

GRAIN CLEANER "GCS"

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GRAIN CLEANING, LLC

OPERATIONS MANUAL

"GCS" GRAIN CLEANER

GRAIN CLEANING, LLC

NORTH AMERICAN AND AUSTRALIAN DISTRIBUTOR

OPERATIONS MANUAL

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INTRODUCTION

“GCS” grain cleaner is using fan powered technology along with latest aerodynamic principles in order to clean grain without any mechanical damage. With capacity ranging from 200 bu/hr (5 t/hr) up to 2200 bu/hr (60 t/hr) GCS grain cleaning equipment fits the needs for any size grain producers. This operations manual is supplied with each grain cleaner and it will allow you to review the design details and learn the operation of the machine.

All workers should be familiar with this manual and the operation of the cleaner. This manual contains information about the design and construction of the machine. Technical data, as well as safety precautions, manufacturer information and conditions of warranty. Detailed record keeping of operating conditions with help with troubleshooting and maintenance.

Upgrades and refinements are an ongoing process. This manual represents the design and construction of this machine as currently offered. Additional details on the product can be obtained from Grain Cleaning, LLC website at www.graincleaningllc.com.

PRODUCT GENERAL INFORMATION

Name of the product:

FAN POWERED SEPARATING MACHINE “GCS” GRAIN CLEANER

Manufacturer:

PE CF “REAL-M”, 8 SEDOVA STR., ZAPORIZHYA, 69057, UKRAINE

Distributor:

**GRAIN CLEANING, LLC
3731 THURSTON AVE, SUITE 100
ANOKA, MN 55303**

1. APPLICATION AND INSTALLATION

1.1. Applications:

Grain cleaner (further referred to as the "machine") is designed for cleaning and grading of grains and seeds of legumes, vegetables and melons.

1.2. Modes of Operations:

- b. Pre-cleaning
- c. Cleaning
- d. Combination of Cleaning and Grading

1.3. Installation:

- a. Covered or enclosed shed
- b. Elevators or processing plants
- c. Mounted on a portable trailer

2. SPECIFICATIONS

Table 1 (US Standard)

Grain cleaner model	Productivity (bushels/hour)	Dimensions: -length, in -width, in -height, in	Energy consumption	Weight (lb)
GCS-200	200	80x16x83	0.75 HP	450
GCS-350	350	94x29x97	1.5 HP	800
GCS-750	750	94x45x97	2 (2x1) HP	1600
GCS-1400	1,400	94x55x97	3 (2x1.5) HP	1800
GCS-2200	2,200	95x70x97	4.5 (3x1.5) HP	2300

Table 2 (Metric)

Grain cleaner model	Productivity (tons/hour)	Dimensions (mm): -length -width -height	Energy consumption (kW)	Weight (kg)
GCS-200	5	2000x400x2100	0.5	220
GCS-350	10	2400x750x2500	1	360
GCS-750	20	2400x1150x2500	1.5 (2x0.75)	750
GCS-1400	40	2400x1400x2500	2 (2x1)	850
GCS-2200	60	2450x1800x2500	3 (3x1)	1100

3. DESIGN OF THE MACHINE

All models of the machine will be delivered as a standard design.

Any modification without consulting Distributor will void the warranty. If you want to make changes, contact Grain Cleaning, LLC for potential operational solutions before modifications.

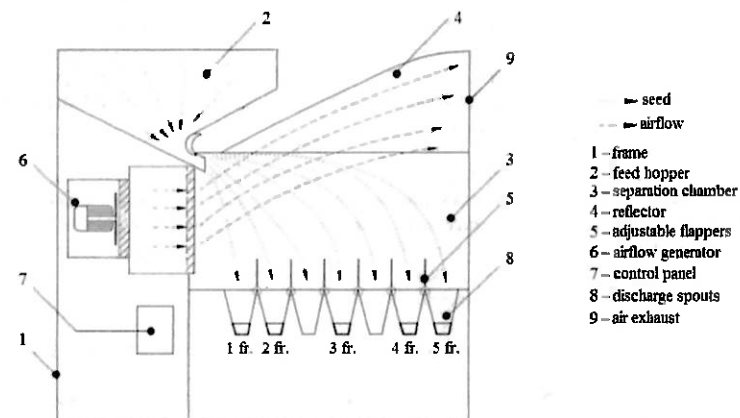
Standard Design Includes:

1. Assembled base machine, accessories may be removed for shipping and will need to be attached after delivery.
2. Mounting points and hardware to allow for a secure shipping.
3. An operational manual for the machine purchased.

4. «GCS» GRAIN CLEANER PRINCIPLE OF OPERATIONS

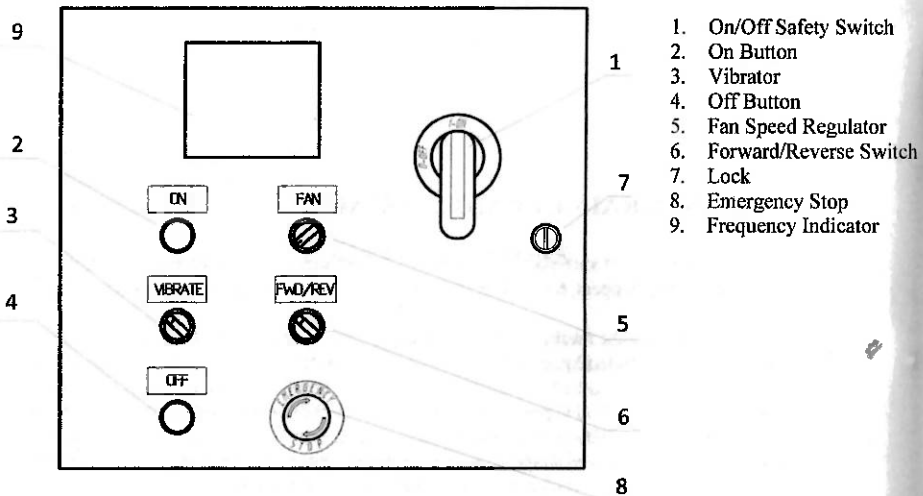
The machine consists of such parts: 1 – frame; 2 – feed hopper; 3 – separation chamber; 4 – reflector; 5 – adjustable flappers; 6 – airflow generator; 7 – control panel; 8 – discharge spouts; 9 – air exhaust.

Feeding of grain into the machine is done through a feed hopper located on top of the machine. The airflow is being generated by an impeller fan(s) RPM on the electric motor is being controlled by a VFD (variable-frequency drive) located inside of control panel which increases or decreases the speed of the fan(s). Usage of VFD provides reliable work of electric motor in all of the modes and has multilevel overload protection. The uniform airflow enters the separating chamber where grains are separated by weight, size and shape with heavier kernels being discharged into spouts 1 through 3 and lighter, damaged kernels discharged into spouts 4 through 6. Flappers located inside of the separation chamber allow a user to make adjustments in order to achieve preferred ratio of the processed seeds. Dust and chaff is being discharged through air exhaust which can be controlled by an aspiration system.



5. DECALS AND MARKING

1. Name and contact information of the distributor - Grain Cleaning, LLC
2. Model and serial number of the machine
3. Electrical specifications
4. Safety warning labels
5. Control panel markings for «On», «Off», «Start», «Stop», «E-Stop», «On/Off Safety Switch», «Forward/Reverse», «Vibrate» and «Fan» are represented below:



6. SAFETY REGULATIONS

Ensuring that everyone who is operating the grain cleaner has familiarized with the recommended operating and maintenance procedures will be key to maintaining a safe environment not just for the operator but for everyone around. Most accidents can be prevented, thus focusing on safety should be priority when operating a GCS grain cleaner. Serious injury or even death can occur when safety instructions are not followed.

This operation manual contains information that provides safe and stable work with the machine. Any deviation from the guidelines set out here is considered as improper use and the manufacturer is not liable for damages which have arisen as a result. Responsibility for such deviations rests with the user.

6.1. General Safety Instructions

Follow the guidelines laid down in the manual for all the work: transportation, commissioning, servicing and repair. Operation manual must always be at the working place of operator. Access to any work with separator should have only staff that is at least 18 years old and after the instructions receiving. Staff should be familiar with the principle of machine, its technical service and warned of possible dangers.

- GCS grain cleaner is designated for outdoor operation only, unless machine has been custom built for indoor use.
- Have a first-aid kit available for use and know how to use it.

- Have a fire extinguisher available, stored in a highly visible location, and know how to use it.
- Wear appropriate protective gear. This list may include but is not limited to:
 - hard hat
 - protective shoes with slip resistant soles
 - protective glasses or goggles
 - heavy gloves
 - wet weather gear
 - hearing protection
 - respirator or filter mask.
- Read and understand the Operator's Manual and all safety signs before operating, servicing, adjusting, repairing, or unplugging the equipment.
- Do not attempt any unauthorized modifications to your GCS product as this could affect function or safety and could affect the life of the equipment.
- Inspect and clean the working area before operating.
- Keep hands, feet, clothing, and hair away from moving parts.
- Ensure bystanders are clear of the area before operating.

6.2. Start-Up Safety

- Do not let inexperienced operators or children run this equipment.
- Connecting the machine and carrying out all electrical work must be performed only qualified electrician.
- The power supply cable should not have any mechanical insulation damages.
- Place all machine controls in neutral before starting.
- Do not operate inside a building unless there is adequate ventilation.
- Ensure all shields are in place and in good condition before operating.
- Make certain electric motors are grounded.

6.3. Transport Safety

- Check with local authorities regarding transport on public roads. Obey all applicable laws and regulations.
- Never have the equipment in operation during transport.
- The equipment should never be transported without strong fixation to the vehicle.
- When unloading and loading operations, observe the following rules:
 - slinging machines must be in accordance with the scheme in specified in "Annex 2".
 - when lifting the machine, do not stand under.

6.4. Service and Maintenance Safety

- Stop machine, turn the power off, and wait for all moving parts to stop before servicing, adjusting or repairing.
- Follow good shop practices including: - keep service area clean and dry - be sure electrical outlets and tools are properly grounded - use adequate lighting for the job.
- Use only tools, jacks, and hoists of sufficient capacity for the job.
- Replace and secure all shields removed during servicing before operating.
- Use heavy leather gloves to handle sharp objects.

6.5. Safe Storage

- Store the machine in a safe and protected area. Make sure the unit is disconnected from power. Do not allow anyone untrained to make adjustments or modification to the unit while not in use.
- Do not permit children to play on or around the stored machine.

6.6. Security Features

The Emergency STOP button is the most important feature. Once it is pressed in, the machine will be turned Off and not re-start until the button is reset.

The control panel must be maintained in a LOCKED condition. Only authorized personnel with electrical training should have access to the key.

6.7. Common Dangers

- Electrical shock from a damaged or insufficiently rated power cord – inspect prior to activating.
- Inhalation problems from excessively dusty product going through the machine – proper face masks needed.
- Machinery noise from the fan and any auxiliary equipment running in the area – wear ear protection.
- Danger of mechanical injury. Do not operate the machine with open rotating parts. During machine operation, it is prohibited to be in the area of exhaust air exit.

ATTENTION!

- DO NOT OPERATE WITHOUT PROPER ELECTRICAL GROUNDING.
- DO NOT OPEN THE ELECTRICAL PANEL WHILE MACHINE IS ELECTRICALLY CONNECTED.
- HIGH HUMIDITY WEATHER CONDITIONS SHOULD BE AVOIDED WHILE OPERATING THE CLEANER.
- ALL SHIELDS AND EMERGENCY EQUIPMENT MUST BE IN PLACE
- OPERATORS MUST BE TRAINED TO OPERATE THE MACHINE WITH INFORMATION FROM THIS MANUAL.
- WHEN OPERATING THE MACHINE WITH RESTRICTION TO AIR FLOW INTO/OUT OF THE CHAMBER – BECAUSE OF THE CAUSED TURBULENCE INSIDE THE MACHINE WILL NOT ALLOW THE PROPER FUNCTIONS OF GRADING AND/OR CLEANING.
- VFD UNIT IS PRE-PROGRAMMED, DO NOT ADJUST WITHOUT OUR GRAIN CLEANING, LLC ASSISTANCE.

7. INSTALLATION OF THE MACHINE

ATTENTION: Machine must be disconnected from power before moving the unit!

7.1. Installation Recommendations

During installation of the machines for the reasons of serviceability the access from all sides must be not less than 40 in. The machine must be leveled using jacks or wheel planking prior to operation. Keep area around the fan inlet clear of any dirt or chaff because dirty air will affect the fan's performance. Do not operate during rain or windy conditions.

7.2. Prior to Start-up

Secure the machine to a safe and sturdy base (floor, mezzanine or trailer frame). Attach discharge deflector to minimize blow-back into the air chamber and to control discharge dust. Align the infeed and take-away equipment to provide a smooth transfer of grain from one system to another.

7.3. Electrical Connections

Connect the grounding to the general grounding loop. Connect power cable to the power supply with voltage in 208-230/460 V. Phasing is not essential during the connection of the machine!

Connection of the machine to the power supply line must be implemented by means of cable with section according to standards, taking into account losses in the feeding line.

7.4. Connecting Ductwork to the Discharge of the Machine

Any duct, plenum or chaff capture device put at the end of the air plenum discharge has to be greater in cross sectional area than the area of the discharge of the machine. Restricting the discharge will cause back pressure into the machine's air chamber and will cause the air inside to tumble. Disturbing the laminar flow in the air chamber will severely affect the performance of the machine. A maximum length of ductwork should not be more than 16 ft.

7.5. Guidelines for Chaff Collector

See Auxiliary 3.

A chaff collector or settling chamber allows the air flow from the machine to slow down and lose its ability to keep the chaff in suspension. The large open area can have a loose mesh over the top, it will help stop ambient wind from entering the collector and blowing out what is in there. If the mesh billows up, that means it is too restrictive and could cause back pressure into the machine.

7.6. Guidelines for the Cyclone

A cyclone uses spinning air inside to remove particles of different densities. They consume their own aid and are rated by how much air they can accept from the upstream device and exhaust it into two air streams – dirty and clean. If you choose to use a cyclone to collect your dust and chaff it is necessary for you to know the air flow that the machine generates. See the chart below to find the volume of air flow for your size machine:

Table 3 (US Standard)

Model of separator	Volume (cfm)
GCS-200	No less 1766
GCS-350	No less 5885
GCS-750	No less 10600
GCS-1400	No less 12950
GCS-2200	No less 15900

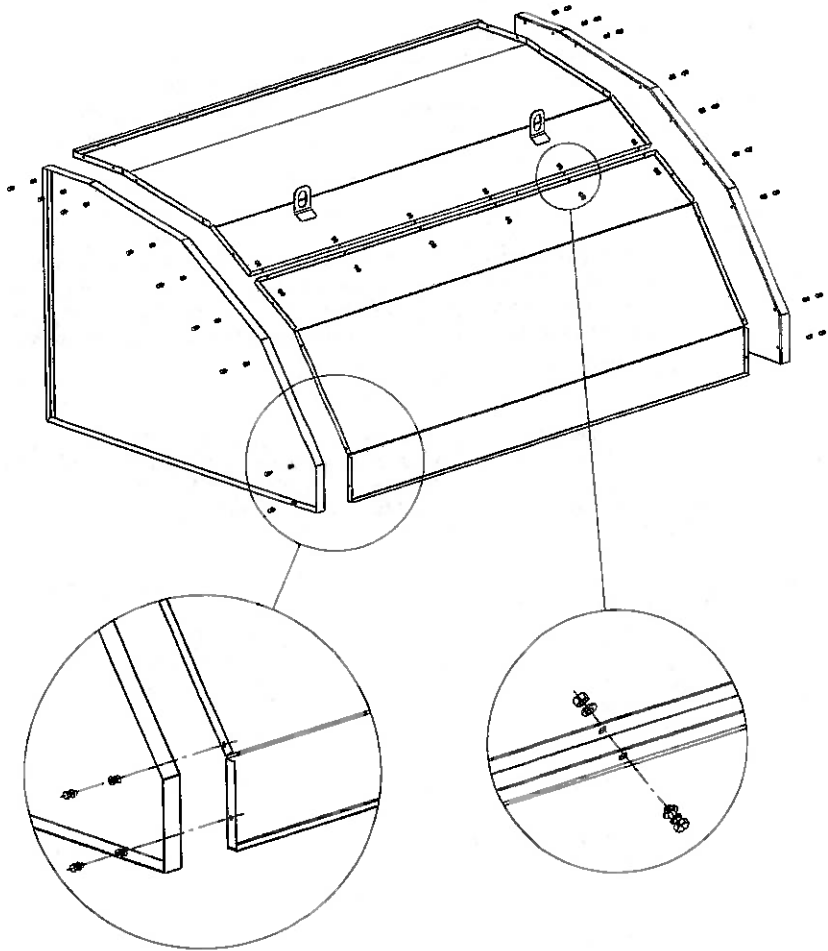
Table 4 (Metric)

Model of separator	Volume (m3/hr)
GCS-200	No less 3000
GCS-350	No less 10000
GCS-750	No less 18000
GCS-1400	No less 22000
GCS-2200	No less 27000

8. ASSEMBLY

8.1. Deflector Assembly

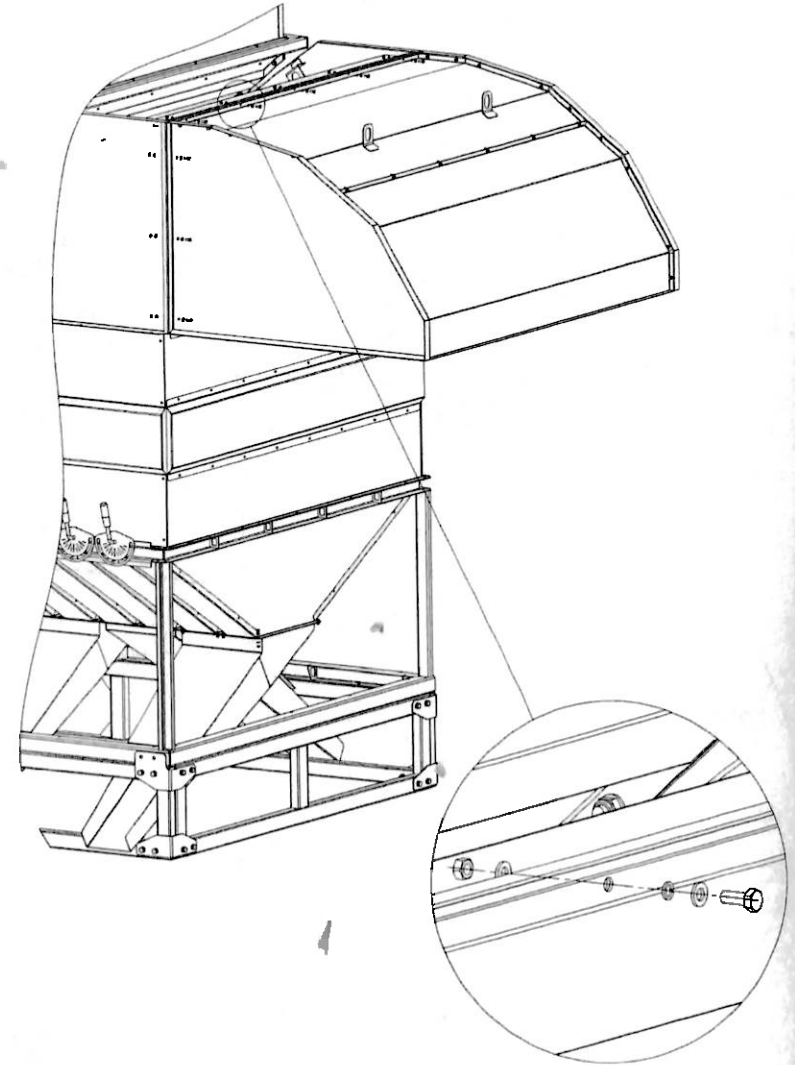
Deflector Assembly



8.2. Deflector installation

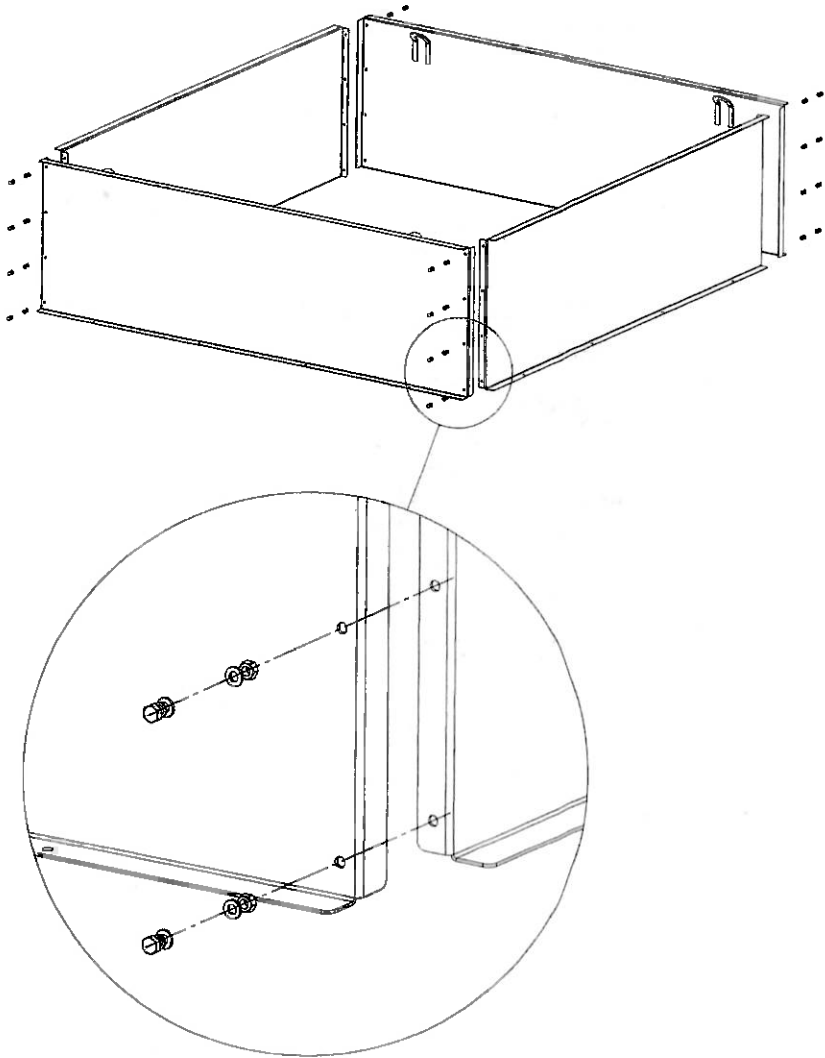
Connect deflector to the air exhaust exit as shown on the drawing below:

Deflector Installation



8.3. Hopper Extension Assembly

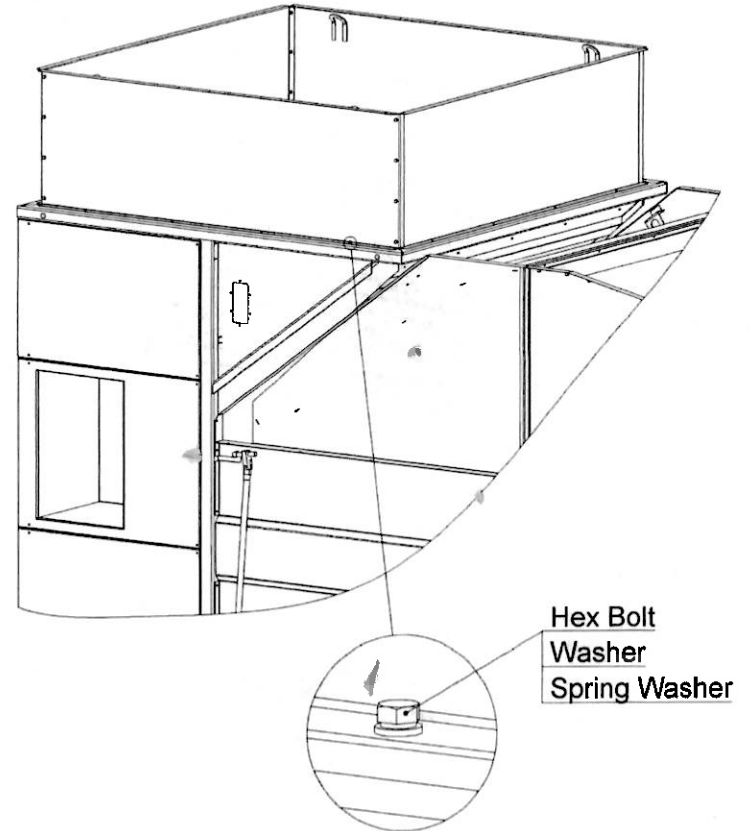
Hopper Assembly



8.4. Hopper Extension Assembly

Install hopper extension on top of the machine hopper as shown on the drawing below

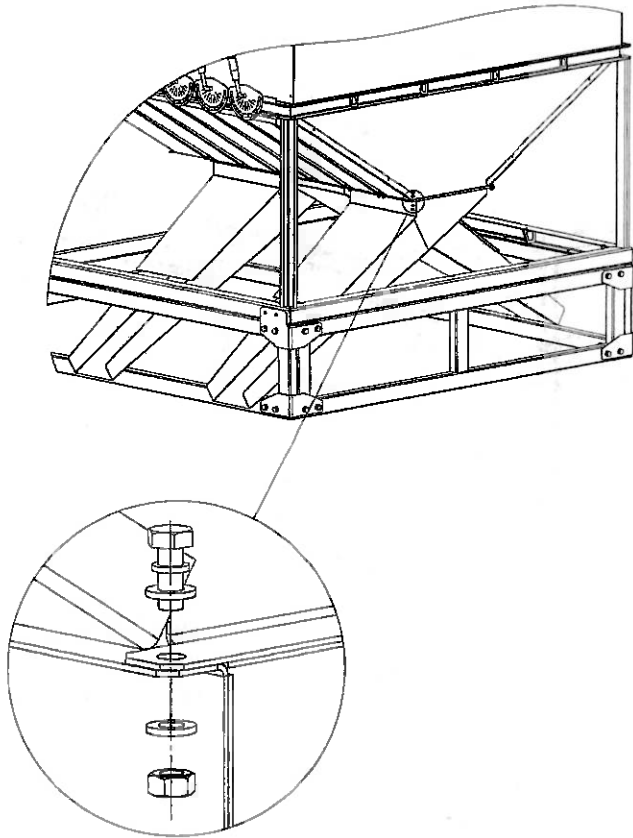
Hopper Installation



8.5. Chutes installation

Connect chutes to spouts as shown on the drawing below:

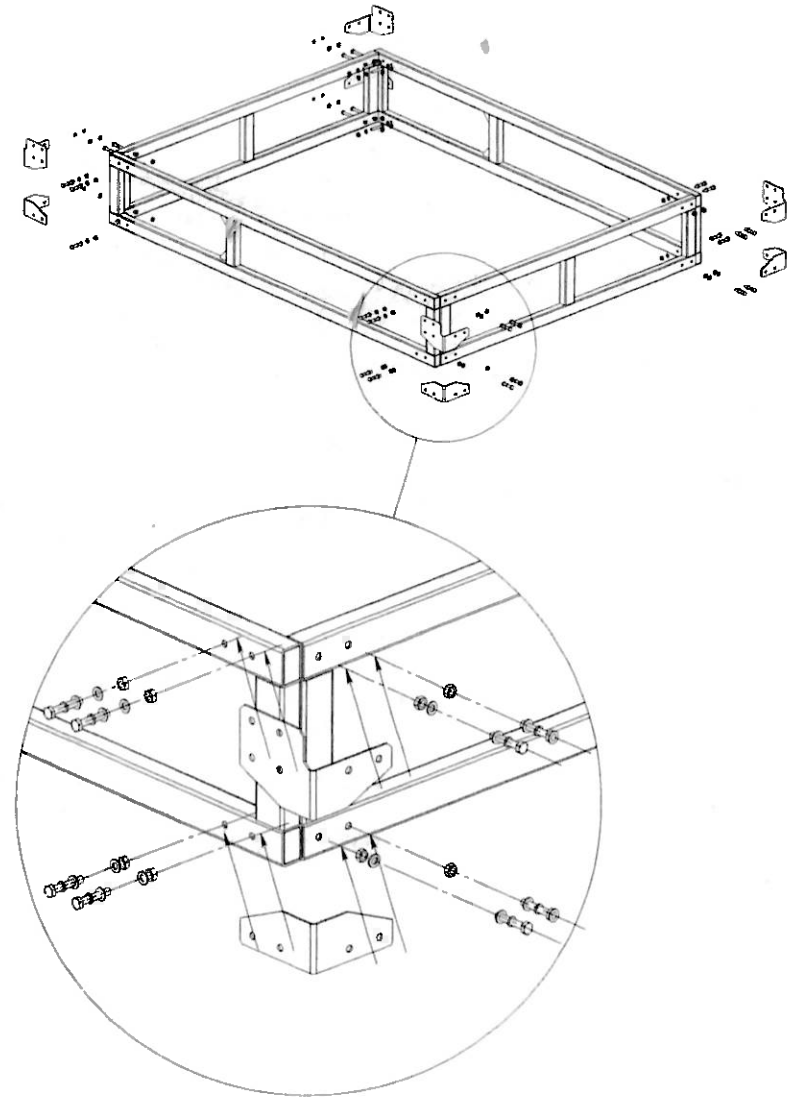
Installation of chutes



8.6. Subframe assembly (only for GCS-2200)

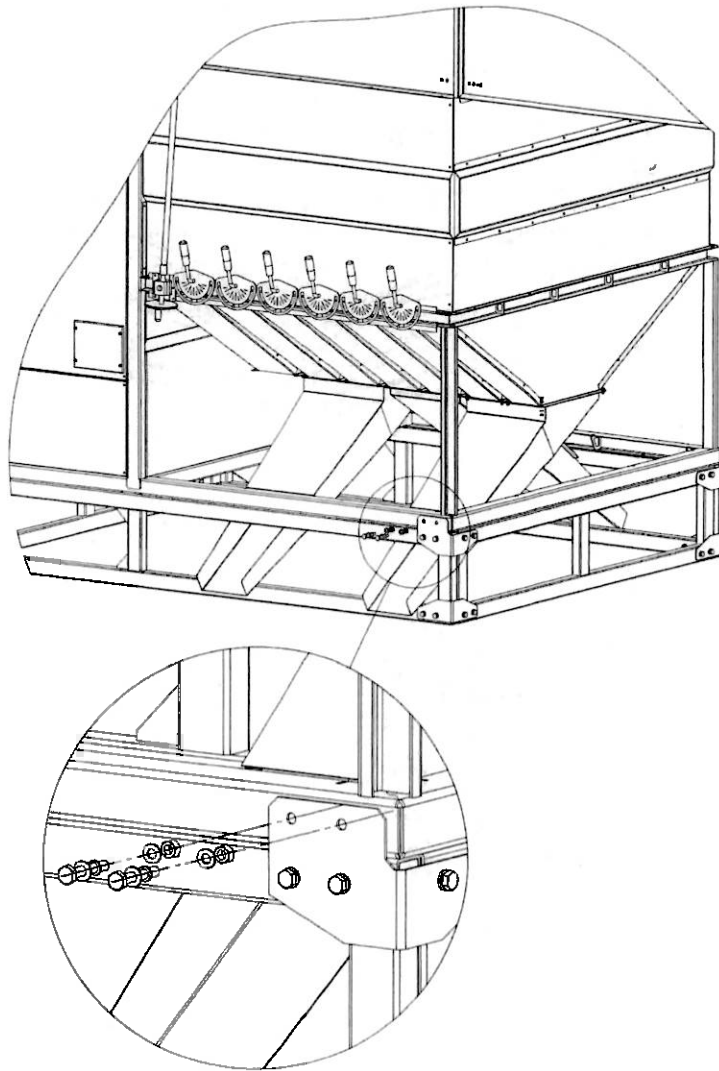
Assemble and install subframe under the main frame of a machine as shown on the drawing below:

Subframe Assembly



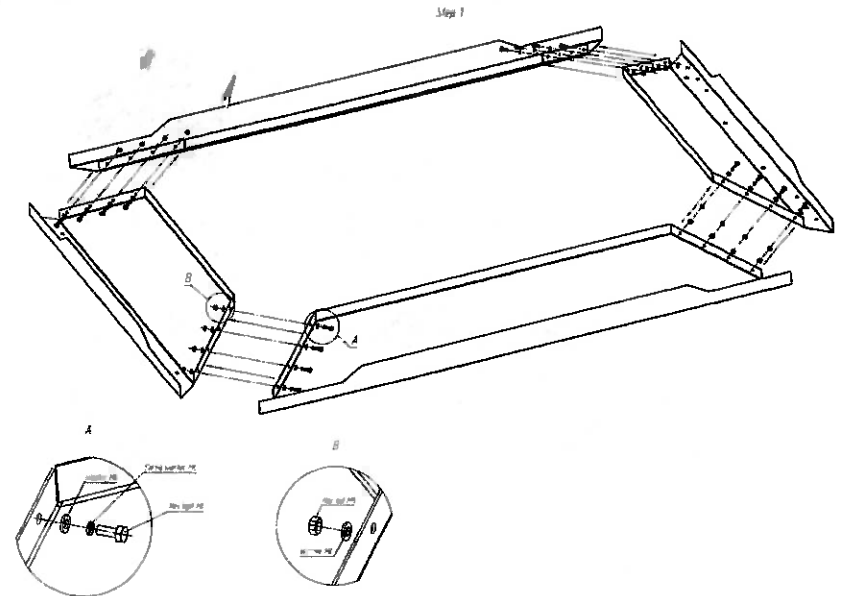
8.7. Subframe installation (only for GCS-2200)

Subframe Installation

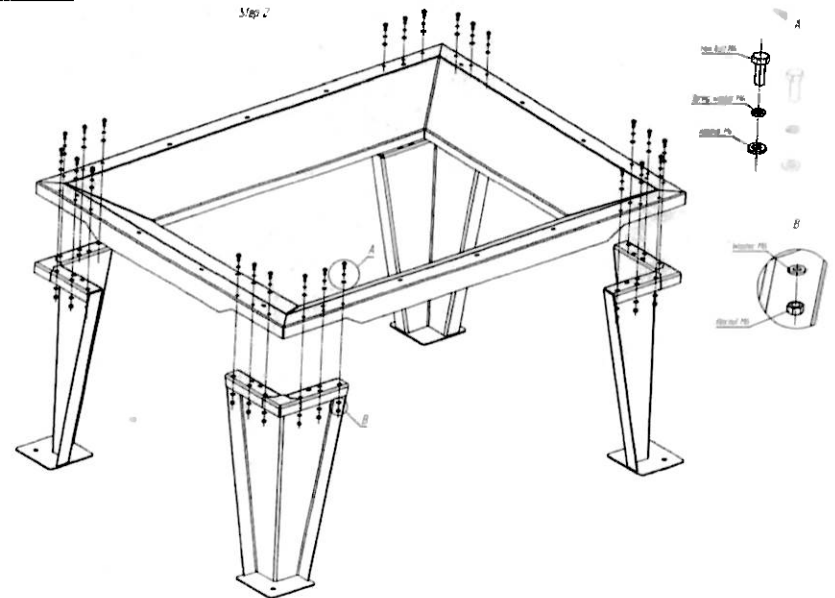


8.8. GCS Scalper Assembly

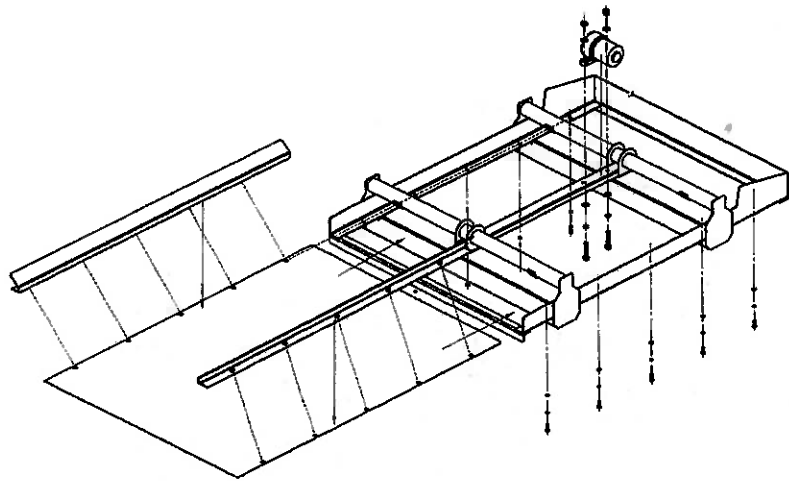
Step 1:



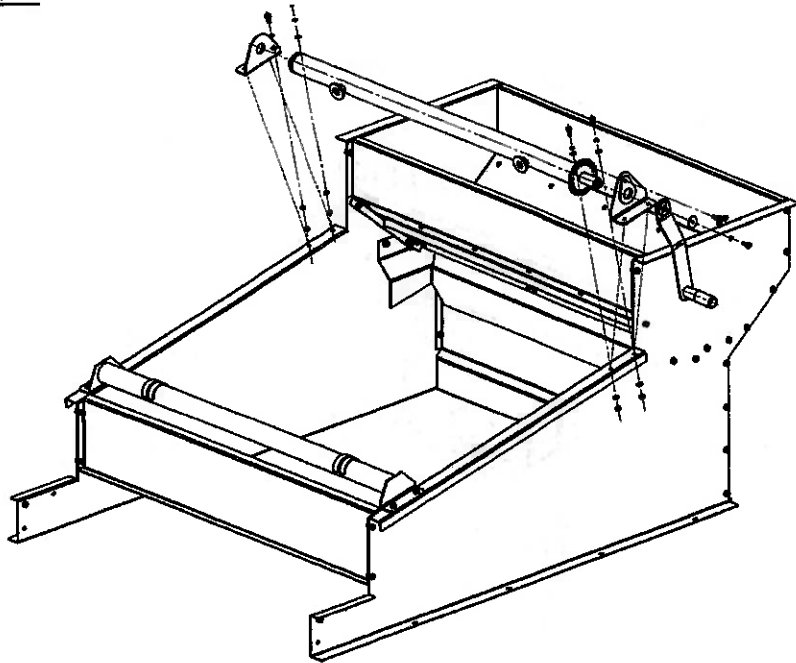
Step 2:



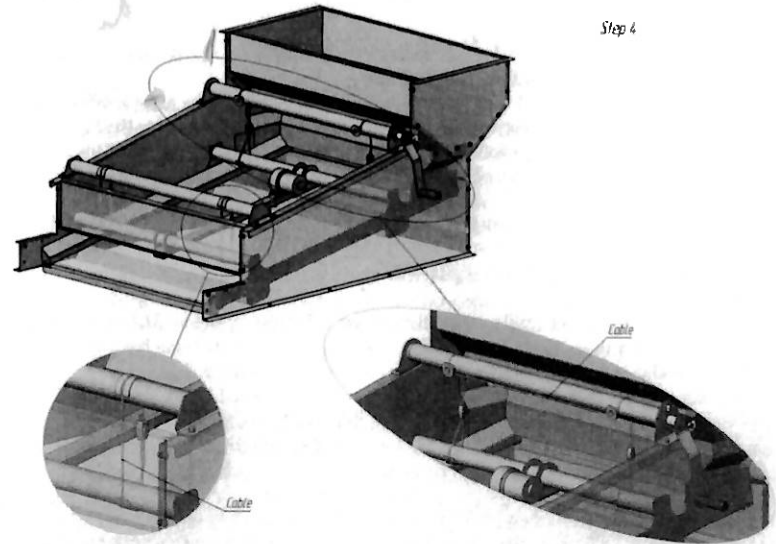
Step 3:



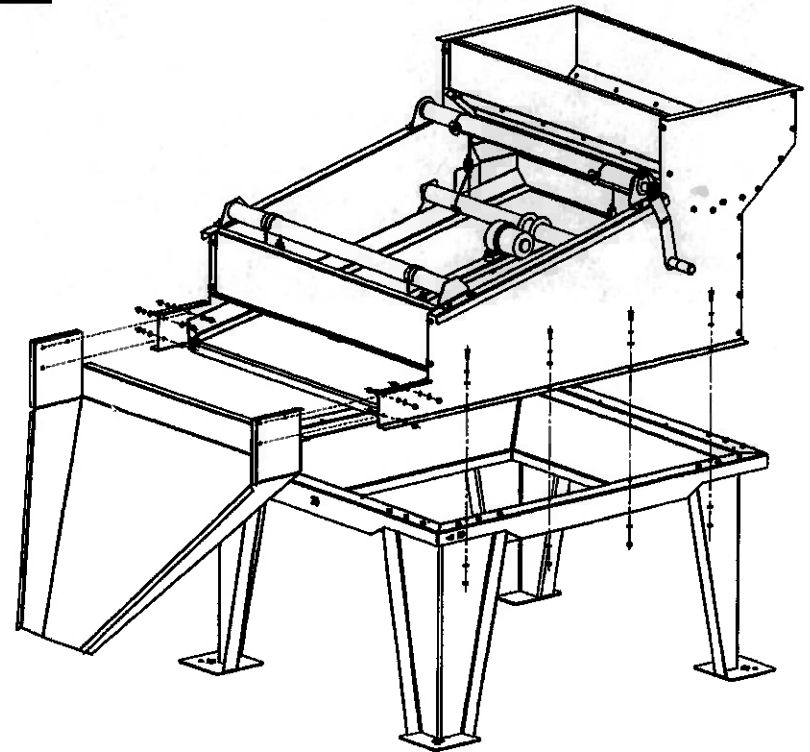
Step 4:



Step 5:



Step 6:



1. MACHINE ADJUSTMENTS

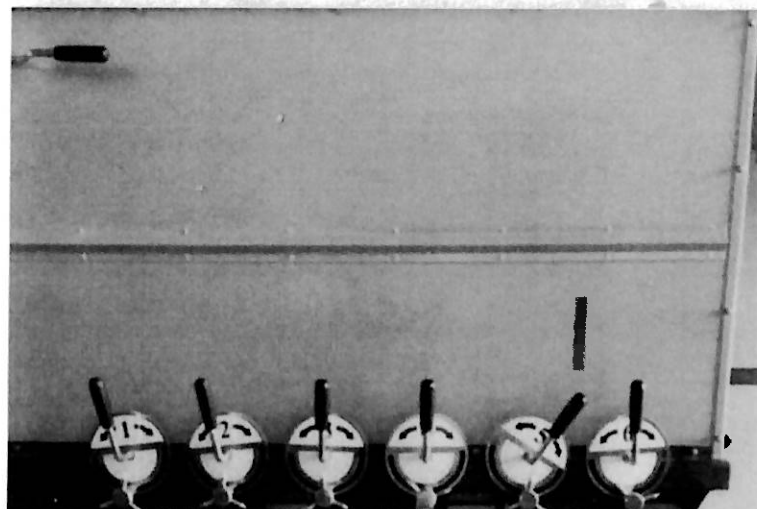
1.1. Starting the Machine

1. Position the grain feed gate handle to the "0" mark.
2. Fill the machine hopper (on top) with grain. Remember, hopper must be at least 60% full at all times (or use the marking on a hopper window to control the level of grain inside the hopper at any given time). The accumulated grain acts as a dam to control the flow of grain out of the hopper. The most common method of infeed control is to put a high/low level sensor in the hopper this will start/stop the infeed auger.
3. Turn the Safety Switch On and push the "On" button on the control panel which should ensure the green light is on.
4. Turn the Fan to 25-30 Hz which is a digital reference for volume of air flow. This varies depending on the crop.
5. Slowly open the hopper gate until you see that the grain is flowing out of ALL the discharge chutes. If you have grain only at one end or the other that means you either do not have enough air (grain coming out of chutes 1-2) or too much air (grain coming out of chutes 5-6).
6. At this point you will need to make adjustments with the Fan speed. Also, you can make adjustments with flappers that regulate area that is being captured by internal chutes to guide the grain to get the desired output for any specific cleaning or grading project. Alternating between upping fan speed and grain flow until desired rate in the bu/hr (t/hr) is achieved.
7. Shutdown of the machine must be implemented in the reverse sequence.
8. In case of occurrence unforeseen mode of the motor operation, VFD will turn it off. To continue work necessary to eliminate the cause of such a situation, that turn off the grain cleaner for 1 minute for the VFD reloading. Emergency shutdown of the machine can be implemented by means of palmar button "Emergency stop" pressing, refer to «Annex 1».

1.2. Modes of Operation

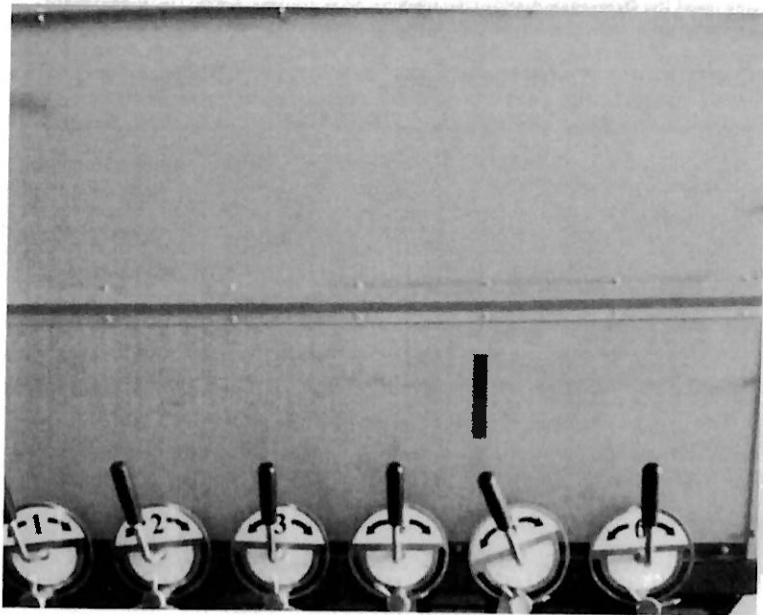
Pre-Cleaning Mode

1. Turn-on the machine as described above.
2. One of the most common applications for the grain cleaner is doing light cleaning of a healthy crop where elimination of about 5-10% from their original sample is needed. The 5-10% that gets cleaned out will then be fed to livestock for example, and 90-95% of the sample will represent the clean grain that will be used by farmer's discretion. The red mark on the cleaner (see image below) represents the cut off area between the "clean" and "dirty" grains which can be adjusted by the 5th flapper displayed on the exhibit (see below).
3. Fan speed or air flow can be regulated using a Variable Frequency Drive (VFD) which controls the RPMs on the fan. Depending on weather conditions, grain type and desired capacity adjustments to the fan speed will need to be made on a case-by-case basis. Remaining adjustments can be made using the flappers on front of the machine as deemed necessary by the operator.



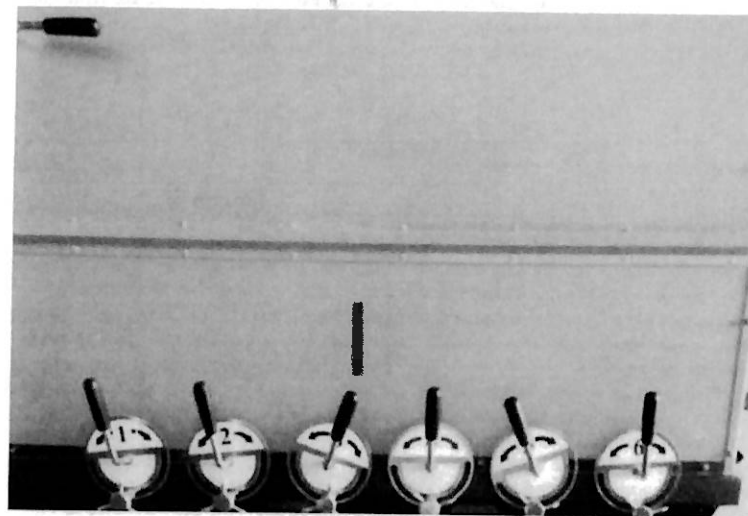
Cleaning Mode

1. Turn-on the machine as described above.
2. In cases when a crop is infected with diseases such as vomitoxin or fusarium (scab) harder cut offs during cleaning will be required. In an effort to salvage most of the healthy grains a farmer might need to cut off higher percentage of their sample, however that still enables them to keep the remaining product. The red mark (see image below) indicates that a much larger section of the cleaner will be capturing the cleaned-out sample compared to what we see in Pre-Cleaning Mode.
3. Fan speed or air flow can be regulated using a Variable Frequency Drive (VFD) which controls the RPMs on the fan. Depending on weather conditions, grain type and desired capacity adjustments to the fan speed will need to be made on a case-by-case basis. Remaining adjustments can be made using the flappers on front of the machine as deemed necessary by the operator.



Cleaning and Grading Mode

1. Turn-on the machine as described above.
2. Precise cleaning and grading is needed in cases when one is trying to take away the best seeding material. In this situation, all of the flappers are in play as we would try and grade the sample and pick out the heaviest kernels that can be used for seeding. As displayed on the image below, 3rd flapper is positioned to separate the heaviest seeds from the rest of the sample.
3. Air flow speed can be regulated using a Variable Frequency Drive (VFD) which controls the RPMs on the fan. Depending on weather conditions, grain type and desired capacity adjustments to the fan speed will need to be made on a case-by-case basis. Remaining adjustments can be made using the flappers on front of the machine as deemed necessary by the operator.



2. GRAIN CLEANER MAINTENANCE

After completion of one cleaning job and transition to a different crop, it is necessary to clean the machine after the dust and residues of the original material. It must be done in the following way:

1. Start the machine like you normally would for cleaning and turn the fan to maximum speed; let the machine work for 1-2 minutes without running any product through.
2. Using the control panel switch the motors to "Reverse" mode and run the machine for 1-2 minutes.
3. Finally, TURN OFF the machine and use compressed air to clean out the remaining particles from inside of the cleaner, as well as from the hopper.
4. At this point, cleaner is ready for another job using different crop.

3. WARRANTY.

Grain Cleaning, LLC guarantees that the goods are new, free and clear of any third-party rights, and guarantees high-quality operation of the goods within the period of 12 months (1-yr manufacturer's warranty) from the date of sale provided that the Buyer observes conditions of use, handling and storage set out in this instruction manual. Electric motor and VFD are treated separately and both have 1-yr manufacturer's warranty; Grain Cleaning, LLC does not hold any responsibility on the motor and VFD. Warranty is provided only to original retail purchasers of GCS grain cleaning products.

Grain Cleaning, LLC will fulfill this limited warranty by, at its option, repairing or replacing any covered part that is defective or is the result of improper workmanship, provided that the part is returned to Grain Cleaning, LLC within thirty (30) days of the date that such defect or improper workmanship is, or should have been, discovered. Under no circumstances are component parts warranted against normal wear and tear. This warranty is expressly in lieu of all other warranties expressed or implied. Grain Cleaning, LLC will in no event be liable for any incidental or consequential damages whatsoever. Nor for any sum in excess of the price received for the goods for which liability is claimed. What is Not Covered Under no circumstances does this limited warranty cover any components or parts that have been subject to the following: negligence; alteration or modification not approved by Grain Cleaning, LLC; misuse; improper storage; lack of reasonable and proper maintenance, service, or repair; normal wear; damage from failure to follow operating instructions; accident; and/ or repairs that have been made with parts other than those manufactured, supplied, and or authorized by Grain Cleaning, LLC. Warranty is considered cancelled if unauthorized adjustments are made to the VFD which do not abide by the instructions in this manual.

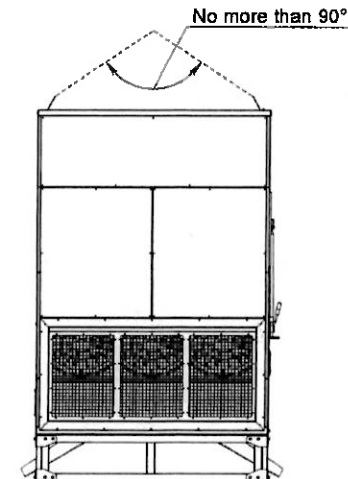
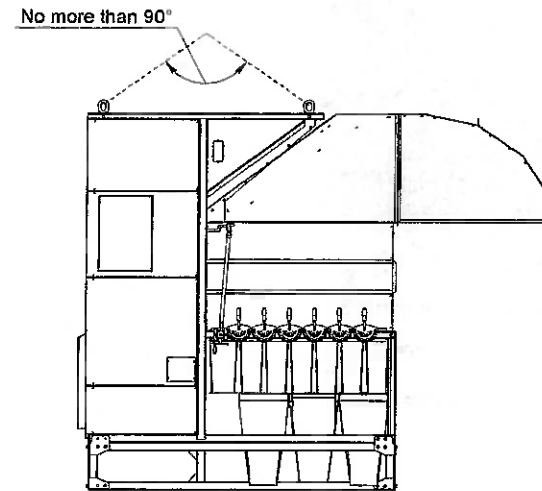
4. DISPOSAL

Disposal of the machine must be carried out in compliance with the requirements of the state and local law on waste electrical and electronic equipment.

The machine cannot be disposed of as ordinary household waste. It contains valuable recyclable materials, so it should be transferred to the receiving points of electrical equipment.

Annex 1 Strapping of "GCS" Grain Cleaner

Strapping of "GCS" Grain Cleaner



Annex 2
Connection with settling chamber

