Continuous Mixed-Flow Grain Dryer with COMMANDER Control System

Operator’s Manual

This manual applies to the following models:
D1660, D1670, D1680, D1690, D16106, D16120, D16140, D16160
D24108, D24150, D24180, D24210, D24240, D24260, D24330, D24380
D32260, D32340, D323440, D32500

Original Instructions
This product has been designed and manufactured to meet general engineering standards. Other local regulations may apply and must be followed by the operator. All personnel must be trained in the correct operational and safety procedures for this product. Use the sign-off sheet below to record initial and periodic reviews of this manual with all personnel.

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1. Introduction

Thank you for your purchase. Follow the instructions in this manual for safe use of this grain dryer. Following proper operation and maintenance will help to keep the grain dryer running in optimal condition.

Keep this manual handy for frequent reference and to review with new personnel. A sign-off form is provided on the inside front cover for your convenience. If any information in this manual is not understood or if you need additional information, please contact AGI or your representative for assistance.

This manual should be regarded as part of the equipment.

1.1. Product Information

Always give your dealer the following product information when ordering parts or requesting service. Please record the product information in the table below for easy reference.

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Figure 1. Dryer Rating Label — CE

Figure 2. Dryer Rating Label — CSA

Figure 3. Dryer Rating Label — Domestic
1.2. Intended Use

The grain dryer is intended for use as listed below and described throughout this manual. Use in any other way is considered contrary to the intended use and is not covered by the warranty.

**Intended use for the grain dryer:**
- Designed to dry free-flowing grains, field crops and oil seeds.

**1.2.1 Misuse**

Do not install/use the grain dryer for/with:
- drying grains at temperatures higher than recommended.
- applications other than drying farm crops.
- excessive chaff, seed pods, half cobs, leafy materials, and other foreign material.
- finely milled grain dust.
- bypassed safety sensors.
2. Safety

2.1. Safety Alert Symbol and Signal Words

This safety alert symbol indicates important safety messages in this manual. When you see this symbol, be alert to the possibility of injury or death, carefully read the message that follows, and inform others.

Signal Words: Note the use of the signal words DANGER, WARNING, CAUTION, and NOTICE with the safety messages. The appropriate signal word for each message has been selected using the definitions below as a guideline.

- **DANGER**: Indicates an imminently hazardous situation that, if not avoided, will result in serious injury or death.
- **WARNING**: Indicates a hazardous situation that, if not avoided, could result in serious injury or death.
- **CAUTION**: Indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.
- **NOTICE**: Indicates a potentially hazardous situation that, if not avoided, may result in property damage.

2.2. General Safety Information

Read and understand all safety instructions, safety decals, and manuals and follow them.

- Owners must give instructions and review the information initially and annually with all personnel. Untrained users/operators expose themselves and bystanders to possible serious injury or death.

- Use for intended purposes only.

- Do not modify the grain dryer in any way without written permission from the manufacturer. Unauthorized modification may impair the function and/or safety. Any unauthorized modification will void the warranty.

- Follow a health and safety program for your worksite. Contact your local occupational health and safety organization for information.

- Always follow applicable local codes and regulations.

2.3. Overhead Power Lines

- Keep grain dryers a horizontal distance of at least 100 ft (30.5 m) from power lines.

- Do not use the grain dryer if there is a chance of any loading or unloading equipment contacting power lines.

- Do not locate grain dryers on both sides of a power line.

- Electrocution can occur without direct contact.
2.4. Grain Dryer Safety

**WARNING**
- Do not overheat grain or operate the dryer temperature too high. Keep the maximum plenum temperature not more than the maximum set point temperature.
- Be cautious of spontaneous combustion when working with oil seeds.
- Grain dust is a fire hazard. Keep all areas (including areas under the perforated floors) free from dust and fines.
- Clean out the dryer after using to remove grain dust, husks, and other materials.
- Screen grain before it goes into a bin to help prevent dust and trash buildup. Using a grain spreader will help distribute dust/fines.
- Ventilate, purge all contaminants, and allow burner, and drying areas to cool inside the heater, in the heater area and the dryer area before any persons enter these areas.
- Do not remove covers, touch, or service internal components during operation.
- Do not install or combine with products from other manufacturers. The design and safety features may not be compatible.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of dryer.
- Do not use the dryer where a high concentration of grain dust or flammable liquids or vapors exist, such as milled grain dust.
- Use the dryer only with the gas types intended, connecting alternate fuel sources to the dryer can result in fires.
- Shut off and lock out or disconnect power and close valve at gas source before inspecting or servicing the heater, or when not in use.
- Keep away from fan impeller/blade; high suction can pull a person toward the inlet. Contact with an unguarded impeller/blade will cause severe injury.
- Keep the fan inlet screen in place at all times.
- Remove foreign material from the fan inlet before operating.
- Do not operate the fan if there is excessive vibration or noise.
- When the power is locked out, fans can still be dangerous because of potential “windmilling.” Always block the impeller/blade before working on any moving parts.

**In case of a dryer fire:**
- Turn off gas at the heater and supply tank.
- Shut off and lock electrical power.
- Seal the aeration fan inlet and any other opening to smother the fire.
- Evacuate all personnel from the area.
- Call the fire department.
2.5. Gas Leak Hazards

**WARNING** If You Smell Gas:
- Turn off gas at the source if possible.
- Do not try to light or relight any appliance.
- Extinguish any flames and remove any sources of ignition from the vicinity of the bin.
- Do not touch any electrical switch.
- Evacuate all personnel from the vicinity of the source of the smell.
- Immediately call your gas supplier. Follow the gas supplier’s instructions.
- If you cannot reach your gas supplier, call the fire department.

2.6. Guards Safety

**WARNING**
- Keep guards in place. Do not operate with guard removed.
- Do not walk on, step on, or damage guards.
- Lock out power before removing a guard.
- Ensure all guards are replaced after performing maintenance.

2.7. Work Area Safety

**WARNING**
- Have another trained person nearby who can shut down the grain dryer in case of accident.
- The work area should be kept clear of bystanders, including children.
- Keep the work area clean and free of debris.

2.8. Drives and Lockout/Tagout Safety

Inspect the power source(s) before using and know how to shut down in an emergency. Whenever you service or adjust your equipment, make sure you shut down your power source and gas supply and follow lockout and tagout procedures to prevent inadvertent start-up and hazardous energy release. Know the procedure(s) that applies to your equipment from the following power sources.

For example:
- De-energize, block, and dissipate all sources of hazardous energy.
- Lock out and tag out all forms of hazardous energy.
- Ensure that only 1 key exists for each assigned lock, and that you are the only one that holds that key.
- After verifying all energy sources are de-energized, service or maintenance may be performed.
- Ensure that all personnel are clear before turning on power to equipment.

For more information on occupational safety practices, contact your local health and safety organization.
2.8.1 Electric Motor Safety

**WARNING**

**Power Source**

- Electric motors and controls shall be installed and serviced by a qualified electrician and must meet all local codes and standards.
- Do not modify the magnetic starter. This component provides overload and under-voltage protection.
- Motor starting controls must be located so that the operator has full view of the entire operation.
- Locate main power disconnect switch within reach from ground level to permit ready access in case of an emergency.
- Motor must be grounded.
- Guards must be in place and secure at all times.
- Ensure electrical wiring and cords remain in good condition; replace if necessary.

**Lockout**

- The main power disconnect switch should be in the locked position during shutdown or whenever maintenance is performed.
- In the event of unexpected fan shutdown, the fan can be reset using the main power switch located on the fan or using a reset button when equipped.

2.9. Personal Protective Equipment

The following Personal Protective Equipment (PPE) should be worn when installing the equipment.

**Safety Glasses**

- Wear safety glasses at all times to protect eyes from debris.

**Coveralls**

- Wear coveralls to protect skin.

**Hard Hat**

- Wear a hard hat to help protect your head.

**Steel-Toe Boots**

- Wear steel-toe boots to protect feet from falling debris.
Work Gloves
• Wear work gloves to protect your hands from sharp and rough edges.

Fall Protection
• Use a fall arrester or fall restraint when climbing or working at heights.

2.10. Safety Equipment

The following safety equipment should be kept on site.

Fire Extinguisher
• Provide a fire extinguisher for use in case of an accident. Store in a highly visible and accessible place.

First-Aid Kit
• Have a properly-stocked first-aid kit available for use should the need arise, and know how to use it.

2.11. Safety Decals

• Keep safety decals clean and legible at all times.
• Replace safety decals that are missing or have become illegible. See decal location figures that follow.
• Replaced parts must display the same decal(s) as the original part.
• Replacement safety decals are available free of charge from your distributor, dealer, or factory as applicable.

2.12. Decal Installation/Replacement

1. Decal area must be clean and dry, with a temperature above 50°F (10°C).
2. Decide on the exact position before you remove the backing paper.
3. Align the decal over the specified area and carefully press the small portion with the exposed sticky backing in place.
4. Slowly peel back the remaining paper and carefully smooth the remaining portion of the decal in place.
5. Small air pockets can be pierced with a pin and smoothed out using the decal backing paper.
2.13. Safety Decal Locations and Details

Replicas of the safety decals that are attached to the grain dryer and their messages are shown in the figure(s) that follow. Safe operation and use of the grain dryer requires that you familiarize yourself with the various safety decals and the areas or particular functions that the decals apply to, as well as the safety precautions that must be taken to avoid serious injury, death, or damage.

Figure 5. Front Left Dryer Safety Decal Locations

Figure 6. Front Right Dryer Safety Decal Locations
2. SAFETY

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

Figure 7. Drag Unload Safety Decal Locations

![Diagram of Drag Unload Safety Decal Locations]

Figure 8. Auger Unload Safety Decal Locations

![Diagram of Auger Unload Safety Decal Locations]

Figure 9. Door Safety Decal Locations

![Diagram of Door Safety Decal Locations]

One decal per door, including cleanout doors

079338 (CSA Only)

036737

079337 (CSA Only)
### Table 1. Safety Decal Details — CSA

<table>
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<th>Decal Number</th>
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| 036726       | **WARNING**
|              | CUTTING HAZARD
|              | To prevent serious injury, keep away from blade when fan is operating. Shut off and lockout or disconnect power before inspecting or servicing. Keep guards in place while operating. |
| 035691       | **HIGH VOLTAGE**
|              | To prevent serious injury or death, turn off and lock out power before servicing. |
| 036725       | **DANGER**
|              | HIGH VOLTAGE
|              | To prevent serious injury or death, turn off and lock out power before servicing. |
| 7713361      | **SAFETY INSTRUCTIONS**
|              | For proper operation:
|              | • Read your operator’s manual carefully. It contains valuable information on how to run this machine safely and economically.
|              | • Clean out dryer after initial filling to prevent fires.
|              | • When operating with oil seeds, be cautious of spontaneous combustion.
|              | • Check fuel line components for leaks after transport and periodically thereafter. |
| 036222       | **WARNING**
|              | BURN HAZARD
|              | To prevent burns from high temperature flame:
|              | • Keep door closed when operating.
|              | • Lock out power before opening inspection door. |
| 035690       | **WARNING**
|              | ENTANGLEMENT HAZARD
|              | To prevent serious injury or death:
|              | • Keep body, hair, and clothing away from rotating pulleys, belts, chains, and sprockets.
|              | • Do not operate with any guard removed or modified. Keep guards in good working order.
|              | • Shut off and lock out power source before inspecting or servicing machine. |
| 036737       | **CAUTION**
|              | DO NOT TOUCH!
|              | Door may be hot and under pressure. Be sure blower has completely stopped and allow unit to cool down before opening door. Failure to heed may result in minor to moderate injury. |
| 1001985      | **DANGER**
|              | ROTATING FLIGHTING HAZARD
|              | To prevent death or serious injury:
|              | • KEEP AWAY from rotating auger flighting.
|              | • Shut off and lock out power before removing cover or servicing. |
| 1002301      | **WARNING**
|              | To prevent serious injury or death:
|              | • Read and understand the manual before assembling, operating, or maintaining the equipment.
|              | • Only trained personnel may assemble, operate, or maintain the equipment.
|              | • Children and untrained personnel must be kept outside of the work area.
|              | • Do not modify the equipment. Keep in good working order.
|              | • Lock out power before performing maintenance.
|              | • If the manual, guards, or decals are missing or damaged, contact factory or representative for free replacements. |
To avoid injury from moving parts, disconnect power to the equipment before (removing, opening) this (cover, door).

**WARNING**

Pour éviter les blessures attribuables aux pièces mobiles débrancher l’appareil avant (de retirer, d’ouvrir) (ce couvercle, cette porte).

**AVERTISSEMENT**

If the information in the manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- **DO NOT** store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- **WHAT TO DO IF YOU SMELL GAS**
  - **DO NOT** try to light any appliance.
  - **DO NOT** touch any electrical switch.
  - **Immediatly call your gas supplier, call the fire department.
  - **Installation and service must be performed by a qualified installer, service agency or the gas supplier.

**FOR YOUR SAFETY** - The use and storage of gasoline and other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous. Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

**Note**

The towing label is only used on certain models that can be safely towed.
To prevent serious injury or death, shut off power and reattach guard before operating machine.

MISSING GUARD HAZARD WARNING

For proper operation:

- Read your operator’s manual carefully. It contains valuable information on how to run the machine safely and economically.
- Clean out dryer after initial filling to prevent fires.
- When operating with oil seeds, be cautious of spontaneous combustion.
- Check fuel line components for leaks after transport and periodically thereafter.
Note
The towing label is only used on certain models that can be safely towed.
3. Features

Read this section to familiarize yourself with the basic component names and functions of the grain dryer.

3.1. General Design Criteria

Note
Grain dryer design is based on load factors. If you wish to add more sections to your dryer in the future, please let NECO know when you place your order so it will be designed to fit to your expanding needs.

3.1.1 Tier Information

• A tier is a set of parts that make up ONE layer of the dryer (also called body section).
• The top four tiers on all dryers are made up of 18 gauge material.
• The tiers below the 18 gauge tiers will be made of heavier materials, based on the required strength of that dryer configuration.

3.1.2 Body Section Information

• An assembled dryer section may be made up of:
  – 3 to 7 tiers
  – a blower
  – a burner
• The lowest body section is attached to the dryer frame and includes the entrance door.

3.1.3 Standard Lengths

Table 3. Standard Lengths

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3.1.4 Total Tier Levels per Length

Table 4. Total Tier Levels per Length

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<td>9.75</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>
3.1.5 Dryer Model Number

The dryer model number provides information on the dryer length and capacity.

- The two digits after “D” are the dryer length.
- Multiply the remaining digits by 10 to determine the approximate bushel capacity for corn. In this example: 40 x 10 = 400 bushels

Example: D 16 60

- 16 indicates this model is a 16 foot long dryer
- 60 indicates this model has a capacity of 60 x 10 = 600 bushels

Using the same process, a model D32500 would be a 32 foot long dryer with an approximate capacity of 5,000 bushels.

3.1.6 Dryer Rating Label

---

**Figure 10. Dryer Rating Label — CE**

**Figure 11. Dryer Rating Label — CSA**

**Figure 12. Dryer Rating Label — Domestic**

---
3.2. Parts of the Dryer

Important
Understanding the terms used to identify the various components of a dryer system will make the instructions in this manual clearer and easier to follow.

3.2.1 Front of Dryer

Figure 13. Front of Dryer (from Fuel Train Side)
Figure 14.  Front of Dryer (from Blower Belt Shield Side)
3.2.2 Rear of Dryer

Figure 15. Rear of Dryer (from Below)

NOTE: The Plenum Door is at the rear of dryer and allows access into the center plenum area. Each dryer section ABOVE THE PLENUM DOOR is separated by a Divider Floor with one Divider Door for plenum access. Divider Doors should always be closed during operation. Optional Cooling Floor(s) & Doors serve a totally different purpose - See Grain Cooling System.
3.2.3 Catwalk Positions

Figure 16. Topside Filling Options

Figure 17. Catwalk Positions

3. FEATURES

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM
3.3. Fuel Supply Components

**WARNING**

Explosion Hazard.

- Know where the main shut-off is.
- Make sure all required personnel are trained.
- Observe all safety rules when working with the fuel system.
- Use lockout/tagout.

**Note**
The layout of fuel train components varies for different dryer types. Although your fuel components may not exactly match what is shown in the following diagrams, the general function of each identified component remains the same.

3.3.1 Liquid Propane (LP)

**Overview Layout**

Each dryer section with a burner has the following fuel system components:

- Inlet section
- Vaporizer section
- Regulator section
- Control loop section

**Figure 18. LP overview layout**
LP Fuel - Inlet Section

Figure 19. LP fuel — inlet section

<table>
<thead>
<tr>
<th>Item # in Diagram</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fuel supply inlet elbow</td>
<td>The main fuel supply connects here on the bottom dryer section. Note that the top dryer section also uses an elbow.</td>
</tr>
<tr>
<td>2</td>
<td>Fuel shut-off valve</td>
<td>The fuel supply for ALL dryer sections can be shut off here.</td>
</tr>
<tr>
<td>3</td>
<td>Fuel supply “T” and transfer line</td>
<td>All middle dryer sections connect here. The upper-most dryer section has an elbow at this location.</td>
</tr>
<tr>
<td>4</td>
<td>Fuel strainer</td>
<td>The fuel strainer traps foreign debris that may be in the liquid fuel line.</td>
</tr>
<tr>
<td>5</td>
<td>Hydrostatic relief valve</td>
<td>The hydrostatic relief valve relieves the hydrostatic pressure that may develop in sections of liquid piping between closed shutoff valves.</td>
</tr>
<tr>
<td>6</td>
<td>Liquid solenoid valve</td>
<td>This is an electrically actuated valve to turn fuel ON or OFF.</td>
</tr>
<tr>
<td>7</td>
<td>Vent pipe assembly (CSA Only)</td>
<td>This piping carries away any liquid discharged from hydrostatic relief valves.</td>
</tr>
</tbody>
</table>
LP Fuel — Vaporizer Section

Figure 20. LP fuel — vaporizer section

<table>
<thead>
<tr>
<th>Item # in Diagram</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Vaporizer coils</td>
<td>Finned tubes that vaporize the liquid propane. These are located in the dryer plenum.</td>
</tr>
</tbody>
</table>
LP Fuel — Regulator Section

Figure 21. LP fuel — regulator section

<table>
<thead>
<tr>
<th>Item # in Diagram</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Pressure regulator</td>
<td>Reduces fuel pressure to the downstream sections of the fuel system.</td>
</tr>
<tr>
<td>9</td>
<td>Pressure gauge</td>
<td>Indicates fuel pressure at the regulator output.</td>
</tr>
<tr>
<td>10</td>
<td>Overpressure relief valve (CSA Only)</td>
<td>Vents excessive vapor pressure that may build up downstream of the regulator.</td>
</tr>
</tbody>
</table>
LP Fuel - Control Loop Section

Figure 22. LP fuel — control loop section

<table>
<thead>
<tr>
<th>Item # in Diagram</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Main valve 1</td>
<td>Electrically actuated valve to turn the fuel ON or OFF to the pilot and burner</td>
</tr>
<tr>
<td>12</td>
<td>Pilot shut-off valve</td>
<td>Manual valve for shutting off fuel to the pilot</td>
</tr>
<tr>
<td>13</td>
<td>Pilot pressure regulator</td>
<td>Further reduces fuel pressure to the pilot solenoid valve</td>
</tr>
<tr>
<td>14</td>
<td>Pilot solenoid valve</td>
<td>Electrically actuated valve to turn the fuel ON or OFF to the pilot</td>
</tr>
<tr>
<td>15</td>
<td>Pilot line</td>
<td>Supplies fuel to the pilot</td>
</tr>
<tr>
<td>16</td>
<td>Main valve 2</td>
<td>Electrically actuated valve to turn fuel ON or OFF to the burner</td>
</tr>
<tr>
<td>17</td>
<td>Electronic modulating motor</td>
<td>Receives signal from the temperature controller. Moves a linkage attached to the butterfly valve to modulate the fuel flow to the burner.</td>
</tr>
<tr>
<td>18</td>
<td>Butterfly valve</td>
<td>Controls flow of fuel to the burner to maintain the desired temperature.</td>
</tr>
<tr>
<td>19</td>
<td>Burner shut-off valve</td>
<td>Manually operated to shut off fuel to the burner</td>
</tr>
</tbody>
</table>
3.3.2 Natural Gas (NG)

Figure 23. NG fuel layout

<table>
<thead>
<tr>
<th>Item # in Diagram</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fuel supply inlet</td>
<td>The main fuel supply connects at this location.</td>
</tr>
<tr>
<td>2</td>
<td>Fuel shut–off valve</td>
<td>The fuel supply for ALL dryer sections can be shut off here.</td>
</tr>
<tr>
<td>3</td>
<td>Pressure regulator</td>
<td>Reduces fuel pressure to the downstream sections of the fuel system.</td>
</tr>
<tr>
<td>4</td>
<td>Main valve 1</td>
<td>Electrically actuated valve to turn fuel ON or OFF to the pilot and burner.</td>
</tr>
<tr>
<td>5</td>
<td>Pressure gauge</td>
<td>Indicates fuel pressure at the regulator output.</td>
</tr>
<tr>
<td>6</td>
<td>Pilot shut-off valve</td>
<td>Manual valve for shutting off fuel to the pilot.</td>
</tr>
<tr>
<td>7</td>
<td>Pilot solenoid valve</td>
<td>Electrically actuated valve to turn the fuel ON or OFF to the pilot.</td>
</tr>
<tr>
<td>8</td>
<td>Pilot line</td>
<td>Supplies fuel to the pilot.</td>
</tr>
<tr>
<td>9</td>
<td>Main valve 2</td>
<td>Electrically actuated valve to turn the fuel ON or OFF to the burner.</td>
</tr>
<tr>
<td>10</td>
<td>Electronic modulating motor</td>
<td>Receives signal from the temperature controller. Moves a linkage attached to the butterfly valve to modulate the fuel flow to the burner.</td>
</tr>
<tr>
<td>11</td>
<td>Butterfly valve</td>
<td>Controls flow of fuel to the burner to maintain the desired temperature.</td>
</tr>
<tr>
<td>12</td>
<td>Burner shut-off valve</td>
<td>Manually operated to shut off fuel to the burner.</td>
</tr>
<tr>
<td>13</td>
<td>Pilot Pressure Regulator (CSA Only)</td>
<td>Further reduces fuel pressure to the pilot solenoid valve</td>
</tr>
<tr>
<td>14</td>
<td>Overpressure relief valve</td>
<td>Vents excessive pressure that may build up downstream of the regulator</td>
</tr>
</tbody>
</table>
3.4. Burner Control and Temperature Control

**WARNING**  
**Electrocution Hazard**
- Know where the main shut-off is.
- Make sure all required personnel are trained.
- Observe all safety rules when working with the electrical system
- Use lockout/tagout.

**Burner Control Box Components**

Figure 24. Burner box components

The Burner Box contains five primary components, which work together to control the combustion inside the dryer. They are:

- **The Air Switch** checks for airflow across the burner.
- **The Spark Igniter** sends voltage to the spark plug to light the pilot.
- **The KS45 Temperature Controller** sends and receives temperature data.
- **The TB45 High Temperature Limit Switch** allows manual control of the high temperature setting by adjustment of the knob. If the high temperature limit is exceeded, the dryer shuts down immediately with NO cool-down period.
- **The Honeywell Flame Safety Relay** checks functions related to combustion:
  - Absence of pilot flame
  - Adequate air flow
  - Presence of burner flame
  - High Temperature Limit
  - Controls outputs for ignition, inlet valves, pilot valve, main valve, and burner reset.
Burner Box Cable(s)

- The grey cable entering the left side of the burner box(es) from each modulating motor is pre-wired at NECO. This cable signals the modulating motor to adjust the butterfly valve, controlling the flow of fuel.

- The yellow burner cable(s) and the grey communication cable(s) are used between each burner box and also from the lowest burner box to the main control box.
  - The yellow cable connects to the T-connector on the top burner box, as does the yellow splitter cable for the fill and low switches.
  - The grey cable plugs directly into the top burner box, while the T-connector is used for lower burner boxes when present.

Figure 25. Burner box cable connections

Components Located at Each Burner

- The spark plug lights the pilot upon signal from the spark igniter.
- The UV sensor checks for two separate conditions relating to the absence or presence of flame.
- The pilot fuel line supplies the fuel for the pilot. This line comes from the main fuel train and has its own manual shut-off, pressure regulator, and solenoid valve.
- The air switch line is connected to the air switch and must sense airflow in order for the burner to light and stay lit.
Temperature Control

(each plenum section with a burner)

- The sealed dual temperature probe has two thermocouples: one for the temperature control (KS45), and the other for the high temperature limit sensing (TB45).

Note

Locate the dual temperature probe in the plenum, 5 ducts away from the burner horizontally and 3 ducts from the floor vertically.
3. FEATURES

3.5. Blower System

- The blower motor, pulley, and blower housing are located at the lowest level of each dryer section. A transition housing connects the blower housing to specific tiers of that section.

- Proper airflow is verified by the static pressure air switch located within the burner box.

- The primary purpose for the blower system is to provide airflow for each dryer section. Most blower/transition housings include a burner system. However, a bottom dryer section can be ordered with a blower, but NO burner. This would be used for cooling only.

- The blower motor size is provided per dryer configuration and customer requirements, and ranges from 15 to 30 HP.

- Refer to Section 7.1 – Standard Model Specifications on page 125 for more information, including total airflow, etc.

- The blower system in the lowest dryer section with a burner can also include an optional system that will cool grain using cooling floors and cooling doors. See Section 3.6 – Grain Cooling System (optional) on page 35.

**Figure 28. Blower system**

- **Note**
  - Shown without safety guard for clarity.

**WARNING**

- Do not run the dryer without the proper guard in place.
3.6. Grain Cooling System (optional)

Overview
• An optional grain cooling system with either one or two cooling floors can be supplied with the dryer. Each of the cooling floors has door openings spaced evenly along the length of the dryer. The operator has several grain cooling options from which to choose.
• The cooling floor(s) work in combination with a manually positioned cooling flap that can direct a portion of the blower system airflow. The cooling flap is in-line with the position of the exterior handle so that the operator can tell at a glance where the cooling flap is positioned. The handle position should be secured with the locking system.
• The cooling flap position determines the amount of cooling air that reaches the grain. Moving the handle down lowers the cooling flap and increases the cooling. To decrease the cooling, move the handle up. To shut off the cooling move the handle all the way up.

Batch Mode Drying / All Heat
• Cooling doors all open
• Cooling flap fully raised for all heat

Figure 29. Batch mode drying / all heat

Continuous Mode Drying / with Cooling
• Cooling doors shut in the top cooling floor give two levels of cooling
• Cooling doors in the bottom cooling floor give one level of cooling
• Cooling flap shown closed for maximum cooling

Note
It is common to operate with the cooling flap only partially closed to achieve the desired level of cooling.
3.7. Grain Level Switches

Overview
In continuous mode the system is capable of monitoring five safety/operational switches. The following three switches are included with the system and are field-installed:

- Fill Dryer switch
- Low Dryer switch
- Plugged Discharge switch

Two optional switches (customer supplied and installed) can be wired into the dryer control:

- Wet Bin Empty switch
- Dry Bin Full switch

Fill Dryer Switch and Low Dryer Switch

Note
Location of the Fill Dryer and Low Dryer switches depend on the style of fill and configuration of the intake grain supply. Refer to the figures in this section for details.

- The Fill Dryer switch senses the presence of grain. It signals the PLC to shut off the filling auger.
- The Low Dryer switch is designed to shut off the dryer just before any ducts are empty so that fuel will not be wasted.

Note
The Commander Control ignores the loss of signal from this switch for a period of time to prevent nuisance alarm triggers due to grain movement.
**Figure 31. Switch — side view**

**ATTENTION:** Correctly set switches MUST be used at the proper locations for both FILL & EMPTY - switches are identified with a decal as to the internal dip switch setting of “H” for fill switch or “L” for low switch.

**Figure 32. Switch — top view**

**Figure 33. Gravity Fill Switch and Cover Locations**

**Roof with Gravity Fill System**

Gravity fill system intake grain at the center. The intake auger system must match to this location.
Figure 34. Hole Cover and Switch Flanges

FILL DRYER SWITCH FLANGE IS 30 DEG.
LOW DRYER SWITCH FLANGE IS 45 DEG.

Figure 35. Fill Dryer Switch Location – Gravity Fill System

FILL DRYER SWITCH ASSEMBLY:
#059167-16-30
(REPLACEMENT SWITCH: #059167RH)
Level Auger Fill System Overview

- Grain intake position must be between 1' and 2' from the end of the dryer level auger.
- Factory configuration, per motor cable length and catwalk access, has the level auger motor located at the front end of the dryer closest to the control box.
- The Fill dryer switch and the Low dryer switch must be located at the OPPOSITE end of the intake grain entry for correct operation.
- Standard auger motor rotation brings the intake grain FORWARD from a grain entry position located at the rear end of the dryer. Reversed auger rotation results in the opposite.
3. FEATURES

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

Figure 37. Level Auger Fill Switch Location

STANDARD AUGER MOTOR ROTATION PULLS GRAIN TOWARD MOTOR

FILL DRYER SWITCH ASSEMBLY:
#059167-16-30
(REPLACEMENT SWITCH: 059167RH)

INTAKE GRAIN AT REAR (2 FT FROM END)

REAR OF DRYER

FILL SWITCH AT OPPOSITE END OF FILLING

FRONT OF DRYER
Roof with Level Auger System

Figure 38. Fill Dryer switch location – Roof with level auger

Figure 39. Low Dryer switch location – gravity fill AND level auger fill systems
3.8. Discharge Equipment

Overview
The discharge system is offered using either auger or drag.

- The grain is fed into a discharge system by a pair of metering rolls powered by a DC drive motor and controlled to discharge grain at the target moisture content.
• The discharge system runs along both sides of the dryer and moves the grain from front (blower end) to rear (plenum door end).
• Cleanout doors are located below each discharge system for ease of maintenance, etc.
• At the rear of the dryer, the grain is combined and directed to a final discharge area.

**Metering Rolls**

• The metering rolls direct the grain to the discharge system at a controlled rate.

**Figure 41. Metering rolls on auger and drag style discharges**

**Metering Rolls DC Drive Motor**

• The DC motor is located under the front frame of the dryer. Chains run from the DC motor to drive sprockets on the ends of the metering rolls.
• When in AUTO mode, the motor receives RPM input from the DC drive unit based on requirements to meet the outlet target moisture content.
• Batch operation and initial automatic mode operation require a manual metering roll speed to be set - this speed would be active until the Dryer Master obtains enough data to begin automated control.
• See Section 8.1 – Manual Dryer Speed on page 127 (in the Appendix) for recommended dryer speed for all dryer models / motor RPMs and desired moisture contents.

**Attention**
If the equipment was ordered heavy for future expansion, there may be a higher RPM motor installed than listed on the chart in the Appendix. Check the DC drive motor rating plate to be sure.

### Table 5. DC drive motor for metering rolls

<table>
<thead>
<tr>
<th>1/4 HP Drive Motors</th>
<th>1/2 HP Drive Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 RPM</td>
<td>60 RPM</td>
</tr>
<tr>
<td>42 RPM</td>
<td>92 RPM</td>
</tr>
<tr>
<td>62 RPM</td>
<td></td>
</tr>
<tr>
<td>83 RPM</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 42. DC Drive Motor**

**Metering Rolls Stall Switch**

- The proximity switch is located to the left of the metering roll drive sprockets. It senses the rotation of the sprocket.
- If the metering rolls jam or stall, the dryer will shut down with a cool down period.
Auger Style Discharge

**WARNING** Shut down the dryer and lock out power before opening any conveyor access points. Use a stick or tool (not hands) for cleanout.

- The discharge motor turns the discharge augers counterclockwise, as seen from the front of the dryer. Grain moves to the rear.
- Each set of clean-out doors open for access to the discharge augers facilitating ease of clean-out.
- Normally, the discharge drive motor has a motor starter, but can be optionally controlled by a VFD. The VFD allows the auger system to match the speed of the metering rolls, resulting in less grain damage, etc.

**Note**
See Section 8.1 – Manual Dryer Speed on page 127 in the Appendix.
3. FEATURES

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

Figure 45. Drive system for auger discharge system (guards are shown open to show detail)

Rear Cross-Augur System

Figure 46. Rear cross-auger system
• The cross auger system combines the dried grain from the two main discharge augers and transfers it to a single discharge output that can be supplied with a left-hand discharge, right-hand discharge, or a center discharge.

• If needed, the orientation of the discharge (RHT, LFT, CTR) can be changed. Contact your NECO dealer.

The following steps describe how to close the clean-out doors on the auger system:

1. Close the outer clean-out door first.

   **Figure 47. Close the outer door first**

   2. While holding the outer door in place, close the inner door until it overlaps with a snug fit.

   **Figure 48. Adjust the latch**

   3. Adjust the latch to a reasonable tension.

   4. Put the latch’s loop into the inner door’s hook.

   5. Secure by pushing the draw latch closed.

   **Figure 49. Push the latch closed**

   **Note**
   
   To open the doors, simply reverse the previous steps (excluding the tension adjustment).
Drag Style Discharge

- The discharge motor rotates the two drags positioned along the sides and moves the grain to the rear of the dryer.
- Normally the discharge drive motor has a motor starter, but can be optionally controlled by a variable frequency drive (VFD).

Figure 50. Drive system for drag discharge system (guard removed to show detail)

Note
On both sides of the main drags under the dryer are metering roll clean-out doors. To open, pull out the pin on each of the clamps. See Figure 51 and Figure 52.
Figure 51. Closed clean-out door

Figure 52. Open clean-out door

Note
To access the drag conveyor itself, open the hinged doors on the bottom of the conveyors. To minimize stress on the bolts, first remove the three nuts on the hinge side of the door, and then remove the three nuts on the opposite side before swinging the door open. Reverse the order when shutting the door. Refer to the figure below.

Figure 53. Removing the hinged door

Rear Cross Drag System
- The cross drag combines the dried grain from the two main drags and transfers it to a single discharge output. This can be supplied with a left-hand or right-hand discharge.
• If needed, the orientation of the discharge (RHT, LFT) can be changed. Contact your NECO dealer.

Figure 54. Cross drag (top view)

Figure 55. Cross drag (bottom view)
3.9. Commander Control Components

3.9.1 Main Control Box

Figure 56. Main Control Box

WARNING
Pushing the E-STOP button will turn OFF all outputs from the PLC. It does NOT shut off power into either Control Box. The Power ON lamp will remain lit on the Main Control front panel.

WARNING
Pushing the E-STOP button will turn OFF all outputs from the PLC. It does NOT shut off power into either Control Box. The Power ON lamp will remain lit on the Main Control front panel.
PLC Details

Figure 57. PLC Details

- 24V ISOLATION RELAYS
- PLC ASSEMBLY M221
- SEE DETAILS BELOW
- E-STOP RELAY
- 24V POWER SUPPLY
- TRANSFORMER 1.5 KVA
- DC DRIVE
- 24V INPUTS FROM STARTER OVERLOADS AND RUN CONFIRMATION RELAYS
- M221 MAIN BASE
- SD CARD ENTRY
- MODBUS COMM FROM BURNER BOX(S)
- ETHERNET PORT
- M221 ANALOG I/O 0-10 VDC FOR MOISTURE SENSORS & DC DRIVE
- M221 BATTERY (Behind Wires)
- M221 DIGITAL I/O EXPANSION
- 120V OUTPUTS TO MOTOR STARTER COILS
3.9.2 HMI Enclosure

Location

NECO recommends that the HMI enclosure be located indoors, with line-of-sight of the dryer. Maximum distance should be within 300 feet (91.4 m) — the maximum length of the Ethernet cabling.

If it is necessary to place the unit outside, subject to temperature and weather extremes, it must be installed inside another enclosure.

Note

Do not locate the HMI screen in direct sunlight.

Figure 58. Example HMI Location
HMI Screen

Figure 59. HMI Screen

**NOTE:** This ON/OFF switch controls the DryerMaster unit only, not the entire HMI enclosure. POWER IS STILL ON INSIDE THE HMI UNIT.

**WARNING** Pushing the E-STOP button will turn OFF all outputs from the PLC. It does NOT shut off power into the HMI or main control panel. The Power ON lamp will remain lit on the Main Control front panel.

Figure 60. Rear View of HMI Screen
3.9.3 Moisture/Temperature Sensor Overview

- The combination moisture/temperature sensing unit (059250W) has a moisture sensing “fin” and a temperature sensing probe directly below it. The sensor provides 0 to 10 VDC signals for both temperature and moisture, which the embedded DryerMaster converts to grain moisture and temperature readings.
- One sensor is located at the top of the dryer for reading INLET grain moisture and temperature.
- One sensor is located at the dryer grain discharge chute for reading OUTLET grain moisture and temperature.
Inlet Moisture/Temperature Sensor

Note
Roof with Gravity Fill AND Level Auger Fill systems locate the inlet sensor on the catwalk side of the roof with a hatch-style door at the end of the catwalk for access.

Figure 64. Inlet sensor location

Outlet Moisture/Temperature Sensor

- The grain is directed past the moisture fin and temperature probe.
- Manual grain samples must be taken for the outlet grain moisture calibration, and also for measuring the grain temperature.

For auger unloads, pull back the spring-loaded locking pin and tilt the sample chute back into the grain flow to collect a sample. For drag unloads, pull out the spring loaded slide gate and grain will flow out of the sample chute.
Outlet Moisture/Temperature Sample Button

**Note**
Pushing the sample button activates the moisture calibration routine, the same as if activated from the HMI in AUTO mode.
3. FEATURES

3.9.4 Discharge Plugged Sensor

- Dryers with auger unloads utilize a proximity switch (059118) to detect a plugged discharge. If the grain encounters a plug and backs up into the discharge chute, the hinged door will lift and when the movement is detected by the proximity switch, the dryer will shut down.

- Dryers with drag unloads utilize a diaphragm switch (059245) to detect plugs. If grain backs up into the discharge chute, the direct contact with the diaphragm switch will cause the dryer to shut down.
3.10. External Transport(s)

NECO provides the ability to control any combination up to two transport devices to FILL (wet grain) the dryer and two transport devices to EMPTY (dry grain) the dryer within the Commander Control system. All motor starters, starter coils, and overload contacts required are customer-supplied.

Depending on what type of transport style and configuration, the necessary data inputs must be entered in the Fill/Empty setup routine (see Section 4.3.4 – Dealer or Customer Entered Setup Data on page 73). These data inputs consist of:

| Is a motor present that needs to be controlled? | PRESENT |
| Does that motor need to run continuous? | RUN CONTINUOUS |
| Does that motor need to stop after drying stops (2 minute delay)? | STOP DRYING AFTER STOPS |
| Start delay (seconds)? | START DELAY |
| Stop delay (seconds)? | STOP DELAY |

The control integrates the external transport equipment actions depending on the presence of the following switches:

- Wet bin empty switch
- Dry bin full switch
- Low Level switch

See Section 8.2 – Optional External Transport Configurations on page 128
4. Operation

Before continuing, ensure you have completely read and understood this manual’s Safety section, in addition to the safety information in the section(s) below.

4.1. Operation Safety

- Keep away from rotating and moving parts, including the auger/mixer flighting, drive components, shafts, and bearings.
- Lock the grain dryer access points (where equipped) and close all other access doors when not in use.
- Always operate with guards, covers, and shields in place.
- Ensure maintenance has been performed and is up to date.
- Ensure that electrical cords are in good condition; replace if necessary.
- The area around the heater should be kept clear and free from combustible materials and other flammable liquids.
- When heater is not in use, shut off gas valve on heater and at gas source.
- Have another trained person nearby who can shut down any powered loading, unloading, or internal equipment in case of accident.
- Keep the work area clean and free of debris.

4.2. Equipment Pre-Check

After completion of assembly and before each use, inspection of the dryer is mandatory. The dryer should be frequently checked and serviced for a trouble-free operation. Use the checklists shown in Figure 70 and Figure 71.
## New Dryer Start-Up Checklist

<table>
<thead>
<tr>
<th>SERIAL#</th>
<th>MODEL#</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Control Type:** PLC/Switches  
**Address:**

<table>
<thead>
<tr>
<th>Program Version: PLC:</th>
<th>HMI:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Phone #:**

### Checklist Items

- Belts - Tension and Alignment
- Chains - Tension and Alignment
- Oil Level in Gearbox
- Metering Rolls Cleaned Out
- Unload Doors Closed Properly
- Blower Motor Rotation
- Blower Motor Amps
- Auger/Drag Rotation
- Metering Rolls Rotation
- Cross Auger/Drag Rotation
- Guards & Shields in Place
- All Gas Unions
- Additional Gas Line Leaks
- Fill Dryer Switch
- Low Dryer Switch
- Thermocouple/High Limit Position
- Thermocouple/High Limit Condition
- Discharge Plug Switch
- Set Gas Pressure
- Air Switch Functionality
- Burner Settings
- Check & Calibrate Moisture Sensor
- Set Min & Max Metering Roll Speeds

### Belt Information

<table>
<thead>
<tr>
<th>Belts</th>
<th>Size</th>
<th>Quantity</th>
<th>Wet 1</th>
<th>Size</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower Belt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unload Belt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level Auger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Additional Comments

---

**Figure 70.** New dryer start-up checklist
### Pre-Season Checklist

<table>
<thead>
<tr>
<th>SERIAL#</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL#</td>
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</tr>
<tr>
<td>CUSTOMER</td>
<td></td>
</tr>
<tr>
<td>CONTROL TYPE: PLC/SWITCHES</td>
<td>ADDRESS</td>
</tr>
<tr>
<td>PROGRAM VERSION: PLC: HMI:</td>
<td>PHONE #</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMMENTS</th>
<th>INITIALS</th>
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<tbody>
<tr>
<td>INSPECT FOR GAS LEAKS</td>
<td></td>
</tr>
<tr>
<td>BELTS-CONDITION &amp; TENSION</td>
<td></td>
</tr>
<tr>
<td>DRIVE CHAINS-CONDITION &amp; TENSION</td>
<td></td>
</tr>
<tr>
<td>GEAR BOX OIL LEVEL &amp; CONDITION</td>
<td></td>
</tr>
<tr>
<td>CLEAN METERING ROLLS</td>
<td></td>
</tr>
<tr>
<td>BEARINGS ON METERING ROLLS</td>
<td></td>
</tr>
<tr>
<td>BEARINGS ON BLOWER</td>
<td></td>
</tr>
<tr>
<td>BEARINGS ON AUGERS (UNLOAD AND FILL)</td>
<td></td>
</tr>
<tr>
<td>GREASE ALL BEARINGS</td>
<td></td>
</tr>
<tr>
<td>CLEAN BURNER</td>
<td></td>
</tr>
<tr>
<td>CLEAN AIR SWITCH TUBE</td>
<td></td>
</tr>
<tr>
<td>AIRSWITCH ADJUSTMENT (IF NEEDED)</td>
<td></td>
</tr>
<tr>
<td>BACK DOOR SEAL</td>
<td></td>
</tr>
<tr>
<td>THERMOCOUPLE WIRE</td>
<td></td>
</tr>
<tr>
<td>CLEAN VAPORIZER TUBE FINS (LP)</td>
<td></td>
</tr>
<tr>
<td>HIGH LIMIT/ THERMOSTAT FUNCTION</td>
<td></td>
</tr>
<tr>
<td>FULL DRYER SWITCH</td>
<td></td>
</tr>
<tr>
<td>LOW DRYER SWITCH</td>
<td></td>
</tr>
<tr>
<td>DISCHARGE PLUGGED SWITCH</td>
<td></td>
</tr>
<tr>
<td>START DRYER AND TEST BURNER</td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE CONTROL</td>
<td></td>
</tr>
<tr>
<td>TEST ALL LIGHTS ON CONTROL PANEL</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BELT INFORMATION--# OF BELTS &amp; SIZES</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOWER BELT SIZE: QUANTITY: WET 1 SIZE: QUANTITY:</td>
</tr>
<tr>
<td>UNLOAD BELT SIZE: QUANTITY: WET 2 SIZE: QUANTITY:</td>
</tr>
<tr>
<td>LEVEL AUGER SIZE: QUANTITY: DRY 1 SIZE: QUANTITY:</td>
</tr>
<tr>
<td>DRY 2 SIZE: QUANTITY:</td>
</tr>
</tbody>
</table>

**Additional Comments**

---

**Figure 71. Pre–season checklist**
4.3. Commander Control Setup

4.3.1 Log In

Prior to Logging In

Note
On-screen controls (buttons, icons, tabs, etc.) that are unavailable (are not currently functional) appear with a “hatched” background pattern. This pattern switches to solid when the control becomes available. Some on-screen items are informational only, while others call up screens, sub-screens or menus.

Figure 72. Unavailable screen control

Figure 73. Available screen control

When the power is turned ON, if the The USB device is connected. message appears:

Figure 74. Main menu screen

1. Tap X to clear the message. The MAIN MENU appears, with the time/date and LOG IN button near the middle-bottom of the screen.

Figure 75. Main menu screen
Prior to logging in, the following controls are available:

SETUP

- Tapping the SETUP button opens the SETUP screen. However, none of the controls on the SETUP screen are available until logging in is complete. Tapping the MAIN MENU button on the SETUP screen returns you to the MAIN MENU screen.

- The HMI and PLC software version numbers appear in the upper-right corner of the SETUP screen. These numbers must be compatible.

Figure 76. Versions compatible (SETUP Screen)

TROUBLESHOOTING

- Tapping the TROUBLESHOOTING button opens the TROUBLESHOOTING screen. NECO and dealer contact information appears on the TROUBLESHOOTING screen.

- None of the controls on the TROUBLESHOOTING screen are available until logging in is complete. Tap the MAIN MENU button to return to the MAIN MENU screen.

Figure 77. Main menu screen

Prior to logging in, the following controls are NOT available:

- ALARMS
- DATA
- FILL/EMPTY DRYER
- GO TO START DRYER

Logging In

1. Tap the LOG IN TO OPERATE button.
The LOG IN screen appears with the NAME and PASSWORD fields in the upper-left corner.

**Figure 79. LOG IN screen**

Temporary keypad touchscreen will appear here in order to enter NAME and PASSWORD.

** Note that both entries require case sensitive input.

UNLOCK

"HOME" ICON

SEE TOUCHSCREEN KEYPAD EXAMPLES BELOW

**Note**
All entries for both the NAME and PASSWORD are case-sensitive.

**Enter NAME**

1. Tap the NAME field box. The alpha-numeric keypad appears.
2. Type one of the following into the NAME field:
   - For basic operation, enter: **USER** (case-sensitive)
   - To access SETUP configuration, enter: **Owner** (case-sensitive)
3. Tap ENTER.

**Enter PASSWORD**

1. Tap the PASSWORD field box. The alpha-numeric keypad appears.
2. Type one of the following into the PASSWORD field:
   - For USER (basic operation), enter: **123** (case-sensitive)
   - For Owner (setup), enter: **MyDryer** (case-sensitive)
3. Tap ENTER.

If an incorrect NAME or PASSWORD was entered (including if the incorrect case was used), the following message is displayed:

**Figure 81.**

- Tap X to acknowledge/dismiss the message and re-start the LOG IN process.

**Complete the LOG in Procedure**

1. Tap UNLOCK. The Current User field displays the NAME of the logged in user.
2. Tap HOME. The MAIN MENU screen appears with the following changes:
   - The LOG OUT button is available in the lower-left corner of the screen.
   - The user NAME appears directly above the LOG OUT button.
   - Depending on the login security level, additional buttons are now available (button is solid rather than hatched pattern), including the OPERATION PERMITTED indicator.
MAIN MENU — After LOG IN

Note
A flashing SETUP button indicates the system configuration data must be restored. This could occur after installing new software, or replacing the PLC battery.

Depending on which screen is currently active, buttons and indicators may appear, or change status:

- The OPERATION PERMITTED indicator may change to a flashing E-STOP ACTIVE indicator.
- Tapping the MAIN MENU button displays the MAIN MENU screen. Touching the BACK button displays the previous screen.

Figure 82. MAIN MENU displaying E-STOP ACTIVE

After LOG IN, the following buttons are available, and the following screens are accessible:

- SETUP — Verify or enter various setup parameters related to the dryer and auxiliary equipment.
- ALARMS — View any current ALARM status
- TROUBLESHOOTING — Contact information for NECO or the local dealer is available for viewing.
- GRAPHS — Graphs can be charted for grain moisture, grain temperature, or grain discharge rate. Data values such as volume throughput are shown.
- FILL/EMPTY DRYER — Used for production filling or emptying of the dryer.
- GO TO START DRYER SCREEN — Used for setting up START DRYER parameters such as which blowers and burners are enabled, etc.

Prior to startup or operation, all SETUP information must either be verified or entered.

- Some information has been input at the NECO factory in order to do system testing prior to shipment of the equipment. Additional information, such as auxiliary equipment, can only be entered after all equipment has been installed.
- Logged in as Owner, go to SETUP and complete the FILL & EMPTY SETUP and TIMERS SETUP requirements.
Note
After this SETUP data has been entered and verified these screens would generally only need to be accessed if there are changes made to the physical dryer configuration, motors replaced, or the status of any auxiliary equipment has changed.

If all SETUP information has been entered and verified:

- Use the New Dryer Checklist or Pre-Season Checklist as required.
- Otherwise, go to the Operation section to determine how best to fill, start, and run the dryer.

LOG OUT

- The LOG OUT button can be activated at any time during the drying process.

Figure 83. LOG OUT button

- Upon LOG OUT the existing process will continue. NECO recommends not leaving the dryer system completely unattended for an extended period of time, even with the DryerMaster in AUTO mode. The moisture content should be regularly checked and calibrated.

4.3.2 SETUP Main Screen

- The current version of PLC and HMI software is shown at the top-right corner of this main SETUP screen. The two version numbers MUST ALWAYS MATCH. If they match the Versions Compatible indicator appears. If they do not match, contact your dealer.
- Some information has been entered and verified at the NECO factory and can NOT be edited or changed unless the user is logged in as an Owner.

Note
The SECURITY SETUP button (H) will not be available if you are logged in as User. To have the button available, and be able to setup the quick login procedure, log in as Owner or Necotech.
**INITIALIZE** or **SAVE CONFIGURATION** Button

- Starting with the Version 50 installation, the various configuration data is periodically saved to the HMI’s USB data port.
- In the event of a battery failure, the configuration and settings can be restored by tapping the INITIALIZE button.

**Figure 85.  SETUP — INITIALIZE**

- Use the SAVE CONFIGURATION button to save data after making setup changes and at the end of the season before turning power off.
4.3.3 NECO Entered Setup Data

A. Select Desired Units of Measurement

- IMPERIAL — Temperature: Fahrenheit (°F); Volume: bushels per hour (BPH)
- METRIC — Temperature: Celsius (°C); Volume: cubic meters per hour (CMH)
- If no units of measurement is chosen, the default is IMPERIAL.
• If, during initialization or setup, the units designation does not match the temperature controller configuration, a warning message appears, and the correct units must be chosen. It may be necessary to change temperature units to C then back to F to clear this message.

**Figure 88. Units of measurement**

![Units of measurement diagram]

**Note**

The system can switch between unit modes. Tap the desired mode button. It will take approximately 45 seconds for the control to change over.

**B. Dryer Configuration**

- Dryer configuration information is entered at the NECO factory and provides the software with the “as-built” dryer configuration.
- The screen can be viewed by any login status, but only NecoTech login status can make changes. For example, if the configuration needs to change due to dryer upgrade, etc.

**Note**

The example screen shown below is a “mock” 24–ft dryer that has three blowers and burners, with each pair feeding four tiers. Units = Imperial (F); fuel system is liquid propane (LP). Since the example is a three blower system, and the dryer has no #4 blower present, the remaining buttons for line #4, as well as #5 and #6 are row inputs, are not visible.
C. User Language

- User language information is entered at the NECO factory.
- The screen can be viewed by any login status, but only Owner login status can make changes.
- User language choices reflect NECO written programming screens only.

D. Screen Configuration

- User language information is entered at the NECO factory.
- The following items can be changed with Owner login status:
  - Brightness
  - Date/Time
Language (changes within the Schneider software screens only)

Figure 91. Screen Configuration screen

Table 6. Schneider Language Choices

<table>
<thead>
<tr>
<th>Enter #</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>English</td>
</tr>
<tr>
<td>2</td>
<td>French</td>
</tr>
<tr>
<td>3</td>
<td>German</td>
</tr>
<tr>
<td>4</td>
<td>Italian</td>
</tr>
<tr>
<td>5</td>
<td>Spanish</td>
</tr>
<tr>
<td>6</td>
<td>Chinese</td>
</tr>
<tr>
<td>7</td>
<td>Portuguese</td>
</tr>
</tbody>
</table>

4.3.4 Dealer or Customer Entered Setup Data

E. Fill/Empty Setup

- See Section 8.2 – Optional External Transport Configurations on page 128 for example layouts and related data.
- This information is entered by your dealer. It provides the software with “as-built” dryer and auxiliary equipment information required for filling and emptying the dryer.
- The screen can be viewed by any login status, but only Owner login status can enter data or make changes.
The following criteria are possible options available for the equipment choices.

**Note**
If "Motor Present" is set to "No," no further options are displayed for that piece of equipment.

Based on the data entered, further options for that piece of equipment are available:

- For each piece of equipment, is a "MOTOR PRESENT"? YES or NO
- If a motor is present, does it "RUN CONTINUOUS"? YES or NO
- If the motor runs continuous, should it stop after drying stops? YES or NO
- START or STOP DELAY values can be entered as required. (See Section 8.2 – Optional External Transport Configurations on page 128 for details.)

**Equipment To Be Controlled**
- WET 2 TRANSPORT (farthest from dryer)
- WET 1 TRANSPORT (closest to dryer)
- LEVEL AUGER (optional part of dryer)
- UNLOAD TRANSPORT (part of the dryer)
- DRY 1 TRANSPORT (closest to dryer)
- DRY 2 TRANSPORT (farthest from dryer)

**Switches To Be Monitored**
- WET BIN EMPTY SWITCH INSTALLED? Yes or No
- DRY BIN FULL SWITCH INSTALLED? Yes or No
- LOW LEVEL SWITCH INSTALLED? Yes or No
- **UNLOAD TRANSPORT STALL SWITCH INSTALLED?** Yes or No

**Metering Rolls Minimum and Maximum Speed**

- The minimum speed default value is 10. This may need to be increased to ensure the moisture sensor remains covered with grain.
- The maximum speed value should reflect the unload system capabilities:
  - If the value is set too high, excessive plugged discharge alarms will occur.
  - If the value is set too low, production will not be maximized.

**Control Setup (overrides)**

- This section allows the operator or technician to “override” switches, etc.
- For fully automatic dryer and moisture control operation, all switches should be “ON”. This will cause the control to automatically proceed to the next stage, without pausing to wait for a screen control to be activated.
- If the DryerMaster system has an alarm, the default control status to proceed is to STOP DRYING. If the screen control is toggled, the dryer will continue running at MANUAL METERING ROLL SPEED.

**Figure 93. Control Setup screen**

**Outlet Moisture Maximum and Minimum Alarm Setpoints**

- Outlet moisture readings outside of these limits will trigger an alarm and shut down the dryer.
- These setpoints are also visible and editable when changing the target moisture. They can be set as close as 0.5% above and below target moisture. Keep in mind the narrower this window the more likely the dryer will shut down.
Timers Setup

- Default timer values are set within the NECO program. These are to be considered a starting point only. The default data may require fine tuning for your specific equipment configuration. Your dealer will assist with this during startup, etc.

- Depending on the equipment configuration, some timer functions may not be used. These are unavailable and cannot be selected.

- Use the Section 8.5 – PLC and HMI Recorded Data Sheet on page 134 to record this information.

Figure 94. Timers Setup screen

To enter or edit Timer data:

1. Tap the field (box) for the data to be changed. The on-screen numeric keypad appears.

Figure 95. On-screen numeric keypad

- Tap the field (box) for the data to be changed. The on-screen numeric keypad appears.

2. Enter the required data.

NOTE: Any restrictions for MINIMUM or MAXIMUM data values will be shown.
3. Tap the ENTER button on the keypad. The Timer field displays the new data.
4. Edit additional timers or navigate to the MAIN MENU, or BACK the SETUP screen using the buttons at the bottom of the screen.

Security Setup

By default, a user name and a password are required to log in and gain access to the dryer operations. The log in security can be disabled for the USER or Owner level access, if needed. Only one of the two is permitted to be active. Once activated and no one is logged in, a quick "login" button will be visible in the middle of the main screen.

Figure 96. Security Setup screen

Vijeo Design'Air Wi-fi

This is optional wi-fi access to the dryer HMI control. An application can be downloaded and installed on a tablet or cell phone to gain access to the dryer HMI when within wi-fi range. The addition of a wi-fi router, cabling, antenna are required for this access. Refer to the Commander Wi-Fi access section in the Appendix.

4.4. Operation Overview

The NECO continuous dryer system can be optimized using various setups and styles of operation. For instance, the steps of operation for a setup that allows for output grain to be directed back into the wet bin can start and operate differently than a setup where the output grain goes directly into a storage bin. Your dealer can help with auxiliary equipment utilization.

The following examples show two of the most popular equipment configuration and operation situation:

- Example A: Output grain is directed to dry bin grain storage.
- Example B: Output grain is directed back to the wet bin to be recycled through the dryer.

Both examples start by filling the dryer with wet grain using the Fill/Empty routine. Once the dryer is filled above the low level switch and any continuous equipment is running, the Start Auto Dryer button is available.

At this point the crop type can be verified or edited, cooling tiers can be designated, burner temperatures can be set, and a choice can be made to begin drying using either the BATCH (all heat) mode or AUTOMATIC mode.
Fuel Delivery
In both examples it is important to first verify that fuel is being delivered to the dryers:

- Before opening the fuel line to full OPEN, make sure that the plenum is heating up correctly.
- For LP units: The 3/4” return line from the vaporizer MUST be warm to the touch.
- Open the fuel line completely and verify the pressure settings on each of the system regulators:
  - LP systems = 4.0 to 6.0 PSI
  - NG systems = 3.0 to 5.0 PSI

4.4.1 Example A: Batch Drying
In this example output grain is directed to dry bin grain storage.

- After the dryer has been filled with wet grain, BATCH mode is used to begin the drying process
- After BATCH drying for approximately 30 minutes, use the FILL/EMPTY BYPASS option to move some grain through the dryer. This short bypass (5 minutes) moves the cooler, higher moisture corn to the heat ducts, increasing the uniformity of grain drying. This also prevents over-temperature exposure to the drier corn kernel.
- Moisture can be monitored on the DryerMaster STATUS screen. (Navigate from the MAIN MENU screen to the TROUBLESHOOTING screen, to the DryerMaster STATUS screen)
- Once the output grain is within acceptable range for storage conditions, AUTO DRYING mode can be used with the DryerMaster Moisture controller once adequate data has been collected.

4.4.2 Example B: Auto Drying

- After the dryer has been filled past the low dryer switch, set the discharge equipment so that the grain output from the rear of the dryer is directed back into the wet bin.
- Starting on the START DRYER screen, set the temperatures so that the hottest temperature is set on to the highest burner (#1) and the temperatures decrease in each section going down through the dryer.
- For example: a three-burner dryer drying 28% moisture #2 Yellow Corn would have the highest temperature of 220 °F in the top burner #1 and the temperature would decrease in 20°F - 40°F increments moving down through the dryer. Burner #2 at 180°F - 200°F and burner #3 at 160°F - 180°F.
- If cooling floors are present on the dryer, run in the all heat configuration until the moisture has reached an acceptable level for storage limitations in the dry bin.
- Go to the START DRYER screen.
- The grain moving through the dryer at this point should be discharged back to the wet bin.
- After the moisture has been brought down to an acceptable level, divert the grain to the dry bin and make sure that some cooling is applied to the grain. Ideally, the grain should be as close to ambient temperature as possible upon exit of the dryer assuming limited aeration capabilities of the dry bin.
4.4.3 Plenum Door Safety Switch

The plenum door safety switch is mounted on the top right-hand corner of the plenum entry door.

**Note**

When the door is open, the emergency stop alarm will appear on the HMI screen. This will turn OFF all outputs from the PLC. It does NOT shut off power into either Control Panel. The Power ON lamp will remain lit on the main Control Panel. Close plenum door for dryer operation.

---

**WARNING**

Be sure to follow proper lockout/tagout procedures prior to entering the dryer.
4. OPERATION

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

4.5. Fill/Empty Dryer

**Figure 97. Fill/Empty Dryer**

- **Dryer Status is shown here:**
  - Dryer full
  - Grain level OK
  - Grain level low
  - Wet bin empty
  - Dry bin full
  - Max fill time exceeded

The following only shows for start dryer or auto dryer:
- Inlet moisture sensor error

- These two columns are either start or stop, depending on which is chosen.

**Note**

If an error occurs, a flashing ALARM indicator/button appears in place of the BACK button. Tap this button to open the ALARMS screen to view and reset the alarm after the condition has been resolved.

**Set Manual Metering Roll Speed**

- See Section 8.1 – Manual Dryer Speed on page 127 for recommended metering roll speed starting point.
- This speed will be used as the manual setpoint for Batch Mode drying and for initial Automatic Drying Mode until the DryerMaster gathers enough moisture data to take full automatic control.
Note

Only the equipment identified in SETUP — FILL/EMPTY will show up in this list. Status indicator is ON or OFF. If the equipment fails to run or a motor overload trips, a fault indicator appears. Once the problem is solved, the alarm indicator goes out. If OFF, push START or if ON, push OFF to start the delay timer for that piece of equipment?

- Wet Transport 2 (farthest from dryer)
- Wet Transport 1 (nearest to dryer)
- Level Auger
- Unload Auger
- Dry Transport 1 (nearest to dryer)
- Dry Transport 2 (farthest from dryer)

Fill Dryer

- Used to initially fill the dryer with grain.
- Tap START to start filling; tap STOP to stop filling. Filling will stop automatically when the Fill switch is activated.

Fill & Empty (Bypass)

- Used if the grain must pass through the dryer, but not actually be dried.
- Tap START to start; tap STOP to stop.

Note

Turn on the Maintain Minimum Grain Dryer Level to prevent grain from bouncing out of the dryer ducts.
Empty Dryer

- Used when no further filling of wet grain is to occur and the remaining grain must be discharged.
- Tap START to start; tap STOP to stop.

Manual Mode

- Press the Manual Mode button to allow manual operation of the Wet 1, Wet 2 and Dry 1, Dry 2 transports when not drying.
- The external transports can be run manually without the need for additional external local/auto switches.
- Both the Wet 1 & Wet 2 transports as well as Dry 1 & Dry 2 transports can be interlocked so that if one faults out the other will stop.
4.6. Start Dryer - Main

4.6.1 Start Dryer Overview

The Start Dryer main screen is used for:

- Setting necessary drying parameters and then activating either BATCH or AUTO mode.
- Refer to the following sections (designated A, B and C) to correctly set parameters for the required drying mode:
  - Section – A. Crop and Cooling Setup on page 84: Change, add, or edit crops and setup cooling tiers. The current crop and cooling tier layout are shown in the upper-left area of the screen, below the NECO logo.
  - Section – B. Enable or Disable Blowers and Burners on page 87: Set enable or disable for blower(s) and burner(s) for either BATCH MODE or AUTO MODE.
  - Section – C. Set Burner Temperature on page 88: Set burner temperature setpoints for either BATCH MODE or AUTO MODE.
A. Crop and Cooling Setup

This CROP/TIER screen appears when CROP AND COOLING SETUP is selected. This screen displays YES beside the current crop selection. The operator can:

- Select a different crop
- Set cooling tiers
- Edit or enter a crop name or description
To select a different crop:

- Tap the NO button beside indicator for the new crop desired.
- YES will appear, and the screen automatically switches to the START DRYER - MAIN screen
- Verify the current crop indication at the upper-left corner of the screen has changed to display the newly selected crop.

To set cooling tiers (floors):

- Tap the button representing the correct number of cooling tiers.
Edit or Add Crop Names

Figure 100. Editing Crop Names

To edit or add a crop name or description:

- Tap the Edit Crop Names button. The Edit Crop Names button changes to display Lock Crop Names. The existing crop name buttons become available, allowing them to be selected.
- Tap any crop name button to be changed. The alpha-numeric keypad appears. The current crop selection is shown at the top of the keypad.

Figure 101. Alpha-numeric keypad

- Make the required changes, using a maximum of 26 characters.
• Tap ENTER.
• Tap the LOCK CROP NAMES button to lock in the changes. The button changes to display EDIT CROP NAMES as before.
• Tap the BACK icon to return to the START DRYER - MAIN screen.
• Verify that the current crop icon at upper-left corner has changed to the newly selected crop.

B. Enable or Disable Blowers and Burners

Overview
• Dryer configuration is set at the factory. The screen will display ONLY the actual blower/burner rows (number 1 to number 6) that are in this particular dryer configuration.
• The SETUP - MAIN and BATCH DRYING screens utilize this layout and can show from 1 to 6 blower rows.
• On multiple blower dryers, the blower start time is staggered, starting with the upper-most section (number 1). The BLOWER START DELAY TIMER is factory set for a five second delay.

Note
Increase the default delay time on dryers that have blower soft-starters or VFDs to allow each blower motor to ramp up to full speed before starting the next motor.

• The ON or OFF status indicators show the current status as either OFF or ON. When the indicator is ON, it appears to be illuminated.

Figure 102. Status indications (at the end of the startup operation sequence)

STATUS INDICATORS

<table>
<thead>
<tr>
<th>BLOWER ENABLE</th>
<th>SPEED SETPOINT</th>
<th>BURNER ENABLE</th>
<th>LIQUID VALVES</th>
<th>PILOT IGNITION</th>
<th>FLAME VDC</th>
<th>MAIN IGNITION</th>
<th>MAIN RUN</th>
<th>TEMPERATURE SETPOINT</th>
<th>TEMPERATURE ACTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>ON</td>
<td>100.00%</td>
<td>YES</td>
<td>OFF</td>
<td>4.28</td>
<td>OFF</td>
<td>ON</td>
<td>200°F</td>
<td>66°F</td>
</tr>
</tbody>
</table>

Startup Operation Sequence

(A, B, C, D, and E, in the following steps refer to reference letters in Figure 102.)
1. The blower turns ON and the BLOWER indicator changes from OFF to ON (A).
2. The BURNER START DELAY TIMER is factory set for a five second delay. Upon blower ON, the delay timer starts. When the timer is complete the LP liquid valve opens and the LIQUID VALVE indicator changes from OFF to ON (B).
3. When LIQUID VALVE goes ON, the valve remains open and purges for a set time of 30 seconds. During this time the BLOWER is ON, but the pilot valve and main valve (M1) remain closed.
4. At the end of the purge period, the pilot valve and M1 valve opens. The spark generator energizes to light the pilot. The PILOT IGNITION indicator changes from OFF to ON (C).
5. When the spark generator creates a pilot flame, the flame sensor voltage appears in the FLAME VDC indicator field (D). If the voltage is 1.25 volts or less the pilot flame is not recognized and an error occurs.
6. After a factory set 10-second period to verify pilot flame, the M2 valve opens.
7. Upon M2 valve opening, a factory set 10–second delay begins.
8. If the air switch does NOT detect blower operation, OR the UV sensor does NOT verify the presence of burner flame, an error occurs. When the UV sensor does detect the burner flame, the main ignition indicator changes from OFF to ON (E).
9. Upon correct blower and burner detection the pilot valve closes and the main run indicator changes from OFF to ON (F).

Possible Burner Settings

Depending on whether BATCH or AUTO mode is selected, the blower/burner settings shown in (BLOWER NUMBER) rows 1, 2, 3, and 4 of the following screenshot are possible:

**Figure 103. Blower and burner indicators**

<table>
<thead>
<tr>
<th>Row</th>
<th>Blower Enable</th>
<th>Blower Speed Setpoint</th>
<th>Burner Enable</th>
<th>Pilot Ignition</th>
<th>Flame OFF</th>
<th>Main Ignition</th>
<th>Main Run</th>
<th>Temperature Setpoint</th>
<th>Temperature Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YES</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>100.00%</td>
<td>OFF</td>
<td>OFF</td>
<td>180°F</td>
<td>180°F</td>
</tr>
<tr>
<td>2</td>
<td>YES</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>100.00%</td>
<td>OFF</td>
<td>OFF</td>
<td>220°F</td>
<td>216°F</td>
</tr>
<tr>
<td>3</td>
<td>YES</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>100.00%</td>
<td>OFF</td>
<td>OFF</td>
<td>220°F</td>
<td>216°F</td>
</tr>
<tr>
<td>4</td>
<td>YES</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>100.00%</td>
<td>OFF</td>
<td>OFF</td>
<td>180°F</td>
<td>180°F</td>
</tr>
</tbody>
</table>

- Row 1: Both blower and burner are enabled for use, so all of the remaining status indicators are visible.
- Row 2: The blower is enable, but the burner is disabled, so the status indicators are NOT visible.
- Row 3: The blower is disabled, so none of the following status indicators (including the burner status) are visible.
- Row 4: The blower is enabled, and this section is operating WITHOUT a burner, so the blower status is visible but the burner and related status indicators (including temperature indications) are NOT visible.

C. Set Burner Temperature

- For each burner setpoint value, once a temperature has been entered, that value stays current until changed. Even if a dryer section burner is disabled, the setpoint value remains effective.
- Tap the setpoint field for the temperature to be entered or changed to open the numeric keypad.
- Enter a temperature setpoint value between a minimum value of 32°F and a maximum of 250°F (0°C - 121°C).
- Tap ENTER to lock in the value.

**Figure 104. Setting burner temperature**

**Note**

The temperature setpoints can be modified at any time during the drying process.
4.6.2 Completion of Dryer Setup

Upon completion of the preceding steps (A, B and C), and prior to starting either BATCH or AUTO drying modes:

- Current dryer status is displayed in the upper-right corner of the screen.
- The START BATCH DRYING or START AUTO DRYING buttons appear when all required conditions are met.

Figure 105. Current dryer status

4.6.3 To Start Batch Drying

- Batch drying CAN be activated with any of the grain level status indicators.

  Note
  Batch drying can begin when grain is at any level within the dryer. If grain is below the top-most set of tier ducts, be aware that the drying heat from that section is wasted.

- Tap the START BATCH DRYING button to proceed. Immediately, the blower and burner starting sequence begins.

Figure 106. Starting batch drying
4.7. Batch Drying Mode

4.7.1 Batch Drying Overview

Batch operations are generally used to start or end a drying cycle and can utilize all or some of the system blowers and burners.

- Refer to the following sections (designated A, B and C) to set up and operate in Batch Drying Mode:
  - Section – A. Set Drying Time on page 91

  Note
  If you switch from BATCH DRYING MODE directly into AUTO DRYING MODE, steps B and C are skipped. However, before AUTO DRYING MODE can start, two conditions must be met. For details, see Section 4.8 – Auto Drying Mode on page 94

  - Section – B. Cooling on page 93
  - Section – C. Restart on page 93

General batch drying notes:
- The operation run time is manually set and can be up to 120 minutes.
- Temperature setpoints can be changed at any time during the process. The actual temperature data per dryer section is shown in the final column.
• The status indicators ON or OFF indicate the progression of startup or shutdown for the various equipment items such as blower, burner, liquid valves, pilot, main ignition, and main run. See Startup Operation Sequence on page 87 for a complete description of this sequence.

A. Set Drying Time

Figure 108. Setting drying time

Total Batch Time
• Default total time = 30 minutes
• Tapping the UP button (▲) increases the total time by 5 minutes (to a maximum run time of 120 minutes).
• Tapping the DOWN button (▼) decreases the total time by 5 minutes (to a minimum run time of 5 minutes).
• The total run time can be changed at any time prior to the time remaining value reaching zero. When the total run time is modified, the time remaining changes accordingly.

Minutes Remaining
• Shows the number of minutes remaining to operate in Batch Drying — Heated mode.
• At a value of 0 the dryer proceeds to Batch Drying — Cooling mode
The Batch Timer can be disabled when all the burners are off. In this mode, the blowers are allowed to run continuously without heat being applied to the grain.

**Note**
The Batch Timer can be disabled when all the burners are off. In this mode, the blowers are allowed to run continuously without heat being applied to the grain.

**To switch directly to AUTO DRYING MODE:**

- Skip the Batch Drying – Cooling mode, or RESTART mode.
- One of the following appears in the upper-right button (see Figure 108 on page 91):
  - FILL DRYER
  - START
  - START AUTO DRYING
- Tapping the button selects the pre-level of auto drying displayed by the button.

**Stop Drying**

- Tapping STOP DRYING stops the batch drying process and initiates COOLING mode.
B. Cooling

Figure 109. Cooling

- **Minutes**
  - This field displays the cooling mode time remaining

- **Stop Cooling**
  - Tapping STOP COOLING shuts down all blowers. The RESTART DRYER button appears.

- **Start Batch Drying**
  - Tapping START BATCH DRYING restarts the process without stopping the blowers. The START DRYER screen appears and displays the blower starting process.

C. Restart

Figure 110. Restart
4. OPERATION

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

• Tap RESTART DRYER to go to the START DRYER – MAIN screen. This enables the operator to continue drying using either BATCH or AUTO mode.

4.8. Auto Drying Mode

4.8.1 Auto Drying Pre-Conditions

For the START AUTO DRYING button to be available, the following two conditions must be met:

1. The dryer status must display DRYER FULL or DRYER LEVEL OK. If neither of these are displayed:
   a. Tap the FILL DRYER button.

   Figure 111. Tap the FILL DRYER button

   The FILL/EMPTY DRYER screen appears.

   Figure 112. The FILL/EMPTY DRYER screen

   b. Tap the START button to fill the dryer. The dryer must fill past the level of the LOW LEVEL sensor. When it does, the dryer status indicator displays DRYER LEVEL OK or DRYER FULL.

2. All required transports must be started prior to initiating AUTO DRYING MODE. If transports are enabled, but not running, the START TRANSPORTS indicator will appear.
Figure 113. The START TRANSPORTS indicator/button

Tap the START TRANSPORTS button to display the FILL/EMPTY DRYER screen.

The FILL/EMPTY DRYER screen appears.

a. Tap the START button to fill the dryer.

b. Allow the dryer to fill past the top level indicator.

c. When ready, the dryer status indicator displays DRYER LEVEL OK or DRYER FULL.

Figure 114. Transports START buttons

4.8.2 Auto Drying Overview

- Refer to the following sections (designated A, B, C, etc.) to set up and operate in Auto Drying Mode:
  - Section – A. Manual Speed on page 98: (DryerMaster collecting data) Burner setup is available
  - Section – B. Auto First Load on page 99: Burner setup is available
  - Section – C. DryerMaster Controlling on page 100: Burner setup is available
  - Section – D. Cooling on page 100
  - Section – E. Restart on page 101
**Note**
When drying in AUTO mode, use small increments of change when making adjustments to either the burner temperatures or target moisture percentage. For example, to change a burner temperature from 180 to 220, adjust to 200 for five to ten minutes, then increase to 220. Use a similar approach to making moisture percentage changes.

**Metering Roll Pause/Resume**

- Pause the metering rolls to temporarily stop the discharge of grain from the dryer. This is typically used when switching between drying bins. When paused, the grain stops discharging from the dryer. The unload and dry transports keep running and empty out. Once empty, the grain is re-directed to a new dry bin location. If the Resume button is not pushed before the timer reaches zero, the dryer will shut down.

![Metering Roll Pause/Resume Diagram]

**Note**
As the various operation stages occur, the display screen center panel area provides the operator with important status information. See the following example:
The BURNER SETUP button on the AUTO DRYING screen

Figure 115. The BURNER SETUP button on the AUTO DRYING screen

- The BURNER SETUP screen appears. Initially it shows the current status.

Figure 116. The BURNER SETUP screen

- In the following examples the screen shows that burner number 4 has been ENABLED.

  **Note**
  
  The CHANGE IN PROGRESS indicator appears until changes are completed.

- As burner number 4 is going through the process of turning ON, the screen does not allow additional changes, or return to the previous stage, until that change is completed. Note that the MAIN MENU button is unavailable, but the STOP DRYING button is available.
Figure 117. Example of CHANGE IN PROGRESS

- After changes are completed, the screen shows the current status.
- Options to proceed include return to MAIN MENU, BACK, or STOP DRYING.

A. Manual Speed

Figure 118. Manual speed control

- The dryer runs at the manual metering roll speed entered until the DryerMaster gathers sufficient data. The manual speed can be “dialed in” and changed to come closer to target moisture.
Figure 119. CONTROL SETUP screen

- If AUTOMATIC DRYERMASTER CONTROL ENABLING is set to OFF, as soon as the DryerMaster has gathered enough data, the ENABLE AUTOMATIC MOISTURE CONTROL button (located with the main center panel) appears.
- Tap ENABLE AUTOMATIC MOISTURE CONTROL to proceed to AUTO FIRST LOAD.

Note
By default, AUTOMATIC DRYERMASTER CONTROL ENABLING is set to ON, the control will proceed into AUTO FIRST LOAD automatically.

B. Auto First Load
The DryerMaster control uses previous history to assist in building a current model, if possible. During AUTO FIRST LOAD, grain cycles through the dryer for enough time to gather completed current data. This time period varies, but can be up to one complete grain cycle. Once a current computer model of correct operation that will meet the target moisture setpoint is obtained, the control proceeds to full DryerMaster automatic operation.

Figure 120. Auto First Load
C. DryerMaster Controlling

- In DryerMaster Controlling mode the DryerMaster is controlling the process and runs until STOP DRYING is activated, or a low level sensor is activated.
- The operator should regularly check the grain moisture graph for abnormalities.
- MOISTURE CALIBRATION for the lower moisture sensor should be done at least every 2-3 hours.
- When changing the TARGET MOISTURE a pop-up window will appear that will also show the Minimum and Maximum alarm setpoints for the outlet grain.

![Figure 121. DryerMaster controlling](image)

D. Cooling

- The COOLING mode default timer setting is five minutes. See SETUP - TIMERS, to modify.
- Blowers continue to run and the burners turn OFF.
- When the timer runs out OR if the STOP COOLING button is activated, ALL blowers shut down immediately and the RESTART DRYER button appears.
Figure 122. Cooling

Press the STOP COOLING button to shut off the blowers if needed without cooling the dryer.

Press the START AUTO DRYING button to cancel the cooling mode and re-start the burners.

E. Restart

Tap RESTART DRYER to go to the START DRYER – MAIN screen. This enables continuation of drying using either BATCH or AUTO modes.
4.8.3 Slide Gate Adjustment

For either auger or drag unload systems, grain passes through a discharge chute, and a portion of the grain is directed over the outlet moisture sensor. The flow of the grain over the moisture sensor is controlled by a metering roll, which rotates at a constant speed whenever the unload system is operating.

Although it is not the primary means of controlling the flow, a slide gate is available to make small adjustments. Typically, the slide gate will not need to be adjusted during normal operation. To adjust the slide gate position, lift up on the sliding lock plate, push or pull the slide gate to the desired location, and then lower the sliding lock plate, ensuring that it engages with one of the notch sets on the slide gate.

During normal operation, grain should cover the fin of the outlet moisture sensor at all times, and a steady flow of grain should be observed through the viewing window on the side of the discharge chute. If the drying rate is low enough that grain does not consistently keep the chute full enough to cover the moisture sensor, try pulling the slide gate out of the chute one notch at a time until the flow is backing up sufficiently. If grain is backing up too much in the chute, try pushing the slide gate further into the chute one notch at a time. Note that the notch furthest out from the chute and closest to the slide gate handle is used to position the slide gate for cleanout, and is not intended for normal operation. Refer to the figure below.
Viewing doors are available for both auger and drag unloads. For auger systems, the viewing door is located on the discharge chute itself. Note that there are two identical doors on the discharge chute. The viewing door is on the opposite side of the chute as the plug switch. If the other door is opened, the switch will indicate a plugged discharge, and the dryer will shut down. For drag unloads, the viewing door is located on top of the cross drag and is not tied into the plugged discharge switch.
4. OPERATION

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM
4.8.4 Moisture Calibration

**Note**
For grains requiring lower range moisture sensing (e.g. 8% for rape seed) contact your dealer for instructions on how to re-calibrate the moisture sensor, or order the low range moisture sensor #059250WLR

On the MOISTURE CALIBRATION screen:

- Start the INLET SENSOR calibration routine by tapping its associated INITIATE button.
- Start the OUTLET SENSOR calibration routine by tapping its associated INITIATE button, or by pressing the SAMPLE button located at the rear of the dryer, near the grain exit chute.

**Figure 124. The MOISTURE CALIBRATION screen**

- Upon starting the calibration routine for either sensor, the SAMPLING indicator will be displayed.

**Figure 125. SAMPLING in progress**

- The DryerMaster obtains an average of moisture readings for the next 30 seconds.
- During this same time period, collect several grain samples near the sensor being calibrated.
- When the automated sampling period ends, the DONE indicator appears.
Figure 126. SAMPLING is DONE

- Have the samples tested for ACTUAL grain moisture content.
- Average the values for the ACTUAL grain moisture content.
- Enter the calculated average for the actual grain moisture content using the SAMPLE TEST MOISTURE button.
- Tap the DONE button.
- A new CURRENT READING is calculated and displayed. The new value will move closer to the TEST MOISTURE value at a maximum of 0.5 per calibration when the difference is greater than 1.0. If the difference is less than 1.0 the value will move half way closer (difference 0.8 then moves 0.4).
  - E.g. In the example shown, the CURRENT READING value was originally 21.6
  - The SAMPLE TEST MOISTURE average of measured values was 24.5
  - Since 24.5 — 21.6 is more than 1.0, the new CURRENT READING moved closer to the SAMPLE TEST MOISTURE value by 0.5 (from 21.6 to 22.1)

Figure 127. CURRENT READING updated after entering SAMPLE TEST MOISTURE average
4.9. Data and Graphs Screens

4.9.1 Data Screen

Figure 128. Data screen

The DATA screen displays the following information:

**Dryer Volume Between Sensors**
- Bushels or cubic meters

**Minutes in Dryer at Current Rate**
- Minutes required for grain to move from the inlet sensor to the outlet sensor at the current discharging rate.

**Discharge Rate Factor**
- The value used to calculate the throughput bushels or cubic meters value.
- Initial adjustment may be necessary to obtain correct throughput value. Also, the discharge rate factor will likely need to be adjusted for different grains.

**Discharging Rate (bu/h or m³/h)**
- Current discharging rate of the dryer

**Metering Roll Percent**
- Meter speed percent, maximum

**Total Throughput (bu or m³)**
- Volume of grain run through the dryer. Note this value increases with or without grain when the metering rolls are running.

**Dryer Run Time**
- Running hours of the dryer
Dry Grain Storage

- Grain Bin volume counters
- Select the desired grain bin counter.

Figure 129. Dry Grain Storage Screen

4.9.2 Performance Data Graphs

Figure 130. Grain Moisture

Figure 131. Temperature
Figure 132. Discharge Rate

- The graph is represented using the current mode of units, showing BPH (bushels per hour) or m$^3$/hr (cubic meters per hour).
- The graph time period can be switched at any time and can be represented for 3, 6, 12, or 24 hour periods.
- Graphs also give current readings for applicable sensors. For instance, the moisture graph shows target moisture, current actual inlet moisture, and current outlet moisture rates. The temperature graph shows current inlet and outlet temperature. The discharge graph toggles, showing either current metering roll speed (%) or volumetric throughput.
- Press the up or down arrow on the Grain Moisture Graph to increase or decrease the moisture range displayed.
4.10. Emergency Shutdown Procedure

1. Push the E-STOP button.

   **WARNING** Pushing the E-STOP button will turn OFF all outputs from the PLC. It does NOT shut off power into either Control Panel. The Power ON lamp will remain lit on the main Control Panel.

2. Turn OFF the electrical power at the main electrical disconnect.

3. Turn OFF the fuel supply at the main ball valve in the bottom dryer section and then at the main fuel source.

4. If the emergency requires grain to be removed from the dryer more quickly than the unload system can operate, there are several alternative routes to clear the grain. With power shut off and locked out, the following methods can be used:

   - Open up one or more of the emergency unload doors around the perimeter of the frame. To open, pull the pin on the clamp assembly. Use caution as the doors can swing open with great force.

Figure 133. Emergency Door — Close
For auger unloads, the cleanout doors can be opened to allow grain to flow by the metering rolls and augers. (See Section 3.8 – Discharge Equipment on page 42.)

For drag unloads, both the metering roll doors on the sides of the drag conveyors and the cleanout doors on the drag conveyors themselves can be opened to let grain flow out. (See Section 3.8 – Discharge Equipment on page 42.)
5. Maintenance

Before continuing, ensure you have completely read and understood this manual’s Safety section, in addition to the safety information in the section(s) below.

5.1. Maintenance Safety

⚠️ WARNING
• Keep components in good condition. Follow the maintenance procedures.
• Ensure the service area is clean, dry, and has sufficient lighting.
• Do not modify any components without written authorization from the manufacturer. Modification can be dangerous and result in serious injuries.
• Lock out power source and shut off gas valves.
• All gas components, connections, and appliances are to be serviced or maintained by a qualified gas technician.
• After maintenance is complete, replace all guards, service doors, and/or covers.
• Use only genuine NECO replacement parts or equivalent. Use of unauthorized parts will void warranty. If in doubt, contact NECO or your local dealer.

5.2. Maintenance Overview

NECO takes pride in choosing quality vendors and products in association with the design and manufacture of our products:
• OEM products have a service life related to operating conditions and usage.
• Vendor supplied products consist of motors, gear reducers, bearings, valves, switches, etc.
• This information is to assist you in keeping the equipment in operating condition and to help obtain correct OEM data for proper maintenance.

Prior to each season or usage:
• Complete the Section 4.2 – Equipment Pre-Check on page 60 section and verify completion for each step.

During regular usage, based on overall conditions and amount of usage:
• Check for debris buildup within the plenum and throughout the system.
• Check all pipe fittings and fuel train components with a qualified detection method.
• Check the burner ports for blockage. See Section 5.3 – Burner Gas Ports on page 113.
• Check all fan and discharge auger belts tension and alignment monthly. Be careful NOT to over tension.
• Check metering roll chain tension monthly.
• Clean air switch line monthly.
• Perform lubrication checks when needed.

**End-of-season equipment shutdown:**
• Open the clean-out doors on both sides and let any grain fall through. If needed, the discharge augers can be run briefly to ensure no grain is left on the topside of a stationary auger system.
• Clean out the rear cross auger.
• For storage, the cleanout doors should be left open so that rain may fall through.
• The belts should be loosened and removed, then stored in a dark place.
• The chains should be removed and lubricated, then stored in an air tight container.

### 5.3. Burner Gas Ports

Conduct initial inspection within the first month after commissioning. Visually check the gas ports of the new burner assemblies for any piping scale or debris. Use a pin vise with drill sizes as shown below:

**Figure 135. Burner gas port checking/cleaning**

Annual inspections are normally adequate once the initial piping debris is removed. Heavy usage of the burner may require checking and cleaning monthly or more.

### 5.4. Solenoid Valves

All solenoid valves should be cleaned annually. The time between cleanings will vary depending on the service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise, or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to open or close.

Cleaning instructions and rebuild kits for valves can be obtained online from vendors such as ASCO, etc.
5.5. Lubrication

On greaseable sealed bearings, apply grease ONLY until a thin bead of new grease is visible along the seal edge. Applying excessive grease may force out the seals, causing contamination and rapid bearing wear.

Table 7. Lubrication Data

<table>
<thead>
<tr>
<th>PART DESCRIPTION</th>
<th>LUBRICATION PRODUCT</th>
<th>PER TIME PERIOD OF USAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower Drive Motor</td>
<td>Mfg Recommendation</td>
<td>Mfg Recommendation</td>
</tr>
<tr>
<td>Cross Auger Gearbox</td>
<td>80/90 Gear Oil 1/2 Full</td>
<td>Check Weekly</td>
</tr>
<tr>
<td>Fan Shaft Bearings</td>
<td>Mfg Recommendation</td>
<td>80 Hours</td>
</tr>
<tr>
<td>Cross Auger Bearings</td>
<td>Mfg Recommendation</td>
<td>100 Hours</td>
</tr>
<tr>
<td>Roller Chains</td>
<td>Le 451/452 Almasol</td>
<td>Annually</td>
</tr>
</tbody>
</table>

5.6. Motors

The OEM drive motors can vary in size and manufacturer, depending on the dryer size and usage requirements. In order to properly maintain the various drive motors within your system, record the manufacturer, model number, etc. from the motors ID tag. Follow manufacturers instructions for proper maintenance, including possible lubrication of shaft bearings.
# 6. Troubleshooting

## 6.1. Solutions Table

In the following section, we have listed some causes and solutions to some of the problems you may encounter.

If you encounter a problem that is difficult to solve, even after having read through this section, please contact your local dealer or distributor. Before you contact them, please have this operation manual and the serial number from your machine ready.

### Temperature Controller

<table>
<thead>
<tr>
<th>Problem</th>
<th>Check</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature control communication error</td>
<td>If other temperature controls are visible</td>
<td>Incorrect address of the temperature controller</td>
<td>Re-address temperature controller</td>
</tr>
<tr>
<td></td>
<td>If other temperature controllers are not visible</td>
<td>Damaged Modbus communication wires</td>
<td>Starting at the front of the PLC, trace Modbus communication cables to the lowest burner box</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose connection at gray communication tee connector</td>
<td>Tighten connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If problem persists contact dealer</td>
</tr>
<tr>
<td>Temperature displays_***</td>
<td>Front of KS45 inside burner box displays FAIL on top display</td>
<td>Damaged thermocouple</td>
<td>Repair twisted end of thermocouple or replace whole wire</td>
</tr>
<tr>
<td>Unable to reach set point temperature</td>
<td>MAIN MENU-&gt; TROUBLESHOOTING-&gt; TEMPERATURE CONTROLS</td>
<td>If mod motor position is at 100% there is a fuel delivery problem</td>
<td>Turn fuel regulated pressure at individual burner up. CAUTION: DO NOT EXCEED 6 PSI for NG .10 PSI for LP</td>
</tr>
<tr>
<td>Actual temperature exceeds set point</td>
<td>MAIN MENU-&gt; TROUBLESHOOTING-&gt; TEMPERATURE CONTROLS</td>
<td>If mod motor position is at 0% there is a fuel delivery problem</td>
<td>Turn fuel regulated pressure down, trouble lighting may occur if operating pressures are turned below 1 PSI</td>
</tr>
<tr>
<td>Unsteady temperature control (high and low)</td>
<td>MAIN MENU-&gt; TROUBLESHOOTING-&gt; TEMPERATURE CONTROLS</td>
<td>Unsteady mod motor position</td>
<td>Turn fuel regulated pressure down, trouble lighting may occur if operating pressures are turned below 1 PSI</td>
</tr>
<tr>
<td></td>
<td>Thermocouple location and condition</td>
<td>Location inside the dryer too close or too far away from burner</td>
<td>Thermocouple should be located three tiers from the floor and five air ducts back from the burner unless otherwise instructed by NECO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermocouple corrosion</td>
<td>Cut and strip and tightly re-twist 3/4&quot; of thermocouple wire</td>
</tr>
<tr>
<td></td>
<td>Natural gas applications</td>
<td>Too high of a ramp rate</td>
<td>Troubleshooting-&gt; temperature controls set ramp rate to 125</td>
</tr>
<tr>
<td>Problem</td>
<td>Check</td>
<td>Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>Limits exceeded before plenum temperature is reached</td>
<td>Check set point of high limit switch</td>
<td>High limit switch set too low</td>
<td>High limit switch to be set 20-30 degrees F above operating temp of individual section. NOTE: V42 is changed to be Max temp on switch</td>
</tr>
<tr>
<td></td>
<td>Check location of thermocouple in relation to the high limit bulb</td>
<td>Thermocouple and high limit switch bulb are too far apart</td>
<td>Thermocouple twisted pair should be within inches of high limit bulb without touching anything conductive</td>
</tr>
</tbody>
</table>

**Honeywell Burner Control**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Check</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will not remote reset</td>
<td>Check to see if a manual reset button on Honeywell works</td>
<td>If manual reset works, failure of 24VDC reset relay</td>
<td>Repair or replace 24VDC reset relay or resolve wiring problem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If manual reset does NOT work, read blink code and repair</td>
<td>Correct Honeywell fault</td>
</tr>
<tr>
<td></td>
<td>Check to make sure connector is firmly plugged into top of controller</td>
<td>Poor connection of reset signal</td>
<td>Tighten wires in connector and ensure that connector is firmly plugged in.</td>
</tr>
<tr>
<td>Honeywell communication error</td>
<td>If other Honeywells are visible</td>
<td>Incorrect address of the Honeywell</td>
<td>Re-address Honeywell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Baud rate jumper installed in the bottom of the Modbus module</td>
<td>Remove the baud rate jumper (NOTE: all new Modbus modules come with jumper installed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incorrect wiring on plug attached to Honeywell</td>
<td>Correct wiring error</td>
</tr>
<tr>
<td></td>
<td>If other Honeywells are not visible</td>
<td>Damaged Modbus communication wires</td>
<td>Starting at the front of the PLC, trace Modbus communication cables to the lowest burner box</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose connection at gray communication tee connector</td>
<td>Tighten connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If problem persists contact dealer</td>
</tr>
</tbody>
</table>

**Moisture Controls**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Check</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture drift on outlet sensor</td>
<td>Blockage in discharge chute</td>
<td>Debris bridging over outlet sensor blocking grain flow</td>
<td>Clean out discharge chute around sensor</td>
</tr>
<tr>
<td></td>
<td>Can sensor be seen through flow of grain</td>
<td>Insufficient grain flow over sensor</td>
<td>Adjust gate in discharge chute to restrict flow of grain</td>
</tr>
<tr>
<td>INLET MOISTURE SENSOR ERROR</td>
<td>Make sure that the Inlet Sensor is completely covered in grain</td>
<td>Incorrect timer settings on filling equipment allowing sensor to become uncovered</td>
<td>Adjust timer settings on the filling equipment to ensure sensor coverage.</td>
</tr>
</tbody>
</table>
### Starting the Dryer in AUTO

<table>
<thead>
<tr>
<th>Problem</th>
<th>Check</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dryer will not light and goes directly into COOLING</td>
<td>If the ALARM screen has any errors in red…</td>
<td>Wet or Dry trans- port failure</td>
<td>Correct problem and reset the alarm</td>
</tr>
<tr>
<td>Dryer will not light</td>
<td>Fan is running but no flame present</td>
<td>Honeywell fault</td>
<td>MAIN MENU-&gt; TROUBLESHOOTING-&gt; BURNER CONTROLS, Identify and resolve issue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spark plug failure</td>
<td>Clean/replace plug</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuel delivery</td>
<td>Identify if too much fuel or not enough and resolve issue</td>
</tr>
<tr>
<td></td>
<td>Fan is running and there is pilot light igniting, but not main ignition</td>
<td>Low or no VDC on UV sensor</td>
<td>Clean/replace sensor - Ensure that wires are tight behind the Honeywell</td>
</tr>
</tbody>
</table>

### General Operation

<table>
<thead>
<tr>
<th>Problem</th>
<th>Check</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANGE BATTERY</td>
<td>Battery in PLC is low, if not replaced DRYER CONFIGURATION can be lost</td>
<td>Battery in PLC should be replaced approx. every 3 years</td>
<td>Replace 1/2 AA battery in the bottom of the PLC in the main control panel</td>
</tr>
<tr>
<td>DRYER CONFIGURATION is lost.</td>
<td>CHANGE BATTERY displayed in lower right corner of HMI screen when powered up</td>
<td>Battery died in PLC during time of non use</td>
<td>Contact dealer to replace battery and re-configure dryer</td>
</tr>
<tr>
<td>E-STOP ACTIVE</td>
<td>Both E-STOP switches must be released</td>
<td>One switch is active</td>
<td>Activate and release each switch</td>
</tr>
<tr>
<td></td>
<td>E-STOP Relay inside main control panel normally</td>
<td>If E-STOP button activated the relay displays</td>
<td>Repair or replace the E-STOP button or repair circuit</td>
</tr>
<tr>
<td></td>
<td>Supply–green</td>
<td>Supply–green</td>
<td>If only one K1 or K2 on check wiring of switch</td>
</tr>
<tr>
<td></td>
<td>K1 –green</td>
<td>K1 –off</td>
<td></td>
</tr>
<tr>
<td></td>
<td>K2 –green</td>
<td>K2 –off</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reset –off</td>
<td>Reset –off</td>
<td></td>
</tr>
<tr>
<td>Unable to get Wet or Dry motors to start</td>
<td>MAIN MENU-&gt; SET UP-&gt; FILL &amp; EMPTY SETUP</td>
<td>Review FILL &amp; EMPTY SETUP page</td>
<td>Turn on necessary options</td>
</tr>
<tr>
<td></td>
<td>MAIN MENU-&gt; TROUBLESHOOTING-&gt; PLC INPUTS</td>
<td>Review PLC INPUT STATUS, blinking icons indicate configuration/wiring errors</td>
<td>Ensure that overloads are on for installed starters. If off, ensure that starters are not overloaded. If not overloaded and still off wiring error present</td>
</tr>
<tr>
<td></td>
<td>MAIN MENU-&gt; ALARMS</td>
<td>Alarm Present</td>
<td>Address any alarm problem in RED</td>
</tr>
<tr>
<td>Unable to get Wet Transport motors to start</td>
<td>MAIN MENU-&gt; SET-UP-&gt; FILL &amp; EMPTY SETUP</td>
<td>WET BIN EMPTY SWITCH enabled</td>
<td>Wet bin is empty</td>
</tr>
<tr>
<td>Problem</td>
<td>Check</td>
<td>Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------------</td>
<td>------------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Check Fill rotary switch operation</td>
<td>PLC thinks that dryer is full</td>
<td>Repair/replace faulty rotary switch</td>
<td></td>
</tr>
<tr>
<td>MAIN MENU-&gt; ALARMS</td>
<td>Alarm Present</td>
<td>Address any alarm problem in RED</td>
<td></td>
</tr>
<tr>
<td>Unable to get Dry Transport motors to start</td>
<td>MAIN MENU-&gt; SET-UP-&gt; FILL &amp; EMPTY SETUP</td>
<td>DRY BIN FULL SWITCH enabled</td>
<td>Dry bin is full</td>
</tr>
<tr>
<td>Presence of active alarm</td>
<td>DISCHARGE PLUGGED</td>
<td>Clear plugged discharge and reset alarm</td>
<td></td>
</tr>
</tbody>
</table>
6.2. HMI Troubleshooting Screens

The following screens are used primarily for troubleshooting:

- ALARMS and ALARM LOG
- TROUBLESHOOTING
- PLC INPUTS STATUS
- PLC OUTPUTS STATUS
- DryerMaster STATUS and DryerMaster VALUES
- TEMP CONTROL STATUS
- BURNER CONTROL STATUS

The Alarm Log shows alarm history. Both screens show time alarm went active and time alarm was reset (RTN).
6. TROUBLESHOOTING

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

Figure 137. TROUBLESHOOTING screen

Figure 138. PLC INPUTS STATUS screen
### Figure 139. PLC OUTPUTS STATUS screen

**PLC OUTPUTS STATUS**

<table>
<thead>
<tr>
<th>MAIN RACK OUTPUTS</th>
<th>EXPANSION CARD OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q0.2 OFF</td>
<td>Q2.0 OFF</td>
</tr>
<tr>
<td>DRY 1 TRANSPORT CONTACTOR</td>
<td>METERING ROLLS</td>
</tr>
<tr>
<td>Q0.3 OFF</td>
<td>Q2.6 OFF</td>
</tr>
<tr>
<td>WET 1 TRANSPORT CONTACTOR</td>
<td>B24 BLOWER VFD ENABLE</td>
</tr>
<tr>
<td>Q0.4 OFF</td>
<td>Q2.7 OFF</td>
</tr>
<tr>
<td>UNLOAD TRANSPORT CONTACTOR</td>
<td>D24 BURNER ENABLE</td>
</tr>
<tr>
<td>Q0.5 OFF</td>
<td></td>
</tr>
<tr>
<td>LEVELER CONTACTOR</td>
<td></td>
</tr>
<tr>
<td>Q0.6 OFF</td>
<td></td>
</tr>
<tr>
<td>BLOWER 1 CONTROLLER</td>
<td></td>
</tr>
<tr>
<td>Q0.7 OFF</td>
<td></td>
</tr>
<tr>
<td>BLOWER 2 CONTROLLER</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>0-10VDC INPUT</th>
<th>0-10VDC OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V0 4.26</td>
<td>V10 0.00</td>
</tr>
<tr>
<td>WET GRAIN MOISTURE</td>
<td>METERING ROLL SPEED</td>
</tr>
<tr>
<td>V1 1.96</td>
<td>V11 5.00</td>
</tr>
<tr>
<td>WET GRAIN TEMPERATURE</td>
<td>UNLOAD VFD SPEED</td>
</tr>
<tr>
<td>V2 2.68</td>
<td></td>
</tr>
<tr>
<td>DRY GRAIN MOISTURE</td>
<td></td>
</tr>
<tr>
<td>V3 2.09</td>
<td></td>
</tr>
<tr>
<td>DRY GRAIN TEMPERATURE</td>
<td></td>
</tr>
</tbody>
</table>

**0-10VDC INPUTS**

- **V0**: 4.26 - Wet grain moisture
- **V1**: 1.96 - Wet grain temperature
- **V2**: 2.68 - Dry grain moisture
- **V3**: 2.09 - Dry grain temperature

**0-10VDC OUTPUTS**

- **V10**: 0.00 - Metering roll speed
- **V11**: 5.00 - Unload VFD speed

**Analog values show as actual voltages 0.00 to 10.00**

**9:13:19 am**

**Remote**

**LOG OUT**

**MAIN MENU**

**OPERATION PERMITTED**

**BACK**

---

### Figure 140. DryerMaster STATUS screen

**Dryer Master® STATUS**

**Crop & Cooling Setup**

- **Dryer Master® Values**
- **Disable Dryer Master®**

**Dryer Master® Auto First Load**

**Control Mode**: 1

**Remote Mode**: 1

**System Mode**: 1

**Main Led**: 1

**Auto First Load**: 1

**Dim Controller Status**: 5

**Current Time**: 3:23:56pm

**Owner**: 2021/09/21

**LOG OUT**

**MAIN MENU**

**OPERATION PERMITTED**

**BACK**

**INLET WET GRAIN**

- **MOISTURE**: 22.2%
- **TEMPERATURE**: 49°F

**TARGET MOISTURE**

- **15.0%**

**OUTLET DRY GRAIN**

- **15.0%**
- **82°F**
6. TROUBLESHOOTING

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

Figure 141. DryerMaster VALUES screen

<table>
<thead>
<tr>
<th>WRITES TO DM</th>
<th>READS FROM DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN NECO SCRIPT</td>
<td>PRODUCT NUMBER 3</td>
</tr>
<tr>
<td>DRIER (WOSH)</td>
<td>104</td>
</tr>
<tr>
<td>HOT ZONE (WOSH)</td>
<td>1152</td>
</tr>
<tr>
<td>COLD ZONE (WOSH)</td>
<td>576</td>
</tr>
<tr>
<td>LAST INLET CAKE %</td>
<td>0.00</td>
</tr>
<tr>
<td>LAST OUTLET CAKE %</td>
<td>15.60</td>
</tr>
<tr>
<td>THROUGHPUT RATE [%]</td>
<td>80</td>
</tr>
<tr>
<td>DISCHARGE RATE [%]</td>
<td>63.52</td>
</tr>
<tr>
<td>SUGGESTED RATE [%]</td>
<td>50.15</td>
</tr>
<tr>
<td>CONTROL MODE REQUEST</td>
<td>1</td>
</tr>
<tr>
<td>REMOTE MODE REQUEST</td>
<td>1</td>
</tr>
<tr>
<td>10 SECOND HEARTBEAT</td>
<td>1</td>
</tr>
<tr>
<td>3.04:58pm</td>
<td>Owner</td>
</tr>
<tr>
<td>2021/09/21</td>
<td>LOG OUT</td>
</tr>
<tr>
<td>MAIN MENU</td>
<td>OPERATION PERMITTED</td>
</tr>
</tbody>
</table>

Figure 142. TEMP CONTROL STATUS screen

<table>
<thead>
<tr>
<th>BLOWER NUMBER</th>
<th>TEMPERATURE SETPOINT</th>
<th>ACTUAL</th>
<th>TEMPERATURE UNITS</th>
<th>MOD. MOTOR POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200°F</td>
<td>200°F</td>
<td>°F</td>
<td>95%</td>
</tr>
<tr>
<td>2</td>
<td>180°F</td>
<td>181°F</td>
<td>°F</td>
<td>87%</td>
</tr>
<tr>
<td>3</td>
<td>160°F</td>
<td>68°F</td>
<td>°F</td>
<td>0%</td>
</tr>
<tr>
<td>4:07:24pm</td>
<td>Owner</td>
<td>LOG OUT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021/09/21</td>
<td>MAIN MENU</td>
<td>OPERATION PERMITTED</td>
<td>BACK</td>
<td></td>
</tr>
</tbody>
</table>
Figure 143. BURNER CONTROL STATUS screen

Figure 144. Blower VFD (Eaton) Screen
6. TROUBLESHOOTING
CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

Figure 145. Fault Code (Eaton) Screen

Figure 146. Communications Screen
7. Specifications

7.1. Standard Model Specifications

Refer to the following table for specifications on standard NECO dryers. They are listed by model number as shown on the rating plate located on the front of the main control.

If the model number of your particular dryer is not shown below, contact your dealer.

Table 8. Standard Model Specifications

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Number of Tiers</th>
<th>Holding Capacity</th>
<th>Number of Burners and Blowers</th>
<th>TOTAL Blower Output (Max)</th>
<th>TOTAL Burner Output (Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bushels</td>
<td>Metric Tones</td>
<td>cubic ft/min</td>
<td>cubic m/min</td>
</tr>
<tr>
<td>D1660</td>
<td>4</td>
<td>579</td>
<td>15</td>
<td>1</td>
<td>21,500</td>
</tr>
<tr>
<td>D1670</td>
<td>5</td>
<td>674</td>
<td>17</td>
<td>1</td>
<td>23,500</td>
</tr>
<tr>
<td>D1680</td>
<td>6</td>
<td>770</td>
<td>19</td>
<td>1</td>
<td>27,500</td>
</tr>
<tr>
<td>D1690</td>
<td>7</td>
<td>866</td>
<td>22</td>
<td>1</td>
<td>32,000</td>
</tr>
<tr>
<td>D16106</td>
<td>8</td>
<td>962</td>
<td>24</td>
<td>2</td>
<td>36,600</td>
</tr>
<tr>
<td>D16120</td>
<td>10</td>
<td>1,155</td>
<td>29</td>
<td>2</td>
<td>47,000</td>
</tr>
<tr>
<td>D16140</td>
<td>12</td>
<td>1,347</td>
<td>34</td>
<td>2</td>
<td>55,000</td>
</tr>
<tr>
<td>D16160</td>
<td>14</td>
<td>1,539</td>
<td>39</td>
<td>3</td>
<td>65,300</td>
</tr>
<tr>
<td>D16180</td>
<td>16</td>
<td>1,731</td>
<td>44</td>
<td>3</td>
<td>78,500</td>
</tr>
<tr>
<td>D24108</td>
<td>6</td>
<td>1,155</td>
<td>29</td>
<td>2</td>
<td>41,200</td>
</tr>
<tr>
<td>D24150</td>
<td>8</td>
<td>1,443</td>
<td>36</td>
<td>2</td>
<td>55,000</td>
</tr>
<tr>
<td>D24180</td>
<td>10</td>
<td>1,732</td>
<td>44</td>
<td>2</td>
<td>62,000</td>
</tr>
<tr>
<td>D24210</td>
<td>12</td>
<td>2,020</td>
<td>51</td>
<td>3</td>
<td>82,500</td>
</tr>
<tr>
<td>D24240</td>
<td>14</td>
<td>2,309</td>
<td>58</td>
<td>3</td>
<td>89,500</td>
</tr>
<tr>
<td>D24260</td>
<td>16</td>
<td>2,597</td>
<td>66</td>
<td>4</td>
<td>110,000</td>
</tr>
<tr>
<td>D24330</td>
<td>20</td>
<td>3,174</td>
<td>80</td>
<td>5</td>
<td>137,500</td>
</tr>
<tr>
<td>D24380</td>
<td>24</td>
<td>3,750</td>
<td>95</td>
<td>6</td>
<td>165,000</td>
</tr>
<tr>
<td>D32260</td>
<td>12</td>
<td>2,693</td>
<td>68</td>
<td>3</td>
<td>108,000</td>
</tr>
<tr>
<td>D32340</td>
<td>16</td>
<td>3,463</td>
<td>88</td>
<td>4</td>
<td>144,000</td>
</tr>
<tr>
<td>D32440</td>
<td>20</td>
<td>4,232</td>
<td>107</td>
<td>5</td>
<td>182,000</td>
</tr>
<tr>
<td>D32500</td>
<td>24</td>
<td>5,001</td>
<td>127</td>
<td>6</td>
<td>216,000</td>
</tr>
</tbody>
</table>
Note
1. Drying capacities represent NECO’s best estimate of attainable wet bushel capacities based on a combination of actual field results and computer analysis.
2. Capacities will vary depending on outside temperature, humidity, initial grain temperature, crop maturity and variety, cleanliness of the grain, test weight, operating temperature, drying vs. cooling zones, etc.
3. Hot grain discharged from the dryer will dry an additional 1.5% – 2% when properly cooled.
4. Average burner output MMBTU/hr is based on 155° F temperature rise. Ambient of 55° F and dryer operating temperature of 210° F.
5. Holding capacity values represent corn at 15.5% moisture content (56 lb/bushel).
8. Appendix

8.1. Manual Dryer Speed

**Note**
These speeds are recommended as a STARTING POINT only for input as manual metering roll speed until the DryerMaster system reaches full automatic. As grain drying factors change, speeds will need to change in order to maintain a correct and steady output grain moisture value.

Some factors to consider when drying grain are:

- The type of grain. Some varieties are moisture-resistant compared to others.
- The end usage of the grain - will it be used for seed, feed, commercial, or some other usage.
- The outside weather conditions - including temperature, humidity, and even wind.
- The moisture content of the incoming grain.
- The cleanliness of the incoming grain.
- The crop region.

**Table 9. Speed setting (DC motor %)**

<table>
<thead>
<tr>
<th>MODEL - RPM</th>
<th>MOISTURE CONTENT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>D1240 - 27 RPM</td>
<td>42%</td>
</tr>
<tr>
<td>D1250 - 27 RPM</td>
<td>52%</td>
</tr>
<tr>
<td>D1260 - 27 RPM</td>
<td>63%</td>
</tr>
<tr>
<td>D1660 - 27 RPM</td>
<td>42%</td>
</tr>
<tr>
<td>D1670 - 27 RPM</td>
<td>52%</td>
</tr>
<tr>
<td>D1680 - 27 RPM</td>
<td>62%</td>
</tr>
<tr>
<td>D1690 - 27 RPM</td>
<td>73%</td>
</tr>
<tr>
<td>D16106 - 42 RPM</td>
<td>53%</td>
</tr>
<tr>
<td>D16120 - 42 RPM</td>
<td>67%</td>
</tr>
<tr>
<td>D16140 - 42 RPM</td>
<td>80%</td>
</tr>
<tr>
<td>D16160 - 62 RPM</td>
<td>63%</td>
</tr>
<tr>
<td>D24108 - 27 RPM</td>
<td>62%</td>
</tr>
<tr>
<td>D24150 - 27 RPM</td>
<td>53%</td>
</tr>
<tr>
<td>D24180 - 42 RPM</td>
<td>67%</td>
</tr>
<tr>
<td>D24210 - 42 RPM</td>
<td>80%</td>
</tr>
<tr>
<td>D24240 - 62 RPM</td>
<td>63%</td>
</tr>
<tr>
<td>D24260 - 62 RPM</td>
<td>72%</td>
</tr>
<tr>
<td>D24330 - 83 RPM</td>
<td>68%</td>
</tr>
<tr>
<td>D24380 - 83 RPM</td>
<td>81%</td>
</tr>
</tbody>
</table>
Table 9  Speed setting (DC motor %) (continued)

<table>
<thead>
<tr>
<th>MODEL - RPM</th>
<th>MOISTURE CONTENT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>D32260 - 62 RPM</td>
<td>54%</td>
</tr>
<tr>
<td>D32340 - 62 RPM</td>
<td>72%</td>
</tr>
<tr>
<td>D32440 - 92 RPM</td>
<td>61%</td>
</tr>
<tr>
<td>D32500 - 92 RPM</td>
<td>73%</td>
</tr>
</tbody>
</table>

8.2. Optional External Transport Configurations

Example 1: Wet 1 Auger and Dry 1 Air System

The following diagram shows an example of a one-wet and one-dry air system to be controlled and operated by the Commander system.

**Note**

Shown for example only. Individual configuration vary.

Figure 147. Wet 1 auger and dry 1 air system

Note

The table information below is an example of the Fill/Empty Setup data inputs that would be required for the Wet/Dry type of layout shown above.

Table 10. Fill/Empty setup data

<table>
<thead>
<tr>
<th>Motor Present</th>
<th>Run Continuous</th>
<th>Stop After Drying Stops</th>
<th>Start Delay Seconds</th>
<th>Stop Delay Seconds</th>
<th>Relay #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet 2 Transport (Farthest From Dryer)</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet 1 Transport (Closest To Dryer)</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>1</td>
<td>63CR</td>
</tr>
</tbody>
</table>
Table 10  Fill/Empty setup data (continued)

<table>
<thead>
<tr>
<th>Motor</th>
<th>Run Continuous</th>
<th>Stop After Drying Stops</th>
<th>Start Delay Seconds</th>
<th>Stop Delay Seconds</th>
<th>Relay #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level Auger</td>
<td>Yes No</td>
<td>1 1</td>
<td>- -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unload Auger</td>
<td>Yes</td>
<td>5 5</td>
<td>- -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry 1 Transport (Closest To Dryer)</td>
<td>Yes</td>
<td>1 1</td>
<td>62CR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry 2 Transport (Farthest From Dryer)</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example 2: Wet 1 and Wet 2 Augers and Dry 1 Auger**

The following diagram shows an example of a two-wet and one-dry air system to be controlled and operated by the Commander system.

*Note*

Shown for example only. Individual configuration vary.

**Figure 148. Wet 1 and Wet 2 augers and Dry 1 auger**

*Note*

The table information below is an example of the Fill/Empty Setup data inputs that would be required for the Wet/Dry type of layout shown above.
Table 11. Fill/Empty setup data

<table>
<thead>
<tr>
<th>Wet 2 Transport (Farthest From Dryer)</th>
<th>Motor Present</th>
<th>Run Continuous</th>
<th>Stop After Drying Stops</th>
<th>Start Delay Seconds</th>
<th>Stop Delay Seconds</th>
<th>Relay #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>75CR</td>
</tr>
<tr>
<td>Wet 1 Transport (Closest To Dryer)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
<td>63CR</td>
</tr>
<tr>
<td>Level Auger</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- -</td>
</tr>
<tr>
<td>Unload Auger</td>
<td>Yes</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
<td>- -</td>
</tr>
<tr>
<td>Dry 1 Transport (Closest To Dryer)</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>1</td>
<td>15</td>
<td>62CR</td>
</tr>
<tr>
<td>Dry 2 Transport (Farthest From Dryer)</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example 3: Wet 1 and Wet 2 Augers and Dry 1 and Dry 2 Augers

The following diagram shows an example of a two-wet and two-dry air systems to be controlled and operated by the Commander system.

Note

Shown for example only. Individual configuration vary.

Figure 149. Wet 1 and Wet 2 Augers and Dry 1 and Dry 2 Augers

Note

The table information below is an example of the Fill/Empty Setup data inputs that would be required for the Wet/Dry type of layout shown above.
Table 12. Fill/Empty setup data

<table>
<thead>
<tr>
<th></th>
<th>Motor Present</th>
<th>Run Continuous</th>
<th>Stop After Drying Stops</th>
<th>Start Delay Seconds</th>
<th>Stop Delay Seconds</th>
<th>Relay #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet 2 Transport (Farthest From Dryer)</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>75CR</td>
</tr>
<tr>
<td>Wet 1 Transport (Closest To Dryer)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td>63CR</td>
</tr>
<tr>
<td>Level Auger</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td>- -</td>
</tr>
<tr>
<td>Unload Auger</td>
<td>Yes</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
<td>- -</td>
</tr>
<tr>
<td>Dry 1 Transport (Closest To Dryer)</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>1</td>
<td>15</td>
<td>62CR</td>
</tr>
<tr>
<td>Dry 2 Transport (Farthest From Dryer)</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>1</td>
<td>5</td>
<td>74CR</td>
</tr>
</tbody>
</table>
8.3. Wiring External Transports

The customer is responsible for wiring any external transport equipment. The following schematics are for reference.

**Figure 150. Wiring Connections for External Transports**

<table>
<thead>
<tr>
<th>TRANSPORT CONNECTIONS</th>
<th>OVERLOAD/FAULT</th>
<th>RUN CONFIRMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WET 2</strong></td>
<td>24V</td>
<td>24V</td>
</tr>
<tr>
<td></td>
<td>to 334</td>
<td>to 335</td>
</tr>
<tr>
<td><strong>WET 1</strong></td>
<td>24V</td>
<td>24V</td>
</tr>
<tr>
<td>NEXT TO DRYER</td>
<td>to 314</td>
<td>to 315</td>
</tr>
<tr>
<td><strong>DRY 1</strong></td>
<td>24V</td>
<td>24V</td>
</tr>
<tr>
<td>NEXT TO DRYER</td>
<td>to 312</td>
<td>to 313</td>
</tr>
<tr>
<td><strong>DRY 2</strong></td>
<td>24V</td>
<td>24V</td>
</tr>
<tr>
<td></td>
<td>to 332</td>
<td>to 333</td>
</tr>
</tbody>
</table>

**TRANSPORT CONNECTIONS**

- 3 pairs of wires are needed for each remote transport device.
- 2 wires for the run signal (route power thru the relay to the starter coil).
- 2 wires for the 24VDC fault (install jumper if unavailable. Coil must not energize if fault).
- 2 wires for the 24VDC run confirmation (PLC must see a change of state).
8.4. Wiring NEMA Starters / IEC Starters / Air Systems

Figure 151. Starter and Air System Wiring Diagrams

**NEMA Type Motor Starter/Overload Wiring**

(NEMA Type Motor Starter/Overload Wiring using Dry 1 as an Example)

24V

(Jumper Installed)

(Run Confirmation)

STATER AUXILLARY CONTACT

STARTER OVERLOAD CONTACT

VOLTAGE FOR STARTER COIL TYPICALLY IS SOURCED AT THE EXISTING MOTOR STARTER/CONTROLLER

**IEC Type Motor Starter & Contactor Wiring**

(IEC Type Motor Starter & Contactor Wiring using Dry 1 as an Example)

24V

(IEC Type Motor Starter & Contactor Wiring using Dry 1 as an Example)

24V

(IEC Type Motor Starter & Contactor Wiring using Dry 1 as an Example)

VOLTAGE FOR STARTER COIL TYPICALLY IS SOURCED AT THE EXISTING MOTOR STARTER/CONTROLLER

**Typical Air System Interface Wiring**

(Typical Air System Interface Wiring using Dry 1 as an Example)

24V

(Air System Fault Contact)

(Run Confirmation)

Air System Running Contact

VOLTAGE FOR STARTER COIL TYPICALLY IS SOURCED AT THE EXISTING MOTOR STARTER/CONTROLLER
### 8.5. PLC and HMI Recorded Data Sheet

(Circle choice or Enter data)

#### SETUP TAB
Temp & Volume Units: 
- Imperial
- Metric

#### SETUP TAB - Dryer Configuration
- **Length:** 12' 16' 24' 32'
- **Gearmotor RPM:**
- **Level Auger:** Yes No
- **Number of Blowers:** 1 2 3 4 5 6
- **Number of Burners:** 1 2 3 4 5 6
- **Number of Tiers at Blower:**
  - Blower #1: 3 4 5
  - Blower #2: 3 4 5
  - Blower #3: 3 4 5
  - Blower #4: 3 4 5
  - Blower #5: 3 4 5
  - Blower #6: 3 4 5
- **Gas Type:** Liquid Propane (LP) or Natural Gas (NG)

#### SETUP TAB - Fill & Empty Setup
- **Wet Transport 2:**
  - Run Continuous: Yes No
  - Stop Ather Drying Stops: Yes No
  - Start Delay Seconds:
  - Stop Delay Seconds:
- **Wet Transport 1:**
  - Run Continuous: Yes No
  - Stop Ather Drying Stops: Yes No
  - Start Delay Seconds:
  - Stop Delay Seconds:
- **Level Auger:** Yes No
  - Run Continuous: Yes No
  - Stop Ather Drying Stops: Yes No
  - Start Delay Seconds:
  - Stop Delay Seconds:
- **Unload Auger:** Yes No
  - Run Continuous: Yes No
  - Stop Ather Drying Stops: Yes No
  - Start Delay Seconds:
  - Stop Delay Seconds:
- **Dry Transport 1:**
  - Run Continuous: Yes No
  - Stop Ather Drying Stops: Yes No
  - Start Delay Seconds:
  - Stop Delay Seconds:
- **Dry Transport 2:**
  - Run Continuous: Yes No
  - Stop Ather Drying Stops: Yes No
  - Start Delay Seconds:
  - Stop Delay Seconds:
- **Wet Bin Empty Switch:** Yes No
- **Dry Bin Full Switch:** Yes No
- **Low Level Switch:** Yes No
- **Metering Roll Max Speed:**

#### SETUP TAB - Timers Setup
- **Auto Filling Delay (10 SEC):**
- **Low Level Ignore (30 SEC):**
- **Max Run Time (5 MIN):**
- **Blower Start Delay (5 SEC):**
- **Burner Enable Delay (5 SEC):**
- **Enable Discharge (30 SEC):**
- **Metering Roll Stall (3 MIN):**
- **Metering Roll Pause (60 SEC):**
- **Discharge Plugged Ignore (1 SEC):**
- **Dryer Cooling Time (5 MIN):**

#### SETUP TAB - Control Setup (Overrides)
- **Inlet Grain Moisture Alarm Setpoint:**
- **Dealer Info:**

#### TROUBLE SHOOTING - Temperature Control
**Ramp Deg/Min**
- 1
- 2
- 3
- 4
- 5
- 6

#### MAIN MENU TAB - Trends
- **Discharge Rate Factor:**
- **Throughput:**
- **Total Throughput:**
- **Hours:**

#### MAIN MENU TAB - Fill / Empty Dryer
- **Manual Metering Roll Setpoint:**
- **Serial #:**
- **PLC & HMI Version #:**
8.6. Updating the PLC and HMI Programs

Program Update Instructions

Note
Updating the PLC and HMI programs results in the loss of certain setup configuration data. Settings on various screens will need to be manually re-entered. Make a copy of the Section 8.5 – PLC and HMI Recorded Data Sheet on page 134 to record the necessary data.

Note
It is best and easiest to take photos of each screen prior to updating the PLC and HMI programs.

- Update the PLC unit first. Then follow with the HMI update.
- In order to access and re-enter data, you must be logged in as:
  User = Necotech
  Password = (Contact your dealer for the required password)

Install PLC and HMI Program
- Installing the XBTGT6330 screen software
  1. Keep the HMI power on.
  2. Install the new single install USB drive with the new files.
  3. When prompted, press the “Yes” icon to begin installing.
  4. Do not remove the USB drive.
  5. When prompted press the “Restart” icon.
  6. Leave this USB in the HMI when finished (do not remove).

Figure 152. XBTGT Series
• Installing the M221 PLC software
  1. Power off the PLC.
  2. Install the SD card in the PLC.
  3. Power on the PLC.
  4. There should be a solid green PWR led and a solid red ERR led.
  5. The green SD led should be on solid (not flashing) green for 10-20 seconds.
  6. After the SD led goes off, power off the PLC.
  7. Remove the SD card, then power on the PLC.
  8. There should be a solid green PWR led and a solid red ERR.
  9. The solid red ERR should go off ~4 seconds.
 10. Then the green RUN led should light and stay flashing beyond 8 times.
 11. Power the PLC off then back on.
 12. The green PWR led will be on solid & the green RUN led should flash ~8 times then go solid on

Figure 153. M221 Series

• Installing the HMIGTO screen software
  1. Power off the HMI.
  2. Remove USB drive from dryer HMI.
  3. Format USB drive to Fat32.
  4. Replace the USB drive in the HMI.
  5. Install the SD card with the new files.
  6. Power on the HMI.
  7. Install should begin automatically (~2 minutes).
  8. When install complete, remove the SD card, then press the “Restart” icon.
Figure 154. HMIGTO Series

- Insert SD card with notch positioned at upper-right corner.
- USB must be installed during update.
- SD card port on left end of HMI rear panel.
8.7. Main Control Box Terminal Strip

**Important**
After installation is complete check the motor wires for the correct motor rotation and auger rotation direction.

Figure 155. Main Control Box Terminal Strip
8.8. Honeywell Burner Control Fault Codes

The Honeywell burner control system displays system faults by illuminating the red ALARM LED, and turning the green POWER LED on and off in patterns. The patterns consist of one or more fast, and one or more slow, flashes of the POWER LED. These patterns are sometimes referred to as “blink codes”. The following table provides a description of the “blink codes” and their meanings.

**Figure 156. Honeywell burner control location and LEDs**

<table>
<thead>
<tr>
<th>CODE (Fast-Slow)</th>
<th>FAULT DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Low AC line voltage</td>
</tr>
<tr>
<td>1-2</td>
<td>AC quality problem</td>
</tr>
<tr>
<td>2-1</td>
<td>Unexpected flame signal</td>
</tr>
<tr>
<td>2-2</td>
<td>Flame signal absent</td>
</tr>
<tr>
<td>2-3</td>
<td>Flame signal overrange</td>
</tr>
<tr>
<td>3-1</td>
<td>Running ILK switch problem</td>
</tr>
<tr>
<td>3-2</td>
<td>Running ILK switch in Standby</td>
</tr>
<tr>
<td>3-3</td>
<td>Valve proving fault</td>
</tr>
<tr>
<td>4-1</td>
<td>Purge card problem</td>
</tr>
<tr>
<td>4-2</td>
<td>Wiring problem/internal fault</td>
</tr>
<tr>
<td>4-3</td>
<td>Flame amplifier problem</td>
</tr>
</tbody>
</table>
Table 13  Power LED fault codes (continued)

<table>
<thead>
<tr>
<th>CODE (Fast-Slow)</th>
<th>FAULT DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-4</td>
<td>Configuration jumper problem</td>
</tr>
<tr>
<td>5-1</td>
<td>PII fault (Normal state when turned off)</td>
</tr>
<tr>
<td>5-2</td>
<td>HFS/LFS fault</td>
</tr>
<tr>
<td>5-3</td>
<td>MOS/Start switch</td>
</tr>
<tr>
<td>6-1</td>
<td>Output drive failure</td>
</tr>
<tr>
<td>6-2</td>
<td>Internal fault</td>
</tr>
<tr>
<td>6-3</td>
<td>Device specific fault</td>
</tr>
<tr>
<td>6-4</td>
<td>Accessory fault</td>
</tr>
<tr>
<td>7-7</td>
<td>Unrecognized fault</td>
</tr>
</tbody>
</table>

8.9. KS45 & TB45 Controller LEDs

<table>
<thead>
<tr>
<th>Color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Ok</td>
</tr>
<tr>
<td>Green, blinking</td>
<td>No Modbus communications</td>
</tr>
<tr>
<td>Red</td>
<td>Excessive Temperature or bad Thermocouple</td>
</tr>
<tr>
<td>Red, blinking</td>
<td>Internal fault, replace controller</td>
</tr>
</tbody>
</table>
### Honeywell Modbus Mode LEDs

<table>
<thead>
<tr>
<th>LED Behavior</th>
<th>Pulse Period</th>
<th>Interval</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mostly ON with 1 blink</td>
<td>50ms (OFF)</td>
<td>1 sec</td>
<td>Normal Operation</td>
</tr>
<tr>
<td>(good)</td>
<td></td>
<td></td>
<td>Both ControlBus and ModBus are active</td>
</tr>
<tr>
<td>Always OFF</td>
<td></td>
<td>OFF</td>
<td>No power or device failure</td>
</tr>
<tr>
<td>Always ON</td>
<td></td>
<td>ON</td>
<td>Modbus card failure</td>
</tr>
<tr>
<td>Mostly OFF with 1 flash</td>
<td>50ms (ON)</td>
<td>3.85 sec</td>
<td>ModBus is not active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check ModBus wiring</td>
</tr>
<tr>
<td>Mostly OFF with 2 pulses</td>
<td>2 x (200ms ON, 200ms OFF)</td>
<td>1.75 sec</td>
<td>Program CRC error</td>
</tr>
<tr>
<td>Most OFF with 3 pulses</td>
<td>3 x (200ms ON, 200ms OFF)</td>
<td>2.15 sec</td>
<td>No ControlBus signal from the burner controller</td>
</tr>
</tbody>
</table>
Honeywell Relay Module blinking Power LED indication

Note
A 5-1 blink code (Pre-Ignition Interlock) is a normal stand-by condition on NECO dryers with Commander & Commander Lite controls when not running.

<table>
<thead>
<tr>
<th>Fault Code</th>
<th>System Failure</th>
<th>Recommended Troubleshooting</th>
</tr>
</thead>
</table>
| Code 1-1 "Low AC Line Voltage" | Low AC Line detected.                              | 1. Check the relay module and display module connections.  
2. Reset and sequence the Relay Module.  
3. Check the 7800 power supply and make sure that frequency and voltage meet specifications.  
4. Check the backup power supply, as appropriate. |
| Code 1-2 "AC Quality Problem" | Excessive noise or device running on slow, fast, or AC line dropout detected. |   |
| Code 2-1 "Unexpected Flame Signal" | Flame sensed when no flame is expected during STANDBY or PURGE. | 1. Check that flame is not present in the combustion chamber; correct any errors.  
2. Make sure that the flame amplifier and flame detector are compatible.  
3. Check the wiring and correct any errors.  
4. Remove the flame amplifier and inspect its connections. Reseat the amplifier.  
5. Reset and sequence the relay module.  
6. If the code reappears, replace the flame amplifier and/or the flame detector.  
7. If the fault persists, replace the relay module. |
<table>
<thead>
<tr>
<th>Fault Code</th>
<th>System Failure</th>
<th>Recommended Troubleshooting</th>
</tr>
</thead>
</table>
| Code 2-2  *Flame Signal Absent* | No-flame time present at the end of the Pilot Flame Establishing Period; lost during the Main Flame Establishing Period or during RUN. | 1. Measure the flame signal. If one exists, verify that it meets specifications.  
2. Make sure that the flame amplifier and flame detector are compatible.  
3. Inspect the main fuel valve(s) and valve connection(s).  
4. Verify that the fuel pressure is sufficient to supply fuel to the combustion chamber. Inspect the connections to the fuel pressure switches. Make sure they are functioning properly.  
5. Inspect the Airflow Switch and make sure that it is functioning properly.  
6. Check the flame detector sighting position; reset and recycle. Measure the flame signal strength. Verify that it meets specifications. If not, refer to the flame detector and/or flame amplifier checkout procedures in the installation instructions.  
7. Replace the flame amplifier and/or the flame detector, if necessary.  
8. If the fault persists, replace the relay module. |
| Code 2-3  *Flame Signal Overrange* | Flame signal value is too high to be valid. | 1. Make sure the flame detector and flame amplifier are compatible.  
2. Remove the flame amplifier and inspect its connections. Reset the flame amplifier.  
3. Reset and sequence the relay module.  
4. Check the flame detector sighting position; reset and recycle. Measure flame strength. Verify that it meets specifications. If not, refer to the flame detector and/or flame amplifier checkout procedures in the installation instructions.  
5. If the code reappears, replace the flame amplifier and/or the flame detector.  
6. If the fault persists, replace the relay module. |
| Code 3-1  *Running/Interlock Switch Problem* | Running or Lockout Interlock fault during Prepurge. | 1. Check wiring; correct any errors.  
2. Inspect the fan; make sure there is no air intake blockage and that it is supplying air.  
3. Make sure the Lockout Interlock switches are functioning properly and the contacts are free from contaminants.  
4. Reset and sequence the relay module to Prepurge (place the TEST/RUN Switch in the TEST position, if available). Measure the voltage between terminal 7 and G (ground); 120 Vac should be present. Switch TEST/RUN back to RUN.  
5. If steps 1 through 4 are correct and the fault persists, replace the relay module. |
| Code 3-2  *Running/Interlock On During Standby* | Lockout Interlock powered at improper point in sequence or On in Standby. | 1. Check wiring to make sure that the Lockout Interlocks are connected properly between terminals 6 and 7. Correct any errors.  
2. Reset and sequence the relay module.  
3. If the fault persists, measure the voltage between terminal 6 and G (ground), then between terminal 7 and G. If there is 120 Vac at terminal 6 when the controller is off, the controller switch may be bad or is jumpered.  
4. If steps 1 through 3 are correct and there is 120 Vac at terminal 7 when the controller is closed and the fault persists, check for a welded or jumpered Running Interlock or Airflow Switch. Correct any errors.  
5. If steps 1 through 4 are correct and the fault persists, replace the relay module. |
| Code 3-3  *VPS in Improper State* | VPS (Valve Proving Switch) in wrong state during VPS Test. | 1. Check wiring, making sure upstream valve is connected to terminal 9 and downstream valve is connected to terminal 17.  
2. Conduct Valve Seat leakage test using a manometer.  
3. Reset and sequence the relay module; if fault repeats, test VPS (connected to terminal 16) is functioning properly; replace if necessary.  
4. Reset and sequence the relay module.  
5. If fault persists, replace the relay module. |
| Code 4-1  *Purge Card Problem* | No purge card or the purge card timing has changed from the original configuration. | 1. Make sure the purge card is seated properly.  
2. Inspect the purge card and the connector on the relay module for any damage or contaminants.  
3. Reset and sequence the relay module.  
4. If the fault code reappears, replace the purge card.  
5. Reset and sequence the relay module.  
6. If the fault code persists, replace the relay module. |
| Code 4-2  *Wiring Problem/ Internal Fault* | Pilot (ignition) valve terminal, main valve, ignition or Main Valve 2 was on when it should be off. | ![WARNING]  
Electrical Shock Hazard; Fire or Explosion Hazard.  
Can cause severe injury, death or property damage.  
Remove system power and turn off power supply.  
1. Remove system power and turn off fuel supply.  
2. Check wiring; correct any errors.  
3. Inspect Pilot Fuel Valve(s), both places, and connections.  
4. Reset and sequence the relay module.  
5. If the fault persists, replace the relay module. |
<table>
<thead>
<tr>
<th>Fault Code</th>
<th>System Failure</th>
<th>Recommended Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code 4-3 <em>Flame Amplifier Problem</em></td>
<td>Flame not sensed, or sensed when it should be on or off.</td>
<td>1. Check wiring; correct any errors. 2. Make sure the flame amplifier and flame detector are compatible. 3. Remove the flame amplifier and inspect the connections. Reseat the amplifier. 4. Reset and sequence the relay module. 5. If the code reappears, replace the flame amplifier and/or the flame detector. 6. If the fault persists, replace the relay module.</td>
</tr>
<tr>
<td>Code 4-4 <em>Configuration Jumper Problem</em></td>
<td>The configuration jumpers differ from the sample taken at startup.</td>
<td>1. Inspect the jumper connections. Make sure the clipped jumpers were completely removed. 2. Reset and sequence the relay module. 3. If the fault persists, replace the relay module.</td>
</tr>
<tr>
<td>Code 5-1 <em>Preignition Interlock</em></td>
<td>Preignition Interlock fault.</td>
<td>1. Check wiring and correct any errors. 2. Check Preignition Interlock switches to assure proper functioning. 3. Check fuel valve operation. 4. Reset and sequence the relay module; monitor the Preignition Interlock status. 5. If the fault persists, replace the relay module.</td>
</tr>
<tr>
<td>Code 5-2 <em>High Fire Sw. or Low Fire Sw.</em></td>
<td>Either High Fire Switch or Low Fire Switch failure.</td>
<td>1. Check wiring and correct any errors. 2. Reset and sequence the relay module. 3. Use manual motor potentiometer to drive the motor open and closed. Verify at motor switch that the end switches are operating properly. Use RUN/TEST switch if manual potentiometer is not available. 4. Reset and sequence the relay module. 5. If the fault persists, replace the relay module.</td>
</tr>
<tr>
<td>Code 5-3 <em>Man-Open Sw.; Start Sw. or Control On</em></td>
<td>Man-Open Switch, Start Switch or Control On in the wrong operational state.</td>
<td>1. Check wiring and correct any errors. 2. Make sure that the Manual Open Valve Switch, Start Switch and Control are operating properly. 3. Start Switch held “On” too long. 4. Reset and sequence the relay module. 5. Reset and sequence the relay module. If the fault persists, replace the relay module (RM7838A1014; RM7838B1013 or RM7838C1004 only).</td>
</tr>
<tr>
<td>Code 6-1 <em>Internal Faults</em></td>
<td>Relay Module self-test failure.</td>
<td>1. Reset and sequence the relay module. 2. If fault reappears, remove power from the device, reapply power, then reset and sequence the relay module. 3. If the fault persists, replace the relay module.</td>
</tr>
<tr>
<td>Code 6-2 <em>Internal Faults</em></td>
<td>Relay Module Self-Test failure.</td>
<td>1. Reset and sequence the relay module. 2. If fault reappears, remove power from the device, reapply power, then reset and sequence the relay module. 3. If fault does not repeat on the next cycle, check for electrical noise being copied into the relay module through the external loads or possibly an electrical grounding issue. 4. If the fault persists, replace the relay module.</td>
</tr>
<tr>
<td>Code 6-3 <em>Device Specific</em></td>
<td>Fault with special OEM input circuits.</td>
<td>1. Check wiring and operation of special OEM inputs. 2. Reset and sequence the relay module. 3. If fault reappears, remove power from the device, reapply power, then reset and sequence the relay module. 4. If the fault does not repeat on the next cycle, check for electrical noise being copied into the relay module through the external loads or possibly an electrical grounding issue. 5. If the fault persists, replace the relay module.</td>
</tr>
<tr>
<td>Code 6-4 <em>Accessory Fault</em></td>
<td>Unused at this time.</td>
<td>—</td>
</tr>
<tr>
<td>Code 7-7 <em>Unused</em></td>
<td>Unused at this time.</td>
<td>—</td>
</tr>
</tbody>
</table>
Fireye Lockout Codes Interpretation

During an alarm condition, the Alarm LED is made to flash at approximately a twice per second rate. The remaining LED’s are illuminated as a coded sequence identifying the reason for the lockout. This remains true if power is removed and then restored in a locked out condition.

<table>
<thead>
<tr>
<th>LED DISPLAY READOUT</th>
<th>FAN</th>
<th>OPEN DAMPER</th>
<th>CLOSE DAMPER</th>
<th>AUTO</th>
<th>IGN</th>
<th>FLAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• T13 FUEL VALVE END SWITCH OPEN</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• M-0 LOW FIRE START OPEN</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>• M-0 LOW FIRE START OPEN - PTFI</td>
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<td></td>
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<tr>
<td>• M-0 LOW FIRE START OPEN - MTFI</td>
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<td></td>
</tr>
<tr>
<td>• M-0 CLOSED</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• M-8 CLOSED</td>
<td></td>
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<tr>
<td>• M-8 HIGH PURGE CIRCUIT OPEN</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>• FALSE FLAME-STANDBY</td>
<td></td>
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<td></td>
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<tr>
<td>• FLAME FAIL PTFI</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>• FLAME FAIL - MTFI</td>
<td></td>
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<tr>
<td>• FLAME FAIL AUTO</td>
<td></td>
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<tr>
<td>• 3-P RUN INTLK OPEN - PREPURGE</td>
<td></td>
<td></td>
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<tr>
<td>• 3-P RUN INTLK OPEN - PURGE</td>
<td></td>
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<tr>
<td>• 3-P RUN INTLK OPEN-PTFI</td>
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<tr>
<td>• 3-P RUN INTLK OPEN-MTFI</td>
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</tr>
<tr>
<td>• 3-P RUN INTLK CLOSED-STANDBY</td>
<td></td>
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<tr>
<td>• 3-P RUN INTLK OPEN-AUTO</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• FUEL VALVE STATE CHANGE</td>
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</tr>
<tr>
<td>• CHECK FUSE</td>
<td></td>
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<tr>
<td>• CHECK WIRING</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>• CHECK SCANNER</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>• CHECK PROGRAMMER</td>
<td></td>
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<tr>
<td>• CHECK CHASSIS</td>
<td></td>
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<tr>
<td>• CHECK EXPANSION MODULE</td>
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</tbody>
</table>
8.10. HMI Wiring Connections

**Important**
The HMI must be connected to a customer-supplied 120 VAC, 400 to 600 VA uninterruptible power supply (UPS).

**Electrical Wiring from Main Control to HMI**
1. Using the labels provided, pull and connect the following wires from the main control terminals to the HMI terminals:

*Figure 157. Terminals Inside HMI Enclosure*

<table>
<thead>
<tr>
<th>Wire Label</th>
<th>Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1A</td>
<td>Blue</td>
</tr>
<tr>
<td>E2</td>
<td>Blue</td>
</tr>
<tr>
<td>E2A</td>
<td>Blue</td>
</tr>
<tr>
<td>24V</td>
<td>Blue</td>
</tr>
<tr>
<td>0V</td>
<td>White</td>
</tr>
</tbody>
</table>

**Ethernet Cable from Main Control to HMI**
1. Pull Cat 6 shielded Ethernet cable from the main control to the HMI. The maximum distance should be less than 300 feet.
2. Terminate each end of the Ethernet cable (if not already terminated).
3. Plug one end into the ethernet switch in the main control panel.
4. Plug the other end into the Ethernet switch inside the HMI enclosure.

*Figure 158. Ethernet Cable Connection in Main Control Panel*  
*Figure 159. Ethernet Cable Connection in HMI Cabinet*
HMI Enclosure Wiring

The following diagram shows electrical and Ethernet wiring entering the HMI enclosure (dashed lines).

Figure 160. HMI Wiring Diagram
The DryerMaster moisture sensor circuit board is factory set and should not need adjustment.

The “J3” jumper should be always set to “STORE” position.
8.12. Commander Wi-Fi access (Vijeo Air App)

**Version date:** 7/5/2018

**Warning**
- You must consider the potential of accidental touches from remote mobile devices. Know and understand the hazards regarding equipment movement started by a remote operation. You, as the operator, are responsible for all gates and interlock for protecting people and equipment.
- Failure to follow these instructions can result in death, serious injury, or equipment damage.

**Required Hardware (source locally)**
- Wi-Fi router
- Ethernet cable
- Tablet or cell phone with Wi-Fi capability

**Hardware installation**
- Locate Wi-Fi router in a suitable location near the HMI enclosure.
- The Wi-Fi router should be powered by its own power supply.
- Connect an ethernet cable from Wi-Fi router to the ethernet switch inside the HMI enclosure.

**Router configuration**
- Configure router
  - static IP address 10.10.11.5
  - subnet mask 255.255.255.0
  - gateway 10.10.11.211
- Set router name (NECO dryer)
- Set router security password to prevent unauthorized access
- Record security password here ____________________

**Required Software (download app)**
- Schneider Vijeo Design’Air (available on google apps)

**Tablet / Phone Wi-Fi settings**
- Connect to router (NECO dryer)
- Enter router security password

**Initial Vijeo Design’Air app settings**
1. Press “+ Add device” icon
2. Name: NECO dryer
3. Host: 10.10.11.101
4. Port: 37891
5. Press “OK”

**Using the Vijeo Air app**
Note
The use of this app allows remote access to monitor, make minor operational setting changes and to stop the dryer only. Starting of equipment must be performed at the dryer HMI panel.

The local operator (User, Owner or NecoTech) via the HMI must start and get the dryer and associated equipment in the desired state of operation.

Once all equipment is running as desired, the local operator enables remote access
MAIN MENU > SETUP > SECURITY SETUP > I ACCEPT > ENABLE REMOTE ACCESS.

When the “ENABLE REMOTE ACCESS” icon is pressed the current operator is logged out and the “Remote” user is logged in on the HMI.

The user is now able to access the dryer control via the Vijeo Design'Air app.

Press the app icon on the tablet / phone, then press “NECO dryer”.

Read accept the liability statement. Press “OK” or “View-only” icon.

Login.
• Username: RemoteWiFi
• Password: 1379
• Press “OK”

At this point the tablet / phone displays the same image the HMI screen.

The operator may remotely:
• change Burner Temperature(s)
• change Target Moisture
• change Manual Metering Speed Setpoint
• and view all screens

Note
If the “LOGOUT” icon is pressed the dryer control will not be able accessible until operator locally re-enables the remote access.

8.13. Dryer Temperature Considerations

High-Limit Temperature Consideration

WARNING Fire Hazard

• In cases where the grain has a lot of trash, or when drying high moisture grain (that is immature or frozen grain), drying at these temperatures may not be possible, as the risk of fire is increased.

• In cases where there is blockage in the machine due to trash, it is possible for this material to become subject to spontaneous combustion.

• Shut the blower(s) OFF immediately in ANY case where a person may see smoke coming from the machine.

• When the High Temperature Limit alarm is activated, the equipment will immediately shut down with NO cool-down period (blowers OFF).
To avoid tripping the High Temperature Limit, ensure the High Limit Switch is set to 30°F (17°C) above the operating temperature at each burner.

**Cool-Down**

When stopping the machine the grain should be cooled down:

- **Manual Cool-Down:** Turn off burners, but leave blowers on for a period of 5 to 15 minutes.
- **Automatic Cool-Down:** The system has five possible grain level monitors. Certain conditions can result in the equipment automatically shutting down. Most of these conditions include a cool-down period. A few conditions, such as High Limit Temperature, that are reached provide a shut-down with NO cool-down period.
8.14. Grain Drying Tips

8.14.1 Specific Crops

**Drying Suggestions**

*For Specific Grains / Situations in Your AGI Neco Dryer*

**Corn**

- **Difficulty:** 1
- **Drying Temp:** 210°F (100°C)

**Notes:**
Corn is probably the easiest of the grains to dry in the Neco dryer. Corn will handle quite high temperatures and is generally dried at 210°F.

**Concerns:**
- Beans’ wings or red dogs will be present during drying and worse with high moisture corn. Cleanup in and around the dryer as often as necessary.
- Very wet beans’ wings can build up on the upper sections of the dryer causing several issues. Accumulations near the inlet moisture sensor can cause faulty readings of the inlet moisture.
- Very high moisture corn will generate large amounts of steam exiting the dryer. Buildup of ice on the fan blades can occur on very cold days causing overramping of the blower motors and dryer shutdowns.

**White Corn / Food Grade**

- **Difficulty:** 1
- **Drying Temp:** 130-160°F (54-60°C)

**Notes:**
Grains that are highly susceptible to stress cracking are well suited to the Neco dryer. Similar to corn, white corn dries well. Slow cooling is the most critical factor with these grains to avoid stress cracking.

**Concerns:**
- Beans’ wings or “white” dogs will be present during drying and worse with high moisture corn. Cleanup in and around the dryer as often as necessary.
- On very warm days use as many cooling floors as possible or run the dryer with reduced temperatures in an All-Heat mode and slow cool in the bin with properly sized aeration fans.

**Caution:** On extremely cold days, the outside cooling air will likely be too cool. The kernels will shrink too quickly and stress cracks will form. Consider slow cooling in the bin. If using the entire bottom section for cooling, run this burner at a low temperature like 80-90°F (27-32°C).
CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

8. APPENDIX

WHEAT

DIFFICULTY:  

DRIYING TEMP: 180°F (82°C) or lower

NOTES: Wheat should be dried at slightly lower temperatures than corn – perhaps 180°F (82°C) to achieve highest quality.

Wheat will dry quite easily and sometimes will move through the dryer so quickly that the unload will have problems keeping up.

CONCERNS: If wheat gets above 28% moisture – watch the quality closely. It may need to run in two passes. Too high of temperatures used on very high moisture wheat can damage the quality.

High moisture wheat that is full of debris can be “sluggish” as it moves through the dryer. Perform periodic inspections to make sure grain columns are moving.

SOYBEANS

DIFFICULTY:  

DRIYING TEMP: 140-145°F (60-63°C)

NOTES: Reduce drying temperatures to 140-145°F (60-63°C). If having problems with seed coat cracking, use slow cooling techniques (see WHITE CORN). Oilseed crops should not be left unattended while drying.

CONCERNS: The plenum area can get a buildup of “fuzz” that needs to be cleaned each day. Soybeans can be quite “trashy”. Bean pods can build up in corners of the dryer causing blockages and “hot spots”.

This lighter material (seed pods) can build up in the dryer to the outside ends of the dryer at the very top (viewed from inside the plenum top section). Every couple of days – turn off the fill equipment until the grain level falls below the low dryer switch. Refill the dryer and continue drying. This will help “flush” some of this material through the dryer. If in doubt, it is a best practice to simply empty the dryer to remove the excess material, refill the dryer, and resume drying.

Leafy material can be pulled into the blowers and ignited at the burner. On very windy days, watch for this issue. Consider drying on a different day.

BARLEY / OATS

DIFFICULTY:  

DRIYING TEMP: 160-170°F (71-77°C)

NOTES: Barley and oats run well in a NECO dryer but bearded barley especially can hang up in the dryer. Reduce burner temperatures to 160-170°F (71-77°C).

Check regularly to make sure the grain is moving through the dryer. Look in each of the lower ducts for grain movement. There might be bridging that is keeping the column from moving freely.

CONCERNS: If working on the outside of the dryer – blockages in the upper ducts can be removed while the dryer is running. If the blockage seems to be in the bottom duct, stop the unload and lockout the machine before trying to work with the metering rolls. If you need to access the ducts inside the dryer, stop the dryer and lockout the machine.

As incoming barley or oats gets dryer, it can get quite light and fail to engage the fill switch to shut down the filling equipment. Lower the adjustable height rotary switch into the grain or consider adding paddle extensions to better engage the grain mass.

If the incoming grain contains large amounts of chaff, consider pre-cleaning or view the section on Special Harvest Conditions – EXCESS CHAFF.

SORGHUM / MILLET

DIFFICULTY:  

DRIYING TEMP: 130-140°F (54-60°C)

NOTES: Sorghum or milo dries relatively well if caution is used. Reduce drying temperatures to 130-140°F (54-60°C).

CONCERNS: Sorghum can be quite “trashy” with chaff and debris. Buildup in the corners of the dryer can cause blockages and “hot spots”.

This lighter material can build up in the dryer to the outside ends of the dryer at the very top (viewed from inside the plenum top section). Every couple of days – turn off the fill equipment until the grain level falls below the low dryer switch. Refill the dryer and continue drying. This will help “flush” some of this material through the dryer. If in doubt, it is a best practice to simply empty the dryer to remove the excess material, refill the dryer, and resume drying.

Leafy material can be pulled into the blowers and ignited at the burner. On very windy days, watch for this issue. Consider drying on a different day.

If coming off the field very wet, too much heat in the upper sections can cause auto-ignition problems. Very wet sorghum as been known to auto-ignite in the grain carts. Reduce heat to the upper section and make sure the grain is getting plenty of air – especially in the wet bin.
8. APPENDIX

CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

EDIBLE BEANS

DIFFICULTY: • • • •

DRYING TEMP: 120-130°F (49-55°C)

NOTES:
The NECO mixed flow dryer is well suited for the gentle drying required with edible beans. Reduce temperatures to 120-130°F (49-55°C) to keep seed coat from cracking or discoloring. At this point the handling of the product needs to be considered.

CONCERNS:
Augers should be slowed down with a pulley change or VFD to keep them running as full as possible. Smaller VFDs can be installed in the main cabinet. Larger VFDs should be installed in a secondary cabinet to reduce electrical noise to components in the main cabinet.

If having problems with seed coat cracking, use slow cooling techniques (see WHITE CORN).

Consider purchasing poly flighting for even better results – or consider the option of a drag unload with VFD. Some customers have installed after market belt conveyors.

RAPE / CANOLA

DIFFICULTY: • • • •

DRYING TEMP: 130-140°F (54-60°C)

NOTES:
Rape seed or canola will dry relatively trouble free – but special conditions apply. Reduce burner temperatures to 130-140°F (54-60°C). Rape seed should not be dried unattended due to its oil content. Rape has numerous varieties. Those with very high oil content should NOT be dried unattended.

CONCERNS:
Material can fly out of the ducts at the top corners for the dryer. These ducts may need to be partially blocked with duct cover (7715095).
Contact the NECO factory to determine if a Small Grains Kit might be applicable to your situation. Or the air can be slowed slightly with a pulley change or even a VFD on the blower motor – but anytime the airflow is reduced, the operator should check to make sure they are still achieving good flame quality. If using a VFD, install the equipment in a secondary cabinet to reduce electrical noise to components in the main cabinet.

If the rape seed gets above 24% - watch quality closely. It may need to run in two passes. If the rape seed or canola has excess chaff – see the section on Special Harvest Situations – EXCESS CHAFF.

RICE

DIFFICULTY: • • • • •

DRYING TEMP: 115-125°F (46-52°C) NIGHT
105-115°F (41-46°C) DAY

NOTES:
Rice can be quite difficult to dry. Most operators will bring rice to the dryer around 19-22% moisture. The dryer should be set to run in all heat (without cooling). Drying temperatures should be set at 115-125°F (46-52°C) in the nighttime and 105-115°F (41-46°C) in the daytime hours.

CONCERNS:
Rice can only be brought down approximately 3-4 points in moisture at a time. More than this and the kernel may shrink too quickly causing internal stress cracking. Some customers have reported success removing 7 points in one pass but complete drying data was not available.

Partially dried rice should be stored in bins with fan aeration and left at least 24 hours to temper. At that point, a decision can be made to leave it in aeration or bring it back through the dryer for a second pass. Rice can also see some moisture rebound in the bin. Final moisture should be brought to 12.5-13.0%. If rice is already less than 18%, consider an air-only pass.

Rice hybrids can be caustic and produce significant wear. Watch very closely the leveling augers if equipped and discharge auger wood bearings. Wood bearings may need to be rotated after only a short while.

SUNFLOWER

DIFFICULTY: • • • • •

DRYING TEMP: 120-130°F (49-55°C)

NOTES:
Sunflowers present the greatest challenge in a high temperature dryer. Because it is an oil seed with a large surface area, it could ignite if subjected to high temperatures for long periods of time. Reduce drying temperature to 120-130°F (49-55°C). Sunflower seeds should NEVER be dried unattended.

CONCERNS:
Sunflowers can be one of the dirtiest crops. The plenum area can get a buildup of “fuzz” that needs to be cleaned each day. Lighter material can build up in the dryer to the outside ends of the dryer at the very top (viewed from inside the plenum top section). Every couple of days – turn off the filling equipment until the grain level falls below the low dryer switch. Refill the dryer and continue drying. This will help “flush” some of this material through the dryer.

If in doubt, it is a best practice to simply empty the dryer to remove the excess material, refill the dryer, and resume drying.

(See CONCERNS continued on next page)
CONTINUOUS MIXED-FLOW GRAIN DRYER WITH COMMANDER CONTROL SYSTEM

SUNFLOWER
DIFFICULTY: ★★★★★
DRYING TEMP: 120-130°F (49-55°C)

(CONCERNS CONTINUE): The seeds can start lifting out of the ducts as they get dryer at the bottom. It may be necessary to restrict the airflow by blocking ducts with duct cover (7715099). Contact the NECO factory to determine if a Small Grains Kit might be applicable to your situation. Or the air can be slowed slightly with a pulley change or even a VFD on the blower motor— but anytime the airflow is reduced, the operator should check to make sure they are still achieving good flame quality. If using a VFD, install the equipment in a secondary cabinet to reduce electrical noise to components in the main cabinet.

On very windy days, make sure floating material is not being pulled back into the blower inlets. If possible, stop drying until calmer conditions are met.

As a last note — sunflowers have one of the highest moisture-rebound rates. It might be necessary to dry to a couple points under the desired setpoint before putting into the bins.

SPECIALTY CROPS
OTHER SPECIALTY CROPS:
The NECO dryer has been used to dry many other specialty crops including radish seed, mustard seed, sesame seed, grass seed, grape seed, chickpeas and even some nuts —like hazelnuts. Drying data was not available in all instances.

Use caution and start slowly until you have learned the best techniques to use in your instance.

Begin at a lower temperature and work your way up to a point where you are comfortable.

Always remember the crop needs to be free flowing, relatively clean of debris and foreign material.

Always maintain a clean dryer and a clean working area around the dryer.

For any questions, please call the NECO factory at 402-453-6932 or send an email to service@necodryers.com.

HARVEST SITUATIONS
SPECIAL HARVEST SITUATIONS:
EXCESS BULK MATERIAL
During difficult harvest seasons, it is very common to speed up the combines to shorten the harvest. This often results in excess corn cobs, stalks, leafy material and the like. This situation can be common with certain types of harvest machines — no matter the speed.

Keep in mind any dryer is designed to dry free flowing grains and not bulky material (cobs, stalks, leaves) that may bridge. Material that is not free flowing may plug up a dryer and restrict the free movement of the grain.

Material that is hung up in the dryer will eventually dry to the point it becomes a hazard. If the grain is full of this material — regularly inspect random sections of the dryer to ensure the grain is free flowing. If in doubt — it is a best practice to empty the dryer and inspect for the presence of this material. Clean the dryer, refill the dryer and resume drying.

Consider putting grain with excess bulky material through a scalper or pre-cleaner before bringing it to the dryer. The grain will flow better, the potential for bridging will be reduced, and you will not be paying to dry the bulk material.

HARVEST SITUATIONS
SPECIAL HARVEST SITUATIONS:
EXCESS CHAFF
Crops that come to the dryer with an excess amount of chaff will cause similar hazards.

Chaff is lighter than grain and will “float” on top of the flowing grain — remaining somewhat stationary and accumulating over time. This can happen anywhere in the dryer.

A tell-tale sign of excess chaff would be the buildup in the heat ducts where the constant flow of air will push it to the sidewall of the dryer. Over time this material will over dry and become a hazard. If the grain is full of this material — regularly inspect random sections of the dryer to ensure there is no buildup of chaff in the heat ducts. If in doubt — it is a best practice to empty the dryer to remove this material. Clean the dryer, refill the dryer and resume drying.

It might be possible to stop drying and simply run the unloads for 15-20 minutes to see if this material will be drawn into the mass of flowing grain. Recheck for the excess chaff condition and if in doubt - empty the dryer completely, refill the dryer and resume drying.

Consider putting material with excess chaff through a pre-cleaner prior to bringing it to the dryer. The grain will flow better, the potential for hot spots will be reduced, and you will not be paying to dry chaff.
8.14.2 Measuring Actual Seed Temperatures

Note
Putting a thermometer directly in the dryer only gives the temperature of the air between the kernels and not the correct temperature of the actual kernels.

When operating in batch mode:
- To determine correct kernel temperature, take a sample from a duct at the lower part of the heating section.
- Put into an insulated (covered) container, with a thermometer directly in the grain.
- After 10 minutes record the temperature reading.
9. Compliance

Declaration of Conformity
Konformitätserklärung

Nebraska Engineering Company (NECO)
a Division of Ag Growth International (AGI)
9364 North 45th Street
Omaha, NE 68152 USA
Phone: 402-453-6912

Continuous Flow Grain Dryer, 380V 3PH 50Hz

Models: D1660CE, D1670CE, D1680CE, D1690CE, D16106CE, D16120CE,
D16140CE, D16160CE
D24108CE, D24150CE, D24180CE, D24210CE, D24240CE,
D24260CE, D24330CE, D24380CE
D32260CE, D32340CE, D32440CE, D32500CE

Conforms to applicable requirements of directive 2006/42/EC
In Übereinstimmung mit der Richtlinie des Rates 2006/42/EC

Omaha, NE USA
10. Limited Warranty

For a period of one (1) year after shipment of goods by the Buyer to the Buyer’s customer, NECO will supply, free of charge, FOB per NECO’s factory located in Omaha, Nebraska, replacement parts for any parts that NECO identifies to be defective due to workmanship or material.

- This limited warranty does not extend to parts that wear due to normal operation and need to be replaced periodically.
- Goods not manufactured by NECO carry only their manufacturer’s warranty.
- This undertaking is in lieu of all other warranties, expressed or implied, including merchantability and fitness for a particular purpose.
- You must obtain a “Return Authority” form NECO prior to returning any defective goods. Those defective goods must be returned, freight-prepaid, to the NECO factory in Omaha, NE. See the back cover of this manual for complete address information.
- NECO reserves the right to make changes or improvements to products and goods without incurring any obligation with respect to previously manufactured products.
- Failure to follow the instructions contained in this manual, as well as the existence of any of the conditions listed below, will cause this Limited Warranty to be null and void:
  1. Improper assembly.
  2. Improper installation, including power and wiring.
  3. Unauthorized alteration of the product or components therein.
  4. Operation of the unit when repairs are needed.
  5. Use of unauthorized parts.
  6. Operation by children or un instructed personnel.
  7. Processing of materials that are abrasive, that do not flow freely, or that are otherwise unsuited for processing in farm equipment.
  8. Misuse of the equipment or any of its components.
  9. Damage due to negligence, abuse, or accidents.

LIMITATION OF LIABILITY

- Buyer agrees that in no event shall NECO have liability for direct damages in excess of the contract price of the goods for which the claim is made.
- Buyer further agrees that in no event shall NECO have liability for loss of use, loss of profits, or for any indirect, incidental, or consequential damages on any claim of any kind.
NECO is an AGI Brand.

AGI is a leading provider of equipment solutions for agriculture bulk commodities including seed, fertilizer, grain, and feed systems with a growing platform in providing equipment and solutions for food processing facilities. AGI has manufacturing facilities in Canada, the United States, the United Kingdom, Brazil, South Africa, India and Italy and distributes its products globally.