAL ELECTRICAL CODE, AS A MINIMUM REQUIREMENT, AND IN COMPLIANCE WITH LOCAL WIRING CODES AS APPLICABLE.

WIRING MUST BE DONE BY A COMPETENT ELECTRICIAN. A LICENSED ELECTRICIAN IS RECOMMENDED, AND MUST BE USED WHEN REQUIRED BY LOCAL OR STATE STATUTES.



Disconnect and lock out all power before wiring.

INCOMING POWER HOOKUP

- 1). The Turbo Booster fans are built for either 220 Volt single phase, 220 Volt three phase, or 460 Volt three phase, input. They use 115 Volt control voltage. The fan motors are rated 10-15 Horsepower (normally referred to as 13 Hp). For 440 Volt three phase applications, a 0.5 kVA control voltage transformer (available from Shivers) must be installed in the Blue Flame for the control voltage. If it is not possible to obtain 115 Volts from one leg of the 220 Volt three phase, the 0.5 kVA control voltage transformer will also be required. Contact the factory if more information is required.
- 2). A circuit breaker must be installed in line with the incoming power to the Turbo Booster control box. The circuit breaker should break all lines if an overload occurs on any single line. An inverse time delay circuit breaker is recommended to handle the motor inrush current while starting the fan. The breaker can be up to 2.5 times the motor nameplate full load amps. Aluminum wire is not recommended, but if used, the wire size must be increased. If the distance from the power company transformer, or the Turbo Booster circuit breaker, is greater than 100 feet, it may be necessary to increase the wire sizes.
- 3). An access hole is provided in the control box for the incoming wiring conduit. If the conduit is attached to the bin wall, keep it at least 3 feet above the foundation to keep the ambient temperature lower. If the bin side wall will be covered with insulating foam, make sure the electrical conduit is not under the foam. When running the conduit from the bin wall to the Turbo Booster, make sure it does not interfere with air damper operation. Make sure it does not block access through the transition lid. Make sure it does not touch the entrance collar or transition as these can get hot. It is recommended to use a flexible conduit to the Turbo Booster. Leave enough flex in the conduit so the Turbo can be removed to allow servicing of the Blue Flame fan motor.

13 Hp TURBO BOOSTER INCOMING POWER WIRING

<u>Voltage</u>	<u>Phase</u>	<u>Max Full Load Amps</u>	<u>Min. Breaker Size</u>	<u>Min. Copper Wire Size</u>	<u>Min. Conduit Size</u>
220V	1	60	100 AMP	4 AWG	1-1/4 inch
220V	3	40	60 AMP	6 AWG	1 inch
440V	3	20	30 AMP	10 AWG	3/4 inch

- 4). It is necessary to have an incoming ground wire (marked green) with the incoming power leads. It should not be more than 1 size smaller than the incoming power leads. It should be connected to earth ground at the breaker panel and at the grounding terminal in the Turbo Booster control box.
- 5). It is not normally necessary to have an incoming neutral (white) wire with the incoming power leads for the 115 Volt control circuits. The neutral connection is normally made in the control wiring to the Blue Flame.
- 6). The incoming power leads are connected to the motor contactor in the Turbo Booster control box.
- 7). The Turbo Booster control power is connected at the factory to one lead of the motor contactor. Normally, this connection is removed and the turbo booster gets its control power from the Blue Flame. If it is not removed, for 3 phase units, make sure this is not connected to the wild leg (a leg with the highest voltage when measured to ground or neutral). If a control voltage transformer is used, the control power wire is removed from the contactor and placed on the transformer secondary. Make sure the control circuitry is not exposed to more than 125 Volts maximum!

CONTROL WIRING

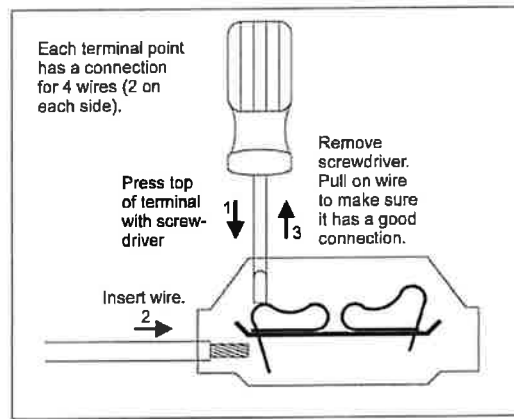
The control wiring will be based upon which Blue Flame the Turbo Booster is connected to. The wiring shown here is for connection to the two most common Blue Flames manufactured by Shivvers. If another fan is used, consult the factory for assistance.

In general, the Turbo Booster should only start after the Blue Flame to which it is wired is already running. It will then shutdown whenever the Blue Flame shuts down.

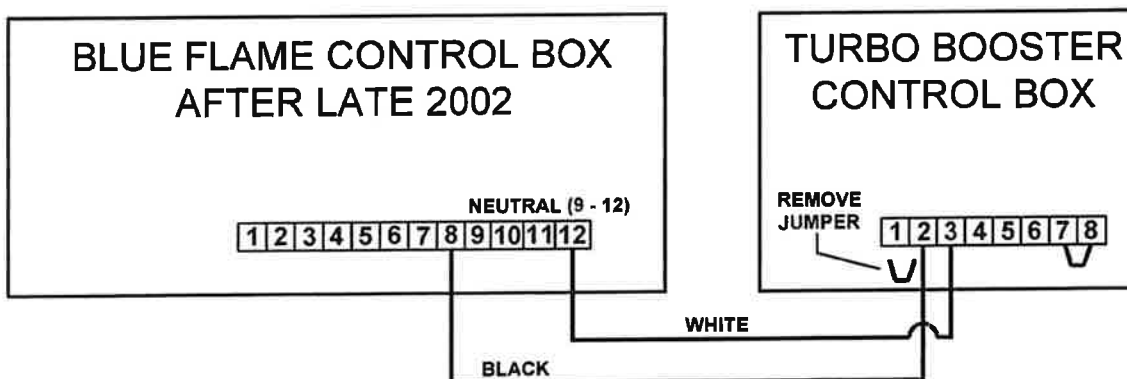
FOR TURBO CONNECTION TO BLUE FLAMES BUILT AFTER LATE 2002

Blue Flames built after late 2002 have a 12 pole terminal strip (numbered 1 thru 12) and use an electronic flame sense module to detect flame. All terminal numbers refer to the 12 pole terminal strip and not to the 8 pole terminal the flame sense module plugs into.

The Blue Flame 12 pole terminal strip is a spring cage clamp type. The following diagram shows how to properly connect the wires. Make sure the wire is lined up to go straight into the terminal before pressing on the spring.



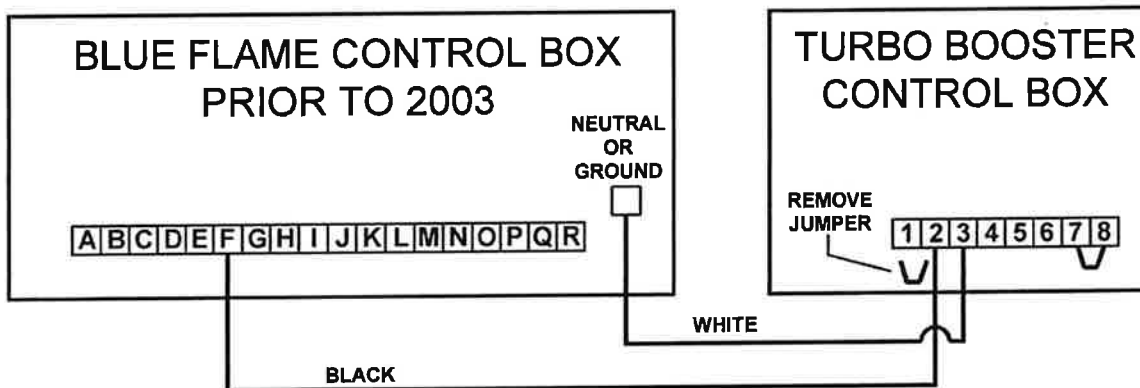
- 1). Connect flexible conduit from the Blue Flame control box to the Turbo Booster control box. Allow enough flex so the Turbo Booster can be removed to allow servicing of the Blue Flame fan motor. Run one black and one white, 16 or 14 AWG, stranded wires through the conduit.
- 2). Remove the jumper from between terminals # 1 and # 2 in the Turbo Booster.
- 3). Connect black wire from Blue Flame terminal # 8 to Turbo Booster terminal # 2.
- 4). Connect white wire from Blue Flame neutral terminal # 9, 10, 11, or 12 (they are all connected together) to the Turbo Booster terminal # 3.



FOR TURBO CONNECTION TO BLUE FLAMES BUILT BEFORE 2003

Blue Flames built before 2003 have an 18 pole terminal strip (lettered A thru R) and use a flame switch to detect flame.

- 1). Connect flexible conduit from the Blue Flame control box to the Turbo Booster control box. Allow enough flex so the Turbo Booster can be removed to allow servicing of the Blue Flame fan motor. Run one black and one white, 16 or 14 AWG, stranded wires through the conduit.
- 2). Remove the jumper from between terminals # 1 and # 2 in the Turbo Booster control box.
- 3). Connect the black wire from the Blue Flame terminal # F to the Turbo Booster terminal # 2.
- 4). Connect the white wire from the Blue Flame ground lug or neutral point (they are usually connected together) to the Turbo Booster terminal # 3.



INITIAL CHECKOUT

- 1). Once the wiring is completed, make sure the burner power switch is off on the Blue Flame. Make sure everyone is out of the grain bin and are safely away from all drying equipment, then unlock the main power. Lock the bin entrances shut, then turn on the main power. Follow the initial checkout procedure in the Blue Flame manual to make sure the Blue Flame is operating correctly. Then shut the Blue Flame off.
- 2). Use a screwdriver to press on the motor contactor in the Turbo Booster control box and check for proper rotation of the fan. Looking into the fan, rotation should be counter clockwise. Air should be blowing into the bin. When the motor contactor is released, the Turbo Booster should stop. If it doesn't, make sure the jumper is removed from between terminals # 1 and # 2 in the Turbo control box.
- 3). Press the fan start switch on the Turbo Booster. The Turbo Booster should not start with the Blue Flame off.
- 4). Turn on the Blue Flame fan switch. Once the Blue Flame is to speed, turn on the Turbo Booster fan switch. You should hear the turbo come up to speed and see the indicator light come on.
- 5). Press the Turbo Booster fan off switch. The turbo should slow down and the indicator light will go out. The Blue Flame will continue to run.
- 6). Turn on the Turbo Booster fan switch. You should hear the turbo come up to speed and see the indicator light come on.
- 7). Turn off the Blue Flame fan switch. Both the Blue Flame and Turbo Booster should shut off.
- 8). Disconnect and lock out the main power.

OPERATING INSTRUCTIONS

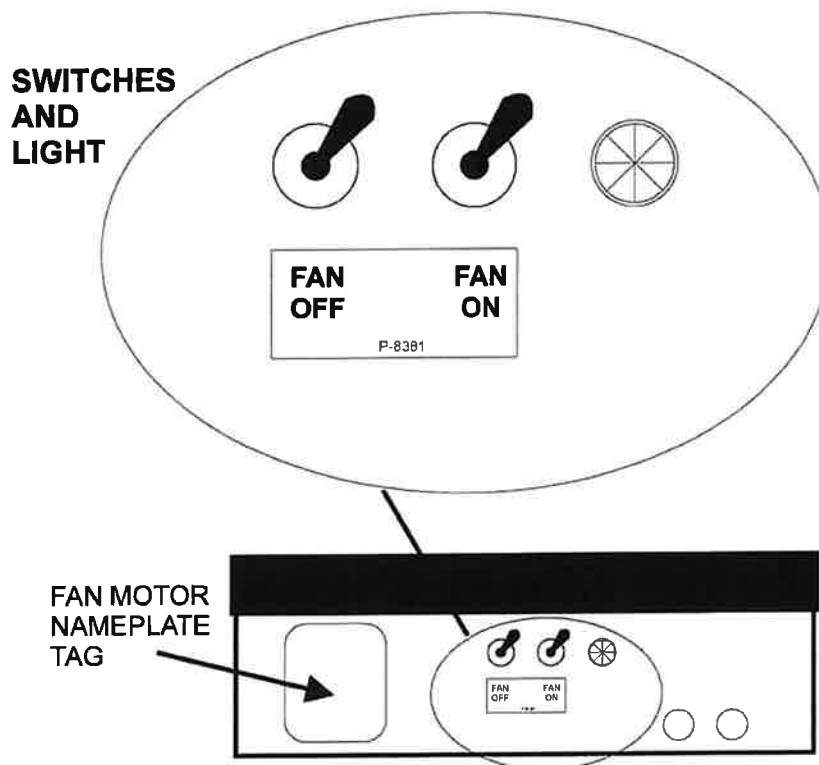
To Operate:

- 1). The Blue Flame fan must be running to provide power to the Turbo Booster. See the Blue Flame manual for instructions on starting it.
- 2). After the Blue Flame fan is at full speed, press the Turbo Booster Fan ON switch.
- 3). After the Turbo Booster fan is at full speed, turn on the Blue Flame burner switch. See the Blue Flame manual for additional instructions.

To Stop:

- 1). Turn off the Blue Flame burner switch, or turn off the gas and burn the gas in the lines, then turn off the burner switch. See the Blue Flame manual for additional instructions.
- 2). Press the Fan OFF switch on the Blue Flame. Both fans will stop. The fans can also be shut off separately by shutting off the Turbo Booster first, then the Blue Flame.

TURBO BOOSTER OPERATOR'S CONTROL PANEL



MAINTENANCE



DANGER

Disconnect and lock out all power before opening any control boxes or removing any shields. Make sure everyone is clear of all drying equipment before restoring power.

- 1). Once every month, start the fan to circulate the grease in the motor bearings. In the off season, do not allow the fan blades on single phase units to free wheel with the wind. It can wear a groove in the centrifugal start switch. Follow motor manufacturer's recommendations for re-lubricating motor bearings.
- 2). Prior to each drying season, make sure the fan blade rotates freely. Make sure the blade is not coated by any foreign material which could unbalance it or block airflow. If blade requires cleaning, make sure power is disconnected and locked out first!
- 3). Prior to each drying season, check to be sure all wiring connections are tight and that the insulation is good. Make sure there isn't any foreign material inside the magnetic motor contactor.
- 4). Maintain a clean operation. Clean up spilled corn, clean out fines under the bin floor (contact Shivvers about clean-out doors), keep all control boxes shut and replace seals if required. Control the rodent population. Control weeds and tall grasses around the Turbo Booster. They can get sucked in and block airflow or start a fire. They can interfere with damper operation.
- 5). During the drying season, check the transition dampers for free movement and proper operation.
- 6). At the end of the season, make sure the main power is disconnected and locked off. There will be fewer problems with lightning damage with all switches and breakers open.

TROUBLESHOOTING

 **DANGER**

Disconnect and lock out all power before opening any control boxes or removing any shields. Make sure everyone is clear of all drying equipment before restoring power.

Only qualified personnel should perform troubleshooting on energized circuits.

All terminal strip numbers refer to the 8 pole terminal strip in the Turbo Booster control box unless otherwise noted.

TURBO BOOSTER FAN WILL NOT START

- 1). Make sure the Blue Flame is running. It has to be started first.
- 2). Make sure the circuit breaker for the turbo is turned on. If it is not turned on, the motor contactor will pull in and the indicator light will come on, but the fan will not run.
- 3). Check 5 amp slow blow fuse.
- 4). Check for power on terminal #7 or #8 with the fan start switch held down. If no power, it could be a bad start switch or stop switch.
- 5). If there is power on terminals #7 and #8 with the fan start switch held down, check for power at the black wire on the Fan Motor Contactor Coil. If there isn't any power at the coil, the Fan Motor thermal switch (J-leads) is open. If motor isn't hot, the motor thermal switch may be defective.
- 6). If there is power on terminal #3 when the fan start switch is held down, there is an open neutral. Make sure terminal #3 is connected to a neutral.
- 7). If there is power at the black wire on the fan motor contactor coil, and not at the white neutral wire on the contactor coil, when holding down the fan start switch, then the contactor coil is open and will need to be replaced.

Troubleshooting cont'd:

FAN WILL RUN ONLY WHILE START SWITCH IS HELD DOWN

(stops when start switch is released)

- 1). Defective (open) auxiliary switch on contactor.

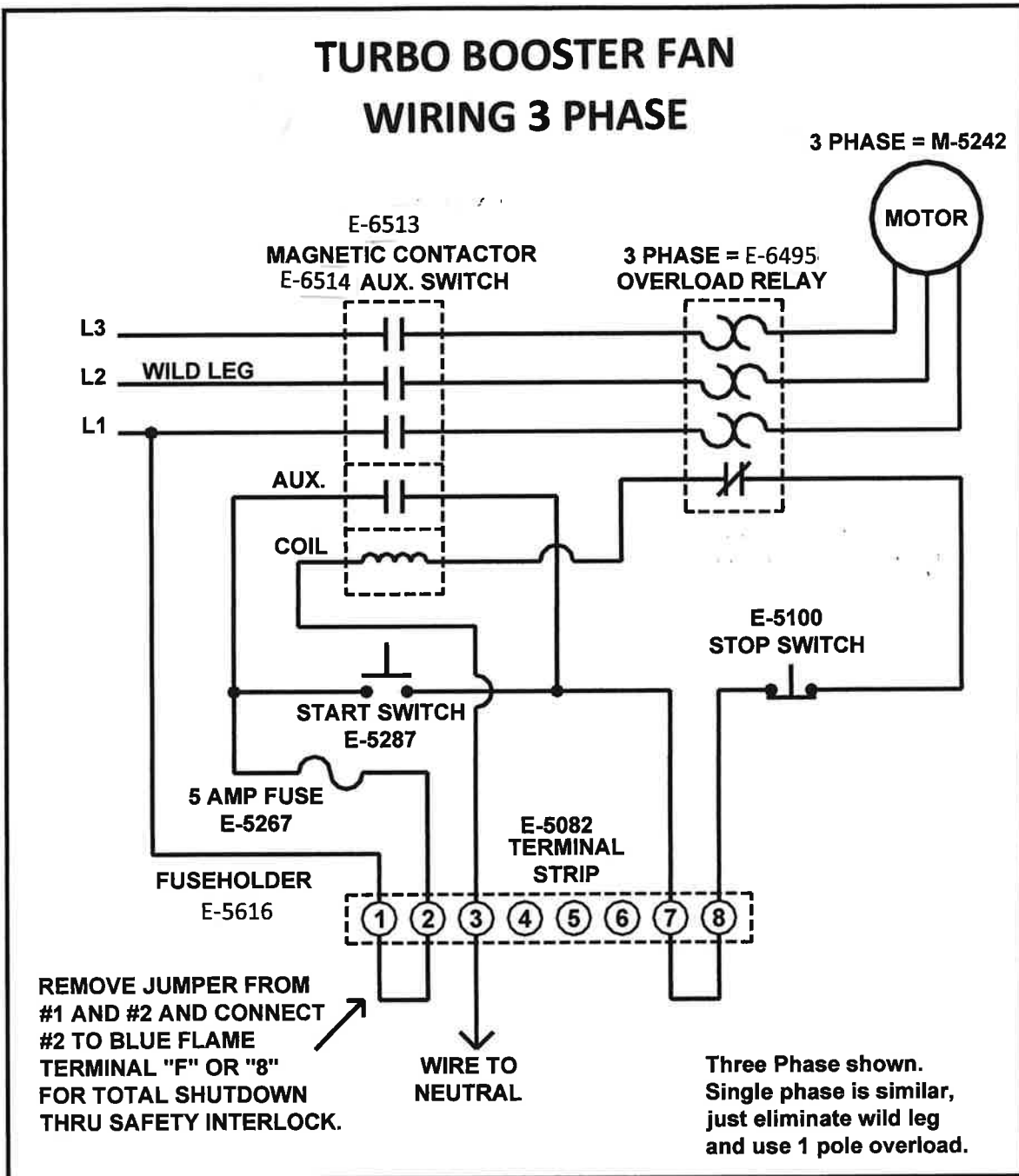
FAN WILL STOP ONLY WHILE STOP SWITCH IS HELD DOWN

(starts back up when stop switch is released)

(starts at same time Blue Flame starts)

- 1). Defective (shorted) auxiliary switch on contactor.
- 2). Defective (shorted) fan start switch.

SCHEMATICS



TURBO BOOSTER FAN WIRING 1 PHASE

1 PHASE = M-5241

