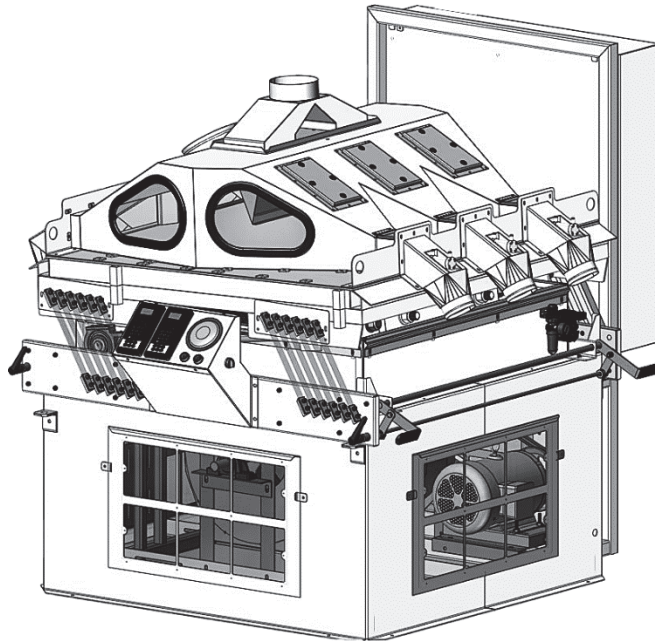


Operations manual

Oliver™

Innovate. Build. Repeat.



Hi-Cap N Series

Destoners

Version 1.0 | 1/5/23

Safety Considerations

Important Safety Precautions for using the Hi-cap Stoner

- Always follow applicable safety standards and protocols when performing maintenance or service.
- Always ensure that the stoner and components are electrically grounded.
- Always de-energize and lock out the electrical panel before working inside the stoner cabinet or inside of the stoner.
- Always wear proper PPE - face shields, hard hats, safety shoes, insulating (rubber) gloves with protectors, insulating sleeves, and flame-resistant (FR) clothing when work must be performed in a live or energized electrical panel.
- Always wear proper PPE - safety glasses, hard hats, safety shoes, respirator and gloves when inspecting the stoner or performing maintenance.
- Never operate the stoner with the air filters removed.
- Never operate the stoner with the deck removed.
- Never operate the stoner with missing or worn parts.
- Never operate the stoner with worn or damaged decks.
- Never use the stoner as a table or workstation.
- Never stand on the stoner and/or dust hood.
- Always wear ear protection when operating the stoner.
- Always keep machine clean and properly adjusted.
- Periodically inspect the Stoner, for wear and correct operation, in accordance with Oliver Manufacturing's maintenance recommendations.

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I.INTRODUCTION

CONGRATULATIONS! You have just purchased a well-built machine that can earn substantial profits for you, if you take time right now to understand the Oliver Stoner N and how it works. Please take a few minutes to read the following document.

The Hi-cap Stoner N-Series is designed to separate particles of similar size that differ in weight, eliminating heavy trash and stones. The Stoner should not be used as a cleaning machine to remove dust, dirt, sticks and other refuse frequently found in harvested crops. In all processing situations, the best results are obtained from the stoner when the product has been thoroughly pre-cleaned and sized, using the proper equipment for these purposes. Under these conditions, the stoner is then able to show what it can really do!

II.INSTALLATION

This section explains the installation requirements for the Stoner. All Oliver Stoners have been tested per Oliver Manufacturing's protocols, at our facility, to ensure the quality of the machine. Stoners are operated on test blocks at the factory for a minimum of five hours. During and after operation, the drive mechanism and controls are checked to ensure that they will operate satisfactorily when you set them up at your factory.

2.1 De-Skidding and Uncrating

Although Oliver is built to give years of service, it can be damaged while uncrating. First the top of the crate should be carefully removed. Then take off the sides. After the top and sides are withdrawn, the Oliver Stoner can be disengaged from the bottom of the crate by removing the four 3/8" bolts located on the mounting flanges of the stoner. While removing the crate, do not put anything on the separating deck. If the deck is damaged, good separations are impossible. Also, be careful not to puncture the filter screens located on the sides of the machine. If the filter screens are damaged, dirt may be sucked into the machine and may plug the deck.

Immediately after uncrating your Oliver Stoner, inspect for shipping damage. If the machine is impaired in any way, it was caused in transit and a claim should be filed with the carrier.

The feed hopper, mounting brackets and discharge hoppers are attached to the inside of the crate or the inside of the stoner. All items securely fastened inside the stoner may be removed by opening the filter screens and cutting the tie wires.

2.2 Foundation and space requirements

Foundation Requirement: A solid foundation is required for your Oliver Stoner. False vibrations from flooring can ruin the separation quality of the machine. A six-inch concrete slab makes an ideal platform but is not essential. Many customers operate Oliver Stoners on wooden floors with no problems. If you feel that your floor is insecure, please contact the factory for recommendations.

Location. The selected location for the installation must also have sufficient space around the equipment for proper ventilation. Do not block the equipment airflow filters. The selected location must have sufficient space around the Electrical cabinet (if equipped) for working clearance as prescribed by the National Electric Code Selection 110-26 or local Authority Having Jurisdiction.

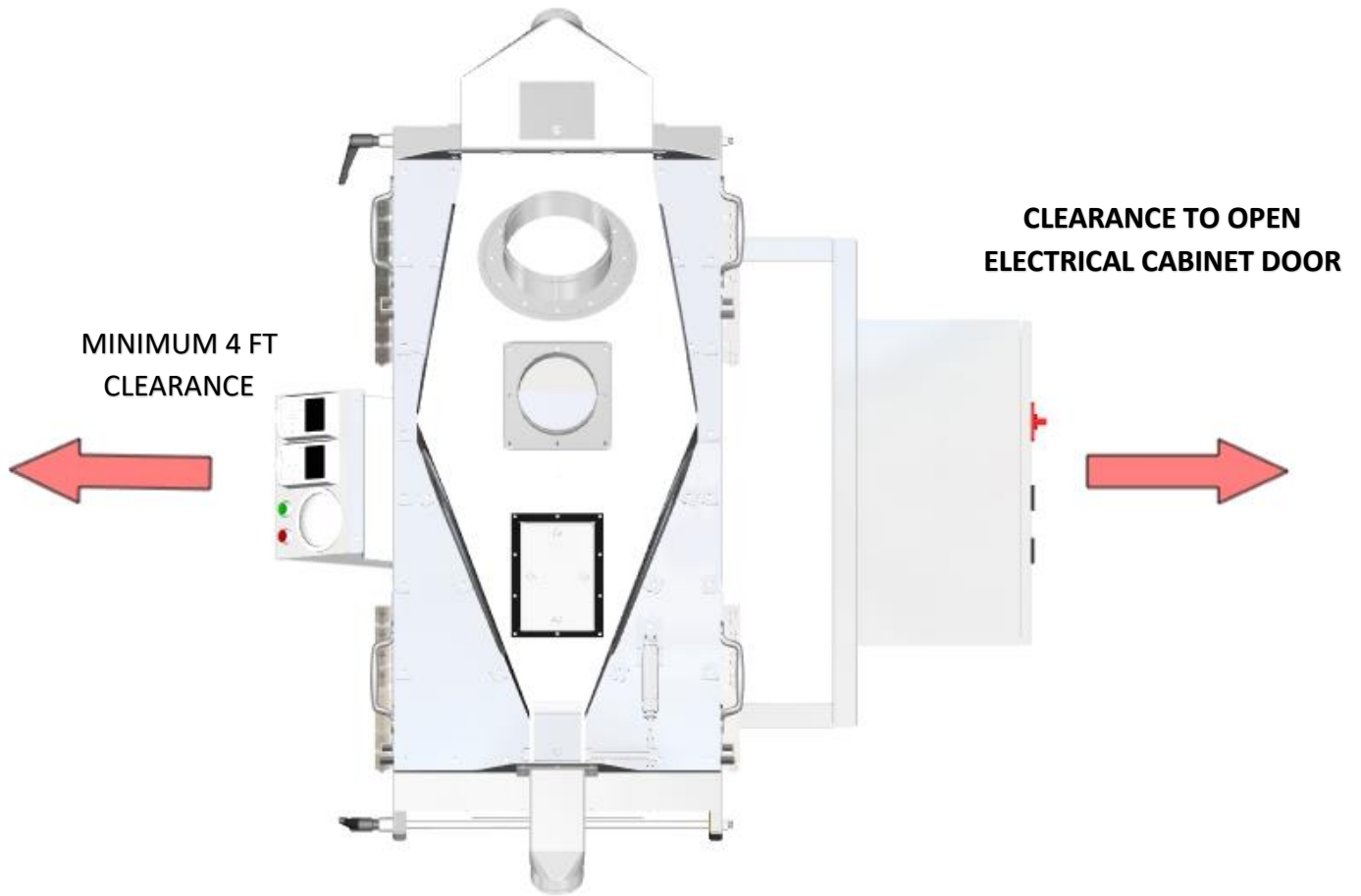


Figure 1: Destoner

When locating your stoner, be sure that you leave adequate clearance to operate the controls and to remove the deck for changing or cleaning. To operate the controls and provide normal maintenance, we recommend a minimum of 4 ft. clearance. A space approximately equal to the dimensions of the deck is adequate for deck removal from the heavy end. Please refer to our layout print at the end of these instruction manual for dimensional information.

2.3 Electrical Requirement: After your stoner is mounted on a secure foundation, you are ready to make electrical connections. The Stoner comes with a complete electrical cabinet that is wired to all the electrical components, such as the motors, reference keypads and dust hood light. Typical voltages would be 230V and 460V, three-phase, at 60 Hz, however other voltages can be accommodated.

Cable Size AWG or kcmil	Terminal Torque Requirements			
	Lbs - in	N-m	Lbs - in	N-m
18-10	35	4.0	80	9.0
8	40	4.5	80	9.0
6 - 4	45	5.1	165	18.6
3	50	5.6	275	31.1
2	50	5.6	275	31.1
1	50	5.6	275	31.1
1/0 - 2/0	50	5.6	385	43.5
3/0 - 4/0	50	5.6	500	58.5
250 - 350	50	5.6	650	73.4
400	50	5.6	825	93.2
500	50	5.6	825	93.2
600 - 700	50	5.6	1000	113.0

Table 1: Electrical Requirements and Precautions

Always ensure that all applicable national and local electrical standards are followed during installation. For field connections, refer to the electrical schematics provided inside of the electrical cabinet. When penetrating the electrical cabinet for field wiring the electrician must enter the cabinet from the bottom. Failure to do this will result in voiding the factory warranty on the electrical cabinet.

OVERCURRENT AND PROTECTIVE DEVICE (OCPD) Sizing. Short circuit and overload protection must be provided upstream of the power quality equipment. Fused disconnects should be sized no less than 135% of the rated capacitor current.

To check for proper belt tension, first turn the machine off. Then apply pressure to the side of the belt midway between the pulleys. The belts should deflect

approximately 1/2 inch. After the machine has operated for 8 to 10 hours, check the belts again. It is normal for new belts to stretch slightly, so the belt tension may have to be adjusted. When belts are too loose, they will slip. This will cause the belts and pulleys to overheat and shorten their life.

Be sure that the shafts are running in the proper direction. All shafts, motor shaft, fan shaft and eccentric shaft, should run counterclockwise when viewed from the side of the machine where the motor is installed. Proper fan rotation is very important and at least half of the problems with new stoners can be traced back to incorrect rotation.

2.4 Clean Air Source/Exhaust

Supply air source should be clean and free of cross drafts or obstructions to interfere with intake. Supply intake should be properly screened to prevent foreign objects from entering the system. Some customers need to bring in clean outside air rather than to draw dusty plant air through the filters installed on the machine. The clean air source should have a filter area not less than the area of the deck surface.

After the stoner is installed and the motor wired so the fans rotate in the proper direction, familiarize yourself with the theory behind stoner operation and the proper usage of the controls before attempting to make a separation. Oliver advice to the customer is to follow local code and regulation for exhaust system.

2.5 Warranty Clause

Failure to follow any or all the Installation requirements previously set forth by this manual will result in a void of the factory warranty. Any damage incurred during transportation or installation of the N series Stoner will not be covered under the factory warranty.

III. FUNCTIONAL OPERATION OF THE STONER

This chapter explains the functionality and operation of the Stoner, how they work, and how they are operated. Do not attempt to operate the Stoner without an understanding of how and why it works. Proper adjustment of all the controls is necessary to obtain the best possible results. All gravity separators and stoners utilize the same principles to affect a separation. Once these principles are understood, it is usually a simple step to adjust a stoner to produce an optimum separation. About 250 B.C., Archimedes discovered the law of specific gravity, which is "ALL BODIES FLOATING IN OR SUBMERGED IN A LIQUID ARE BUOYED UP BY A FORCE EXACTLY EQUAL TO THE WEIGHT OF THE LIQUID THEY DISPLACE." The specific gravity of a particle is the ratio of its density to some standard substance, the standard usually being water with a unit of 1. Particles having a specific gravity of less than 1 will float and particles with a specific gravity greater than 1 will sink.

Oliver stoners use air as a standard rather than water. Since air is lighter than water, the relative difference between particles of differing weights is widened. For this reason, the stoner is a very, sensitive machine and, when operated correctly, can produce a very precise separation.

3.1 The Process of Stratification

Air is used as the separating medium for the process of stratification. Stratification occurs by forcing air through the particle mixture so that the particles rise or fall by their relative weight to the air. Figure 1 below represents a cross section of the stoner directly over a fan. A particle mixture has been introduced on top of the screen deck with the fans off.

In Figure 2 the fan has been turned on so that the heaviest particles rest on the surface of the deck and the lightest particles are completely free of the surface of the deck. Proper regulation of the air flow at this time is critical or all particles will be blended and lifted free from the separating surface by excess air (Figure 3).

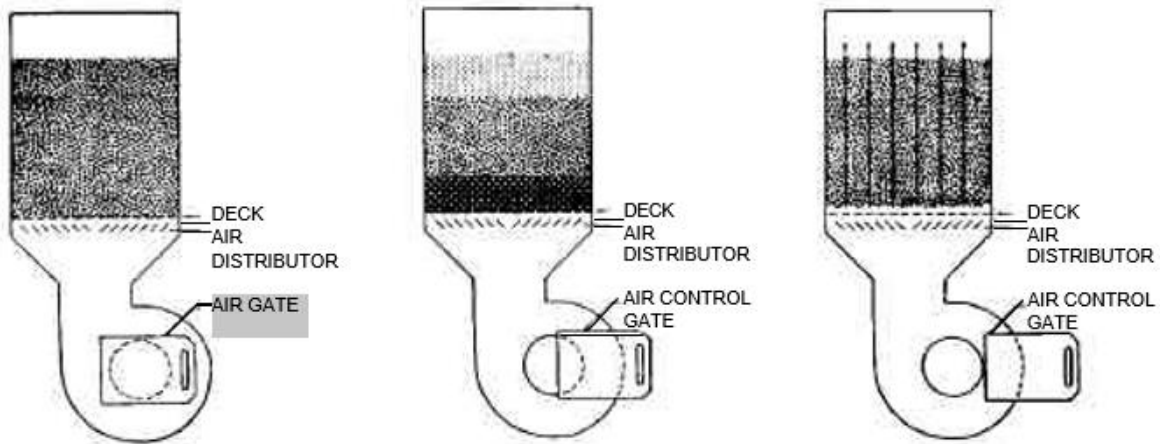


Figure 2: Stratification process

3.2 Theory in Practice.

Figure 3 represents a top view of the ideal situation in the operation of the seed mixture, similar to Figure 1, falls from the feeder onto the deck. The area immediately under the feeder is called the stratification zone. In this area, the vibration of the deck and the lifting action of the air combine to stratify the material into layers with heavier layers on the bottom and lighter layers on the top as shown by Figure 2. Separation cannot occur until the material becomes stratified. The size of the stratification area will depend on the difficulty of the separation and on the capacity at which you are processing. At no time should it exceed 1/3 of the deck surface.

The more difficult the separation, the greater is the area that is required to obtain proper stratification. For example, the stratification area is large when separating mud clods from saleable beans, because there is relatively little difference in weight.

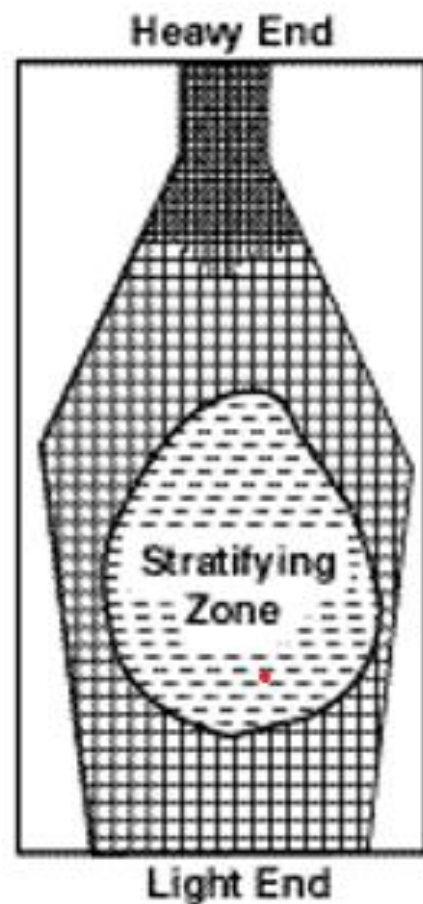


FIGURE 3

However, the stratification area is small when removing rocks or stones from beans, because there is a large difference in weight. Higher capacities likewise require greater areas for stratification.

Once the material is stratified, the vibrating deck begins pushing the heavier layers in contact with the deck uphill toward the stone discharge. At the same time, the upper lighter layers, which do not contact the deck, begin to float downhill toward the clean product discharge.

It should be noted that, since the stratification process is not instantaneous, some of the heavier materials will be carried down the deck toward the discharge end before they can sink to the bottom of the fluidized bed. This is normal and acceptable as long as the heavy trash does not flow off the deck with the cleaned product. When you are not making a proper separation, it is an indication of one of the following problems:

1. Feed rate too high - stratification area too large.
2. Machine improperly adjusted -- improper stratification.
3. Material not suitable for separation on a stoner.

Each of the above is a distinct problem and will be discussed fully in this manual.

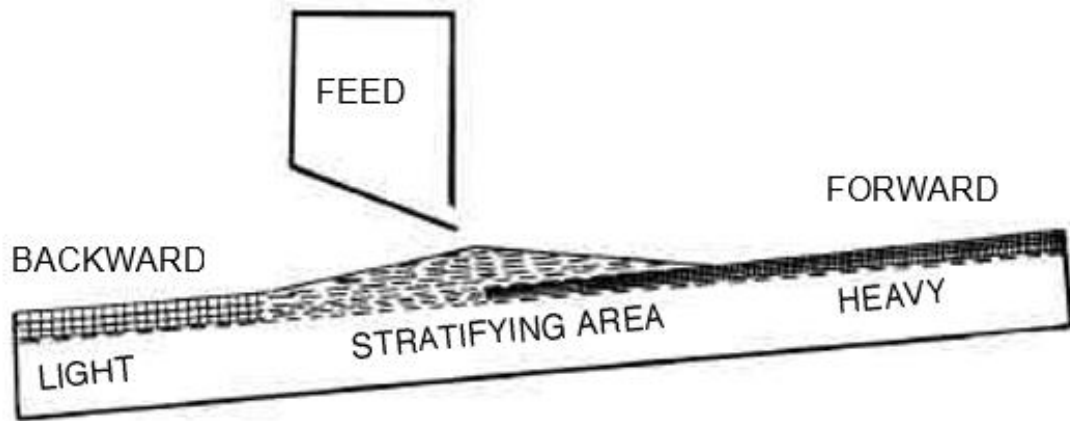


Figure 4: Sectional view of stoner deck operation

This figure 4 above is a sectional diagram of what occurs on a stoner deck. Compressed air forced through the mesh of the deck cover lifts the lighter particles upward, while heavier particles sink against the air currents and come to rest on the deck surface, providing the air is properly adjusted. The heavier particles are forced to travel uphill by mechanical action, while the lighter particles float downhill on a film of air.

While stoners have greater capacities than gravity separators, based on square feet of relative deck area, there is a limit as to the amount of feed flowing to the deck. As the feed is increased, the stratifying area is also increased. The stratifying area should not occupy more than 1/3 of the entire deck area.

We have already stressed the need for earlier processing of products before they are introduced onto the stoner. (See p. 1.). This pre-sorting enables separations that are otherwise impossible. There are three guide- lines developed by the late Oliver W. Steele that state what can be separated and what cannot be separated on a gravity separator or stoner.

3.3 Oliver's Guidelines for Use of Stoner



Rule 1. PARTICLES OF THE SAME SIZE BUT DIFFERING SLIGHTLY IN SPECIFIC GRAVITIES CAN BE SEPARATED.

A common example of this would be the separation of similar size stones from seed where the stones are heavier than the seed.



RULE 2. PARTICLES OF THE SAME SPECIFIC GRAVITIES BUT DIFFERING IN THE SIZE WILL BE GRADED ACCORDING TO THE SIZE OF THE PARTICLES.

Unlike the gravity separator, a stoner produces a two-way separation rather than a continuous grade at discharge. Due to this two-way separation, sizing is not done on a stoner, because the accuracy of separation is poor.



RULE 3. PARTICLES DIFFERING IN SPECIFIC GRAVITIES AND ALSO DIFFERING IN SIZE CANNOT BE EFFICIENTLY SEPARATED.

An example of this would be the separation of adobe from pinto beans where the particles are nearly the same size and the weight as well. In cases such as this, the stoner must be operated at a lower capacity; and one should expect a lower quality separation.

IV. CONTROL COMPONENTS OF THE STONER

Before starting to operate the machine, it is necessary to have a thorough understanding of the controls and their location on the Oliver Stoner. **PROPER REGULATION OF CONTROLS IS THE KEY TO SUCCESSFUL STONER SEPARATION, AND THE PROPER USE OF THESE CONTROLS SHOULD BE UNDERSTOOD PRIOR TO ATTEMPTING AN ACTUAL SEPARATION.**

4.1 THE DECK

The most important part of the stoner is the deck, because it is the main separating surface. It consists of a carefully constructed metal frame to counteract false vibrations with a screen or polymer over cover that is the surface on which the separation takes place.

The highest or uphill end of the deck is the stone discharge and the lower or downhill portion of the deck is the clean product discharge.

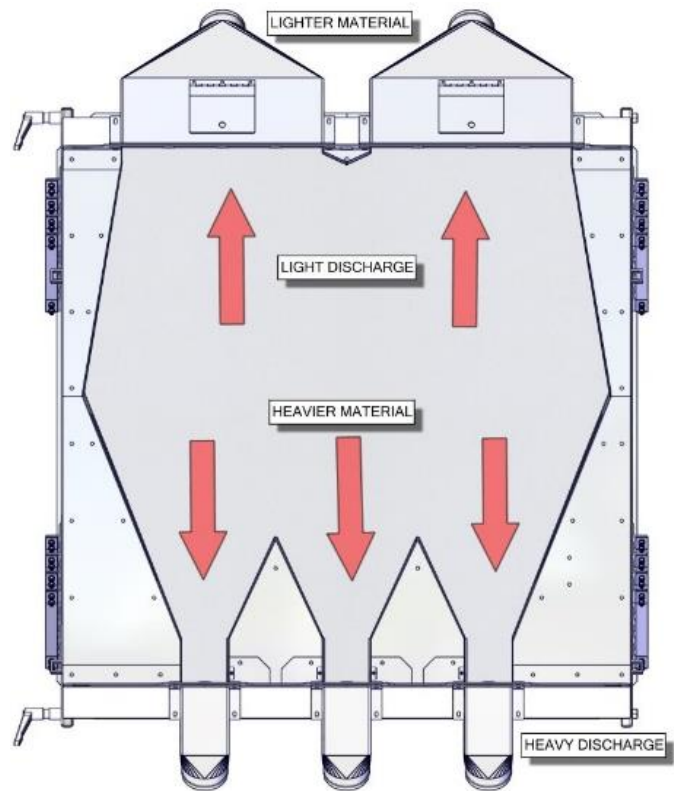


FIGURE 5

Oliver Stoners have one, two or three stone discharge traps depending on the model. The Oliver Model 2448 N Stoner has one stone trap. The Model 3648 N Stoner has two stone traps, and the Model 4848 and 6048 N Stoner each have three stone traps.

The features of the deck will be discussed further in these instructions, but knowledge of their location is important as well as understanding the controls that affect the four variable adjustments in the Oliver Stoner.

4.2 STONER ADJUSTMENTS

All Stoners have four variable adjustments that must be properly adjusted and balanced to obtain optimum separations. These are Feed Rate, Tilt, Eccentric Speed and Air Control. We will discuss the controls for each of these variables in turn. (Please refer to Figure 6.)

1. FEED CONTROL.
2. TILT ADJUSTMENT.
3. VFD AIR ADJUSTEMENT FOR AIR.
4. VFD ECCENTRIC SPEED.
5. DUST HOOD PRESSURE GUAGE.
6. EXHAUST BLAST GATE CONTROL.
7. START/STOP BUTTON
8. HIGH END PNEUMATIC GATE
9. HIGH END GATE 3-WAY SWTICH

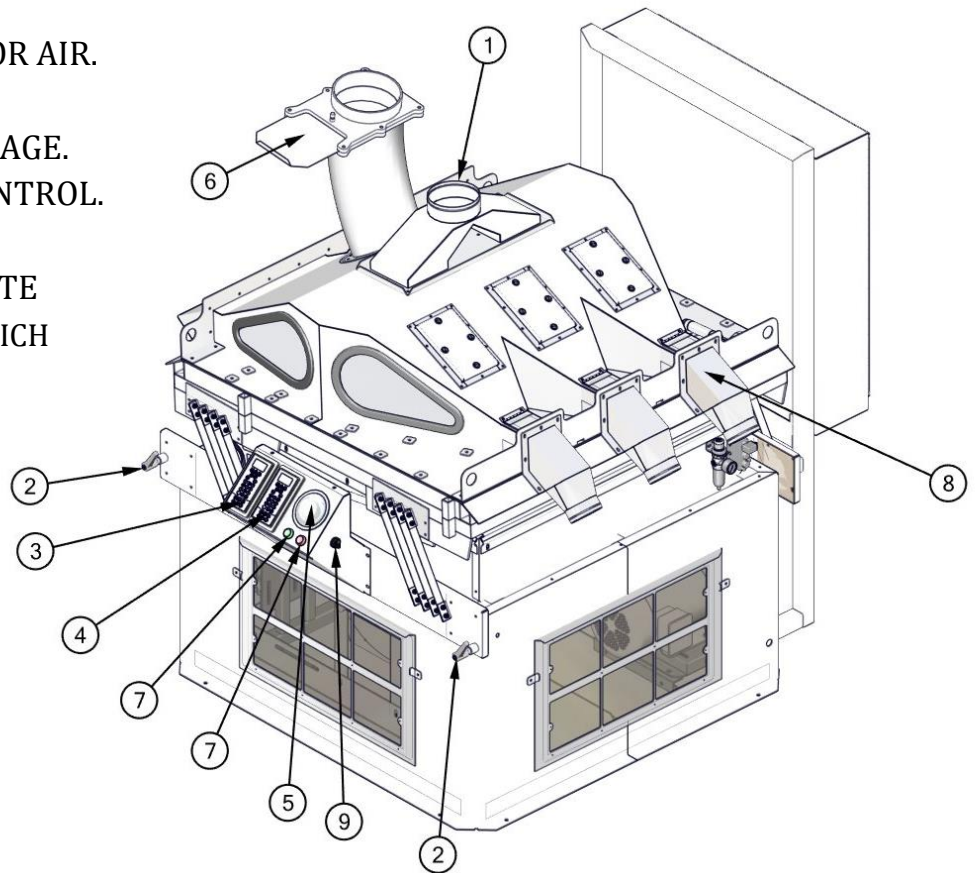


FIGURE 6: STONER CONTROLS

START/STOP BUTTON:

The START/STOP button controls the machine start and stop of this Nautilus stoner. When start button is pressed, it will start air, eccentric motion, timer for the high-end gate and activate the dust hood light. When stop button is pressed it will stop the operation of the stoner completely.



FIGURE 7: CONSOLE

FEED RATE:

The feed rate can be controlled with external feed bin or vibrating feeder. Built in feeder with 6-inch round inlet located on top of the dust hood as shown in figure 8 and labelled with balloon 1. The external feeder controls the amount fed onto the separating deck. You must supply your own feeder control or can be purchased as option from the factory.

The feed rate, whether fast or slow, should be uniform and free of surges. Surges in the incoming feed will show up in the discharge of the machine as a poor-quality separation. We suggest the use of surge bins above the feeder, if processing will be interrupted.

Generally, the average feed rate is determined by the average capacity of the processing line of equipment. For optimum separation on your stoner, your feed rate should be as low as possible without falling below the minimum feed rate at

which the deck can be fed and still obtain the necessary separation. When starting your stoner, always start at the minimum feed rate; obtain your required separation, then increase the feed rate to the desired capacity.

TILT:

Tilt is the difference in the elevation between the high end of the deck and the low end of the deck. Increasing tilt will cause the material to shift toward the low end of the deck. Decreasing tilt will cause the material to shift toward the high end of the deck. Normally, the best separations are obtained when the tilt is set at or near the maximum steepness. However, care should be taken not to set the tilt too steep.

The tilt is too steep when material cannot be made to flow toward the high end of the deck by increasing the eccentric speed. Too little tilt is shown when all the material moves toward the heavy side of the deck despite a slow eccentric speed. The tilt is adjusted by loosening the two clamping handles (2) and moving the tilt adjustment handle (2) in toward the machine for more tilt and away from the machine for less tilt.

VFD AIR ADJUSTMENT: Air regulation is one of the most important adjustments to be made on a stoner. The most common mistake in air regulation is the use of too much air. Separation is not made by "blowing" the light material from the heavy but by using a controlled air flow to create the stratified layers, which are then separated by the vibrating action of the deck. Too much air will cause a boiling or bubbling action lifting the heavier particles from the deck and mixing them with the lighter top layers. Too little air will cause the material to appear sluggish and pile up on the high end of the deck.

With proper air regulation, the bed of material will be almost fluid in appearance. With the exception of the stratifying zone under the feeder, the material on the surface should be agitated and free flowing. Bubbling should be kept to a minimum, allowing the vibrating deck to make the separation.

VFD ECCENTRIC SPEED:

Eccentric speed and tilt are closely related. Increasing eccentric speed will cause material to be shifted towards the high side of the deck. Decreasing eccentric speed will cause material to be shifted toward the low side of the deck. Generally, by increasing eccentric speed (which shifts material toward the high side) and increasing tilt (which shifts light material back toward the low side) a more precise separation can be obtained. Too much eccentric speed can be observed when all the material shifts toward the high end of the deck despite maximum tilt being used. Eccentric speed is adjusted by turning the pressing UP or DOWN arrow on the VFD remote pad (4) located on the machine console.

4.3 EXHAUST AIR ADJUSTMENT:

Integrated dust hood Hi-cap “N” stoner requires proper adjustments of exhaust air for stoner operation and dust control. The most common mistake in exhaust air regulation is the use of too much air. Separation is not made by "exhausting too much air " the light material with dust will be exhausted. Magnetic differential pressure gauge (5) should monitored to maintain appropriate negative static pressure using exhaust blast gate. Opening and closing the exhaust blast gate will increase or decrease the static pressure inside the dust hood.



FIGURE 8: DUTHOOD PRESSURE GAUGE ON THE CONSOLE

Too much air will cause a boiling or bubbling action lifting the light and heavier particles from the deck and exhaust most of the material to dust collection system. Too little air will cause the dust escape to the light end of the stoner and containment the light fraction material.

With proper air regulation, the bed of material will be almost fluid in appearance. All the controls on the stoner serve a purpose and must be balanced with the other controls to obtain optimum separation. With this understanding, we are now able to advance to making an actual separation.

4.4 HIGH END PNEUMATIC GATE CONTROL:

This gate controls amount heavy particle removal from the deck. Typically, this gate will be closed and periodically open to let collected heavy fraction to be discharged. This gate is controlled by two timers on the cabinet: Gate open and Gate close timers.



FIGURE 9: GATE TIMER OPEN AND CLOSED ON THE CABINET

On the console, we also have High end gate override switch which can be operated independent of the timer. This is three-way switch, which operates the gate close/open and auto. Close/Open will independently open or close the high gate and Auto will automatically open or close the gate with the timer settings.



FIGURE 10: GATE 3-WAY SWITCH ON THE CONSOLE

V. START UP AND OPERATION OF STONER

5.1 INITIAL STARTING PROCEDURES

An experienced Oliver operator should have little trouble starting the stoner and obtaining good results. However, for many of us, the confusion that results when the machine is initially turned on defies description. Many of the initial adjustments must be made soon after material is fed onto the deck. Therefore, it is a good idea to operate the machine empty for a few minutes prior to attempting to make a separation. During this period, one should listen to the machine to become familiar with the way it sounds during operation. Also, observe the oscillating action of the deck. Change the eccentric speed control to make the deck oscillate faster and slower.

Locate the tilt control handle. Loosen the clamps and operate the tilt control to increase and decrease the tilt of the deck. Remember that tilt and eccentric speed must be balanced against each other to create a smooth uniform bed of material across the deck.

Check the feeding mechanism to ensure that you can control the feed rate. Finally, increase and decrease air through the deck with VFD air adjustment. Although this does not produce a visible effect on an empty deck, changes in air volume may be noted by holding your hand over the deck as the air gate controls are operated. The air control settings are the most important part of successful stoner operation.

Before turning the machine off, make one final check to ensure that the fan shaft is turning in the right direction. When viewed from the main drive belt side (the belt from the motor to the fan shaft) all shafts should rotate counterclockwise.

5.2 HI-CAP N STONER OPREATION PROCEDURE

1. Set the eccentric speed and tilt to approximately $3/4$ of their maximum setting. Set VFD air sped to 15% for small material and about 30% for material larger than $1/8$ ". Open the feed gate slightly and adjust the eccentric speed so that the material spreads uphill slightly faster than downhill.

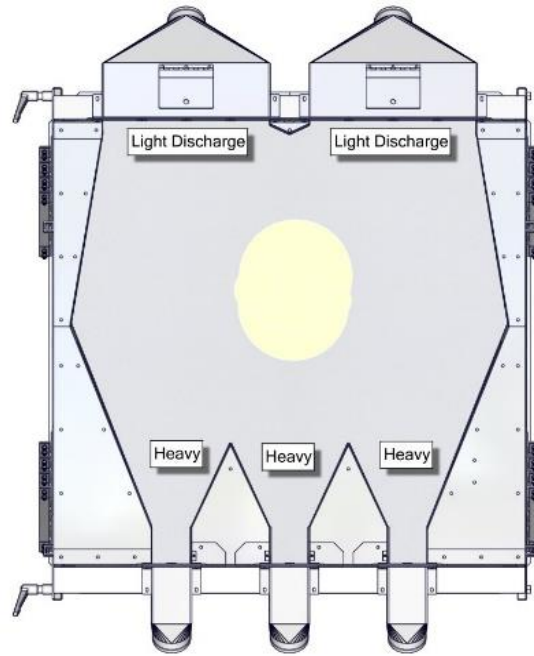


FIGURE 11

2. When $1/3$ of the deck is covered, begin opening the air gate controls. As the deck continues to fill, open the air gates only enough to maintain a minimum fluidization.

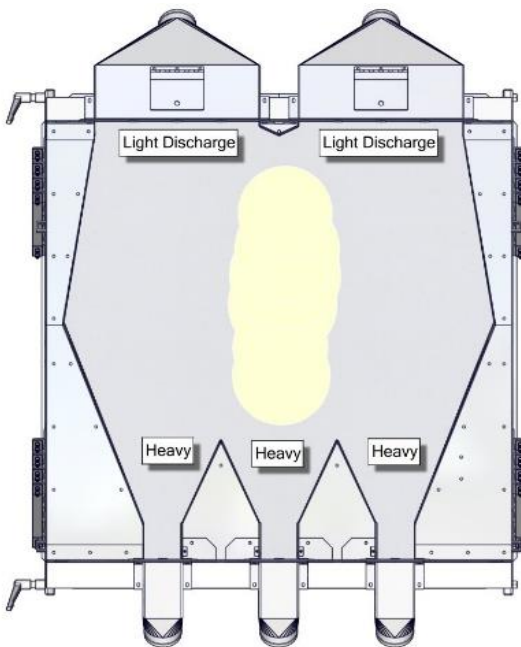


FIGURE 12

3. On many products a zone of light material will form at the lower edge of the bed as the deck fills. This is normal and indicates that sufficient air is present. If the percentage of heavy material is high, you may note the beginnings of a heavy separation in the heavy discharge area.

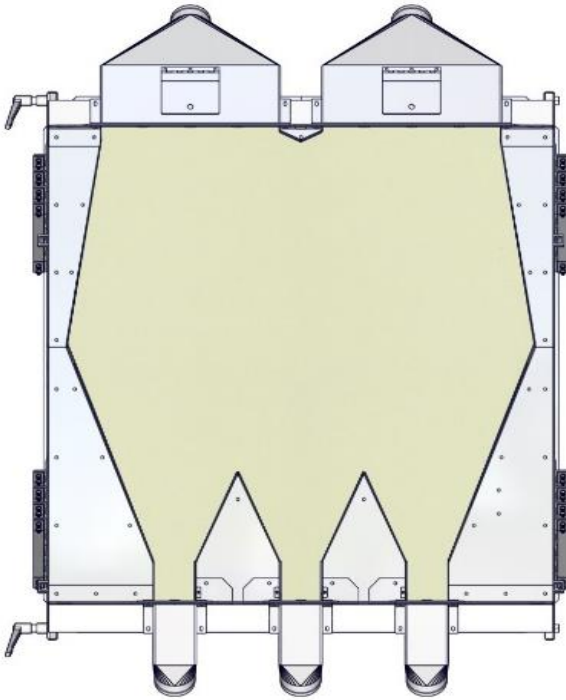


FIGURE 13

4. When the deck fills completely, the zone of lighter material at the lower edge of the bed will disappear. While maintaining a continuous feed and keeping the heavy discharge closed, adjust the eccentric speed, tilt and air so that the bed is approximately twice as deep on the heavy end as it is on the light end. Always use the minimum amount of air that will give proper stratification. As the heavy discharge area fills with heavy material, adjust gate open/close timer so that the outlet(s) to maintain a bed of heavy material that extends from 8 to 12 inches from the heavy end of the deck.

5.3 INCREASING CAPACITY

The above discussion gives the general procedure for starting and operating an Oliver Stoner. After obtaining satisfactory results at low capacity, increasing capacity is a relatively simple operation. Only after satisfactory results are achieved should this be tried.

1. Increasing tilt and eccentric speed.

Begin by increasing the tilt. This will cause the material to shift toward the clean product discharge. To correct this, increase the eccentric speed until the material is shifted back to the proper pattern. Continue increasing tilt and eccentric speed alternately until you have the tilt at the maximum amount where you can still maintain the correct bed depth by adjusting the eccentric control.

2. Increasing the feed rate.

Next open the feed gate slightly. This increases the feed rate and the bed depth will increase. Wait a couple of minutes to observe the change in the material on deck. As the bed depth increases over the deck, it may be necessary to increase the air setting slightly to compensate for the thicker bed. Continue increasing the feed rate until you reach the maximum feed rate where you still obtain the desired separation.

3. High end Gate operation.

Heavy discharge should adjust by high gate control timers to maintain 8 to 12 inches heavy fraction build up on the deck outlet. Typically, open timer is set to be in seconds and close timer is set in minutes. Depending percentage of heavy fraction, both this timer can be adjusted to seconds, minutes or hours. Refer the appendix D for the timer dip switch settings.

5.4 IN CASE OF DIFFICULTY - TROUBLE-SHOOTING

Most stoner operators can get acceptable separations after working with the machine for a few minutes. However, in some cases, even experienced operators run into problems that they cannot solve. If your stoner is not giving satisfactory results, or even if it is, but you would like to see better results, we suggest you read the following paragraphs.

Many operators expect results too soon on their stoner. When an adjustment is made, you should wait at least two minutes before deciding whether the adjustment has made any improvement. The reason for this is that, because of the volume of material on the deck, a certain amount of time is required for the deck surface to adjust to the new conditions.

Do not attempt to operate the machine without an understanding of why it works. The more one understands any situation, the better he is able to cope with it. Your stoner makes a separation based on a particle's weight and its resistance to air

flow. Proper adjustment of all the controls is necessary to obtain the best separation. As we have mentioned, your Oliver Stoner has four adjustments - Feed Rate, Tilt, Eccentric Speed and Air Control.

FEED RATE determines the capacity of the machine. The minimum feed rate is the lowest rate of feed at which you can maintain an adequate cover over the entire deck. The maximum rate is the highest rate at which you still obtain an acceptable separation. Between these limits the quality of the separation generally goes down as the capacity is increased and up as the capacity is decreased.

TILT is the difference between the high and low ends of the deck. Normally, tilt should be set at the maximum where you can still maintain an acceptable pattern across the deck. Too much tilt is present when material cannot be made to climb to the high end of the deck. Too little tilt is present when you cannot float material to the low end of the deck.

ECCENTRIC SPEED is the rate of oscillation of the table. Eccentric action provides the agitation so that the material can be stratified, and the reciprocating motion separates the heavier lower layers from the lighter upper layers of material. Eccentric motion and tilt must be balanced to get the best separating action. Too much eccentric speed will cause material to flow to the high side of the deck. Insufficient eccentric speed will not agitate the material enough for proper stratification. Usually, with too little eccentric speed, material will lay on the table without moving and the table will quickly become over loaded.

AIR is used as the stratifying agent. Unless material is properly stratified initially, a good separation cannot be obtained. Too much air will cause a bubbling, boiling action that remixes the material as fast as it is stratified. Too little air will not stratify the material properly.

10 MOST FREQUENT PROBLEMS

From conversations with processors over a period of years, we have compiled a list of the ten problems most generally encountered when setting up a new machine. We list these problems below along with some suggested solutions.

1. Fans running backwards. At least half of the problems with new machines can be traced to backwards rotation of the fans. If it seems that you have a problem with insufficient air, we suggest you check this, as silly as it seems. When viewed from the side where the motor is located, the fans and shafts should run counter-clockwise.
2. Blinded decks. If you think you have insufficient air and the fans are running correctly, remove the deck and clean it. The deck can be cleaned best by blowing the dirt and chaff out from the top down.
3. Dirty air filters. The air filters on the side of the machine are designed to screen dirt out of the air before it enters the machine. If they become plugged, the fans cannot pull enough air through them to provide a proper separation. They can be cleaned by removing them from the machine and gently tapping them on the floor. A more effective cleaning may be obtained by removing the filters and using compressed air to blow the dirt out.
4. Inadequate foundations. Although Oliver Stoners are counterbalanced, they must be attached to a secure foundation. A six-inch concrete slab is best but is not essential. Many processors run Oliver Stoners on wooden floors with no problems. If you can feel any vibration in the floor while the machine is running, you probably have too weak a foundation. Weak foundations lower the quality of separation, because the foundation absorbs some of the oscillating action intended for separation.
5. Operating at too much capacity. Often merely lowering the operating capacity slightly will greatly improve the separation. Capacity is usually dependent on the

standards to be met and the quality of the material being fed onto the stoner. Quality and capacity are inversely related, that is, increasing capacity usually lowers quality and decreasing capacity usually improves quality.

6. Loose clamps. Loose clamps are not a common problem, but they occur more often than people realize. Loose clamps usually occur when an operator makes an adjustment and fails to tighten the clamps sufficiently. The result of loose clamps is false vibrations. False vibrations absorb much of the oscillatory action of the deck and produce results similar to weak foundations.
7. Using the wrong deck cover. Deck covers are the portion of the machine that actually makes the separation. Without friction between the deck cover and the material to be separated, no separation will result. Therefore, a cover must be selected that will perform well with a specific product. Using the wrong cover will result in poor separation, very low capacity and will sometimes cause sufficient damage to the deck that it must be rebuilt. Generally, the cover should have a rough surface texture and the openings should be as large as possible without allowing material to fall through. We make four types of standard decks: cloth for small grasses and materials smaller than 1/16"; 30 mesh wire for seeds the size of alfalfa (between 1/16" and 1/8" in size); 16 mesh for materials between 1/8" and 1/4" (cereal grains); and 10 mesh wire for materials larger than 1/4" (beans, for example). We can also supply a variety of special decks to meet your particular needs.
8. Belts slipping. This is a common occurrence with new machinery. New belts tend to stretch slightly and should be checked frequently during the first couple weeks of operation. To check a belt, turn the machine off. Then apply pressure to the back of the belt midway between the two pulleys. The belt should deflect approximately 1/2 inch.
9. Attempting to separate commodities unsuitable for separation. This is a very rare problem, as normally a stoner will make some improvement in any seed lot. However, a stoner is a specialized machine designed to separate particles of varying density and similar sizes. If material does not fall into that classification, then it probably cannot be separated on a stoner.

10. Wrong adjustment. This is most commonly a problem with new, inexperienced operators. The solution to this problem is usually more experience. Do not be afraid to make adjustments on the machine. Make an adjustment. Wait a couple of minutes to determine the effect. Then decide if it is good or bad. If the effect is good, then try something else for further improvement. If the effect is bad, return to the original setting. Allow a couple of minutes and then try another adjustment. Finally, remember to make all adjustments in small increments. It is better to approach the final setting through several small steps than to make one adjustment that may be too large.

The final pattern on the deck may vary depending on the particle you are processing. However, for most commodities, the overall pattern will generally be similar. We suggest an average depth of material of from 1 to 2 inches for material larger than 1/4 inch; from 1/2 to 1 inch for material ranging from 1/8 to 1/4 inch in diameter; from 1/4 to 1/2 inch for material from 1/16 to 1/8 inch in diameter and less than 1/4 inch for material smaller than 1/16 inch in size. As a general rule, the bed depth at the high end of the machine should be from 1 to 2 times the depth across the low end of the machine. The average depth under the feeder will normally be about the same or slightly greater than the depth at the stone discharge. These patterns will not be correct for all commodities. However, if you can approximate these conditions on the deck surface, you should see a definite separation. From this point you can make the necessary adjustments to obtain an optimum separation.

As an additional aid in setting your stoner, we have provided some examples of situations that can occur and have listed adjustments which help correct the pattern. (See Figure 14.)

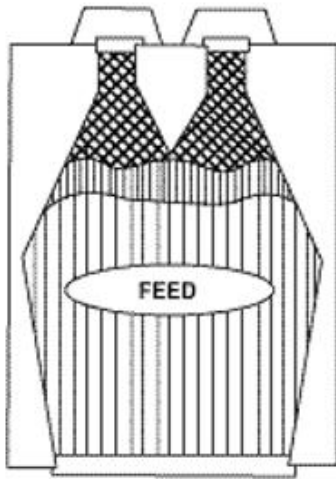


FIGURE 14A

Correct Adjustment

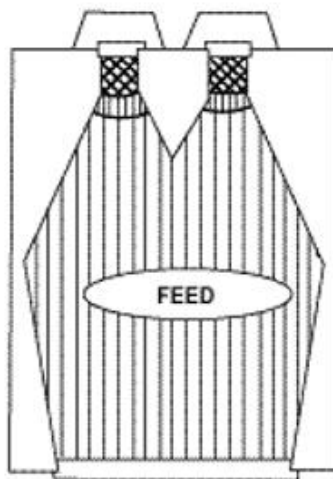


FIGURE 14B

1. Insufficient Tilt.
2. Too much Eccentric Speed.
3. Too little air.

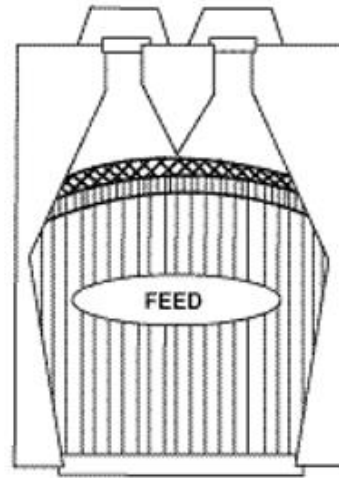


FIGURE 14C

1. Excessive Tilt.
2. Too little Eccentric Speed.
3. Too much Air.

Finally, if you can't get the separation you want, please call the factory (719) 254-7814. Our staff will be glad to give you the approximate settings to separate your product on your machine. If you have specific problems or questions, let us know. We will be glad to share our thoughts on the subject with you.

For the convenience of our customers, we maintain a laboratory service where we can process your samples. There is no charge and all samples will be returned if requested. If you have a sample you would like tested, just call us. Then we can discuss your problem and determine how much of a sample is needed for testing. If you like, we can set the test dates so that you can be present during the test.

AUXILIARY EQUIPMENT

Although stoners do a very good job removing a small percentage of heavy material from a relatively large portion of light material, they will not normally do a good job in the alternate situation: removing a small fraction of light material from a relatively large fraction of heavy material. For this kind of a separation, we recommend a gravity separator. In many cases, the incoming feed contains both a small percentage of heavy trash and a small percentage of light trash along with a large percentage of good material. For this reason, we often install both stoners and gravity separators to produce a final, clean product free of both heavy and light trash. If you have problems with a small percentage of light trash, we suggest you contact us about the use of a gravity separator. We manufacture both stoners and gravity separators in a wide range of sizes and capacity ratings. We can supply a gravity separator that will be an approximate capacity match for your stoner.

DUST CONTROL ACCESSORIES

Remember *Hi-cap "N"* stoner requires proper adjustments of exhaust air for stoner operation and dust control. With some commodities, dust is still present on the particles when they are introduced onto the stoner. This can be both annoying and illegal. Oliver has two systems to combat dust and get it away from the machine. These are described in the enclosed brochure on our dust control methods. Please take time to read this, if excessive dust is a problem in your processing.

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V. Appendices

Appendix A

Maintenance and Basic Troubleshooting

A.1 – Recommended Maintenance items

Hi-cap “N” stoner are designed to give years of trouble-free service. However, as with all machinery, periodic maintenance is required to keep it in top condition. The following is a list of some areas that can be problems, if not periodically checked.

A.1.1 – The Deck

To maintain optimum product flow, the deck should be checked frequently and cleaned or repaired as needed. Even in very clean atmospheres, dust and dirt will build up on the underside of the deck. This causes a restriction of air flow through the deck and will eventually plug the deck completely (blinded deck). When the deck becomes plugged, it will be necessary to remove it from the machine and thoroughly clean it. A deck that is only partially cleaned will become plugged sooner. To check if a deck is clean, place a light on a drop cord under the deck. If the deck is clean, you should be able to see light through every opening of the deck cover. Dirty areas will show up as dark spots and should be cleaned more thoroughly.

Because decks are in direct contact with the product, they are subjected to abrasive wear. Inspect your deck frequently for wear. As a deck wears out, the surface becomes smoother and it becomes more and more difficult to move product along the deck.

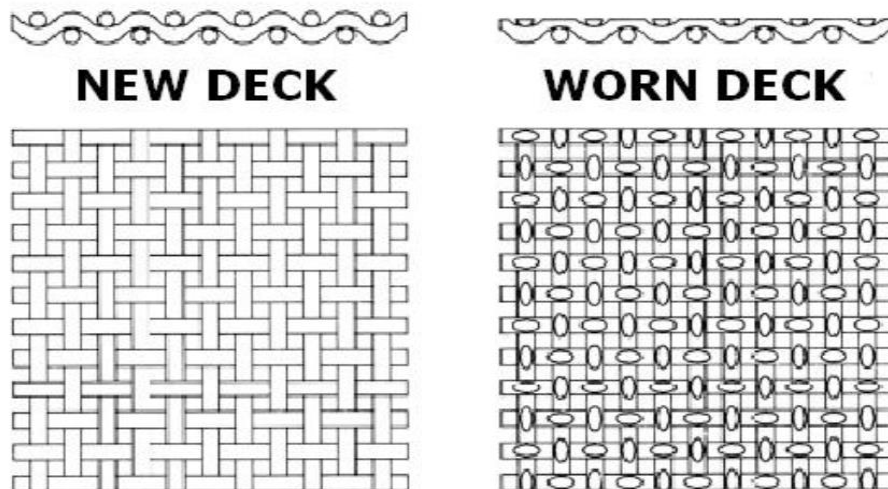


Figure 15: New deck vs. worn deck

Normally, when the wires of the deck overcover are worn halfway through, it is time to repair the deck. If the deck cover is worn completely through, there is danger of

ruining the undercover, which develops the air pattern. As long as the undercover is not damaged, it is not necessary to replace it. When rebuilding a deck, always inspect the deck thoroughly. Look at the underside of the deck and inspect each rib for cracks, dents, bends or other problems. If the ribs are damaged, it will be necessary to tear down the deck completely to repair or replace them.

A.1.2 BELTS AND SHAFTS:

There are two sets of belts and sheaves in your Oliver Stoner. These are the main drive belts or fan belts; and the eccentric belt from the motor to the eccentric shaft. New machines should be checked very frequently for the first few weeks, because new belts tend to stretch as they are broken in. To check belt tension, turn off the machine. Then apply pressure to the outside of the belt midway between the two sheaves. The belt should deflect approximately 1/2 inch.

The eccentric belt, from the motor to the eccentric shaft, has a shaft running through it. The shaft must be removed to install a new belt. For this reason, a spare belt is installed around the shaft on all new machines. When the original belt wears out, merely remove the spare belt from its mountings and slip it in place of the original. If the second belt wears out and you lack the time required to install a new belt, you can replace it with a link belt. However, this is a temporary measure; and we recommend the link belt be replaced with standard V belts as soon as it is convenient. Proper tension is maintained on the eccentric belt for achieve proper eccentric motion.

A.1.3 – Bearings

To prolong bearing life, each bearing should be greased with 1 to 2 shots of grease at the start of each season. Sealed bearings are installed at the factory and will give much better service if they are not over-greased. A bad bearing will normally be detected by a rumbling noise in the machine, or by feeling an unusual vibration. To determine if a bearing is defective, run the machine for at least 30 minutes. Then, turn off the machine and lock out the power supply. Touch the bearing surface. If the bearing is excessively hot, it is probably bad and must be replaced.

A.1.4 – Air Filters

The Hi-cap “N” stoner come equipped with air filters on the side of the blower frames, they are designed to screen dirt out of the air before it enters the machine. If they become plugged, the fans cannot pull enough air through them to provide proper stratification. The air filters can be cleaned by removing them from the machine and gently tapping them on them, or a more effective cleaning may be obtained by removing the filters and using compressed air to blow out the dirt. If you must clean filters while the machine is running use an industrial vacuum cleaner and vacuum the dirt from the filter surface.

A.2 – Basic Troubleshooting

Most operators of Hi-cap stoner can get acceptable separation after working with the machine for a few minutes. However, many operators expect results too soon from their stoners. When an adjustment is made, wait at least couple of minutes before deciding whether it has made any improvement. A certain amount of time is required for the entire deck surface to adjust to the new conditions. From conversation with customers over a period of years, we have compiled a list of problems most generally encountered with an operation of stoner.

A.2.1 – Blinded Deck

If there is insufficient air and the fans are running correctly, it could be that the deck needs cleaning. The deck can be cleaned best by blowing the dirt and chaff out from the top downward, while the dryer is running.

A.2.2 - Dirty Air Filters/Obstructed Airflow

If there is insufficient air and the fans are running correctly, it could also be that the air filters surrounding the mainframe have become plugged and are not allowing enough airflow to achieve product stratification.

A.2.3 – Inadequate Foundation

Although the Hi-cap “N” stoner is counterbalanced, it must be attached to a secure foundation. If any vibration can be felt in the floor while the machine is running, the foundation is probably too weak. Weak foundations can lessen the ability of the eccentric motion because the foundation absorbs some of the eccentric motion. A weak foundation can also shorten the mechanical life of the machine. Call the factory if you feel that you have an installation problem.

A.2.4 – Belt Slipping

Belts commonly slip on new machinery. New belts tend to stretch slightly and should be checked frequently during the first couple of weeks of operation. To check a belt, turn off the machine and lock out the power supply. Then apply pressure to the back of the belt midway between the two pulleys. The belt should deflect approximately 1/2 inch.

A.2.5 – Wrong Machine Settings

This is commonly a problem with new, inexperienced operators. The solution is usually gaining more experience. Do not be afraid to adjust the machine. Make an adjustment. Wait a couple of minutes to determine the effect and decide if it is good. Then try something else for further improvement. If the effect is bad, return to the original setting. Finally, remember to make all adjustments in small increments. It is better to approach the final setting through several small steps than to make one large adjustment.

Periodically check the bearing support brackets to ensure that they are tight. If their brackets become loose, the result will be false vibration, which may cause poor separation, bearing failure or several related problems.

ORDERING REPAIR PARTS

We maintain a complete card file on all machines that have been built by Oliver Manufacturing Company. All machines are serial numbered. To ensure that you receive the correct parts, we must have the serial number of your machine. The serial number is located on a plate on the side of the air chest. (See Figure 6.) In addition, we need the model number of the machine.

When we receive orders for parts, we ship as soon as possible after receiving the order. Normally, we will ship by the fastest, cheapest method unless otherwise specified. Incomplete or incorrect information when ordering will cause unavoidable delays in shipping. If you have a special problem or cannot locate some of the required information, please contact us. We will work with you to provide what you need as quickly and as inexpensively as possible. A parts list is enclosed for your assistance.

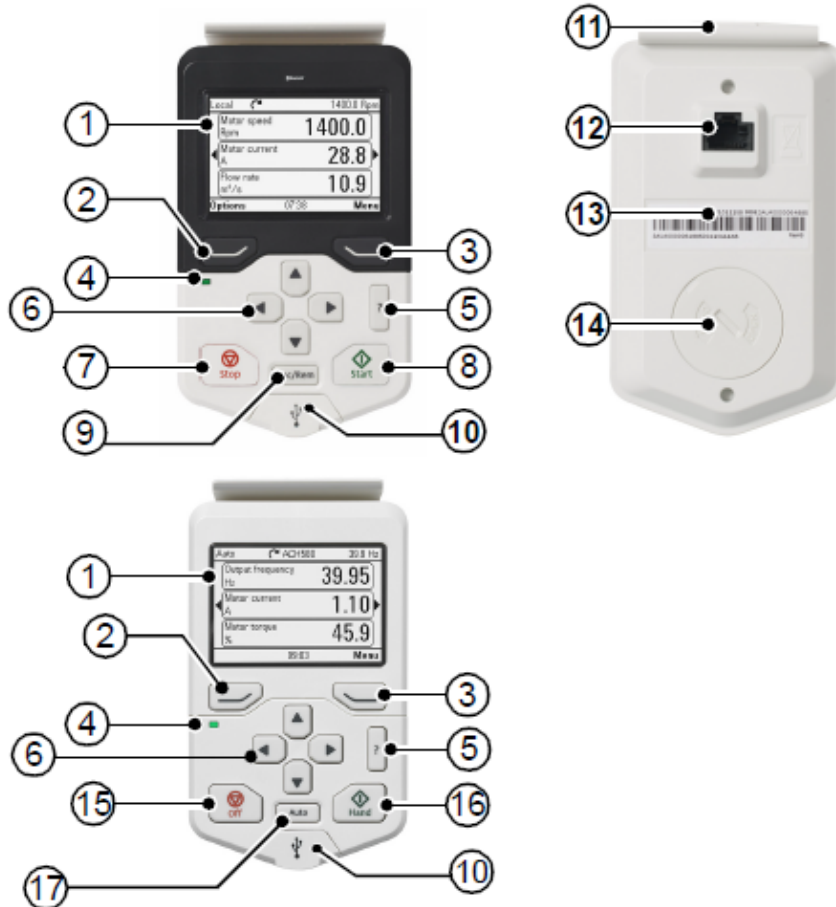
Appendix B

The ABB ACS380 VFD

The ABB ACS380 VFD

B.1 - Getting to know the VFD Keypad

Display, keys and parts



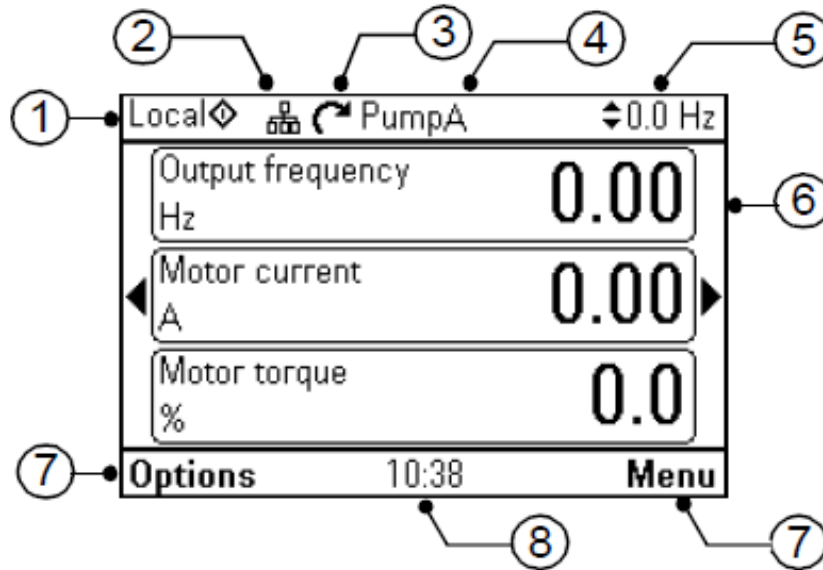
1	Display
2	Left softkey
3	Right softkey
4	Status LED
5	Help
6	Arrow keys
7	Stop (see <i>Start and Stop</i>)
8	Start (see <i>Start and Stop</i>)
9	Local/Remote (see <i>Loc/Rem</i>)

10	USB connector
11	Clip
12	RJ-45 connector
13	Type code label on the panel
14	Battery cover
15	Off
16	Hand
17	Auto

Figure 16 - VFD keypad overview

■ Display

In most views, the following control panel elements are shown on the display:

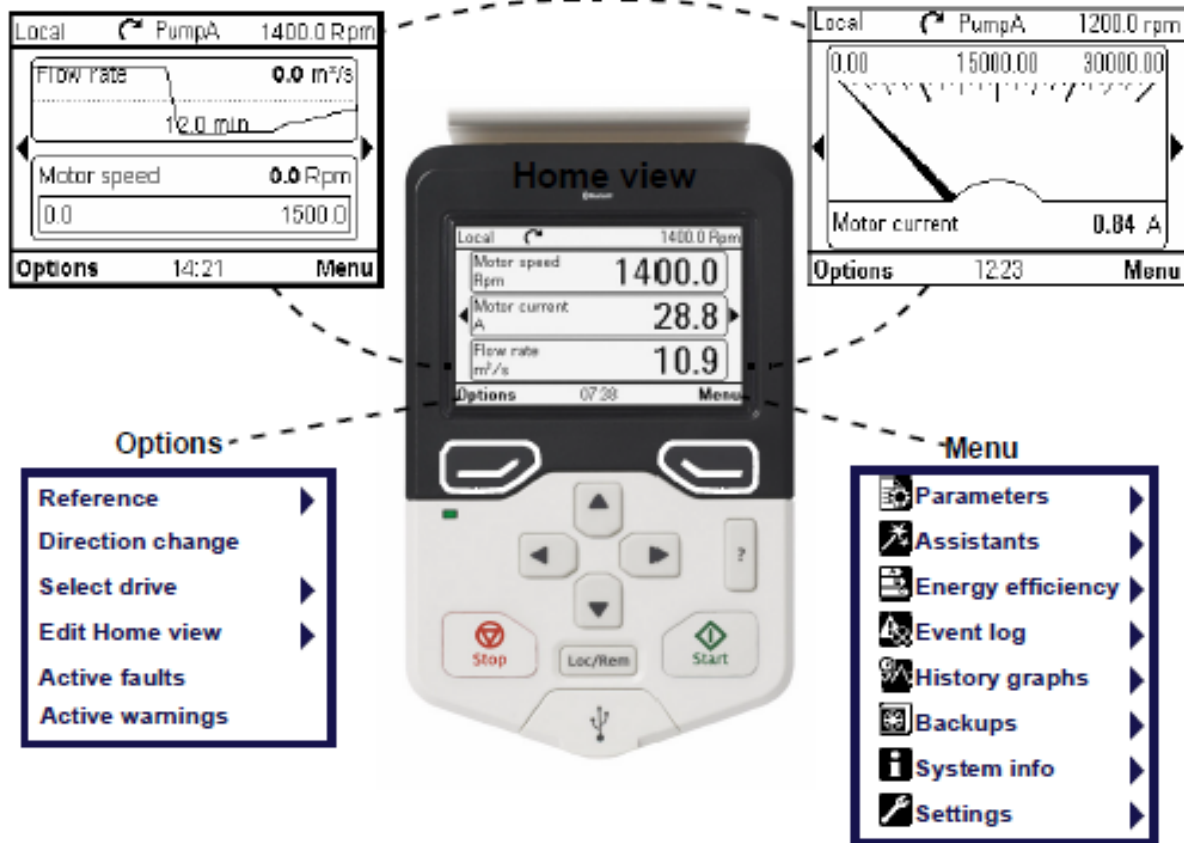


No.	Panel element	Function
1	Control location and related icons	Indicates how the drive is controlled: No text: The drive is in local control, but controlled from another device. The icons in the top pane indicate which actions are allowed. Local: The drive is in local control, that is, controlled from the control panel. Remote: The drive is in remote control, that is, controlled through I/O or fieldbus.
2	Panel bus	Indicates that there are more than one drive connected to this panel. To switch to another drive, go to Options → Select drive .

Figure 17 - VFD keypad display

Control panel navigation

Use the arrow keys and softkeys for navigation. Follow the choices on the screen.



Note: The menu shown is an example only. The Menu varies based on the drive/device to which the panel is connected.

■ Navigation memory

The Assistant control panel has a navigation memory that allows you to backtrack your steps through the user interface with the arrow keys ◀ and ▶. The path you have last accessed remains in the memory for 10 minutes.

- The left arrow key (◀) moves you backwards in the menu structure. If you press ◀ repeatedly, you return back to the Home view.
- The right arrow key (▶) moves you forward in the menu structure. If you press ▶ repeatedly, you move forward along the path in the menu structure you had previously accessed.





Figure 18 - VFD keypad status line

B.2 - Getting to know the VFD Keypad

You operate the control panel with menus and keys. The keys include two context sensitive soft keys, whose current function is indicated by the text shown in the display above each key.

You select an option, e.g. operation mode or parameter, by scrolling with the up and down arrow keys until the option is highlighted (in reverse video) and then pressing the relevant soft key. With the right soft key, you usually enter a mode, accept an option or save the changes. The left soft key is used to cancel the made changes and return to the previous operation level.

■ Basic operation of the drive

<i>Task</i>	<i>Actions</i>
Start and stop the drive.	In local control, press  to start the drive and  to stop the drive.
Set the reference (for example, speed) in the Home view.	In local control, go to Options > Reference . Set the reference with the arrow keys. For detailed instructions, see Setting the reference (page 50).
Switch between local and remote control.	Press  .
Change the direction of motor rotation.	In local control, go to Home view , press  (Options) to open the Options menu and select Direction change .

When a fault or alarm occurs, the panel goes automatically to the Fault mode showing the fault or alarm. You can reset it in the Output or Fault mode.

■ Faults and warnings

See [Fault tracing \(page 57\)](#) for detailed information on faults and warnings.







<i>Task</i>	<i>Actions</i>
Hide/view an active fault.	Faults are automatically displayed. If you hide a fault by pressing  (Hide), it automatically reappears after 60 seconds of no key presses. You can also view the fault through Options > Active faults .
Open help page on a fault.	Press  to view the help page.
Reset an active fault.	Press  (Reset) to reset an active fault.
View tripping faults.	Go to Menu → Event log → Faults .
Hide/view an active warning.	Warnings are automatically displayed. If you hide a warning by pressing  (Hide), it automatically reappears if the warning is still active after 60 seconds of no key presses.
Open help page on a warning.	Press  (How to fix) or  to view the help page.
Reset an active warning.	Warnings disappear automatically once the condition that has triggered it goes away.
View past warnings and faults.	Go to Menu → Event log → Other events .

Figure 19- VFD Faults and Warnings

A.2 - Programming the VFD from the Keypad

Parameters mode

In the Parameters mode, you can:

- view and change parameter values
- start, stop, change the direction and switch between local and remote control.

How to select a parameter and change its value
















Step	Action	Display
1.	Go to the Main menu by pressing  if you are in the Output mode, otherwise by pressing  repeatedly until you get to the Main menu.	<pre> LOC MAIN MENU 1 PARAMETERS ASSISTANTS CHANGED PAR EXIT 00:00 ENTER </pre>
2.	Go to the Parameters mode by selecting PARAMETERS on the menu with keys  and  , and pressing  .	<pre> LOC PAR GROUPS 01 01 OPERATING DATA 03 FB ACTUAL SIGNALS 04 FAULT HISTORY 10 START/STOP/DIR 11 REFERENCE SELECT EXIT 00:00 SEL </pre>
3.	Select the appropriate parameter group with keys  and  . Press  .	<pre> LOC PAR GROUPS 99 99 START-UP DATA 01 OPERATING DATA 03 FB ACTUAL SIGNALS 04 FAULT HISTORY 10 START/STOP/DIR EXIT 00:00 SEL </pre> <pre> LOC PARAMETERS 9901 LANGUAGE ENGLISH 9902 APPLIC MACRO 9904 MOTOR CTRL MODE 9905 MOTOR NOM VOLT EXIT 00:00 EDIT </pre>
4.	Select the appropriate parameter with keys  and  . The current value of the parameter is shown below the selected parameter. Press  .	<pre> LOC PARAMETERS 9901 LANGUAGE 9902 APPLIC MACRO ABB STANDARD 9904 MOTOR CTRL MODE 9905 MOTOR NOM VOLT EXIT 00:00 EDIT </pre> <pre> LOC PAR EDIT 9902 APPLIC MACRO ABB STANDARD [1] CANCEL 00:00 SAVE </pre>
5.	Specify a new value for the parameter with keys  and  . Pressing the key once increments or decrements the value. Holding the key down changes the value faster. Pressing the keys simultaneously replaces the displayed value with the default value.	<pre> LOC PAR EDIT 9902 APPLIC MACRO 3-WIRE [2] CANCEL 00:00 SAVE </pre>
6.	<ul style="list-style-type: none"> • To save the new value, press . • To cancel the new value and keep the original, press . 	<pre> LOC PARAMETERS 9901 LANGUAGE 9902 APPLIC MACRO 3-WIRE 9904 MOTOR CTRL MODE 9905 MOTOR NOM VOLT EXIT 00:00 EDIT </pre>

Figure 20 - Changing VFD parameters

A.3 - Eccentric Parameter list

The following is a list of the changed parameters set by Oliver Manufacturing at the factory; all other configuration parameters not shown in this list are to remain the default value as set by the drive manufacturer. These changed parameters should not be adjusted unless recommended by an Oliver representative.

VFD1 (Fan) Parameter Settings			
Par	Name	Set to	(Default)
11.5	DIO1 configuration	Digital output	Input
11.6	DIO1 output source	Running	Not energized
21.3	Stop mode	Coast	Ramp
21.19	Scalar start mode	Automatic	Const time
22.11	Ext1 speed ref1	Control panel (ref copied)	AI1 scaled
28.11	Ext1 frequency ref1	Control panel (ref copied)	AI1 scaled
28.71	Freq ramp set selection	Acc/Dec Time 1	Acc/Dec time 1
28.72	Freq acceleration time 1	2.000 s	3.000 s
28.73	Freq deceleration time 1	5.000 s	3.000 s
30.13	Minimum frequency	9.00 Hz	-60.00 Hz
-	-	-	-
96.1	Language	English	Not selected
96.16	Unit selection	0b0001 0101	0b0000
99.6	Motor nominal current	See dwg	-
99.9	Motor nominal speed	See dwg	-
99.10	Motor nominal power	See dwg	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
Once all settings are in, set parameter 96.02 parameter lock code to: 358			

Label keypad 'VFD1'

VFD2 (Eccentric) Parameter Settings			
Par	Name	Set to	(Default)
11.5	DIO1 configuration	Digital output	Input
11.6	DIO1 output source	Running	Not energized
21.3	Stop mode	Coast	Ramp
21.19	Scalar start mode	Automatic	Const time
22.11	Ext1 speed ref1	Control panel (ref copied)	AI1 scaled
28.11	Ext1 frequency ref1	Control panel (ref copied)	AI1 scaled
28.71	Freq ramp set selection	Acc/Dec Time 1	Acc/Dec time 1
28.72	Freq acceleration time 1	2.000 s	3.000 s
28.73	Freq deceleration time 1	5.000 s	3.000 s
30.13	Minimum frequency	36.00 Hz	-60.00 Hz
30.14	Maximum frequency	52.00 Hz	60.00 Hz
96.1	Language	English	Not selected
96.16	Unit selection	0b0001 0101	0b0000
99.6	Motor nominal current	See dwg	-
99.9	Motor nominal speed	See dwg	-
99.10	Motor nominal power	See dwg	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
Once all settings are in, set parameter 96.02 parameter lock code to: 358			

Update VFD2 keypad to display motor speed:	
Options ->	edit home screen -> select the top display
Parameter:	Motor Speed Estimate
Min -	0
Max -	1521
Scale	
Min -	0
Max -	600
Units -	RPM
Label keypad 'VFD2'	

- During power up and setup on the timers, adjust timers from NPN inputs to PNP:
- Set DIP switch to Setup mode: 8 = ON
- Toggle RST button to "Input Logic Settings" screen
- Change from "nEG" to "PoS"
- Hit RST button
- Power down
- Set DIP switch to Run mode: 8 = OFF

Table 2: Fan and Eccentric VFD parameter list

WARNING!!



DO NOT ATTEMPT TO SERVICE ANY ORIGINAL EQUIPMENT DEVICES. THIS INCLUDES, BUT IS NOT LIMITED TO, COMPONENTS SUCH AS MOLDED CASE CIRCUIT BREAKERS, CAPACITOR CELLS, CONTACTORS, AND CONTROLLERS.



Failure to properly install, maintain and inspect the equipment may result in equipment damage, improper operation, shortened equipment life span and voided warranty.

Appendix C

Timer manual

C.1 Getting to know timer operation

Koyo

Digital Timer series KT-V
KT-V4S-D
KT-V4S-C-D

Operation Manual

Thank you for purchasing Koyo KT-V series timer.
 Please read this operation manual carefully before installing or operating the counter.
 We recommend to keep this manual in appropriate place for your future use. We also recommend to include this manual in the package when you re-sell or export after installing on any machine or equipment.

AutomationDirect.com
 1-800-633-0405
 KOYO ELECTRONICS INDUSTRIES CO.,LTD.

■ Safety Consideration

To minimize the risk of potential safety problem, read this section carefully before installing or operating this counter. Do not perform damage or serious injury to personnel can result from failure to read all follow "WARNING" and "CAUTION" in this section.

- Failure to follow instruction under this "WARNING" mark may result in serious injury to personnel or severe damage to equipment.
- Failure to follow instruction under this "CAUTION" mark may result in injury to personnel or damage to equipment.

This symbol indicates a general prohibition.
 This symbol indicates an enforcement or an instruction.

[Use Environment and Conditions]

- WARNINGS**
- Do not use this counter in inflammable or explosive atmosphere.
 - Do not use this product for applications involving human safety.
- CAUTIONS**
- Please use and store the product in the range of the environment (operation, impact, temperature, moisture, etc.) specified in the specifications. Otherwise, fire or damage to the product may be caused.
 - Please understand the product before using it.

[Installation and Wiring]

- WARNINGS**
- Use the product only with the power supply voltage listed in the specifications. Otherwise, fire, electric shock, or accidents may be caused.
 - Avoid incorrect wiring so as to cause fire or accidents.
- CAUTIONS**
- Execute wiring and installation as specified in the specifications. Otherwise, fire or accidents may be caused.
 - Execute wiring according to a method which prevents electric shock or accidents.
 - Use only the specified screws to fix the terminal block. Otherwise, fire or accidents may be caused.

[Use Method]

- WARNINGS**
- Do not touch the terminals while they are energized. This may cause electric shock or accidents because of incorrect operation.
 - Use the product only according to the method specified in the specifications. Otherwise, injuries or accidents may be caused.
 - Set value change during operation can cause serious accidents by switching the output to ON as a not intended set value. Inverse of a mistake in the operation procedure. Operation shall be executed by an authorized person within the scope where the safety of humans and equipment is assured.
- CAUTIONS**
- Do not insert foreign objects into the openings of the product. This can cause electric shock or accidents.
 - Do not block the ventilation openings. This will cause rising temperature in the body and can cause fire or accidents.

[Maintenance]

- CAUTIONS**
- Do not try to disassemble or repair the product. This can cause fire, electric shock, or accidents.
 - Execute maintenance and operations with the power supply switched off. Electric shock can be caused when the work is executed with the power supply reconnection.

[Discarding]

- WARNINGS**
- When discarding the product, please treat it as industrial waste. Burning to be treated, and fire or faulty injury may be caused.

■ CE Marking

This product conforms to both the Low Voltage and EMC Directives under conditions described below.

- (1) **Low Voltage Directives**
 Applicable standard: EN61010-1
 It requires an appropriate basic installation in the least which is connected to the safety output, when switching voltage of the stop output is above 120V.
- (2) **EMC Directives**
 Applicable standard: EMI: EN55011
 EMS: EN50062-2*

* If the product is with DC power supply, it requires a EMC/EMC test (EN 55022) installed on the power supply.

■ UL-Recognized

Note that the product with DC power supply is UL-Recognized only with class II power supply.

■ General specifications

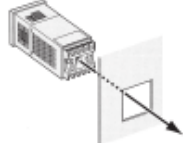
Item	Rating	
	AC power supply type	DC power supply type
Rated supply voltage	AC100-240V	DC12-24V
Rated power supply voltage tolerance (max)	AC85-264V	DC10-26.4V
Power consumption	About 11 VA	About 4 W
Sensor power supply	None (non-sensor type only)	
Memory in case of power failure	EEPROM: Retaining for 100,000 times or less Memory time: 10 years	
Ambient temperature	-10 to 50°C	
Storage temperature	-20 to 70°C (no ice formation)	
Ambient humidity	35 to 85% RH (no condensation)	
Withstand voltage	AC: 2 kV for 1 minute Between AC rail (L1) and equipment DC: DC power supply type only (between L1 and relay contact)	
Vibration resistance	Durable: Operation mode (in an operation mode) 10 to 50 Hz, 0.5 mm/s RMS E-momentary: Operation mode (in an operation mode) 10 to 50 Hz, 0.5 mm/s RMS	
Shock resistance	Durable: All rms values (100 to 1000 Hz in all axes directions) E-momentary: All rms values (100 to 1000 Hz in all axes directions)	
Moisture resistance	AC power supply: ±1.5 kV DC power supply: ±1.8 kV Between power supply terminal (pulse width: 1 μs, rise: 100 ns)	
Protective construction	IP65 (only the front panel)	
Weight	170 g	124 g
Terminal block	Applicable wire	0.25-1.65mm ²
	Applicable clamp terminals	R1, J2-S
Terminal block	Permissible tightening torque	0.8Nm (5kgfcm)

■ Performance specifications

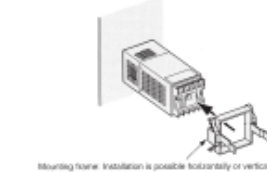
Item	Specifications
Type	Display/Off delay/On/Off/Protect/Filter set/adjust
Number of digits	4 digits
Display device	Current value: Red LED High 10mm Present value: Green LED High 10mm
Range of time	0.001H-0.999h
	0.01% ~ 99.9%
	0.1s ~ 999.9s
	1s ~ 9999.9s
	1h ~ 999.9h
	1d ~ 9999.9d
Display select	The current time or The remaining time
Timer accuracy	0.01%/21 bits (Apply greater value)
Input	Input type: Negative logic (open collector output) Input voltage: Positive logic: 15V Negative logic: 2.3kV (DC power supply) 1.6kV (DC power supply type)
	Input voltage: 1, 0 to 2V, "H" 1 to 20V
Recommended start type	10ms/100mA or less
External reset	Min. signal width: 5ms DC supply: 70mA open collector output 24V, 100mA, withstand voltage 30V, residual voltage 1.5V or less
Output	Relay output 1 transfer contact, AC100V/10 (resistance load)
Output time (Pulse)	Variable from 10 to 999.9ms every 10ms
Key protection	Any desired key can be set
Installation method	Only enclosed installation (terminal block connection)

■ Installing Counter

① Insert the timer into the panel mounting hole.



② Install the mounting frame from the rear.



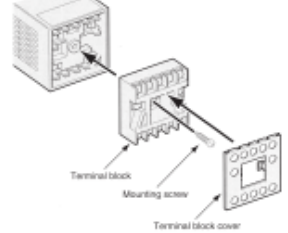
■ Panel description

- ① **Output LED (red)**
 - Run mode: This lights when output is ON.
 - Alarm mode: This flashes when alarm output is ON.
- ② **Protection LED (red)**
 - Run mode: This flashes when it is in key protect mode (initially, at the time of key ON).
 - Setup mode: It indicates key protect configuration.
- ③ **RTST key**
 - Run mode: The current value is reset.
 - Alarm mode: (If when displaying the current time, present value when displaying the remaining time.)
 - Setup mode: Select what is setup.
- ④ **Current value LED (red)**
 - Run mode: It indicates the current value.
 - Alarm mode: It indicates the setup configuration.
- ⑤ **Set value LED (red)**
 - Run mode: It indicates the set value.
 - Alarm mode: It indicates the set value.
 - Setup mode: It indicates what is setting up.
- ⑥ **Present value LED (green)**
 - Run mode: After changing the present value, the present value becomes effective after a condition of the key input has lasted for about one second.
 - Setup mode: The setting contents are selected.
- ⑦ **Digit keys**
 - Run mode: After changing the present value, the present value becomes effective after a condition of the key input has lasted for about one second.
 - Setup mode: The setting contents are selected.
- ⑧ **Key indicator**
 - Run mode: It indicates the key input.
 - Alarm mode: It indicates the key input.
 - Setup mode: It indicates the key input.

■ Dimensions (in mm)

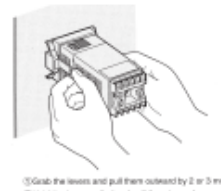
Dimensions (in mm):
 Mounting frame: 40mm width, 45mm height.
 100 (AC power supply type): 100mm width, 45mm height.
 65 (DC power supply type): 65mm width, 45mm height.
 Panel thickness: 1 to 5mm.
 Depth dimension:
 DC power supply type: 65mm.
 AC power supply type: 106mm.

■ Mounting terminal block and terminal block cover



CAUTION Use only the enclosed screw to fix the terminal block. Observe the permissible tightening torque of 0.3 Nm (2 kgfcm). Otherwise, fire or accidents may be caused.
 Install the terminal block cover after completion of wiring.

■ Removal of the timer



① Grab the levers and pull them outward by 2 or 3 mm.
 ② Hold the levers pulled and pull them towards you.

■ Terminal description

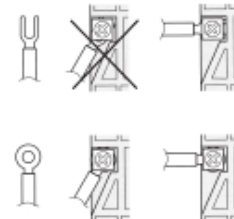
KT-V4S-D
 Sensor power supply: 24VDC/50mA, 100mA, 200mA
 DC output: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
 Relay output: COM, NC, NO, 24V, 100mA

KT-V4S-C-D
 Sensor power supply: AC 100 to 240 V power supply
 DC output: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
 Relay output: COM, NC, NO, DC 12 to 24 V power supply

* Protection output is used together with DC output (OUT) terminal.

■ Caution for wiring

- Keep the wires away from power lines.
- Keep the KT-V timer away from the places where there is heavy noise.
- Do not use unused terminal pins for any other purpose.
- Do not use a life-shape clamp when installing the wire in diagonal position, use a round-shape clamp, as shown below.

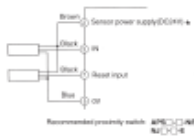


C.2 Timer dip switch selection

Input connection examples

In case of an NPN open collector output type proximity switch

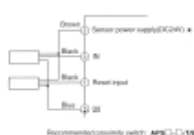
● Input logic: Negative logic (no-voltage input) (E1)



Recommended proximity switch: APM3-C-103 M3-C-102

In case of a voltage output type or a PNP open collector output type proximity switch

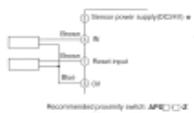
● Input logic: Positive logic (voltage input) (E2)



Recommended proximity switch: APM3-C-103 M3-C-102

In case of a DC two-wire type proximity switch

● Input logic: Negative logic (no-voltage input) (E3)

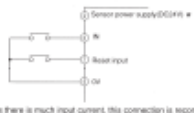


Recommended proximity switch: APM3-C-103 M3-C-102

In case of a switch or relay

● Input logic: Negative logic (no-voltage input)

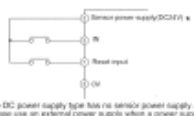
● Response time of start input : 15ms



*As there is much input current, this connection is not recommended.

● Input logic: Positive logic (voltage input)

● Response time of start input : 15ms



*The DC power supply type has no sensor power supply. Please use an external power supply when a power supply is required.

Output connection examples

In case of contact output



In case of an NPN open collector output



Key operation

1. Change of the Preset Value

Each time a digit key is pressed, the corresponding digit of the preset value is incremented by one.

This set value becomes effective about one second after each digit switch is released.

● An example for digit hexadecimal: \square (Hex) \square (Dec) \square (Hour) \square (Min)



Example: When the preset setting is "123"

When the key \square is pressed, 124

When the key \square is pressed, 124

When the key \square is pressed, 234

2. Current Value Resetting

The current value is reset by pressing the reset key (response time: 0.1s).

When the key \square is pressed while the current value is "0", "0" will be shown, displaying the remaining time.

The preset value will be returned displaying the remaining time.

3. Key Protection

When the DIP switch 7 is set to ON, the reset key and the digit keys are prohibited. When a prohibited key is pressed, the LED corresponding to the key flashes. For key protection, select the key to be prohibited in setup mode and set the DIP switch 7 to ON. At the time of shipping, key protection in setup mode is prohibited for all keys, so that prohibition for all keys is possible just twirling the DIP switch 7 to ON.

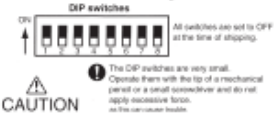
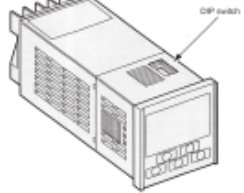
DIP switch setting

● Setting is executed with the DIP switches on top of the timer.

● Operate the DIP switches when the power is switched off.

● Operation in assigned condition is not effective.

When a DIP switch has been changed, press the \square key in run mode to reset the current value.



Function	Position	On / Off	Operation
Output mode selection	1	● / ○	ON-delay
	2	● / ○	OFF-delay
	3	● / ○	One shot
	4	● / ○	Accumulation
	5	● / ○	Filter
Time range selection	6	● / ○	0.1 sec
	7	● / ○	0.1 min
	8	● / ○	0.1 hour
	9	● / ○	0.1 day
Display selection	10	● / ○	the current time
Key protection	11	● / ○	Key protection
Operation mode selection	12	● / ○	Setup mode
	13	● / ○	Run mode

Setup mode

Settings which can not be set by DIP switches are set in this setup mode.

- Setup mode setting items
- Response time of start input: 1 / 5 / 10ms
 - Input logic: Positive logic, negative logic
 - Output mode: Flicker mode, DIP switches
 - Range of time: 30 min / 0.1 hour, DIP switches
 - Output time: Setting of the flicker mode output time as 10 to 9999 ms (in units of 10 ms)
 - Prediction output: An offset value is set as regard to the preset value.
 - Reset key protection: Reset key prohibition is set.
 - Digit key protection: Prohibition of any digit key can be set.

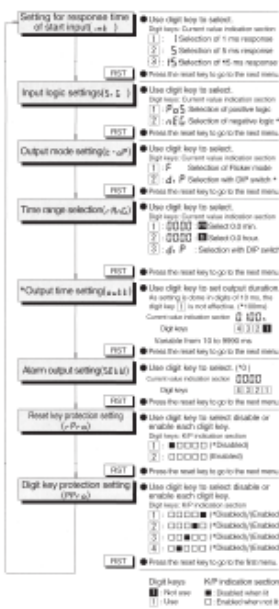
1. Switching between setup mode and run mode



- Setup mode is reached when the power is switched on with DIP switch 8 set to ON.
- Run mode is reached when the power is switched on with DIP switch 8 set to OFF.

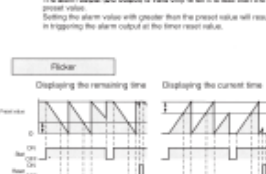
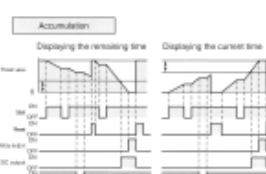
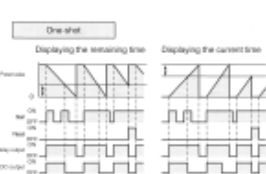
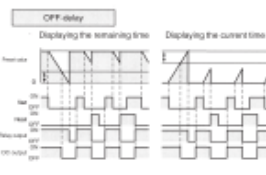
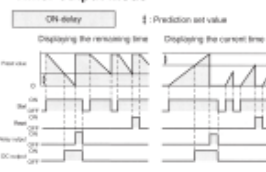
2. Setup mode operation

Execute initial setting by the menu method as shown in the following table. An asterisk (*) indicates the factory default.

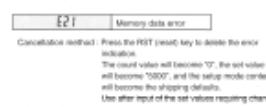


- * If skip setting items with * mark except flicker mode.
- * When the initial settings is changed in setup mode, the current value must be reset in run mode by pressing the \square key.
- * The setting contents become effective when the \square key is pressed to go to the next menu.

Timer output mode



Error indication



Caution items

- The 0 V terminal ② of the DC type power supply and the input common 0 V terminal ③ are short-circuited inside the timer.
- Do not increase the power supply voltage gradually, but use a switch, a relay, etc. to impress the entire rated voltage at once.
- When a DC 2-wire type proximity switch is used, set the input logic to negative logic for use.
- When the current value is changed during counting, the change becomes effective about one second after key input.
- Enter the setting contents for the DIP switches and the setup mode into the enclosed recording chart for maintenance and keep this chart at a secure place.
- Avoid use in the following environments:
 - Locations with an ambient temperature above 50°C or below -10°C.
 - Locations with an ambient humidity over 85% or where condensation can be caused by rapid temperature changes.
 - Locations with dust, iron powder, corrosive gas, etc.
 - Locations exposed to direct sunlight.
 - Locations with strong vibrations or shocks.
- For testing of insulation withstand voltage, insulation resistance, etc., first separate the KT-V from the control circuits.
- ESM saves the data in EEPROM when the power is shut down. The EEPROM can only be written for less than 100,000 times.

Use these tables to keep your settings in record.

DIP switch settings (mark selected items by "○")

Switch No.	ON	OFF
1		
2		
3		
4		
5		
6		
7		
8		

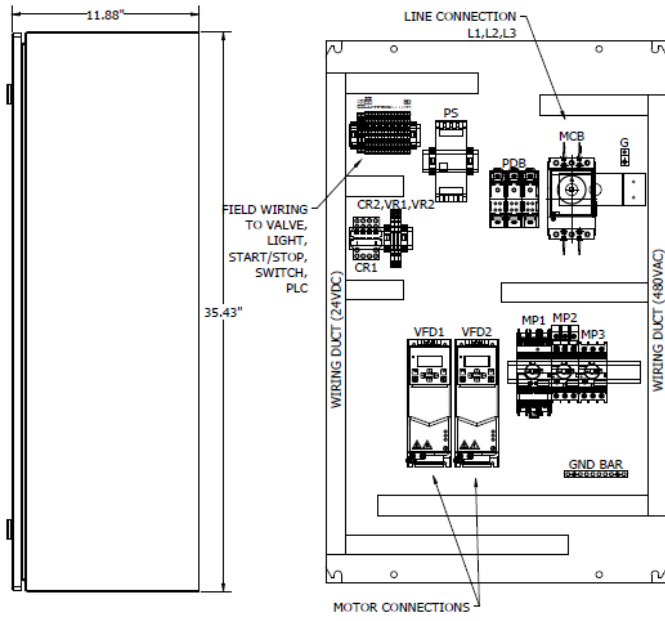
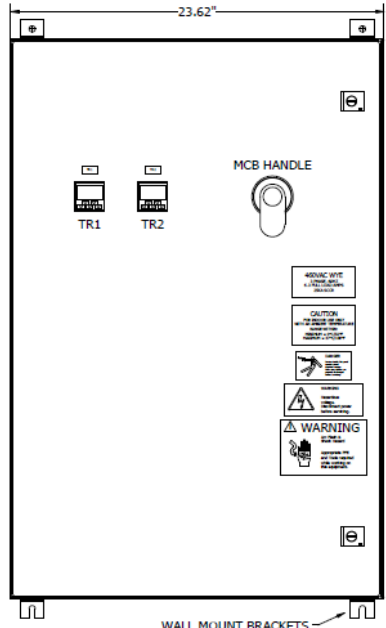
Setup mode (mark selected items by "○")

Item	Setting
Response time (start input)	1 5 10
Input logic	PoS -EG
Output mode	F P
Output time	
Range of time	
Reset key protection	Disabled Enabled
Digit key protection	1 2 3 4 (Mark Disabled with "○")

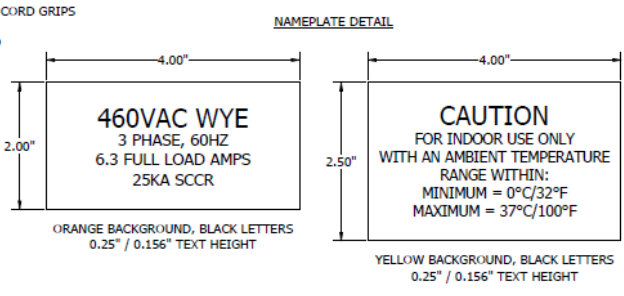
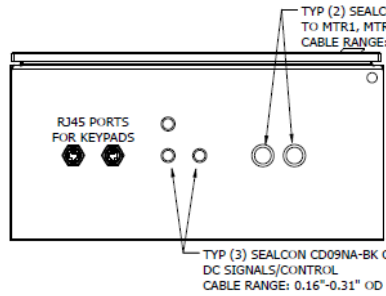
Appendix D

Electrical and Dimensional drawings

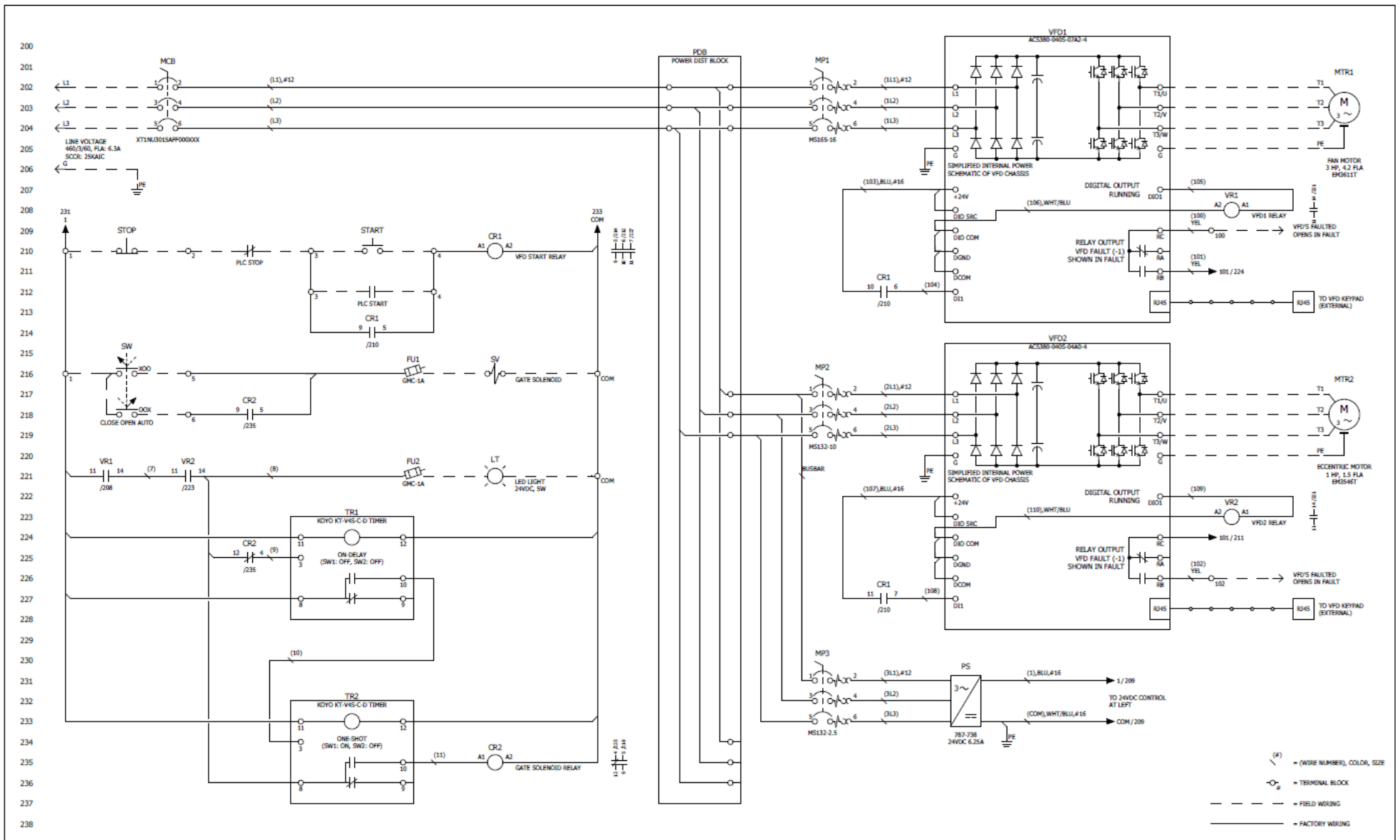
D.1 Electrical drawings



System BOM: ZECJVS486 (05/21/2020)			
Item	Qty	Part Number	Description
1	1	801370	RTTL-AMP/DC/INC
2	1	801370	RTTL-AMP/DC
3	1	801370	RTTL-AMP/DC
4	3	CD09NA-26	CORD GRIP 3/8" NPT
5	2	CD09NA-26	CORD GRIP 1/2" NPT
6	14	2000-1481	WAGO 4 CONDUCTOR B. WIRE TERM BLK-TSE
7	1	2000-1482	WAGO PWR. / INTERMEDIATE PLATE ORANGE
8	2	2000-1481	WAGO 5/32 Term Header
9	5	246-117	WAGO PWR. TERM - 1/8" Dia
10	1	353-702	WAGO 24P/20G 25AMP POWER SUPPLY
11	3	625-104	WAGO 20PT RELAY 24VDC COIL, 24V WAG
12	1	SH20-02	4P RELAY EDGE
13	1	284840-0200W	SPOT RELAY 24 VDC COIL
14	1	AC3000-040-040-4	ABB TRIP 1.25A 400V F1 Fuse
15	1	AC3000-040-040-4	ABB TRIP 4.5A 400V F1 Fuse
16	3	8956-04	Automation Device PCB, 175 amp
17	2	CR2-VR1	Resistor 1/4W
18	1	CR2-VR2	Resistor 1/4W
19	1	CR1	Resistor 1/4W
20	1	CR2-VR1	Resistor 1/4W
21	1	CR2-VR2	Resistor 1/4W
22	1	CR1	Resistor 1/4W
23	1	CR2-VR1	Resistor 1/4W
24	1	CR2-VR2	Resistor 1/4W
25	1	CR1	Resistor 1/4W
26	1	CR2-VR1	Resistor 1/4W
27	2	CR2-VR2	Resistor 1/4W
28	1	CR1	Resistor 1/4W
29	1	CR2-VR1	Resistor 1/4W
30	1	CR2-VR2	Resistor 1/4W
31	1	CR1	Resistor 1/4W
32	1	CR2-VR1	Resistor 1/4W
33	1	CR2-VR2	Resistor 1/4W
34	2	CR1	Resistor 1/4W
35	1	CR2-VR1	Resistor 1/4W
36	1	CR2-VR2	Resistor 1/4W
37	1	CR1	Resistor 1/4W
38	1	CR2-VR1	Resistor 1/4W
39	1	CR2-VR2	Resistor 1/4W
40	1	CR1	Resistor 1/4W
41	1	CR2-VR1	Resistor 1/4W
42	1	CR2-VR2	Resistor 1/4W
43	1	CR1	Resistor 1/4W
44	1	CR2-VR1	Resistor 1/4W
45	1	CR2-VR2	Resistor 1/4W
46	1	CR1	Resistor 1/4W
47	1	CR2-VR1	Resistor 1/4W
48	1	CR2-VR2	Resistor 1/4W
49	1	CR1	Resistor 1/4W
50	1	CR2-VR1	Resistor 1/4W
51	1	CR2-VR2	Resistor 1/4W
52	1	CR1	Resistor 1/4W
53	1	CR2-VR1	Resistor 1/4W
54	1	CR2-VR2	Resistor 1/4W
55	1	CR1	Resistor 1/4W
56	1	CR2-VR1	Resistor 1/4W
57	1	CR2-VR2	Resistor 1/4W
58	1	CR1	Resistor 1/4W
59	1	CR2-VR1	Resistor 1/4W
60	1	CR2-VR2	Resistor 1/4W
61	1	CR1	Resistor 1/4W
62	1	CR2-VR1	Resistor 1/4W
63	1	CR2-VR2	Resistor 1/4W
64	1	CR1	Resistor 1/4W
65	1	CR2-VR1	Resistor 1/4W
66	1	CR2-VR2	Resistor 1/4W
67	1	CR1	Resistor 1/4W
68	1	CR2-VR1	Resistor 1/4W
69	1	CR2-VR2	Resistor 1/4W
70	1	CR1	Resistor 1/4W
71	1	CR2-VR1	Resistor 1/4W
72	1	CR2-VR2	Resistor 1/4W
73	1	CR1	Resistor 1/4W
74	1	CR2-VR1	Resistor 1/4W
75	1	CR2-VR2	Resistor 1/4W
76	1	CR1	Resistor 1/4W
77	1	CR2-VR1	Resistor 1/4W
78	1	CR2-VR2	Resistor 1/4W
79	1	CR1	Resistor 1/4W
80	1	CR2-VR1	Resistor 1/4W
81	1	CR2-VR2	Resistor 1/4W
82	1	CR1	Resistor 1/4W
83	1	CR2-VR1	Resistor 1/4W
84	1	CR2-VR2	Resistor 1/4W
85	1	CR1	Resistor 1/4W
86	1	CR2-VR1	Resistor 1/4W
87	1	CR2-VR2	Resistor 1/4W
88	1	CR1	Resistor 1/4W
89	1	CR2-VR1	Resistor 1/4W
90	1	CR2-VR2	Resistor 1/4W
91	1	CR1	Resistor 1/4W
92	1	CR2-VR1	Resistor 1/4W
93	1	CR2-VR2	Resistor 1/4W
94	1	CR1	Resistor 1/4W
95	1	CR2-VR1	Resistor 1/4W
96	1	CR2-VR2	Resistor 1/4W
97	1	CR1	Resistor 1/4W
98	1	CR2-VR1	Resistor 1/4W
99	1	CR2-VR2	Resistor 1/4W
100	1	CR1	Resistor 1/4W



F	Field Modifications	05/21/20	JRP	Oliver Manufacturing Plug and Play ZECJVS486	Created by:	JRP	Palmer DCS 2810 South Raritan St Englewood, CO 80110 (720)484-8547		Panel Layout Type 12 VFD control panel	Drawing number 18437-01
Rev	Description	Date	By		Date:	4/6/2020				
				Customer:	AAP Automation, Inc.	PO:	6173066			



F	Field Modifications	05/21/20	JRP
Rev	Description	Date	By

Oliver Manufacturing
Plug and Play ZECJVS486

Customer: AAP Automation, Inc. PO: 6173066

Created by: JRP
 Date: 4/6/2020
 Approved by: JQ

Palmer DCS
 2810 South Raritan St
 Englewood, CO 80110
 (720)484-8547



Wiring Schematic
 Type 12
 VFD control panel

Drawing number
18437-01
 Page: 2 of: 3

VFD1 (Fan) Parameter Settings			
Par	Name	Set to	(Default)
11.5	DIO1 configuration	Digital output	Input
11.6	DIO1 output source	Running	Not energized
21.3	Stop mode	Coast	Ramp
21.19	Scalar start mode	Automatic	Const time
22.11	Ext1 speed ref1	Control panel (ref copied)	AI1 scaled
28.11	Ext1 frequency ref1	Control panel (ref copied)	AI1 scaled
28.71	Freq ramp set selection	Acc/Dec Time 1	Acc/Dec time 1
28.72	Freq acceleration time 1	2.000 s	3.000 s
28.73	Freq deceleration time 1	5.000 s	3.000 s
30.13	Minimum frequency	9.00 Hz	-60.00 Hz
-	-	-	-
96.1	Language	English	Not selected
96.16	Unit selection	0b0001 0101	0b0000
99.6	Motor nominal current	See dwg	-
99.9	Motor nominal speed	See dwg	-
99.10	Motor nominal power	See dwg	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
Once all settings are in, set parameter 96.02 parameter lock code to: 358			

Label keypad 'VFD1'

- During power up and setup on the timers, adjust timers from NPN inputs to PNP:
- Set DIP switch to Setup mode: 8 = ON
 - Toggle RST button to "Input Logic Settings" screen
 - Change from "nEG" to "PoS"
 - Hit RST button
 - Power down
 - Set DIP switch to Run mode: 8 = OFF

VFD2 (Eccentric) Parameter Settings			
Par	Name	Set to	(Default)
11.5	DIO1 configuration	Digital output	Input
11.6	DIO1 output source	Running	Not energized
21.3	Stop mode	Coast	Ramp
21.19	Scalar start mode	Automatic	Const time
22.11	Ext1 speed ref1	Control panel (ref copied)	AI1 scaled
28.11	Ext1 frequency ref1	Control panel (ref copied)	AI1 scaled
28.71	Freq ramp set selection	Acc/Dec Time 1	Acc/Dec time 1
28.72	Freq acceleration time 1	2.000 s	3.000 s
28.73	Freq deceleration time 1	5.000 s	3.000 s
30.13	Minimum frequency	36.00 Hz	-60.00 Hz
30.14	Maximum frequency	52.00 Hz	60.00 Hz
96.1	Language	English	Not selected
96.16	Unit selection	0b0001 0101	0b0000
99.6	Motor nominal current	See dwg	-
99.9	Motor nominal speed	See dwg	-
99.10	Motor nominal power	See dwg	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
Once all settings are in, set parameter 96.02 parameter lock code to: 358			

Update VFD2 keypad to display motor speed:

Options -> edit home screen -> select the top display

Parameter: Motor Speed Estimate

Min - 0

Max - 1521

Scale

Min - 0

Max - 600

Units - RPM

Label keypad 'VFD2'

F	Field Modifications	05/21/20	JRP
Rev	Description	Date	By

Oliver Manufacturing
 Plug and Play ZECJVS486
 Customer: AAP Automation, Inc. PO: 6173066

Created by: JRP
 Date: 4/6/2020
 Approved by: JQ

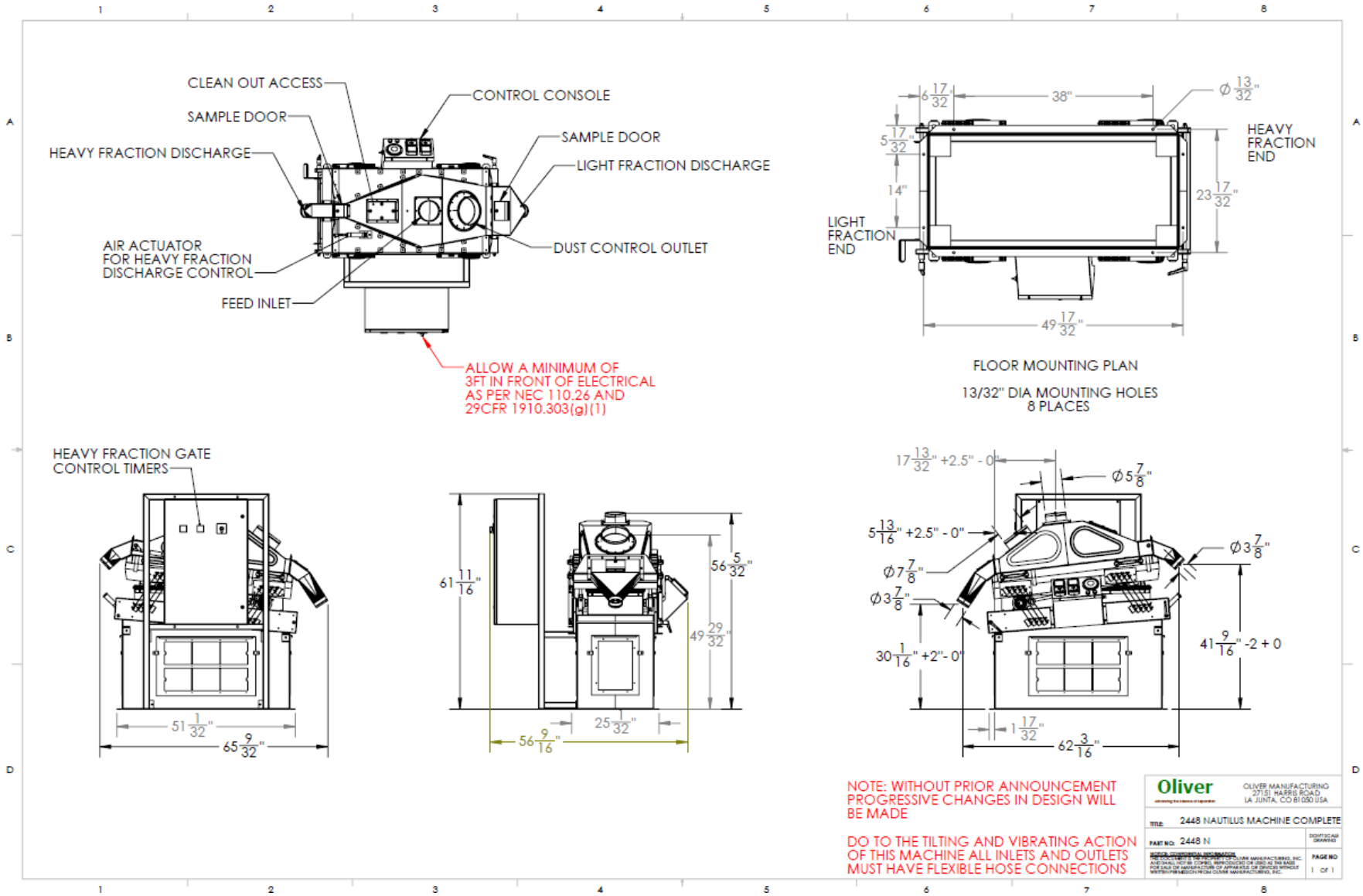
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VFD Parameters
 Type 12
 VFD control panel

Drawing number
18437-01
 Page: 3 of: 3

D.2-DIMENSIONAL LAYOUT DRAWINGS



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