

The INSTRUCTION MANUAL is behind this door.

PLEASE READ: GETTING STARTED

PAGE 2 of MANUAL

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ELEVEN CROZERVILLE RD .
ASTON , PA . 610 459 - 4300

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| MAGUIRE LOW PRESSURE DRYER |
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| OCTOBER 8, 2004 |
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| I N S T A L L A T I O N O P E R A T I O N M A I N T E N A N C E |
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MAGUIRE PRODUCTS, INC.

LOW PRESSURE DRYER

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MAGUIRE PRODUCTS, INC.
11 Crozerville Road
Aston, Pennsylvania 19014
610-459-4300
FAX # 610-459-2700

PART I - GETTING STARTED

PLEASE READ THIS PAGE

You don't have to read the entire manual....

BUT.....

PLEASE READ THE NEXT FIVE PAGES.

It will take about 10 minutes.

THESE PAGES COVER:

SAFETY: TWO safety issues.

DISCLAIMERS: What we can NOT promise.

INSTALLATION: Assembly and setup.

OPERATION: What buttons to push.

MAGUIRE "LPD" Dryers are protected by U.S. patent 6,154,980.
Additional U.S. and International patents are pending.

GETTING STARTED:

PROCEED TO: SAFETY ISSUES NEXT PAGE

SAFETY ISSUES

HOT SURFACES:

As with all dryers, there are HOT SURFACES to avoid. Temperatures can reach 250F (121C), or 300F, (150C) on high temperature models.

All heated surfaces are contained within the external enclosure. When the door is opened you can access and touch hot surfaces. Typically these surfaces are not at dangerous temperatures, however all hot surfaces should be avoided.

Warning Labels indicate HOT SURFACES
USE CAUTION when removing and installing canisters.
USE GLOVES if necessary.
DO NOT REACH into the dryer enclosure.

INDEXING OF THE MATERIAL CANISTERS:

At the end of each cycle canisters automatically index.

The forces that cause rotation are light. However, the inertia of already moving canisters might cause injury. For this reason an interlock on the access door prevents all operations while the door is open.

DO NOT DEFEAT this interlock.

DO NOT try to index the canisters by hand, against the force of the positioning air cylinder. They will swing back rapidly when released.

If you disconnect the air supply and then rotate the canisters by hand, reconnecting the air will cause the canisters to swing rapidly back to their start position.

When connecting the air supply:
KEEP hands CLEAR.
Have the DOOR CLOSED.

DOOR SAFETY INTERLOCK:

There is a safety interlock switch on the door. If you open the door, all operations will stop. After closing the door, you will need to press START to restart the dryer. Accumulated cycle time will not be lost.

GETTING STARTED:

PROCEED TO: DISCLAIMERS NEXT PAGE

DISCLAIMERS

PRODUCTION of FAULTY PRODUCT:

This dryer is of a new design. We have had excellent results in all tests performed to date, but we HAVE NOT tested every material available to the Plastics industry.

Materials vary widely throughout the industry. We have not anticipated all materials or processing conditions. We are not certain that our equipment will perform properly in all instances. You must observe and verify the performance level of our equipment in your plant as part of your overall manufacturing process. You must verify to your own satisfaction that this level of performance meets your requirements. We CAN NOT be responsible for losses due to product not dried correctly, even when due to equipment malfunction or design incorrect for your requirements; and/or any consequential losses due to our equipment not drying material to your requirements.

We will only be responsible to correct, repair, replace, or accept return for full refund if our equipment fails to perform as designed, or we have inadvertently misrepresented our equipment for your application.

If, for any reason, this disclaimer is not acceptable to you, we will gladly take the equipment back for full refund, including freight costs both ways.

ACCURACY of THIS MANUAL

We make every effort to keep this manual as correct and current as possible. However, technology and product changes occur more rapidly than the reprinting of this manual. Generally, modifications made to the dryer design or to the operation of the software are not reflected in the manual for several months. The date on the cover of this manual will indicate approximately how current this manual is. We always reserve the right to make these changes without notice, and we do not guarantee the manual to be entirely accurate. If you question any information in this manual, or find errors, please let us know so that we may make the required corrections. We will gladly provide you with updated manuals at any time. We welcome comments and suggestions on ways we can improve this manual.

Please e-mail comments and suggestions to:
webmaster@magire.com.

GETTING STARTED:

PROCEED TO: INSTALLATION NEXT PAGE

PART II - INSTALLATION

1. Connect power to a properly fused disconnect. Voltage and amp ratings are specified on the serial number plate.

SINGLE PHASE UNITS are 230/240 volts.
THREE PHASE UNITS are 60 cycle 230/480 volts
or 50 cycle 400 volts

Series 30 dryers are available in single phase as standard, three phase optional. All larger units are three phase standard. 1000 series are 480 (or 400) volts only.

On THREE PHASE units: CONFIRM CORRECT ROTATION.
Turn power on.

| | |
|--|------------------------------|
| Press: * | Display will say: (PASSWORD) |
| Press: 22222 | Display will say: (P x.x) |
| Press: BLOWER | |
| Press: CONVEY | |
| Place hand over the VACUUM port. VACUUM indicates correct rotation. | |
| If air is blowing OUT, this is NOT correct. Reverse any two power leads to correct rotation. | |
| Press: EXIT | Display will say: (P x.x) |

2. Connect an air supply.
A minimum of 80 psi (5.5 bar) is required.
If your air has oil in it add an oil separator filter.
Oil in the air will combine with dust drawn from the canisters forming a paste inside the vacuum generator. It will stop working and require cleaning.

Observe the air pressure gauge to be sure pressure does not drop when the vacuum generator is on. If pressure drops, the air supply line is not adequate.

3. Install the receiver.
If we have supplied a conveying receiver, install it over your process machine. Run the VACUUM hose, the MATERIAL CONVEYING hose, and the LEVEL SENSOR cable.

VERY IMPORTANT:

DO NOT wire tie the SENSOR cable to the MATERIAL hose. This will induce static spikes into the processor. Keep them separated.

USING YOUR OWN RECEIVER: see the next page.

4. Install your own conveying system for loading the dryer hopper.

USING YOUR OWN RECEIVER / LOADING SYSTEM

If you have installed our receiver:

| | | |
|-------------|-----------|-----------|
| PROCEED TO: | OPERATION | NEXT PAGE |
|-------------|-----------|-----------|

If you use your own loading system;

Our integrated conveying system automatically shifts air flow to provide hot conveying or make-up air to the material line.

Other systems will not automatically do this unless you follow certain instructions. If you do not do this, the air that is drawn into the material convey line will be ambient air from within the dryer frame, which has been pulled down through the material in the canister. This serves to cool otherwise hot dry material which does not help dryer performance.

To avoid pulling ambient air down through dry material, you should disconnect the hot air supply tube from the material tray. This allows ambient air to be drawn directly in for conveying, and avoids cooling all the material in the canister.

A better solution is to connect to your system so that the correct valves will shift at time of loading, making hot dryer air available for conveying. A pneumatic diagram is available showing how to make the correct connections. It is not provided here since frequent design updates might make it incorrect. Call us.

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| GETTING STARTED: | | |
| PROCEED TO: | OPERATION | NEXT PAGE |

PART III - OPERATION

1. Fill the hopper on top of the dryer with material.
2. Set the TEMPERATURE - (TEMP thumbwheel switches)

USE THE SAME temperature setting recommended by the resin manufacturer for conventional desiccant dryers. DO NOT exceed it unless you are sure the material will not soften and stick together.

Standard heat models can be set as high as 260 f (120c). High heat models can be set to 300f (150c).

3. Set the CYCLE TIME - (CYCLE thumbwheel switches)

See RECOMMENDED CYCLE TIMES, next page.

These are suggested starting points only. Run moisture tests to determine correct cycle times, or submit your material to us for determination.

4. OPERATOR STATION, on right side:

On the POWER box:

- a. Turn MAIN POWER on. (RED switch)

On the CONTROLLER:

- b. Turn MODE switch to AUTO.
- c. Press CYCLE START.
- d. Two timed cycles must be completed before material is available to be conveyed. When material is available, turn the CONVEY switch to ON.

NOTE: If you ever run material that does not require drying, set both Temperature and Cycle time to 000. This keeps the heater off and allows indexing as required.

RECOMMENDED CYCLE TIMES

replace this page with
Cycle time table

STANDARD OPERATING SEQUENCE

This section will help you understand what the dryer is doing as it runs.

Inside the dryer enclosure are three identical material canisters which rotate through 3 stations:

- Station 1 (right rear) is the FILL and HEAT station.
- Station 2 (left rear) is the VACUUM or DRY station.
- Station 3 (front) is the DISPENSE and CONVEY station.

With material in the hopper above the fill station, Press CYCLE START to begin the sequence.

The Canisters will index to a starting position based on the position when last shut down, and the lock will engage.

"Operation" begins only after lock engagement is confirmed by the "lock-engaged" switch.

"Operation" means the following actions occur:

1. The bottom heat plate under station 1 is raised, and the plate over station 1 is lowered.
2. The canister fill valve over station 1 opens, filling the canister. A sensor located under station 1 confirms the canister is in place before the fill valve can open.
3. The top and bottom vacuum plates at station 2 close.
4. The vacuum take-off pan under station 3 is raised.
5. Two small cylinders over station 3 extend to lower a cover disk on to the top of the canister. This keeps moist air out.
6. The air cylinder over station 3 extends to open the canister dispense valve located inside the canister at the bottom, to deliver material to the process. If the bottom sensor was not uncovered at the time of indexing, the fill valve will delay opening until the sensor becomes uncovered.
7. The vacuum generator turns on.
If adequate vacuum is not reached within 90 seconds, the alarm activates and displays (VACUUM).
8. The blower turns on.
9. The heater turns on 2 seconds later.
If rising temperature is not detected within 120 seconds, the heater turns off, the system stops, the alarm activates and displays (NO HEAT).

With the opening of the FILL valve, canister 1 begins to fill. Hot air enters the bottom of the canister to heat the material as it fills.

The heating process continues for the cycle time set (thumbwheel 2). Both blower and heater are sized to heat a single canister of material in about 20 minutes.

After the cycle time, the cycle ends and the canisters index.

The heated material has now moved to the vacuum, or number 2, station. Here the vacuum dries the full charge of heated material. Vacuum of at least 25 inches of mercury is usually sufficient, but a vacuum of 29 inches is attainable.

The vacuum cycle can or may be interrupted periodically by a hot air purge to clear moist air from the canister.

NOTE: The CYCLE TIMER only counts time when the heated air temperature is within 20 degrees of target, and the vacuum is up to 25 inches. Therefore, the first minute or so of each cycle does not count toward cycle time.

After the cycle time, the canisters index again, moving the dried material to the dispense and convey location, station 3.

Two cycles have passed and you are ready to start production.

From now on, indexing occurs at the end of each cycle time. This is the standard mode, "advance on time". If you have selected the "advance when empty" option, then indexing occurs only when the level sensor below station 3 indicates the dispensing canister is empty.

NOTE: If you are using "advance when empty" option you have the ability to set a short fill time. If the time to use the material in the canister is more than double the minimum cycle time (thumbwheel 2), we suggest you decrease the FILL time so that the canister does not hold so much material. Excessively long cycle times may allow dried material to begin to re-absorb moisture.

CHANGING COLORS - "ON THE FLY"

To CHANGE COLORS without stopping production:

PLAN AHEAD!

If your canisters are full, you have at least ONE hour of material in the pipe line. So, you must plan far enough ahead to allow time to consume this material. So....

ONE hour before the change is required:

1. Set the MODE switch to "CLEAN". In this mode, canisters DO NOT INDEX automatically.
2. Shut off your feed system and clean the dryer hopper and the loader or blender supplying material. Be sure to clear the fill valve area under the dryer hopper. The fill valve is accessible and removable by removing one bolt from the hopper base and rotating the hopper out of position.

Perform a full clean out and color change up to this point, the fill point above the canister.

In the CLEAN mode CANISTERS DO NOT INDEX when empty. The ALARM sounds and the display says (CLEAN).

When the ALARM sounds:

1. Press "Alarm Silence" to preserve your sanity.
2. Remove, clean, and replace the canister; close door.
3. Press the INDEX button.
4. After Indexing occurs, begin the filling of the newly cleaned canister with the new color blend.

Repeat these 4 steps as each of the remaining canisters empty.

After the final canister is cleaned:

1. Clear the conveying line to the process machine.
2. Begin conveying the new color blend to the process.

NOTE: In the CLEAN mode, canisters do not advance on the time out of the TIME cycle. Canisters always wait until the canisters are empty, sensor uncovered. If the time exceeds double the normal cycle time, the alarm will sound. Either silence, or press advance if you are concerned that material may be picking up moisture.

CLEAN OUT

CANISTER REMOVAL:

LPD 30, 100 and 200 series canisters are removable. There is a latch on each side of the canister. Rotate these latches up and toward you. Grip the handles firmly and lift the canister from its supports.

If hot, use gloves.

CANISTER DISASSEMBLY:

Canisters can be disassembled for full access to the interior space and complete clean out.

Set the canister on the floor. Turn it UPSIDE DOWN. Note the flat bottom disk with holes. Using both hands, press down slightly on all four sides of this disk and rotate in either direction to release. Gloves are recommended.

Remove the disk. Grip the pin protruding from the perforated cone and lift the cone out by tilting to one side to clear protruding hardware.

You now have full access to the inside of the canister.

Do NOT remove any remaining parts. All mounting hardware has been sealed at the factory to be vacuum tight. DO NOT remove or tamper with any bolts.

To reassemble:

Install perforated cone first. This can be tricky. But remember, it came out, it will go back. Install the retaining disk. To twist disk into place, place pressure on all four engagement points while rotating the disk under the retaining bolt heads. Gloves are recommended.

VACUUM TAKE-OFF CHAMBER

The vacuum take off chamber has a hinged door for clean out. It also allows material to be emptied from a full canister. Opening the window access door will allow cleaning of this space. You can then use the control panel to manually operate the "empty" valve, allowing material to flow into a box placed in front of the dryer.

CONTROLS

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| OPERATOR STATION - RIGHT SIDE of CONTROLLER: |
|--|

CYCLE START (BLUE) Press to START the cycle.
Lights when the unit is running automatically.

CYCLE STOP (AMBER) Press to STOP the cycle.
Lights when the unit has been stopped by the operator or has stopped between cycles in the "clean out" mode.

MODE: AUTO / CLEAN

Select AUTO for normal automatic indexing of canisters.

Select CLEAN to PREVENT AUTOMATIC INDEXING.
This is for COLOR CHANGES. INDEXING will NOT occur automatically. Instead the ALARM will sound, and the operator knows to CLEAN OUT the empty canister for the next color.

With a CLEANED CANISTER in place, the door is closed and the INDEX button is pressed to restart the cycle.

INDEX (CLEAR) Press to MANUALLY ADVANCE the canisters.

In the CLEAN mode,
you must press the INDEX button to advance the canisters. The next cycle starts as soon as INDEXING is complete.

In the AUTO mode,
the index button does not work unless you press CYCLE STOP first. INDEX then serves to manually advance the canisters. After INDEXING, press CYCLE START to start the next cycle.

When lit in combination with BLUE:
Cycle has timed out, indexing is about to occur automatically.

When lit in combination with AMBER:
Cycle has been stopped by the CYCLE STOP button.
INDEX button must be pressed to index the canisters.

When blinking in combination with AMBER:
Cycle has stopped in the "clean" mode, the operator must press the INDEX button to advance the canisters.

SILENCE ALARM This button silences the STROBE and BEEPER ALARMS, but does not remedy the cause of the alarm.

CONVEY: ON / OFF Operates only if a vacuum receiver is connected to the dryer controls. Turn ON to enable conveying of dried material to your process machine.

SET CONVEY TIME Operates only if we provide a vacuum receiver connected to the dryer controls. Press and hold to set the convey time. When conveying starts, immediately press the "convey time" button and hold until the desired level in the receiver is reached; then release. This load time will be saved by the software. The minimum possible time, as well as initial default setting, is two seconds.

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| FRONT PANEL CONTROLS |
|----------------------|

TEMPERATURE - thumbwheel setting
Up to 250f/121c degrees, standard model.
Up to 300f/149c on high heat model.

CYCLE TIME - thumbwheel setting
the time in minutes for one cycle. Usually about 20 minutes, but can be anywhere from 10 to 60 minutes, depending on type of material.
See enclosed Chart.

NOTE: Material that does not require drying may still be allowed to pass through the system by setting both thumbwheels to 000. The heater and vacuum will not operate, but indexing will still occur.

DISPLAYS - self explanatory.

STROBE LIGHT AND BEEPER ALARMS

The Strobe light flashes and the Beeper sounds when any condition occurs requiring operator intervention.

KEYPAD - see next section

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|-------------------------------------|
| OUTPUTS on LEFT SIDE of CONTROLLER: |
|-------------------------------------|

PRINTER output

This is a parallel printer port. This allows information to be ported directly to a printer giving the benefit of a permanent printed record. Two printouts are available:

1. A listing of the internal parameter table.
(press *77 in the PROGRAM mode.)
2. A periodic printout of temperature, vacuum reading, and elapsed cycle time. There is a detailed explanation of this printout in the PRINTED OUTPUTS section of this manual.
(press *54 in the PROGRAM mode, use "*" to set printer flag ON.)

Any common parallel printer that you would use with a small PC computer may be used. Connect using a standard parallel printer connecting

cable, (34 pin parallel Centronix connector to a DB25 IBM compatible connector), available from us or at any computer store.

COMPUTER input / output

If you choose to gather and record data automatically and continuously by computer, this connector allows for connection to an IBM PC type computer operating under MS-DOS, WINDOWS, or LINUX or various other interface devices.

The COMPUTER port is a DB9 (9 pin) male port. You will need a specially wired cable from us to connect to the serial output on your standard PC computer. You will need software from us for communicating with your Dryer. Your computer operating system must be WINDOWS, or LINUX. This software allows downloading settings and retrieval of information and will produce reports for those customers who wish to take advantage of this feature.

One or many Dryers, as well as our Weigh Scale Blenders, can be connected to one computer. Customers that wish to do their own programming may interact with the Dryers by way of a program that we provide which will move information into an ASCII text file for access by other software. We also provide "protocols" for those who wish to communicate directly. Drivers are available for interaction with other commercially available plant management systems.

For multiple Dryers, or communication over longer distances, an additional piece of hardware is required.

Ask for our G2 (Gravimetric Gateway) manual for complete information.

CONVEY LEVEL SENSOR - plug receptacle

The level sensor from the material receiver plugs in here. This allows the dryer to control conveying of material to your process using the dryer's blower and hot air for conveying.

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|---|
| CONTROLS to the LEFT of the CONTROL PANEL |
|---|

- | | |
|---------------|--|
| VACUUM GAUGE | Reads the current vacuum inside the canister. This is useful as a check against the readout on the controller display. |
| MANUAL FILL | Press to manually operate the fill valve, over the fill station canister. Useful if the canister is set for timed fill, and you need to add additional material to the canister. Works only when the dryer is in the OPERATE mode. |
| MANUAL CONVEY | Press to force a convey cycle, when some additional conveying is required to keep up with the process. Works only when the dryer is in the OPERATE mode. |

These keys operate in the PROGRAM mode only:

STAR FUNCTIONS
PARA (PARAMETERS)

This STAR FUNCTION list is followed by an explanation of each STAR FUNCTION, then followed by the PARAMETER list.

Press * and two numbers for the following functions:

- *11 DATE - TIME, real-time clock.
- *12 Move table from ROM to RAM - reloads default settings.
- *22 Auto Monday Morning Start Up.
- *23 Move from RAM to EEPROM.
- *32 Move from EEPROM to RAM.
- *25 ROM OK flag, "CE" to clear.
- *39 Select Convey with Line Purge feature.
- *44 Select to advance when EMPTY or on TIME OUT.
- *45 Change MANUAL mode PASSWORD.
- *54 Print cycle information.
- *66 LPD I.D. number (1-255).
- *77 Print parameters.
- *78 Change PROGRAM mode PASSWORD.
- *89 Select degrees "F" or "C"
- *97 Temporary Maintenance Flag - disables interlock.
- *99 Enable calibration of vacuum sensor.
Use "*" key to select readout or toggle flags ON or OFF.

STAR FUNCTIONS - Full Explanations

- *11 Press (*,1,1) to enter the correct date and time into the real-time clock. Correct date and time is helpful if you are retrieving information using a printer or are collecting data by computer. Six entries will be requested.

The first display will indicate USA or EUROPE date format. USA will cause all dates to be displayed MONTH/DAY/YEAR. EUROPE will cause all dates to display DAY/MONTH/YEAR. Use the CE key to toggle from one to the other.

The remaining five entries are two digits each;
MONTH __, DAY __, YEAR __, HOUR __, MIN __.

Use the * key to step through all displays without change. enter new settings where required. The correct date and time for Easter Standard Time were entered at the factory. You will want to correct this for your time zone.

- *22 Press (*,2,2) to select the Automatic Start option. This allows for an automatic start of the dryer heating and vacuum cycle, the same as pressing the START button. The Power switch must already be ON.

When *22 is selected,
The display will say (AUTO START - DISABLED).

Use the CE key to toggle between DISABLED and ENABLED.
If you select (AUTO START - DISABLED), press * to exit.

With (AUTO START - ENABLED) selected,
Use the * key to toggle through each week day.
Use the CE key to select between (MONDAY - NEVER) and
(MONDAY __:__).

With (MONDAY __:__) selected, enter the time on that day you
want the unit to start. Use a 24 hour clock. Example:
(MONDAY 07:00), which is 7 AM. 7 PM would be 19:00

Use the * key to go to next day.
Use the CE key to select NEVER or __:__.
Enter a time where you want an auto start to occur.
Press EXIT twice when done.

Typically, a 3 shift operation will use auto start for
Monday morning only, with all other days set to NEVER.

12 Press (,1,2) to move the PARAMETER table from ROM to RAM.
This allows system to operate with the parameters that were
originally supplied as default numbers with the system.

EXPLANATION: All PARAMETERS are stored in a table that
resides in three places: ROM, RAM, and EEPROM.

ROM stands for "Read Only Memory." This memory portion of
the circuit board cannot be altered in any way except by
physically replacing this chip on the board. It contains
the program and the copy of the parameter table that we
supply as standard with all controllers.

EEPROM stands for "Electrically Erasable Programmable Read
Only Memory." This memory portion of the circuit board can
be altered by the computer by special request only, and data
stored here is not lost even if the battery backed up RAM
should lose power. It contains all parameters and control
numbers that are unique to your system. At the factory we
have set what we believe to be the proper parameters for
your application into the EEPROM.

RAM stands for "Random Access Memory." It is the memory
portion of the circuit board that would go blank if power
were removed from it. We have provided a battery back-up
for the RAM so this should never be a problem. On normal
power off and power on, the data and parameters that reside
in RAM are not lost. However, RAM is the portion of memory
most easily corrupted due to unforeseen circumstances in the
poor electrical environment of a factory. Should some
unforeseen circumstances cause the data in RAM to be
corrupted or lost, a CLEAR-RESTART procedure is provided
that will retrieve the parameter table stored in the EEPROM
and copy it into RAM memory for use. If you make changes to
the PARAMETER table, these changes reside only in RAM and
may be lost in the event of an unforeseen computer
malfunction. To insure that your changes are saved for
future runs, it is necessary to move this information from

RAM to the EEPROM.

NOTE: The battery used for backup is a lithium battery that is part of an I.C. chip on the board. It has an expected 10 year life and is not easily accessible for replacement. Should it fail, we suggest that it be replaced at our factory.

- *23 Press (*,2,3) to move the PARAMETER table from RAM to EEPROM. This information is then available for retrieval using the CLEAR routine (press CE key on Power Up) or by using the *32 function described next.
- *32 Press (*,3,2) to move EEPROM information to RAM. This is useful for retrieving correct information that you may have stored earlier in the EEPROM. Also, if you have been making changes to RAM tables and now wish to restore all parameters to what they were at power up, this is the function to use.
- *25 Press (*,2,5) to check the ROM-CHECK flag. Whenever your controller is on, the processor is continuously performing an integrity check of the ROM program chip supplied with the unit. Each complete scan of the program takes about one minute. If any single check reveals an incorrectly set bit, the ROM CHECK flag is turned on. This flag is checked every time you power up. If the flag has been set the display will say (ROM BAD), followed by the date and time of the last check that was found bad. If the flag has not been set, (ROM OK) will be displayed. To turn the flag off, you must select this option, (*25), and, with (ROM BAD) displayed, press the "CE" key. This will clear the flag and it will remain off until another error is detected. The seriousness of the problem will be somewhat indicated by the date and time of the last bad check and how frequently you find it necessary to turn this flag off. Even with an error, your controller may still work perfectly. However, we suggest you request a new program chip from us as soon as possible.
- *39 Press (*,3,9) to select between:

| |
|-----------------|
| STANDARD CONVEY |
|-----------------|

| |
|------------------|
| CONVEY AND PURGE |
|------------------|

Selecting the Line Purge option will cause the "dispense" or "canister empty" valve to remain closed at all times except just before conveying material. With this option ON, when the Convey sensor calls for material to be vacuum conveyed to the process machine, the canister empty valve will open first, only for a few seconds, to fill the take off tray (below the canister). It will then close and the convey cycle will start loading only that material, emptying the take-off tray and also purging the convey line. This feature helps to reduce the possibility of moisture contamination during long idle times associated with very low production rates.

44 Press (,4,4) to select between:

ADVANCE ON TIME

ADVANCE ON EMPTY
Fill Time _

The default selection is ADVANCE ON TIME. This is the standard mode of operation. The canisters advance (index) when the cycle timer times out, even though it is not empty.

With ADVANCE ON EMPTY selected, canisters advance only after the canister is empty, the sensor in the vacuum take-off tray is uncovered. In this mode a full canister may take an hour or more to be consumed if throughput is low. Cooling of material and moisture pick up may be a problem. To solve that, you can shorten the fill, only partially filling the canister.

Fill time, in seconds, may be entered at this point. Each second equals about 2 pounds on LPD 100 / 200 series dryers, and 1/2 pound on LPD 30 series dryers. An entry of zero (00) will cause the fill valve to stay open, which means a full canister. Entries up to 50 seconds are allowed. The CFT parameter holds the entry and it can be altered there as well.

45 Press (,4,5), followed by a 5 digit number to change the PASSWORD number for entering the MANUAL mode. The system is supplied with the number "11111" as the password number. If you wish to restrict use of this mode to only yourself, you may make up your own number and enter it here.

52 Press (,5,2) to alter the operation of the dispense cylinder. Displays are (DISP ON), (DISP OFF). Normal operation is DISP ON. When OFF is selected, the dispense valve will not operate in the normal automatic way. The front canister will not empty. This is useful in a Lab environment, where the operator intends to remove the full canister from the dryer once the material is dried.

54 Press (,5,4) to ENABLE printout of data during each cycle operation.

PRINTER ENABLED
TIME INTERVAL: 010s

PRINTER DISABLED

When ENABLED, and with a printer connected, a line of information prints repeatedly based on the TIME INTERVAL you select. A also line prints at the end of the cycle as well as every time the vacuum turns on or off.

This information includes date, time, elapsed cycle time, temperature, heater percentage on, vacuum. This is excellent information to track dryer performance. More detailed explanation of this information is in the PRINTER OUTPUT section of this manual.

Use the * key to toggle between ENABLED and DISABLED.
When ENABLED, use the keypad to enter the desired TIME
INTERVAL, in seconds.

Press EXIT when done.

66 Press (,6,6) to enter an identification number for this particular Dryer. This I.D. number appears on all printed reports. If you have more than one unit, this helps to identify reports. If you are using a computer to automatically gather data, then each controller must have a unique address. Valid numbers are 000 to 255. They need not be consecutive. When units are connected to a computer, do not use the number 000 for identification.

77 Press (,7,7) to print a copy of all internal parameters. A printer must be connected and ready. Three columns will print since parameters reside in three different locations in memory: RAM; ROM, and EEPROM. Identifying headings print above each column.

78 Press (,7,8, followed by a 5 digit number) to change the PASSWORD number for entering the PROGRAM mode. The system is supplied with the number "22222" as the password number. If you wish to restrict use of this mode to only yourself, you may make up your own number and enter it here.

If you forget your password number, call us for help.

89 Press (,8,9) to select the TEMPERATURE unit, "F" for Fahrenheit, or "C" for Celsius. "F" is generally preferred in the U.S. "C" is preferred for nearly all countries outside the U.S.

Use the * key to toggle between "F" and "C".
Press EXIT when done.

97 Press (,9,7); display will say (NORMAL). Press the * key to display (SERVICE). Selecting SERVICE will allow all devices to continue operating with the door open. The door safety interlock is bypassed. This bypass is active for 20 minutes only, or until power is cycled off and on. This feature allows service personal to temporarily observe operation for trouble shooting and diagnostic purposes without removing panels or in some other way defeating the safety interlock.

99 Press (,9,9, followed by a 5 digit number) to calibrate the Vacuum readout. Assuming the vacuum generator is not currently on, the display will say (C = 000). This is the raw count number. Press *, display says (* ZERO *). The "operate" and "vacuum" outputs come on automatically. Observe the displayed raw count number. When it is steady, press the star (*) key and enter the current inches (or millimeters) of mercury as read from the vacuum gauge to the left of the controller. You're done.

If you have set *89 to select temperature readings in "C" Celsius, then you must use Millimeters (mm) for calibrating the vacuum readout.

PARAMETERS

All LOW PRESSURE DRYER controllers operate according to certain internal PARAMETERS. Because customer requirements vary, we have made 33 parameters accessible for change through the keypad.

Press the PARA repeatedly key to view all the parameters.
Parameters are always five digits, using leading zeros as required.

TIMES are expressed as full seconds or full minutes.

PERCENTS are expressed in full percents.

TEMPERATURES are expressed in full degrees (f or c).

=====

PARAMETER LIST - BRIEF EXPLANATIONS

DRY 00000 - Minimum Cycle time - minutes
TTP 00000 - Target temperature - degrees (f or c)
CFT 00000 - Canister Fill Time, in Advance on Empty mode only.
SHP 00100 - Start heat - Percentage Heat On time - %
NHA 00020 - No Heat Alarm - seconds
STC 00050 - Start Temperature Control - F degrees delta
HTO 00003 - Heat Adjustment Time - seconds
TDF 00005 - Temperature Rise Too Fast - F degrees
HAL 00510 - Heat Adjustment Limit - percent
HCT 00001 - Heat Cycle Multiplier
BTM 06004 - Blower: off on high temp, on before Heat - seconds
ECD 00005 - End of Cycle Delay - seconds
NVT 00001 - No Vacuum Threshold - Inches of Mercury
LRT 00003 - Lock Release Time - seconds
PST 00003 - Position Settle Time - seconds
LDD 00003 - Lock Detect Delay - seconds
HOT 00003 - Heater OFF Temperature
ATS 00012 - Anticipated Temp - Sooner
ATL 00040 - Anticipated Temp - Later
NCT 00005 - No change Temperature
RCC 00008 - Rate of Correction Constant
MAX 00300 - Allowable maximum temperature setting
CFA 01003 - Convey alarm: retry time and failures before alarm.
VPD 02527 - Vacuum Pressure Differential
VAL 25090 - Vacuum Alarm
PRG 10015 - Vacuum Purge frequency and time.
POD 00010 - Purge Off Delay - minutes, turn solenoid off if idle.
HDY 05005 - Heat Delay after convey - delays heater restart.
DOP 00005 - Door Open Pause, minutes before cycle is aborted.
EDC 00002 - Empty Delay Close, use with Convey with Purge *39.
DBS 00000 - Delay Blower Start, allows fill time of canister.
PHD 00030 - Pre Heat delay - seconds.
HFT 03005 - Heat Failure Time - Seconds / Temperature

PARAMETERS - FULL EXPLANATIONS

DRY 00000 - Minimum Cycle time - minutes

The minimum time required for the complete drying of one batch. This assures adequate heat time to heat the material and also adequate vacuum time to dry the material. The middle thumbwheel switch is normally used to set this value. If this parameter is set to a value, then this value overrides the thumbwheel switch. Otherwise leave this parameter set to zero so the thumbwheel switches control.

TTP 00000 - Target temperature - degrees (f or c)

This is at least 20 degrees below the softening point of the plastic to prevent clumping of pellets, but must be over 150/160 to assure boil off of moisture under vacuum.

The top thumbwheel switch is normally used to set the target temperature. If this parameter is set to a value, then this value overrides the thumbwheel switch. Otherwise leave this parameter set to zero so the thumbwheel switches control.

CFT 00000 - Canister Fill Time - seconds

The *44 function is used to set this number. This parameter is where the setting is stored. A setting here will cause the canister to be only partially filled. The ADVANCE ON EMPTY mode must be on for this to make any sense. When set to 00000, there is no time out, the canister fills until the canister level sensor detects material and closes the valve.

SHP 00100 - Start heat - Heat On time - percent

The heater temperature is controlled by turning power on and off every second. The percentage of ON time each second determines the power to the heater. This parameter sets the initial starting Percentage of Heat-On time, placing a starting limit on heater capacity in case the heater is entirely too strong for the job. For the equipment we have provided, leave this parameter set to 100.

NHA 00060 - No Heat Alarm - seconds

This is the maximum time limit, in seconds, after the heat cycle begins, during which one of the following two conditions must be detected: Either the temperature must climb 20 degrees, or the temperature must move at least 20 percent toward the target temperature. If neither condition is met the "NO HEAT" alarm will sound.

Such an occurrence would signal a failure of either the heater or the blower. This parameter protects the heater from burn out in the event the blower fails or air flow is blocked. This is a one time check. After satisfying this condition, we assume heating is OK.

After the Dryer reaches set temperature, and is stable, we use this parameter to detect heat loss. If the temperature drops 10 degrees or more below target, and stays there for longer than the time specified in this parameter, the "NO HEAT" alarm will sound.

STC 00050 - Start Temperature Control - F degrees delta

This parameter specifies the degrees below Target temperature where heater control begins. The heater stays at full startup power (100 percent on) until this temperature is reached. Once this point is reached, temperature control begins.

HTO 00003 - Heat Adjustment Time - seconds

This parameter determines the maximum time between heat control adjustments. It should be set high enough to allow time for a change to be seen by the heat sensor. It should not be less than the time for some feedback to occur. Too short a time results in excessive control adjustments and overshooting. Too long a time may result in overshooting under some conditions because necessary adjustments do not occur rapidly enough.

TDF 00005 - Temperature Rise Too Fast - F degrees

Temperature rise of this amount in less time than the HTO parameter (above) will force an immediate checking of the heat power setting. This allows for more frequent downward adjustment, if necessary, during rapid temperature ramp up. It controls during rapid temp rise only.

HAL 00510 - Heat Adjustment Limit - percentage point change

The Maximum Heat adjustments that can occur in one adjustment cycle. This limits the maximum percentage heat adjustment per adjustment cycle to prevent excessive adjusting before correct feed back can occur. What we are adjusting is the percentage of time the heater is turned on each second. 005xx is the limit to an UPWARD adjustment. xxx10 is the limit to a downward adjustment. For example, if the "percentage on" is currently 60, then this parameter would limit the next adjustment to no more than 5 points up, or 10 points down, to either 65 or 50.

HCT 00001 - Heat Cycle Multiplier

Standard heater on/off cycle is 1 second. If you wish to have longer cycles, set this multiplier to some greater value. We currently see no advantage to longer cycle times.

BTM 06002 - Blower OFF time if heat is off, and temp is exceeded.
Blower On-Time before Heat-On - seconds

The first 3 digits (060xx) indicate, in seconds, how long the

blower will be turned off if the heater duty cycle has dropped to zero, and the temperature is still climbing. This occurs when the requested temperature is low, usually below 180F (82C) on a 100 series dryer, and the blower by itself generates enough heat to exceed the set temperature. Default is 60 seconds. If rising temperature is still a problem, increase to 120 or 180, which is 2 or 3 minutes.

The last 2 digits (xxx02) indicate the delay, in seconds, after the blower is started, before the Heater is turned on. This assures that the blower is up to speed and air is flowing over the heater, before powering up the heater.

=====

The following 5 parameters control INDEXING sequence.

ECD 00005 - End of Cycle Delay - seconds

This is the delay, in seconds, the station 3 level sensor must be uncovered before the next cycle is initiated. This prevents a momentary uncovering of the sensor, during conveying for example, from ending a cycle and advancing the canisters prematurely.

=====

NVT 00001 - No Vacuum Threshold - Inches (mm) of Mercury

Readings below this setting are considered Atmospheric Pressure. Indexing of canisters is delayed until this value (or lower) is reached. This assures the vacuum plates are released before an attempt is made to advance the canisters. If unit is set for Metric, this number will be set to 00025 millimeters.

=====

LRT 00003 - Lock Release Time - seconds

This is the delay, in seconds, after the lock is released, before indexing occurs. This assures the lock is fully released before indexing.

=====

PST 00003 - Position Settle Time - seconds

This is the time, in seconds, that is allowed for indexing to the next position. After this time the software checks to be sure that the canisters did advance, and then operates the lock solenoid.

=====

LDD 00003 - Lock Detect Delay - seconds

After the lock solenoid is activated, this is the time, in seconds, that lock detect must be present continuously before the cycle begins. This assures the cam is fully seated into the detent which assures that canister movement has stopped. At the end of this time the cycle starts. If this time out does not occur within 5 seconds of operation of the lock, an ALARM will sound.

=====

The following 5 parameters control drying temperature.

HOT 00003 - Heater OFF Temperature

Degrees above Target (TTP) which forces the Heater OFF. This limits unintentional overshoot. It is a safety, not part of normal heat control logic. If it does occur a downward temperature adjustment to heater percent on time occurs before the heater is turned back on.

ATS and ATL - Anticipated Temperatures - Sooner and Later

The next two parameters, ATS and ATL, work together to anticipate two future temperatures, allowing control logic to keep the rate of rise correct, allowing rapid temperature rise while preventing overshoot. By looking at two consecutive temperature readings, a rate of change is calculated and from this, two forward anticipated temperatures are calculated; one sooner and one later. Temperature adjustments ONLY occur when both forward temperatures are over or both are under the target.

When both are OVER, adjustment is DOWNWARD. When both are UNDER, adjustment is UPWARD.

ATS 00012 - Anticipated Temp - Sooner - seconds

This parameter specifies the "sooner" time forward, in seconds, to anticipate temperature. It controls when temperature is climbing or falling too RAPIDLY. Higher numbers cause more cautious corrections. Lower Numbers allow logic to ramp up to temperature more quickly. If temperature overshoots on initial ramp up, this number is too low.

ATL 00040 - Anticipated Temp - Later - seconds

This parameter specifies the "later" time forward, in seconds, to anticipate temperature. This parameter controls when temperature is climbing or falling to SLOWLY. Higher numbers cause more cautious corrections, useful to prevent hunting once target has been reached, or nearly reached.

NCT 00005 - No change Temperature - 0.1 degrees

This prevents adjustments from occurring if BOTH the ATS and ATL temperatures are within this limit, in 1/10 degrees, of TARGET. Using the default setting (NCT 00005), if both future temperatures calculated using ATS and ATL are within 1/2 (0.5) degrees of Target, no adjustment occurs.

RCC 00008 - Rate of Correction Constant

Interacts with the adjustment amount math routine to fix the extent of correction that an error causes. Lower numbers cause larger corrections, but may produce hunting. Higher numbers produce smaller corrections, and are safer, but slows correction response time. The number is used in a software algorithm to calculate corrections. Call

us if you want to know exactly how it works. We have to leave our competitors something to figure out on their own. If hunting above and below target occurs continuously, raise this number.

=====

MAX 00260 - Allowable maximum temperature setting - F degrees

Any temperature setting, on the top thumbwheel, above this number is limited to this number. The alarm activates if the thumbwheel switches are set to a higher temperature. On power up, the software determines which heat sensor is present and adjusts this parameter automatically, to either 250f or 300f (121c or 149c).

=====

CFA 01003 - Convey Failure alarm - sec / tries - ignore sensor flag

If a convey sequence does not result in the sensor being covered, this parameter determines the time delay before the loader will try again. It also sets how many tries must occur before the alarm is activated. x10xx sets retry time to 10 seconds. xxx02 sets the number of tries before alarm to 2.

The first digit of this parameter is normally zero. It can be set to 1 for a special circumstance. Normally the loader is used to convey from the dryer canister to the process. Therefore the loader is set to load ONLY if the sensor, at the dryer, under the canister, is covered. If you have elected to use the loader function to convey from your material source TO the dryer, to fill the dryer, then this sensor MUST be ignored. If the first digit of this parameter is set to 1 (1xxxx) the status of this sensor will be ignored.

=====

VPD 02728 - Vacuum Pressure Differential - inches of mercury

This parameter sets the vacuum readings that turn the vacuum circuit ON and OFF. This serves to reduce compressed air consumption. Using the default settings, the vacuum generator stays on until a vacuum of 28 inches is reached. Then it turns off and remains off until vacuum falls below 27 inches. Entering unreachable numbers, like 03540, keeps the vacuum on all the time. If unit is set for Metric, this number is still set in INCHES of mercury.

NOTE: At HIGHER ELEVATIONS lower this parameter, VPD, and the next parameter, VAL, 1 inch for each 1000 feet above sea level.

The vacuum sensor, as well as the gauge on the side of the dryer, read out based on atmospheric pressure of the surrounding air against the partially evacuated cylinder. The actual vacuum level, referred to as absolute vacuum, is different. Instruments that read absolute vacuum are prohibitively expensive. So we make do with standard vacuum gauges. The problem is if you operate at high elevations, like Denver, an absolute pressure of 3 inches reads as 22 instead of 27 inches here in Philadelphia. 22 is then too low for the ALARM parameter default setting, so the alarm goes off.

The good news is, while the numbers are different, the unit stills dries correctly, since absolute pressure is the critical

factor. Just change the parameters to compensate for these conditions. Reduce 1 inch for every full 1000 feet above sea level.

For example, in Denver, (elevation: 5670') set VPD to 02223 and VAL to 20090.

=====

VAL 25090 - Vacuum Alarm - inches / seconds

This parameter sets the point at which the system ALARMS if a proper vacuum is not established. If a VACUUM of 25 inches is not reached within 90 seconds after the start of a cycle, the Alarm sounds. Additionally, if, after reaching 25, the vacuum drops to 2 inches below 25 (23), the alarm sounds. Vacuum is necessary for drying. If this alarm sounds, a vacuum problem exists and must be corrected.

Read "NOTE" above.

=====

PRG 10015 - Purge frequency and duration - min / sec

This parameter instructs the software to operate the purge valve for 15 seconds (xx015), once every 10 minutes (10xxx). More frequent purges may be required for some materials. However most materials require no purge or one purge. The purge valve will also operate one additional time at the end of the cycle to bleed off vacuum.

=====

POD 00010 - Purge Off Delay, turn off if idle - minutes.

This parameter is to lengthen the life of the Purge solenoid. When a cycle ends, this solenoid is energized to relieve the vacuum in the canister, allowing the vacuum plates to open. If the process has been stopped, the solenoid simply stays energized. This parameter turns the solenoid off after a reasonable time.

=====

HDY 05005 - Heat during and delay after convey - percent / seconds.

Because hot air is diverted during conveying, temperature readings may not be correct. As a precaution, this parameter reduces the heater percentage-on time during conveying, and then also waits a specified time after conveying before adjustments begin. This prevents overheating and allows heat readings to stabilize after a convey cycle.

=====

DOP 00005 - Door Open Pause before cycle is aborted - minutes.

If the door is opened during operation the system shuts off. Closing the door will restart the cycle at the same timing point when shut down. This parameter sets a time limit, after which the cycle timer will be reset to zero. A new full cycle time will take place upon restart. Default is 5 minutes.

=====

EDC 00002 - Empty Delay Close, use with Convey with Purge *39 - sec.

This parameter times how long the canister "empty" valve stays open after material covers the sensor. When the *39 "convey with purge" option is being used, material is not allowed to lay in the take off area. To accomplish this, the "empty" valve only opens when material is required, just prior to it being conveyed. Once the sensor is covered, the valve closes again. But first it waits the 2 seconds specified in this parameter to be sure the take off area is full.

=====

DBS 00000 - Delay Blower Start, allows fill time for canister - sec.

This parameter delays the blower start if you want the canister to fill first. With a partially filled canister, the blower may blow the material up into the air and plug the screen at the top, or cause the filter to clog with small particles prematurely. Delaying blower start up prevents this. But this does add to the cycle time. Leave it set to 00000 unless you have this particular problem.

=====

PHD 00030 - Pre Heat delay - seconds.

This parameter delays all heat adjustments at the start of each cycle, for the time specified. When cold material is shifted into position after indexing, the initial heat readings swing widely. This delays temperature adjustment until some stability is reached.

=====

HFT 03005 - Heat Failure Time - Seconds / Temperature

This parameter tells the software what is the very least to expect when the heat percentage on time is increased. The default value says that after 30 seconds, the temperature should not be below current setting by more than 5 degrees. After a call for more heat, if the temperature drops more than is possible with all systems working correctly, this parameter will cause a shut down of the dryer.

=====

CHANGING PARAMETERS

To change a PARAMETER, the sequence of keystrokes is as follows:

| | | | |
|--|-------|-------------------|---------------|
| Press: | * | Display will say: | (PASSWORD) |
| Press: | 22222 | Display will say: | (P x.x) |
| Press: | PARA | Display will say: | (DRYxxxxx) |
| Press: | PARA | to walk FORWARD | through list. |
| Press: | * | to BACK UP | in the list. |
| When the PARAMETER you want is displayed, enter a new setting using the number keys. You must enter 5 digits. Use leading zeros. | | | |
| Press: | EXIT | Display will say: | (P x.x) |

Additional information can be found in the KEYPAD section.

SAVING PARAMETERS in the EEPROM

If the changes you have made are PERMANENT, SAVE them in the EEPROM.

Sometimes during normal operation, electrical noise or RF (Radio Frequency) noise will corrupt the processor memory. It may be necessary to do a CLEAR to fix this problem.

A "CLEAR" will clear all data from memory and replace it with information stored in the EEPROM.

So it is a good idea to have an exact copy of RAM stored in the EEPROM for just such an emergency.

To copy ALL PARAMETERS into the EEPROM, the sequence of keystrokes is as follows:

| | | | |
|--|------------|-------------------|------------|
| Be in PROGRAM mode, first 2 steps above: | | | |
| | | Display will say: | (P x.x) |
| Press: | * | Display will say: | (INSTR --) |
| Press: | 23 | Display will say: | (SAVING) |
| Wait: | when done, | Display will say: | (P x.x) |
| Press: | EXIT | Display will say: | (x.x) |

With this done, all correct Parameters may be restored from EEPROM to RAM at any time by doing a CLEAR.

To do a CLEAR, hold the "CE" key down when turning POWER ON.

THEORY OF VACUUM DRYING

Water boils at 212 F (100 C) degrees. However, this is only true at sea level, which is to say at standard atmospheric pressure, which is 14.7 pounds/sq in (1 bar), also expressed as 29.92 inches (760mm) of Mercury (Hg).

At lower pressures the boiling point of water is reduced.

Standard atmospheric pressure can support a column of Mercury 29.92 inches (760mm) high. If we pull a perfect vacuum above a column of Mercury, the mercury will rise in that column 29.92 inches and, for that reason, the number we can expect to read on the vacuum gauge, at full vacuum, is 29.92 inches. Lesser vacuums read lower numbers. No vacuum reads zero.

When water is subjected to a vacuum level of 25 inches (635mm) of mercury, it will boil at 133F (56C) degrees. When plastic pellets are heated to 160F (71C) degrees, or greater, and subjected to a vacuum of 25 inches (635mm), the water vapor within wants very much to boil. This increased molecular activity within the pellet and the greatly reduced pressure surrounding the pellet drives the moisture from the pellet in a remarkably short time. This then is the reason for the remarkable short drying time of a vacuum dryer.

PERFORMANCE

The true measure of a dryer's performance is determined by the moisture content of the resin after the dryer has done its job. Resin moisture content, however, is not easily measured, so dryer manufacturers use other criteria to assure performance.

Conventional "desiccant" dryers use DEW POINT as a measure of performance. This is a measure of the dryness of the air passing over the resin, but not the dryness of the resin itself.

For example, for a particular resin, experience may tell us that 180f (82c) degree air dried to minus 40 dew point, and passed over the material for 4 hours, is sufficient to reduce the moisture content of that resin to the required level of dryness.

Since our LPD dryer does NOT use dry air, we have no "dew point" to measure.

In our case, for the same resin, experience tells us that a vacuum of 25 inches (635mm) applied for 20 minutes to material that has been heated to 180f (82c) degrees, is sufficient to reduce the moisture content of that same resin to the correct level of dryness.

Therefore, just as desiccant driers assure dry material by measuring temperature and DEW POINT over time, we assure dry material by measuring temperature and VACUUM over time.

When we assure that a certain temperature has been reached and a certain vacuum level achieved for a correct length of time, we can then be assured the material is dry.

You may visually assess performance by monitoring temperature and vacuum levels yourself. Of course, the final test is in the quality of the product you manufacture. We welcome your comments and observations.

FEATURES

You have purchased the most innovative dryer to be made available to the plastics industry in over 50 years (at least that's what we think). This is a dryer that does not use dry air to dry material. Instead, it uses reduced pressure (more commonly called vacuum) to lower the boiling point of water, thereby causing all moisture to rapidly "boil" off at temperatures well below the normal boiling point of water.

Here is why this dryer is so much better:

1. The capital cost of this technology is comparable to a desiccant dryer.
2. Operating cost is LESS THEN HALF that of a desiccant dryer and in many cases reduced by as much as 80 percent.
3. Your "Monday morning" start up time is cut from 4 hours to under an hour.
4. Your material change over time is reduced to ZERO if you plan ahead about one hour. Color changes can be made "On the fly" with NO lost time.
5. The routine desiccant maintenance associated with desiccant dryers is eliminated. Our dryer has no "routine" maintenance items.
6. For those who sometimes forget to plan ahead, your unused inventory of blended material is 40 minutes, not 4 hours.
7. Plastics often loose physical properties when exposed to high heat for extended periods. Our dryer dramatically shortens this heat time, minimizing or eliminating these problems.

We did not invent vacuum drying.

But...

We did invent the multi stage process used in our LPD dryers. We are the first to bring Vacuum drying technology to the plastics industry in a package that is affordable, reliable, and simple to operate.

We hope you are as proud as we are to be a part of this revolution in drying technology.

NOTE to our Competitors:

Our would-be competitors will, no doubt, be among the first to read this manual. We wish to tell them that all inventive aspects of this new technology are subject to domestic and international patents either issued or now pending. We intend to aggressively pursue our rights under these patents at such time when they issue.

MODELS

| Model | Throughput per hour lbs / kg | footprint dimension inches | Available (estimated) |
|----------|------------------------------------|----------------------------------|--------------------------|
| LPD-30 | 33 / 15 | 16 x 16 | now |
| LPD-100 | 110 / 50 | 28 x 28 | now |
| LPD-200 | 220 / 100 | 30 x 31 | now |
| LPD-1000 | 1100 / 500 | 60 x 60 | Dec 2004 |
| LPD-500 | 550 / 250 | 60 x 60 | Jan 2006 |

Throughputs listed here are nominal. Actual throughput depends on the material and drying requirements.

PRINTER OUTPUTS

As an aid to monitoring dryer performance and documenting operation, a printed output of dryer operation information may be obtained for each cycle. This is done by activating the *54 printer function and connecting a printer to the printer port.

A typical printout for each cycle looks like this:

```
08/23/2000 ID: 000 TARGET: 160 F CYCLE: 020 m FILL: 011 s
02:17:19 PM 0:00 TEMP: 133.7 F HEAT: 26% VAC: 5 in Hg.
02:17:39 PM 0:00 TEMP: 143.7 F HEAT: 29% VAC: 17 in Hg.
02:17:59 PM 0:00 TEMP: 153.6 F HEAT: 29% VAC: 21 in Hg.
02:18:19 PM 0:00 TEMP: 157.8 F HEAT: 29% VAC: 24 in Hg.
02:18:19 PM 0:00 TEMP: 157.8 F HEAT: 29% VAC: 24 in Hg.
02:18:28 PM 0:08 TEMP: 159.0 F HEAT: 29% VAC: 25 in Hg.
02:19:33 PM 1:05 TEMP: 160.1 F HEAT: 23% VAC: 28 OFF 2:23
02:21:22 PM 2:54 TEMP: 160.1 F HEAT: 23% VAC: 25 ON 6:23
02:23:28 PM 5:00 TEMP: 160.1 F HEAT: 23% VAC: 28 in Hg.
02:28:28 PM 10:00 TEMP: 160.1 F HEAT: 23% VAC: 28 in Hg.
```

The first line is a "header" line for each cycle:
Date, Unit ID number, and Thumbwheel settings.

```
08/23/2000 ID: 000 TARGET: 160 F CYCLE: 020 m FILL: 005 s
```

The header is followed by lines of information that print as often as you specify in the frequency entry. In addition, a line prints every time the vacuum turns on and every time it turns off.

Each line includes:

Time, accumulated cycle time, current temperature, heater duty cycle, and current vacuum.

```
02:28:28 PM 10:08 TEMP: 160.1 F HEAT: 23% VAC: 28 in Hg.
```

Vacuum ON/OFF lines also give the time the vacuum was ON or OFF.

```
02:19:33 PM 10:08 TEMP: 160.1 F HEAT: 23% VAC: 28 OFF 2:23
```

In this example, vacuum was OFF for 2 minutes, 23 seconds.

ALARMS

ALARMS and their cause.

| Display: | Problem: |
|----------------------|---|
| CANS. DID NOT INDEX | Canisters failed to advance during indexing. The "lock" switch was not forced open by the movement of the canisters. |
| CANS. DID NOT LOCK | Canisters failed to LOCK in place after indexing. The "lock" switch is not closed, indicating the cam disk (and canisters) did not advance fully to a correct position. |
| VACUUM FAILURE | Vacuum failed to reach target within time specified by the VAL parameter, or vacuum dropped more than 2 inches after having reached the target. Controlled by the "vacuum" sensor in the controller. |
| NO HEAT | Sufficient heat rise was not detected within time specified by the NHA parameter. Controlled by the "temperature" sensor. |
| CONVEYER | Loader did not satisfy the level sensor on the last attempt. Controlled by the receiver level sensor. |
| TARGET TEMP TOO HIGH | The Thumbwheel switch setting exceeds the maximum allowable temperature as defined by the MAX parameter. |
| CANISTER NOT FOUND | There is NO canister under the fill valve, or the bottom plate is missing in the canister. Controlled by the safety switch under the heat station. This alarm may also indicate that air supply is low or disconnected. |
| CYCLE TIME | The level sensor under the dispense (front) canister is uncovered (canister empty) before the cycle time is complete. |
| NO HEAT RISE | There has been a drop in temperature in spite of a request by the software to increase the temperature and sufficient time for the increase to take place. Controlled by the HFT parameter. |

"LOCK" SWITCH LOCATION:

The "lock" sensor switch is located in the front, on the top plate surface. It is mounted under the bar which holds the cam bearing. When the cam bearing is engaged, the switch is pressed into a White plastic pillar bolted to the top plate. This pillar, clearly visible when door is open, is an eccentric cam and can be rotated to adjust for proper switch closure.

"CANISTER SAFETY" SWITCH LOCATION:

This switch is mounted on a white plastic pillar bolted under the heat plate below the heat station. It is visible, down low to the right rear, when the door is open. A "yellow" air line runs to it. Operation of the switch can be confirmed when the heat plate rises against a canister.

"CLEAR" ROUTINE

A "CLEAR" routine is available that will clear all data, flags, and all other current information from memory. Since MEMORY is battery backed up, turning power off does not clear all fields. Some information is intentionally held for later use. A "CLEAR" routine will clear all RAM data and start with the information stored in the EEPROM. This is the same data that existed when new, or data that you may have intentionally saved earlier.

To execute a "CLEAR", hold down the "CE" key while turning POWER ON, then release. When done correctly, the display will say (CLEAR).

CLEAR does not clear EEPROM information but instead loads EEPROM into RAM. Vacuum calibration is NOT lost.

(To load EEPROM with correct RAM information, see KEYPAD, *23)

CLEAR ALL - RESTART

The same as the CLEAR, above, but EEPROM information is also cleared. There are only TWO times when you want to do a CLEAR ALL.

1. When a NEW PROGRAM CHIP has been installed.
New chips often have different PARAMETER table layouts. Information may reside in memory locations that do not match the new program. CLEAR ALL - RESTART fixes this.
2. When all else fails.
CLEAR ALL - RESTART will sometimes fix problems that the simple CLEAR routine misses.

The keys to press on power up are the top row: left, center, and right keys. The left and right keys are the DISP and EXIT keys. The center key is not identified, but is the center of the top five keys. Hold all three down as power is turned on, then release. When done correctly the display will say (CLEARALL).

Vacuum calibration WILL be lost. You will have to follow the Vacuum calibration procedure given in this manual.

Since parameter table information is lost, you will want to reenter parameters that were previously modified. See BRIEF EXPLANATION of PARAMETERS for a quick review of which ones might have been changed.

ADJUSTMENTS

AIR PRESSURE: VACUUM.

Air pressure effects the ability to draw a high vacuum. We recommend a pressure setting of 75 to 80 PSI. The gauge should continue to read this setting even when the vacuum unit is on. If it does not maintain pressure your supply line is not sized properly.

INDEXING SPEED:

Smoothness of the indexing depends on the proper adjustment of the exhaust flow control valves, located on the air supply to each of the three "position" cylinders. When adjusted correctly, the canister will rotate fully to the next position, but without overshoot. Each adjuster controls canister movement only when the cylinder to which it is mounted is de-energized. In other words, it controls cylinder exhaust air. All three must be adjusted to assure correct operation into each position.

These are factory set to fully closed, then opened 2 turns.

CLOSING RATE OF ALL TOP AND BOTTOM PLATES:

The air cylinders that operate the plates above and below the vacuum station, below the heat station, and above and below the Dispense station, are all operated by ONE solenoid. There is a flow control device in the air line to slow down the closing and prevent slamming of these plates. This device is located inside the cabinet, behind the controller, accessible when the cabinet door is opened.

It is factory set to fully closed, then opened 2 full turns.

LOCK CYLINDER ENGAGEMENT RATE:

The cylinder that engages the cam to lock the canisters in position, has a flow control on it to allow for smooth engagement.

It is factory set to fully closed, then opened 3/4 turn.

CORRECT CANISTER INDEXING / LOCATION:

The LOCK cylinder presses a roller into a cam to locate and lock the canisters in the exact correct position. If, after locking, the canister positions are NOT correct, there is an adjustment. The roller is bolted to an arm. This arm pivots from a point near the front edge of the top plate. This pivot point is in a slotted hole. With the locking roller engaged against the cam, loosen the pivot bolt and rotate the entire canister assembly as required to the perfect position. Re-tighten the bolt. Note: Some units use a bracket with four mounting bolts and all must be loosened for adjustment.

MATERIAL CONVEYING RATE

When material is conveyed to the process machine, the rate at which material is picked up by the air steam is important. Too little takes too long to load, too much may block the required flow of air. This rate is adjustable. Open the door. Under the front canister there is

a window to view the flow of material. Adjustment devices vary. Adjust the air flow as required.

VACUUM DETECTOR CALIBRATION:

The circuit board has a vacuum detection device built into it. This assures that during operation, the vacuum is high enough to dry the material, and at the end of each cycle, the vacuum falls low enough to assure the vacuum plates have released before indexing to a new position.

This calibration is correct if the display drops to zero while indexing, and reaches 27 to 30 while drying. The number is vacuum in Inches.

To Calibrate:

| | |
|--------------|------------------------------|
| Press: * | Display will say: (PASSWORD) |
| Press: 22222 | Display will say: (PROGRAM) |
| Press: * | Display will say: (INSTR __) |
| Press: 99 | Display will say: (C= 000) |
| Press: * | Display will say: (* ZERO *) |
| | followed by (C= xxx) |

Vacuum will turn on. Wait for readings to stabilize.

| | |
|----------------------------------|------------------------------|
| Press: * | Display will say: (VAC= __") |
| Enter correct vacuum from gauge: | (VAC= 28") |

AMBIENT AIR / PROCESS AIR EXCHANGE VALVE:

All 200 series and larger units have air exchange valves. They are not required on the 30 series and optional on the 100 series. The operating handle projects through a side panel, down low. Keep it pressed in for high temperatures, pull out for lower temperatures.

Higher horsepower blowers impart considerable heat to the process air. Temperatures may rise above the set point, even with the heater remaining off. To counter these unwanted high temperatures, it is necessary to allow some, or all, hot process air to escape to atmosphere while cooler ambient air is drawn into the blower.

If temperature exceeds set point, open the valve far enough to allow temperature to stabilize at a point where the heaters are cycling just enough for control. It is also acceptable to open the valve as far as possible. But for high temperatures, keep closed. For operating at lower temperatures, open the valve.

POSSIBLE SERVICE ISSUES

LOSS OF VACUUM:

If ALL canisters fail to hold vacuum:

1. Confirm adequate air pressure, 75 to 80 PSI.
2. Confirm the problem is not on the circuit board by comparing vacuum gauge reading to controller display.
3. Check the rubber seals on the top and bottom disks.
Wipe clean with a solvent cleaner if they are contaminated by dust and powder, etc. Check for deep cuts.
4. Confirm the vacuum plates are loose and can tilt slightly so they properly self align to the canister surface.
5. Check the air solenoid.
Air should be blowing out the vacuum venturi exhaust port.
6. Check the Vacuum Generator.
With canisters removed, reach in and cover the vacuum port in the underside of the top vacuum plate. The gauge should go immediately to full vacuum. If it is slow to reach full vacuum the vacuum generator may be contaminated from oil in the compressed air mixing with dust drawn from the canister. If your air is oily, add an oil separator.
7. Check the Purge Valve.
Remove and plug the purge line to confirm that a leaking purge valve is not the source of the problem.

If only ONE canister fails to hold vacuum:

1. Inspect the contact edges of the canisters for damage.
2. Confirm all through-bolt connections are tight.
3. Confirm the canister seam is air tight. Add tape along this seam to check.

VACUUM PLATES

Over time, the vacuum rubber seals may become grooved or loose resiliency and not seal well. Our experience with these gaskets is limited to about 3 years. If you have problems, they can be easily replaced. The vacuum plates, when installed properly, are free to move slightly for self alignment.

HEATER

The heater is controlled by software turning power on and off every second. The percentage of ON time, displayed during operation, gives some indication as to how hot the material has become. As material comes up to temperature, the percentage ON time becomes lower. The displayed temperature is the inlet air as it enters the heating canister. If the system does not show an increasing temperature within a set time after cycle start, an air flow or heater problem is indicated, and the system shuts down.

There are two high temperature SAFETY CUT OFF switches. One is mounted directly to the heater element cartridge. If the blower fails or the air stream is blocked, overheating of the heater element cartridge will trip this safety switch at 300 degrees F (150C). The second is mounted inside the cabinet above the heater outlet. It measures ambient air inside the cabinet and trips at 185F (85C). If a hot air tube fails, inside ambient temperature will rise and this switch will trip. Either

switch will break the control power to the heater relays which will shortly result in an alarm condition. Both switches are MANUAL reset only, and you have to remove the rear cover to access them. We do this so you will then be able to inspect all internal parts closely. These switches should never trip. If they do, something else has failed.

FILTER CLOGGED

A clogged filter will result in a lower than usual heater on-time duty cycle and a delay in reaching temperature. The partially blocked, slower moving air can not remove heat from the heating element as effectively, and therefore the heater on time percentage is lower. A delay in temperature rise will eventually result in an alarm. Your particular processing conditions will determine how frequently this filter should be checked or cleaned.

CHECK OUT PROCEDURE

If you have reason to disassemble and reassemble parts of your dryer, this procedure will confirm that all air line connections are correct.

1. Have NO MATERIAL in the hopper above the unit.
2. Place ALL switches OFF; POWER OFF.
3. Install at least one canister.
4. Connect air supply.
5. Open door and rotate the carousel by hand so that the canister or canisters rotate through all stations. There should be no interference.

If interference is noted, then a cylinder solenoid may be plumbed backwards.

No POSITION cylinders should be pulling at the carousel.
The LOCK should NOT be engaged.
The FILL valve should be closed (cylinder retracted).
The CONVEY hot air valve should not be shifted.

6. Turn the controller on, and go into PROGRAM mode.
Press the OPERATE key. Confirm that all plates engage the canisters:
 - a) one below the heat station.
 - b) one above and one below the vacuum station.
 - c) one above and one below the dispense station.
7. Press the LOCK key.
Confirm the LOCK engages.
8. Press the FILL key.
Confirm the valve opens, cylinder extends.
9. Press the CONVEY key.
Confirm the air valves shift.
10. Press each POSITION key.
When the buttons are pressed in numerical order, confirm that each advances the canisters in a Counter Clockwise direction

(viewed from above) (POS1, then POS2, then POS3, then POS1, etc).

POS1 retracts the rear cylinder. POS2 retracts the left cylinder, POS3 retracts the right cylinder.

CONTROL PANEL REMOVAL

The control panel is removable for service. If you have a controller problem, a complete new control panel may be installed in minutes.

1. Unplug the low voltage power connection from the box below.
2. Remove two screws to open the door.
3. Inside, unplug ribbon cables from the terminal strip board.
4. Disconnect the vacuum line (green tube) at the quick disconnect.
5. Unscrew large plastic nut from back surface; top center.
6. Tilt controller and lift slightly to remove.

MATERIAL NOT DRIED CORRECTLY

Drying is accomplished when all material reaches the proper temperature, and is then placed under sufficient vacuum for a sufficient period of time.

Measurement of moisture content of material, both prior to and after drying, is accomplished by using a moisture analyzer such as one manufactured by Arizona Instruments.

If you are not obtaining the results you want please provide us with the following information so that we may properly diagnose the problem.

General material type: (PET, NYLON, etc.):
Manufacturer:
Material designation:
Desiccant dryer recommended drying temperature:
Desiccant dryer recommended drying time:
Target moisture level for processing:

LPD settings: temperature:
cycle time:
vacuum reading reached:

Moisture content before drying:
Moisture content obtained after drying:

Other clues or comments:

A sample of your material may be required for our own testing. We would need at least 35 pounds.

BUILT IN SOFTWARE TEST PROCEDURES

These routines allow testing of the various inputs and outputs.

Enter the TEST mode by holding down the 5 key and the blank key to the right of the 6 key, while turning power on.

The display will say: (INST [])

Enter 01 for the Keypay test.

Enter 06 for the Printer test.

Enter 07 for the Thumbwheel test.

The keypad test shows the name of a pressed key. Blank keys display the key's row and column position in the matrix. Press the EXIT key TWICE to exit the test.

The Printer test sends the ASCII character set to a printer connected to the Dryer.

The Thumbwheel test shows the thumbwheel switch settings. The TOP set is displayed first. Press the "*" key to advance to the other two thumbwheel switch sets.

To EXIT, either cycle the power switch, or press the EXIT key. Allow 1 second for a soft reset to occur.

CONTROL INPUTS and OUTPUTS

INPUTS:

5 volt digital temperature signal.

Located in the hot air inlet port directly under the heat station.

Material supply level sensor (24 volt)

Located under the dispense station, to signal that all material has been used, and the canisters must index.

Lock detection switch.

Mounted on the locking bar to assure the cam roller has dropped into a detent, assuring full correct position after indexing.

Door Interlock switch.

Mounted on the door, to stop all operation while the door is open.

Vacuum detection device

Mounted on the circuit board, with a small air line running to it. This provides an analog signal to the circuit board for a vacuum reading, over the full range of 0 to 30 inches vacuum.

Heater overheat thermal switch

Heater overheat is a manual reset thermal disk (opens at 269F) mounted on the aluminum tube that contains the heater elements. This would signal a blower failure or blocked air flow. This will break the control circuit to the solid state heater relays.

Cabinet ambient air overheat switch

Cabinet overheat is a manual reset thermal disk (opens at 170F) mounted inside the cabinet above the heater outlet end. This would signal an hot air hose failure. This will break the control circuit to the solid state heater relays.

Loader Receiver level sensor.

Tells when the receiver is low, and the air flow valve must shift to convey material to the receiver.

Canister in place signal.

Mounted on the heat plate below the fill/heat station. When air pressure raises the heat plate, a cylinder rod extends upward and contacts the plate in the bottom of the canister. This forces the cylinder to move backward which operates a switch. No switch closure causes an alarm and displays (CANISTER)

Operator Station inputs:

Cycle Start

Cycle Stop

Mode Select - Auto/Cleanout

Index

Convey On/Off (wired in line with sensor signal)

Alarm Silence button

Plug for remote loader level switch.

Front Panel Inputs:

Keypad

Temperature thumbwheel switches (3 digits)

Minimum Cycle time thumbwheel switches (3 digits) (could be 2)

OUTPUTS:

Air solenoid bank:

| | |
|------------|---|
| Position 1 | Pulls the canisters into position 1. |
| Position 2 | Pulls the canisters into position 2. |
| Position 3 | Pulls the canisters into position 3. |
| Lock | Operates the locking roller on the position cam. |
| Seal | Closes the 2 vacuum plates, the bottom heater plate, and raises the bottom material take off plate while lowering the top cover disk. |
| Fill | Shifts (opens) the valve above the fill/heat station to allow filling of the canister. |
| Empty | Opens the front canister dispense valve. |
| Convey | Shifts the air flow valve to use the heated blower air to convey material to the process. |

Additional outputs:

| | |
|-------------------|--|
| Air Venturi valve | Turns on the air to the air venturi vacuum generator. |
| Heater | We use 2 solid state relays (each rated 25 amps) cycling them on and off every second, to control the heater. |
| Blower | We use 2 solid state relays (25 amps) to control the blower motor. |
| Purge valve | Opens to let hot air into the bottom of the vacuum canister for optional purging of moist air during the vacuum cycle, and allowing hot air in at the end of the vacuum cycle. |

Operator Station outputs:

Green Light
Red Light
Amber Light

Controller outputs:

2 x 20 character lines
Alarm - strobe and beeper
MLAN/G2 computer communications port.
Printer port.

LPD - WIRING DIAGRAM

LPD - EXPLODED VIEW - PARTS

Replace this page with correct diagrams.

OUR DESIGN PHILOSOPHY

While we do have competitors, our equipment is different. Here is why.

When we design equipment, we have FIVE objectives. All are important, but not all are obvious. In their order of importance they are:

1. FUNCTION:

This is very simple; the customer has certain requirements, and we must meet these requirements. This is the most obvious consideration, the first consideration, and the one consideration that can most easily be tested and compared.

2. RELIABILITY:

This is not so easy to test. Time and experience is the only way to be sure equipment will last a long time, require little or no maintenance, and provide maximum "up" time. The true cost of equipment can be much higher when maintenance and lost production time are added in.

3. SERVICEABILITY:

When it breaks, how easily can it be serviced. Can your employees do it, do it quickly, and do it right? Is skilled and costly outside service required? Are parts readily available? How much time will it take to get it running again.

4. EASE OF USE:

What percentage of your employees will be able to run this equipment. All of them? Only the best of them? Maybe only the engineers in the office? How about the night shift? Ease of use is very important. Production suffers when equipment is difficult to understand and operate.

5. PRICE:

Very important. Especially to us. Customers often consider this the most important item and it is easy to compare.

Our competitors often get number 1 and 5 right, "Function" and "Price". On the other hand "Reliability", "Serviceability", and "Ease of use" are difficult to measure, hard to value, and hard to use as selling points. They are also much more difficult features to achieve in the design. We take these three objectives very seriously, incorporating them into product from the very beginning of the design process. Lost production time, while difficult to predict, is very expensive. For that reason we place these design goals ahead of cost. In the long run our customers are better served by this philosophy and, therefore, so are we.

WARRANTY

MAGUIRE PRODUCTS offers THE MOST COMPREHENSIVE WARRANTY in the plastics auxiliary equipment industry. We warrant each MAGUIRE LPD DRYER manufactured by us to be free from defects in material and workmanship under normal use and service; excluding only those items listed below as 'excluded items'; our obligation under this warranty being limited to making good at our factory any Dryer which shall, within FIVE (5) YEARS after delivery to the original purchaser, be RETURNED intact to us, transportation charges PREPAID, and which our examination shall disclose to our satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on our part, and MAGUIRE PRODUCTS neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its Dryers.

This warranty shall not apply to equipment repaired or altered outside MAGUIRE PRODUCTS INC. factory, unless such repair or alteration was, in our judgment, not responsible for the failure; nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by Maguire Products, Inc.

Our liability under this warranty will extend only to equipment that is returned to our factory in Aston, Pennsylvania, PREPAID.

Please note that we always strive to satisfy our customers in whatever manner is deemed most expedient to overcome any problems they may have in connection with our equipment.

EXCLUDED ITEMS:

The ability of the canisters to hold vacuum will be compromised if the vacuum seal edge is damaged from mishandling. We do not warranty canisters damaged from improper handling. We do, however, warranty the seals.

DISCLAIMER - PRODUCTION of FAULTY PRODUCT

This dryer is of a new design. We have had excellent results in all tests performed to date, but we HAVE NOT tested every material available to the plastic's industry. We have not anticipated all possible materials, processing conditions, and requirements. We are not certain that our equipment will perform properly in all instances. You must observe and verify the performance level of this equipment in your plant as part of your overall manufacturing process. You must verify to your own satisfaction that this level of performance meets your requirements. We CAN NOT be responsible for losses due to product not dried correctly, even when due to equipment malfunction or design incorrect for your requirements; and/or any consequential losses due to our equipment not drying material to your requirements.

We will only be responsible to correct, repair, replace, or accept return for full refund, our equipment if it fails to perform as designed, or we have inadvertently misrepresented our equipment for your application. If for any reason this disclaimer is not acceptable, we will accept return of the equipment for full refund, including freight costs both ways.