CP6050 VIBRATORY CONTROL SYSTEM

INSTALLATION, OPERATION & MAINTENANCE MANUAL

PLEASE READ THOROUGHLY BEFORE ATTEMPTING INSTALLATION

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GENERAL INTRODUCTION

Dear Customer

Thank-you for buying your equipment from Cox & Plant Products Ltd.
This manual will help you understand how your equipment operates and what is required to maintain peak performance. Please read it carefully and keep it on file for reference.

The directions for use include lists of spare and wearing parts as well as descriptions of mounting and maintenance procedures for use in your daily operation. If the need should arise we recommend that you use only genuine Cox & Plant Products Ltd replacement parts. When ordering please specify the SERIAL NUMBER of your machine (usually found on the DATA LABEL mounted on the reaction base).

The serial number is extremely important in order for us to provide you with the correct parts.

If more complicated repairs are necessary, we ask you kindly to contact Cox & Plant Products Ltd for engineer assistance.

All technical details of your Cox & Plant Products Ltd equipment are filed at our Head Office.

In case any machine fault is stated before taking the machine into use or transport damage has occurred, notice should be given to us. The extent of the guarantee covering the Cox & Plant Products Ltd equipment appears from the ”Conditions of Sales and Delivery for Cox & Plant Products Ltd.”

The Cox & Plant Products Ltd equipment is constantly subject to tests and improvements for which reason we reserve the right to make construction modifications. Moreover, our directions for use include documentation and descriptions of optional extras, if any, for which reason the configuration of your equipment in some respects can diverge from the information of this manual.

For your guidance, the documentation and description included in our directions for use should not be submitted to any third party without the consent of Cox & Plant Products Ltd.

Your complete satisfaction is important to us, so please forward any comments to our Technical Services department.

Yours faithfully

Cox & Plant Products Ltd.

SAFETY PRECAUTIONS

Most accidents can be avoided by observing certain precautions. Read and take the following precautions before assembly, operation or maintenance of this equipment to help prevent accidents. Equipment assembly, operation and maintenance should be performed only by those who are responsible and are instructed to do so.

WARNING:
In the interest of safety, never perform maintenance work on any of the equipment while it is running. Prior to commencing maintenance work, always isolate the equipment.

Read and take the following precautions before assembly, operation or maintenance of this equipment.

1. Assembly, operation and maintenance of this equipment should only be performed by suitably trained and qualified personnel.

2. Always place warning signs on the electrical control panels to prevent the accidental operation of equipment.

3. Never perform any maintenance or connections on the equipment without the electrical power being isolated (locked out).

4. Never operate equipment without guards.

5. Observe warning signs at all time.

6. All electrical connections should be made only by qualified personnel. (Failure to do so may result in damage, which is not covered under the guarantee)

7. Before connecting the unit to the power source, check that the operating voltage of your unit (usually 240V single phase 50Hz) is the same as the local power line voltage.

8. Ensure that the pressure is relieved from any pneumatic hoses and equipment prior to disconnection (applicable to conveyors only fitted with pneumatic gates).

9. Always install emergency stop buttons in obvious locations that have easy access and are near potential hazards. All emergency stop buttons should be clearly marked and functioning correctly. Immediately report malfunctions.

10. Beware of all pinch/nip points and unguarded moving machinery.

11. Never stand on the conveyor.

12. Never attach additional weight to the conveyor tray other than for the purpose it is designed for – conveying product.

INSTALLATION

NOTE!
TO ENSURE CORRECT INSTALLATION WE ADVISE THAT THIS IS DONE BY A QUALIFIED COX AND PLANT SITE ENGINEER.

1. Check for any visible signs of damage upon receipt of the equipment in order to ensure the correct claims procedure.
Immediately report any damage to Cox and Plant Products Ltd or the transport company.

2. On receiving your conveyor, the control panel and conveyor should be carefully unpacked removing any protective covering, tape, shipping blocks and packing bands etc.

CAUTION!
DO NOT LIFT THE UNIT BY THE TRAY. THIS WILL DISTORT AND DAMAGE THE LEAF SPRINGS.
DO NOT LIFT THE CONVEYOR UNDER THE REACTION BASE IF A SUPPORT STAND IS FITTED.

3. Lifting procedure
Conveyors may be delivered to site fitted to the support stand (if supplied) or separately. Lifting should always be from underneath the reaction base or the support stand at the recommended lifting points (see **FIG 2**).

IMPORTANT!
It is the forklift truck driver's responsibility to ensure the conveyor is stable during lifting and that no damage occurs to the anti-vibration mounts, or any electrical items fitted to the conveyor.

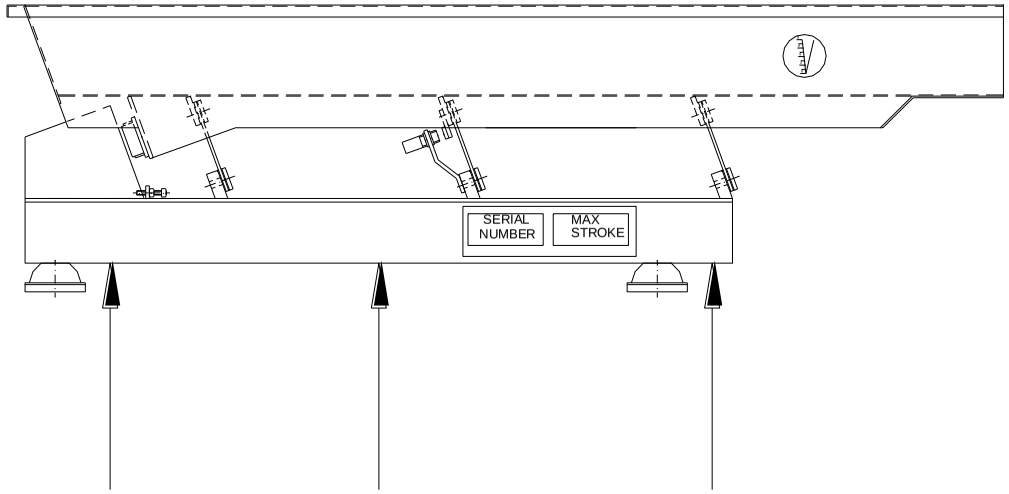
NOTE!
DAMAGE TO ANY EQUIPMENT IS NOT VALID UNDER THE GUARANTEE

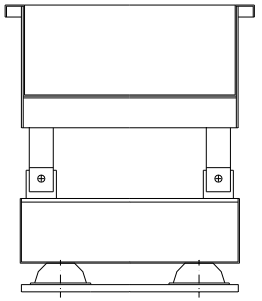
4. Site positioning
In situations where the conveyors are to be floor mounted then the floor should be as flat and as level as possible. In the case of an uneven floor then the conveyor should be levelled up correctly in the direction of flow and across its width using packers under the support stand feet.

NOTE!
Failure to ensure the conveyor is level will affect the product flow. When the conveyor is levelled up it can be bolted down using expansion bolts.

NOTE!
It is the customer's responsibility of ensuring correct installation of expansion bolts. Never force the feet down to the floor thus twisting the support stand and inducing stresses that may damage the conveyor.

Fig. 2





RECOMMENDED LIFTING POINTS UNDER REACTION BASE.

CAUTION!
DO NOT LIFT UNDER THE REACTION BASE IF A SUPPORT STAND IS FITTED.

IMPORTANT!
IT IS THE FORKLIFT TRUCK DRIVERS RESPONSIBILITY TO ENSURE THE CONVEYOR IS STABLE DURING LIFTING AND THAT NO DAMAGE OCCURS TO THE ANTI-VIBRATION MOUNTS OR ANY ELECTRICAL ITEMS FITTED THE THE CONVEYOR.

NOTE! DAMAGE TO ANY EQUIPMENT IS NOT VALID UNDER THE GUARANTEE

COX & PLANT
ADVANCED WORLDWIDE CONVEYING SOLUTIONS SINCE 1973

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1.0 DESCRIPTION OF EQUIPMENT

SYSTEM OVERVIEW

The CP6050 controller is a specially designed electronic control system for use on vibratory conveyors using electromagnets as the prime mover. The vibratory conveyors are used to move product of various forms at a set speed independent of the amount of product on the conveyor. The conveyor runs at a natural resonant frequency typically 23Hz.

The control unit enclosure is manufactured from stainless steel. The outer door has a lockable handle to give a minimum lifetime seal to IP66. On the side of the box an isolator is fitted with a facility to padlock it in the off position.

The control system comprises the main control unit, an electromagnet fitted to the conveyor and a solid-state vibration sensor to provide feedback to the control panel.

The CP6050 controller is divided into 2 circuit boards the main control PCB forms the hub of the control system, this contains all of the signal collecting and data processing functions required for the system to function, and provides the drive output to control the magnet operation through the separate off board solid state drive output. The other PCB is the CP6010 display PCB that is mounted either onto the main control PCB or onto the rear of a panel door as shown below to provide the operator interface display and controls.

1.1 CP6050 FRONT PANEL LAYOUT

CP6050 ENCLOSURE WITH DOOR REMOVED

1.2 STROKE AMPLITUDE CONTROL

This control determines the amount of vibration required when local operation is selected (see section 1.3).

1.3 LOCAL/MANUAL/REMOTE TOGGLE SWITCH

This has 2 functions one is to select the source of the amplitude control, this can either be local' via the 'stroke amplitude control' on the front panel, or 'remote', possible sources of remote are: -

a) 0-10V remote signal
b) 4-20 mA remote signal
c) Remote 10k potentiometer
d) Automatic flow control

The other option is the centre 'manual' setting on the toggle switch this will run the conveyor directly without the need for an external run signal and revert the stroke control to the local front panel position. This setting can also be used as a manual inhibit to stop the conveyor, this function is set via the dip switch (see section 3.7).

The above remote options are selected using the internal 'options setting' 8-way DIL switch located on the main PCB see section 3.7 for settings.
The local/remote toggle switch can also be used to reset the system when a fault condition occurs; this is achieved by moving the switch to a different position and back to its original setting.

1.4 'SUPPLY ON' INDICATOR

This is a green LED and indicates that the control system is powered up.

1.5 'SYSTEM FAULT' INDICATOR

This is a yellow LED and indicates that a problem has been located by the system,
To recover from this condition the front panel local/remote toggle switch can be used to reset the system, this is achieved by moving the switch to a different position and back to its original setting.
If a fault persists then please record the exact display given, then power down the control unit for a period of 10 seconds and then reapply power. If the unit does not respond then please refer to section 3.8.

1.6 'RUN' INDICATOR

This is a green LED and indicates that the conveyor is in a normal operating condition.

1.7 `INHIBIT' INDICATOR

This is a red LED indicating that the conveyor is halted for one of three reasons: -
a) The run signal is not present at the terminals of the main PCB.
b) The control system is still initiating after power up (approx 10 seconds).
c) A fault condition has been located that prevents the conveyor from operating.

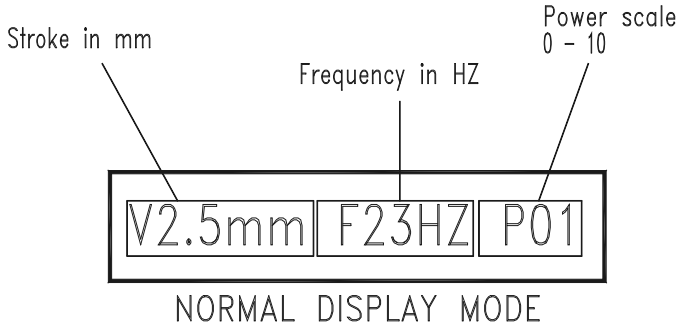
1.8 LCD DISPLAY

The display provides the user interface for the system and as such has been designed with simplicity in mind, the display provides the following information and facilities: -

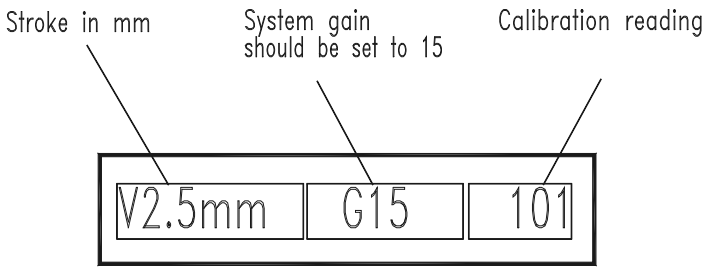
1.9 LCD DIPLAY FORMAT

A 16-character LCD display is incorporated on the display PCB; this provides the user with the following information

Normal display mode: -
Stroke in mm
Frequency in Hz
Power level in a scale of 0-10.



NORMAL DISPLAY MODE



DIAGNOSTIC MODE

Diagnostic display mode: -
Stroke in mm
System gain
Calibration setting

Should you need to contact COX AND PLANT PRODUCTS please record the LCD display readings and any fault Symptoms.

2.0 INSTALLATION OF EQUIPMENT

WARNING! – <u>Under no circumstance should welding be carried out without disconnecting TB 1-4 terminal block connectors from the CP6050 control card. Failure to do so may result in damage to the magnet drive coil or control box electronics and Cox and Plant Products Ltd cannot accept any responsibility for the resultant damage.</u>

When the control panels are installed the following points should be considered: -

2.1 MOUNTING OF CONTROL BOXES

The control panels should be mounted such that no extraneous vibration can affect the long-term reliability of the controller. The preferred method is to mount the panels on rigid support framework or walls, but if they have to be mounted on frames subject to small amounts of vibration then it is recommended that anti vibration mounts are used to limit the forces to that specified in EES 1980 TYPE TESTING OF ELECTRONIC MODULES.

2.2 MOUNTING OF SENSORS

The sensor should be mounted onto the support arm provided on the conveyor and set to a gap of 10mm from the face of the magnet to the face of the sensor.

2.3 EQUIPMENT WIRING

The equipment should be wired by competent personnel and wired in accordance with the latest IEE regulations. Notice should be taken of the customer's codes of practice and other special health and safety precautions relating to such equipment.
Any holes made in the control panels shall be fitted with the correct size glands or fittings using sealing washers to retain the IP66 sealing of the panel. Where flexible cables are connected into the panel they shall be sealed with compression type weatherproof glands.
The sensor connection along with the run input signal and the 240V AC power supply input will be terminated onto the DIN rail terminals as provided.
Din rail connections are also provided to fit up to 2 electromagnets.
Any remote control of stroke amplitudes will be directly connected to TB4 on the main CP6050 PCB. See sections 3.2-3.4 for details.

Voltage free contacts are provided to signal to other equipment and conveyors in a line to signal 'run' and fault, the contacts are connected terminals din rail and are rated at 0.5A 48v dc resistive, see the system wiring drawings enclosed for terminal markings.

2.4 SPECIFICATION

Control Box Operating Voltage: 240V AC Single Phase 50Hz
Power Consumption: Maximum 16 Amps
Weight: 12Kg
Dimensions: 420mm x 410mm x 180mm
Operating Temperature: -10ºC TO +40ºC

3.0 COMMISSIONING

The equipment should reach the customer fully set up and in good condition, any signs of damage should be reported immediately.
If all system wiring to main supply, sensor and drive magnets has been completed the unit may be powered up for an initial system test, prior to this test the toggle switch should be set to 'local' and the stroke control turned to approximately half way.
On applying power the 'power on led' and 'inhibit led' should be lit and a display message of 'INITIALISING V1A' should be displayed, after 8-10 seconds the display will change either to an inhibit message or the normal operator display, if inhibit is shown then the unit is waiting for an external signal to run, in this case then either set the external equipment to run or which the toggle switch to the centre manual position, the conveyor should now operate at a stroke determined by the front control panel.

3.1 SETTING THE STROKE

For new installations and sensor replacement (Read in conjunction with Fig 1 diagram -section **4.2 GENERAL CONSTRUCTION OF VIBRATORY CONVEYORS**)
Check the maximum stroke by reading the data label fitted to the reaction base, this will normally be in mm typically 4mm or 6mm, locate SW2 on the main CP6050 PCB (see system wiring drawing for location), this is a rotary switch with a range of 0-9, turn the switch until the arrow points to the stroke number that corresponds with the maximum stroke number reading on the data label. Turn the stroke control knob fully anti-clockwise. Power up the system & slowly turn the stroke control knob fully clockwise, ensuring the drive coil magnet & puller bar (`I' piece) do not foul i.e. `Hammer'.
If `Hammering' does occur then immediately turn the stoke control knob anti-clockwise until the `Hammering' stops.
Adjust VR5 (on main PCB) by turning it anti-clockwise approximately 4 complete turns. Turn the stroke control knob fully clockwise, then adjust VR5 by turning it clockwise until the conveyor maximum stoke shown on the data label matches the measurement on the amplitude indicator & LCD display. Check the 2 vibrating lines on the amplitude indicator intersect at the same stroke.

3.2 SYSTEM CHECKS

If it is suspected that a problem exists, first visually check that no wires have come loose and that the circuit breakers have not tripped, after which the following procedures can be followed to recheck the equipment or re-commission it after spares replacement.

Check supplies

Turn on the unit and check that the 'supply on' indication is lit, if not check that there is 240V AC present in the panel and at the main input PCB terminals, if power is available then check that the sensor cable connection between the main PCB and the conveyor mounted sensor is not damaged. Also check that the LED on the sensor is lit once supplies have been established on the controller, if not then check the sensor connections. If no reason is found then replace the sensor.

Check inhibit/run signal

Check that the conveyor is in the run condition (green run LED on display) and that the conveyor amplitude increases when the stroke control is turned clockwise.

3.3 REMOTE STROKE CONTROL POTENTIOMETER

If it is required to fit a stroke control either onto the control cabinet or remotely close to the conveyor a 10k linear potentiometer may be fitted, this should be wired into terminals 3, 4 and 6 with the wiper connected to 6, low side to 3 and high side to 4, if when tested the stroke control operates backwards then reverse connections to 3 and 4.

3.4 FITTING INSTRUCTIONS FOR A 0-10V INPUT

In the case of systems where the stroke control is connected to a remote 0-10V control signal, the connectors required are as follows: -

TB4 term 3 to the 0V side of the input signal.
TB4 term 6 to the 0-10V side of the input signal.

Check that the option switches are set for 0-10V operation.

POS3 = OFF
POS4 = OFF

NOTE: -The 0-10V signal should be electrically isolated from the remote system supply due to differences in polarity and voltage levels occurring between the two systems, under no circumstances should the 10V output be greater than 15V or damage can occur.

CALIBRATING REMOTE INPUTS -

This should only be carried out once the conveyor operates correctly in local mode.

To calibrate remote stroke control signals after following the connection and set-up instructions above: -

A. Turn on option switch one to put the unit into diagnostic display mode.

B. Set the front panel toggle switch set to the remote setting and run the conveyor.

C. With the remote source set to maximum adjust VR4 so that the calibration reading on the far right of the display reads ‘101’.

D. Turn OFF option switch one.

3.5 FITTING INSTRUCTIONS FOR A 4-20 mA INPUT

Note. It is recommended that the 4-20 mA signal be electrically isolated from its source.

In the case of systems where the stroke control is connected to a remote 4-20mA control signal, the connections required are as follows: -

TB4 term 3 to the 0V side of the input signal.
TB4 term 6 to the 4-20mA side of the input signal.

Check that the option switches are set for 4-20mA operation (see section 3.7)

POS3 = ON
POS4 = ON

CALIBRATING REMOTE INPUTS -
This should only be carried out once the conveyor operates correctly in local mode.

To calibrate remote stroke control signals after following the connection and set-up instructions above: -

A. Turn on option switch one to put the unit into diagnostic display mode.

B. Set the front panel toggle switch set to the remote setting and run the conveyor.

C. With the remote source set to maximum adjust VR4 so that the calibration reading on the far right of the display reads ‘101’.

D. Turn OFF option switch one.

3.6 AUTOMATICALLY SELF ADJUSTING STROKE OPERATION

Description (Switch 6 System™)
This method of operation is designed to automatically vary the stroke of the CP6050 when feeding into a weighing machine without the need for operator intervention; this provides the weighing system with a more constant flow of product whilst product is available to the conveyor. The Switch 6 System™ operates by comparing the ‘run’ time lengths received at the CP6050 run input (terminals 6 & 7 of the 12 way conductor), If the run signal is longer than 5 seconds then the conveyor stroke will be increased, if it is shorter then the stroke will be decreased. The stroke is increased or decreased by 5% in each case.
This function is enabled by settings on the option switch (see section 3.7).

3.7 OPTION SWITCH SETTINGS

The option switch is located on the main circuit board and is designed to provide a method of setting up the control system functions; the switch has eight slide options these are as follows:

POS1	-	On	= Diagnostic display option (engineers use for set-up only)
		Off	= Normal operator display.
POS2	-	On	= Soft start enabled, this limits the rate that power is applied to the conveyor to restart when a run signal is received.
POS3	-	On	= 4-20 interpretation of the remote signal, this should be use in conjunction with POS4.
		Off	= 0-10V
POS4	-	On	= 4-20mA input selected in place of 0-10V on the 0-10V terminals.
		Off	= 0-10V on the 0-10V terminals.
POS5	-	On	= Future use only set to off position
POS6	-	On	= Automatic stroke control, this is designed for when the conveyor is feeding a weighing machine to provide a more even flow of product, this option will only operate with the toggle switch set to local. **(Switch 6 System™)**
POS7	-	On	= 3 Phase drive option.
		Off	= Single-phase drive option.
POS8	-	On	= The centre manual position of the local/remote Switch is altered to be a manual inhibit for halting the conveyor.
		Off	= Centre switch position is a manual run position and will override any other inhibit signals.

3.8 FAULT FINDING

DISPLAY MESSAGES

1. Blank display no LED's lit	No power to unit or ribbon cable from main PCB to display PCB not connected, check isolator, circuit breakers and power feed in.
2. 'INITIALISING V1A'	The system is powering up, this should only last 8-10 seconds and will be followed by either a normal run status or an 'INHIBITED' message.
3. 'SYSTEM INHIBITED'	Waiting for a run signal from an external system.
4. 'MANUAL INHIBIT'	Centre manual position selected on front panel toggle switch. With inhibit option set on internal option switches. See section 3.6 if manual run required.
5. 'SYSTEM FAULT'	See fault diagnosis
6. 'FREQ TOO LOW'	See fault diagnosis

FAULT DIAGNOSIS

1. Conveyor will not start and remains with 'SYSTEM INHIBITED' message on display.

This problem is normally due to a remote device not sending the required run signal. It should be via a clean contact shorting the din rail run terminals (see system drawing for terminal numbers.) If a signal is not received, the open circuit voltage across the terminals will be approximately 15V. If the signal is correct the voltage should be below 0.5V to run.

2. The conveyor display shows a run status but the conveyor is not moving or attempting to move but does not show a fault condition.

The stroke required via the front panel control or from a remote source is too low for the conveyor to respond, a threshold of 5% of the stroke is required before the conveyor will respond.

3. The conveyor display shows a run status but the conveyor does not move, after a period the conveyor shows system fault.

This may be due to one of several reasons: -

A. The load circuit breaker has tripped cutting off power to the magnets.

B. The magnet has failed open circuit.

C. There is a wiring problem between the control panel and the conveyor magnet.

D. The Triac and Snubber module is faulty and needs replacing.

4. The conveyor display shows a run status the conveyor moves but the stroke reading is 0.0mm, after a period the conveyor shows system fault.

This is the normal symptom associated with a sensor related problem that indicates that although the conveyor is moving a signal is not being received from the sensor, check the voltages around the sensor, these should be: -

Black to White 0V when stationary approx. 2V ac when conveyor moving at full stroke.

Black 0V

Black to Brown +15V

Black to Blue -15V

Check these voltages both at the panel and at any junction box, if the voltages are wrong at the panel then disconnect the sensor and check at the terminals without the sensor connected if the power is restored then a

short has occurred in the sensor or its wiring. If all the voltages are correct but no signal is received on the yellow core then replace the sensor.

5. The conveyor runs with a very low stroke at a higher than normal frequency e.g. 50Hz this may also occur even when run is not selected.

This is normally due to Triac failure. Replace the Triac and Snubber assembly.

6. Unstable running of conveyor

This can be due to many factors the following are common: -

A. Conveyor frequency too high, frequencies of 24Hz and above can affect the stability of the conveyor, we would normally recommend a frequency not higher than 23Hz.

B. Sensor loose on its bracket, or sensor bracket vibrating due to load problems.

C. Control system fitted as an upgrade but sensor magnet not changed (this could be the wrong polarity).

D. Springs in poor condition or bolts not sufficiently tight.

E. System gain altered from normal setting of 15 (see diagnostic display and set to 15 via pre-set VR1).

F. System overloaded, check that the system is not running near level of 'P10' this can be viewed on the far right of the normal display mode.

G. Check for mechanical problems starting with loose items on the conveyor including the magnet and any sieves or fitted gates, also check for broken springs or cracks in metalwork and support frame, or any mechanical abrasion or contact with other objects.

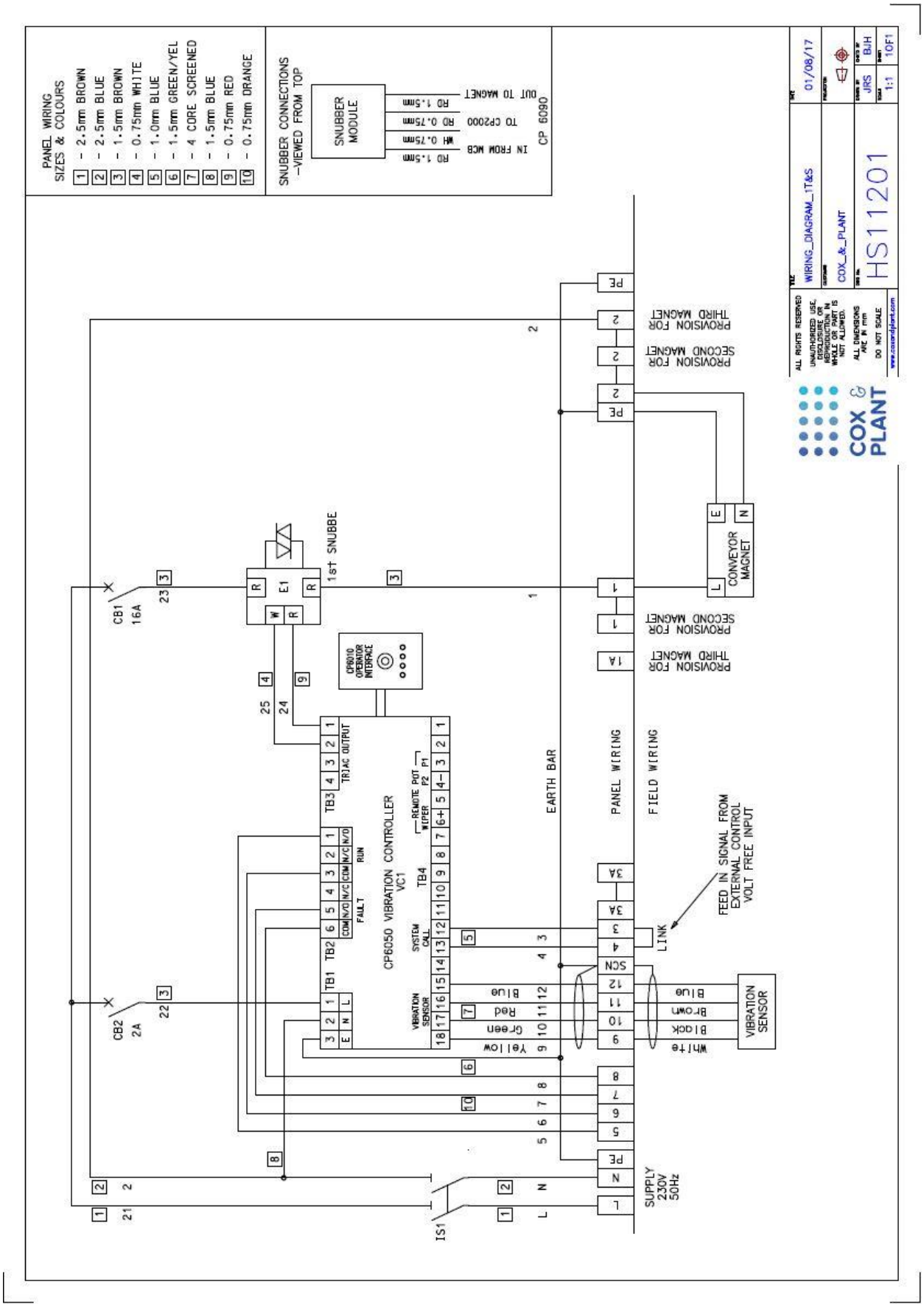
H. Check the main power supply is the correct frequency 240V single phase 50Hz

7. 'FREQ TOO LOW' Displayed on LCD

The normal reason for this is that the conveyor frequency has dropped below the normal operating range of 18-23Hz; this is because of gradual wear or breakages on the conveyor springs. We would normally recommend that the conveyor frequency is periodically checked and if it is dropping below 20Hz then replacement springs be fitted at the nearest opportunity, the conveyor frequency is displayed on the LCD display in both normal and diagnostic modes.

Note: - The conveyor should be ran for 30 seconds from power up to enable the frequency to settle before a reading is taken.

3.9 SYSTEM WIRE DRAWING



4.0 ELECTRO MAGNETIC VIBRATORY CONVEYORS

4.1 Principle of conveying by vibration

The tray of a conveyor is driven at a pre described angle, the angle depending upon the type of product being conveyed and its physical characteristics: the angle is usually 20 degrees. In operation the tray moves forward and upward and then returns to its original position. The tray propels the product forward but, since the return stroke of the tray is faster than the gravitational pull on the product, the product falls ahead of the position it occupied at the start of the cycle. As the cycle is repeated, the product moves forward in a series of short hops although to the eye it appears as a continuous uniform motion. Altering the amplitude and frequency of the vibration can vary the nature of the product flow.

Vibratory Motion

The vibratory motion is obtained from an electrically driven coil box that passes impulses to the I-piece fixed to the conveyor tray. The coil box transmits impulses to the conveyor tray on the backstroke; the return stroke is obtained from the spring action of the fibreglass leaf springs.

The fibreglass leaf springs are at a predetermined angle to give both forward and upward movement to the vibrated tray enabling the material to be moved towards the discharge end.

Amplitude of Vibration

The conveyor is designed to work at predetermined maximum amplitude, which must not be exceeded. In the unlikely event of greater amplitude being required, reference should be made to Cox & Plant Products Limited. The maximum amplitude of any given conveyor can be found marked on the label attached to the reaction base.

Check that the maximum amplitude does not exceed that shown on the label.

4.2 GENERAL CONSTRUCTION OF VIBRATORY CONVEYORS

(see Fig. 1)

Cox & Plant Products Limited electromagnetic conveyors comprise of the following elements:

1. **Conveying tray.**
2. **Reaction base.**
3. **Fibre glass leaf springs.**
4. **Anti vibration mountings.**
5. **Drive coil (Magnet) and Puller Bar ('I' Piece**)
6. **Feedback Sensor and Feedback Magnet**.
7. **Control Box & Electronic Control System.**
8. **Amplitude indicator.**
9. **Panel Isolator**
10. **Data Label**

The tray is attached through links containing fibreglass torsion leaf springs to a heavy reaction mass. The reaction mass itself is supported on resilient mountings so that the complete system represents a spring mass system with its own natural frequency of vibration. The drive unit provides impulses at a rate that causes the system to vibrate close to its natural frequency. The frequency depends upon the weights involved and the stiffness of the fibreglass leaf springs and it is therefore possible to select the frequency within certain limits, according to the application for which the machine is required.

1. Conveying Tray

The conveying tray is made of either stainless steel or polypropylene. It is suitably stiffened by the addition of support brackets so that it will withstand the effect of continuous vibration. Screening decks consisting of perforated plates, profile bar or wire mesh can be provided.

2. Reaction Base

This is designed to weigh between four to seven times as much as the tray and can be constructed in solid mild steel bar with a painted finish, fully clad in stainless steel or manufactured from stainless steel sawn bar.

3. Fibre Glass Leaf Springs

The tray is supported on fibreglass leaf springs, which can maintain a constant spring rate thus keeping the flow rate consistent.

4. Anti-Vibration Mountings

The reaction mass is supported on resilient mountings to isolate vibration from the floor or surrounding structure. The resilient support is provided by rubber cone type anti vibration mountings.

5. Drive Coil (Magnet) and Puller Bar ('I' Piece)

The drive coil is a fully potted and sealed, wound copper coil, which drives the Puller Bar ('I' Piece) that is fitted to the tray via signals from the electronic controller.

6. Feedback Sensor and Sensor Magnet

This is a Hall Effect sensing unit that via the feedback sensor magnet feeds back the amplitude of the conveyor to the control system.

7. Control Box & Electronic Control System

The electronic control system controls the amplitude, and power of the vibrating tray and coil box. This controller automatically modulates the power to give constant amplitude by using the information from the feedback sensor. The type and number of springs fitted and the weight of the tray determine the frequency of vibration. The control system is normally housed in a separate control box close to the conveyor, but it can be positioned in a main control panel or in a safe environment.

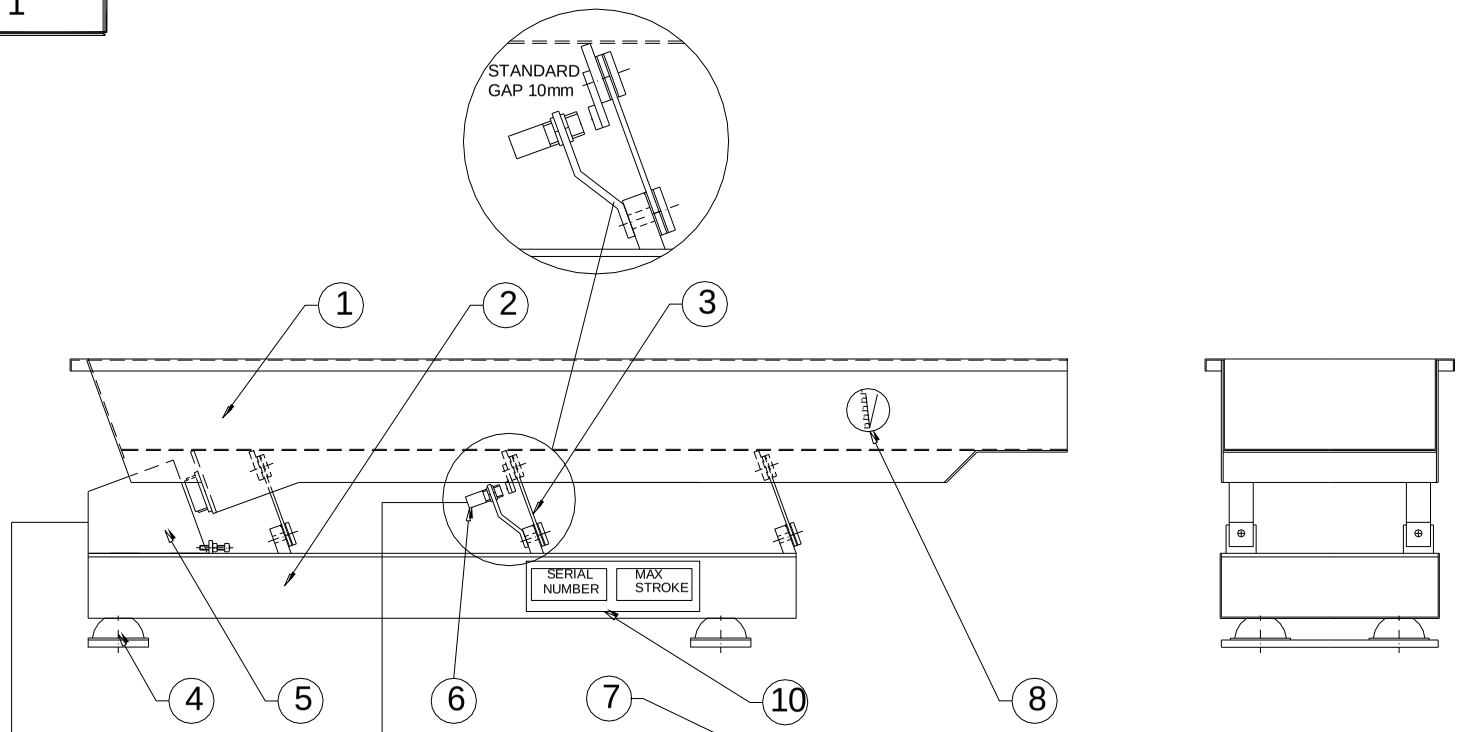
8. Amplitude Indicator
On the side of the conveying tray a disc can be found marked off in 1mm divisions of amplitude. As the conveying tray vibrates the two lines will appear to cross, where this occurs the measurement of amplitude will be indicated e.g. 4 divisions = 4mm.

9. Panel Isolator
Located on the side of the control box. This enables the power source to be isolated (locked out).

10. Data Label
Mounted on the reaction base. Stamped on it is the conveyors HS serial no, and the maximum conveyor stroke.

WARNING:
Under no circumstances should the conveyor be allowed to run above the maximum amplitude stated on the conveyor data labels. Failure to prevent this will result in permanent damage to both the tray and the fibreglass leaf springs. When running too high, amplitude causes very high stresses to develop in the fibre glass leaf springs leading to fracture and frequency loss.
Cox & Plant Products Limited cannot accept any responsibility for the resultant damage.

Fig. 1



1 CONVEYING TRAY
2 REACTION BASE
3 FIBRE GLASS LEAF SPRINGS
4 ANTI-VIBRATION MOUNTINGS
5 DRIVE COIL (MAGNET) & PULLER BAR (`I' PIECE)
6 FEEDBACK SENSOR & FEEDBACK SENSOR MAGNET
7 CONTROL BOX
8 AMPLITUDE INDICATOR
9 PANEL ISOLATOR
10 DATA LABEL

COX & PLANT

ADVANCED WORLDWIDE
CONVEYING SOLUTIONS SINCE 1973

5.0 MAINTENANCE

5.1 GENERAL MAINTENANCE

CLEANING THE CONVEYOR

Safe and proper maintenance of the vibratory conveyor is essential to the long service life and reliability you should expect.

Some products naturally adhere to the tray and hoppers. These products, if allowed to build up will add to the dead weight of the tray and influence the natural frequency of the conveyor. Product deposit build up on the tray should be checked and removed as a daily practice.

This should be done with a plastic scraper. Do not use a metal scraper.

WARNING!
Never lubricate the leaf springs. This eliminates the clamping effect of the leaf springs against their mountings.

CAUTION!
Any signs of excessive heat build up or burned components are an indication of a problem. Investigate and correct the cause immediately. This could avoid a potentially major component failure.

Drive magnet coils, under normal operational conditions should feel warm but never too hot to touch.

WARNING!
Before performing any maintenance work, the electrical power supply must be isolated (locked out)

5.2 ROUTINE MAINTENANCE

After installation and commissioning, the vibratory conveyor supplied will give long trouble free life provided preventative and or breakdown maintenance is carried out.

Daily
1.Check amplitude
2.Check any fitted screens are secure

Weekly
1.Check tray for any signs of damage i.e. cracks
2.Check any fitted screens for any signs of damage i.e. cracks
3.Check any fitted gates or diverters for signs of damage
4.Check general noise levels (excessive or unfamiliar noise usually indicates a problem)

Six monthly
1.Check condition of leaf springs.
They will give long trouble free life provided they are maintained and correctly used. Replace any cracked or damaged leaf springs as soon as possible with the recommended Cox and Plant replacements spares.

Yearly
1.Check condition of anti-vibration mounts.

5.3 CHANGING A DRIVE COIL MAGNET

NOTE! ENSURE DRIVE COIL (MAGNET) IS STAMPED WITH IDENTICAL NUMBER TO EXISTING ONE

5.3.1 Isolate the power supply and disconnect the wires
(NOTE! WIRING CONNECTIONS).

5.3.2 Remove the drive coil magnet, which is fixed with four M10 or M12 bolts.
(NOTE! THE AIR GAP DISTANCE PRIOR TO REMOVAL)

5.3.3 Reposition the new drive coil magnet having first checked that it is the same type. Slacken off the adjusting screws if required & re-tighten them after setting the drive coil magnet air gap. NOTE! If the screws are not accessible then slacken them off and re-tighten prior to installing new magnet.

5.3.4 Set the air gap distance between the `I' piece & drive coil magnet face using a suitable spacer (distance as previous magnet).

5.3.5 Tighten the four M10 or M12 bolts. M10 bolts to 60lbf.ft or M12 bolts to 80lbf.ft. Also be sure to use a washer and star washer with each bolt.

5.3.6 Set the amplitude adjustment dial to minimum (turn anti-clockwise).

5.3.7 Re-connect the wires as per old drive coil magnet or see system-wiring diagram.

5.3.8 Switch ON power.

5.3.9 Check Drive Coil Magnet does not foul Puller Bar 'I' Piece when amplitude adjustment dial set to maximum stroke.

5.4 CHANGING A LEAF SPRING

WARNING!

When changing leaf springs, ensure the earth strip is fitted. Failure to do so can result in permanent damage to the control card. Cox & Plant Products Limited cannot accept any responsibility for the resultant damage.

Replacement leaf springs must be of the same size and thickness as the existing leaf springs. Cox and Plant Products Ltd recommended changing all leaf springs rather than just one. Work on one leaf spring assembly at a time (Begin at the infeed end of the conveyor). Make a note of the location & arrangement of each leaf spring assembly.
Ensure the new leaf spring assembly is identical to the removed assembly.
When properly assembled there should be no tension or distortion on the leaf springs.

5.4.1 **LEAF SPRINGS WITH TWO FIXING HOLES,** (one at the tray and one at the base).

5.4.2 Remove the two M12 retaining bolts.

5.4.3 Fit a new leaf spring of equal thickness to the original.
(NOTE! Thickness is important as the leaf spring ply variations are very close)

5.4.4 It is recommended that new bolts & Aerotight nuts are used.

5.4.5 Tighten the M12 nuts to 70Nm.

5.4.6 After six hours running of the conveyor all the nuts should be re-torqued to 70Nm.

5.4.7 **LEAF SPRINGS WITH FOUR FIXING HOLES**, (two at the tray, two at the base)

5.4.8 Remove the four M10 retaining bolts.

5.4.9 Fit a new leaf spring of equal thickness to the original.
(NOTE! Thickness is important, as the leaf spring ply variations are very close).

5.4.10 It is recommended that new bolts & Aerotight nuts are used.

5.4.11 Before tightening the bolts check the clamping plates are correctly orientated.
i.e. Radius edges are against the leaf spring where it deflects the most.

5.4.12 Tighten the M10 nuts to 50Nm.

5.4.13 After six hours running of the conveyor all the nuts should be re-torqued to 50Nm.

5.4.14 **LEAF SPRING CARRIERS WITH 2 LEAF SPRINGS ATTACHED**

5.4.15 Remove the retaining bolts.

5.4.16 Fit a new leaf spring of equal thickness to the original. (NOTE! Thickness is important, as the leaf spring ply variations are very close)

5.4.17 It is recommended that new bolts & Aerotight nuts are used.

5.4.18 Ensure the tufnol spacer is positioned between the leaf springs before tightening the bolts.

5.4.19 Before tightening the bolts check the clamping plates (only if rectangular) are correctly orientated i.e. Radius edges are against the leaf spring where it deflects the most.

5.4.20 Tighten M10 nuts to 50Nm.

5.4.21 After six hours running of the conveyor all the nuts should be re-torqued to the figures above (**See 5.4.20**)

WARNING!

When changing leaf springs, ensure the earth strip is fitted. Failure to do so can result in permanent damage to the control card. Cox & Plant Products Limited cannot accept any responsibility for the resultant damage.

5.5 CHANGING A FEEDBACK SENSOR

5.5.1 Isolate the power supply and disconnect the wires. (Note wiring connections)

5.5.2 Remove the existing feedback sensor that is fixed in place with two thin locknuts.

5.5.3 Reposition the new feedback sensor and set to the correct gap 10mm. For 4mm or 6mm max stroke.

NOTE!
If the gap is too much then the drive coil magnet will foul the puller bar ('I' Piece). If the gap is not enough then the conveyor max stroke reduces.

IF IN DOUBT, CONTACT COX AND PLANT PRODUCTS LTD.

5.6 TROUBLE SHOOTING

A. PROBLEM – Conveyor is noisy. If the conveyor is noisy due to a mechanical fault as described then this should be corrected immediately to prevent damage to the conveyor

Cause	Corrective Action
Drive Coil magnet and 'I' Piece (Puller bar) Gap incorrect	Adjust gap 3.5mm gap for 4mm max stroke 5mm gap for 6mm max stroke 7mm gap for 8mm max stroke
Incorrect chute connections i.e. rigid	Flexible chute connection to be used preferably rubber or flexible material
Fouling fixed units	Ensure clearance
Loose nuts and bolts	Tighten to suitable torque
Loose items on conveyors i.e. gates or screens	Tighten appropriate clamping devices
Cracks in conveyor tray or leaf springs	Consult Cox and Plant Products Ltd. Replace faulty leaf springs

	(See section **5.4 CHANGING A LEAF SPRING**)
Incorrect frequency tuning	Retune (See section **3.1 SETTING THE STROKE**) or consult Cox and Plant Products Ltd
Feedback Sensor or mounting bracket is loose or wiring is damaged.	Retighten or replace sensor. (See section **5.5 CHANGING A FEEDBACK SENSOR**)
Feedback Sensor to sensor magnet gap incorrect	Reset gap (See section **5.5 CHANGING A FEEDBACK SENSOR**)

B. PROBLEM – Conveyor keeps tripping out due to overloading of product

Cause	Corrective Action
Incorrect line methodology	Revise product methodology
Level sensor devices faulty or not working	Repair or replace with an identical item
Concentrated load of product on tray	Breaker bars or deflectors required to support excessive weight/load. If in doubt consult Cox and Plant Products Ltd.

C. PROBLEM – Uneven product Movement

Cause	Corrective Action
Conveyor uneven due to incorrect installation.	Level up conveyor (See section **INSTALLATION**)
Broken leaf springs or loose bolts.	Replace leaf springs or tighten bolts (see section 5.2 Routine Maintenance). **5.4 CHANGING A LEAF SPRING**

IF IN DOUBT - CONSULT COX & PLANT PRODUCTS LTD

5.7 CLEANING AND HYGIENING

NOTE!
BEFORE COMMENCING CLEANING, ENSURE THE CONTROL PANEL DOOR IS FULLY CLOSED (SEALED) AND THE POWER SUPPLY IS ISOLATED (LOCKED OUT)

THIS SECTION IS INTENDED AS A GUIDELINE
Routine maintenance consists mainly of cleaning the equipment each day, especially the components which are in contact with the product.

When cleaning the conveyor with a high pressure water jet cleaner, or similar device, direct flushing on the drive coil magnet, control panel (IP66) and electrical components should be avoided or kept to a minimum even though they are to IP standards. **Failure to do so will result in potential problems.**

For 'wet' application cleaning (stainless steel base, tray and support stand) clean down with a high-pressure water jet, with or without detergent.

For 'dry' application cleaning stainless steel tray (mild steel painted base and support frames), clean down with a damp cloth and / or high-pressure air hose. Base and support can be cleaned with a brush, dry cloth or high-pressure air hose.

Some products have a tendency to adhere to the tray and build up over a period of time. This can be removed with a plastic scraper. Do not use a metal scraper, as it will scratch the tray surface.

When cleaning Cox & Plant equipment we recommend that you observe the following instructions:

Clean the unit by vacuum or wiping off with soft dry or wet patches. For wetting use only water or neutral cleaning agents [pH value between 5 & 8] without:

* Chlorides
* Fluorides
* Sulphates

ALWAYS COMPLETELY RINSE WITH CLEAN WATER INCLUDING NON VISIBLE UNDERSIDES.

ALWAYS OBSERVE THE MANUFACTURERS CLEANING AGENT RECOMMENDED CLEANING INSTRUCTIONS IN CONJUNCTION WITH THE EQUIPMENT MATERIALS UTILISED.