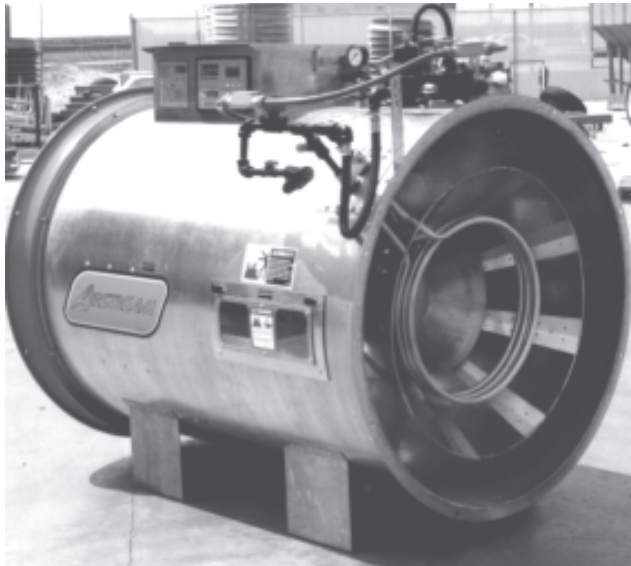




Series 2000 Top Dry Heater Control

Operator's Manual

PNEG-743

Date: 5-3-2006



PNEG-743

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Heater Operation

Thank you for choosing a GSI product. It is designed to give excellent performance and service for many years.

This manual describes the operation of the Series 2000 Top Dry Heater Control Unit. Different models are offered, including a 36" diameter and a 42" diameter, with a choice of horsepower available on the fan motor.

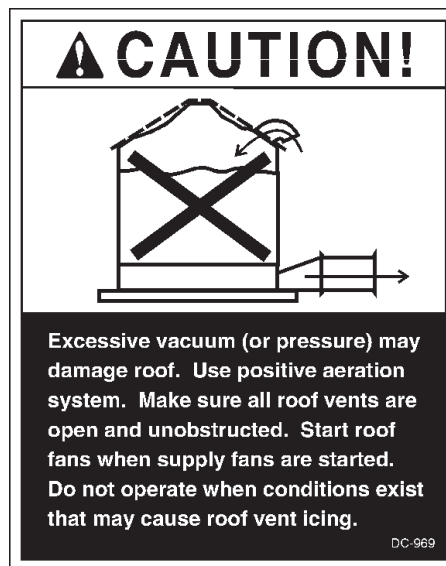
The principal concern of the GSI Group, Inc. ("GSI") is your safety and the safety of others associated with grain handling equipment. This manual

is written to help you understand safe operating procedures, and some of the problems that may be encountered by the operator or other personnel.

As owner and/or operator, it is your responsibility to know what requirements, hazards and precautions exist, and to inform all personnel associated with the equipment, or who are in the heater area. Avoid any alterations to the equipment. Such alterations may produce a very dangerous situation, where serious injury or death may occur.

Roof Damage Warning

GSI cannot warrant any roof damages due to excessive vacuum or internal pressure caused by fans or other air moving systems. Adequate ventilation and/or "makeup air" devices should be provided for all powered air handling systems. GSI does not recommend the use of downward flow systems (suction). Severe roof structural damage can result from any blockage of air passages. Running of fans during certain high humidity/cold weather conditions can cause freezing over of air exhaust or intake ports.



The GSI Group, Inc. recommends contacting your local power company, and having a representative survey your installation so the wiring is compatible with their system, and adequate power is supplied to your unit.

Safety decals should be read and understood by all people in the grain handling area. The bottom right decal should be present on the inside bin door cover of the two ring door, 24" porthole door cover and the roof manway cover.

If a decal is damaged or is missing contact:

The GSI Group, Inc.
1004 E. Illinois St.
Assumption, IL 62510
217-226-4421

A free replacement will be sent to you.





The control panel of the Top Dry heater unit.

Setup And Configuration

There are three possible configuration modes for the Top Dry.

1. *Stand alone heater control.* Master control is located on fan/heater and no other control is necessary. Running fan/heater in this mode requires climbing up to fan/heater to start unit and adjust controls.

2. *Econo control center.* In this case the control is located up on the fan/heater and has been pre-programmed. Power is then applied from a switch below. The start switch is a momentary switch that is attached to J7-7 connector. The dryer is started by depressing that momentary switch. Note, that in this mode, the display is remote, therefore error conditions will shut the dryer down but cannot be viewed unless you climb up and look at the display.

3. *Manual control center.* In this case the master control is up on top where all the sensors and limits are attached. The remote display below is attached via a serial 2 wire link. The remote display is used to program the master, view errors and start the dryer. In essence, the remote display is just a slave extension of the master.

Power Up

Limit switches are checked upon power up. The control checks all the limit switches. If a limit switch has become open circuit the control displays which limit is open circuit. The control will not operate with a limit switch error. The fan will not turn on with an error condition. There is no way to bypass an error condition. It must be fixed (see errors page 22). The air switch is also checked on power up. The air switch should indicate no airflow. This is necessary to check the function of the air-flow switch. The air switch error on power up cannot be bypassed since, in the Top Dry system, the fan is controlled by the heater control.

If multiple heaters are tied together, and the master detects that the slaves fan is on (the air switch stuck?), the master will lock up displaying "SLA ERROR".

Normal Operating Displays Heater Not Running

The main display shows either dry time (lower left cursor), cool down time (lower 2nd from left cursor), plenum (lower 2nd from right cursor) or grain temperature (lower right cursor). *The "mode select" switch (fan bypass) is used to select the mode to be*

displayed. Note, that the cursors don't flash when in the normal display. They do flash when in the program mode.

The dry and cool time shown on the display is "AIRFLOW" or "NO AIRFLOW" is displayed if air is flowing or not flowing. "RX TX" is displayed if there is a master with remote.

The limits are continuously checked during the off mode. A limit switch open or any other error condition will cause the display to show the limit or error condition. When the dryer is not running, if the limit or error condition is corrected, the LCD returns to its normal display. This is not the case with an error or limit condition during the drying operation. This causes the display to lock up in the error display mode, the dryer stops running, and the error must be corrected. The toggle switch must then be shut off and

turned on again (see section on "Running the Dryer" page 18, for mode explanation).

Programming Top Dry Plenum And Grain Temperatures

Depress the program temperature switch on either the master or remote. The upper left cursor will be flashing. Use the up and down arrow switches to program the temperature.

This first temperature setting is the temperature at which the entire burner shuts off--no flame. Depressing the program switch again will cause the display to advance to setting the cycle temperature (upper 2nd from left cursor flashing). This temperature setting is the temperature above which the heater goes to low flame. Depressing the program switch again will cause the display to advance to the grain temperature limit setting (upper 2nd



Setting the plenum hi limit on the control box.

from right cursor flashing). When the grain temperature gets to this point (or dry timer times down), the heater control advances to the cool cycle. If no cool time is programmed in, the dryer shuts down when the grain gets to that temperature. Depressing the program switch again will cause the display to advance to setting the differential temperature setting (upper right cursor flashing). This differential is basically hysteresis. When

main or cycle solenoids shut off due to exceeding the temperature set point, that burner will not come on again until the temperature falls below the set point minus temperature differential. Depressing the program switch again will cause the control to exit the program mode.



Programming Top Dry-Dry And Cool Timers

Depressing the program dry and cool times switch will cause the lower left cursor to begin flashing, indicating a new dry time may be entered. This dry time is the length of time the heater will run in the dry mode (burners controlling to the temperature set in the above program mode). This time can be set from 1.0 hours to 20.0 hours. Depressing the program dry and cool times switch again will cause the lower 2nd from left cursor to begin flashing.

Setting the dry time on the control box.

This is the cool period. When the burners get shut down due to the dry timer timing out, or grain reaching temperature set point, the fan continue to run cool. This cool time can be set from 0.0 hours to 20.0 hours. **If set to 0.0 hours, there is no cool period.** Depressing the program dry and cool times switch again will cause the control to exit the program mode.

Programming Top Dry Fan Delay For Slaves

Fan delay time is the amount of time in seconds between the fans starting. Power up with the "Program Dry/Cool Timers" and "Program Temperatures" switches depressed to adjust the programmable to adjust the programmable delay for Top Dry fans.

The dry time and cool time "carrots" on the display both flash indicating it is in the program delay time mode.

Note: This can only be done on the master.

Setting Gas Pressure

1. At fan/heater turn toggle switch to "ON" position. If using a remote display or econo start, place that toggle switch in the "ON" position also.
2. Press the increase and decrease buttons at the same time to reset.
3. Press the "PROGRAM TEMPERATURE" button.
4. Use the increase or decrease button to set the "PLENUM HIGH LIMIT SET POINT" to desired setting (160°-200°).
5. Press the "PROGRAM TEMPERATURE" button to continue to set the "CYCLE SET POINT".
6. Use the increase or decrease buttons to set the "CYCLE SET POINT" to desired setting (140°-180°).



Set grain temperature on control panel display.

Airflow and purging on control panel display.



7. Press the "PROGRAM TEMPERATURE" button to continue to set the "GRAIN TEMPERATURE SET POINT".
8. Use the increase or decrease buttons to set "GRAIN TEMPERATURE SET POINT" to 140°.
9. Press the "PROGRAM TEMPERATURE" button to continue to set the "TEMPERATURE DIFFERENTIAL".
10. Use the increase or decrease buttons to set the "TEMPERATURE DIFFERENTIAL" to 10°.
11. Open all manual gas shut off valves, on and to the fan/heater unit.
12. Press the start button.
13. Make sure that the blade is spinning in the right direction. If not place the toggle switch in the "OFF" position and correct the problem.
14. After the fan reaches full speed the display should read "AIRFLOW" in the upper right hand corner and "PURGING" in the lower left corner.
15. After 10 seconds the burner should ignite. If not, turn "OFF" the toggle switch and then back "ON". Repeat 12-15.
16. When the burner ignites the display should read "HI-FLAME" at the left of the display. Loosen the nut on the main regulator and turn screw in, to increase pressure and out to decrease pressure. The pressure gauge should be set at 10-15 lbs. for LP units, or 4-6 lbs. for natural gas units.

17. Press the "PROGRAM TEMPERATURE" button to change the temperature set points. Press it again to change the "CYCLE SET POINT". The display should read 160°.
18. Decrease the "CYCLE SETPOINT TEMPERATURE" until the heater cycles to low flame.
19. Open or close the low cycle ball valve until the gas pressure is 3-5 lbs. for LP, or 1-2 lbs. for natural gas.
20. Increase the cycle set point to return to high flame.
21. Turn off fan/heater by placing the toggle switch in the "OFF" position.
22. Repeat process on second fan/heater if applicable.
23. Watch heater run several minutes to make sure it cycles between hi and lo flame properly.
24. Hi-flame pressure should be adjusted so plenum reaches cycling temperature easily.
25. Lo-flame should be adjusted so temperature drops slowly, until switching back to high flame.

Running Fan Without Burner

1. To run fan without burner press the down arrow key then press the start key. This will start the fan without running the burner. The fan will run continuously until the toggle switch is shut off.

Running The Dryer

The display will indicate "FLAME" when flame is sensed. If no flame is sensed the "FLAME" message will be off. The display indicates what part of the cycle it is in. The display will indicate whether it is in the "HI-FLAME" or

"LO-FLAME" part of the cycle (see "Programming Top Dry Plenum And Grain Temperatures" page 15, for setting the HI/LO-FLAME temperature). If the temperature is above the high temperature setting, the flame will be off, the "FLAME" message will be out and the display will be flashing "OFF-CYCLE".

The limits are continuously checked during the drying operation. A limit switch open or any other error condition will cause the dryer to shut down, and then the fan will shutdown. If a limit opens or an error condition occurs during drying, the control will lockup in the error display mode. Power must be shut off and back on to clear the error condition, even when the error or limit that caused the shut down has been corrected.

The main display shows either dry run time (lower left cursor), cool down time (lower 2nd from left cursor), plenum (lower 2nd from right cursor) or grain temperature (lower right cursor). ***The "mode select" (fan bypass) is used to select the mode to be displayed.*** Note, that the cursors do not flash when in the normal display. They do flash when in the program mode (see page 18).

The dry and cool down shown on the display is the amount of time remaining in the dry or cool period. ***Note, that if unit is in the dry time period, you cannot view the cool time remaining, since the unit is not in the cool period.*** However, the cool period may be altered or viewed by entering the program mode. The same is true if the heater control is in the cool period. You cannot view the dry run time, since that time has already expired.

Run Hours Display

Run hours are recorded when the controller detects that the fan is on (airflow). The hours may be viewed by depressing the "HOURS" to get hours and "HOURS X 1000" to get the number of 1000 hours accumulated.

1. Raise chutes.
2. Fill drying chamber with grain.
3. Turn toggle switch at fan/heater to "ON" position. If using a remote display or economy start, place that toggle switch to the "ON" position also.
4. Push "PROGRAM (DRY/COOL TIMES)" button on the series 2000 control panel to enter program mode. Arrow should be flashing at lower left side of screen above "DRY TIME".
5. Set dry time using increase or decrease buttons as recommended for your grain type and moisture content (see drying rates chart page 20).
6. Push "PROGRAM (DRY/COOL TIMES)" button to continue to set the cool time. Arrow should be above "COOL TIME".
7. Set cool time desired by using increase or decrease buttons.
8. Push "PROGRAM (DRY/COOL TIMES)" button to exit programming mode.
9. Push "PROGRAM TEMPERATURES" button to enter temperature programming mode. Arrow should be flashing at upper left of screen under "PLENUM HIGH LIMIT SET POINT".
10. Use the increase or decrease buttons to set plenum high limit. High limit should be set 20 degrees higher than desired plenum temperature when drying.
11. Press "PROGRAM TEMPERATURES" button to continue to set "PLENUM CYCLE SET POINT".
12. Use the increase or decrease buttons to set plenum cycle set point. This is the desired plenum temperature for normal drying. Use the recommended plenum temperature for your grain type and moisture content.
13. Press the "PROGRAM TEMPERATURES" button to continue to set the "GRAIN TEMPERATURE SET POINT".
14. Use the increase or decrease buttons to set the grain temperature set point. On the first batch the set point should be 140°.
15. Press the "PROGRAM TEMPERATURES" button to continue to set the "TEMPERATURE DIFFERENTIAL".
16. Use the increase or decrease buttons to set the temperature differential. The recommended set point is 10°.
17. Press the "PROGRAM TEMPERATURES" button to exit the program mode.
18. Press the increase and decrease buttons at the same time to reset current settings.
19. Once all times and temperatures have been set press the start button to begin drying.
20. Monitoring of the plenum, grain temperatures, dry time and cool times is possible by pressing the mode select button to alternate between modes.
21. Immediately after the burner shuts off and the dryer is in the cool cycle, take note of the current grain temperature.
22. When the dryer shuts down enter this grain temperature in place of the 140° grain temperature set point entered earlier.
23. Dump batch.
24. After dumping the batch test the moisture content of the grain. Average several samples. When computing moisture content make allowances for cooling of the grain.
25. If the grain moisture content is lower than desired, lower the dry time by 20% and repeat steps 18-23 again on next batch.
26. If the grain moisture content is higher than desired, increased dry time by 30% and repeat steps 18-23 again on next batch.
27. If the grain moisture content is within the desired range, increase the dry time by 20% on the next batch. This insures that the burner will turn off at the proper grain temperature and allows for a wetter batch.
28. After changing times press the increase and decrease buttons at the same time to reset.

DRYING RATES/SHELLED CORN Series 2000 Top Dry Heater Control

Top Dry Batch Series

			18' diameter 1 fan		21' diameter 1 fan		24' diameter 1 fan		27' diameter 1 fan		27' diameter 2 fan	
Fan and heater unit(s)	Plenum temperature (fahrenheit)	Moisture removal %	BU/HR	Batch time hours	BU/HR	Batch time hours	BU/HR	Batch time hours	BU/HR	Batch time hours	BU/HR	Batch time hours
10-12 H.P. 36" fan 3.5 million BTU/HR	140	5%	283	1.9	321	2.3	356	2.8	385	3.1	569	2.1
		10%	180	3.0	203	3.6	226	4.4	244	4.9	369	3.3
		15%	112	4.8	126	5.9	141	7.1	152	7.9	225	5.3
	160	5%	338	1.6	382	1.9	425	2.4	460	2.6	678	1.8
		10%	214	2.5	242	3.1	269	3.7	291	4.1	441	2.7
		15%	134	4.0	151	4.9	168	6.0	182	6.6	269	4.5
	180	5%	433	1.2	490	1.5	*	*	*	*	869	1.4
		10%	274	2.0	310	2.4	*	*	*	*	564	2.1
		15%	171	3.2	194	3.8	*	*	*	*	343	3.5
10-16 H.P. 36" fan 4.5 million BTU/HR	140	5%			357	2.1	398	2.5	448	2.7	638	1.9
		10%			226	3.3	252	4.0	284	4.2	393	3.1
		15%			141	5.2	157	6.4	177	6.8	252	4.8
	160	5%			426	1.7	474	2.1	534	2.2	761	1.6
		10%			270	2.7	300	3.3	338	3.6	469	2.6
		15%			168	4.4	187	5.3	211	5.7	301	4.0
	180	5%			545	1.4	607	1.6	*	*	974	1.2
		10%			345	2.1	384	2.6	*	*	600	2.0
		15%			215	3.4	240	4.2	*	*	386	3.1
10-16 H.P. 42" fan 5.75 million BTU/HR	140	5%					486	2.1	543	2.2		
		10%					308	3.2	344	3.5		
		15%					192	5.2	214	5.6		
	160	5%					580	1.7	648	1.9		
		10%					367	2.7	410	2.9		
		15%					230	4.3	256	4.7		
	180	5%					742	1.3	829	1.4		
		10%					470	2.1	525	2.3		
		15%					294	3.4	328	3.7		
20 H.P. 42" fan 6.75 million BTU/HR	140	5%					504	2.0	562	2.1		
		10%					319	3.1	356	3.4		
		15%					199	5.0	222	5.4		
	160	5%					602	1.7	671	1.8		
		10%					381	2.6	425	2.8		
		15%					238	4.2	266	4.5		
	180	5%					770	1.3	859	1.4		
		10%					487	2.1	544	2.2		
		15%					305	3.3	340	3.5		
30 H.P. 42" fan 8.75 million BTU/HR	140	5%							602	2.0		
		10%							381	3.1		
		15%							238	5.0		
	160	5%							718	1.7		
		10%							455	2.6		
		15%							284	4.2		
	180	5%							919	1.3		
		10%							582	2.1		
		15%							363	3.3		
40 H.P. 42" fan 10.25 million BTU/HR	140	5%							686	1.7		
		10%							434	2.8		
		15%							271	4.4		
	160	5%							819	1.5		
		10%							519	2.3		
		15%							324	3.7		
	180	5%							1,048	1.1		
		10%							664	1.8		
		15%							414	2.9		

*Indicates insufficient burner BTUs.

Estimated at ambient temperature 45 degrees F, relative humidity 65%.

Use only as a guide, conditions will vary capacities.

1/4 cfm cooling.

Series 2000 Top Dry Heater Control **DRYING RATES/SHELLED CORN**

Top Dry Batch Series

			30' diameter 1 fan		30' diameter 2 fan		36' diameter 1 fan		36' diameter 2 fan	
Fan and heater unit(s)	Plenum temperature (fahrenheit)	Moisture removal %	BU/HR	Batch time hours	BU/HR	Batch time hours	BU/HR	Batch time hours	BU/HR	Batch time hours
10-12 H.P. 36" fan 3.5 million BTU/HR	140	5%	396	3.8	629	2.4			741	2.9
		10%	251	6.0	398	3.8			469	4.6
		15%	157	9.5	249	6.0			293	7.3
	160	5%	473	3.2	751	2.0			884	2.5
		10%	299	4.9	475	3.2			560	3.9
		15%	187	8.0	297	5.1			350	6.1
	180	5%	*	*	961	1.5			*	*
		10%	*	*	609	2.5			*	*
		15%	*	*	380	3.9			*	*
10-16 H.P. 36" fan 4.5 million BTU/HR	140	5%	461	3.3	728	1.9	521	4.1	841	2.6
		10%	292	5.1	461	3.3	330	6.5	533	4.0
		15%	182	8.2	288	5.2	206	10.4	333	6.5
	160	5%	550	2.8	869	1.8	622	3.4	1,004	2.1
		10%	348	4.4	550	2.7	394	5.4	636	3.4
		15%	218	6.8	344	4.4	246	8.7	397	5.4
	180	5%	*	*	1,112	1.4	*	*	1,284	1.6
		10%	*	*	704	2.1	*	*	814	2.7
		15%	*	*	440	3.4	*	*	508	4.2
10-16 H.P. 42" fan 5.75 million BTU/HR	140	5%	562	2.7			650	3.3	1,022	2.1
		10%	356	4.2			411	5.2	647	3.3
		15%	222	6.7			257	8.4	404	5.3
	160	5%	670	2.2			775	2.8	1,219	1.8
		10%	425	3.5			491	4.4	772	2.8
		15%	265	5.6			306	7.1	482	4.5
	180	5%	858	1.8			*	*	1,560	1.4
		10%	543	2.7			*	*	988	2.2
		15%	339	4.4			*	*	617	3.5
20 H.P. 42" fan 6.75 million BTU/HR	140	5%	599	2.5			674	3.2	1,058	2.0
		10%	379	3.9			427	5.1	670	3.2
		15%	237	6.4			267	8.0	418	5.2
	160	5%	715	2.1			805	2.7	1,262	1.8
		10%	453	3.3			510	4.2	799	2.7
		15%	283	5.3			318	6.7	499	4.4
	180	5%	915	1.6			*	*	1,615	1.3
		10%	580	2.6			*	*	1,023	2.1
		15%	362	4.1			*	*	639	3.4
30 H.P. 42" fan 8.75 million BTU/HR	140	5%	638	2.4			717	2.9	1,142	1.9
		10%	405	3.6			454	4.7	723	2.9
		15%	253	5.9			284	7.5	452	4.7
	160	5%	762	2.0			856	2.5	1,363	1.5
		10%	482	3.1			542	4.0	863	2.5
		15%	302	4.9			338	6.4	539	4.0
	180	5%	975	1.5			1,095	2.0	1,744	1.3
		10%	618	2.4			694	3.1	1,105	2.0
		15%	386	3.9			433	4.9	690	3.2
40 H.P. 42" fan 10.25 million BTU/HR	140	5%	726	2.1			810	2.7		
		10%	460	3.3			513	4.2		
		15%	287	5.2			320	6.7		
	160	5%	867	1.8			966	2.2		
		10%	549	2.7			612	3.5		
		15%	343	4.4			382	5.6		
	180	5%	1,110	1.4			1,236	1.8		
		10%	702	2.1			783	2.7		
		15%	439	3.4			489	4.4		

*Indicates insufficient burner BTUs.

Estimated at ambient temperature 45 degrees F, relative humidity 65%.

Use only as a guide, conditions will vary capacities.

1/4 cfm cooling.

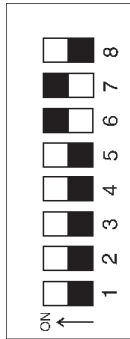
Configuration Dip Switches (Normally Done At Gsi)

These switches are used to configure the heater control for various types of heaters.

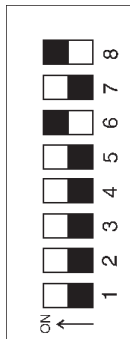
Multiple heaters connected together through the serial link.



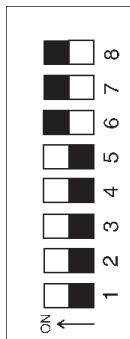
Top Dry stand alone with **no** remote display at the bottom-dip switch 6 on/all others off.



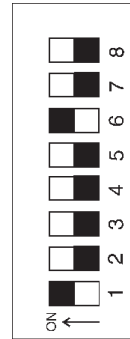
Top Dry master with a remote display at the bottom-dip switch 6 & 7 on/all others off.



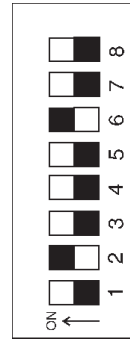
Top Dry master with a remote display at the bottom and one slave fan heater-dip switch 6 & 8 on/all others off.



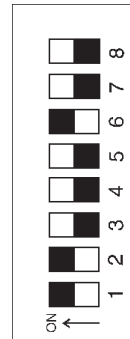
Top Dry master with a remote display at the bottom and 2 slave fan heater-dip switch 6, 7 & 8 on/all others off.



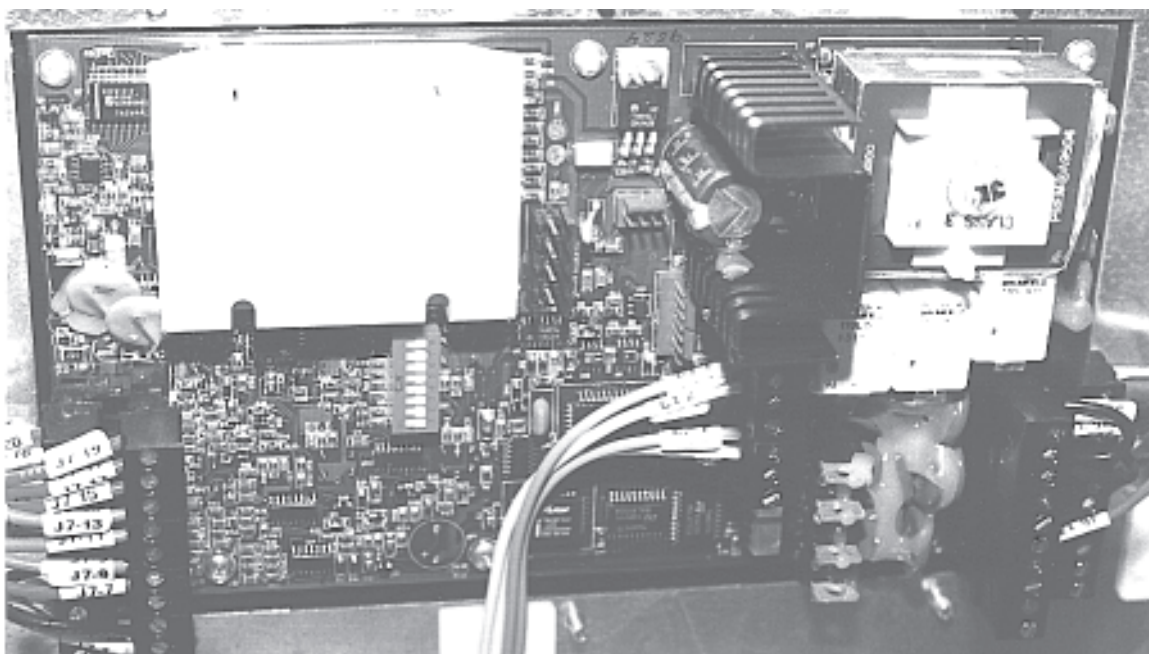
Top Dry remote display at the bottom-dip switch 1 & 6 on/all others off.



Top Dry 2nd fan heater-dip switch 2 & 6 on/all others off.



Top Dry 3rd fan heater-dip switch 1, 2 & 6 on/all others off.



The backside of the control board, showing the dip switch placement.

Limit Switches

The following limit switch errors light up individually on the heaters LCD screen:

PLENUM, HOUSING, VAPOR, TEMP HI LIMIT

Multiple Heater Error Conditions

Two or more heaters may be connected together

through the serial link. If the master cannot communicate with a slave controller, the master will display "SLA" on the main display and the "RX" "TX" symbols will be flashing. *If a limit switch error or one of the error numbers 1 through 8 occurs, that error is displayed on the slave where the error originates. The master displays "SLA ERROR".*

MISC ERROR NUMBERS

1	2	3	4	5	6
Plenum temperature probe 1 open	Plenum temperature probe 1 short	Grain temperature probe 2 open	Grain temperature probe 2 short	Airflow open	Airflow short
7	8	9	10	11	12
Illegal flame sense Error 7 is most likely caused by stuck open solenoid. Error 7 will not shut down fan until loss of flame is detected by control.	Flame probe short error	Slave #1 inconsistent with master with either the drying grain flag or the LP main solenoid or cycle solenoid-most likely the slave got reset powering up with the solenoids off	Slave #2 inconsistent same as error 9 for slave #1	Slave #3 inconsistent same as error 9 for slave #1	Wrong voltage. Dip switch #5 is the voltage selector switch. If dip switch #5 in "ON" that selects 240 VAC. If the unit has only 120 VAC applied, error 12 will show up. If dip switch #5 is "OFF" that selects 120 VAC. If the unit has 240 VAC applied error 12 will show up. This is important because if the fan heater is set up at GSI for 120 VAC and the customer connects to 240 VAC the heater control will work, but if allowed to operate the solenoids will have 240 VAC applied to them which will damage solenoids.
(Errors 9 through 11 are displayed only if multiple heaters are tied together through serial link). Note: <i>Temperature sensor connection</i>-the temperature sensor (bolt) must always be connected to the master. In the case of the Top Dry, both temperature sensors must be connected to the master (unit at the top). Top Dry grain temperature input is connected to J7 pins 14 and 18.					

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