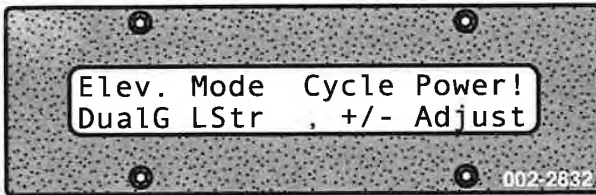


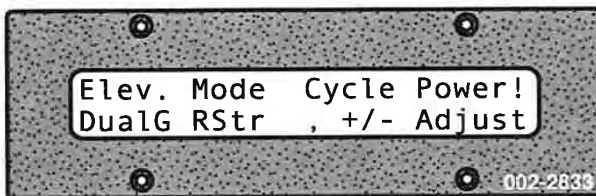
Notice: When setting guideline through a transition from a straight section of highway to a curved section of highway it is extremely important to project grade out to the guideline. An unsatisfactory product will occur when operating with dual grade or slope control if the guideline is not projected to grade.

Dual Grade Control

Note: This is the preferred method of set up when rideability specifications are a concern.



Dual Grade Display, Left Steer



Dual Grade Display, Right Steer

To operate the machine with right hand grade control, and left hand grade control, depress the calibrate switch. Scroll through the various displays until the elevation mode is indicated. Use the slope adjust switches (+ or -) to change the mode to "DualG LStr" or "DualG RStr". After the appropriate grade and steering mode settings are selected, depress the calibrate switch to return to the main screen. Refer to the Preliminary Adjustments section for final adjustment procedures.

Note: The network controller power must be cycled, turned off and restarted, to enable any changes that have been selected in the calibrate mode.

The left front leg elevation is controlled by the left front grade sensor, connected to the left front bulkhead, and the left front elevation control loop. The right front leg elevation is controlled by the right front grade sensor, connected to the right front bulkhead, and the right front elevation control loop. The front steering is controlled by the left front steer sensor, connected to the left front bulkhead, and the front steering control loop when "DualG LStr" is selected. The front steering is controlled by the right front steer sensor, connected

to the right front bulkhead, and the front steering control loop when "DualG RStr" is selected.

The left rear leg elevation is controlled by the left rear grade sensor, connected to the left rear bulkhead, and the left rear elevation control loop. The right rear leg elevation is controlled by the right rear grade sensor, connected to the right rear bulkhead, and the right rear elevation control loop. The rear steering is controlled by the left rear steer sensor, connected to the left rear bulkhead, and the rear steering control loop when "DualG LStr" is selected. The rear steering is controlled by the right rear steer sensor, connected to the right rear bulkhead, and the rear steering control loop when "DualG RStr" is selected.

Notice: When setting guideline through a transition from a straight section of highway to a curved section of highway it is extremely important to project grade out to the guideline. An unsatisfactory product will occur when operating with dual grade or slope control if the guideline is not projected to grade.

09 Pre-Pour Adjustment



Machine parallel to guideline (steering)

WARNING!

BE CERTAIN THAT THE AREA IN FRONT OF, AND BEHIND THE MACHINE IS CLEAR BEFORE MOVING THE MACHINE. BE CERTAIN THAT THE AREA AROUND THE MACHINE IS CLEAR BEFORE TURNING THE MACHINE. CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

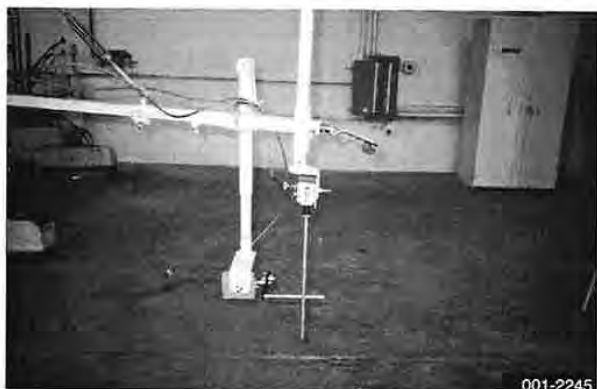
Manually move the machine into position along the guideline. Steer the front and rear tracks of the machine left or right as necessary until the side of the

form sideplate is near the correct offset distance from the guideline. Stop the machine when the side of the form is parallel to the guideline. Place the front and rear tracks to the straight ahead position.



Machine parallel to guideline (grade)

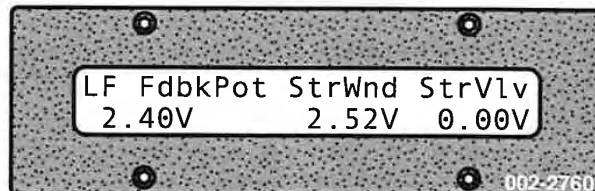
Lower the machine evenly, using the jog switches, until the front and rear of the sideplate on each side of the form, is just touching the subgrade. Shut off the engine, turn the ignition key to the "on" position and place the Forward/Reverse switch in the "Forward" position.



Adjust Steer Sensors

Preliminary sensor adjustment: It is advisable to screw the adjustable steering sensor mount out (clockwise), with the crank in the end of the sensor arm assembly, 3 to 4 inches (76 to 100 mm) before making sensor adjustments. This will allow for minor steering adjustments if needed. Place the steering sensor wands on the machine side of the line. Turn the sensor L-shaped mount bracket until the shaft through each of the steering sensors is parallel to the guideline. Adjust the front steering sensor left or right (in or out) until the steering wand is perpendicular to the guideline. If a large amount of adjustment, 1 inch (25 mm) or more, is necessary to adjust the steering wand perpendicular, loosen the set screws in the sensor mount and adjust the sensor arm assembly in or out as needed. Tighten both set screws securely.

(Save crank adjustment for "fine tuning" adjustments). Adjust the front and rear steering sensors to the guideline in the same manner.



Test Display used to center steer sensor

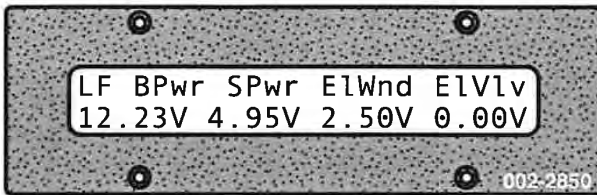
To calibrate the steering sensors, it will be necessary to depress the test switch. Depress the NEXT/LAST switches until the appropriate display appears for the front steer sensor on the main screen. Place the steer select switch in the "auto" position and make sure the forward/reverse switch is in the "forward" position. With the steering sensor centered, the display should read "StrWnd 2.50V." If the steering sensor centering signal reads more or less than "2.50V", adjust the steering sensor in or out with the crank adjustment on the sensor mount until it reads "2.50V". Depress the NEXT/LAST switches until the appropriate display appears for the rear steer sensor. Adjust the rear steer sensor in the same manner.



Adjust Grade Sensors to Guideline

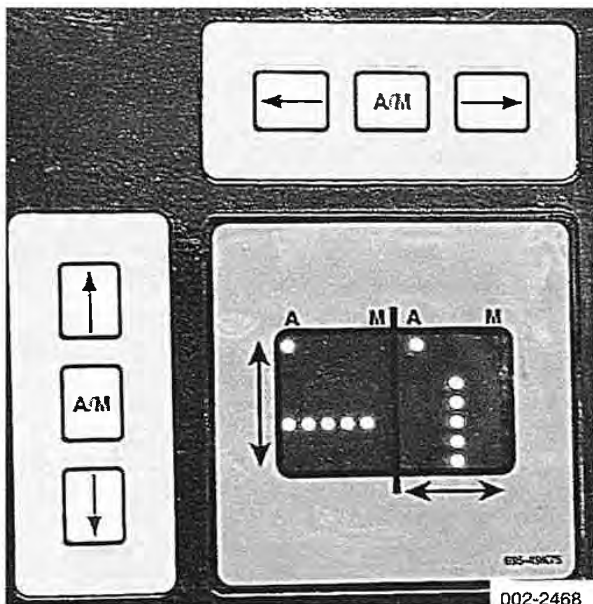
It is advisable to screw the adjustable grade sensor jack mount out (clockwise), with the crank on the end of the grade jack assembly, 6 inches (150 mm) before making sensor adjustments. Place the grade sensor wand under the guideline. Turn the sensor L-shaped mount bracket until the shaft through the grade sensor is at a 90 degree right angle to the guideline. Adjust the grade sensor up or down until the grade arm is parallel to the guideline. If a large amount of adjustment is necessary to adjust the grade arm, loosen the set screws in the grade sensor jack and raise or lower the jack as needed. Tighten both set screws securely. Loosen the L-shaped clamp bolt in

the grade jack assembly and slide the jack left or right until the grade sensor wand is centered beneath the guideline. Tighten the clamp bolt securely. Loosen the set screw in the steering sensor square tube mount and slide the sensor assembly up or down until the guideline is approximately 10 to 12 inches (250 to 300 mm) from the sensor shaft. Tighten the set screw securely. The sensor mounts should be adjusted until there is no less than 1/4 inch (6 mm) and no more than 1-1/2 inch (38 mm) between the sensor wands.



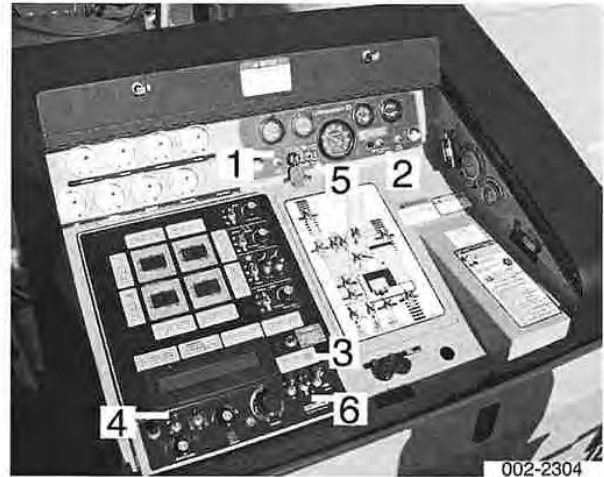
Test display used to center grade sensor

To calibrate the grade sensors, it will be necessary to depress the test switch. Depress the NEXT/LAST switches until the appropriate display appears for a grade sensor on the main screen. With the grade sensor centered, the display should read "ElWnd 2.50V." If the grade sensor centering signal reads more or less than "2.50V", adjust the appropriate grade sensor up or down with the crank adjustment on the sensor mount until it reads "2.50V". Depress the NEXT/LAST switches until the next grade sensor voltage reading appears on the main screen. Adjust all grade sensors in the same manner.



Adjust Slope Setpoint

If slope control is to be used, adjust the proper slope into the machine and observe the slope control loops. Depress and hold the appropriate slope setpoint switch until the indicator LED arrow on either the front or rear slope control loop centers. Setting the slope setpoint in this manner assumes that the slipform mold has been lowered so that the sideplates just contact the grade.



Controls set to move forward

⚠ WARNING! ⚠

CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACK BEFORE MOVING IT. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS TO PREVENT SEVERE INJURY.

Depress the start assist switch and start the engine (1). Depress the emergency stop reset switch to set the emergency stop system for operation (2). Place the control system in "run" by depressing the run/standby switch (3). Place the servo lock switch in the "off" position (4). Increase the engine speed to maximum (5). Place the two speed switch in the "slow" position and the forward/reverse travel switch in the forward "F" position (6). Place the travel/neutral switch in the "travel" position and slowly move the travel variable speed control dial clockwise to start machine movement (6). Move forward 20 to 30 ft. (6 to 9 m) and stop the machine.



Measure grade between line and frame

Place a straight edge under the end car frame just to the rear of the front swinging leg and hold it tight against the bottom. Extend the straight edge out over the guideline and measure the distance between the top of the straight edge and the guideline. Record this measurement.

Place the straight edge under the end car frame just to the front of the rear swinging leg and measure the distance between the top of the straight edge and the guideline. Both the front and rear measurements must be the same. If not, raise or lower the front, or rear grade sensor until both measurements are equal. Repeat the process on the right side. If operating the machine with dual grade (guideline on both sides of the machine) adjust both sides in the same manner.

Note: The engine must be running and the automatic control system must be in the "run" mode when making the necessary corrections.



Measure offset between line and frame

Place a straight edge against the outer edge of the end car just to the rear of the front swinging leg (on same side as steering sensors), and extend it down to guideline height. Measure the distance between the machine side of the straight edge and the guideline. Record this measurement.

Place a straight edge against the outer edge of the end car just to the front of the rear swinging leg (on same side as steering sensors), and extend it down to guideline height. Measure the distance between the machine side of the straight edge and the guideline. This measurement should be within 1/4 in. (6 mm) of the front measurement. If not, adjust the front, or rear, steering sensor left or right as required. After adjusting the sensors, move the machine forward 20 to 30 ft. (6 to 9 m) to allow the steering system to correct itself and recheck the measurements.

Note: After the machine has been set parallel to the guideline, check the right tracks to be certain that they are parallel to the left. If not, align the steering system following the instructions in the Maintenance chapter.



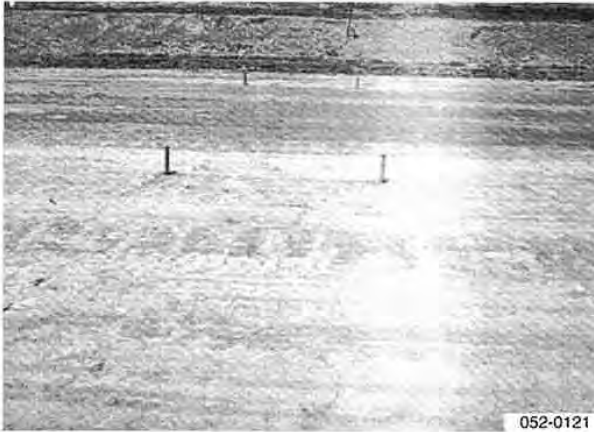
Measure offset between line and form

WARNING!

CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACKS BEFORE MOVING THE MACHINE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

After the machine has been set parallel to the guideline, it will be necessary to set final offset and grade. To set the offset, measure from the inside edge of the rear of the sideplate, on the steering sensor side, over to the guideline. This measurement must be the correct offset. If not, adjust both steering sensors in or out evenly, as necessary. After the

sensors have been adjusted, move the machine forward 20 to 30 ft. (6 to 9 m) and recheck the measurement. Adjust as necessary.



052-0121

Two lines of grades stakes across grade

To set the final grade, it is recommended to set two lines of stakes across the grade and set the paver over them. One stake in each line should be set 2 ft. (610 mm) in from each edge, and one in the center. There should be approximately 3 ft. (0.91 m) between the lines of stakes. The stakes should be driven into the grade until the heads are exactly 1 in. (25 mm) below the finished grade.

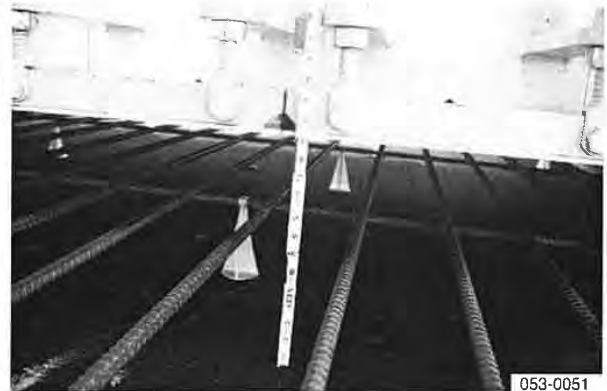
Drive the paver over the stakes until one line is under the rear of the form just ahead of the stainless trowel section and the other is under the front of the form, just to the rear of the throat opening. Adjust the grade sensors on each side evenly up or down until there is a 1 in. (25 mm) clearance between the head of the edge stakes and the bottom of the form. If necessary, adjust the PTA up or down until there is a 1 in. (25 mm) clearance between the head of the center stakes and the bottom of the form.



002-2372

Adjust slope setting

If the machine is being operated with slope control on one side, adjust the slope setting until the rear of the form on the slope side is 1 in. (25 mm) above the head of the stake. Depress the slope setpoint (+/-) switches until a clearance of 1 in. (25 mm) exists between the head of the stake and the bottom of the form. Raise the grade controlled side approximately 1/2 in. (13 mm) and note if the slope side responds the same amount. Lower the grade controlled side to the original setting and note if the slope controlled side returns to the correct grade. If not, readjust the slope settings as necessary.



053-0051

Measure grade between stainless and ground

The grade can also be set by measuring the distance between the stainless and the trimmed grade on each side. Adjust the sensors on each side up or down evenly as necessary. This method is not nearly as accurate as the previous method.



Controls set for reverse

⚠ WARNING! ⚠

CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACKS BEFORE MOVING THE MACHINE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

After all adjustments have been made raise the sideplates up completely (if hydraulically operated). Place the forward/reverse direction switch in the "reverse" position and back the machine past the start of the pour 15-20 ft. (4.6-6.1 m) if possible. Refer to the Paving Operations section for further instructions.

10 Adjustments for Paving Operations

Starting the Pour From a Header



Machine set behind header

If the pour is to start from a header, the header must be cut at least 1 in. (25 mm) smaller on both ends than the width of the form. The header must be adequately braced, as the vibration of the concrete against it will cause an excessive amount of pressure. The header must also be set at least 1/2 in. (13 mm) below the grade of the finished product. Back the machine 15 to 20 ft. (4.6 to 6.1 m) past the header (guideline should be set past the header at least this far) if possible.

⚠ CAUTION! ⚠

DO NOT PLACE FORM OIL ON THE OPERATORS PLATFORM, OR THE WORK BRIDGE, AS IT MAY CAUSE THEM TO BECOME VERY SLIPPERY. INJURY MAY RESULT IF SLIPPAGE OCCURS. CLEAN PLATFORMS AND WORKBRIDGES IMMEDIATELY TO PREVENT ACCIDENTS.

Place the forward/reverse direction switch in the "forward" position and the travel/neutral switch in the "travel" position. Place the grade sensor wands under the line (if necessary), and the steering sensor wands on the machine side of the line (if necessary). Place the control systems in the automatic mode. Place the servo lock switch in the "off" position. Lower the sideplates on the form down to grade as previously described. Before beginning paving operations, coat all areas of the form that will be in contact with the concrete with form oil to aid in cleanup (top of form, back of form, sides of form, sideplates, etc.).



Machine over header

⚠ WARNING! ⚠

CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACKS BEFORE MOVING THE MACHINE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS. DO NOT STAND BEHIND THE CONCRETE SUPPLY TRUCK WHEN IT IS BACKING INTO POSITION.

Place concrete 3 to 4 in. (77 to 100 mm) deeper than required on the proper side and along the full width of the header. Continue to place concrete the full width for 8 to 10 ft. (2.4 to 3 m). Move the machine forward until the header is approximately 1 ft. (300 mm) under the form and stop.



Placing concrete in front of the mold

Due to constrictions on the job site, it may be necessary to lower a dual grade guideline and back the supply truck in front of the paver. Place the concrete in the auger and allow the auger to spread the concrete evenly across the width of the paving mold. When getting started off a header in this manner, it will be necessary to operate only the vibrators that are in the concrete. Rotate the variable speed dial for each vibrator as it is covered by concrete.

⚠ WARNING! ⚠

CONTACT WITH MOVING AUGERS OR TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE AUGERS OR TRACKS BEFORE OPERATING THEM. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

Place the vibrator off/auto switches in the "auto" position and place the trimmer FNR switch in the neutral "N" position (to allow proper operation of the auxiliary vibrator system). Rotate each vibrator variable control valve, that has a vibrator attached to it, to the maximum position. Discharge concrete from the supply truck onto the grade in front of the machine. Start moving the concrete with the augers by placing the auger FNR switches in the forward (F) or reverse (R) positions and rotating the auger control knobs clockwise. Rotate the travel variable speed control knob just enough to start the operation of the vibrators without moving the machine. Allow the vibrators to force concrete under the form until it is full around the header. If pouring integral curb, run the auger in the proper direction to force concrete to the outer end of the form. Concrete level should be kept 4 to 6 in. (100 to 150 mm) above the top of the curb opening.



Finish concrete around header

⚠ CAUTION! ⚠

CONTINUOUS EXPOSURE TO ENGINE AND MACHINE NOISE CAN CAUSE HEARING INJURY. DO NOT OPERATE THE MACHINE WITHOUT ADEQUATE HEARING PROTECTION.

After the concrete is consolidated around the header, rotate the travel variable speed control knob clockwise to start the machine forward movement. Start the tamper bar operating by placing the tamper FNR switch in the forward (F) position and rotating the tamper control knob clockwise. The tamper bar should operate at a slow steady movement and does not require a high speed oscillation. Adjust the travel speed and the vibration as required. After machine has cleared the header, place forms alongside of the edges and finish the concrete along the header as necessary.

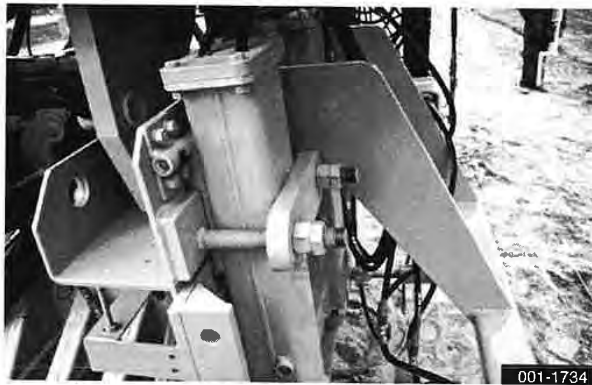
If the pour is starting against an existing slab, allow the vibrators to run until the concrete will no longer flow back into the form.



Vertical hinged sideplate swing clamps

If the form is equipped with vertical hinged sideplates, loosen the swing clamps to allow the sideplate to pivot

out away from the existing concrete slab. Raise the machine a small amount to avoid damage to the form prior to backing the machine over the existing concrete slab. Back the machine up until the existing concrete is just about to contact the front half of the sideplates. Lower the machine until the stainless steel is 1/8 inch (3 mm) above the existing concrete slab. Vibrate concrete back to the existing concrete slab and begin forward movement as previously described. Stop the machine when the rear edge of the stainless steel is past the existing concrete slab.



Vertical hinged sideplate swing clamps

Close the vertical hinged sideplate against the side of the form. It may be necessary to open and close the sideplate several times, cleaning the area between the sideplate and the form after each cycle. This is necessary to completely seal the two surfaces together and produce a sharp edge on the concrete slab. Securely tighten the swing clamps to prevent further movement during the pour. Adjust the grade sensors for the proper grade when the stainless steel is clear of the existing concrete slab.

Continuing the Pour



002-2333

Concrete spread evenly in front of machine

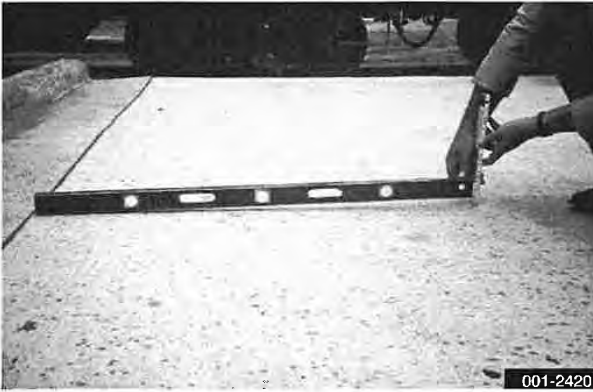


WARNING!



DO NOT STAND BEHIND THE CONCRETE SUPPLY TRUCK WHEN IT IS BACKING INTO POSITION. CONTACT WITH MOVING AUGERS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE AUGERS BEFORE OPERATING THEM. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

After getting started off the header or from the existing slab, it is recommended to spread concrete evenly in front of the machine. The concrete level at the paver should be kept from the center of the auger to the top of the auger. By placing concrete evenly in front of the paver and maintaining a uniform head across the full width, surface rideability and finish of the final product will improve.



Check cross slope

After pouring 15 to 20 ft. (4.6 to 6.2 M), check the finished product for slope, grade, line and crown accuracy. If any adjustments are needed, make them in small increments over a 5 ft. (1.5 m) distance. For example, if the grade requires a change of 1/4 in. (6 mm), adjust it 1/8 in. (3 mm) every 5 ft. (1.5 m). To check the slope, place a level on the concrete surface and raise the lower end until the level is plumb. Measure from the bottom of the level to the top surface of the concrete and adjust the slope as necessary.

Note: If the machine is being operated with cross slope on one side, the accuracy of the slope should be checked and adjusted before making any grade adjustments. Adjusting the cross slope will affect the elevation on the grade controlled side.

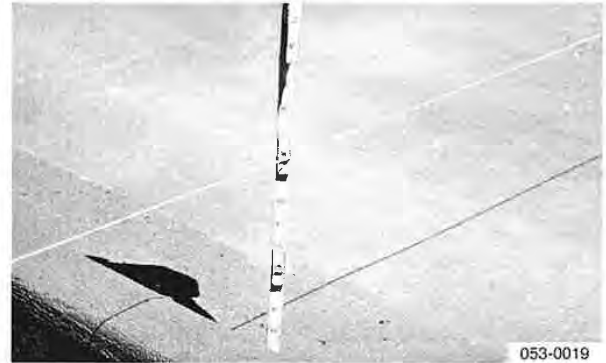


Check concrete grade

To check the grade, place a level above or below the guideline and level it out over the edge of the finished product. Measure from the guideline side of the level down to the reference point on the concrete (top back of curb, flow line, etc.). Adjust the front and rear grade sensors up or down evenly to get the proper measurement. If the grade must be raised, lower the

sensors. If the grade must be lowered, raise the sensors.

Note: When checking the grade to the top back of curb, or the edge of the slab, be certain that the curb, or the edge, has not slumped down too far. To avoid getting the machine out of square with the line, adjust both grade sensors on one side evenly.



Pull line across slab to check grade

To check grade when using two guidelines (projected to grade) in the dual grade mode, pull a stringline between the two guidelines. Measure from the stringline down to the reference point on the concrete (top back of curb, flow line, etc.). Adjust the front and rear grade sensors up or down evenly to get the proper measurement. If the grade must be raised, lower the sensors. If the grade must be lowered, raise the sensors.



Check concrete offset

To check the offset, plumb the level vertically along the side of the line. Measure the distance between the guideline side of the level and the reference point on the concrete. Evenly adjust both steering sensors right or left as necessary. If the edge of the slab must be moved away from the line, move the sensors

towards the line. If the edge of the slab must move closer to the line, move the sensors away from the line.

Note: To avoid getting the machine out of parallel with the line, adjust both steering sensors evenly.



Check crown with stringline

To check the crown of the slab, pull a stringline tight across the slab from one side to the other. Position the line above the edge of slab on each side, the same measurement as the amount of crown that is required. If pouring integral curb, measure up from the flow line. The line should just touch the concrete at the high point of the crown. Adjust as necessary.

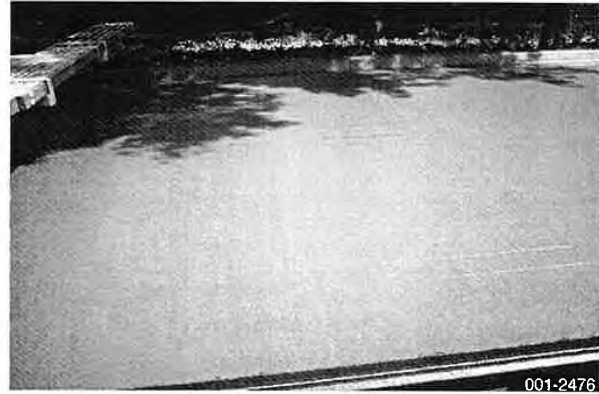
Note: When checking the crown, be certain that the line is tight to eliminate any sag which would affect the measurements.



Check edge slump

Place a straight edge, at a right angle to the edge, on the top of the concrete with one end protruding over the edge a small amount to check for excessive edge slump when pouring a flat slab. If edge slump is excessive check for wet concrete, insufficient vibration, excessive vibration or an incorrectly adjusted form edge. Correct the problem by drying the concrete,

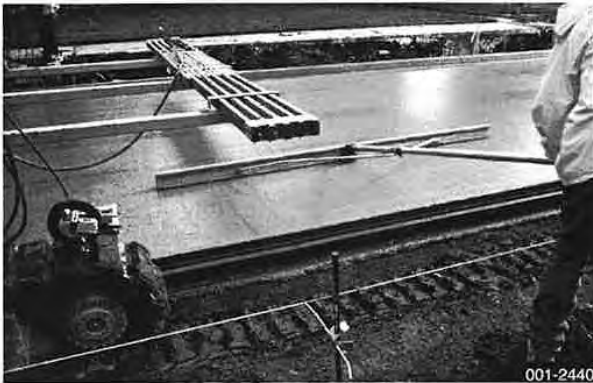
increasing or decreasing vibration or correctly adjusting the form edge or any combination.



Good slab

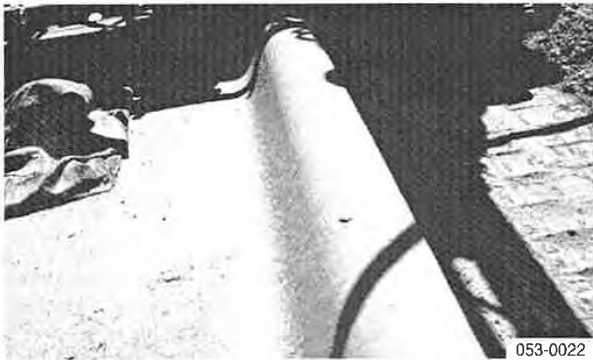
Production rate is determined by many factors, of which a few are:

1. Delivery rate of the concrete. If the concrete cannot be readily placed in front of the machine, the production rate will be lowered. The width and depth of the concrete will have a direct effect on how far each load of concrete will go.
2. Amount of hand work to be done behind the machine. If pouring integral curb and many driveways must be cut in the curb, it is important that the machine not get too far ahead. This would allow the concrete to set and make the cutting of each driveway progressively more difficult.
3. How wet or dry the concrete is. If the concrete is on the wet side (high slump), it may be necessary to increase travel speed and/or decrease vibration and tamper bar speed, which will in turn increase production rate. If the concrete is on the dry side (low slump), it may be necessary to decrease travel speed and/or increase vibration and tamper bar speed, which in turn will decrease production rate. Recommended concrete slump is 1 to 2 in. (25 to 50 mm).



Straight edge on slab

If all paving operations are correct, the finished slab should have a smooth appearance with no, or very few, voids. After the slab has slipped from the paver, a straight edge is normally used to check for any imperfections. Any imperfections should be corrected to produce the smoothest possible finish. When moving the straight edge forward, it should not be moved more than half of its' length at a time.



Good curb

If pouring integral curb, it is important that the concrete level be kept high enough above the top of the curb opening to produce a good curb. Run the auger to keep adequate concrete above the curb opening.



Wet concrete

If a puffy surface appears on the concrete surface, it may be the result of over vibrating and running the tamper bar too fast and/or traveling too slow when the concrete is wet. The solution would be to get the concrete drier, spread it on the grade ahead, or decrease vibration and tamper bar speed and/or increase travel speed. If the concrete is excessively wet, it may be recommended to refuse to accept it.



Dry concrete

If the concrete surface is full of voids, or is tearing, it may be the result of under vibrating and running the tamper bar too slow and/or traveling too fast when the concrete is dry. The solution would be to either add water to the concrete mix, or decrease travel speed and/or increase vibration and tamper bar speed.

Voids in the concrete surface can also be caused by over vibrating the concrete. If the concrete level is kept low, over vibrating will cause the grout to flow to the surface. This is normally indicated by an excessive amount of grout flowing forward in front of the machine. It may be necessary to decrease the vibration to correct the problem.



Hump caused by running vibrators

During paving operations, it occasionally becomes necessary to stop and start the machine travel. When stopping, rapidly move the travel control knob counterclockwise to stop the machine. This causes the vibrators and the tamper bar to stop at the same

instance as the machine travel ceases. Also move the auger control knobs counterclockwise to stop their rotation. When starting the machine travel, rapidly move the travel control knob clockwise to begin machine movement. This will start the vibrators and the tamper bar at the same instance as the machine travel begins. Move the auger control knobs clockwise to begin movement of the concrete in front of the form. After the machine is moving, adjust the travel speed as necessary. If the vibrators continue to run with the machine stopped, it may cause a hump in the final slab.

GOMACO Tip: It is recommended to control the travel speed to keep the machine moving forward at all times during pouring operations. If the delivery of concrete is slow, or has stopped for some reason (such as plant breakdown), slow the machine travel to minimum. Each time that the machine is stopped to wait for concrete delivery or for some other cause, a bump in the slab may be produced.



Bump caused by bumping line or sensitivity too high

During paving operations it is important that nothing or no one bumps the guideline. Be certain there is no debris against the guideline which could become entangled in the sensor wands. Make certain persons working behind the machine do not come in contact with the line.

A similar mark in the concrete surface can be caused by a high sensitivity level setting and can be seen when a grade sensor passes a guideline stake. Adjust the sensitivity level a small amount on the side corresponding to the mark in the concrete.



Bad edge caused by low concrete level

If the concrete level is not kept above the edge profile opening, it can cause the edge, or curb to not fill completely. If the edge is not filling completely, run the auger to force more concrete into the edge of the form.



Low grade

If low spots are present in the subgrade, it is advisable to fill them with fill material prior to pouring operations. The fill material should then be compacted to the required density. Low areas in the subgrade can cause the edge top line of the finished product to sag. If the job is not trimmed prior to pouring, it is recommended to spot check for high and low grade spots.

Pouring on low grade can cause severe loss of concrete yield. For example, with the grade 1/2 in. (12.7 mm) low over a width of 20 ft. (6.1 m), an additional 100 cu. yd. (76.4 m³) would be required over a distance of 3245 ft. (989 m). Pouring on high grade can cause thin slabs which may require removal if severe enough.

GOMACO Tip: It is recommended to trim the subgrade to exact elevation, using an automated grade trimmer following the same guideline that the paver will follow. For best concrete yield, do not allow trucks to drive on the grade after it is trimmed.



Curb drop form

Occasionally when pouring an integral curb it becomes necessary to install a driveway opening in the curb. If the profile section is equipped with a driveway cutout blade, insert the blade at the appropriate location. If a driveway cutout blade is not used, it will be necessary to remove the excess concrete after forms have been placed behind the curb.



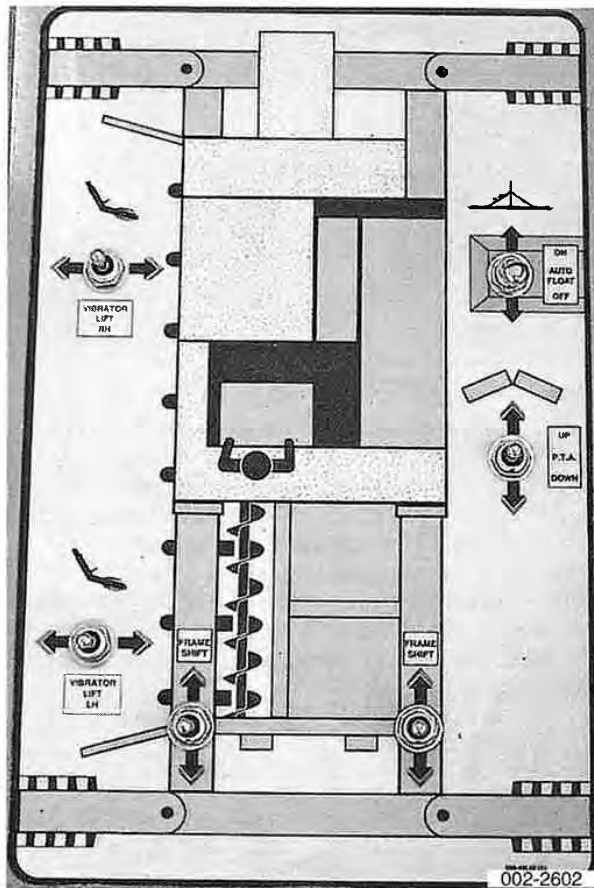
Placing forms behind a driveway curb

Place adequate forms of the proper height behind the curb and stake securely. Place a form of the proper height in the gutter section and remove the top of the curb. After the top of the curb has been removed, finish the concrete to produce a smooth transition from the full curb to the cut curb.



Box out for intersection tie-in

If an intersecting roadway must be connected to the new slab, it is recommended to place a box out at the beginning, or ending transition of the radius. The box out is normally 2 ft. (600 mm) wide. The length of the box out is determined by the size of the radius. Normally at no point in the transition, should the concrete width be narrower than 2 ft. (600 mm). Stake the box out securely and fill it with dirt or sand. After the paver has passed over it, remove the dirt or sand and finish as necessary.



Crown changes using the PTA switch

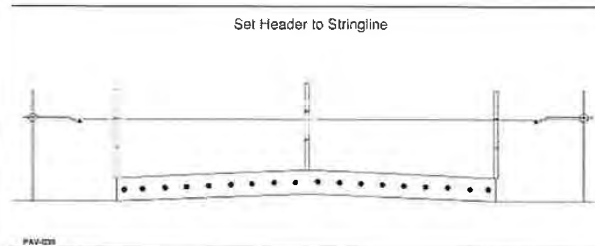
If crown adjustments are necessary during paving operations, raise or lower the crown in small increments, using the PTA switch, approximately 1/8 in. (3 mm) every 5-10 ft. (1.5-3 m) or more. The machine should be moving when crown changes are made.

Note: It is highly recommended that the self supporting PTA should be equipped with a sensor system when rideability specifications are required. Contact your GOMACO dealer or GOMACO for further details.



Paving over final header

Ending the Pour: If the pour is going to end at a header, it must be set solid. The header should be set 1/2 in. (13 mm) below the final concrete surface grade and cut 1 in. (25 mm) short on each side for ample sideplate clearance. It is recommended to place dirt or sand against the side of the header, opposite the machine, to help support it. When the vibrators reach the header, raise them high enough to clear it. Continue to pave over the header. When the vibrators have cleared the header, place the vibrator off/auto switches in the "off" position. Rotate the auger control knobs and the tamper control knob counterclockwise to stop their operation. Proceed forward with the machine until the header has slipped from under the rear of the form.



Adjust header up or down to stringline

After the machine has cleared the header, the header must be adjusted to the proper finished height. It is recommended to stretch a stringline across the finished slab approximately 25 ft. (7.6 m) before the header. Record the measurements at the two outside edges and the centerline of the slab and transfer these measurements to the header. Adjust the header up, or down, to match the measurements. Finish the slab as necessary.

If the pour is to end against an existing slab that is wider than the paving width, pave forward until the sideplate extensions are against the end of the slab.

The sideplate extensions may be removed to allow paving closer to the existing slab.

If the pour is to end against an existing slab that is narrower than the paving width, pave forward until the vibrators are against the end of the slab. Raise the vibrators and pave forward until the end of the existing slab is even with the front of the form.

Note: If the existing slab is narrower than the paving width, be certain that the grade is excavated for the sideplates along the edges if paving up to end of slab.

After paving over the header or up to the existing slab, stop the machine travel. Place the elevation control loops in the "Man" mode (slope control loops may be left in "Auto"). Using the all jog switch on the network control box, raise the machine to the maximum up position. Place the steer mode select switch in one of the manual positions. Move the machine to an area where it can be cleaned and clean it as soon as possible.



Mark sensor location

The sensors should be removed before washing the machine. It is advisable to mark the sensor location on the mounts prior to removal. This will speed setup time if the pour is to be continued at a later date. Be certain to place protective dust caps in/over electrical plugs to keep moisture and dirt out.

Cleaning Operations



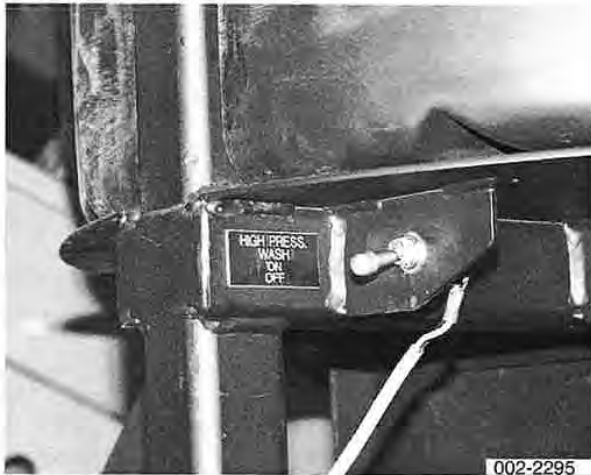
Clean machine

The machine should be cleaned as soon as possible after pouring operations have ended. It is advised to fill the water tank on the machine (if so equipped) at the start of the pour, so water for cleaning purposes is available at the end of the pour. Turn and remove the lid to fill the water tank.

⚠ WARNING! ⚠

CONTACT WITH A MOVING CONVEYOR BELT AND ROLLERS, OR A MOVING AUGER, CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT THE CONVEYOR, OR AUGER, AREA IS CLEAR BEFORE STARTING THE ENGINE. DO NOT STAND ON THE CONVEYOR OR IN THE SLIPFORM MOLD HOPPER AREA DURING CLEANING OPERATIONS. DO NOT OPERATE THE CONVEYOR OR THE AUGER WHEN WASHING THE MACHINE.

Uncoil the hose from the hose hanger and wash the concrete off of the machine. It is recommended that the bottom of the form be washed first. Clean the bottom of the form thoroughly, as any concrete left to dry on the bottom will affect the final concrete finish when the pour is resumed. When washing the conveyor belt, stop the belt travel and wash the side that is visible. After the belt is clean on one side, rotate the belt enough to expose the opposite side and stop it before cleaning it. When washing the auger in the slipform mold, stop the auger and wash the side that is visible. After the auger is clean on one side, rotate the auger enough to expose the opposite side and stop it before cleaning it.



High pressure wash switch

⚠ WARNING! ⚠

THE HIGH PRESSURE WASH SYSTEM USES HIGH PRESSURE WATER. DO NOT AIM THE NOZZLE AT ANY PART OF THE BODY, AS SERIOUS INJURY CAN OCCUR. WEAR PROPER EYE PROTECTION WHEN CLEANING THE MACHINE.

If the machine is equipped with the optional high pressure wash system, uncoil the hose from the hanger. Place the high pressure wash switch in the "on" position and decrease engine speed to 1500 rpm. Direct the nozzle on the hose at the concrete and pull the trigger. Be certain that the water tank has water in it, and do not allow the pump to run without water, as severe damage to the pump could result.

⚠ WARNING! ⚠

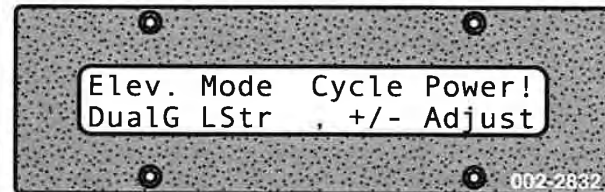
THE REAR TRACK (WHEN IN 3-TRACK MODE) MUST BE KEPT AS FAR TO THE LEFT AS POSSIBLE TO PROVIDE THE MOST STABILITY DURING LOADING OR UNLOADING. THE MACHINE SHOULD ALSO BE DISASSEMBLED TO THE NORMAL TRANSPORT WIDTH WHETHER IN 3-TRACK OR 4-TRACK CONFIGURATIONS.

Paving Through Transitions

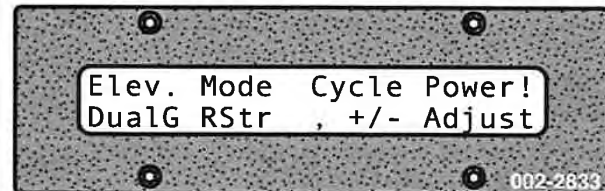
When paving with grade control on one side and slope control on the other, it occasionally becomes necessary to switch from slope control to grade control for paving through transitions and super elevations. Pave forward until the starting point of the transition is even with the center of the form and stop the machine. Place the servo lock switch in the "on" position. Mount the grade sensors on the appropriate side and connect

them as described in section 07. Place the grade sensor wands under the guideline or on the track yokes.

Note: For best results when rideability specifications are a concern it is highly recommended that the machine be operated on dual grade control, not slope control.

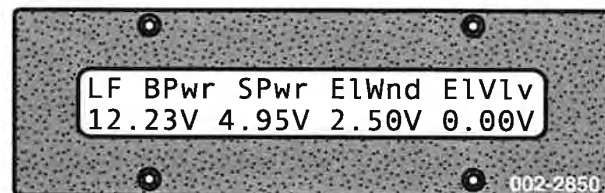


Dual Grade Display, Left Steer



Dual Grade Display, Right Steer

To operate the machine with dual grade control depress the calibrate switch. Scroll through the various displays until the elevation mode is indicated. Use the slope adjust switches (+ or -) to change the mode to "DualG LStr" or "DualG RStr". After the appropriate grade and steering mode settings are selected, depress the calibrate switch to return to the main screen. The operator must cycle the power before any changes are enabled. Adjust the grade sensors as follows.

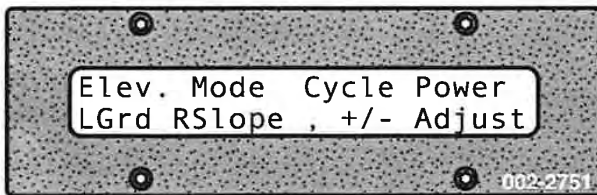


Test display used to center grade sensor

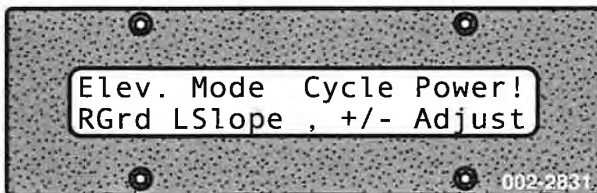
To calibrate the grade sensors, it will be necessary to depress the test switch. Depress the NEXT/LAST switches until the appropriate display appears for a grade sensor on the main screen. With the grade sensor centered, the display should read "ElWnd 2.50V." If the grade sensor centering signal reads more or less than "2.50V", adjust the appropriate grade sensor up or down with the crank adjustment on the sensor mount until it reads "2.50V". Depress the NEXT/LAST switches until the next grade sensor

voltage reading appears on the main screen. Adjust all grade sensors in the same manner. Place the servo lock switch in the "off" position. Make certain all systems are in "automatic" operation and continue paving operations.

When ready to switch back to slope control, stop the machine when the end of the transition is even with the center of the form. Place the servo lock switch in the "on" position. Disconnect both grade sensor cables from the grade plugs on the slope side.

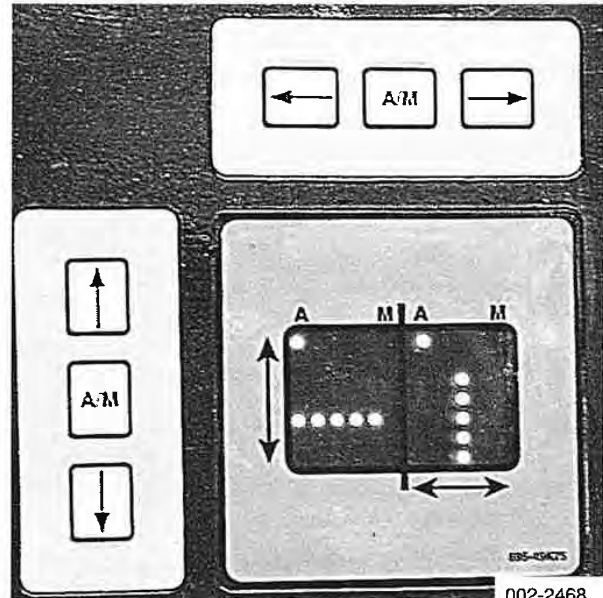


Grade Left; Slope Right Display



Grade right, Slope left display

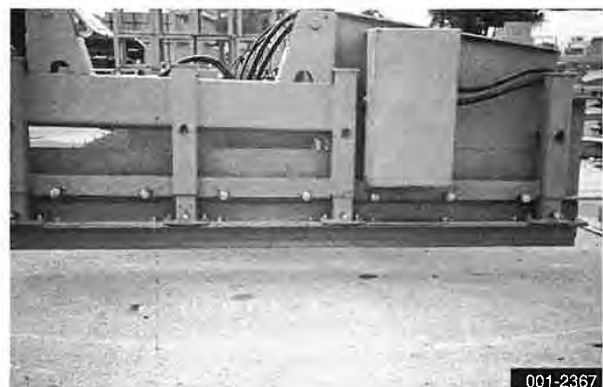
To operate the machine with slope control depress the calibrate switch. Scroll through the various displays until the elevation mode is indicated. Use the slope adjust switches (+ or -) to change the mode to "LGrd RSlope" or "RGrd LSlope". After the appropriate grade and steering mode settings are selected, depress the calibrate switch to return to the main screen. The operator must cycle the power before any changes are enabled. Adjust the desired amount of cross slope as follows.



Centered LED lights

Note the position of the rear slope loop LED indicator. If an arrow indicates that the slope sensor is off center, adjust the slope setpoint until the LED lights center (note the slope reading before changing). Place the servo lock switch in the "off" position and continue to pave. If the slope setpoint was changed, slowly adjust it back to its original setting.

Pouring Alongside Existing Slab (Widening)



Sideplate Extension Bolts

When pouring against an existing slab, it is necessary to remove the bottom extension from the sideplate on the existing slab side. Remove the bolts from the extension pieces on the main sideplate and the front extension.

Replace the bottom extension with the skid bar. Insert the 1/2 X 1-3/4 inch carriage bolts and install flat washers, lock washers and nuts. Tighten securely.



Straightedge From Main Pan Under Sideplate

Loosen the sideplate anchor bolts. Place a straight edge under the form at a right angle to the sideplate. Adjust the sideplate up or down, until the bottom of the skid bar is even with the top of the straight edge. Adjust the front and rear the same. Tighten the sideplate anchor bolts securely.



Straightedge Under Main Pan

With a straight edge placed under the form at a right angle to the sideplate, adjust the edge of the flat profile section up or down until it is even with the top of the straight edge. Adjust the rear edge of the stainless up or down as necessary to match the edge of the main pan.



Machine in Position on Edge of Slab

Move the machine into position along the existing slab, so that the edge of the form is even with the edge of the slab (tracks will be on the existing slab). Lower the machine evenly until the bottom of the skid plate is resting on the slab, front and rear.



Sensor Position for Lock to Grade

The grade control for the machine can be setup to run lock-to-grade on any of the four legs, using the track as a grade ski. Install the sensor mounts as described previously. Mount a sensor for grade control to the bottom of the grade jack with the mounting bolt pointed forward and the sensor shaft pointed toward the machine. The grade sensor wand is mounted with the round tube towards the rear and pointing toward the side of the machine. The wand should be attached, so that when the stop pin in the sensor is centered between the pins in the shaft, the wand is parallel to the mounting bolt (horizontal). Tighten the attaching "thumbscrew" securely.

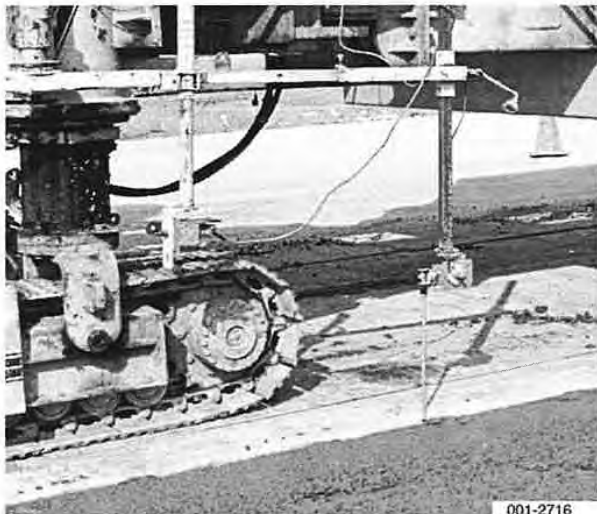
Note: When operating locked-to-grade, the surface on which the tracks are to be operated must meet or exceed the rideability specifications if specifications are required.

⚠ CAUTION! ⚠

WHEN SERVICING THE ELECTRICAL SYSTEM OR WELDING ON THE MACHINE, ALWAYS DISCONNECT THE GROUND STRAP FROM THE BATTERY TO PREVENT DAMAGE TO THE MACHINE ELECTRICAL SYSTEMS.

The grade wand may be placed on the top of the track yoke, near the center, or a round bar 3/8 X 12 inch (10 X 300 mm) may be welded to the track yoke with 6 inches (150 mm) of the bar pointed forward. Position the sensor mount so the grade wand can be placed under the round bar. Calibrate the grade sensor as described earlier.

Steering for scab-on operations is normally taken from a preset guideline which also controls grade on the side of the machine opposite the existing slab side.



Steer sensors on slab

The machine can be setup to operate with no guideline when operating against an existing slab. Set the grade control on the two tracks operating on the existing slab for lock to grade operation as explained previously. The opposite side is operated on slope control.

Rear steering is controlled by locking the steering sensor wand against the edge of the form. By adjusting the sensor closer to or farther away from the form, the rear track can be locked to a straight ahead position. It may be necessary to adjust the sensor position periodically to maintain the position of the form next to the existing slab.

Front steering is controlled by running the front sensor wand against the edge of the slab. Follow the same procedures for mounting a steer sensor for left-hand guideline or right-hand guideline. Attach a protective hose over the tip of the steer wand that will be running against the edge of the slab. Lower the sensor mount until the tip of the steer wand is 3-4 inches (75-100 mm) below the top of the existing slab. Make certain that the edge of the existing slab is in reasonable repair to prevent damage to the steer wand.

11 Transport Procedures

⚠ WARNING! ⚠

THE TRACK BRAKE SWITCH MUST BE "ON" ANY TIME THE MACHINE IS LOADED OR UNLOADED OR MOVING UP OR DOWN STEEP EMBANKMENTS. THE REAR TRACK (WHEN IN 3-TRACK MODE) MUST BE KEPT AS FAR TO THE LEFT AS POSSIBLE TO PROVIDE THE MOST STABILITY DURING LOADING OR UNLOADING. THE MACHINE SHOULD ALSO BE DISASSEMBLED TO THE NORMAL TRANSPORT WIDTH WHETHER IN 3-TRACK OR 4-TRACK CONFIGURATIONS.

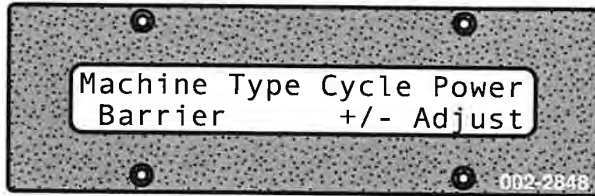
When changing the 4-track frame from paving mode to barrier/transport mode it will be necessary to complete the following procedures.



Swing leg in transport mode

Support the 4-track frame on the left side and raise the left front and left rear tracks off of the grade. Loosen, disconnect and remove the turnbuckles from the inside of the swinging legs. Disconnect the outer turnbuckle from the left end frame. Swing the legs around to the end of the 4-track frame and pin the outer turnbuckles to the mount in the center of the left end frame. It may be necessary to adjust the turnbuckles to align the

swinging legs in a straight position with the 4-track frame. Position the right legs in the same manner.



Change network program configuration

Prior to moving the machine, it will be necessary to properly align the steering on each of the tracks. Begin by depressing and releasing the calibrate (CALIB) switch on the network control box. Depress and release the NEXT switch until the machine type is displayed on the main screen. Depress the slope set switches +/- until the "BARRIER" designation is displayed. Depress and release the CALIB switch to return the main screen to the normal operating display.

Note: The system power must be turned off and restarted before any calibrate changes will be enabled.



Steering feedback calibration

Calibrating the Steering Cylinders: Three adjustments are required for each steering cylinder: left turn limit, center and right turn limit. Begin by starting the engine and depress and release the SET switch. The main screen will indicate "STORE to Save Slope Null & Feedback Pot. Points". To select a steering control loop, depress the LAST or NEXT switch until the appropriate sensor signal is indicated

on the main screen (Photo 002-2823). Turn the track as far to the left as required to prevent the track from contacting obstacles on the jobsite. Depress the STORE switch and depress the NEXT switch (Photo 002-2824). Turn the track to the straight ahead position and measure for correct adjustment (Refer to the maintenance chapter for measurement information). When it is adjusted parallel to the machine frame or guideline depress the STORE switch and depress the NEXT switch (Photo 002-2825). Turn the track as far to the right as required to prevent the track from contacting obstacles on the jobsite. Depress the STORE switch. Continue to depress the NEXT switch to repeat the procedure for the other tracks (if necessary). Refer to the Maintenance chapter for more information.

Note: The left and right limits prevent the network controller from stroking the cylinder completely and causing the track to contact an obstacle. When radius work is required, make certain that the left and right limit settings do not prevent the track from turning enough to complete the radius.

Transport position for sideplate extensions

Remove the bolts from the front sideplate extensions and turn each one to the inside of the form. Insert the bolts to lock the sideplate extensions into position for transport. If an auto float is attached to the rear of the machine, it will be necessary to remove it for transport.

WARNING!

WHEN MOVING THE MACHINE, MAKE CERTAIN ALL PERSONNEL ARE CLEAR OF THE WORKING AREA AND ANY MOVING PARTS. SEVERE INJURY OR DEATH CAN OCCUR IF ANY PERSONNEL ARE PULLED INTO OR UNDER ANY MOVING PARTS.

When moving forward in the barrier/transport mode, the left front track drive and the right rear track drive will turn the correct direction after they have been switched from the paving mode. It will be necessary to switch the right front track drive and the left rear track drive motor hoses for forward operation when the track directional switch is in the forward position. This is necessary so all drive motors will turn the tracks in the same direction.

⚠ **WARNING!** ⚠

WHEN MOVING THE MACHINE IN THE TRANSPORT POSITION, MAKE CERTAIN THAT THE SLOPE SYSTEM IS NOT IN THE AUTO POSITION. LOSS OF MACHINE CONTROL WILL RESULT IN SEVERE INJURY OR DEATH IF ANY PERSONNEL ARE CAUGHT UNDER THE MACHINE IF THE MACHINE TIPS OVER.

Raise the machine high enough to clear any obstacles while loading or unloading the machine. Place the travel FR switch in the forward (F) position and rotate the travel control knob to start machine travel. To manually steer the machine, depress the run/standby switch on the main screen to place it in the run mode. Select one of the manual steer modes on the manual steer select switch and steer the tracks using the manual steer knob.

12 Minimum Clearance Setup

The procedures listed in this section are amendments to the paving section in the operators manual that are specific changes required to operate and setup the Commander III 4-track without the left rear leg attached to the machine frame. Refer to the previous sections of this chapter as necessary for further instructions.

Removing the left rear leg



Remove rear leg for minimum clearance paving

Place adequate support under the left rear corner of the machine frame and lower the machine until all weight is removed from the left rear leg. Attach an appropriate lifting device to the lifting eye on the top of the left rear leg. Disconnect the hydraulic hoses to the elevation cylinder, steer cylinder, track tension cylinder and track drive motor. Disconnect the smart steer cylinder electrical cable and remove the emergency stop button from the left rear leg. Remove the left rear

leg from the machine frame. Remove the left rear leg swinging pivot to reduce the weight hanging on the left rear corner of the machine frame.

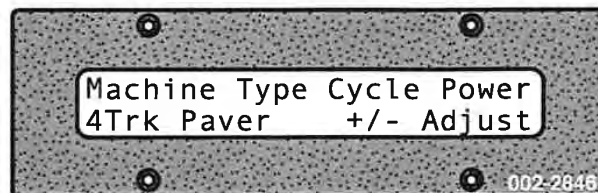
Note: Do not disconnect the emergency stop button and remove it from the machine frame. Attach the button in a readily accessible position on the left rear corner of the machine frame. Safety devices should never be removed from the machine.

Attach mold mounts: Remove the center and left rear turnbuckle mounting eyes on the outside of the left end frame. Attach the paving mold mounts to the outside of the left end frame in place of the turnbuckle mounting eyes. Adjust the paving mold mounts parallel to each other from front to rear on the machine frame and tighten the bolts securely.

Attach the paving mold to the machine frame as described in the 4-track paving section. Adjust the paving mold as described in the 4-track paving section of the Commander III operators manual.

Network controller operation

When paving in the minimum clearance setup, the network controller must be operated in the "R" (Run) mode with either dual grade or slope operation. The following procedures are required to operate the machine when the left rear leg has been removed.



4-track paver programming

Prior to moving the machine, it will be necessary to properly align the steering on each of the tracks. Begin by depressing and releasing the calibrate (CALIB) switch on the network control box. Depress and release the NEXT switch until the machine type is displayed on the main screen. Depress the slope set switches +/- until the "4Trk Paver" designation is displayed. Depress and release the CALIB switch to return the main screen to the normal operating display.

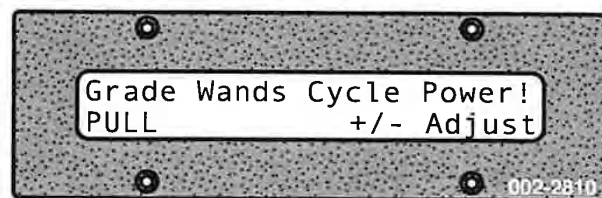
Note: The system power must be turned off and restarted before any calibrate changes will be enabled.



Steering feedback calibration

Calibrating the Steering Cylinders: Three adjustments are required for each steering cylinder: left turn limit, center and right turn limit. Begin by starting the engine and depress and release the SET switch. The main screen will indicate "STORE to Save Slope Null & Feedback Pot. Points". To select a steering control loop, depress the LAST or NEXT switch until the appropriate sensor signal is indicated on the main screen (Photo 002-2823). Turn the track as far to the left as required to prevent the track from contacting obstacles on the jobsite. Depress the STORE switch and depress the NEXT switch (Photo 002-2824). Turn the track to the straight ahead position and measure for correct adjustment (Refer to the maintenance chapter for measurement information). When it is adjusted parallel to the machine frame or guideline depress the STORE switch and depress the NEXT switch (Photo 002-2825). Turn the track as far to the right as required to prevent the track from contacting obstacles on the jobsite. Depress the STORE switch. Continue to depress the NEXT switch to repeat the procedure for the other tracks (if necessary). Refer to the Maintenance chapter for more information.

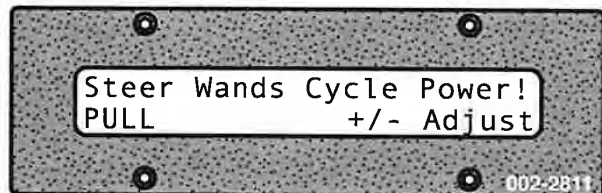
Note: The left and right limits prevent the network controller from stroking the cylinder completely and causing the track to contact an obstacle. When radius work is required, make certain that the left and right limit settings do not prevent the track from turning enough to complete the radius.



Grade sensor mode selection

Depress the calibrate switch on the service panel and use the NEXT switch to scroll forward to the grade sensor mode. Use the slope adjust switches (+ or -) to change the mode to "PULL" if the round tube of the grade wand is on the same side as the cord. If the round tube of the grade wand is on the same side as the mounting bolt, change the mode to "PUSH".

Note: The grade sensor for the left rear leg is not required for operation when the leg has been removed.

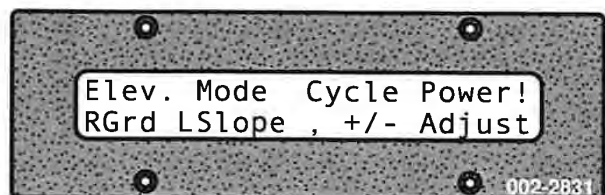


Steer sensor mode selection

Using the NEXT switch, scroll forward to the steer sensor mode. Use the slope adjust switches (+ or -) to change the mode to "PUSH" if the round tube of the steer wand is facing forward. If the round tube of the steer wand is facing towards the rear of the machine, change the mode to "PULL".

Note: The steer sensor for the left rear leg is not required for operation when the leg has been removed. The smart cylinder must be connected or a dummy plug connection simulating a smart cylinder may be used to prevent diagnostic displays associated with the missing cylinder.

Right Side Grade Control/Left Side Slope Control



Grade Right; Slope Left Display

To operate the machine with right hand grade control, and left side slope control, depress the calibrate switch. Scroll through the various displays until the

elevation mode is indicated. Use the slope adjust switches (+ or -) to change the mode to "RGrd LSlope". After the appropriate grade and steering mode settings are selected, depress the calibrate switch to return to the main screen. Adjust the desired amount of cross slope with the appropriate switch on the main screen. Refer to the Preliminary Adjustments section for final adjustment procedures.

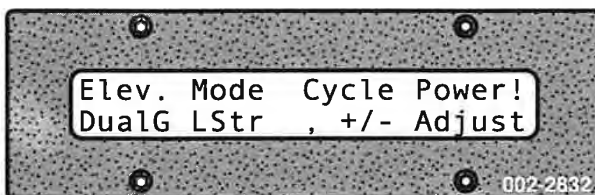
The left front leg elevation is controlled by the front slope sensor (located on the front cross frame of the 4-track frame) and the left front elevation control loop. The right front leg elevation is controlled by the right front grade sensor, connected to the right front bulkhead, and the right front elevation control loop.

Depress the A/M switches on the left rear leg elevation to place the elevation and steering control loops in manual control on the display meter. The right rear leg elevation is controlled by the right rear grade sensor, connected to the right rear bulkhead, and the right rear elevation control loop.

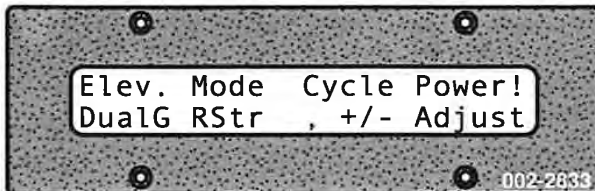
Notice: When setting guideline through a transition from a straight section of highway to a curved section of highway it is extremely important to project grade out to the guideline. An unsatisfactory product will occur when operating with dual grade or slope control if the guideline is not projected to grade.

Dual Grade Control

Note: This is the preferred method of set up when rideability specifications are a concern.



Dual Grade Display, Left Steer



Dual Grade Display, Right Steer

To operate the machine with right hand grade control, and left hand grade control, depress the calibrate switch. Scroll through the various displays until the

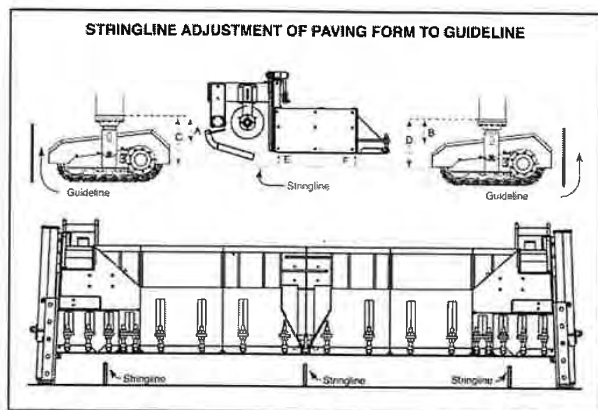
elevation mode is indicated. Use the slope adjust switches (+ or -) to change the mode to "DualG LStr" or "DualG RStr". After the appropriate grade and steering mode settings are selected, depress the calibrate switch to return to the main screen. Refer to the Preliminary Adjustments section for final adjustment procedures.

The left front leg elevation is controlled by the left front grade sensor, connected to the left front bulkhead, and the left front elevation control loop. The right front leg elevation is controlled by the right front grade sensor, connected to the right front bulkhead, and the right front elevation control loop. The front steering is controlled by the left front steer sensor, connected to the left front bulkhead, and the front steering control loop when "DualG LStr" is selected. The front steering is controlled by the right front steer sensor, connected to the right front bulkhead, and the front steering control loop when "DualG RStr" is selected.

Depress the A/M switches on the left rear leg elevation to place the elevation and steering control loops in manual control on the display meter. The right rear leg elevation is controlled by the right rear grade sensor, connected to the right rear bulkhead, and the right rear elevation control loop. The rear steering is controlled by the left rear steer sensor, connected to the left rear bulkhead, and the rear steering control loop when "DualG LStr" is selected. The rear steering is controlled by the right rear steer sensor, connected to the right rear bulkhead, and the rear steering control loop when "DualG RStr" is selected.

Notice: When setting guideline through a transition from a straight section of highway to a curved section of highway it is extremely important to project grade out to the guideline. An unsatisfactory product will occur when operating with dual grade or slope control if the guideline is not projected to grade.

Setting Final Grade



Two lines of grades stakes across grade

To set the final grade of the paving form, set a stringline parallel to the machine guideline. Two stringlines should be placed 18 inches (45 cm) to the inside of each sideplate and 2 inches (5 cm) below the top of the finished concrete surface to be poured. If a PTA (powered transition adjuster) is in the form, it will be necessary to place a third stringline under the center of the PTA.

Place the sensors on the machine and move the machine so that the sensors are located between two guideline stakes. Stop and adjust the machine to the guideline using a level so that points (A) and (B) in the preceding drawing are equal to the same measurement. Next, check the measurement at points (C) and (D) to make certain that the stringline is parallel to the guideline.

Measure from the stringline to the bottom of the paving form at points (E) and (F) on either the left or right side of the paving form. Both measurements should be equal. If not, it will be necessary to adjust the paving form hanger, at the front of the paving form, to increase or decrease the measurement at point (E) to equal the measurement at point (F). Tighten the form hanger securely. Adjust the opposite side of the form in the same manner. If a PTA is located in the paving form, measure from the stringline to the bottom of the PTA at points (E) and (F). If the measurements are not equal, it will be necessary to adjust the PTA adjustment screws as described previously in this chapter.

Dual Grade Control: Adjust the grade sensors on each side evenly up or down until there is a 2 in. (5 cm) clearance between the head of the edge stakes and the bottom of the form.

The bottom of the form should be parallel to the top of stringline when measuring at the front and rear of the paving form. When checking the measurement on the left side of the paving form, it may become necessary to loosen and adjust the form mounts on the left side to achieve the parallel measurement from front to rear. When the bottom of the form is parallel, tighten all mounts securely and move the machine to the beginning of the pour.



Adjust slope setting

Slope Control: If the machine is being operated with slope control on one side, adjust the slope setting until the rear of the form on the slope side is 2 in. (5 cm) above the stringline. Depress the slope setpoint (+/-) switches until a clearance of 2 in. (5 cm) exists between the stringline and the bottom of the form. Raise the grade controlled side approximately 1/2 in. (13 mm) and note if the slope side responds the same amount. Lower the grade controlled side to the original setting and note if the slope controlled side returns to the correct grade. If not, readjust the slope settings as necessary.

The bottom of the form should be parallel to the stringline when measuring at the front and rear of the paving form. When checking the measurement on the left side of the paving form, it may become necessary to loosen and adjust the form mounts on the left side to achieve the parallel measurement from front to rear. When the bottom of the form is parallel, tighten all mounts securely and move the machine to the beginning of the pour.



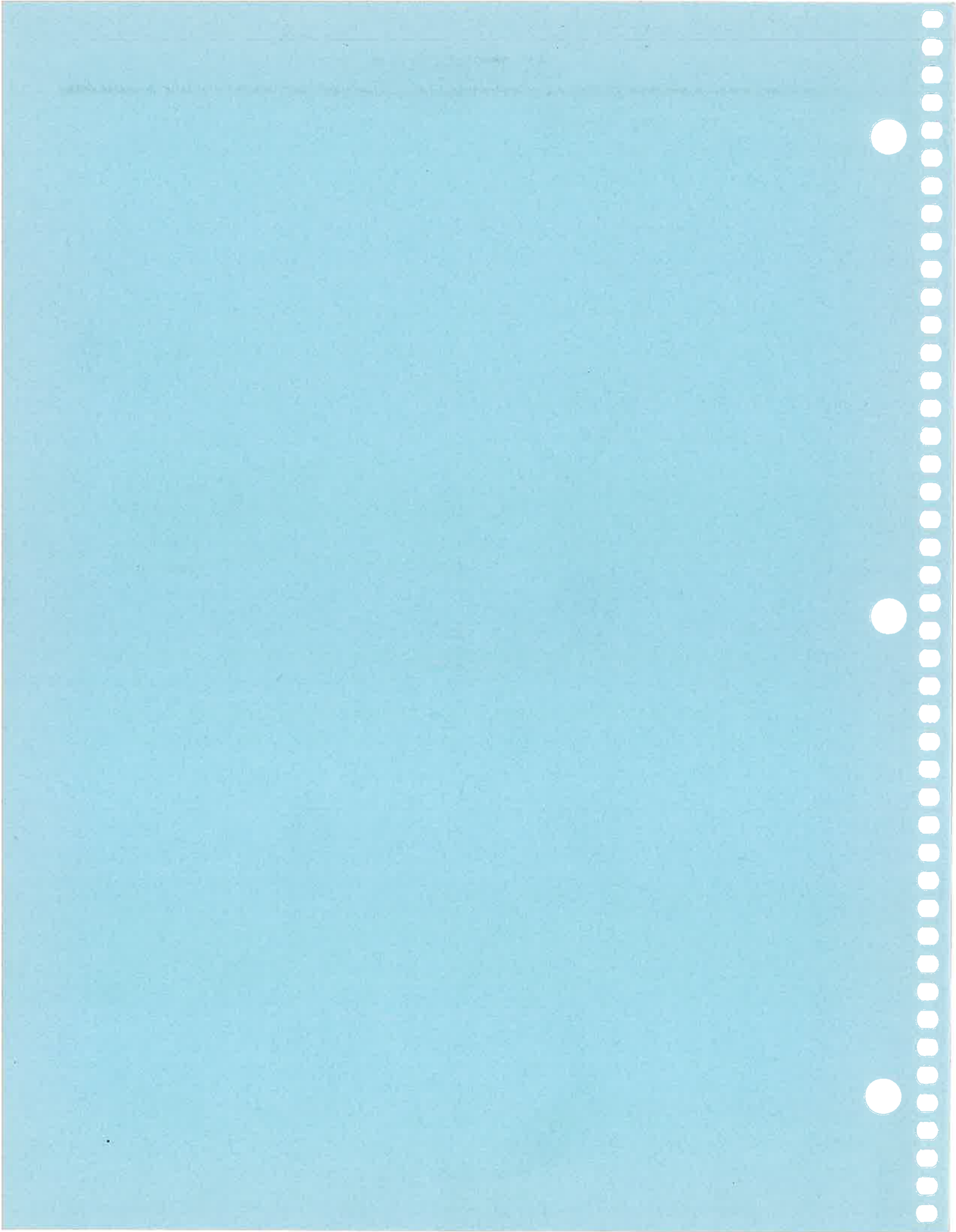
View of minimum clearance paving



View of minimum clearance paving

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Chapter VII 4-Track Barrier Set Up

01 Content of Chapter

This chapter covers the preparation, setup, and barrier paving operations for a Commander III 4-track frame. If the 4-track hydraulic and electrical components are not installed, it will be necessary to contact GOMACO for the instructions and procedures for installation. Choose a stable, flat level area to assemble the machine. **Pay particular attention to all Safety statements.**

	NOTICE WARNING! DO NOT OPERATE THIS EQUIPMENT UNTIL YOU HAVE READ AND THOROUGHLY UNDERSTAND THE OPERATORS MANUAL. FAILURE TO FOLLOW THIS PROCEDURE MAY RESULT IN INJURY OR DEATH. DANGER! DO NOT ALTER OR MODIFY THIS PRODUCT WITHOUT THE EXPRESS WRITTEN CONSENT OF THE MANUFACTURER. UNAUTHORIZED MODIFICATION MAY RESULT IN SERIOUS INJURY OR DEATH.
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DCAL-058

02 Preparing the Machine Frame

Frame preparation



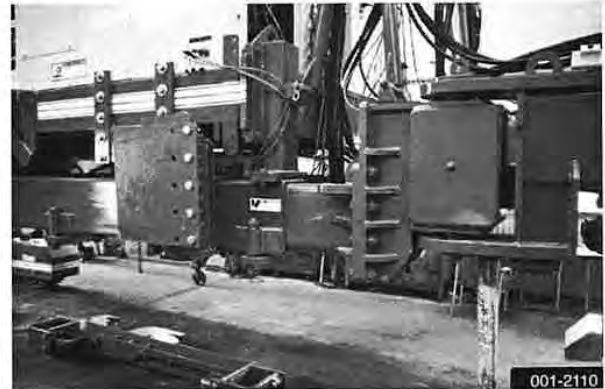
Remove 6ft. (1.83 m) frame extensions

⚠ WARNING! ⚠

KEEP AWAY FROM PARTS THAT ARE BEING LIFTED. SEVERE INJURY OR DEATH CAN OCCUR IF LIFTED PARTS WERE TO FALL. KEEP AWAY FROM PINCH POINTS AND AREAS WHERE MOVEMENT IS RESTRICTED. SEVERE INJURY OR DEATH CAN OCCUR IF THE LIFTED PART WERE TO SWING AND STRIKE ANY PERSONNEL.

If 6 ft. (1.83 m) frame extensions are present in the stationary side of the 4-track frame it will be necessary to remove them. Block the 4-track main frame adequately. If suitable lifting equipment is available

the end frame and legs can be removed from the 4-track frame in one lift. If suitable lifting equipment is not available it will be necessary to reduce the size of the lift by removing the legs and tracks before removing the end frame. Remove the frame extensions with a suitable lifting device and reattach the end frame to the 4-track frame. Tighten securely.



Retract extension beams

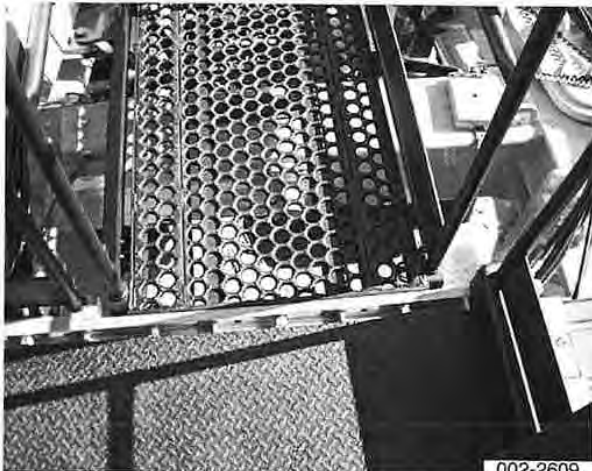
The extendible side of the 4-track frame should be retracted completely. Loosen the frame clamps on the extension beams. Using the frame extend switches, retract the extension beams into the 4-track frame completely. Tighten the frame clamps securely.

Note: The front and rear of the 4-track frame must be retracted simultaneously.



Remove corner guard rail

To mount the conveyor it will be necessary to remove some of the guard rails on the machine frame. Disconnect the left front corner guard rail from the machine frame. Lift and remove the corner guard rail from the machine and store in a secure location to prevent damage.

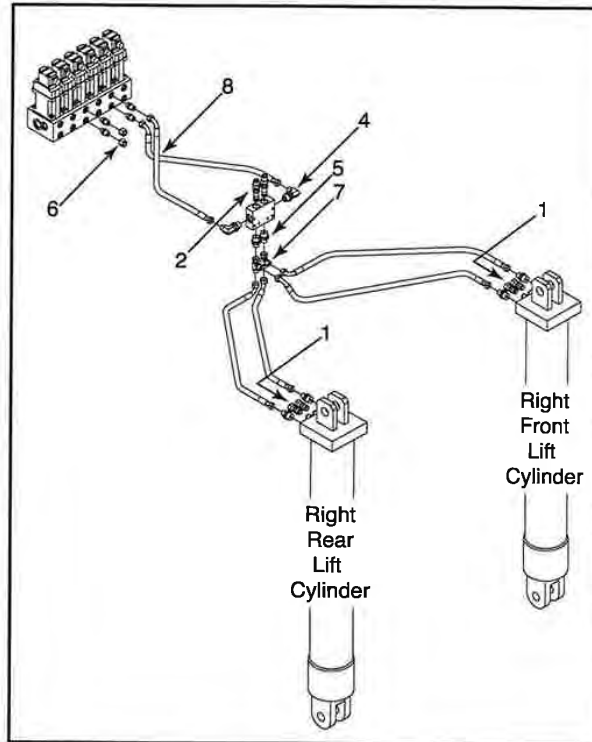


Remove walkway guard rails

Disconnect and remove the guard rails on the front walkway. This will allow the conveyor to be mounted

without contacting the guard rails. Store the guard rails in a secure location to prevent damage.

Hydraulic stabilizer installation



Install stabilizer hydraulic circuit

To prevent the machine frame from twisting due to the rigid frame, a stabilizer hydraulic circuit should be installed. The drawing indicates the components required for installation. The following procedures should be used to install the hydraulic stabilizer components.

Notice: Lower the right side of the machine completely or onto blocking to remove all weight from the lift cylinders.

Make certain that the right front and right rear legs have been lowered completely to remove all weight from the lift cylinders. Remove the two counterbalance valves from each of the lift cylinders and replace with cavity plugs (No.1 in diagram).

Note: Wrap the counterbalance valves in clean lint-free cotton rags and seal in plastic bags to prevent damage and contamination of the valves.

Insert two counterbalance valves (No.2 in diagram) into the top ports of the counterbalance valve block and tighten securely. Install two 90 degree o-ring face

seal/o-ring boss fittings (No.4 in diagram) to ports V1 and V2 on the double counterbalance valve block provided. Tighten securely. Install two o-ring face seal/o-ring boss 6-10 fittings (No.5 in diagram) in to ports C1 and C2 on the counterbalance valve block provided. Tighten securely. Install the swivel end of the swivel tee 6-6 fittings (No.7 in diagram) on to the fittings in ports C1 and C2. Tighten securely.

Disconnect the bottom hose from the servo manifold block directly below the right rear grade servo valve and connect the hose to the tee fitting labeled C2 on the counterbalance manifold provided. Cap (No.6 in diagram) both fittings below the right rear servo valve. Disconnect the top hose from the servo manifold block directly below the right front grade servo valve and connect the hose to the tee fitting labeled C1 on the counterbalance manifold provided. Disconnect the bottom hose from the servo manifold block directly below the right front grade servo valve and connect the hose to the tee fitting labeled C2 on the counterbalance manifold provided. Connect a 3/8 X 84 in. hose (No.8 in diagram) between the top port of the right front grade servo and port V1 on the counterbalance manifold provided. Connect a 3/8 X 84 in. hose (No.8 in diagram) between the bottom port of the right front grade servo and port V2 on the counterbalance manifold provided. Tighten all fittings as previously described. To expell any air that may be in the hydraulic lines, fully extend and retract the lift cylinders several times.

03 Positioning the Legs

Vertical Positioning

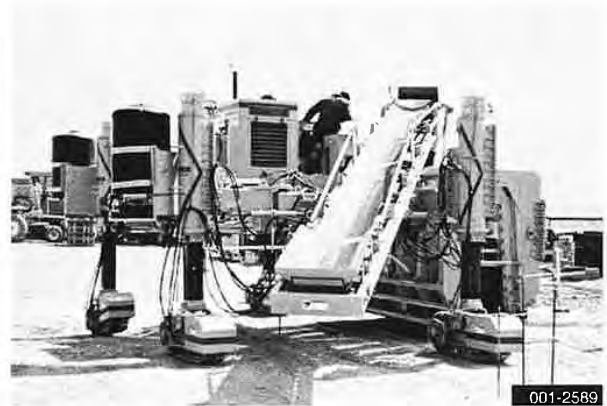


Vertical leg position

The vertical positioning of the leg mounts will be determined by the height of the wall. Normally, for side mounted barrier wall, the leg mounts are placed in the lowest position (position #1). Refer to the vertical

leg positioning section of chapter 3 for instructions for repositioning the leg mounts vertically.

Lateral Positioning



Swinging leg position (full swing)



Swinging leg position (standard)

⚠ CAUTION! ⚠

SEVERE DAMAGE TO THE TURNBUCKLES CAN OCCUR IF THE TURNBUCKLES ARE TIGHTENED INCORRECTLY.

When pouring side mounted barrier wall, the swinging legs on the right side of the machine can be positioned to the maximum right (out) position for best stability (see photo above). If clearance problems exist, the swinging legs on the right side may be positioned anywhere within the leg swing radius (see photo above). The left front and left rear swinging legs are normally positioned in the straight ahead (center) position. If two turnbuckles are used, tighten the

turnbuckles by rotating the barrel and pulling the threads into the barrel of the turnbuckle.



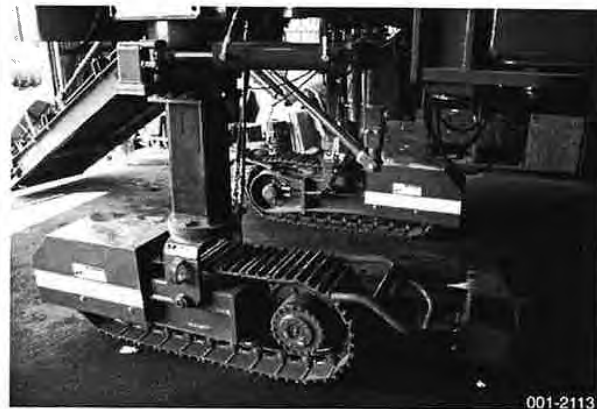
Track yoke adjustment

After adjusting the swinging legs, check the stroke of the steer cylinders (also refer to the track positioning section at this time). If the steer cylinder is not near the center of its stroke when the track is straight ahead, adjustment may be necessary. Each inner leg tube is bolted to the track yoke allowing adjustment to center the stroke of the steer cylinder and allowing the track to be turned approximately the same amount in either direction. Support the frame near the leg that will be rotated. Lower the frame onto the support and take the weight off the track. Remove the four bolts from the track yoke and retract or extend the steer cylinder to turn the inner leg to the next set of holes in the yoke. The steer cylinder should be extended approximately 6 inches (15 cm) when the track is straight ahead. Turn the track on the center spindle bolt to the set of holes required to face the track straight ahead (it may be necessary to loosen the center spindle bolt). Insert the bolts, lock washers and nuts and tighten securely.

Track Positioning



Tracks facing correct direction



Tracks facing incorrect direction



WARNING!



MAKE CERTAIN ALL PERSONNEL ARE CLEAR OF THE MACHINE AND ANY MOVING PARTS BEFORE STARTING THE ENGINE. CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. KEEP HANDS, FEET AND LOOSE CLOTHING CLEAR OF ANY PINCH POINTS AND MOVING PARTS. SEVERE INJURY OR AMPUTATION CAN OCCUR IF PERSONNEL ARE CAUGHT IN OR STRUCK BY MOVING PARTS.

When switching from paving mode to barrier mode, the track drive sprockets should be to the rear of the track frame when the machine travels forward. If all tracks do not face the same direction as previously indicated it will be necessary to rotate the track(s) to face the correct direction. Adequately support the 4-track frame next to the track(s) to be rotated. Disconnect the hydraulic hoses to the track drive motor and the track tension cylinder. Remove the four bolts, lock washers, and nuts connecting the track yoke to the inner leg tube. Start the engine and jog the inner leg tube up to remove the weight from the track. Kill the engine. Rotate the track to face the correct direction (a bolt in the center of the track yoke will maintain correct alignment). Before inserting the bolts connecting the track yoke to the inner leg tube, check the steer cylinder stroke as indicated previously in the lateral positioning section. Align the holes and insert the four bolts, lock washers and nuts and tighten securely. Thoroughly clean the quick couplers on the track tension and track drive hoses to prevent dirt from entering the hydraulic system. Connect the track tension hose and the track drive motor hoses. Start the engine and raise the leg high enough to remove the blocking. If needed, rotate any other tracks on the

machine to face the correct direction using the same procedure.

⚠ **WARNING!** ⚠

CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACKS BEFORE MOVING THE MACHINE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

Check the track drive motor hoses for correct connection by starting the engine and placing the track forward/reverse switch in the forward (F) position. Rotate the travel variable speed knob clockwise and make certain all tracks are rotating in the forward direction. If not, stop the machine, kill the engine and reverse the track drive hoses on the incorrectly connected tracks.

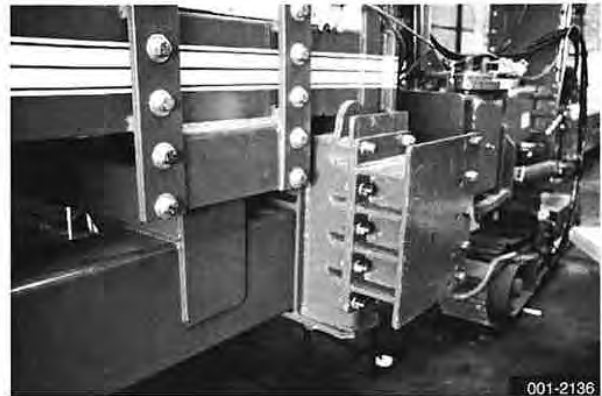
04 Mounting the Form

Installing Form Mounts



Front form mounting bracket

Clamp the front form mounting bracket to the left side of the 4-track frame to the rear of the left front swinging leg. Tighten the mounting bolts securely.



Rear form mounting bracket

Clamp the rear form mounting bracket to the left side of the 4-track frame to the front of the left rear swinging leg. Tighten the mounting bolts securely.



Measure distance between mounting brackets



Adjust mounts on machine frame

It will be necessary to align the front and rear mounting brackets with the mounts on the form. Measure the distance between the mounts on the form and transfer the same distance to the mounting brackets on the

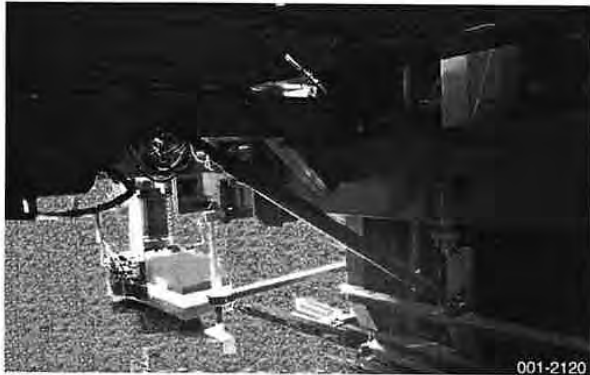
machine frame. Adjust the mounting brackets as necessary and tighten securely.

Mounting the Form



Mounting form

Place the form on a relatively flat spot. Move the machine into position along side of the form. Raise or lower one side of the machine or the other so that the mounts on the machine are parallel to the mounts on the form. Install the bolts, flat washers, lock washers and nuts and tighten securely (flat washers go on slotted hole side) for each mount.



Install rear turnbuckle

Install a stabilizing turnbuckle between the lug on the bottom of the 4-track cross frame tube and the lug on the rear of the form, near the bottom. If the lug is not present on the machine, consult the factory for the mounting lug and location instructions.



Install front turnbuckle

Install a stabilizing turnbuckle between the lug on the bottom of the 4-track cross frame tube and the lug on the rear of the form, near the bottom. If the lug is not present on the machine, consult the factory for the mounting lug and location instructions.

05 Preparing the Barrier Form

Adjusting Standard Sideplates

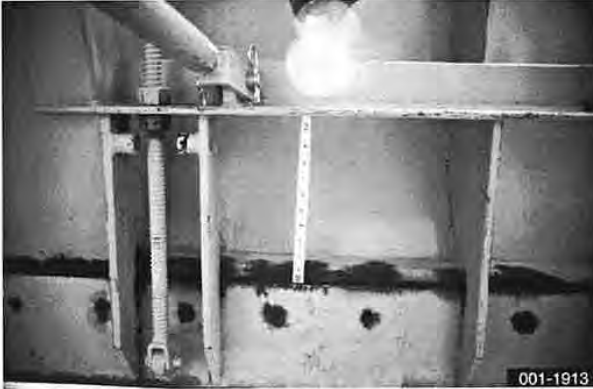


Adjusting rear sideplates

Adjust the rear of the sideplate on each side of the form to give the proper amount of exposed vertical surface. Measure from the angled transition bend line to the bottom of the sideplate. Adjust the sideplate up or down with the rear adjustment bolt. Lock the adjustment in place when the proper measurement is attained. Make the measurement in line with the adjustment bolt.

If the back of the barrier form is a straight side (parapet), measure the amount of exposed sideplate below the main portion of the form on the front side, after it has been set for the proper amount of exposed surface. Adjust the sideplate on the back side of the form until the amount of exposed sideplate below the

main portion of the form is the same as the front. Make the measurement in line with the adjustment bolt.

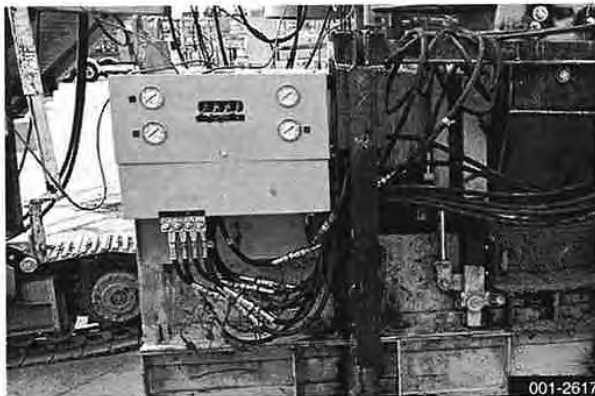


Adjusting front sideplates

Measure from the top of the sideplate to the bottom of the angle iron on the side of the form, in line with the rear adjustment bolt. Measure the distance from the top of the sideplate to the bottom of the angle iron on the side of the form, in line with the front adjustment bolt. Adjust the front of the sideplate until the measurement is the same as the rear.

Note: Sideplate adjustment is normally easier with the form attached to the machine and raised off the ground.

Adjusting Pressure Compensated Hydraulic Sideplates



Pressure compensated sideplate console

If the form is equipped with pressure compensated hydraulic sideplates, it will be necessary to install the control valve console to the guard rail near the operator or on the form. Connect each of the cylinder hoses to the corresponding quick couplers on each control valve. Connect two hydraulic extension hoses between the pressure and return hoses on the control

valves and the hydraulic sideplate hoses located under the left rear corner of the control console. Be sure to thoroughly clean the quick couplers to prevent dirt from entering the hydraulic system.

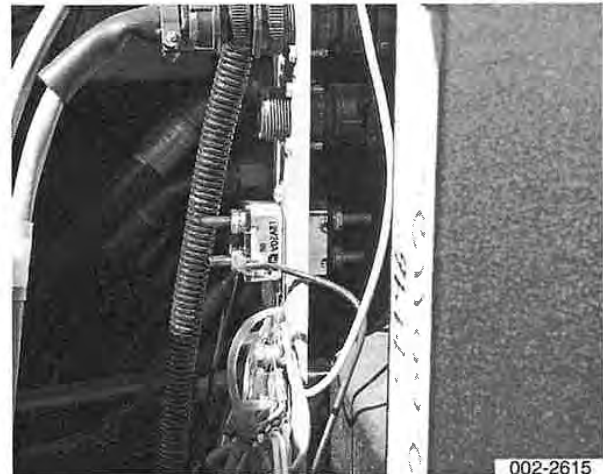
Note: Large forms may have control valves factory installed onto the form. Connect the pressure and return hoses as necessary.

Notice: Do not connect the hoses on the machine for the hydraulic sideplates together, or loss of lift pressure will result.

To adjust the hydraulic sideplates refer to section 9 for final adjustment procedures.

If the form is equipped with sensed profiles or sideplates, it will be necessary to attach the sensor mounts and sensors as well as provide a power and ground to the control box on the form.

Variable Barrier Profile Sensor Installation



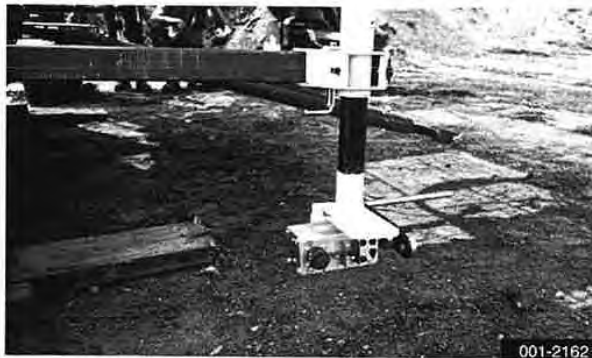
Connect power cable to circuit breaker

A cable is provided for power and ground to the control box from the electrical system on the Commander III. Attach the small ring connector to the auxiliary side of the power washer circuit breaker located above the power relay on the front console door. Connect the large ring connector to a ground lug or bolt on the front console door. Connect the cable connector to the matching connector from the control box on the form.



Attach sensor mount arm

The On-Off sensors are connected to the profile or sideplate at the front and rear. Insert a sensor mount arm into the square tubes on the front and on the rear of the profile or sideplate and tighten the setscrews securely. Attach a grade sensor jack to the sensor mount arm.

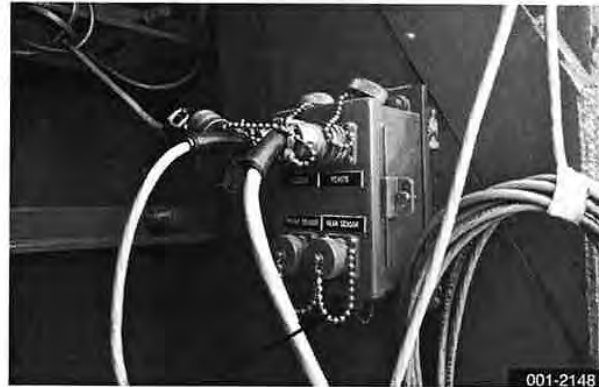


On-Off sensor and wand

Mount an On-Off sensor, for profile or sideplate control, to the mount on the adjustable grade jack with the mounting bolt facing the forward direction of travel and the sensor shaft away from the side of the form. Mount the sensor with the top level and tighten the mounting bolt securely.

The On-Off sensor wand is mounted with the round tube towards the reverse direction of travel and pointing away from the side of the form. The wand should be attached, so that when the pin in the shaft is centered between the stops on the sensor, the wand is parallel to the mounting bolt (horizontal). Tighten the attaching "thumbscrew" securely.

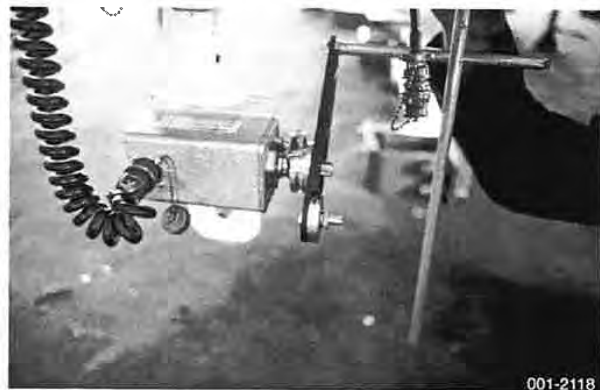
Note: Rotating the sensor wand in an up position should raise the profile or sideplate. Rotating the sensor wand in a down position should lower the profile or sideplate.



Connect sensors to bulkheads

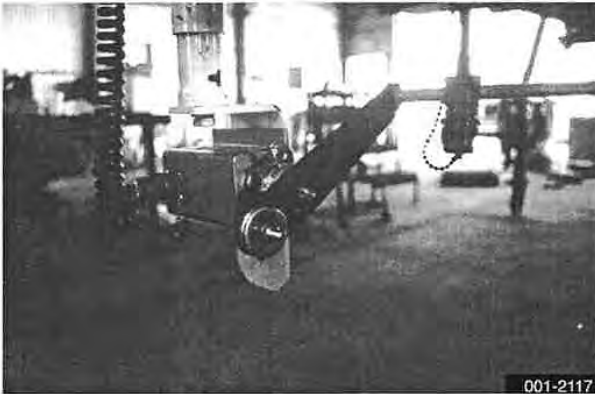
Connect the sensors to their respective plugs on the control box. Front sensor to the front bulkhead plug and rear sensor to the rear bulkhead plug.

Notice: When the sensors are disconnected, place dust caps over/in the electrical plugs to keep moisture and dirt out.



Grade Wand Weight Washers

It is normally recommended to remove two of the counterweight washers from the rear of the grade wand, so only two remain.



Adjust Spring Tension

Adjust the spring tension on the sensor shafts to hold the roll pin in contact with the stop pin. Adjust the spring tension to hold the grade wand in the up position.

Refer to the Final Adjustment section (section 09) for adjustment procedures.

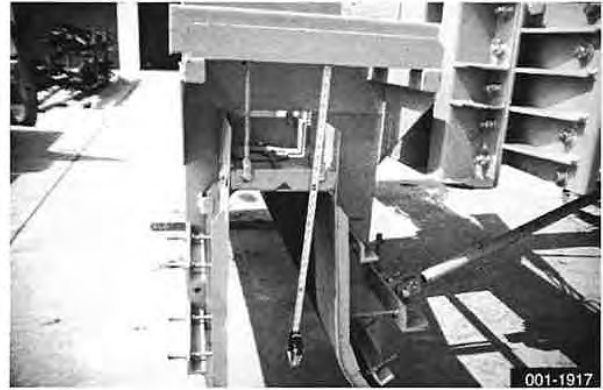
Adjusting Top Plate



Measure top cap

Place a straight edge, from side to side, below the bottom rear edge of the sideplates. Measure from the straight edge to the rear edge of the stainless top cap. This measurement should be the same as the required height of the wall, plus approximately 3/4 in. (2 cm) allowance for slump.

Notice: This measurement may increase or decrease based upon concrete slump, support structures within the wall, width of the wall and the height of the wall. Adjust as necessary to compensate for any deviations.



Adjust top cap

To adjust the top plate, loosen the attaching bolts on both sides of the form. Adjust the rear edge of the top plate up or down with the adjusting bolts until the wall is the correct height. Lock the nuts on the adjusting bolts securely. Place a straight edge across the two square tubes on the top of the form directly over the rear of the top plate. Measure from the straight edge down to the flat portion of the plate on each side. These two measurements should normally be even. If not, adjust one side or the other as necessary.



Center top cap adjustment

Note the measurement at the rear of the form between the straight edge and the top plate. Move the straight edge forward to the center set of adjusting bolts. Adjust the center of the top plate until it is approximately 1/4 in. (6 mm) above the rear of the plate. Move the straight edge forward to the front set of adjusting bolts. Adjust the front of the plate until it is approximately 1/2 in. (13 mm) above the rear of the plate. Tighten all of the adjusting nuts securely. Tighten the attaching bolts on both sides of the form securely.

Stainless Trowel Adjustment



Adjust leading edge of stainless

Adjust the stainless trowel section on each side of the form so the leading edge is approximately 1/8 in. (3 mm) outside of the rear edge of the main form. Make the adjustment at all adjustment points. Tighten the adjustment nuts securely.

Place a 4 ft. (1.2 m) straight edge from the rear of the stainless trowel section, up into the main form in line with one of the adjusting bolts. Adjust the rear of the stainless until there is a 1/8 in. (3 mm) gap between the rear edge of the main form and the straight edge. Tighten the adjustment nuts securely. Do the same at each set of adjustment bolts.



Vibrator installed in barrier wall sideplate

If the variable barrier wall requires the sideplate to extend below the bottom of the standard vibrator mount position, a special mount will be installed in the sideplate for a vibrator. Remove the flat metal plate and install the vibrator mount box using sealer around the mount to prevent concrete leakage. Use a small amount of lubricant on the tip of the vibrator to aid the insertion of the vibrator through the rubber seal. Insert and tighten the bolts securely.

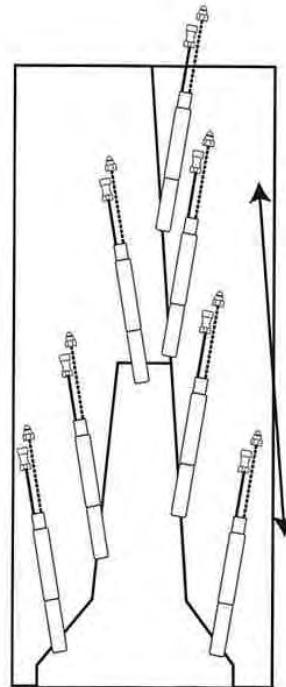
Note: It may be necessary to replace the rubber seal at regular intervals to prevent concrete leakage.

Vibrator Installation

Vibrators used in a variable barrier mold are normally the straight housing type. The first vibrator is installed with the tip centered to one side of the barrier wall base. A second vibrator can be installed in the other side of the wall base.

Position the left and right vibrators with their tips 6 to 8 in. (15 to 20 cm) in from their respective sides. The tips should be positioned 4 to 6 in. (10 to 15 cm) above the bottom of the profile section.

Note: If pouring over cage steel, make certain that there is at least 1 in. (2.54 cm) clearance between the vibrator and the cage steel.



Install vibrators

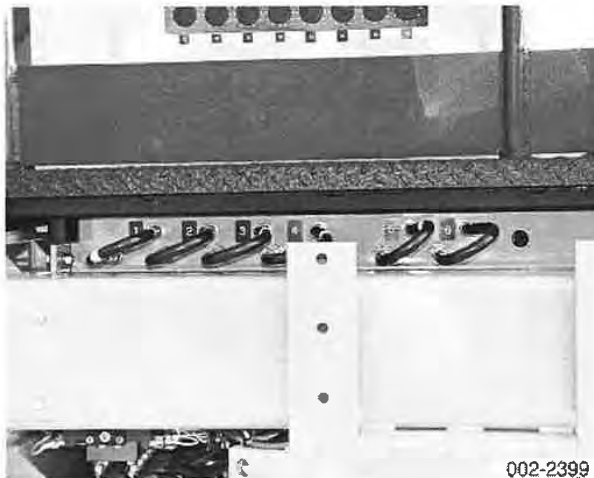
The vibrator(s) installed along the stationary side of the form opening should clear any steel by a minimum of 1 in. (2.54 cm). If no steel is being inserted into the wall, the vibrator(s) can be installed with the tip towards the center of the wall opening. Evenly space the vibrator(s) to get the best consolidation of the concrete. This insures that the wall is thoroughly vibrated from top to bottom.

The vibrators installed along the moving profile side of the form opening should clear any steel by a minimum of 1 in. (2.54 cm). If no steel is being inserted into the wall, the vibrator(s) can be installed with the tip towards the center of the wall opening. Evenly space

the vibrator(s) to get the best consolidation of the concrete. The moving profile requires one or two vibrators placed above the top of the stationary profile (when fully retracted). The vibrator(s) in this position will not be used until the profile is moved down far enough to place the vibrator(s) next to the wall opening. This insures that the wall is thoroughly vibrated from top to bottom through a transition.

Note: Make certain that the vibrators on the moving profile side have enough clearance to miss the vibrators on the stationary side as the profile is moved up or down.

The top vibrator in the stationary side is installed with the tip centered in the throat opening of the wall top. Be certain that the tip will clear any steel by a minimum of 1 in. (2.5 cm). Tighten the mounting bolts and setscrews securely on all vibrators.



Connect vibrators to bulkheads

Thoroughly clean the quick couplers on the vibrator drive hoses and the bulkhead quick couplers to prevent dirt from entering the hydraulic system. Connect the vibrator drive hoses to the vibrator outlet quick couplers. It is recommended that the vibrators be connected in a consecutive order beginning with number one at the top. Any vibrator outlet that does not have a vibrator attached to it, must have a loop hose connected.

Thoroughly clean the connections on the hopper gate hoses (if equipped) and the hold down hoses to prevent dirt from entering the hydraulic system. Connect the hold down hoses to the hopper gate hoses.

Note: Most variable barrier forms will provide a valve on the front of the form for the hopper gate. It will be connected to the solenoid valve bank for hydraulic pressure and return hoses.

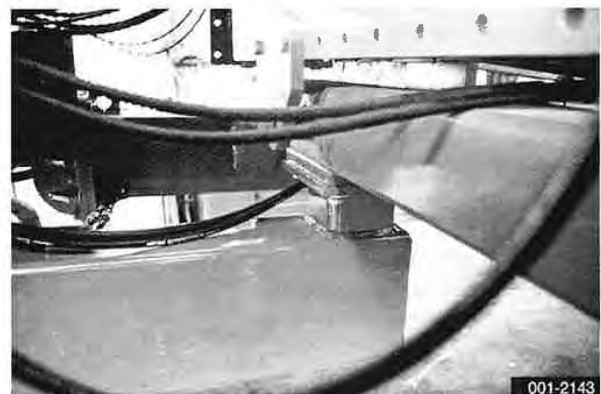
Secure each of the vibrator protective hoses to prevent them from being pulled into the hopper of the form. Position the hoses to reduce the amount of concrete flow restriction in the form hopper.

06 Preparing and Mounting the Conveyor

Notice: If 6 ft. (1.83 m) frame extensions are attached to the front of the machine, they must be removed from the frame before mounting the conveyor.



Install conveyor support beam



Second support beam mount

WARNING!

KEEP HANDS AND FEET AWAY FROM MOVING PARTS. DO NOT USE FINGERS TO ALIGN HOLES. SEVERE INJURY OR AMPUTATION CAN OCCUR IF PARTS WERE TO SUDDENLY MOVE.

Attach the conveyor support beam to the 4-track frame by removing the inside turnbuckle from the left front leg. Remove the turnbuckle mount from the front of the 4-track frame. Using a suitable lifting device, lift the conveyor support beam into position and align the holes in both of the mounts (in the end frame and under the cross frame). Place the turnbuckle mount bracket over the top of the support beam bracket on the end frame and insert a bolt, lock washer and flat washer into each of the six holes. Insert a bolt, lock washer and flat washer in each of the four holes under the cross frame. Tighten securely.

Note: Longer bolts will be needed when attaching both the turnbuckle mount and the conveyor mount in the same position.

When pouring variable barrier wall, it is normally recommended that one or two 4 ft. (1.2 m) conveyor extensions be installed. The conveyor must be removed from the machine, if installed, to install the extension(s). Run the conveyor so the belt splice is centered on the top of the conveyor. Disconnect the conveyor drive hoses at the bulkhead quick couplers and the lift hoses at the lift cylinder. Remove the bolt through the conveyor lift assembly yoke at the bottom of the upper conveyor support. Using an adequate lifting device, remove the conveyor from the machine. Remove the conveyor discharge chute and the mounting brackets from the bottom of the conveyor. Lay the conveyor on a flat, level surface.

Note: It may be advisable to remove the hoses from the drive motor before laying the conveyor on the ground to prevent damage. Be certain to plug the motor ports to keep dirt from entering the motor.

If variable sideplates are on both sides of the form, it may be necessary to install two 4 ft. conveyor extensions in the conveyor frame to reach the hopper of the form and reduce the incline angle of the conveyor. Contact the nearest GOMACO dealer or GOMACO for the requirements.



Remove the belt splice

With Spliced Belt: Loosen the belt tension by loosening the conveyor adjusting bolts (drive pulley end) completely. Bend the locking washer on the end of the conveyor belt splice pin straight. Remove the splice pin.

Note: For easier splice pin removal, it may be necessary to clean all of the concrete out of the splice.



Install belt extension

Install the 8 ft. (2.4 m) belt extension so the splice rivet heads are up. Insert the splice pin and secure by bending the locking washer.

After the extension has been inserted, pull the ends of the belt together and install the splice pin. Secure the pin by bending the locking washer.

Note: It will be necessary to remove the return roller from the conveyor extension prior to inserting it into the frame. Reattach the return roller after the frame and belt are assembled.

With Vulcanized Belt: Loosen the belt tension by loosening the conveyor adjusting bolts and nuts at both ends completely. Remove the return rollers



(including the conveyor extension) to allow removal of the belt over the side of the conveyor frame. Remove the belt.

Place the longer belt next to the conveyor frame after the frame extension has been inserted. Place the belt around the drive and idler pulleys and slide it into place on the pulleys. Attach the return rollers to their original positions supporting the belt.



Separate the conveyor sections

Installing Conveyor Extension: Remove the belt as previously described. Remove the four bolts through the connector joint on each side of the conveyor frame. Pull the two sections of conveyor apart approximately 5 ft. (1.5 m).

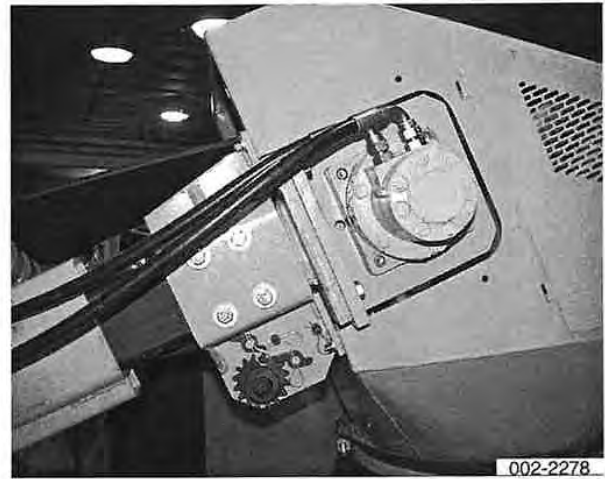


Insert frame extension

Slide the 4 ft. (1.2 m) frame extension into place so it engages the ears on the lower conveyor section. Install the four bolts, lock washers and nuts on each side and tighten securely. Slide the upper conveyor section towards the extension so the ears on it engage the upper section. Install the four bolts, lock washers and nuts on each side and tighten securely.

Install the belt as previously described and adjust the belt tension. The belt should be tight enough to

prevent slippage. Adjust the tension by turning the adjusting bolts and nuts on the drive and idler pulleys. Be certain each pulley is adjusted evenly on both sides. Adjust the conveyor belt alignment as instructed in the Maintenance chapter.



Attach charge chute

Using a suitable lifting device, raise the drive end of the conveyor off the ground. Lift the charge chute into place and insert the mounting pins into the clips on the underside of the conveyor. Swing the chute up into position and secure with the attaching bolts. Tighten the bolts securely.



Install hinge mount bracket

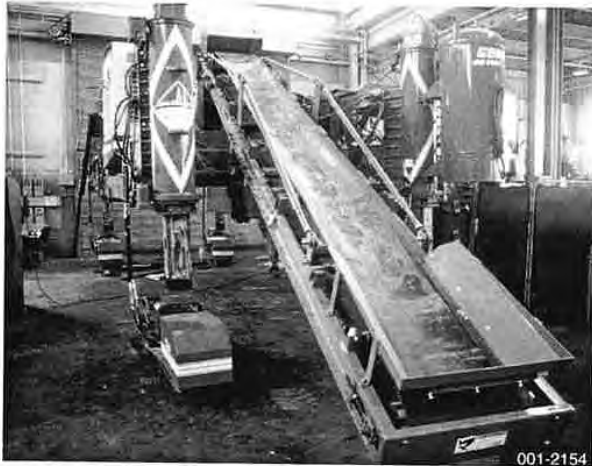
Clamp the hinge mount bracket to the end of the conveyor support beam. Tighten the bolts, lock washers and nuts securely. Attach the hinge assembly to the hinge mount bracket with the hinge pin. Secure the hinge pin with a hair pin. Insert the inner mount tube in the top of the hinge assembly so that the cylinder lug is oriented above the cylinder lug on the hinge assembly. Install the vertical lift cylinder

between the two lugs and secure with cylinder pins and hair pins.



Install conveyor supports

Install the upper conveyor support to the bottom of the conveyor frame extension in the holes closest to the top joint. Install the lower conveyor support in the first set of holes below the frame extension. Tighten all bolts securely.



Attach conveyor to machine frame

⚠ **WARNING!** ⚠

SEVERE INJURY OR DEATH CAN OCCUR IF PERSONNEL ARE CAUGHT IN OR STRUCK BY MOVING OR FALLING PARTS. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

Using a suitable lifting device, raise the conveyor and align the upper conveyor support with the top of the inner mount tube/hinge assembly. Lower the upper conveyor support into the center of the inner mount tube assembly until the support flanges contact each other. Raise the yoke end of the lower conveyor support and attach it to the upper conveyor support tube. Install the bolt and tighten securely.

Thoroughly clean the quick couplers on the conveyor lift hoses to prevent dirt from entering the hydraulic system. Connect the conveyor lift hoses to the conveyor lift cylinder. Thoroughly clean the quick couplers on the rear shift hoses and the conveyor vertical lift quick couplers to prevent dirt from entering the hydraulic system. Connect the rear shift hoses to the conveyor vertical lift cylinder.



Swing conveyor into position

⚠ **CAUTION!** ⚠

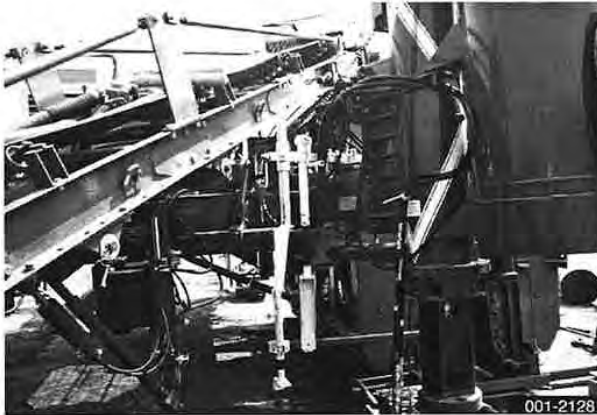
MAKE CERTAIN ALL PERSONNEL ARE CLEAR OF THE CONVEYOR BEFORE SWINGING. SEVERE INJURY CAN OCCUR IF PERSONNEL ARE CAUGHT IN OR STRUCK BY THE SWINGING CONVEYOR.

Swing the conveyor so the discharge chute is positioned over the center of the form hopper. It may also be necessary to raise or lower the conveyor vertically to aid in positioning the discharge chute and prevent the conveyor hopper from dragging on the

grade. Insert and tighten the bolts in the hinge mount securely to hold the conveyor in place.

07 Mounting the Sensors

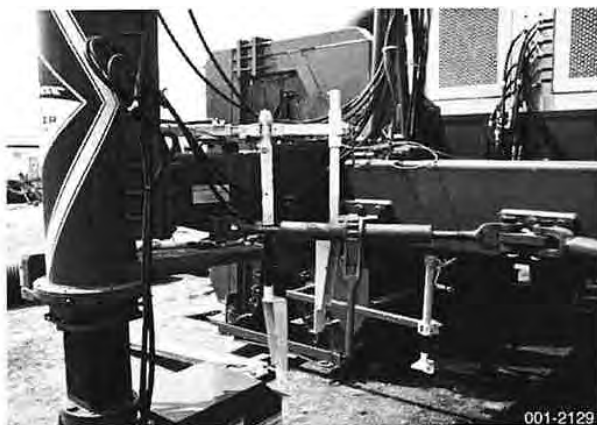
Guideline Under Machine



Attach left front sensor pivot and arm

Mount a sensor pivot mount to the mount under the left front swinging leg of the 4-track frame, with the long end of the mount pointed towards the right front corner of the machine. Tighten the mounting bolt securely. Slide a sensor arm assembly into the pivot mount. The sensor mounts should be positioned just below the conveyor mount. Tighten the mounting setscrews securely.

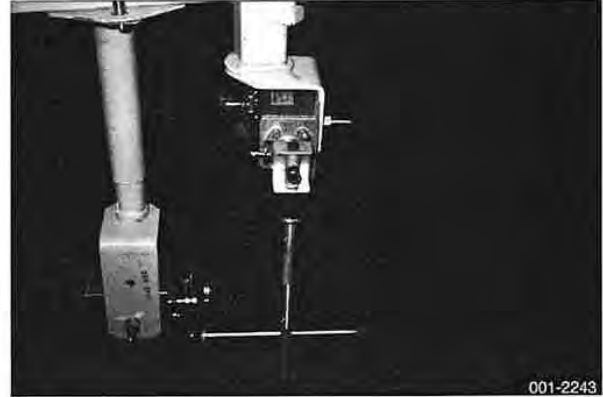
Note: It may be necessary to shorten the length of the sensor arm assembly to clear the side of the form.



Attach left rear sensor pivot and arm

Mount a sensor pivot mount to the mount under the left rear swinging leg of the 4-track frame, with the long end of the mount pointed towards the right rear corner of the machine. Tighten the mounting bolts securely.

Slide a sensor arm assembly into the pivot mount. The sensor mounts should be positioned below the control console. Tighten the setscrews securely.



Mount grade and steer sensor

Network Sensor Installation: Mount a sensor for elevation control to the mount on the adjustable grade jack with the mounting bolt facing the rearward direction of travel and the sensor hub away from the side of the form. Mount the sensor so the top of it is level and tighten the mounting bolt securely. The front and rear grade sensors are mounted in the same manner.

The grade sensor wand is mounted so that the round tube is towards either the front of the machine (same side as the cord) and pointing away from the side of the form or; toward the rear of the machine (same side as the mounting bolt) and pointing away from the side of the form. The wand should be attached, so that when the stop pin in the sensor shaft is centered between the stops on the sensor, the wand is parallel to the mounting bolt (horizontal). Tighten the attaching "thumbscrew" securely.

Note: All grade sensors and wands must be installed in the same manner. If one sensor or wand is facing the wrong direction according to the calibrate settings in the Network controller, it will work backwards (see later).

Mount a sensor for steering control to the square tube mount with the mounting bolt facing towards the form and the sensor hub towards either the front or the rear. Mount the sensor so the top of it is level and tighten the mounting bolt securely. The front and rear steering sensors are mounted in the same manner.

The steering sensor wand should be attached to the sensor hub, so that when the stop pin in the sensor shaft is centered between the stops on the sensor, the

wand is at a 90° angle to the mounting bolt (vertical). Tighten the attaching "thumbscrew" securely.

Note: All steer sensors and wands must be installed in the same manner. If one sensor or wand is facing the wrong direction according to the calibrate settings in the Network controller, it will work backwards (see later).



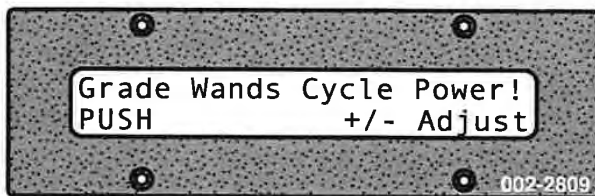
Connect Sensor Cords to Bulkhead Plug

Connect the sensors to their respective plugs on the bulkhead. Steering sensors to the "steer" plugs, and grade sensors to the "grade" plugs.

Note: When connecting the sensors for each control circuit, connect the sensor into the bulkhead nearest the leg the sensor is going to control.

Notice: When the sensors are disconnected, place dust caps over/in the electrical plugs to keep moisture and dirt out.

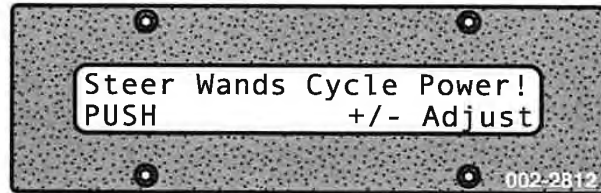
Network controller calibration



Grade sensor mode selection

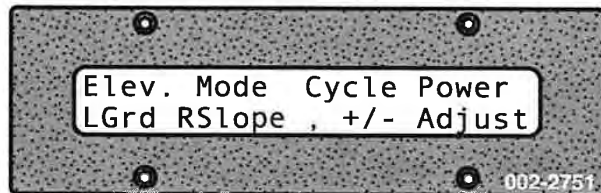
Depress the calibrate switch on the service panel and use the NEXT switch to scroll forward to the grade sensor mode. Use the slope adjust switches (+ or -) to change the mode to "PULL" if the round tube of the grade wand is on the same side as the cord. If the round tube of the grade wand is on the same side as the mounting bolt, change the mode to "PUSH". The

operator must cycle the power before any changes are enabled.



Steer sensor mode selection

Using the NEXT switch, scroll forward to the steer sensor mode. Use the slope adjust switches (+ or -) to change the mode to "STEER WANDS = LEAD" if the round tube of the steer wand is facing forward. If the round tube of the grade wand is facing towards the rear of the machine, change the mode to "STEER WANDS = TRAIL". The operator must cycle the power before any changes are enabled.

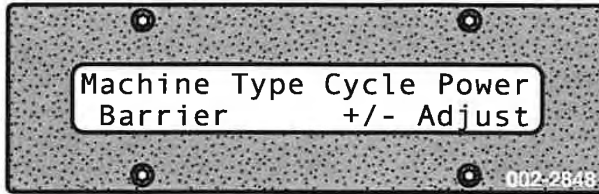


Network panel for left grade, right slope

To operate the machine with left hand grade control, and right side slope control, depress the calibrate switch. Scroll through the various displays until the elevation mode is displayed. Use the slope adjust switches (+ or -) to change the mode to "L Grd RSlope". After the appropriate grade and steering mode settings are selected, depress the calibrate switch to return to the main screen. Adjust the desired amount of cross slope with the appropriate switch on the main control panel. Refer to the Preliminary Adjustments section for final adjustment procedures. The operator must cycle the power before any changes are enabled.

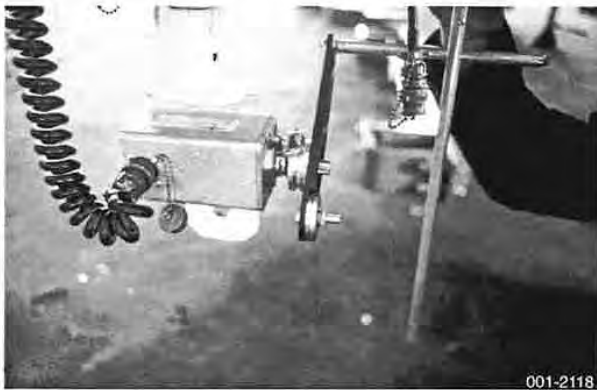
The left front leg elevation is controlled by the front grade sensor connected to the left front grade plug, and the left front elevation control loop. The left rear leg elevation is controlled by the left rear grade sensor, connected to the left rear grade plug, and the left rear elevation control loop. The right front leg elevation is controlled by the slope sensor, located in the battery box, and the right front elevation control loop. The right rear leg elevation is controlled by the right rear grade sensor, connected to the right rear grade plug, and the right rear elevation control loop. The steering of both front tracks is controlled by the front steer sensor connected to the front steer plug and the front

steer control loops. The steering of the rear tracks is controlled by the rear steer sensor connected to the rear steer plug and the rear steer control loop.



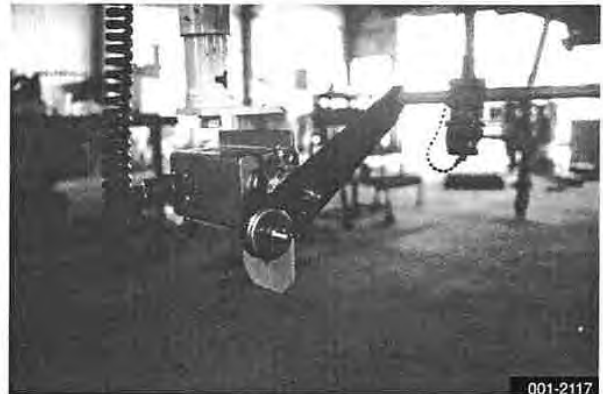
Change network program configuration

Prior to moving the machine, it will be necessary to properly align the steering on each of the tracks. Begin by depressing and releasing the calibrate (CALIB) switch on the network control box. Depress and release the NEXT switch until the machine type is displayed on the main screen. Depress the slope set switches +/- until the "Barrier" display is shown. Depress and release the CALIB switch to return the main screen to the normal operating display. The operator must cycle the power before any changes are enabled.



Grade Wand Weight Washers

It is normally recommended to remove two of the counterweight washers from the rear of the grade wand, so only two remain.



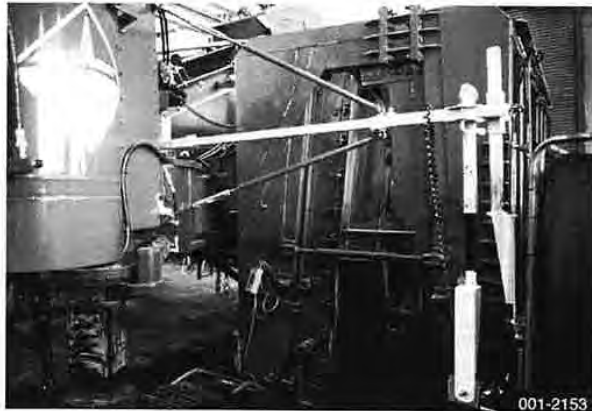
Adjust Spring Tension

Adjust the spring tension on the sensor shafts to hold the roll pin in contact with the stop pin. Adjust the spring tension to hold the grade wand in the up position and the steering wand away from the machine frame.

Check for correct sensor wand spring tension after the machine has been adjusted to the guideline. Note the position of the guideline on the grade sensor wand. Pull the steering sensor wand away from the guideline and note movement of the guideline on the grade wand. If movement exceeds 1/8 in. (3 mm), the steering sensor spring tension is too tight. Loosen tension slightly. Check for looseness of spring tension by pulling the guideline away from the steering wand. The steering sensor wand should move out towards the guideline until the stop pin in the sensor shaft contacts the stop pin in the side of the sensor. If not, tighten the spring tension slightly. If sensor wands deflect the guideline more than 1/8 in. (3 mm), but stop pins in sensor and shaft will not contact one another, suspect an inadequately tensioned guideline. Adjust the guideline as necessary.

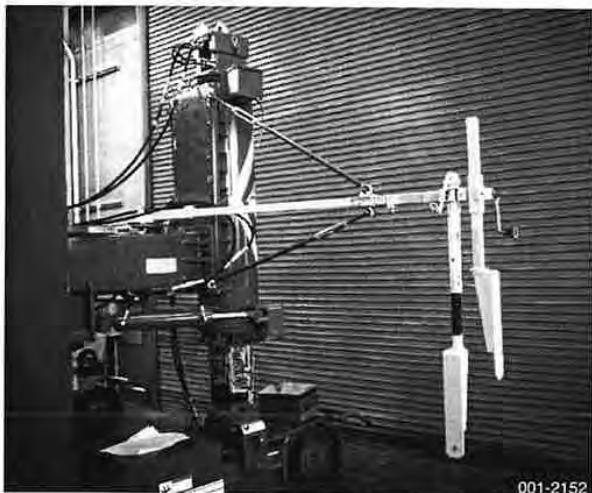
Note the position of the guideline on the steering sensor wand. Pull grade sensor wand down, away from the guideline and note movement of the guideline on the steering wand. If movement exceeds 1/8 inch (3 mm), the grade sensor spring tension is too tight. Loosen tension slightly. Check for looseness of spring tension by pulling the guideline away from the grade wand. The grade sensor wand should move up towards the guideline, until the stop pin in the sensor shaft contacts the stop pin in the side of the sensor. If not, tighten the spring slightly. If sensor wands deflect the guideline more than 1/8 inch (3 mm), but stop pins in sensor and shaft will not contact one another, suspect an inadequately tensioned guideline. Adjust the guideline as necessary.

Guideline on Left Side of Machine



Attach front sensor pivot and arm

Mount a sensor pivot mount to the bottom or on top of the left front swinging leg and tighten securely. It is normally advisable to have the long end of the pivot mount out towards the sensor arm assembly for stability. Slide a brace bracket onto the sensor arm assembly, with the center lug up. Slide the sensor arm assembly into the pivot mount until the end of the arm is near the final offset distance from the side of the form. Align the end of the sensor arm with the front of the hopper on the form. Tighten the setscrews securely. Attach the L-shaped bracket to the top or bottom of the frame extension. Connect the long end of the brace rod to the bracket on the frame extension and the short end of the brace rod to the bracket on the sensor arm. Adjust the turnbuckle to remove all flex from the sensor arm.



Attach rear sensor pivot and arm

Mount a sensor pivot mount to the bottom or on top of the left front swinging leg and tighten securely. It is normally advisable to have the long end of the pivot

mount out towards the sensor arm assembly for stability. Slide a brace bracket onto the sensor arm assembly, with the center lug up. Slide the sensor arm assembly into the pivot mount until the end of the arm is near the final offset distance from the side of the form. Align the end of the sensor arm with the front of the hopper on the form. Tighten the setscrews securely. Attach the L-shaped bracket to the top or bottom of the frame extension. Connect the long end of the brace rod to the bracket on the frame extension and the short end of the brace rod to the bracket on the sensor arm. Adjust the turnbuckle to remove all flex from the sensor arm.

Mount a sensor for elevation control to the mount on the adjustable grade jack with the mounting bolt facing forward and the sensor hub away from the side of the machine. Mount the sensor so the top of it is level and tighten the mounting bolt securely. The front and rear grade sensors are mounted in the same manner.

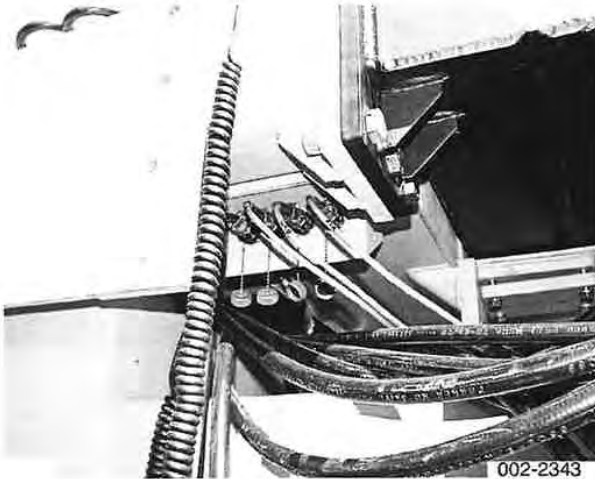
The grade sensor wand is mounted so that the round tube is towards either the front of the machine (same side as mounting bolt) and pointing away from the side of the machine or; toward the rear of the machine (same side as the cord) and pointing away from the side of the machine. The wand should be attached, so that when the stop pin in the sensor shaft is centered between the stops on the sensor, the wand is parallel to the mounting bolt (horizontal). Tighten the attaching "thumbscrew" securely.

Note: All grade sensors and wands must be installed in the same manner. If one sensor or wand is facing the wrong direction according to the calibrate settings in the Network controller, it will work backwards (see later).

Mount a sensor for steering control to the square tube mount with the mounting bolt facing away (out) from the machine frame and the sensor hub towards either the front or the rear. Mount the sensor so the top of it is level and tighten the mounting bolt securely. The front and rear steering sensors are mounted in the same manner.

The steering sensor wand should be attached to the sensor hub, so that when the stop pin in the sensor shaft is centered between the stops on the sensor, the wand is at a 90° angle to the mounting bolt (vertical). Tighten the attaching "thumbscrew" securely.

Note: All steer sensors and wands must be installed in the same manner. If one sensor or wand is facing the wrong direction according to the calibrate settings in the Network controller, it will work backwards (see later).

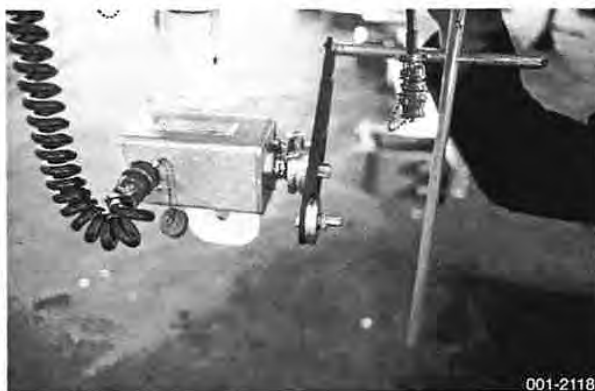


Connect Sensor Cords to Bulkhead Plug

Connect the sensors to their respective plugs on the bulkhead. Steering sensors to the "steer" plugs, and grade sensors to the "grade" plugs.

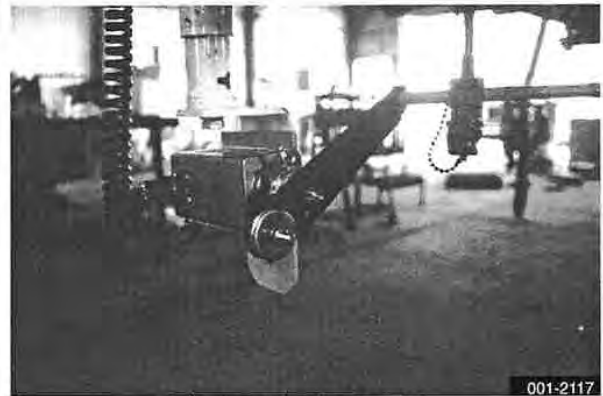
Note: When connecting the sensors for each control circuit, connect the sensor into the bulkhead nearest the leg the sensor is going to control.

Notice: When the sensors are disconnected, place dust caps over/in the electrical plugs to keep moisture and dirt out.



Grade Wand Weight Washers

It is normally recommended to remove two of the counterweight washers from the rear of the grade wand, so only two remain.



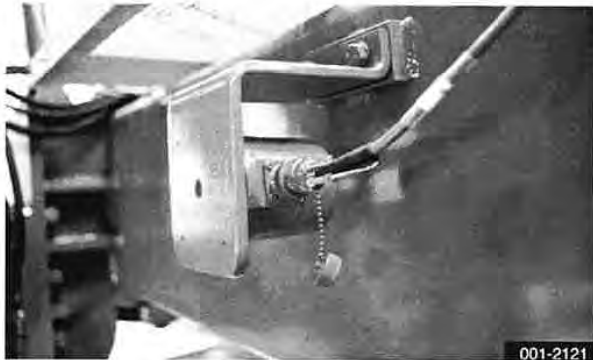
Adjust wand spring tension

Adjust the spring tension on the sensor shafts to hold the roll pin in contact with the stop pin. Adjust the spring tension to hold the grade wand in the up position and the steering wand away from the machine frame.

Check for correct sensor wand spring tension after the machine has been adjusted to the guideline. Note the position of the guideline on the grade sensor wand. Pull the steering sensor wand away from the guideline and note movement of the guideline on the grade wand. If movement exceeds 1/8 in. (3 mm), the steering sensor spring tension is too tight. Loosen tension slightly. Check for looseness of spring tension by pulling the guideline away from the steering wand. The steering sensor wand should move out towards the guideline until the stop pin in the sensor shaft contacts the stop pin in the side of the sensor. If not, tighten the spring tension slightly. If sensor wands deflect the guideline more than 1/8 in. (3 mm), but stop pins in sensor and shaft will not contact one another, suspect an inadequately tensioned guideline. Adjust the guideline as necessary.

Note the position of the guideline on the steering sensor wand. Pull grade sensor wand down, away from the guideline and note movement of the guideline on the steering wand. If movement exceeds 1/8 inch (3 mm), the grade sensor spring tension is too tight. Loosen tension slightly. Check for looseness of spring tension by pulling the guideline away from the grade wand. The grade sensor wand should move up towards the guideline, until the stop pin in the sensor shaft contacts the stop pin in the side of the sensor. If not, tighten the spring slightly. If sensor wands deflect the guideline more than 1/8 inch (3 mm), but stop pins in sensor and shaft will not contact one another, suspect an inadequately tensioned guideline. Adjust the guideline as necessary.

Slope Sensor Mounting



Slope Sensor Mount (barrier)

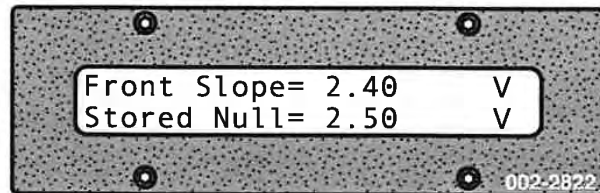
To operate the machine on slope control, it will be necessary to install the rear slope sensor mount and slope sensor. Facing forward direction of travel in the barrier mode will determine the front of the 4-track frame. The front slope sensor will not be mounted. The rear slope system is installed with a hydraulic stabilizer to prevent a frame twist from occurring and causing one of the tracks to raise off of the grade. If this circuit is not installed, call GOMACO or your GOMACO distributor and request kit number GT69-152. Refer to section 02, Preparing the Machine Frame for installation procedures.

The rear slope sensor should be mounted to the formed mounting plate with 4 screws and clamps. The mounting plate should be attached to the rear mount on the 4-track frame with two 1/2 X 3/4 inch bolts and lock washers. When the sensor has been properly mounted, the cable bulkhead in the side of the slope sensor canister should face towards the left side of the 4-track frame and the notch in the side of the slope sensor canister should face down. Connect a sensor cable between the rear slope sensor and the bulkhead for the 3 track slope sensor on the back of the control box.

Note: When changing from 4 track barrier mode to 4 track paving mode it will be necessary to change the position of the slope sensors to the appropriate positions on the 4-track frame. Refer to the 4-track paving setup section for slope sensor positioning.

It will be necessary to calibrate the slope sensor to get accurate slope control. It will be necessary to level all four sides of the 4-track frame before calibrating the slope sensor. Using the manual jog switches on each of the individual modules for grade control, place a level on the top or bottom of the left end frame and jog the front or rear legs up or down until the left end

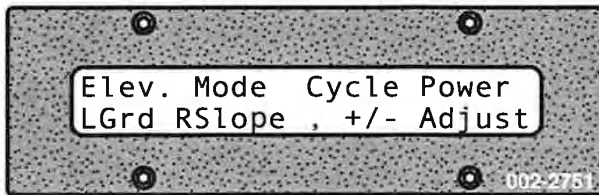
frame is level. Place a level on the top or bottom of the front frame and jog the right side up or down until the frame is level. Place a level on the top or bottom of the right end frame and jog the front or rear legs up or down until the right end frame is level. Place a level on the top or bottom of the rear frame and jog the right side up or down until the frame is level. Double check all sides, making adjustments as necessary until all four sides are level. When this is finished, stop the engine and return the key to the "on" position.



Front slope sensor calibration

Centering the Slope Sensor: Prior to storing a new null point, level the 3-track machine frame from side to side or level the 4-track machine frame on all four sides. When the machine frame is level, turn off the engine. Turn the ignition key to the "on" position to operate the network controller. Depress and release the SET switch. The main screen will indicate "STORE to Save Slope Null & Feedback Pot. Points". Depress the LAST or NEXT switch until the appropriate slope sensor is indicated on the main screen. The main screen will indicate which sensor is ready for adjustment and the voltage value that the network controller is receiving from the sensor. The lower line will indicate the stored null voltage of the sensor.

Adjust the machine frame in a level position as previously described. If the top line of the display does not read between 2.40 and 2.60 Volts, loosen the appropriate slope sensor and rotate it until the top line voltage reads between 2.40 and 2.60 Volts. Tighten the mounting screws securely. Depress the STORE switch to store the new null point. Depress the NEXT switch and repeat the procedure for the other slope sensor (if applicable). Refer to the Maintenance chapter for more information.

Left Side Grade Control/Right Side Slope Control


Grade Left; Slope Right Display

To operate the machine with left hand grade control, and right side slope control, depress the calibrate switch. Scroll through the various displays until the elevation mode is displayed. Use the slope adjust switches (+ or -) to change the mode to "LGrd RSlope". After the appropriate grade and steering mode settings are selected, depress the calibrate switch to return to the main screen. Adjust the desired amount of cross slope with the appropriate switch on the main control panel. Refer to the Preliminary Adjustments section for final adjustment procedures. The operator must cycle the power before any changes are enabled.

The left front leg elevation is controlled by the left front grade sensor connected to the grade bulkhead plug nearest to the left front leg, and the left front elevation control loop. The left rear leg elevation is controlled by the left rear grade sensor connected to the grade bulkhead plugs nearest to the left rear leg, and the left elevation control loop. The right rear leg elevation and the right front leg elevation are controlled by a slope sensor, (located on the rear cross frame of the 4-track frame) and the right rear elevation control loop. The right front elevation control loop display will be operated in the manual mode.

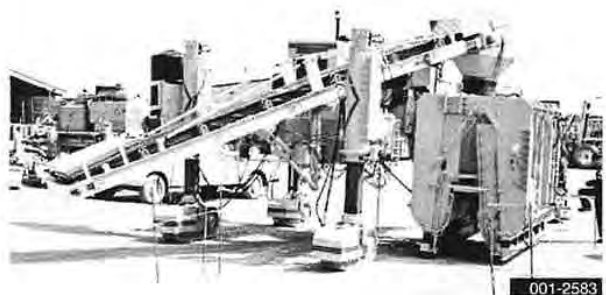
Note: The hydraulic stabilizer system must be installed between the right front leg and the right rear leg elevation cylinders. This system will prevent one of the four tracks from lifting off the ground if a frame twist were to occur.

08 Preliminary Adjustments


Adjust form parallel with frame

Place a level across the frame of the machine (left to right). Using the grade or slope jog switches, manually level the machine from side to side. Stop the engine or place the servo lock switch in the "on" position. Place the level across the square tubes at the top of the open front extension shroud on the form. Adjust the front stabilizing turnbuckle until the top front of the form is level. Secure the turnbuckle in place with the jam nut. Place the level across the square tubes near the rear of the form. Adjust the rear stabilizing turnbuckle until the top of the form is level. Secure the turnbuckle in place with the jam nut.

Note: If the form does not have the open front extension shroud, place the level on the top front of the hopper to adjust the front turnbuckle.



Align machine parallel with guideline

⚠ WARNING! ⚠

CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACKS BEFORE MOVING THE MACHINE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

If control of the machine is being taken from a guideline on the left side, refer to the Preliminary Adjustment section of the Standard Set-Up chapter. If the guideline is under the machine, move the machine into position over the guideline. Steer the front or rear of the machine left or right as necessary, until approximately the same distance exists between the guideline and the front of the form and the guideline and the rear of the form. If pouring over cage steel, the form should be parallel to and centered over the steel. Steer the front and rear tracks to the straight ahead position.

Note: If the machine will not move, check the emergency stop reset light (if equipped). If it is illuminated, depress the reset switch.



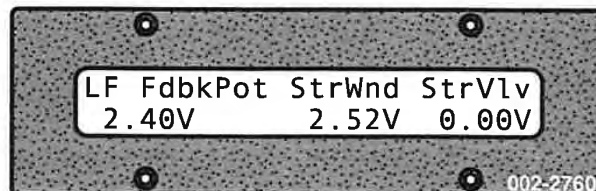
Lower machine parallel with guideline

Place the slope control circuit in "automatic" and adjust the slope setting to the required amount of slope. Lower the machine using the front and rear grade jog switches until the bottom of the slipform mold is lightly resting on the grade. Be sure the frame is approximately the same distance above the guideline at front and rear. Be certain that the tracks are straight ahead and stop the engine. Leave the ignition switch in the "on" position.



Adjust sensors to guideline

Preliminary sensor adjustment: It is advisable to screw the adjustable steering sensor mount out (clockwise), with the crank in the end of the sensor arm assembly, 3 to 4 inches (76 to 100 mm) before making sensor adjustments. This will allow for minor steering adjustments if needed. Place the steering sensor wands on the machine side of the line. Turn the sensor L-shaped mount bracket until the shaft through each of the steering sensors is parallel to the guideline. Adjust the front steering sensor left or right (in or out) until the steering wand is perpendicular to the guideline. If a large amount of adjustment, 1 inch (25 mm) or more, is necessary to adjust the steering wand perpendicular, loosen the set screws in the sensor mount and adjust the sensor arm assembly in or out as needed. Tighten both set screws securely. (Save crank adjustment for "fine tuning" adjustments). Adjust the front and rear steering sensors to the guideline in the same manner.

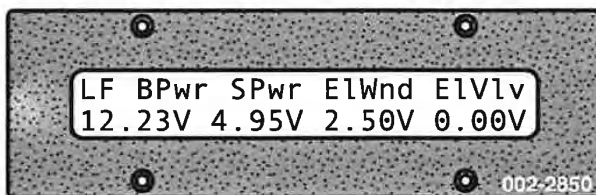


Test Display used to center steer sensor

To calibrate the steering sensors, it will be necessary to depress the test switch. Depress the NEXT/LAST switches until the appropriate display appears for the

front steer sensor on the main screen. Place the steer select switch in the "auto" position and make sure the forward/reverse switch is in the "forward" position. With the steering sensor centered, the display should read "STEER 2.50V." If the steering sensor centering signal reads more or less than "2.50V", adjust the steering sensor in or out with the crank adjustment on the sensor mount until it reads "2.50V". Depress the NEXT/LAST switches until the appropriate display appears for the rear steer sensor. Adjust the rear steer sensor in the same manner.

It is advisable to screw the adjustable grade sensor jack mount out (clockwise), with the crank on the end of the grade jack assembly, 6 inches (150 mm) before making sensor adjustments. Place the grade sensor wand under the guideline. Turn the sensor L-shaped mount bracket until the shaft through the grade sensor is at a 90 degree right angle to the guideline. Adjust the grade sensor up or down until the grade arm is parallel to the guideline. If a large amount of adjustment is necessary to adjust the grade arm, loosen the set screws in the grade sensor jack and raise or lower the jack as needed. Tighten both set screws securely. Loosen the L-shaped clamp bolt in the grade jack assembly and slide the jack left or right until the grade sensor wand is centered beneath the guideline. Tighten the clamp bolt securely. Loosen the set screw in the steering sensor square tube mount and slide the sensor assembly up or down until the guideline is approximately 10 to 12 inches (250 to 300 mm) from the sensor shaft. Tighten the set screw securely. The sensor mounts should be adjusted until there is no less than 1/4 inch (6 mm) and no more than 1-1/2 inch (38 mm) between the sensor wands.



Test display used to center grade sensor

To calibrate the grade sensors, it will be necessary to depress the test switch. Depress the NEXT/LAST switches until the appropriate display appears for a grade sensor on the main screen. With the grade sensor centered, the display should read "ElWnd 2.50V." If the grade sensor centering signal reads more or less than "2.50V", adjust the appropriate grade sensor up or down with the crank adjustment on the sensor mount until it reads "2.50V". Depress the NEXT/LAST switches until the next grade sensor

voltage reading appears on the main screen. Adjust all grade sensors in the same manner.

Adjust the spring tension on the sensor hubs to hold the wands firmly in contact with the guideline, but not tight enough to deflect the guideline. Check for the correct spring tension after the machine has been adjusted to the guideline. Note the position of the guideline on the grade wand. Pull the steering wand away from the guideline and note the movement of the guideline on the grade wand. If the movement exceeds 1/8 in. (3 mm), the steering spring tension is too tight. Loosen the tension slightly. Note the position of the guideline on the steering wand. Pull the grade wand down, away from the guideline and note the movement of the guideline on the steering wand. If the movement exceeds 1/8 in. (3 mm), the grade sensor spring tension is too tight. Loosen the tension slightly. Pull the guideline away from both sensor wands. The steering wand should move left towards the guideline until the stop pin in the sensor hub contacts the stop pin in the side of the sensor. If not, tighten the spring slightly. The grade wand should move up towards the guideline, until the stop pin in the sensor hub contacts the stop pin in the side of the sensor. If not, tighten the spring slightly. If the sensor wands deflect the guideline more than 1/8 in. (3 mm), but the stop pin in the sensor and the shaft will not contact one another, suspect that the guideline is inadequately tensioned. Adjust the guideline as necessary.

Note: When checking the sensor wand spring tension, it should be done half way between stations so the guideline holders do not interfere. The control system should be in the "standby" mode or the servo lock switch must be in the "on" position when checking the sensor spring tension.



Adjust Slope Setpoint

If slope control is to be used, adjust the proper slope into the machine.

WARNING!

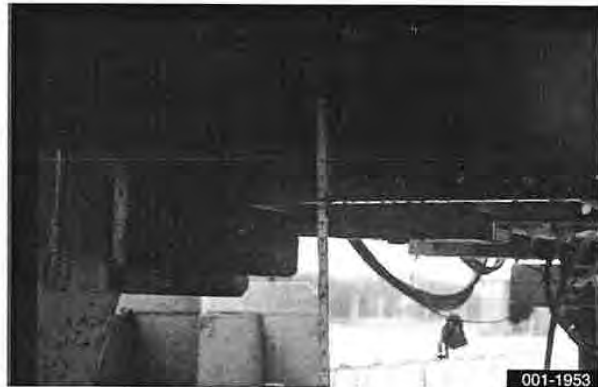
CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACKS BEFORE MOVING THE MACHINE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

Start the engine and place the main screen in the "Run" mode and all control loops in the "Auto" (A) position. Be sure the Servo Lock switch is in the "Off" position, the Steer Select switch is in the "String Steer" position and increase the engine speed to maximum. Place the travel forward/reverse switch in the "forward" position and the travel/neutral switch in the "travel" position. Slowly rotate the travel control knob clockwise to start machine movement. Move the machine forward 20 to 30 ft. (6.1 to 9.1 M), stop, and leave all the controls in automatic.



Measure to guideline (front)

Measure from the bottom of the machine frame down to the guideline at the front. Record this measurement.



Measure to guideline (rear)

Measure from the bottom of the machine frame down to the guideline at the rear. This measurement should be within 1/4 in. (6 mm) of the front measurement. If not, adjust the grade sensors up or down and recheck the measurement.

Note: It is advisable to raise the low end of the machine, rather than lower the high end.



Straight edge to guideline (front)

Place a straight edge against the outer edge of the 4-track frame just to the rear of the front swinging leg (on same side as steering sensors), and extend it down to guideline height. Measure the distance between the machine side of the straight edge and the guideline. Record the measurement.



Straight edge to guideline (rear)

⚠ WARNING! ⚠

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Place a straight edge against the outer edge of the 4-track frame just to the front of the rear swinging leg (on same side as steering sensors), and extend it down to guideline height. Measure the distance between the machine side of the straight edge and the guideline. This measurement should be within 1/4 in. (6 mm) of the front measurement. If not, adjust the front, or rear, steering sensor left or right as required. After adjusting the sensors, move the machine forward 20 to

30 ft. (6 to 9 m) to allow the steering system to correct itself and recheck the measurements.

Note: After the machine has been set parallel to the guideline, check the right tracks to be certain that they are parallel to the left. If not, align the steering system following the instructions in the Maintenance chapter.

09 Final Adjustments



Adjust slope of parapet wall

Adjust the slope of the straight back barrier form by holding a level against the straight side of the form. Plumb the level vertically and adjust the slope setting on the machine until the batter of the back of the wall is correct.



Adjust slope of barrier wall

To adjust the slope of a standard barrier, locate the center of the top of the wall. Locate the center of the base of the wall. Hold a level in line with these two marks. Adjust the slope setting until the wall is at the desired slope.



Measure offset distance (left guideline)

When the guideline is on the left side of the machine, plumb a level vertically against the guideline, in line with the rear of the form hopper. Measure the distance between the guideline side of the level and the reference point (center of top, edge of base, etc.)

on the form. This measurement should be the required offset distance. If not, adjust the front and rear steering sensors evenly as necessary. Moving the sensors towards the guideline (left), increases the distance between the guideline and form. Moving the sensors away from the guideline (right) decreases the distance between the guideline and form. After each adjustment, move the machine forward 20 to 30 ft. (6 to 9 m) and recheck the offset.

Notice: Once the machine frame is adjusted to be parallel to the guideline it should remain parallel. All adjustments thereafter, should be changed equally and in the same direction.

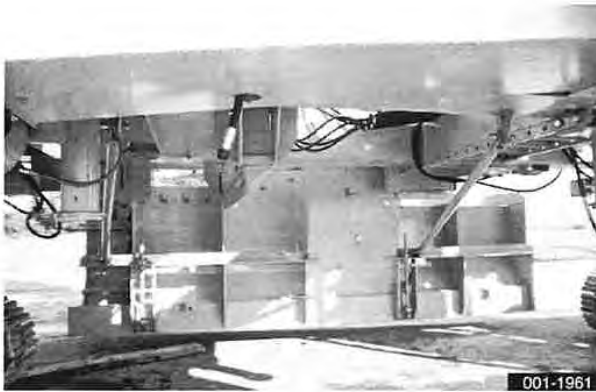


Measure offset distance (guideline under machine)

⚠ WARNING! ⚠

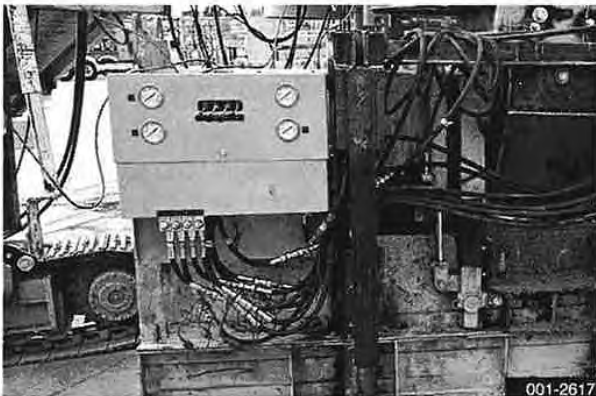
CONTACT WITH MOVING TRACKS CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE TRACKS BEFORE MOVING THE MACHINE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS.

When the guideline is under the machine, plumb a level vertically against the guideline, in line with the rear of the form hopper. Measure the distance between the guideline side of the level and the reference point (center of top, edge of base, etc.) on the form. This measurement should be the required offset distance. If not, adjust the front and rear steering evenly as necessary. Moving the sensors toward the guideline (right), increases the distance between the guideline and the form. Moving the sensors away from the guideline (left) decreases the distance between the guideline and the form. After each adjustment, move the machine forward 20 to 30 ft. (6 to 9 m) and recheck the offset.



Sideplate clearance adjustment

If the barrier form is equipped with standard sideplates, or hydraulic sideplates which are not sensed and the wall is being poured on a smooth surface such as concrete or asphalt, the grade is normally adjusted so that the bottom of the form clears any high spots in the grade by at least 1/8 in. (3 mm). Adjust the grade sensors up or down evenly as necessary and recheck measurement.



Check pressure compensated setting

After the machine has been set to grade, move the hydraulic sideplate control valves to the down position. Lower the sideplates until they are resting on the grade front and rear. Adjust each pressure control valve so that there is 300 psi $\pm$ 50 psi (2067 kPa $\pm$ 344.5 kPa) indicated on the gauges. To adjust the pressure, loosen the jam nut and turn the adjusting screw in to increase pressure, or out to decrease pressure. Tighten the jam nut securely. The valves are normally adjusted to the same pressure.



Check grade adjustment

If the barrier form is equipped with sensed sideplates, or the wall is being poured on an uneven base, such as gravel or dirt, hold a level, plumbed horizontally, above or below the guideline and extended over to the rear of the form. Measure from the guideline side of the level to the top of the rear of the form. If the measurement is incorrect, adjust both grade sensors up or down equally as required. Moving the sensors up, lowers the grade and moving the sensors down raises the grade. One turn of the grade jack crank changes the grade approximately 1/8 in. (3 mm).

Note: Be certain to allow for top slump when checking grade.



On-Off sensor controls

If the profile or sideplates are sensed it will be necessary to adjust the sensors to allow the profile to just touch or be adjusted up to 1/4 in. (6 mm) above the base that the wall is to be poured on. Adjust the front and rear On-Off sensors up or down until the profile or sideplate is in contact with the base or up to 1/4 in. (6 mm) above the base. If a large amount of adjustment is necessary to center the indicator, loosen

the setscrews in the grade sensor jack and raise or lower the jack as needed. Tighten the setscrews securely. To operate the On-Off sensors automatically, place the run/standby switch on the sensor in the "run" position. The indicator lights on the sensors illuminate when an up or down correction is called for. If the sensor is "centered" neither light will be illuminated.

The sensitivity screw controls how fast the sensor will operate. Turning the screw clockwise will decrease the "centered" dead band of the sensor. Turning the screw counterclockwise increases the "centered" dead band of the sensor. Once the wand is rotated out of the centered dead band, the sensor will send an up or down signal to the solenoid valves controlling oil flow to the profile or sideplate cylinders.



Check clearance over cage steel

If the barrier wall is to be poured over cage steel, it is recommended to dry run the length of the job, if possible. Make certain that the steel is properly set and the vibrators clear it by a minimum of 1 in. (2.5 cm).

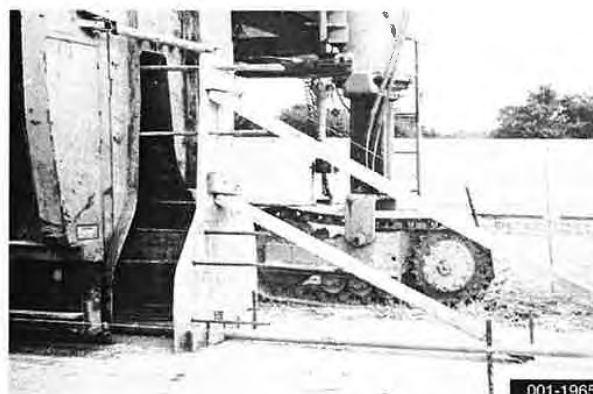
⚠ WARNING! ⚠

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After the machine has been set to steer alignment and grade, it will be necessary to move it back to the start of the job. Set the forward-reverse switch to the "reverse" position. Place the travel neutral switch in the "travel" position. Move the travel variable control knob in the "increase" direction to move the machine to the start of the pour. It may be necessary to raise

the machine a small amount to prevent the form from catching on any obstacles.

10 Pouring Operations



Starting from header

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Starting Pour From Header: When first beginning the barrier wall pour, it is recommended that a template header form be used to start from. The header form should be at least 1/2 in. (13 mm) smaller than the wall on the top and both sides. Set the header form at the beginning point of the pour and brace it adequately as there will be an extreme amount of pressure against it when the concrete is first vibrated against it. After the header form is set, slowly back the machine over it until it is approximately 1 1/2 ft. (46 cm) from the rear of the form hopper. Stop the machine. Place the forward-reverse switch in the "forward" position and the travel neutral switch in the "travel" position. Be certain that the control system is in "automatic" and the servo lock switch is in the "off" position. Move the control valves for the pressure compensated sideplates to the down position to lower the sideplates on to the grade.



CAUTION!



DO NOT PLACE FORM OIL ON THE OPERATORS PLATFORM, OR THE WORK BRIDGE, AS IT MAY CAUSE THEM TO BECOME VERY SLIPPERY. INJURY MAY RESULT IF SLIPPAGE OCCURS. CLEAN PLATFORMS AND WORK BRIDGES IMMEDIATELY TO PREVENT ACCIDENTS.

It is advisable to coat the inside and outside of the form and the machine frame below the conveyor with form oil. The conveyor frame, receiving hopper and the discharge hopper should also be coated. Avoid placing oil on the inside surface of the belt as it could cause slippage.

GOMACO Tip: Place plastic or burlap over the machine frame, directly below the conveyor to aid in clean up at the end of the day.

A minimum of 30 minutes prior to arrival of concrete on the job site, the operator should test all controls and accessories on the machine for proper operation. This procedure should be repeated daily to allow enough time for replacement or repair of a defective component should it become necessary.



Vibrate concrete around header



WARNING!



KEEP HANDS, FEET AND CLOTHING AWAY FROM MOVING CONVEYOR BELT AND ROLLERS. BE CERTAIN THAT NO ONE IS NEAR THE CONVEYOR BEFORE STARTING IT. SERIOUS INJURY OR DEATH MAY RESULT IF ENTANGLED. DO NOT STAND BEHIND THE CONCRETE SUPPLY TRUCK WHEN IT IS BACKING INTO POSITION. SERIOUS INJURY OR DEATH MAY OCCUR IF STRUCK BY THE MOVING TRUCK.

Move the conveyor forward/neutral/reverse switch in the "forward" position and rotate the conveyor variable speed control knob clockwise to begin turning the conveyor. Place the appropriate vibrator off/auto switch in the "auto" position. Rotate each vibrator variable control valve, that has a vibrator attached, counterclockwise to the maximum position. Discharge concrete onto the conveyor belt from the supply truck. Fill the hopper of the slipform mold at least three fourths full. Rotate the travel variable speed knob "clockwise" just enough to start the operation of the vibrators without moving the machine. Allow the vibrators to force the concrete back into the form, until they can force no more into it. Keep the slipform hopper at least three fourths full by starting and stopping the conveyor as necessary.

GOMACO Tip: By spraying the underside of the form and the grade with water, before dumping concrete into the form, it may be possible to fill the form more fully. It may also help to spray a small amount of water onto the first small amount of concrete in the hopper to help it slip into the form more easily.

Continuing the Pour From an Existing Wall



Back form against existing wall

WARNING!

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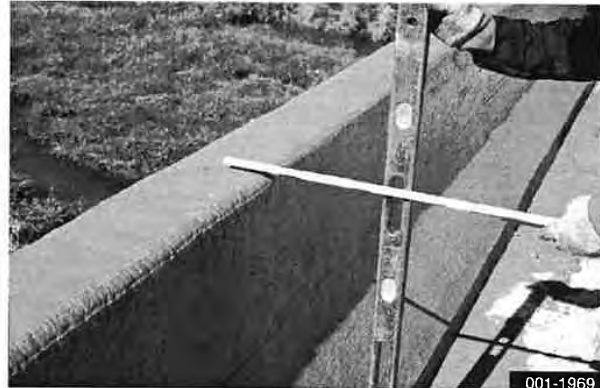
If the pour is to start or continue, from an existing wall, it is necessary that the grade at the end of the existing wall is correct. Back the machine to the start of the pour, as previously described, until the rear of the slipform mold is against the existing wall.

Note: The slipform mold will not fit over the product that was poured with it at a previous time. Concrete slump causes the product to expand wider than the slipform profile.



Remove cover plate in top of form

Set all controls for pouring as previously described. Remove the cover plate from the top of the form. Begin filling the form and vibrating the concrete back into the form. Insert a stinger type vibrator into the opening in the top of the form and vibrate the concrete to the rear of the form. Continue to vibrate the concrete until the form is completely full. Stop the main vibrators on the machine and withdraw the stinger vibrator. Reinstall the cover plate on the top of the form. Begin pouring forward as previously described. By filling the form in this manner, a majority of the hand work needed to complete the joint is eliminated.



Check slope of finished product

After pouring 15 to 20 ft. (4.6 to 6 m) check the final product for proper slope, steer alignment and grade. If adjustments are needed, make them in small increments over a great distance. For example, if the grade requires a change of 1/4 in. (6 mm), adjust it 1/8 in. (3 mm) every 5 ft. (1.5 m) or more. To check the slope of a straight backed barrier (parapet), plumb a level vertically along the back of the wall and check for the correct amount of batter. To check the slope of a standard barrier, plumb a level vertically along the edge of the wall base and measure over to the center of the wall. Adjust the slope setting as necessary.



Check offset

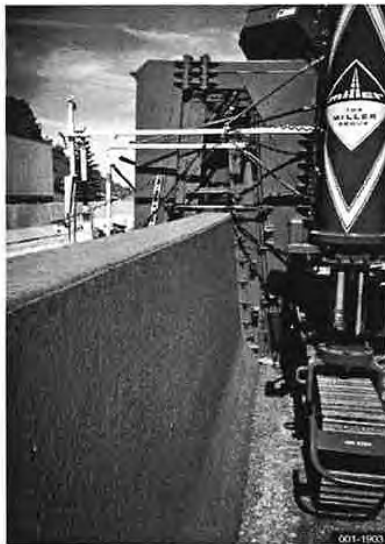
To check the offset, plumb a level vertically along the side of the guideline. Measure the distance between the guideline side of the level and the concrete reference point (center of top, edge of base, etc.). Adjust the front and rear steering sensors evenly, left or right as necessary.



Check grade

To check the grade, lightly place a level on the top of the wall and plumb it over, or under, the guideline. Measure the distance between the concrete side of the level and the guideline. Adjust the front and rear grade sensors up or down, evenly, to get the proper measurement.

Notice: Consistent concrete slump is essential in maintaining proper grade elevation.



Good finished product

Continuing the Pour: Production rate (or travel speed) is determined by many factors, of which a few are:

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1. Delivery rate of the concrete mix. If the concrete mix cannot be readily discharged from the supply truck, the production rate will be lowered. The size of the slipform mold will have a direct affect on how far each load will go.

GOMACO Tip: If the concrete redi-mix truck is equipped with secondary discharge fins, it is recommended to remove them to aid in the discharge of the low slump concrete mix.

2. How dry the concrete mix is (slump). The drier the concrete, the slower the travel speed will be, resulting in a lower production rate. The recommended concrete slump is 1 in. +/- 1/4 in. (2.5 cm +/- 6 mm).



Check cage steel entering form

When pouring over cage steel, it is important that the steel be set straight and even. Observe the steel going into the front of the form to be sure there is equal clearance on all sides. Adjust steel or machine as necessary. Be certain that the steel is adequately tied and braced to prevent movement.



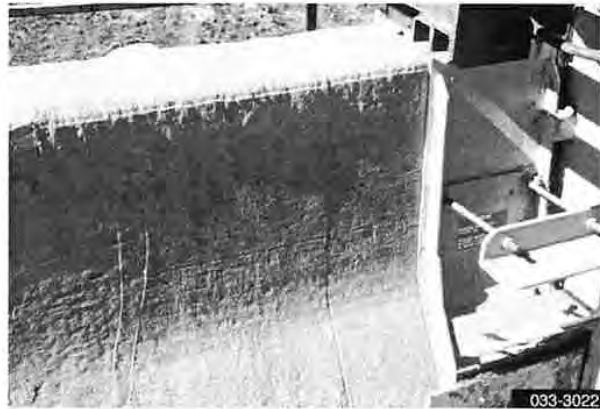
Wet concrete

When the concrete mix becomes too wet (high slump), it may be necessary to increase the travel speed and/or decrease the vibration to avoid a "puffy" surface. If the concrete is extremely wet, the top of the wall may slump excessively, or even fall over. When pouring over cage steel, wet concrete may cause the bars of steel to reflect in the concrete surface. The solution would be to get the concrete mix drier, or refuse to accept it.



Dry concrete

When the concrete mix becomes too dry (low slump), it may be necessary to decrease travel speed and/or increase vibration to eliminate "voids" in the concrete surface. If the concrete is extremely dry, large "voids" may appear in the surface, or the concrete may even pull apart. The solution would then be to add water to the concrete mix, or if necessary, refuse to accept it.



Vibrators operating after stopping machine

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During pouring operations, it occasionally becomes necessary to stop and start the machine travel. When stopping, rapidly move the travel variable speed knob counterclockwise to stop the machine movement. This causes the vibrators to stop at the same instance as the machine travel ceases. When starting the machine travel, rapidly move the travel variable speed knob clockwise. This will start the vibrators at the same instance as the machine travel begins. After the machine is moving, adjust the travel speed as necessary.

GOMACO Tip: When it is necessary to stop for a short period of time, it is recommended to rotate the travel variable speed knob just enough to start the vibrators operating. Allow the vibrators to operate for 5 to 10 seconds before moving the machine to shake the concrete free in the form. This will help eliminate the possibility of the wall tearing when the machine moves forward. It may also be advisable to turn all the vibrator variables to the maximum position.



Concrete set up in form

When it becomes necessary to wait for concrete delivery, it is recommended to have the hopper completely full when the last truck departs, especially if the temperature is extremely warm. Slowly move the machine forward approximately 1 ft. (30 cm) every 5 to 10 minutes. It is recommended to set the vibrators to maximum before moving the machine, after it has set for a period of time.



Contact with guideline

During pouring operations, it is important that nothing, or no one bumps the guideline. Be sure there is no debris against the guideline which could become entangled in the sensor wands. Be certain that persons working around the machine do not come in contact with the guideline.



Setting repair forms

When the top of the wall needs to be repaired due to any of the preceding causes, it is recommended to install forms on each side. Clamp the forms in place so the ends are even with the top of the good sections of wall. Fill the forms with concrete and finish as necessary.



Example of concrete slump variance

Small variations of concrete slump can cause the top of the product to vary up or down during pouring operations. Maintaining a constant concrete slump will help eliminate the variance in the top of the wall. To check, a 10 to 12 foot (3.0 to 3.7 m) straight edge may be used when placed lightly on top of the wall. Repair any fluctuation greater than 1/8 in. (3 mm) as necessary.



Broom finish

Apply any finishing practices to the wall as may be necessary such as a broom finish. Cut any necessary control joints. After all finishing is completed, apply curing compound as necessary.



Feeding continuous steel

⚠ WARNING! ⚠

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In many cases, cage steel is not required for barrier wall but continuous steel reinforcing rod or steel cable is inserted into the front of the form hopper to tie the wall together. A fluted tube is provided in the front of the hopper for each rod or cable to be inserted. It may be necessary to guide the reinforcing rod into the fluted tube to prevent the rod from jamming in the tube.



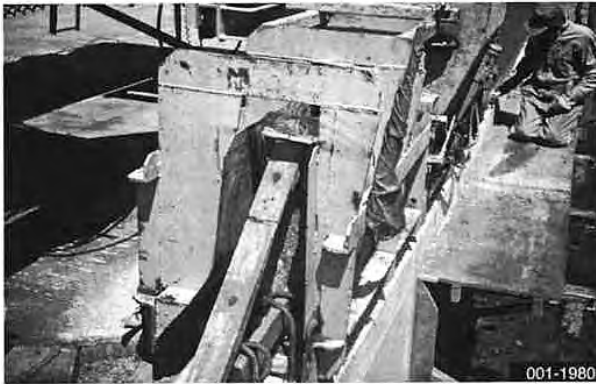
Expansion joint

If no steel is required in the wall but expansion joints are required it will be necessary to open and close the front of the form to allow the expansion joint to pass through. When setting an expansion joint it will be necessary to support and brace the material adequately, as there will be an extreme amount of pressure against it as the concrete in the hopper, being vibrated, goes over it. The expansion material should also be cut at least 1/2 in. (13 mm) smaller than the wall on the top and both sides. As the expansion material begins to go into the front of the form, be certain that it does not catch on the sides or top.



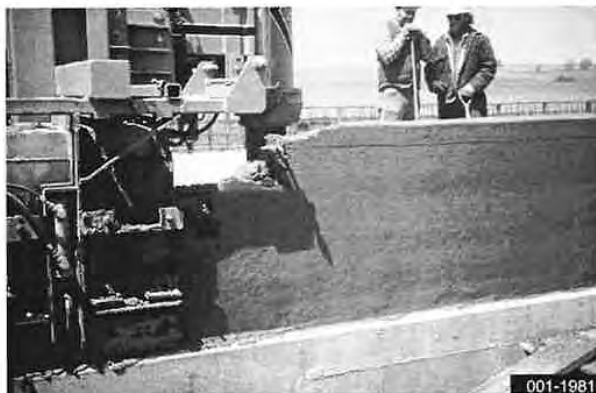
Spray the wall with curing compound

Cover the wall with wet burlap or spray with a curing compound as required to prevent excessive moisture evaporation.



Pouring over header

When pouring over cage steel, it is possible to set a template header form to pour over at the end of the pour. The header form should be cut at least 1/2 in. (13 mm) smaller than the wall on the top and both sides. Set the header form at the end of the pour and brace it adequately, as there will be an extreme amount of pressure against it as the concrete in the hopper, being vibrated, goes over it. As the header form begins to go into the front of the form, be certain that it does not catch on the sides or top.



Ending pour

Ending the Pour: When ending the pour, stop the conveyor. Continue to move the machine forward until all of the concrete has slipped from under the form. Place the vibrator off/auto switches in the "off" position. Place the elevation control loops in the "Man" mode (slope control loops may be left in "Auto"). Using the all jog switch on the network control box, raise the machine to the maximum up position. Place the steer mode select switch in one of the manual positions. Move the machine to an area where it can be cleaned and clean it as soon as possible.

The sensors should be removed before washing the machine. It is advisable to mark the sensor location on the mounts prior to removal. This will speed setup

time if the pour is to be continued at a later date. Be sure to place protective dust caps in/over electrical plugs to keep moisture and dirt out.

Cleaning Operations



Clean machine

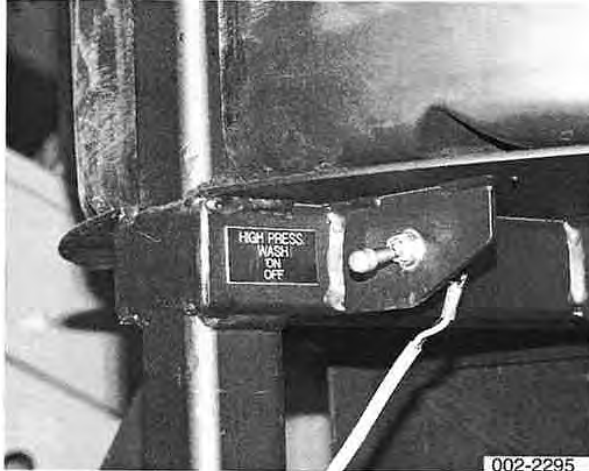
The machine should be cleaned as soon as possible after pouring operations have ended. It is advised to fill the water tank on the machine (if so equipped) at the start of the pour, so water for cleaning purposes is available at the end of the pour. Turn and remove the lid to fill the water tank.

! WARNING! !

CONTACT WITH A MOVING CONVEYOR BELT AND ROLLERS, OR A MOVING AUGER, CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT THE CONVEYOR, OR AUGER, AREA IS CLEAR BEFORE STARTING THE ENGINE. DO NOT STAND ON THE CONVEYOR OR IN THE SLIPFORM MOLD HOPPER AREA DURING CLEANING OPERATIONS. DO NOT OPERATE THE CONVEYOR OR THE AUGER WHEN WASHING THE MACHINE.

Uncoil the hose from the hose hanger and wash the concrete off of the machine. It is recommended that the bottom of the form be washed first. Clean the bottom of the form thoroughly, as any concrete left to dry on the bottom will affect the final concrete finish when the pour is resumed. When washing the conveyor belt, stop the belt travel and wash the side that is visible. After the belt is clean on one side, rotate the belt enough to expose the opposite side and stop it before cleaning it. When washing the auger in the slipform mold, stop the auger and wash the side

that is visible. After the auger is clean on one side, rotate the auger enough to expose the opposite side and stop it before cleaning it.



High pressure wash switch

⚠ WARNING! ⚠

THE HIGH PRESSURE WASH SYSTEM USES HIGH PRESSURE WATER. DO NOT AIM THE NOZZLE AT ANY PART OF THE BODY, AS SERIOUS INJURY CAN OCCUR. WEAR PROPER EYE PROTECTION WHEN CLEANING THE MACHINE.

If the machine is equipped with the optional high pressure wash system, uncoil the hose from the hanger. Place the high pressure wash switch in the "on" position and decrease engine speed to 1500 rpm. Direct the nozzle on the hose at the concrete and pull the trigger. Be certain that the water tank has water in it, and do not allow the pump to run without water, as severe damage to the pump could result.

⚠ WARNING! ⚠

THE REAR TRACK (WHEN IN 3-TRACK MODE) MUST BE KEPT AS FAR TO THE LEFT AS POSSIBLE TO PROVIDE THE MOST STABILITY DURING LOADING OR UNLOADING. THE MACHINE SHOULD ALSO BE DISASSEMBLED TO THE NORMAL TRANSPORT WIDTH WHETHER IN 3-TRACK OR 4-TRACK CONFIGURATIONS.

11 Transport Procedures

⚠ WARNING! ⚠

THE REAR TRACK (WHEN IN 3-TRACK MODE) MUST BE KEPT AS FAR TO THE LEFT AS POSSIBLE TO PROVIDE THE MOST STABILITY DURING LOADING OR UNLOADING. THE MACHINE SHOULD ALSO BE DISASSEMBLED TO THE NORMAL TRANSPORT WIDTH WHETHER IN 3-TRACK OR 4-TRACK CONFIGURATIONS.

When changing the 4-track frame to barrier/transport mode it will be necessary to complete the following procedures.

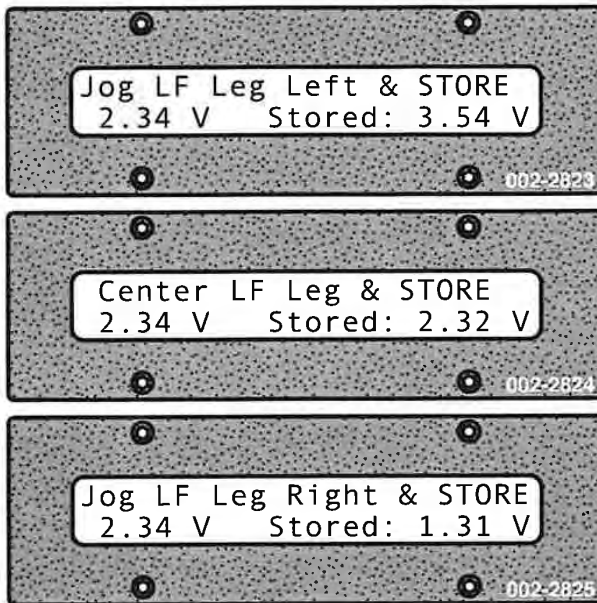


Swing leg in transport mode

Support the 4-track frame on the left side and raise the left front and left rear tracks off of the grade. Loosen, disconnect and remove the turnbuckles from the inside of the swinging legs. Disconnect the outer turnbuckle from the left end frame. Swing the legs around to the end of the 4-track frame and pin the outer turnbuckles to the mount in the center of the left end frame. It may be necessary to adjust the turnbuckles to align the swinging legs in a straight position with the 4-track frame. Position the right legs in the same manner.

⚠ WARNING! ⚠

WHEN MOVING THE MACHINE, MAKE CERTAIN ALL PERSONNEL ARE CLEAR OF THE WORKING AREA AND ANY MOVING PARTS. SEVERE INJURY OR DEATH CAN OCCUR IF ANY PERSONNEL ARE PULLED INTO OR UNDER ANY MOVING PARTS.



Steering feedback calibration

Calibrating the Steering Cylinders: Three adjustments are required for each steering cylinder: left turn limit, center and right turn limit. Begin by starting the engine and depress and release the SET switch. The main screen will indicate "STORE to Save Slope Null & Feedback Pot. Points". To select a steering control loop, depress the LAST or NEXT switch until the appropriate sensor signal is indicated on the main screen (Photo 002-2823). Turn the track as far to the left as required to prevent the track from contacting obstacles on the jobsite. Depress the STORE switch and depress the NEXT switch (Photo 002-2824). Turn the track to the straight ahead position and measure for correct adjustment (Refer to the maintenance chapter for measurement information). When it is adjusted parallel to the machine frame or stringline depress the STORE switch and depress the NEXT switch (Photo 002-2825). Turn the track as far to the right as required to prevent the track from contacting obstacles on the jobsite. Depress the STORE switch. Continue to depress the NEXT switch to repeat the procedure for the other tracks (if necessary). Refer to the Maintenance chapter for more information.

Note: The left and right limits prevent the network controller from stroking the cylinder completely and causing the track to contact an obstacle. When radius work is required, make certain that the left and right limit settings do not prevent the track from turning enough to complete the radius.

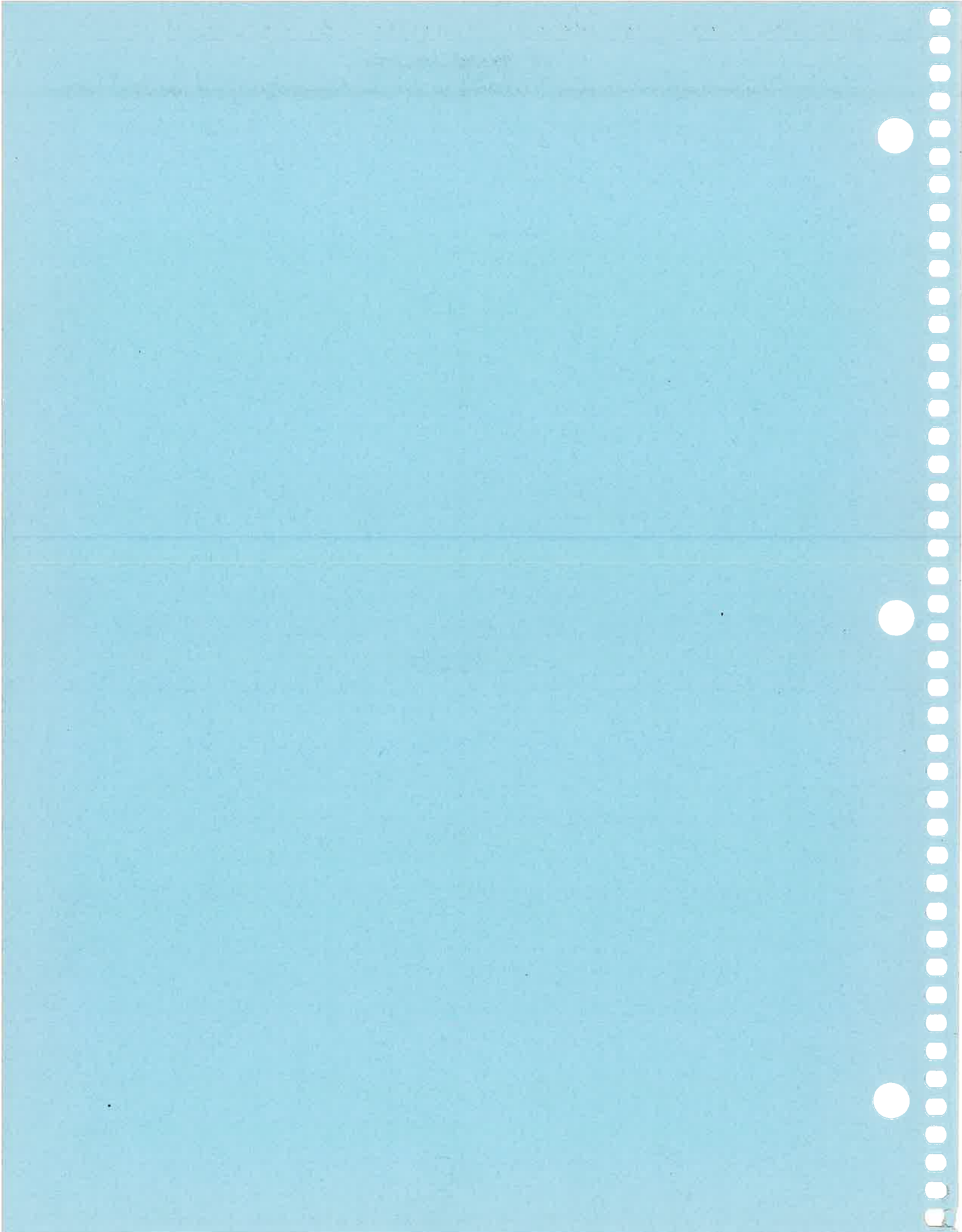
⚠ WARNING! ⚠

WHEN MOVING THE MACHINE IN THE TRANSPORT POSITION, MAKE CERTAIN THAT THE SLOPE SYSTEM IS NOT IN THE AUTO POSITION. LOSS OF MACHINE CONTROL WILL RESULT IN SEVERE INJURY OR DEATH IF ANY PERSONNEL ARE CAUGHT UNDER THE MACHINE IF THE MACHINE TIPS OVER.

Raise the machine high enough to clear any obstacles while loading or unloading the machine. Place the forward/reverse switch in the "forward" position and turn the travel variable speed control knob to start machine travel. To manually steer the machine, depress the run/standby switch on the main control panel to place it in the run "R" mode. Select one of the manual steer modes on the manual steer select switch and steer the tracks using the manual steer dial.

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Chapter VIII Troubleshooting

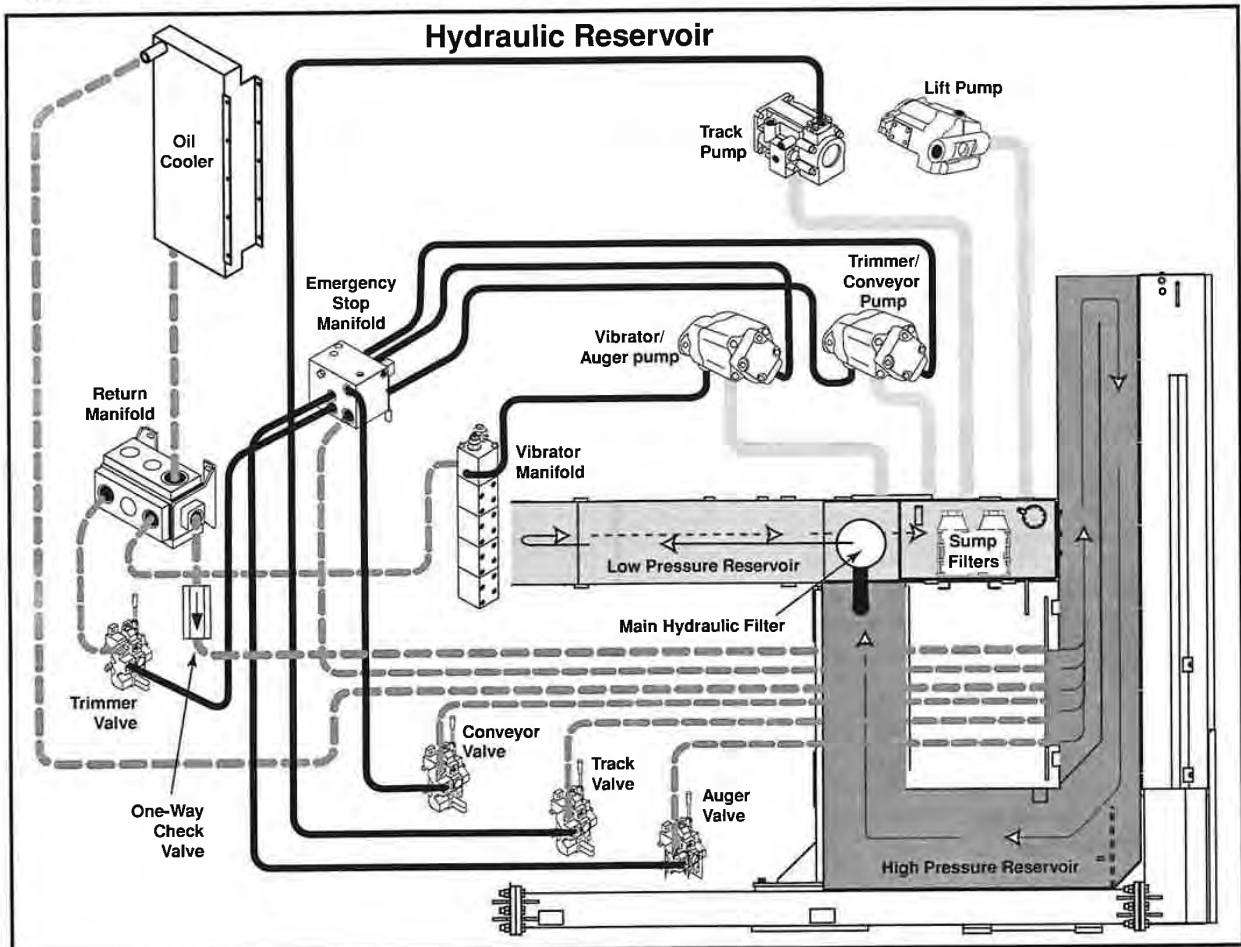
01 Content of Chapter

This chapter gives procedures to follow in the event of a machine failure. Determine which system is at fault and refer to the corresponding section for troubleshooting procedures. Refer to the Operator's Manual when references to other chapters are used.

Pay particular attention to all safety statements.

02 Troubleshooting the Engine

For troubleshooting procedures on the engine, refer to the appropriate engine manual, or contact your nearest Caterpillar, Cummins or John Deere engine dealer.



03 Troubleshooting the Hydraulic Reservoir System

The hydraulic reservoirs are contained within the machine frame. Beginning at the right side of the operators' console, the oil flow is routed through two 100 wire mesh sump filters, into the suction ports of the main hydraulic pumps. From the pumps, the oil is forced into the various systems that power the machine functions. Each system contains individual main relief valve(s) set to bypass at a specific pressure. If a system were to stall, causing the corresponding relief valve to open, the bypassed oil is

either routed back to the return manifold (trimmer and vibrators), or to the high pressure reservoir (conveyor and auger). The opening of one relief valve in no way affects the operation of the other systems. Any return oil from the conveyor, track or auger systems is dumped back into the high pressure reservoir. Any return oil from the trimmer or vibrator systems is dumped into the return manifold. From the return manifold, the oil is routed through the oil cooler where heat is transferred to the atmosphere. The oil flows from the oil cooler into the reservoir across the rear of the machine frame. The rear tank is a sealed tank and

is referred to as the pressure tank. The oil must flow through the main hydraulic filter to get out of the tank. The amount of pressure in the pressure tank will depend on the amount of pressure required to force the hydraulic oil through the main filter. This pressure is indicated on the filter pressure gauge. If the pressure reaches 25 psi (1.7 bar), the filter relief valve will open, allowing unfiltered oil to be dumped into the system. From the main filter, the oil flows into the center reservoir to the sump filters, where the cycle is repeated (the hydraulic tank after the main filter is referred to as the reservoir, or low pressure tank). The purpose of the in-line check valve between the return manifold and the pressure tank is to protect the oil cooler from extreme pressure during cold weather operation. If the pressure required to force the hydraulic oil through the oil cooler exceeds 142 psi (9.8 bar), the check valve will open and dump the oil directly back to the pressure tank. As the oil warms and the pressure drops below 142 psi (9.8 bar), the check valve closes, routing the oil back through the cooler. The hydraulic oil reservoir capacity is 149 gallons (564 L).

Symptom:

High main filter pressure.

Corrective Measures:

1. Clogged filter. Remove and replace the main filter element as instructed in the Maintenance chapter.
2. Contaminated oil. If the filter must be replaced frequently, the oil may need to be changed. If water or diesel fuel has gotten in to the hydraulic oil, it must be changed. The best method to use to determine the condition of hydraulic oil is to have it tested.
3. Cold oil. If the hydraulic oil is extremely cold, it may cause high pressure. Allow the oil to warm up and recheck pressure.

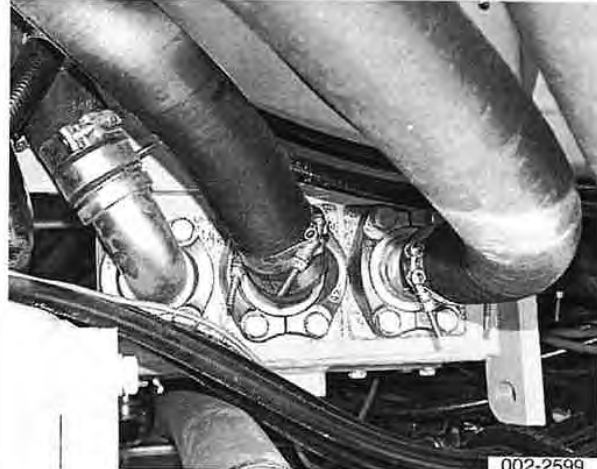
Symptom:

Main pumps cavitate or aerate.

Corrective Measures:

1. Low hydraulic oil level. Add the proper hydraulic oil to bring the level up to the full mark on the sight gauge, with the oil cold.

2. Sump filters clogged. Remove and clean the filters following the instructions given in the Maintenance chapter.



Connections on pumps

3. Loose connections between the pumps and the hydraulic reservoir. Tighten all fittings and hose clamps. It may be necessary to remove the flange fittings and couplings and replace the o-ring seals.

Symptom:

Oil flowing from breather cap.

Corrective Measures:

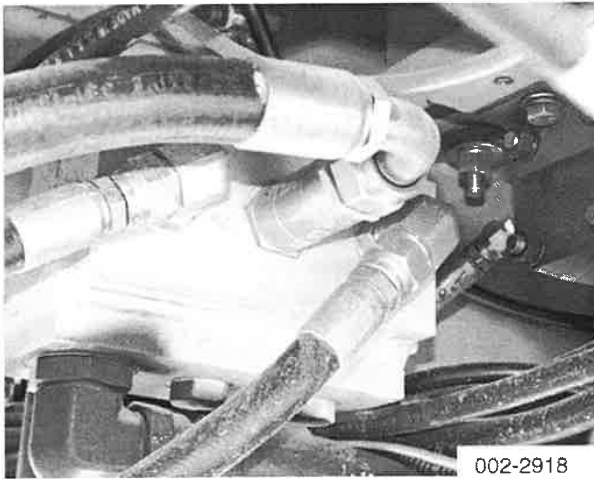
The hydraulic reservoir oil level is too high. The oil level should be at the full mark on the sight gauge with the oil cold.

Symptom:

Hydraulic oil overheats.

Corrective Measures:

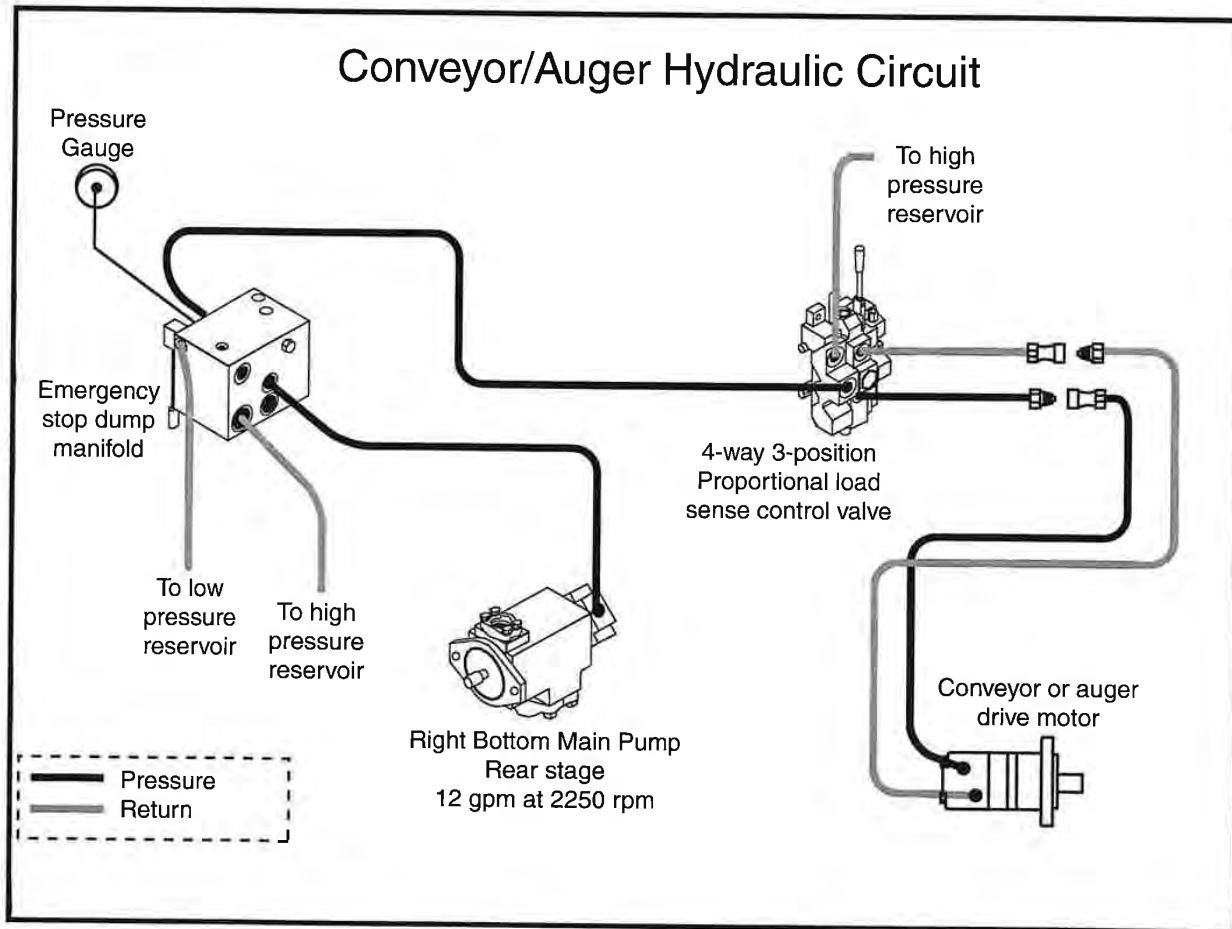
1. Air flow through the hydraulic oil cooler restricted. Clean the fins of the oil cooler.



002-2918

Oil cooler bypass check valve

2. The in-line check valve between the return manifold and the pressure tank is stuck open, allowing the hydraulic oil to pass directly to the pressure tank, instead of passing through the cooler. Replace the check valve if faulty.
3. Relief valve open. If a hydraulic system is constantly stalling out, excessive heat is generated. Reduce the work load on the system to keep it from stalling. If a circuit is not being used, be certain the control is in the "off" position.
4. Excessive loading with high ambient (outside) temperature. Reduce the work load on all systems if the ambient temperature is excessive.

04 Conveyor Hydraulic Circuit


The oil flow for the conveyor/auger circuit begins at the rear stage of the lower right pump assembly which delivers 12.0 gpm (lpm) at 2250 rpm at 130°F (°C). Filtered hydraulic oil for the pump is supplied from the low pressure reservoir. From the pump the oil is routed to the emergency stop dump manifold. A line tapped into the manifold is connected to the pressure gauge, through which the system pressure is monitored.

A 4-way 2-position pilot operated valve, in the emergency stop manifold, is spring-loaded to direct hydraulic flow to the high pressure reservoir through a return port in the emergency stop manifold. When the emergency stop solenoid coil is energized, the emergency stop solenoid valve is closed causing pilot pressure to increase. The pilot pressure is directed against the 4-way 2-position valve and spring, causing it to shift and directing the hydraulic flow to the directional control valve. When the emergency stop solenoid coil is de-energized, the solenoid valve

returns to its normally open position and pilot pressure is drained to the low pressure reservoir. The spring-loaded 4-way 2-position valve returns to its original position, draining the pump hydraulic flow to the high pressure reservoir.

Note: Each of three 4-way pilot operated valves in the emergency stop manifold are controlled by the emergency stop solenoid valve.

The hydraulic flow is restricted as it enters the inlet of the directional control valve. A pilot pressure reducing-relieving valve begins to increase system pressure until it reaches 200 psi (14 bar). When pilot pressure is reached, hydraulic flow is directed through the control valve return port to the high pressure reservoir. A pressure differential of 200 psi (14 bar) should be maintained between the pressure inlet line and the tank return line.

Pilot pressure is supplied to two electrically operated proportional pulsar solenoid valves. If the FNR control

switch is placed in the forward direction and the variable control knob is rotated, a variable electric signal is supplied to one of the pulsar solenoid coils, causing it to direct pilot pressure against one end of the control valve spool. The more the control knob is rotated, the faster the conveyor will turn. As the control valve spool is shifted, pressure oil is directed out one of the two work ports. The oil flows through quick couplers and into one of the working ports on the conveyor drive motor, causing it to rotate the drive shaft. As the motor shaft turns, the conveyor will turn. Return oil from the drive motor flows out the opposite port on the motor, back through the opposite quick couplers, through the control valve and back to the return manifold. The oil will then be returned through the hydraulic oil cooler to the high pressure reservoir.

If the FNR control switch is placed in the "reverse" position, the opposite pulsar solenoid coil is energized, causing it to direct pilot pressure against the opposite end of the control valve spool and causing the conveyor to rotate in the reverse direction.

When the control valve is centered, the hydraulic oil is bypassed to the tank port at 200 psi (14 bar) plus any additional pressure in the return line. The bypass pressure reading displayed on the pressure gauge is referred to as "standby pressure".

If the conveyor or auger quick couplers become disconnected, or the conveyor/auger is prevented from turning, the blocked hydraulic flow will build system pressure until the control valve pressure limiter returns the flow to the pressure tank. The pressure relief setting is adjusted for 2400 psi (165 bar).

Symptom:

Conveyor will not turn. Normal pressure indicated.

Corrective Measures:

1. Insufficient conveyor belt tension, allowing the drive pulley to slip. Adjust the belt tension as instructed in the Maintenance chapter.
2. Motor drive shaft coupling is defective. Remove the conveyor drive motor and inspect the motor shaft and the coupler. Replace parts as necessary. It will first be necessary to loosen the conveyor belt tension as the drive pulley is supported by the motor bearings on the motor side.

Symptom:

Auger will not rotate. Normal pressure indicated.

Corrective Measures:

⚠ **WARNING!** ⚠

DO NOT ATTEMPT TO ADJUST THE CHAIN WITH THE ENGINE RUNNING. CONTACT WITH MOVING CHAIN OR AUGER CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE CHAIN OR AUGER BEFORE ENGAGING CONTROL VALVE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS TO PREVENT SEVERE INJURY.



Broken drive chain

1. Drive chain off of sprockets or broken. If the chain is broken, repair or replace it as necessary. Adjust the chain tension as described in the Maintenance chapter.



Drive sprocket key

2. Square key between drive sprocket and the auger shaft has sheared off. Inspect key and replace as necessary.
3. Bolts connecting the auger sections together are missing or broken. Repair or replace as necessary.

Symptom:

Conveyor belt will not remain trained (centered).

Corrective Measures:

! WARNING! !

KEEP HANDS, FEET AND CLOTHING AWAY FROM MOVING CONVEYOR BELT AND ROLLERS. DO NOT ATTEMPT TO CLEAN THE ROLLERS OR PULLEYS WITH THE CONVEYOR OPERATING. SERIOUS INJURY OR DEATH MAY RESULT IF ENTANGLED.



Concrete build up

1. Concrete build up on drive or idler pulleys, or on troughing or return rollers. Inspect and clean as necessary.
2. Troughing rollers, return, or drive pulley out of alignment. Rollers and drive pulley must be at a 90° angle to the conveyor frame. To adjust, place a framing square against the roller or pulley and adjust as necessary.
3. Faulty belt splice. Check belt splice for square. Splice should be 90° to the belt edge. Check with a framing square and replace or repair the belt or splice as necessary.

Symptom:

Conveyor or auger stalls at low pressure.

Corrective Measures:

1. Main relief valve not maintaining 2400 psi (165 bar) relief pressure. Refer to the maintenance chapter for instructions on how to check and adjust relief pressure.

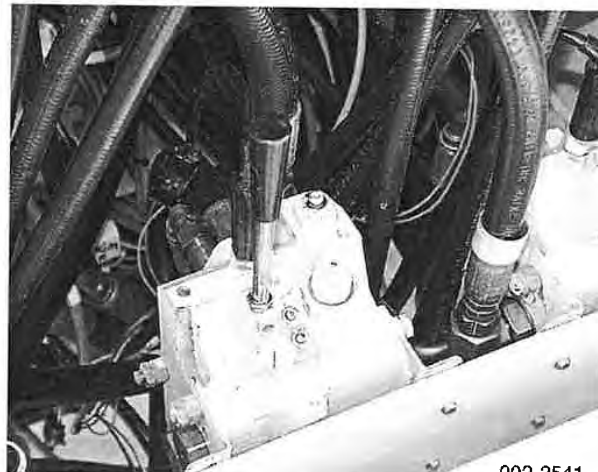
! CAUTION! !

CONTINUOUS EXPOSURE TO ENGINE NOISE CAN CAUSE HEARING INJURY. DO NOT OPERATE THE MACHINE WITHOUT ADEQUATE HEARING PROTECTION.

2. Hydraulic motor allowing oil to leak past the rotor internally, relieving system pressure. Disconnect both drive motor hoses at the quick couplers. Activate the control valve (engine running at 2250 rpm). If the pressure gauge indicates 2400 psi (165 bar) relief pressure, the motor is defective and must be repaired or replaced.

Symptom:

Conveyor/Auger will not operate. The pressure gauge indicates zero pressure. No standby pressure is indicated on the pressure gauge.

Corrective Measures:


Manual override lever

Open the access door to the rear of the operators console and depress the manual override lever in either direction. If the conveyor or auger will operate

with the manual override lever, the problem is in the electrical drive signal to the control valve. Refer to the Conveyor/Auger electrical troubleshooting section. If the conveyor or auger will not operate with manual override lever, the problem is hydraulic. Refer to the following measures for troubleshooting information.

⚠ **DANGER!** ⚠

CHECK FOR ANY PERSONNEL IN OR AROUND THE AUGER, TRACKS OR TRIMMERWHEEL PRIOR TO RESETTING THE EMERGENCY STOP SYSTEM. SEVERE INJURY OR DEATH WILL OCCUR WHEN CAUGHT IN THE AUGER, TRACKS OR TRIMMERWHEEL.



Emergency stop button

1. Emergency stop button is depressed. If the emergency stop reset light is illuminated, check all emergency stop buttons on the machine making certain that they are released to the out position. Depress the emergency stop reset switch. The reset light should stop illuminating.

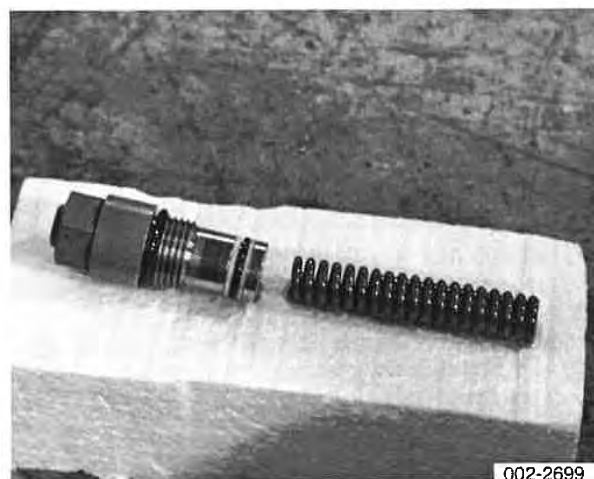
If the emergency stop reset light will not stop illuminating after the reset switch has been depressed, the problem may be electrical. Refer to the emergency stop electrical troubleshooting section for more information.

Note: The emergency stop system will affect all hydraulic functions on the machine except for the lift circuit.



Pilot pressure valve

2. Pilot pressure valve is contaminated. Remove and inspect the valve for any contamination. Swap the pilot pressure valve between the conveyor valve and auxiliary auger valve. If the problem switches to the auxiliary auger valve, the pilot pressure valve is defective and must be replaced.



Relief valve and compensator spring

3. High pressure relief valve is contaminated. Remove and inspect the valve for any contamination. Swap the relief valve between the conveyor valve and auxiliary auger valve. If the problem switches to the auxiliary auger valve, the relief valve is defective and must be replaced.



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4-way 2-position emergency stop valve

4. The 4-way 2-position valve spool is contaminated or defective causing the hydraulic flow to return to the tank. Remove and clean any contamination from the valve spool in the emergency stop manifold. Check all o-rings for damage and replace as necessary.

Symptom:

Conveyor runs slower than normal. Stalls at proper relief pressure.

Corrective Measures:

CAUTION!

DO NOT STALL A SYSTEM WITH AN UNKNOWN RELIEF PRESSURE SETTING. IF THE PRESSURE SETTING IS TOO HIGH, SERIOUS MACHINE DAMAGE MAY OCCUR. WHEN CHECKING A RELIEF PRESSURE SETTING, TURN THE ADJUSTMENT SCREW OUT 2 OR 3 TURNS BEFORE STALLING THE SYSTEM.

1. Defective pump. Check with a flow meter if available. A good indication of a defective pump is to compare system pressure to engine rpm. To check, disconnect both drive hoses at the quick couplers. Start the engine and run it at 1000 rpm. Reset the emergency stop system. Place the network control system in the Run mode, the FNR switch in the forward position and slowly rotate the conveyor/auger control knob clockwise. Note the increasing pressure on the corresponding pressure gauge. If the pressure continues to increase above 2400 psi (165 bar), immediately move the control knob

back to the off position. Readjust the pressure relief valve following the instructions in the Maintenance chapter. If the pressure does not increase above 2400 psi (165 bar), rotate the control knob the maximum amount and increase the engine speed to maximum. Gradually reduce the engine speed while noting the pressure reading on the gauge. A damaged pump will not maintain relief pressure, but the pressure will drop rapidly as engine speed is reduced. A good pump will maintain approximately the same pressure as engine speed decreases. Replace or repair the pump if found to be defective.

2. Engine is not operating at maximum speed (2250 rpm). If the engine speed is low, hydraulic pump output flow will be low, causing the conveyor/auger circuit, as well as all other hydraulic systems to operate slower. Increase engine speed to maximum.

Symptom:

Conveyor stalls at high pressure.

Corrective Measures:

WARNING!

KEEP HANDS, FEET AND CLOTHING AWAY FROM MOVING CONVEYOR BELT AND ROLLERS. DO NOT ATTEMPT TO CLEAN THE ROLLERS OR PULLEYS WITH THE CONVEYOR OPERATING. SERIOUS INJURY OR DEATH MAY RESULT IF ENTANGLED.

1. Conveyor belt stuck. Inspect drive and idler pulleys for concrete build up or other debris and clean as necessary.
 2. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler using a pipe coupling or a coupler known to be good.
- Note:** A defective or disconnected quick coupler may cause the motor shaft seal to rupture. If hydraulic oil leakage is evident inside the conveyor drive gearbox, repair or replace the assembly.
3. Drive motor is defective. Remove the motor from the conveyor and apply pressure to the motor. If the motor will not run (high pressure indicated), repair or replace as necessary. To

remove the motor, it will first be necessary to loosen the conveyor belt tension as the drive pulley is supported by the motor bearings.

Symptom:

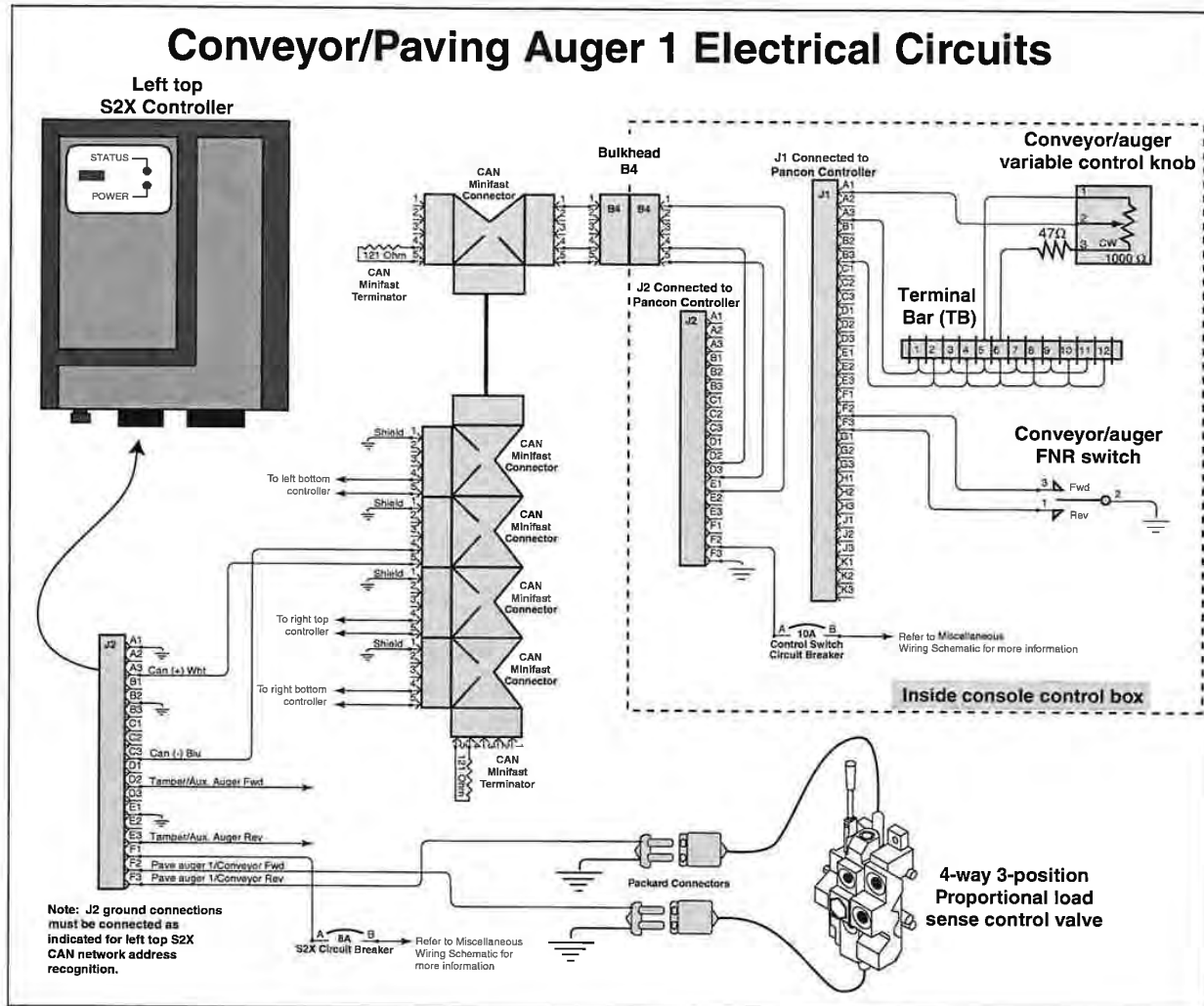
Auger stalls at high pressure.

Corrective Measures:

1. An excessive amount of concrete is around the auger and may have started to harden. Operate the vibrators to aid in freeing the auger.
2. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler using a pipe coupling or a coupler known to be good.

Note: A defective or disconnected quick coupler may cause the motor shaft seal to rupture. If hydraulic oil leakage is evident, repair or replace the motor.

3. Drive motor is defective. Disconnect the drive chain from the motor and apply pressure to the motor. If the motor will not operate (high pressure indicated), repair or replace as necessary.

05 Conveyor/Auger Electrical Circuits


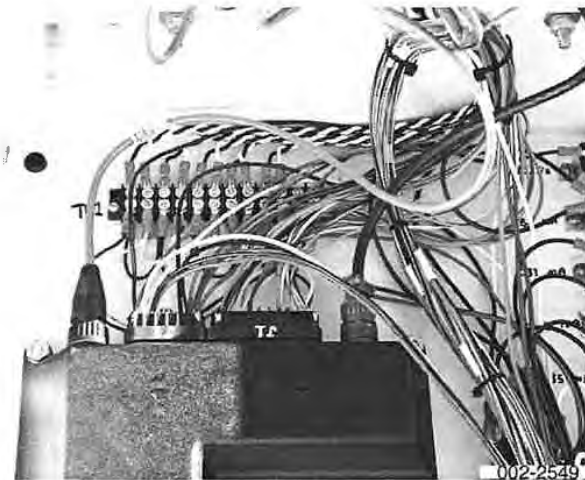
The network control system is used to electrically operate the conveyor/auger hydraulic proportional control valve. Two controllers are used to operate the conveyor/auger electrical circuit. The Pancon controller is the main computer on the machine and is located in the console control box. It receives the input information from the various sources and processes that information. In the conveyor/auger circuit the input devices are the conveyor/auger variable control knob and the conveyor/auger FNR (forward/neutral/reverse) switch. After processing is completed, the Pancon controller sends an appropriate response signal through the CAN communication network to the appropriate S2X controller located on the front access door of the control console. The S2X controller will receive the response from the Pancon

controller and will send the appropriate output drive signal to the conveyor/auger proportional control valve.

To make the system operational, the Pancon controller receives a 12 volt power source from a 10 amp circuit breaker and ground connection to the machine frame. Each S2X controller on the front access door receives 12 volt power from a 10 amp circuit breaker and a ground connection to the machine frame. To operate the variable control knobs, the Pancon controller supplies 5 volts and a ground connection to the terminal bar inside the control box. The terminal bar is used to distribute the power and ground connections to the various control knobs on the control box.

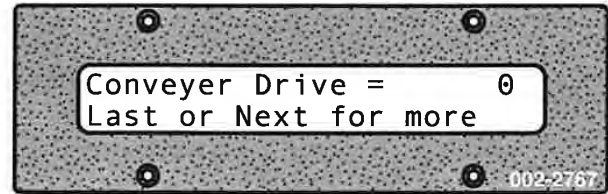
From the terminal bar, 5 volts and a ground connection are provided to the conveyor/auger variable control knob on pins 1 and 3. A resistor is connected into the

ground wire on pin 3 to create a minimum output voltage of 0.21 volts when the control knob is turned off. The Pancon controller recognizes this minimum voltage as the "off" position of the control knob. As the control knob is rotated clockwise, the output voltage will vary from 0.21 volts to a maximum of 5.00 volts. The control knob output voltage is routed from terminal 2 to pin A1 on the 30 pin connector attached to the Pancon controller. An adjustable threshold voltage is preset in the Pancon controller to begin rotation of the conveyor/auger. The threshold is normally adjusted to begin the rotation of the conveyor/auger circuit when the control knob is rotated clockwise approximately 25% from the "off" position. Refer to the Maintenance chapter for this adjustment procedure.



18 pin and 30 pin connectors on Pancon controller

To determine direction control, the conveyor/auger forward/neutral/reverse switch is positioned in the appropriate direction. A ground connection is routed through the switch, in either the forward or reverse positions, and into pins F2 or F3 on the 30 pin connector attached to the Pancon controller. If a ground connection is received on pin F2, forward rotation of the conveyor/auger circuit is selected. If a ground connection is received on pin F3, reverse rotation of the conveyor/auger circuit is selected. If a ground is not received on either pin F2 or F3, the Pancon controller assumes the neutral mode has been selected and will not allow an output drive signal to the proportional control valve. The Pancon controller must be in the Run mode, the circuit must be in working order and the emergency stop system must be reset before an output signal can be sent to the appropriate S2X controller on the front access door.



Conveyor output drive signal

As the variable control knob output voltage increases, the Pancon controller will send a corresponding signal to the left top S2X controller on the front access door to the console. This signal is routed through the CAN network cable between the Pancon controller in the control box and the S2X controller on the front access door. This signal is processed by the left top S2X controller and a corresponding output drive signal is routed from the 18 pin connector to the proportional control valve. The output will vary from 0 to 80 percent and corresponds with the amount of variable control knob signal.

Notice: Make certain to carefully read all troubleshooting displays on the main display screen. This will indicate the number of problems that are currently affecting the machine. The general location of each problem is given on the display and will help in narrowing the area for troubleshooting.

Symptom:

All main hydraulic systems; trimmer, tracks, conveyor/auger, auger/tamper and paving auger 2 will not operate.

Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on each control valve and move it in either direction. If the systems do not operate, the problem may be hydraulic. Refer to troubleshooting the conveyor/auger hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the hydraulic systems operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



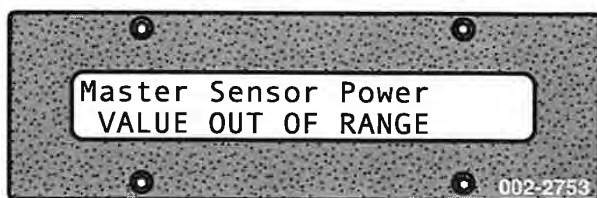
Reset the emergency stop light

1. One of the emergency stop buttons is depressed. Reset the depressed button to the out position and depress the emergency stop reset switch on the engine control panel to reset the system. If the light will not reset, refer to troubleshooting the emergency stop system.



Emergency stop reset display

2. One of the variable control knobs is not rotated to the off position or one of the FNR switches is not in the neutral position. Rotate the control knobs to the off position and place the FNR switches in the neutral position. The display should indicate the normal operating display if the emergency stop system is reset.
3. Manual override lever will not operate the conveyor/auger or other hydraulic systems. The reset light is not illuminated. This may indicate that the emergency stop manifold solenoid coil is defective or the power relay on the front access door is sticking or defective. Refer to troubleshooting the emergency stop electrical system for more information.



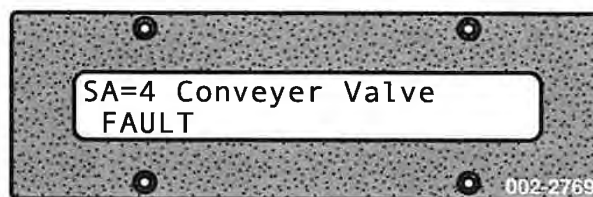
Sensor power short inside control box

4. Sensor power is shorted inside the control box for the variable control knobs. Disconnect the power and ground wires (twisted pairs) for each variable control knob individually until the display does not indicate the value is out of range. The control knob or the wiring connected to the control knob, that was last disconnected, is

defective. Repair or replace the shorted wiring and/or the control knob as necessary.

If all wires to the control knobs have been removed from the terminal bar and the display still indicates Master Sensor Power - Value Out Of Range; then either the wiring between the terminal bar and the 30 pin connector is shorted to ground; or the Pancon controller is shorted internally. Check the wiring for damage and good connections and repair as necessary. Replace the Pancon controller if all other connections are good.

Symptom:



Conveyor valve fault display

The display indicates Conveyor Valve Fault. The conveyor/auger circuit will not operate in one or both directions.

Corrective Measures:

Place the conveyor/auger FNR switch in the opposite direction and attempt to operate the circuit. If the conveyor/auger will operate and the display indicates that the problem no longer exists, then the problem is directional. Directional components include the FNR switch and wiring, the S2X output valve drives, the cables between the S2X and the control valve and the proportional solenoid coils on the control valve. Since the display indicates that the problem is located at the conveyor valve, the problem exists between the S2X controller and the control valve. Refer to the following procedures to locate the problem.

1. The packard connector at the control valve is disconnected. Reconnect the cables.
2. The packard connector at the control valve is contaminated. Disconnect both packard connectors and clean with an electrical contact cleaner. Reconnect after cleaning.
3. The proportional solenoid coil is defective. Disconnect the packard connector from each of the two solenoid coils and swap the cables. Reconnect the packard connectors and attempt to operate the conveyor/auger in each of the two

directions. If the conveyor/auger fault remains in the same direction of rotation, the pulsar solenoid valve may be defective. Stop the engine and remove the hydraulic oil fill cap to remove any pressure that may be in the reservoir. Remove both pulsar solenoid valves simultaneously from the control valve assembly and quickly swap them to prevent excessive hydraulic oil loss. Make certain that the o-ring seal at the base of the pulsar solenoid valve stem is in place and not damaged. Check the control valve cavity if the o-ring is missing from the valve stem. Replace the o-ring if necessary.

Note: A small amount of vacuum may be placed on the hydraulic reservoir to prevent oil loss when swapping the pulsar solenoid valves.

After swapping the pulsar solenoid valves and reconnecting the cables, attempt to operate the circuit. If the problem switches to the opposite direction, the pulsar solenoid valve coil is defective and must be replaced. If the problem stays in the same direction, there may be an internal problem with the control valve spool or the o-ring is missing from the base of the pulsar solenoid valve. Remove and recheck the o-ring on the pulsar solenoid valve. Replace the o-ring as necessary. Remove the valve spool to check for any contamination or corrosion. Replace or repair as necessary.

4. Defective wiring between the S2X controller and the packard connector. Remove the 18 pin connector from the S2X controller and disconnect the suspected packard connector. Using an ohm meter, check the wiring for continuity between pin F2 on the 18 pin connector and the corresponding color coded wire in the packard connector at the control valve. Check continuity between pin F3 on the 18 pin connector and the corresponding color coded wire in the packard connector for the opposite direction at the control valve. If continuity does not exist, the wiring is defective and must be repaired or replaced.



S2X controllers mounted to access door

5. Defective S2X controller. Each of the S2X controllers are programmed the same and are interchangeable. Disconnect both packard connectors from the S2X controller believed to be defective and swap the controller with one of the S2X controllers known to be good. Reconnect the wiring and test. If the problem switches to a different location on the machine, the S2X controller is defective and must be replaced.

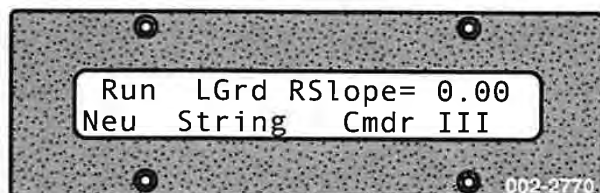
Note: The bottom right S2X controller on the access door does not operate any conveyor, auger, trimmer or track controls. Temporary operation can be resumed by swapping an S2X controller with a defective output drive to the bottom right location.

Symptom:

The conveyor/auger will not operate in one or both directions.

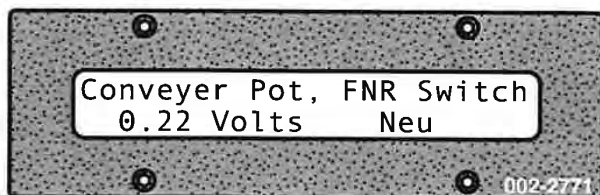
Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on the conveyor/auger control valve and move it in either direction. If the conveyor or auger does not operate, the problem may be hydraulic. Refer to troubleshooting the conveyor/auger hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the conveyor or auger does operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



Run mode indicated on display

1. The network control system is not in the RUN mode. Depress the RUN/STANDBY switch to indicate RUN on the main display screen.

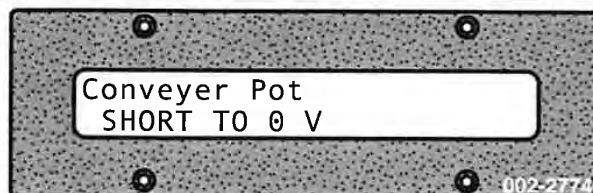
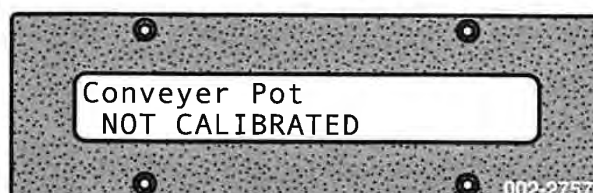


Service mode display

2. The FNR switch or wiring is defective. Depress the SERVICE switch on the control box. Depress the NEXT switch until the conveyer pot display is indicated. View the position of the FNR switch on the display while changing the position of the FNR switch on the console.

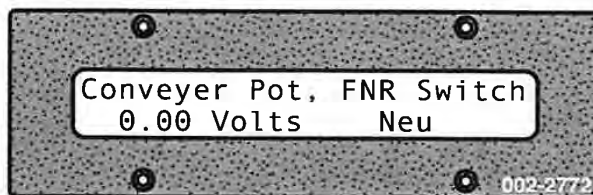
If the display corresponds to the selected switch position, the FNR switch and wiring are operating normally.

If the display does not correspond to the selected switch position, the FNR switch or the wiring may be defective. Remove the wire from the center terminal of the FNR switch and momentarily connect it to either terminal 1 or terminal 3 on the FNR switch. If the display will now indicate the missing position, the FNR switch is defective and must be replaced. If the display still indicates a defective reading, check the wire between the J1 packard connector and the FNR switch for tight connections and continuity. Make certain a good ground connection is present by placing a jumper wire between the machine frame and the FNR switch. Repair or replace the wiring as necessary.



Defective output signal from conveyer control knob

3. Conveyer Pot; NOT CALIBRATED or SHORT TO 0 V is indicated on the display. This indicates that the conveyer control knob variable output voltage is not being received by the Pancon controller.

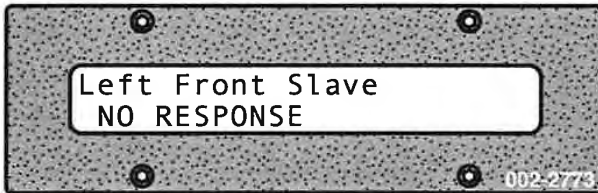


Defective conveyer pot output voltage indicated

To test, depress the SERVICE switch on the control box. Depress the NEXT switch until the conveyer pot display is indicated. The normal voltage range should be 0.21 volts to 5.00 volts as the conveyor/auger control knob is rotated clockwise. If the reading is 0.00 volts, make certain that 5.00 volts is provided to the control knob on pin 1 and a good ground connection is provided on pin 3. Make certain that the output wire between pin 2 on the control knob and pin A1 on the 30 pin connector is securely connected and check for continuity. If a good ground and 5.00 volts of power exists, the control knob is defective and must be replaced.

Symptom:

The display indicates Left Front Slave No Response.

Corrective Measures:


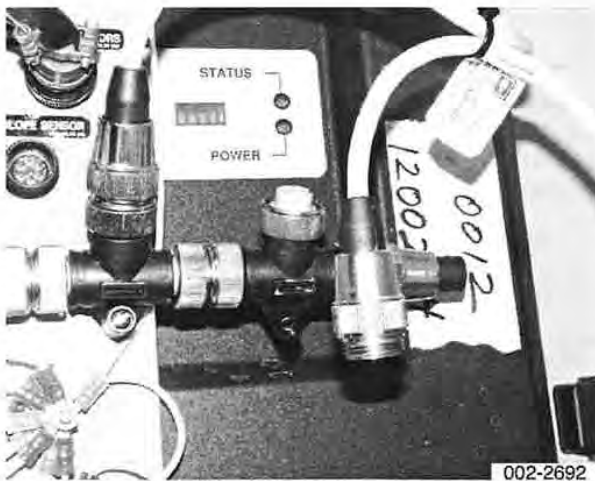
No response indicated on display

This problem indicates that the S2X is not communicating through the CAN network to the Pancon controller and the other S2X controllers. Remove the 18 pin and 30 pin connectors from the S2X believed to be defective. Swap the S2X with one of the other S2X controllers known to be good. If the problem switches to a different location on the machine, the S2X is defective and must be replaced.

If the screen indicates that the problem remains with the left front slave (S2X) after swapping, the CAN network cable connection between the 18 pin connector and the CAN minifast connector is defective and must be repaired or replaced.

Symptom:

All S2X slaves are indicating NO RESPONSE on the display.

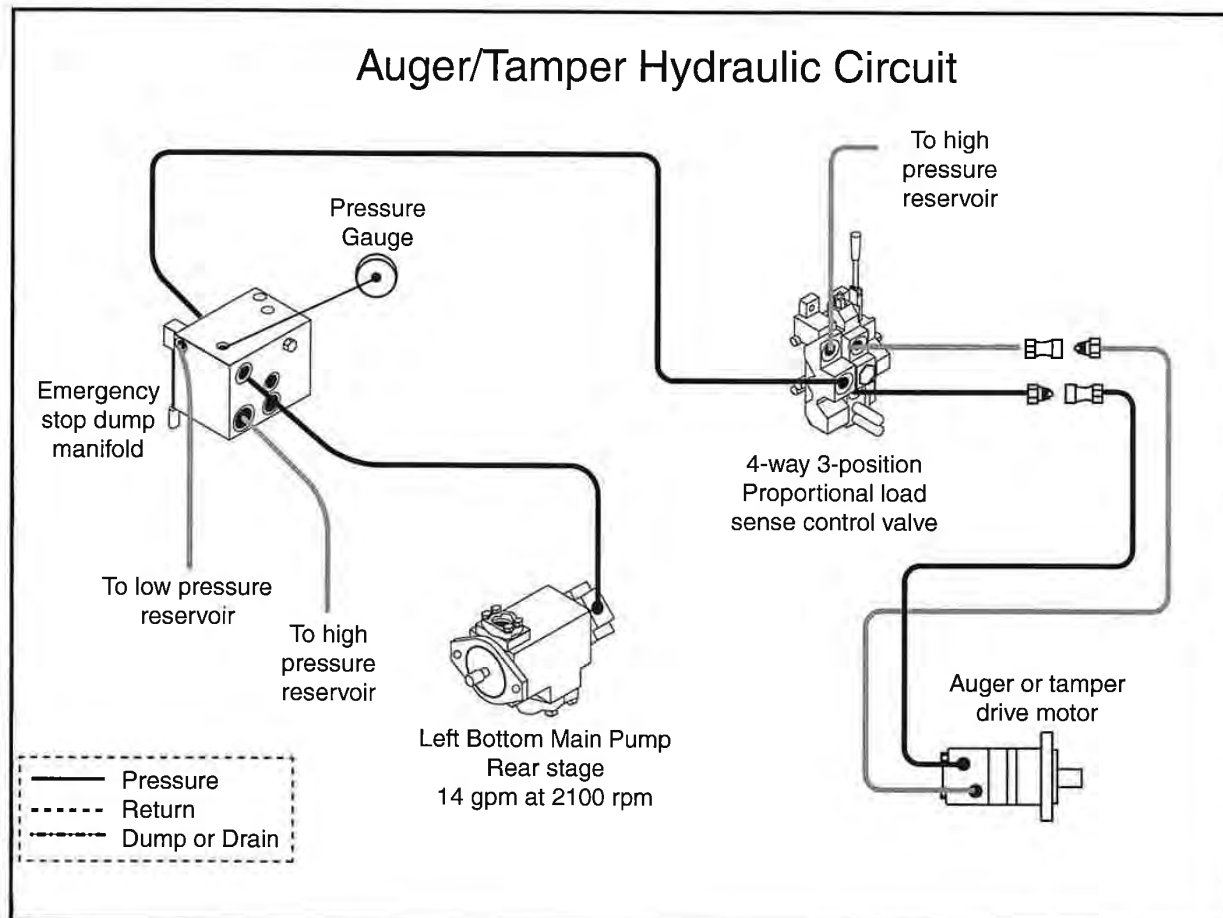
Corrective Measures:


CAN network minifast connectors and terminator

This indicates that the CAN network cables may be defective. Make certain that the CAN minifast terminators are in place on the minifast connectors as indicated in the electrical drawing.

Remove the right bottom cable connector from the end of the CAN minifast connectors on the front access door. Remove the CAN cable from bulkhead 4 on the back of the control box. Check for continuity between the bulkhead 4 cable and the disconnected CAN minifast connector on the front access door. If continuity does not exist, disconnect and recheck each of the cables in the CAN network wiring harness until the defective component is located. Repair or replace the wiring harness as necessary.

If continuity exists in the wiring harness, check continuity between bulkhead 4 and the 18 pin connector on the Pancon controller. Repair or replace the control box wiring as necessary.

06 Auxiliary Auger/Tamper Hydraulic Circuit


The oil flow for the auger/tamper circuit begins at the rear stage of the lower left pump assembly which delivers 14.0 gpm (53 lpm) at 2250 rpm at 130°F (55°C). Filtered hydraulic oil for the pump is supplied from the low pressure reservoir. From the pump the oil is routed to the emergency stop dump manifold. A line tapped into the manifold is connected to the pressure gauge, through which the system pressure is monitored.

A 4-way 2-position pilot operated valve, in the emergency stop manifold, is spring-loaded to direct hydraulic flow to the high pressure reservoir through a return port in the emergency stop manifold. When the emergency stop solenoid coil is energized, the emergency stop solenoid valve is closed causing pilot pressure to increase. The pilot pressure is directed against the 4-way 2-position valve and spring, causing it to shift and directing the hydraulic flow to the directional control valve. When the emergency stop solenoid coil is de-energized, the solenoid valve returns to its normally open position and pilot pressure

is drained to the low pressure reservoir. The spring-loaded 4-way 2-position valve returns to its original position, draining the pump hydraulic flow to the high pressure reservoir.

Note: Each of three 4-way pilot operated valves in the emergency stop manifold are controlled by the emergency stop solenoid valve.

The hydraulic flow is restricted as it enters the inlet of the directional control valve. A pilot pressure reducing-relieving valve begins to increase system pressure until it reaches 200 psi (14 bar). When pilot pressure is reached, hydraulic flow is directed through the control valve return port to the high pressure reservoir. A pressure differential of 200 psi (14 bar) should be maintained between the pressure inlet line and the tank return line.

Pilot pressure is supplied to two electrically operated proportional pulsar solenoid valves. If the FNR control switch is placed in the forward direction and the

variable control knob is rotated, a variable electric signal is supplied to one of the pulsar solenoid coils, causing it to direct pilot pressure against one end of the control valve spool. The more the control knob is rotated, the faster the auger will turn. As the control valve spool is shifted, pressure oil is directed out one of the two work ports. The oil flows through quick couplers and into one of the working ports on the auger drive motor, causing it to rotate the drive shaft. As the motor shaft turns, the auger will turn. Return oil from the drive motor flows out the opposite port on the motor, back through the opposite quick couplers, through the control valve and back to the return manifold. The oil will then be returned through the hydraulic oil cooler to the high pressure reservoir.

If the FNR control switch is placed in the "reverse" position, the opposite pulsar solenoid coil is energized, causing it to direct pilot pressure against the opposite end of the control valve spool and causing the auger to rotate in the reverse direction.

When the control valve is centered, the hydraulic oil is bypassed to the tank port at 200 psi (14 bar) plus any additional pressure in the return line. The bypass pressure reading displayed on the pressure gauge is referred to as "standby pressure".

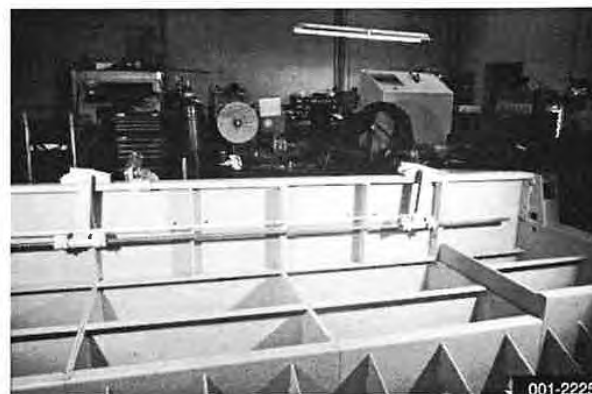
If the auger or tamper quick couplers become disconnected, or the auger/tamper is prevented from turning, the blocked hydraulic flow will build system pressure until the control valve pressure limiter returns the flow to the pressure tank. The pressure relief setting is adjusted for 2400 psi (165 bar).

Symptom:

Tamper bar will not move. Normal pressure indicated.

Corrective Measures:

1. Bolt attaching the tamper bar drive arm to the motor is missing or broken. Repair or replace as necessary.



Check tamper bar assembly

2. Tamper bar assembly is loose or broken. Check all set screws and connections. Tighten or repair all connections as necessary.

Symptom:

Auger will not rotate. Normal pressure indicated.

Corrective Measures:



DO NOT ATTEMPT TO ADJUST THE CHAIN WITH THE ENGINE RUNNING. CONTACT WITH MOVING CHAIN OR AUGER CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE CHAIN OR AUGER BEFORE ENGAGING CONTROL VALVE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS TO PREVENT SEVERE INJURY.



Broken drive chain

1. Drive chain off of sprockets or broken. If the chain is broken, repair or replace it as

necessary. Adjust the chain tension as described in the Maintenance chapter.



Drive sprocket key

2. Square key between drive sprocket and the auger shaft has sheared off. Inspect key and replace as necessary.
3. Bolts connecting the auger sections to the stub shaft inside the hopper are missing or broken. Repair or replace as necessary.

Symptom:

Auger or tamper stalls at low pressure.

Corrective Measures:

1. Main relief valve not maintaining 2400 psi (165 bar) relief pressure. Refer to the maintenance chapter for instructions on how to check and adjust relief pressure.

CAUTION!

CONTINUOUS EXPOSURE TO ENGINE NOISE CAN CAUSE HEARING INJURY. DO NOT OPERATE THE MACHINE WITHOUT ADEQUATE HEARING PROTECTION.

2. Hydraulic motor allowing oil to leak past the rotor internally, relieving system pressure. Disconnect both drive motor hoses at the quick couplers. Activate the control valve (engine running at 2250 rpm). If the pressure gauge indicates 2400 psi (165 bar) relief pressure, the motor is defective and must be repaired or replaced.

Symptom:

Auger/tamper will not operate. The pressure gauge indicates zero pressure. No standby pressure is indicated on the pressure gauge.

Corrective Measures:

Open the access door to the rear of the operators console and depress the manual override lever in either direction. If the auger or tamper will operate with the manual override lever, the problem is in the electrical drive signal to the control valve. Refer to the Auger/tamper electrical troubleshooting section. If the auger or tamper will not operate with manual override lever, the problem is hydraulic. Refer to the following measures for troubleshooting information.

WARNING!

CHECK FOR ANY PERSONNEL IN OR AROUND THE AUGER, TRACKS OR TRIMMERWHEEL PRIOR TO RESETTING THE EMERGENCY STOP SYSTEM. SEVERE INJURY OR DEATH WILL OCCUR WHEN CAUGHT IN THE AUGER, TRACKS OR TRIMMERWHEEL.



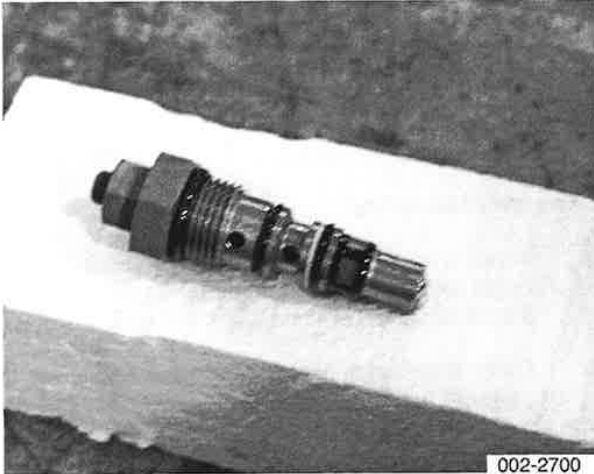
Emergency stop button

1. Emergency stop button is depressed. If the emergency stop reset light is illuminated, check all emergency stop buttons on the machine making certain that they are released to the out position. Depress the emergency stop reset switch. The reset light should stop illuminating.

If the emergency stop reset light will not stop illuminating after the reset switch has been depressed, the problem may be electrical. Refer

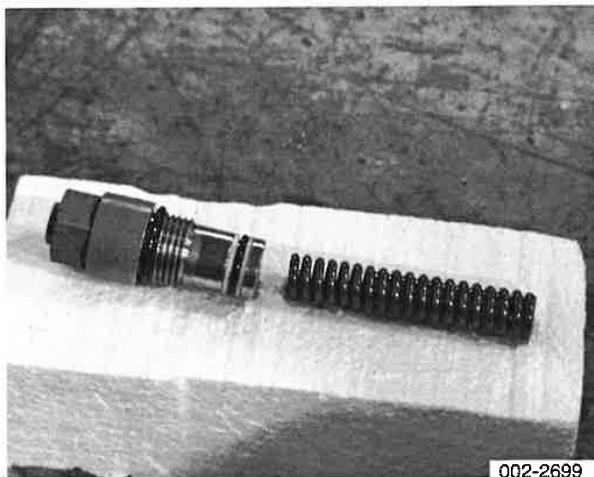
to the Miscellaneous electrical troubleshooting section for more information.

Note: The emergency stop system will affect all hydraulic functions on the machine except for the lift circuit.



Pilot pressure valve

2. Pilot pressure valve is contaminated. Remove and inspect the valve for any contamination. Swap the pilot pressure valve between the auger/tamper valve and the conveyor valve. If the problem switches to the conveyor valve, the pilot pressure valve is defective and must be replaced.



Relief valve and compensator spring

3. High pressure relief valve is contaminated. Remove and inspect the valve for any contamination. Swap the relief valve between the auger/tamper valve and the conveyor valve. If the problem switches to the conveyor valve,

the relief valve is defective and must be replaced.



4-way 2-position emergency stop valve

4. The 4-way 2-position valve spool is contaminated or defective causing the hydraulic flow to return to the tank. Remove and clean any contamination from the valve spool in the emergency stop manifold. Check all o-rings for damage and replace as necessary.

Symptom:

Auger or tamper runs slower than normal. Stalls at proper relief pressure.

Corrective Measures:



DO NOT STALL A SYSTEM WITH AN UNKNOWN RELIEF PRESSURE SETTING. IF THE PRESSURE SETTING IS TOO HIGH, SERIOUS MACHINE DAMAGE MAY OCCUR. WHEN CHECKING A RELIEF PRESSURE SETTING, TURN THE ADJUSTMENT SCREW OUT 2 OR 3 TURNS BEFORE STALLING THE SYSTEM.

1. Defective pump. Check with a flow meter if available. A good indication of a defective pump is to compare system pressure to engine rpm. To check, disconnect both drive hoses at the quick couplers. Start the engine and run it at 1000 rpm. Reset the emergency stop system. Place the network control system in the Run mode, the FNR switch in the forward position and slowly rotate the auxiliary auger control knob clockwise. Note the increasing pressure

on the corresponding pressure gauge. If the pressure continues to increase above 2400 psi (165 bar), immediately move the control knob back to the off position. Readjust the pressure relief valve following the instructions in the Maintenance chapter. If the pressure does not increase above 2400 psi (165 bar), rotate the control knob the maximum amount and increase the engine speed to maximum. Gradually reduce the engine speed while noting the pressure reading on the gauge. A damaged pump will not maintain relief pressure, but the pressure will drop rapidly as engine speed is reduced. A good pump will maintain approximately the same pressure as engine speed decreases. Replace or repair the pump if found to be defective.

2. Engine is not operating at maximum speed (2250 rpm). If the engine speed is low, hydraulic pump output flow will be low, causing the auger/tamper circuit, as well as all other hydraulic systems to operate slower. Increase engine speed to maximum.

Symptom:

Tamper stalls at high pressure.

Corrective Measures:

KEEP HANDS, FEET AND CLOTHING AWAY FROM MOVING CONVEYOR BELT AND ROLLERS. DO NOT ATTEMPT TO CLEAN THE ROLLERS OR PULLEYS WITH THE CONVEYOR OPERATING. SERIOUS INJURY OR DEATH MAY RESULT IF ENTANGLED.

1. Tamper bar stuck. Inspect tamper bar for concrete build up or other debris and clean as necessary.
2. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler using a pipe coupling or a coupler known to be good.

Note: A defective or disconnected quick coupler may cause the motor shaft seal to rupture. If hydraulic oil leakage is evident inside the conveyor drive gearbox, repair or replace the assembly.

3. Drive motor is defective. Remove the motor from the tamper drive and apply pressure to the motor. If the motor will not run (high pressure indicated), repair or replace as necessary.
4. Tamper bar not timed properly. Refer to the 4-track paving mold assembly for proper adjustment and timing of the tamper bar assembly.

Symptom:

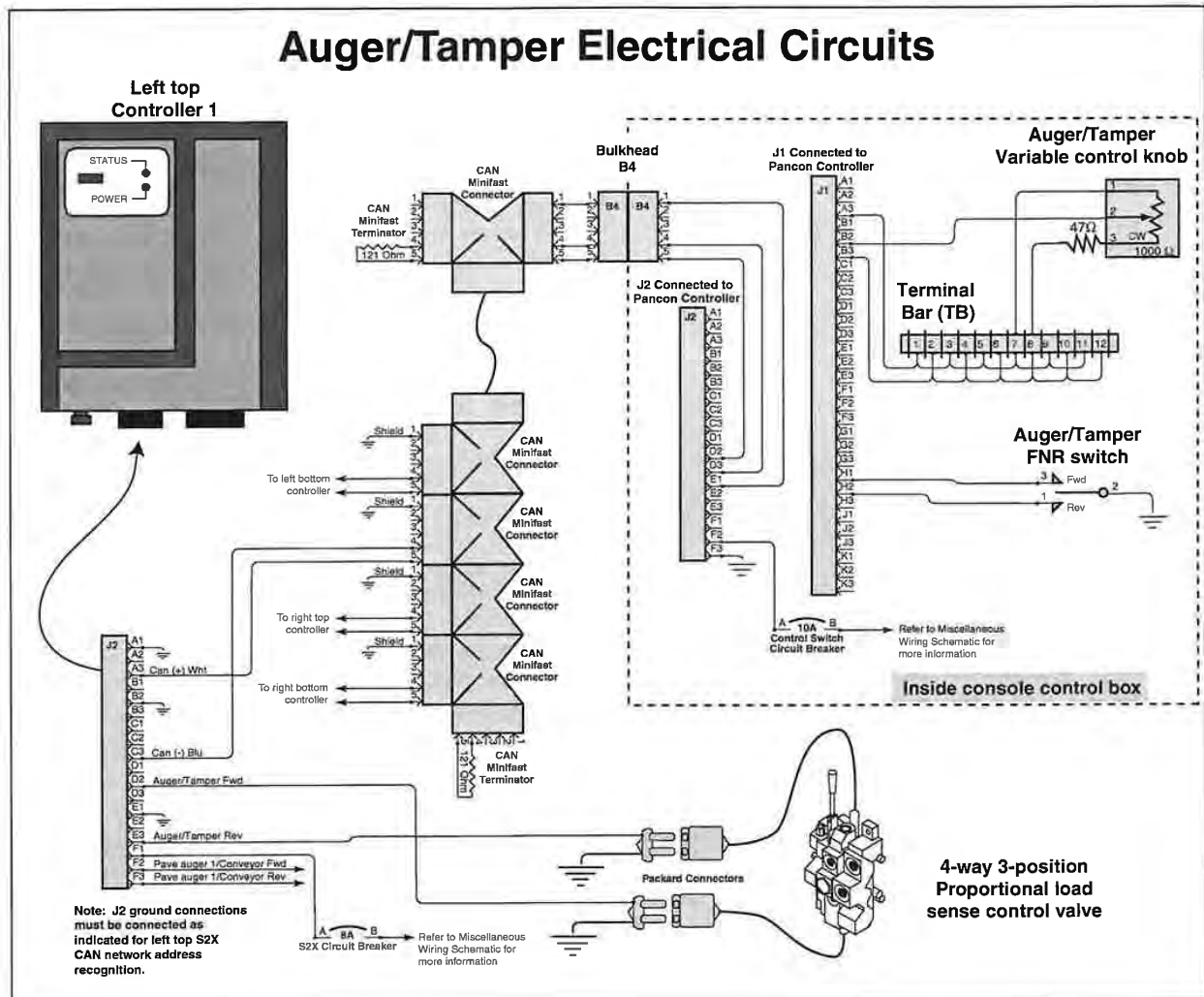
Auger stalls at high pressure.

Corrective Measures:

1. An excessive amount of concrete is around the auger and may have started to harden. Operate the vibrators to aid in freeing the auger.
2. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler using a pipe coupling or a coupler known to be good.

Note: A defective or disconnected quick coupler may cause the motor shaft seal to rupture. If hydraulic oil leakage is evident, repair or replace the motor.

3. Drive motor is defective. Disconnect the drive chain from the motor and apply pressure to the motor. If the motor will not run (high pressure indicated), repair or replace as necessary.

07 Auxiliary Auger/Tamper Electrical Circuits


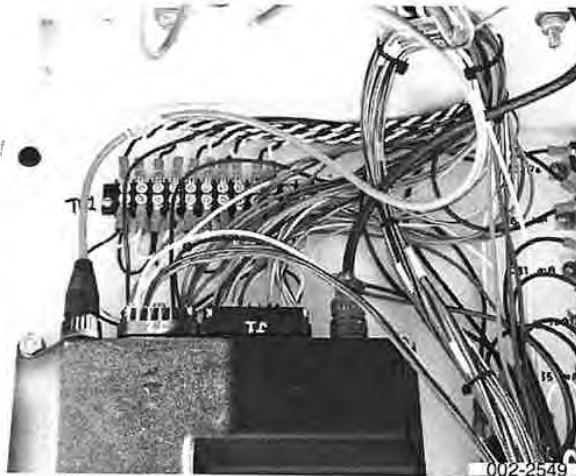
The network control system is used to electrically operate the auger/tamper hydraulic proportional control valve. Two controllers are used to operate the auger/tamper electrical circuit. The Pancon controller is the main computer on the machine and is located in the console control box. It receives the input information from the various sources and processes that information. In the auger/tamper circuit the input devices are the auger/tamper variable control knob and the auger/tamper FNR (forward/neutral/reverse) switch. After processing is completed, the Pancon controller sends an appropriate response signal through the CAN communication network to the appropriate S2X controller located on the front access door of the control console. The S2X controller will receive the response from the Pancon controller and

will send the appropriate output drive signal to the auger/tamper proportional control valve.

To make the system operational, the Pancon controller receives a 12 volt power source from a 10 amp circuit breaker and ground connection to the machine frame. Each S2X controller on the front access door receives 12 volt power from a 10 amp circuit breaker and a ground connection to the machine frame. To operate the variable control knobs, the Pancon controller supplies 5 volts and a ground connection to the terminal bar inside the control box. The terminal bar is used to distribute the power and ground connections to the various control knobs on the control box.

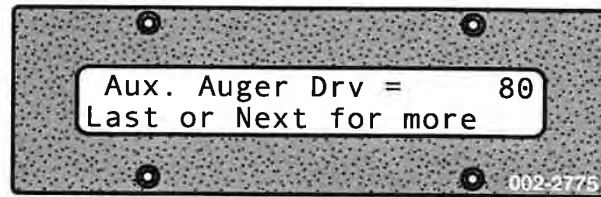
From the terminal bar, 5 volts and a ground connection are provided to the auger/tamper variable control knob on pins 1 and 3. A resistor is connected into the

ground wire on pin 3 to create a minimum output voltage of 0.21 volts when the control knob is turned off. The Pancon controller recognizes this minimum voltage as the "off" position of the control knob. As the control knob is rotated clockwise, the output voltage will vary from 0.21 volts to a maximum of 5.00 volts. The control knob output voltage is routed from terminal 2 to pin B2 on the 30 pin connector attached to the Pancon controller. An adjustable threshold voltage is preset in the Pancon controller to begin rotation of the auger/tamper. The threshold is normally adjusted to begin the rotation of the auger/tamper circuit when the control knob is rotated clockwise approximately 25% from the "off" position. Refer to the Maintenance chapter for this adjustment procedure.



18 pin and 30 pin connectors on Pancon controller

To determine direction control, the auger/tamper forward/neutral/reverse switch is positioned in the appropriate direction. A ground connection is routed through the switch, in either the forward or reverse positions, and into pins H1 or H2 on the 30 pin connector attached to the Pancon controller. If a ground connection is received on pin H1, forward rotation of the auger/tamper circuit is selected. If a ground connection is received on pin H2, reverse rotation of the auger/tamper circuit is selected. If a ground is not received on either pin H1 or H2, the Pancon controller assumes the neutral mode has been selected and will not allow an output drive signal to the proportional control valve. The Pancon controller must be in the Run mode, the circuit must be in working order and the emergency stop system must be reset before an output signal can be sent to the appropriate S2X controller on the front access door.



Auxiliary auger output drive signal

As the variable control knob output voltage increases, the Pancon controller will send a corresponding signal to the left top S2X controller on the front access door to the console. This signal is routed through the CAN network cable between the Pancon controller in the control box and the S2X controller on the front access door. This signal is processed by the left top S2X controller and a corresponding output drive signal is routed from the 18 pin connector to the proportional control valve. The output will vary from 0 to 80 percent and corresponds with the amount of variable control knob signal.

Notice: Make certain to carefully read all troubleshooting displays on the main display screen. This will indicate the number of problems that are currently affecting the machine. The general location of each problem is given on the display and will help in narrowing the area for troubleshooting.

Symptom:

All main hydraulic systems; trimmer, tracks, conveyor/ auger, auger/tamper and paving auger 2 will not operate.

Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on each control valve and move it in either direction. If the systems do not operate, the problem may be hydraulic. Refer to troubleshooting the auger/tamper hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the hydraulic systems operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



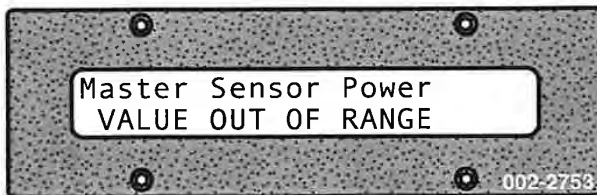
Reset the emergency stop light

1. One of the emergency stop buttons is depressed. Reset the depressed button to the out position and depress the emergency stop reset switch on the engine control panel to reset the system. If the light will not reset, refer to troubleshooting the emergency stop system.



Emergency stop reset display

2. One of the variable control knobs is not rotated to the off position or one of the FNR switches is not in the neutral position. Rotate the control knobs to the off position and place the FNR switches in the neutral position. The display should indicate the normal operating display if the emergency stop system is reset.
3. Manual override lever will not operate the auger/tamper or other hydraulic systems. The reset light is not illuminated. This may indicate that the emergency stop manifold solenoid coil is defective or the power relay on the front access door is sticking or defective. Refer to troubleshooting the emergency stop electrical system for more information.



Sensor power short inside control box

4. Sensor power is shorted inside the control box for the variable control knobs. Disconnect the power and ground wires (twisted pairs) for each variable control knob individually until the display does not indicate the value is out of range. The control knob or the wiring connected to the control knob, that was last disconnected, is

defective. Repair or replace the shorted wiring and/or the control knob as necessary.

If all wires to the control knobs have been removed from the terminal bar and the display still indicates the Master Sensor Power - Value Out Of Range; then either the wiring between the terminal bar and the 30 pin connector is shorted to ground; or the Pancon controller is shorted internally. Check the wiring for damage and good connections and repair as necessary. Replace the Pancon controller if all other connections are good.

Symptom:



Auxiliary auger valve fault display

The display indicates Auxiliary Auger Valve Fault. The auger/tamper circuit will not operate in one or both directions.

Corrective Measures:

Place the auger/tamper FNR switch in the opposite direction and attempt to operate the circuit. If the auger/tamper will operate and the display indicates that the problem no longer exists, then the problem is directional. Directional components include the FNR switch and wiring, the S2X output valve drives, the cables between the S2X and the control valve and the proportional solenoid coils on the control valve. Since the display indicates that the problem is located at the auxiliary auger/tamper valve, the problem exists between the S2X controller and the control valve. Refer to the following procedures to locate the problem.

1. The packard connector at the control valve is disconnected. Reconnect the cables.
2. The packard connector at the control valve is contaminated. Disconnect both packard connectors and clean with an electrical contact cleaner. Reconnect after cleaning.
3. The proportional solenoid coil is defective. Disconnect the packard connector from each of the two solenoid coils and swap the cables. Reconnect the packard connectors and attempt

to operate the auger/tamper in each of the two directions. If the auger/tamper fault remains in the same direction of rotation, the pulsar solenoid valve may be defective. Stop the engine and remove the hydraulic oil fill cap to remove any pressure that may be in the reservoir. Remove both pulsar solenoid valves simultaneously from the control valve assembly and quickly swap them to prevent excessive hydraulic oil loss. Make certain that the o-ring seal at the base of the pulsar solenoid valve stem is in place and not damaged. Replace the o-ring if necessary.

Note: A small amount of vacuum may be placed on the hydraulic reservoir to prevent oil loss when swapping the pulsar solenoid valves.

After swapping the pulsar solenoid valves and reconnecting the cables, attempt to operate the circuit. If the problem switches to the opposite direction, the pulsar solenoid valve coil is defective and must be replaced. If the problem stays in the same direction, there may be an internal problem with the control valve spool or the o-ring is missing from the base of the pulsar solenoid valve. Remove and recheck the o-ring on the pulsar solenoid valve. Replace the o-ring as necessary. Remove the valve spool to check for any contamination or corrosion. Replace or repair as necessary.

4. Defective wiring between the S2X controller and the packard connector. Remove the 18 pin connector from the S2X controller and disconnect the suspected packard connector. Using an ohm meter, check the wiring for continuity between pin D2 on the 18 pin connector and the corresponding color coded wire in the packard connector at the control valve. Check continuity between pin E3 on the 18 pin connector and the corresponding color coded wire in the packard connector for the opposite direction at the control valve. If continuity does not exist, the wiring is defective and must be repaired or replaced.



S2X controllers mounted to access door

5. Defective S2X controller. Each of the S2X controllers are programmed the same and are interchangeable. Disconnect both connectors from the S2X controller believed to be defective and swap the controller with one of the S2X controllers known to be good. Reconnect the wiring and test. If the problem switches to a different location on the machine, the S2X controller is defective and must be replaced.

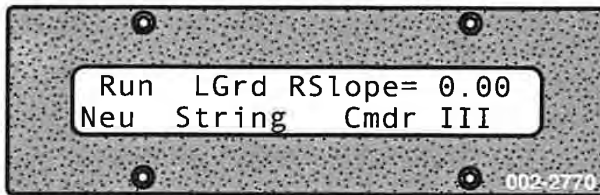
Note: The bottom right S2X controller on the access door does not operate any conveyor, auger, trimmer or track controls. Temporary operation can be resumed by swapping an S2X controller with a defective output drive to the bottom right location.

Symptom:

The auger/tamper will not operate in one or both directions.

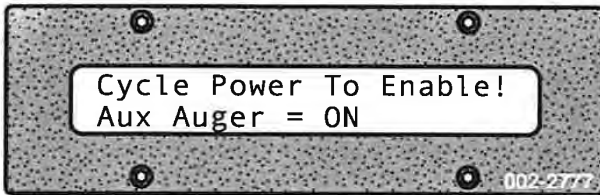
Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on the auger/tamper control valve and move it in either direction. If the auger or tamper does not operate, the problem may be hydraulic. Refer to troubleshooting the auger/tamper hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the auger or tamper does operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



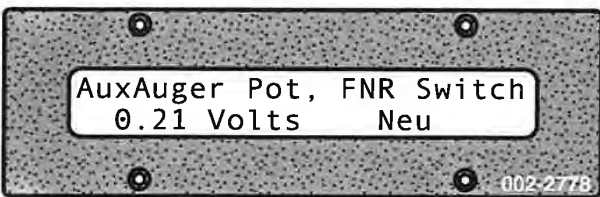
Run mode indicated on display

1. The network control system is not in the RUN mode. Depress the RUN/STANDBY switch to indicate RUN on the main display screen.



Calibrate mode display

2. The auxiliary auger controls are disabled in the Calibrate mode. Depress the Calibrate switch on the control box. Depress the NEXT switch until the Aux Auger display is indicated. If the display indicates the "off" position, depress either the + or - switch until the "on" mode is indicated. Restart the computer to allow operation of the auxiliary auger controls.



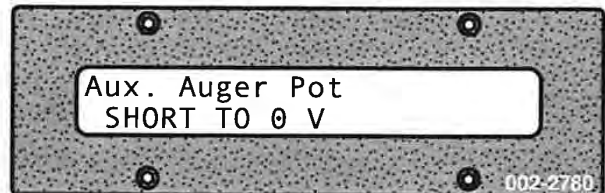
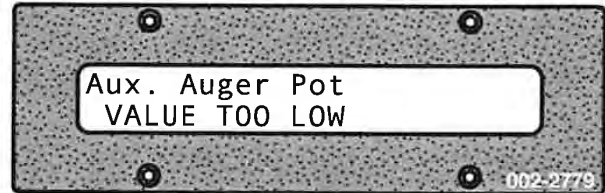
Service mode display

3. The FNR switch or wiring is defective. Depress the SERVICE switch on the control box. Depress the NEXT switch until the conveyor pot display is indicated. View the position of the FNR switch on the display while changing the position of the FNR switch on the console.

If the display corresponds to the selected switch position, the FNR switch and wiring are operating normally.

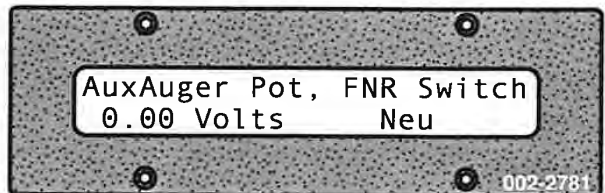
If the display does not correspond to the selected switch position, the FNR switch or the wiring may be defective. Remove the wire from the center terminal of the FNR switch and momentarily connect it to either terminal 1 or terminal 3 on the FNR switch. If the display will now indicate the missing position, the FNR

switch is defective and must be replaced. If the display still indicates a defective reading, check the wire between the J1 connector and the FNR switch for tight connections and continuity. Make certain a good ground connection is present by placing a jumper wire between the machine frame and the FNR switch. Repair or replace the wiring as necessary.



Defective output signal from conveyor control knob

4. Auxiliary Auger Pot; NOT CALIBRATED, VALUE TOO LOW or SHORT TO 0 V is indicated on the display. This indicates that a variable output voltage is not being received by the Pancon controller.



Defective conveyor pot output voltage indicated

To test, depress the SERVICE switch on the control box. Depress the NEXT switch until the conveyor pot display is indicated. The normal voltage range should be 0.21 volts to 5.00 volts as the auger/tamper control knob is rotated clockwise. If the reading is 0.00 volts, make certain that 5.00 volts is provided to the control knob on pin 1 and a good ground connection is provided on pin 3. Make certain that the output wire between pin 2 on the control knob and pin A1 on the 30 pin connector is securely connected and check for continuity. If a good ground and 5.00 volts of power exists, the control knob is defective and must be replaced.

Symptom:

The display indicates Left Front Slave No Response.

Corrective Measures:

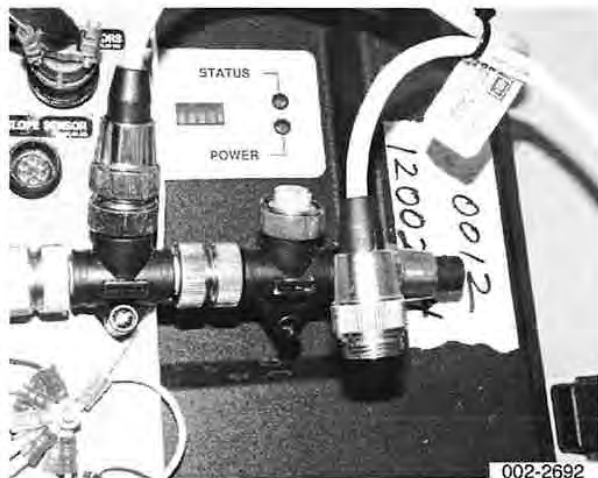

No response indicated on display

This problem indicates that the S2X is not communicating through the CAN network to the Pancon controller and the other S2X controllers. Remove the 18 pin and 30 pin connectors from the S2X believed to be defective. Swap the S2X with one of the other S2X controllers known to be good. If the problem switches to a different location on the machine, the S2X is defective and must be replaced.

If the problem remains with the left front slave (S2X), the CAN network cable connection between the 18 pin connector and the CAN minifast connector is defective and must be repaired or replaced.

Symptom:

All S2X slaves are indicating NO RESPONSE on the display.

Corrective Measures:


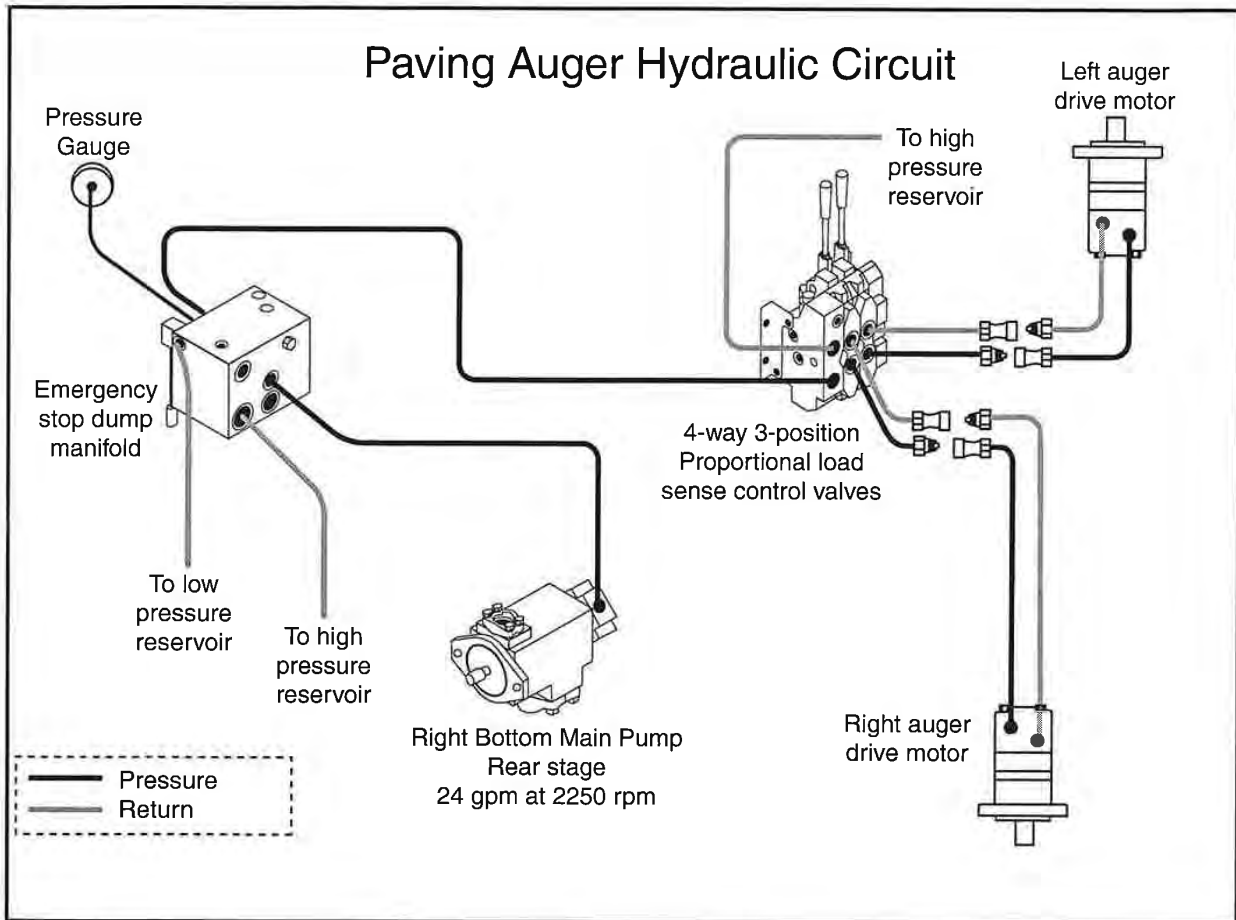
CAN network minifast connectors and terminator

This indicates that the CAN network cables may be defective. Make certain that the CAN minifast

terminators are in place on the minifast connectors as indicated in the electrical drawing.

Remove the right bottom cable connector from the end of the CAN minifast connectors on the front access door. Remove the CAN cable from bulkhead 4 on the back of the control box. Check for continuity between the bulkhead 4 cable and the disconnected CAN minifast connector on the front access door. If continuity does not exist, disconnect and recheck each of the cables in the CAN network wiring harness until the defective component is located. Repair or replace the wiring harness as necessary.

If continuity exists in the wiring harness, check continuity between bulkhead 4 and the 18 pin connector on the Pancon controller. Repair or replace the control box wiring as necessary.

08 Paving Auger Hydraulic Circuit


The oil flow for the paving auger circuit begins at the rear stage of the lower right pump assembly which delivers 24.0 gpm (91 lpm) at 2250 rpm at 130°F (55°C). Filtered hydraulic oil for the pump is supplied from the low pressure reservoir. From the pump the oil is routed to the emergency stop dump manifold. A line tapped into the manifold is connected to the pressure gauge, through which the system pressure is monitored.

Note: The conveyor/auger pump output is increased from 12.0 gpm (lpm) to 24.0 gpm (91 lpm) when the paving auger circuit is added to a 4-track machine. The additional oil is divided between the paving auger and conveyor/auger control valves.

A 4-way 2-position pilot operated valve, in the emergency stop manifold, is spring-loaded to direct hydraulic flow to the high pressure reservoir through a return port in the emergency stop manifold. When the emergency stop solenoid coil is energized, the

emergency stop solenoid valve is closed causing pilot pressure to increase. The pilot pressure is directed against the 4-way 2-position valve and spring, causing it to shift and directing the hydraulic flow to the directional control valve. When the emergency stop solenoid coil is de-energized, the solenoid valve returns to its normally open position and pilot pressure is drained to the low pressure reservoir. The spring-loaded 4-way 2-position valve returns to its original position, draining the pump hydraulic flow to the high pressure reservoir.

Note: Each of three 4-way pilot operated valves in the emergency stop manifold are controlled by the emergency stop solenoid valve.

The hydraulic flow is restricted as it enters the inlet of the directional control valve. A pilot pressure reducing-relieving valve begins to increase system pressure until it reaches 200 psi (14 bar). When pilot pressure is reached, hydraulic flow is directed through the control valve return port to the high pressure

reservoir. A pressure differential of 200 psi (14 bar) should be maintained between the pressure inlet line and the tank return line.

Pilot pressure is supplied to two electrically operated proportional pulsar solenoid valves. If the FNR control switch is placed in the forward direction and the variable control knob is rotated, a variable electric signal is supplied to one of the pulsar solenoid coils, causing it to direct pilot pressure against one end of the control valve spool. The more the control knob is rotated, the faster the auger will turn. As the control valve spool is shifted, pressure oil is directed out one of the two work ports. The oil flows through quick couplers and into one of the working ports on the auger drive motor, causing it to rotate the drive shaft. As the motor shaft turns, the auger will turn. Return oil from the drive motor flows out the opposite port on the motor, back through the opposite quick couplers, through the control valve and back to the return manifold. The oil will then be returned through the hydraulic oil cooler to the high pressure reservoir.

If the FNR control switch is placed in the "reverse" position, the opposite pulsar solenoid coil is energized, causing it to direct pilot pressure against the opposite end of the control valve spool and causing the auger to rotate in the reverse direction.

When the control valve is centered, the hydraulic oil is bypassed to the tank port at 200 psi (14 bar) plus any additional pressure in the return line. The bypass pressure reading displayed on the pressure gauge is referred to as "standby pressure".

If the auger or tamper quick couplers become disconnected, or the paving auger is prevented from turning, the blocked hydraulic flow will build system pressure until the control valve pressure limiter returns the flow to the pressure tank. The pressure relief setting is adjusted for 2400 psi (165 bar).

Symptom:

Auger will not rotate. Normal pressure indicated.

Corrective Measures:

! WARNING! !

DO NOT ATTEMPT TO ADJUST THE CHAIN WITH THE ENGINE RUNNING. CONTACT WITH MOVING CHAIN OR AUGER CAN CAUSE SERIOUS INJURY. BE CERTAIN THAT NO ONE IS NEAR THE CHAIN OR AUGER BEFORE ENGAGING CONTROL VALVE. KEEP HANDS, FEET AND LOOSE CLOTHING AWAY FROM MOVING PARTS TO PREVENT SEVERE INJURY.



Broken drive chain

1. Drive chain off of sprockets or broken. If the chain is broken, repair or replace it as necessary. Adjust the chain tension as described in the Maintenance chapter.



Drive sprocket key

2. Square key between drive sprocket and the auger shaft has sheared off. Inspect key and replace as necessary.

3. Bolts connecting the auger sections to the stub shaft inside the hopper are missing or broken. Repair or replace as necessary.

Symptom:

Auger stalls at low pressure.

Corrective Measures:

1. Main relief valve not maintaining 2400 psi (165 bar) relief pressure. Refer to the maintenance chapter for instructions on how to check and adjust relief pressure.

! CAUTION! !

CONTINUOUS EXPOSURE TO ENGINE NOISE CAN CAUSE HEARING INJURY. DO NOT OPERATE THE MACHINE WITHOUT ADEQUATE HEARING PROTECTION.

2. Hydraulic motor allowing oil to leak past the rotor internally, relieving system pressure. Disconnect both drive motor hoses at the quick couplers. Activate the control valve (engine running at 2250 rpm). If the pressure gauge indicates 2400 psi (165 bar) relief pressure, the motor is defective and must be repaired or replaced.

Symptom:

Paving auger will not operate. The pressure gauge indicates zero pressure. No standby pressure is indicated on the pressure gauge.

Corrective Measures:

Open the access door to the rear of the operators console and depress the manual override lever in either direction. If the paving auger will operate with the manual override lever, the problem is in the electrical drive signal to the control valve. Refer to the Paving auger electrical troubleshooting section. If the paving auger will not operate with the manual override lever, the problem is hydraulic. Refer to the following measures for troubleshooting information.

! DANGER! !

CHECK FOR ANY PERSONNEL IN OR AROUND THE AUGER, TRACKS OR TRIMMERWHEEL PRIOR TO RESETTING THE EMERGENCY STOP SYSTEM. SEVERE INJURY OR DEATH WILL OCCUR WHEN CAUGHT IN THE AUGER, TRACKS OR TRIMMERWHEEL.

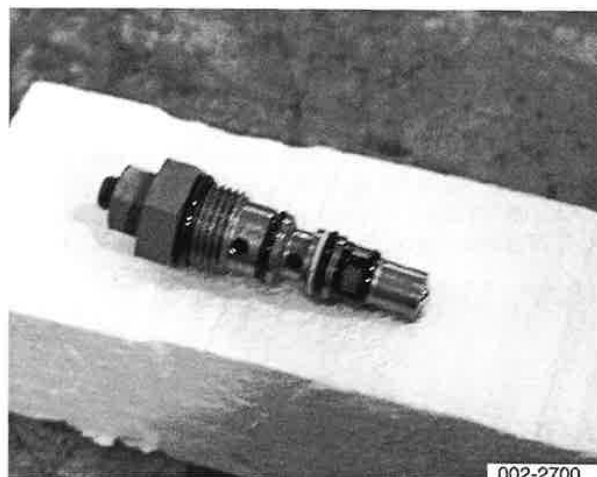


Emergency stop button

1. Emergency stop button is depressed. If the emergency stop reset light is illuminated, check all emergency stop buttons on the machine making certain that they are released to the out position. Depress the emergency stop reset switch. The reset light should stop illuminating.

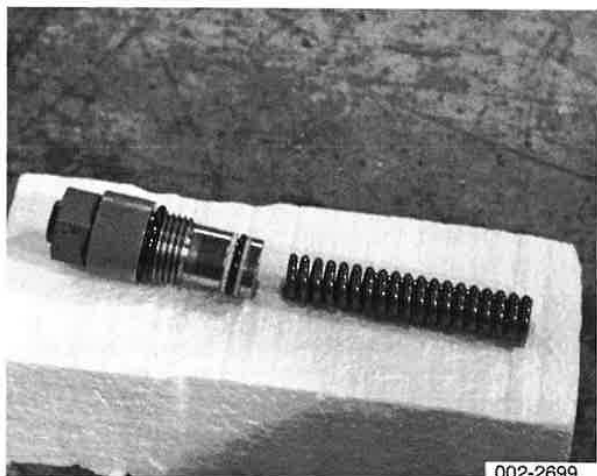
If the emergency stop reset light will not stop illuminating after the reset switch has been depressed, the problem may be electrical. Refer to the Miscellaneous electrical troubleshooting section for more information.

Note: The emergency stop system will affect all hydraulic functions on the machine except for the lift circuit.



Pilot pressure valve

2. Defective pilot pressure reducing-relieving valve. If standby pressure is not evident but the trimmer and auxiliary auger controls operate, the pilot pressure valve may be defective. Remove the valve from the control valve housing and swap with the auxiliary control valve. If the symptom switches to the auxiliary auger controls, the pilot pressure valve is defective and must be replaced.



Relief valve and compensator spring

3. High pressure relief valve is contaminated. Remove and inspect the valve for any contamination. Swap the relief valve between the auger/tamper valve and the conveyor valve. If the problem switches to the conveyor valve, the relief valve is defective and must be replaced.



4-way 2-position emergency stop valve

4. The 4-way 2-position valve spool is contaminated or defective causing the hydraulic flow to return to the tank. Remove and clean any contamination from the valve spool in the emergency stop manifold. Check all o-rings for damage and replace as necessary.

Symptom:

Auger runs slower than normal. Stalls at proper relief pressure.

Corrective Measures:

CAUTION!

DO NOT STALL A SYSTEM WITH AN UNKNOWN RELIEF PRESSURE SETTING. IF THE PRESSURE SETTING IS TOO HIGH, SERIOUS MACHINE DAMAGE MAY OCCUR. WHEN CHECKING A RELIEF PRESSURE SETTING, TURN THE ADJUSTMENT SCREW OUT 2 OR 3 TURNS BEFORE STALLING THE SYSTEM.

1. Defective pump. Check with a flow meter if available. A good indication of a defective pump is to compare system pressure to engine rpm. To check, disconnect both drive hoses at the quick couplers. Start the engine and run it at 1000 rpm. Reset the emergency stop system. Place the network control system in the Run mode, the FNR switch in the forward position and slowly rotate the paving auger control knob clockwise. Note the increasing pressure on the corresponding pressure gauge. If the pressure continues to increase above 2400 psi (165 bar), immediately move the control knob back to the

off position. Readjust the pressure relief valve following the instructions in the Maintenance chapter. If the pressure does not increase above 2400 psi (165 bar), rotate the control knob the maximum amount and increase the engine speed to maximum. Gradually reduce the engine speed while noting the pressure reading on the gauge. A damaged pump will not maintain relief pressure, but the pressure will drop rapidly as engine speed is reduced. A good pump will maintain approximately the same pressure as engine speed decreases. Replace or repair the pump if found to be defective.

2. Engine is not operating at maximum speed (2250 rpm). If the engine speed is low, hydraulic pump output flow will be low, causing the paving auger circuit, as well as all other hydraulic systems to operate slower. Increase engine speed to maximum.

Symptom:

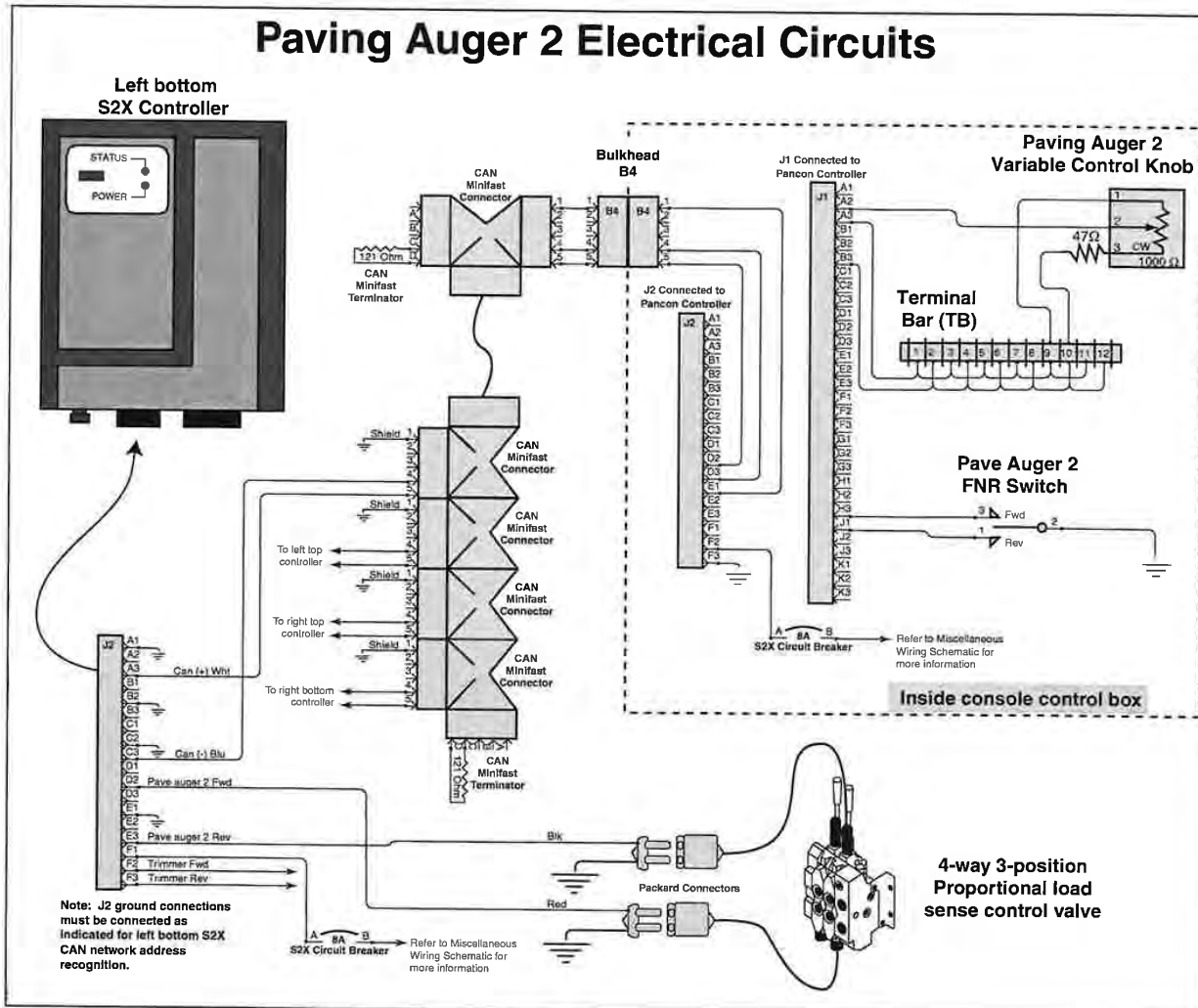
Auger stalls at high pressure.

Corrective Measures:

1. An excessive amount of concrete is around the auger and may have started to harden. Operate the vibrators to aid in freeing the auger.
2. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler using a pipe coupling or a coupler known to be good.

Note: A defective or disconnected quick coupler may cause the motor shaft seal to rupture. If hydraulic oil leakage is evident, repair or replace the motor.

3. Drive motor is defective. Disconnect the drive chain from the motor and apply pressure to the motor. If the motor will not run (high pressure indicated), repair or replace as necessary.

09 Paving Auger Electrical Circuits


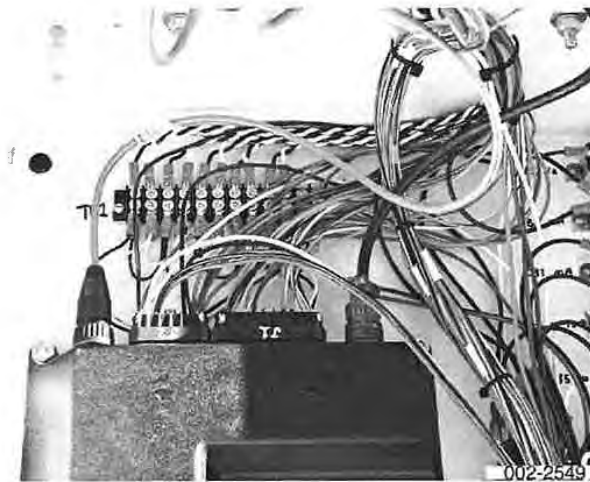
The network control system is used to electrically operate the paving auger hydraulic proportional control valve. Two controllers are used to operate the paving auger electrical circuit. The Pancon controller is the main computer on the machine and is located in the console control box. It receives the input information from the various sources and processes that information. In the paving auger circuit the input devices are the paving auger variable control knob and the paving auger FNR (forward/neutral/reverse) switch. After processing is completed, the Pancon controller sends an appropriate response signal through the CAN communication network to the appropriate S2X controller located on the front access door of the control console. The S2X controller will receive the response from the Pancon controller and

will send the appropriate output drive signal to the paving auger proportional control valve.

To make the system operational, the Pancon controller receives a 12 volt power source from a 10 amp circuit breaker and ground connection to the machine frame. Each S2X controller on the front access door receives 12 volt power from a 10 amp circuit breaker and a ground connection to the machine frame. To operate the variable control knobs, the Pancon controller supplies 5 volts and a ground connection to the terminal bar inside the control box. The terminal bar is used to distribute the power and ground connections to the various control knobs on the control box.

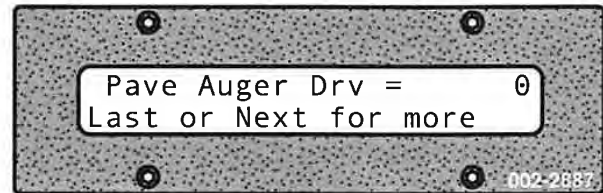
From the terminal bar, 5 volts and a ground connection are provided to the paving auger variable control knob on pins 1 and 3. A resistor is connected into the

ground wire on pin 3 to create a minimum output voltage of 0.21 volts when the control knob is turned off. The Pancon controller recognizes this minimum voltage as the "off" position of the control knob. As the control knob is rotated clockwise, the output voltage will vary from 0.21 volts to a maximum of 5.00 volts. The control knob output voltage is routed from terminal 2 to pin A2 on the 30 pin connector attached to the Pancon controller. An adjustable threshold voltage is preset in the Pancon controller to begin rotation of the paving auger. The threshold is normally adjusted to begin the rotation of the paving auger circuit when the control knob is rotated clockwise approximately 25% from the "off" position. Refer to the Maintenance chapter for this adjustment procedure.



18 pin and 30 pin connectors on Pancon controller

To determine direction control, the paving auger forward/neutral/reverse switch is positioned in the appropriate direction. A ground connection is routed through the switch, in either the forward or reverse positions, and into pins H3 or J1 on the 30 pin connector attached to the Pancon controller. If a ground connection is received on pin H3, forward rotation of the paving auger circuit is selected. If a ground connection is received on pin J1, reverse rotation of the paving auger circuit is selected. If a ground is not received on either pin H3 or J1, the Pancon controller assumes the neutral mode has been selected and will not allow an output drive signal to the proportional control valve. The Pancon controller must be in the Run mode, the circuit must be in working order and the emergency stop system must be reset before an output signal can be sent to the appropriate S2X controller on the front access door.



Pave auger output drive signal

As the variable control knob output voltage increases, the Pancon controller will send a corresponding signal to the left bottom S2X controller on the front access door to the console. This signal is routed through the CAN network cable between the Pancon controller in the control box and the S2X controller on the front access door. This signal is processed by the left bottom S2X controller and a corresponding output drive signal is routed from the 18 pin connector to the proportional control valve. The output will vary from 0 to 80 percent and corresponds with the amount of variable control knob signal.

Notice: Make certain to carefully read all troubleshooting displays on the main display screen. This will indicate the number of problems that are currently affecting the machine. The general location of each problem is given on the display and will help in narrowing the area for troubleshooting.

Symptom:

All main hydraulic systems; trimmer, tracks, conveyor/ auger, auger/tamper and paving auger 2 will not operate.

Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on each control valve and move it in either direction. If the systems do not operate, the problem may be hydraulic. Refer to troubleshooting the paving auger hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the hydraulic systems operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



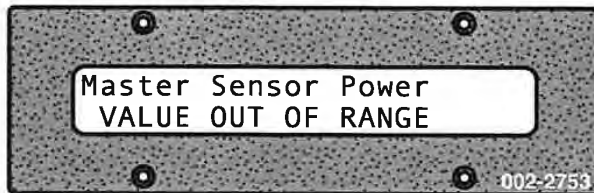
Reset the emergency stop light

- One of the emergency stop buttons is depressed. Reset the depressed button to the out position and depress the emergency stop reset switch on the engine control panel to reset the system. If the light will not reset, refer to troubleshooting the emergency stop system.



Emergency stop reset display

- One of the variable control knobs is not rotated to the off position or one of the FNR switches is not in the neutral position. Rotate the control knobs to the off position and place the FNR switches in the neutral position. The display should indicate the normal operating display if the emergency stop system is reset.
- Manual override lever will not operate the paving auger or other hydraulic systems. The reset light is not illuminated. This may indicate that the emergency stop manifold solenoid coil is defective or the power relay on the front access door is sticking or defective. Refer to troubleshooting the emergency stop electrical system for more information.



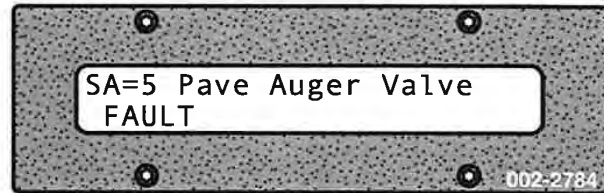
Sensor power short inside control box

- Sensor power is shorted inside the control box for the variable control knobs. Disconnect the power and ground wires (twisted pairs) for each variable control knob individually until the display does not indicate the value is out of range. The control knob or the wiring connected to the control knob, that was last disconnected, is

defective. Repair or replace the shorted wiring and/or the control knob as necessary.

If all wires to the control knobs have been removed from the terminal bar and the display still indicates the Master Sensor Power - Value Out Of Range; then either the wiring between the terminal bar and the 30 pin connector is shorted to ground; or the Pancon controller is shorted internally. Check the wiring for damage and good connections and repair as necessary. Replace the Pancon controller if all other connections are good.

Symptom:



Paving auger valve fault display

The display indicates Paving Auger Valve Fault. The paving auger circuit will not operate in one or both directions.

Corrective Measures:

Place the paving auger FNR switch in the opposite direction and attempt to operate the circuit. If the paving auger will operate and the display indicates that the problem no longer exists, then the problem is directional. Directional components include the FNR switch and wiring, the S2X output valve drives, the cables between the S2X and the control valve and the proportional solenoid coils on the control valve. Since the display indicates that the problem is located at the paving auger valve, the problem exists between the S2X controller and the control valve. Refer to the following procedures to locate the problem.

- The packard connector at the control valve is disconnected. Reconnect the cables.
- The packard connector at the control valve is contaminated. Disconnect both packard connectors and clean with an electrical contact cleaner. Reconnect after cleaning.
- The proportional solenoid coil is defective. Disconnect the packard connector from each of the two solenoid coils and swap the cables. Reconnect the packard connectors and attempt to operate the paving auger in each of the two

directions. If the paving auger fault remains in the same direction of rotation, the pulsar solenoid valve may be defective. Stop the engine and remove the hydraulic oil fill cap to remove any pressure that may be in the reservoir. Remove both pulsar solenoid valves simultaneously from the control valve assembly and quickly swap them to prevent excessive hydraulic oil loss. Make certain that the o-ring seal at the base of the pulsar solenoid valve stem is in place and not damaged. Replace the o-ring if necessary.

Note: A small amount of vacuum may be placed on the hydraulic reservoir to prevent oil loss when swapping the pulsar solenoid valves.

After swapping the pulsar solenoid valves and reconnecting the cables, attempt to operate the circuit. If the problem switches to the opposite direction, the pulsar solenoid valve coil is defective and must be replaced. If the problem stays in the same direction, there may be an internal problem with the control valve spool or the o-ring is missing from the base of the pulsar solenoid valve. Remove and recheck the o-ring on the pulsar solenoid valve. Replace the o-ring as necessary. Remove the valve spool to check for any contamination or corrosion. Replace or repair as necessary.

4. Defective wiring between the S2X controller and the packard connector. Remove the 18 pin connector from the S2X controller and disconnect the suspected packard connector. Using an ohm meter, check the wiring for continuity between pin D2 on the 18 pin connector and the corresponding color coded wire in the packard connector at the control valve. Check continuity between pin E3 on the 18 pin connector and the corresponding color coded wire in the packard connector for the opposite direction at the control valve. If continuity does not exist, the wiring is defective and must be repaired or replaced.



S2X controllers mounted to access door

5. Defective S2X controller. Each of the S2X controllers are programmed the same and are interchangeable. Disconnect both connectors from the S2X controller believed to be defective and swap the controller with one of the S2X controllers known to be good. Reconnect the wiring and test. If the problem switches to a different location on the machine, the S2X controller is defective and must be replaced.

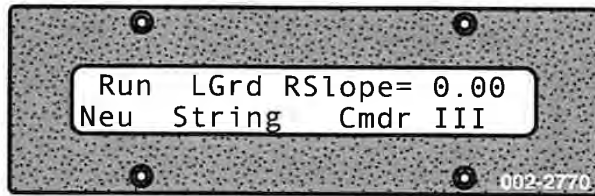
Note: The bottom right S2X controller on the access door does not operate any conveyor, auger, trimmer or track controls. Temporary operation can be resumed by swapping an S2X controller with a defective output drive to the bottom right location.

Symptom:

The paving auger will not operate in one or both directions.

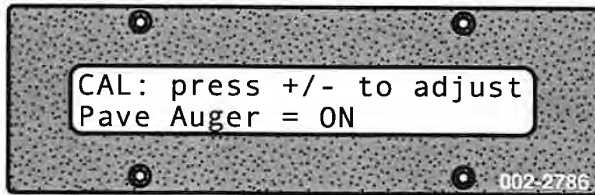
Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on the paving auger control valve and move it in either direction. If the auger does not operate, the problem may be hydraulic. Refer to troubleshooting the paving auger hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the auger does operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



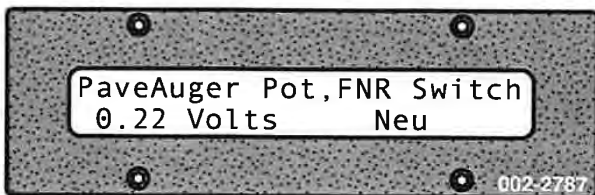
Run mode indicated on display

1. The network control system is not in the RUN mode. Depress the RUN/STANDBY switch to indicate RUN on the main display screen.



Calibrate mode display

2. The pave auger controls are disabled in the Calibrate mode. Depress the Calibrate switch on the control box. Depress the NEXT switch until the Pave Auger display is indicated. If the display indicates the "off" position, depress either the + or - switch until the "on" mode is indicated. Restart the computer to allow operation of the pave auger controls.



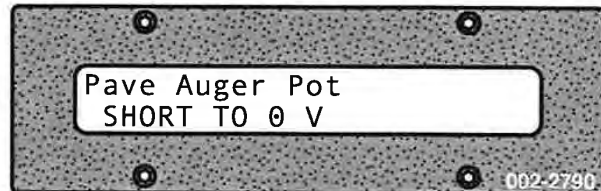
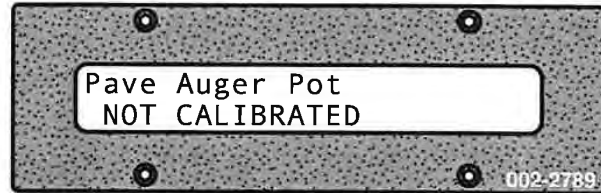
Service mode display

2. The FNR switch or wiring is defective. Depress the SERVICE switch on the control box. Depress the NEXT switch until the pave auger pot display is indicated. View the position of the FNR switch on the display while changing the position of the FNR switch on the console.

If the display corresponds to the selected switch position, the FNR switch and wiring are operating normally.

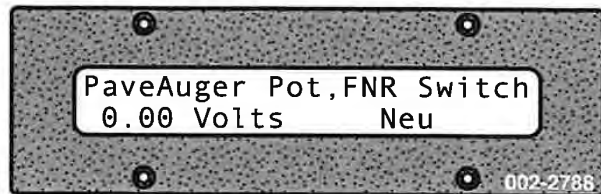
If the display does not correspond to the selected switch position, the FNR switch or the wiring may be defective. Remove the wire from the center terminal of the FNR switch and momentarily connect it to either terminal 1 or terminal 3 on the FNR switch. If the display will now indicate the missing position, the FNR

switch is defective and must be replaced. If the display still indicates a defective reading, check the wire between the J1 connector and the FNR switch for tight connections and continuity. Make certain a good ground connection is present by placing a jumper wire between the machine frame and the FNR switch. Repair or replace the wiring as necessary.



Defective output signal from conveyor control knob

3. Pave Auger Pot; NOT CALIBRATED or SHORT TO 0 V is indicated on the display. This indicates that a variable output voltage is not being received by the Pancon controller.



Defective pave auger pot output voltage indicated

To test, depress the SERVICE switch on the control box. Depress the NEXT switch until the conveyor pot display is indicated. The normal voltage range should be 0.21 volts to 5.00 volts as the paving auger control knob is rotated clockwise. If the reading is 0.00 volts, make certain that 5.00 volts is provided to the control knob on pin 1 and a good ground connection is provided on pin 3. Make certain that the output wire between pin 2 on the control knob and pin A2 on the 30 pin connector is securely connected and check for continuity. If a good ground and 5.00 volts of power exists, the control knob is defective and must be replaced.

Symptom:

The display indicates Left Rear Slave No Response.

Corrective Measures:

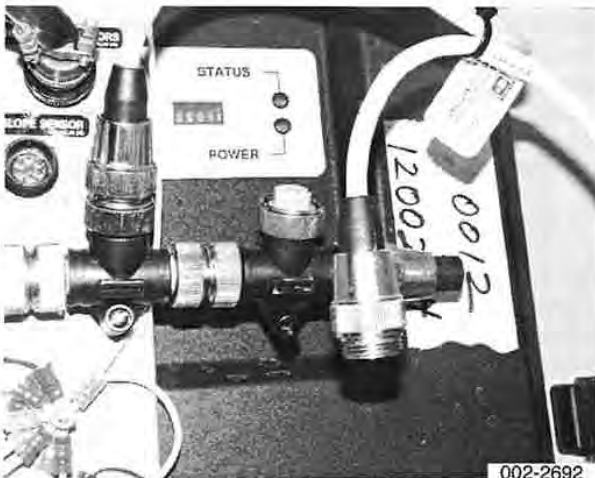

No response indicated on display

This problem indicates that the S2X is not communicating through the CAN network to the Pancon controller and the other S2X controllers. Remove the 18 pin and 30 pin connectors from the S2X believed to be defective. Swap the S2X with one of the other S2X controllers known to be good. If the problem switches to a different location on the machine, the S2X is defective and must be replaced.

If the problem remains with the left rear slave (S2X), the CAN network cable connection between the 18 pin connector and the CAN minifast connector is defective and must be repaired or replaced.

Symptom:

All S2X slaves are indicating NO RESPONSE on the display.

Corrective Measures:


CAN network minifast connectors and terminator

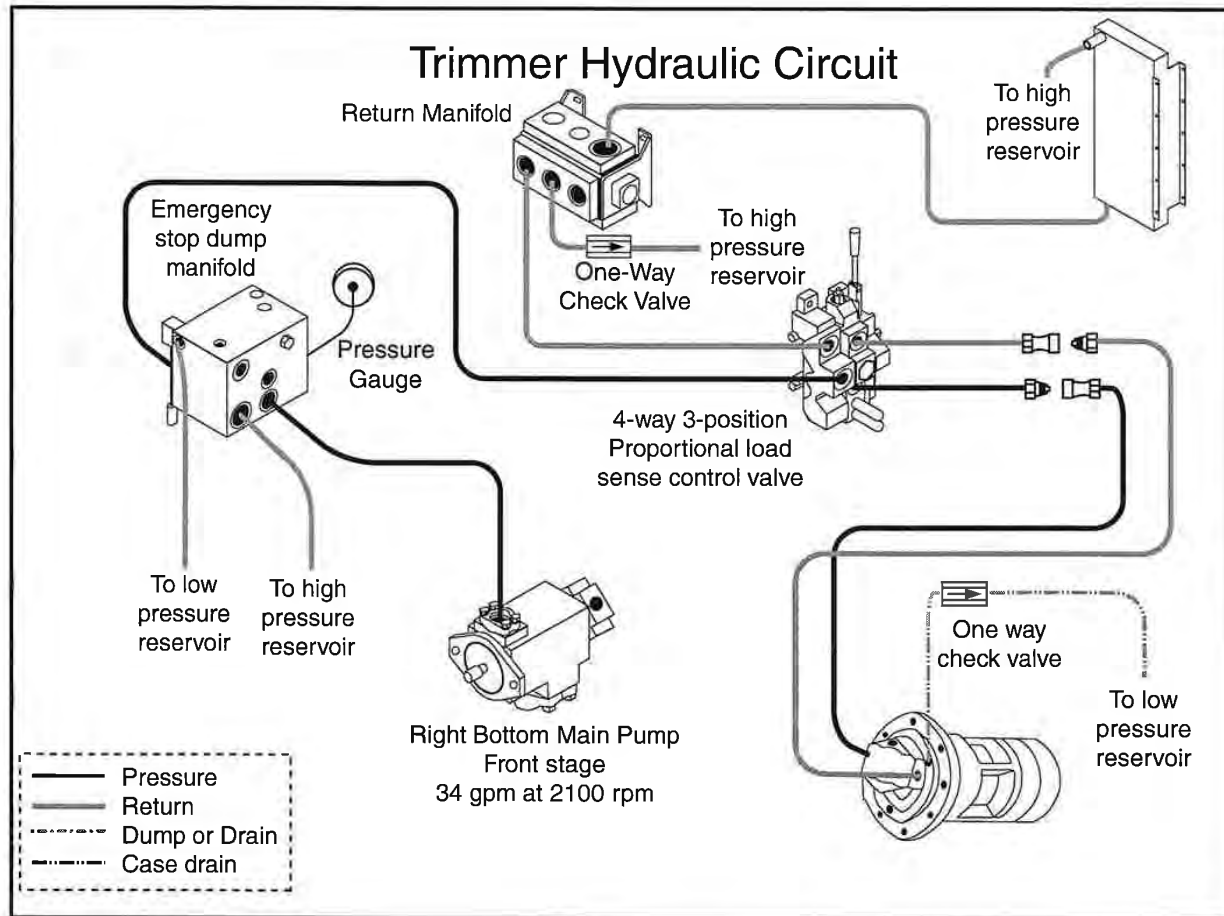
This indicates that the CAN network cables may be defective. Make certain that the CAN minifast

terminators are in place on the minifast connectors as indicated in the electrical drawing.

Remove the right bottom cable connector from the end of the CAN minifast connectors on the front access door. Remove the CAN cable from bulkhead 4 on the back of the control box. Check for continuity between the bulkhead 4 cable and the disconnected CAN minifast connector on the front access door. If continuity does not exist, disconnect and recheck each of the cables in the CAN network wiring harness until the defective component is located. Repair or replace the wiring harness as necessary.

If continuity exists in the wiring harness, check continuity between bulkhead 4 and the 18 pin connector on the Pancon controller. Repair or replace the control box wiring as necessary.

10 Trimmer Hydraulic Circuit



The oil flow for the trimmer circuit begins at the front stage of the lower right pump assembly which delivers 34.0 gpm (lpm) at 2250 rpm at 130°F (°C). Filtered hydraulic oil for the pump is supplied from the low pressure reservoir. From the pump the oil is routed to the emergency stop dump manifold. A line tapped into the manifold is connected to the pressure gauge, through which the system pressure is monitored.

A 4-way 2-position pilot operated valve, in the emergency stop manifold, is spring-loaded to direct hydraulic flow to the high pressure reservoir through a return port in the emergency stop manifold. When the emergency stop solenoid coil is energized, the emergency stop solenoid valve is closed causing pilot pressure to increase. The pilot pressure is directed against the 4-way 2-position valve and spring, causing it to shift and directing the hydraulic flow to the directional control valve. When the emergency stop solenoid coil is de-energized, the solenoid valve returns to its normally open position and pilot pressure

is drained to the low pressure reservoir. The spring-loaded 4-way 2-position valve returns to its original position, draining the pump hydraulic flow to the high pressure reservoir.

Note: Each of three 4-way pilot operated valves in the emergency stop manifold are controlled by the emergency stop solenoid valve.

The hydraulic flow is restricted as it enters the inlet of the directional control valve. A pilot pressure reducing-relieving valve begins to increase system pressure until it reaches 200 psi (14 bar). When pilot pressure is reached, hydraulic flow is directed through the control valve return port to the high pressure reservoir. A pressure differential of 200 psi (14 bar) should be maintained between the pressure inlet line and the tank return line.

Pilot pressure is supplied to two electrically operated proportional pulsar solenoid valves. If the trimmer control is placed in the forward direction, an electric

signal is supplied to one of the pulsar solenoid coils, causing it to direct pilot pressure against one end of the control valve spool. As the control valve spool is shifted, pressure oil is directed out one of the two work ports. The oil flows through quick couplers and into one of the working ports on the trimmer drive motor, causing it to rotate the drive shaft. As the motor shaft turns, the trimmer will turn. Return oil from the drive motor flows out the opposite port on the motor, back through the opposite quick couplers, through the control valve and back to the return manifold. The oil will then be returned through the hydraulic oil cooler to the high pressure reservoir.

If the trimmer control switch is placed in the "reverse" position, the opposite pulsar solenoid coil is energized, causing it to direct pilot pressure against the opposite end of the control valve spool and causing the trimmer to rotate in the reverse direction.

When the control valve is centered, the hydraulic oil is bypassed to the tank port at 200 psi (14 bar) plus any additional pressure in the return line. The bypass pressure reading indicated on the pressure gauge is referred to as "standby pressure".

If the trimmer quick couplers become disconnected, or the trimmer is prevented from turning, the blocked hydraulic flow will build system pressure until the control valve pressure limiter returns the flow to the pressure tank. The pressure relief setting is adjusted for 2500 psi (172 bar).

Symptom:

Trimmer stalls at low pressure.

Corrective Measures:

1. Main relief valve not maintaining 2500 psi (172 bar) relief pressure. Refer to the maintenance chapter for instructions on how to check and adjust relief pressure.

CAUTION!

CONTINUOUS EXPOSURE TO ENGINE NOISE CAN CAUSE HEARING INJURY. DO NOT OPERATE THE MACHINE WITHOUT ADEQUATE HEARING PROTECTION.

2. Hydraulic motor allowing oil to leak past the rotor internally, relieving system pressure. To check for excessive internal wear, disconnect the case drain line. With the trimmer running freely at maximum speed, oil draining from the case drain

line should not exceed 1/2 gpm (1.6 lpm). If the amount of drain oil is excessive, replace the motor.

Symptom:

Trimmer will not operate. The pressure gauge indicates zero pressure. No standby pressure is indicated on the pressure gauge.

Corrective Measures:

Open the access door to the rear of the operators console and depress the manual override lever in either direction. If the trimmer will operate with the manual override lever, the problem is in the electrical drive signal to the control valve. Refer to the Trimmer electrical troubleshooting section. If the trimmer will not operate with manual override lever, the problem is hydraulic. Refer to the following measures for troubleshooting information.

WARNING!

CHECK FOR ANY PERSONNEL IN OR AROUND THE AUGER, TRACKS OR TRIMMERWHEEL PRIOR TO RESETTING THE EMERGENCY STOP SYSTEM. SEVERE INJURY OR DEATH WILL OCCUR WHEN CAUGHT IN THE AUGER, TRACKS OR TRIMMERWHEEL.



Emergency stop button

1. Emergency stop button is depressed. If the emergency stop reset light is illuminated, check all emergency stop buttons on the machine making certain that they are released to the out position. Depress the emergency stop reset switch. The reset light should stop illuminating.

If the emergency stop reset light will not stop illuminating after the reset switch has been depressed, the problem may be electrical. Refer to the Miscellaneous electrical troubleshooting section for more information.

Note: The emergency stop system will affect all hydraulic functions on the machine except for the lift circuit.

Pilot pressure valve

2. Defective pilot pressure reducing-relieving valve. If standby pressure is not evident but the trimmer controls operate, the pilot pressure valve may be defective. Remove the valve from the control valve housing and check for any contamination in the screen filter.

Relief valve and compensator spring

3. High pressure relief valve is contaminated. Remove and inspect the valve for any contamination. Clean and install the relief valve. If pressure is not indicated, refer to the Maintenance chapter for relief pressure adjustment procedures.



002-2954

4-way 2-position emergency stop valve

4. The 4-way 2-position valve spool is contaminated or defective causing the hydraulic flow to return to the tank. Remove and clean any contamination from the valve spool in the emergency stop manifold. Check all o-rings for damage and replace as necessary.

Symptom:

Trimmer runs slower than normal. Stalls at proper relief pressure.

Corrective Measures:



CAUTION!



DO NOT STALL A SYSTEM WITH AN UNKNOWN RELIEF PRESSURE SETTING. IF THE PRESSURE SETTING IS TOO HIGH, SERIOUS MACHINE DAMAGE MAY OCCUR. WHEN CHECKING A RELIEF PRESSURE SETTING, TURN THE ADJUSTMENT SCREW OUT 2 OR 3 TURNS BEFORE STALLING THE SYSTEM.

1. Defective pump. Check with a flow meter if available. A good indication of a defective pump is to compare system pressure to engine rpm. To check, disconnect both drive hoses at the quick couplers. Start the engine and run it at 1000 rpm. Reset the emergency stop system. Place the network control system in the Run mode and the FNR switch in the forward position. Note the increasing pressure on the corresponding pressure gauge. If the pressure continues to increase above 2500 psi (172 bar), immediately place the FNR switch in the neutral position. Readjust the pressure relief valve following the instructions in the Maintenance chapter. If the pressure does not increase above 2500 psi (172 bar), increase the engine speed to maximum. Gradually reduce the engine speed while noting the pressure reading on the gauge. A damaged pump will not maintain relief pressure, but the pressure will drop rapidly as engine speed is reduced. A good pump will maintain approximately the same pressure as engine speed decreases. Replace or repair the pump if found to be defective.
2. Engine is not operating at maximum speed (2250 rpm). If the engine speed is low, hydraulic pump output flow will be low, causing the trimmer circuit, as well as all other hydraulic systems to operate slower. Increase engine speed to maximum.

Symptom:

Trimmer stalls at high pressure.

Corrective Measures:

1. Trimming an excessive amount at a high rate of travel. Reduce the amount being trimmed and/or reduce the travel speed.
2. Trimmer teeth worn creating excessive trimmer wheel drag. Replace the teeth as instructed in the Maintenance chapter.

⚠ **DANGER!** ⚠

IF THE TRIMMER WHEEL IS FULL OF MATERIAL THAT MUST BE CLEARED BY HAND OR MATERIAL MUST BE REMOVED FROM THE SUBGRADE, THE TRIMMER WHEEL MUST BE STOPPED AND THE ENGINE MUST BE SHUT OFF BEFORE CLEARING THE MATERIAL OR SERIOUS INJURY, OR DEATH CAN RESULT. FOR ADDITIONAL SAFETY, REMOVE THE KEY FROM THE IGNITION SWITCH. BE CERTAIN THAT PERSONNEL ARE CLEAR OF THE TRIMMER WHEEL BEFORE STARTING THE ENGINE. KEEP HANDS AND FEET CLEAR OF TRIMMER WHEEL WHILE IN OPERATION.

3. Debris lodged between trimmer wheel and shroud. Inspect the area between the wheel and shroud or end plates for debris and clean as necessary.



Check for defective quick couplers

4. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler using a pipe coupling or a coupler known to be good.

5. Drive motor is defective. Remove the motor from the trimmer gearbox and apply pressure to the motor. If the motor will not run (high pressure indicated), repair or replace as necessary.
6. Damaged gearbox. Generally when the gearbox is internally damaged, it becomes noisy before it stops functioning. Remove the gearbox from the trimmer wheel and examine the internal gears and bearings. Replace or repair the gearbox if damage is evident. Refer to the Overhaul & Parts Manual for the GT17-019 Trimmerhead Drive Gearbox manual for the necessary instructions to repair the gearbox (form #I0749001E available from GOMACO).

Symptom:

Oil leak at gearbox.

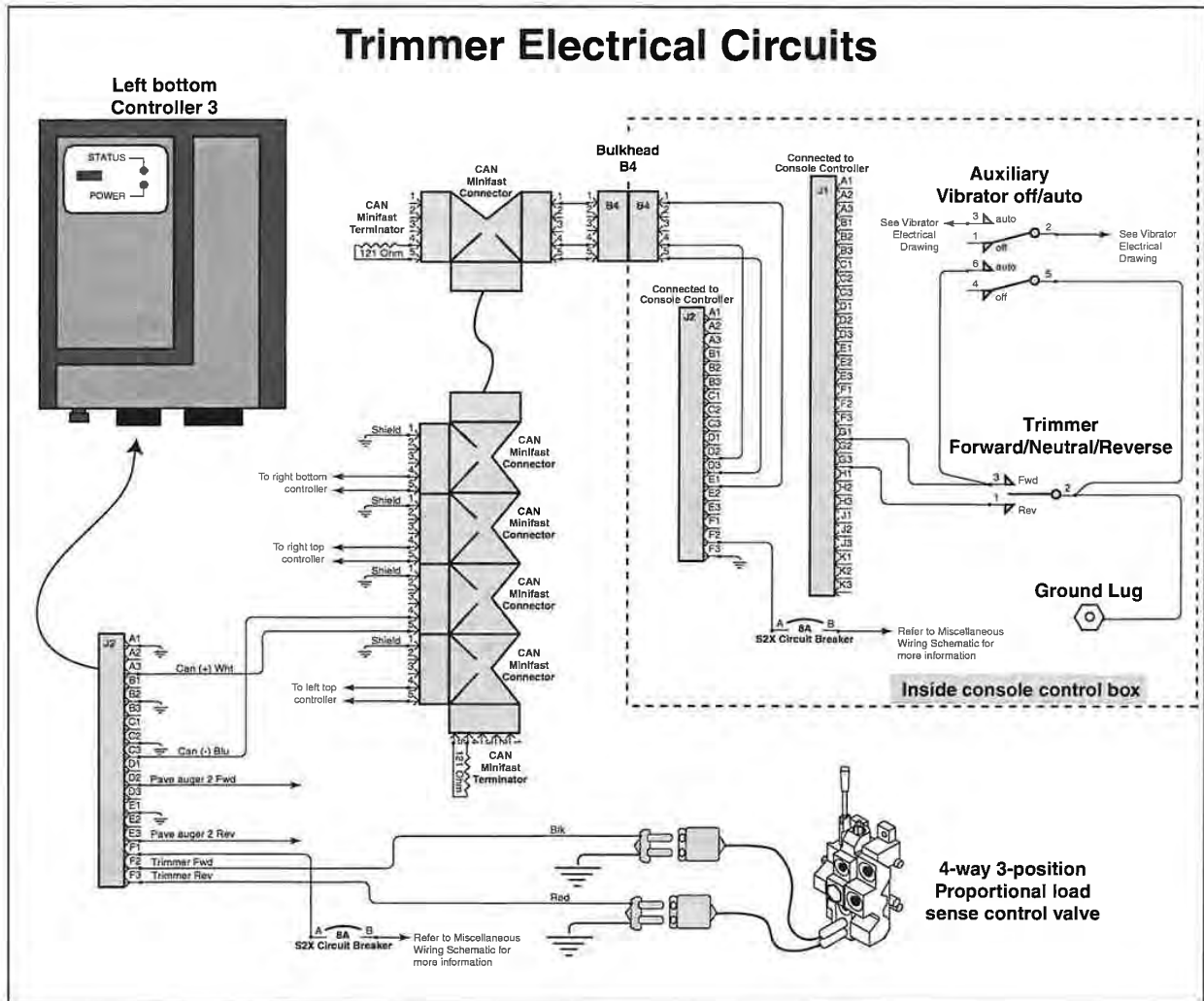
Corrective Measures:

1. Hydraulic oil leaking from around the motor housing in the gearbox. Remove the motor from the gearbox assembly and replace the o-ring around the base of the motor. Refer to the Overhaul & Parts Manual for the GT17-019 Trimmerhead Drive Gearbox manual for the necessary instructions to repair the gearbox (form #I0749001E available from GOMACO).
2. Hydraulic oil leaking from behind the gearbox mounting plate. The duo-cone seal inside the gearbox has ruptured. Remove the gearbox assembly from the trimmer wheel. Replace the seal as necessary. Refer to the Overhaul & Parts Manual for the GT17-019 Trimmerhead Drive Gearbox manual for the necessary instructions to repair the gearbox (form #I0749001E available from GOMACO).

Note: Excessive back pressure on the case drain line can cause the duo-cone seal to rupture. Make certain that the case drain line is not pinched, causing restriction. Do not place quick couplers in the case drain line. Excessive back pressure caused by quick couplers has been known to cause the seal to rupture.

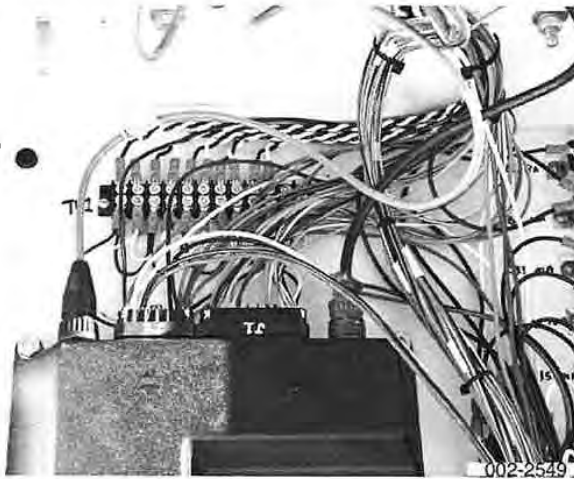


11 Trimmer Electrical Circuits



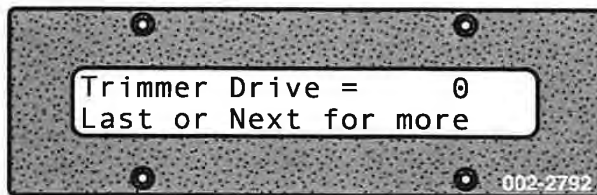
The network control system is used to electrically operate the trimmer hydraulic proportional control valve. Two controllers are used to operate the trimmer electrical circuit. The Pancon controller is the main computer on the machine and is located in the console control box. It receives the input information from the various sources and processes that information. In the trimmer circuit the input device is the trimmer FNR (forward/neutral/reverse) switch. After processing is completed, the Pancon controller sends an appropriate response signal through the CAN communication network to the appropriate S2X controller located on the front access door of the control console. The S2X controller will receive the response from the Pancon controller and will send the appropriate output drive signal to the trimmer proportional control valve.

To make the system operational, the Pancon controller receives a 12 volt power source from a 10 amp circuit breaker and ground connection to the machine frame. Each S2X controller on the front access door receives 12 volt power from a 10 amp circuit breaker and a ground connection to the machine frame.



18 pin and 30 pin connectors on Pancon controller

To determine direction control, the trimmer forward/neutral/reverse switch is positioned in the appropriate direction. A ground connection is routed through the switch, in either the forward or reverse positions, and into pins G1 or G3 on the 30 pin connector attached to the Pancon controller. If a ground connection is received on pin G1, forward rotation of the trimmer circuit is selected at 100% drive speed. If a ground connection is received on pin G3, reverse rotation of the trimmer circuit is selected at 100% drive speed. If a ground is not received on either pin G1 or G3, the Pancon controller assumes the neutral mode has been selected and will not allow an output drive signal to the proportional control valve. The Pancon controller must be in the Run mode, the circuit must be in working order and the emergency stop system must be reset before an output signal can be sent to the appropriate S2X controller on the front access door.



Trimmer output drive signal

As the FNR switch is placed in the forward or reverse position, the Pancon controller will send a corresponding signal to the left bottom S2X controller on the front access door to the console. This signal is routed through the CAN network cable between the Pancon controller in the control box and the S2X controller on the front access door. This signal is processed by the left bottom S2X controller and a corresponding output drive signal is routed from the 18 pin connector to the proportional control valve. The

output will be 0 or 100 percent and corresponds with the position of the trimmer FNR switch.

Notice: Make certain to carefully read all troubleshooting displays on the main display screen. This will indicate the number of problems that are currently affecting the machine. The general location of each problem is given on the display and will help in narrowing the area for troubleshooting.

Symptom:

All main hydraulic systems; trimmer, tracks, conveyor/auger, auger/tamper and paving auger 2 will not operate.

Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on each control valve and move it in either direction. If the systems do not operate, the problem may be hydraulic. Refer to troubleshooting the trimmer hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the hydraulic systems operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



Reset the emergency stop light

1. One of the emergency stop buttons is depressed. Reset the depressed button to the out position and depress the emergency stop reset switch on the engine control panel to reset the system. If the light will not reset, refer to troubleshooting the emergency stop system.



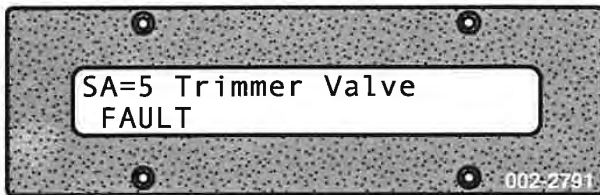
Emergency stop reset display

2. One of the variable control knobs is not rotated to the off position or one of the FNR switches is

not in the neutral position. Rotate the control knobs to the off position and place the FNR switches in the neutral position. The display should indicate the normal operating display if the emergency stop system is reset.

3. Manual override lever will not operate the trimmer or other hydraulic systems. The reset light is not illuminated. This may indicate that the emergency stop manifold solenoid coil is defective or the power relay on the front access door is sticking or defective. Refer to troubleshooting the emergency stop electrical system for more information.

Symptom:



Trimmer valve fault display

The display indicates Trimmer Valve Fault. The trimmer circuit will not operate in one or both directions.

Corrective Measures:

Place the trimmer FNR switch in the opposite direction and attempt to operate the circuit. If the trimmer will operate and the display indicates that the problem no longer exists, then the problem is directional. Directional components include the FNR switch and wiring, the S2X output valve drives, the cables between the S2X and the control valve and the proportional solenoid coils on the control valve. Since the display indicates that the problem is located at the trimmer valve, the problem exists between the S2X controller and the control valve. Refer to the following procedures to locate the problem.

1. The packard connector at the control valve is disconnected. Reconnect the cables.
2. The packard connector at the control valve is contaminated. Disconnect both packard connectors and clean with an electrical contact cleaner. Reconnect after cleaning.
3. The proportional solenoid coil is defective. Disconnect the packard connector from each of the two solenoid coils and swap the cables. Reconnect the packard connectors and attempt

to operate the trimmer in each of the two directions. If the trimmer fault remains in the same direction of rotation, the pulsar solenoid valve may be defective. Stop the engine and remove the hydraulic oil fill cap to remove any pressure that may be in the reservoir. Remove both pulsar solenoid valves simultaneously from the control valve assembly and quickly swap them to prevent excessive hydraulic oil loss. Make certain that the o-ring seal at the base of the pulsar solenoid valve stem is in place and not damaged. Replace the o-ring if necessary.

Note: A small amount of vacuum may be placed on the hydraulic reservoir to prevent oil loss when swapping the pulsar solenoid valves.

After swapping the pulsar solenoid valves and reconnecting the cables, attempt to operate the circuit. If the problem switches to the opposite direction, the pulsar solenoid valve coil is defective and must be replaced. If the problem stays in the same direction, there may be an internal problem with the control valve spool or the o-ring is missing from the base of the pulsar solenoid valve. Remove and recheck the o-ring on the pulsar solenoid valve. Replace the o-ring as necessary. Remove the valve spool to check for any contamination or corrosion. Replace or repair as necessary.

4. Defective wiring between the S2X controller and the packard connector. Remove the 18 pin connector from the S2X controller and disconnect the suspected packard connector. Using an ohm meter, check the wiring for continuity between pin F2 on the 18 pin connector and the corresponding color coded wire in the packard connector at the control valve. Check continuity between pin F3 on the 18 pin connector and the corresponding color coded wire in the packard connector for the opposite direction at the control valve. If continuity does not exist, the wiring is defective and must be repaired or replaced.



S2X controllers mounted to access door

5. Defective S2X controller. Each of the S2X controllers are programmed the same and are interchangeable. Disconnect both connectors from the S2X controller believed to be defective and swap the controller with one of the S2X controllers known to be good. Reconnect the wiring and test. If the problem switches to a different location on the machine, the S2X controller is defective and must be replaced.

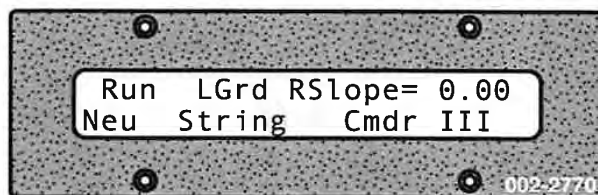
Note: The bottom right S2X controller on the access door does not operate any conveyor, auger, trimmer or track controls. Temporary operation can be resumed by swapping an S2X controller with a defective output drive to the bottom right location.

Symptom:

The trimmer will not operate in one or both directions.

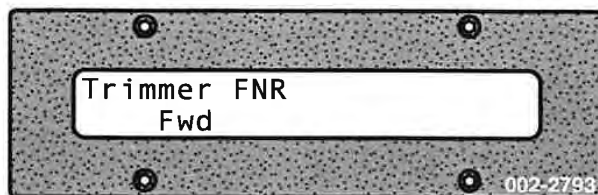
Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on the trimmer control valve and move it in either direction. If the trimmer does not operate, the problem may be hydraulic. Refer to troubleshooting the trimmer hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the trimmer does operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



Run mode indicated on display

1. The network control system is not in the RUN mode. Depress the RUN/STANDBY switch to indicate RUN on the main display screen.



Service mode display

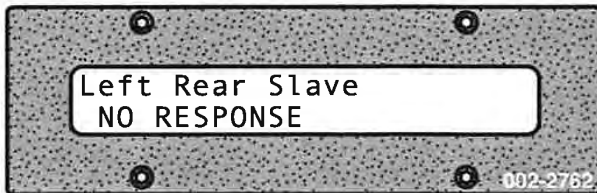
2. The FNR switch or wiring is defective. Depress the SERVICE switch on the control box. Depress the NEXT switch until Trimmer FNR is indicated. View the position of the FNR switch on the display while changing the position of the FNR switch on the console.

If the display corresponds to the selected switch position, the FNR switch and wiring are operating normally.

If the display does not correspond to the selected switch position, the FNR switch or the wiring may be defective. Remove the wire from the center terminal of the FNR switch and momentarily connect it to either terminal 1 or terminal 3 on the FNR switch. If the display will now indicate the missing position, the FNR switch is defective and must be replaced. If the display still indicates a defective reading, check the wire between the J1 connector and the FNR switch for tight connections and continuity. Make certain a good ground connection is present by placing a jumper wire between the machine frame and the FNR switch. Repair or replace the wiring as necessary.

Symptom:

The display indicates Left Rear Slave No Response.

Corrective Measures:


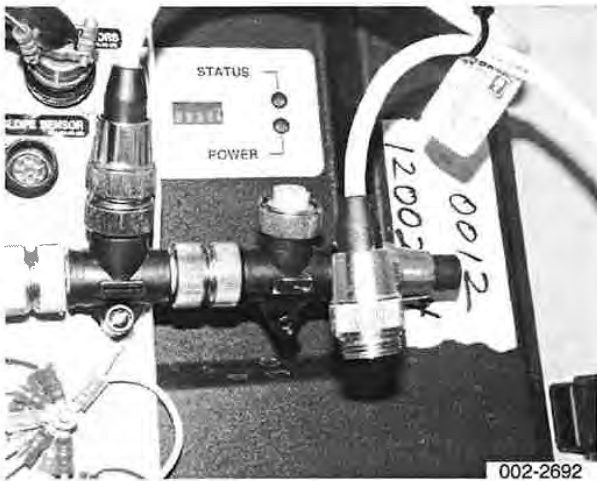
No response indicated on display

This problem indicates that the S2X is not communicating through the CAN network to the Pancon controller and the other S2X controllers. Remove the 18 pin and 30 pin connectors from the S2X believed to be defective. Swap the S2X with one of the other S2X controllers known to be good. If the problem switches to a different location on the machine, the S2X is defective and must be replaced.

If the problem remains with the left rear slave (S2X), the CAN network cable connection between the 18 pin connector and the CAN minifast connector is defective and must be repaired or replaced.

Symptom:

All S2X slaves are indicating NO RESPONSE on the display.

Corrective Measures:


CAN network minifast connectors and terminator

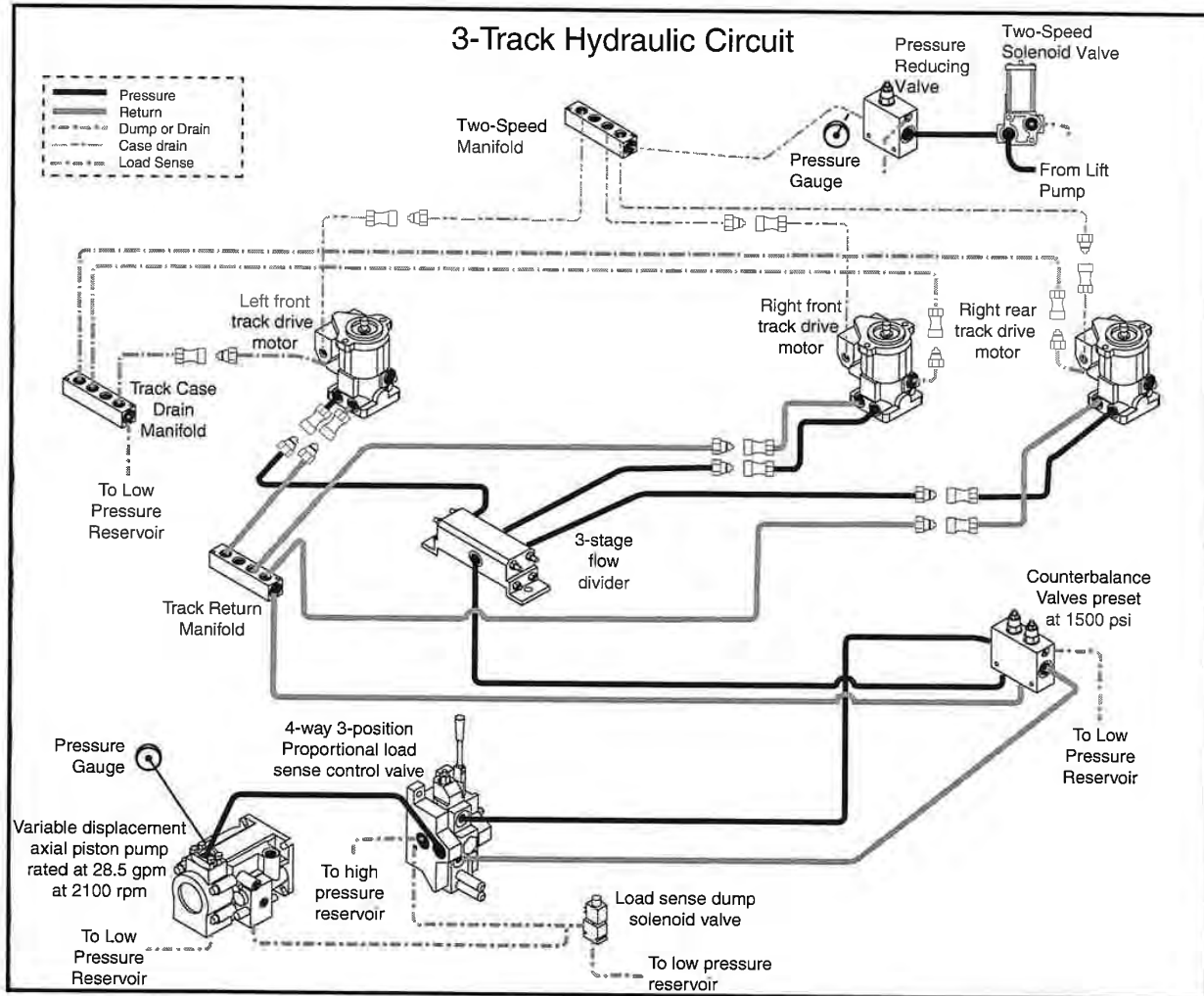
This indicates that the CAN network cables may be defective. Make certain that the CAN minifast terminators are in place on the minifast connectors as indicated in the electrical drawing.

Remove the right bottom cable connector from the end of the CAN minifast connectors on the front access

door. Remove the CAN cable from bulkhead 4 on the back of the control box. Check for continuity between the bulkhead 4 cable and the disconnected CAN minifast connector on the front access door. If continuity does not exist, disconnect and recheck each of the cables in the CAN network wiring harness until the defective component is located. Repair or replace the wiring harness as necessary.

If continuity exists in the wiring harness, check continuity between bulkhead 4 and the 18 pin connector on the Pancon controller. Repair or replace the control box wiring as necessary.

12 Track Hydraulic Circuit



The oil flow for the travel circuit begins at the upper left pump assembly which delivers 28.5 gpm (108 lpm) at 2250 rpm at 130°F (54°C). The track hydraulic system is an open loop, load sensed, pressure compensated hydraulic system. From the pump the oil is routed to the inlet of the proportional control valve. With the valve in the centered position, pressure begins to build in the system. This pressure increase is directed against one end of the load sense valve (opposite spring). When the pressure reaches 365 psi (25 bar), the load sense valve will shift against spring tension. As the valve shifts, pressure is directed against the swash plate yoke control piston. The control piston will tilt the swash plate yoke to the neutral (no flow) position. When the swash plate yoke is at the neutral position, the pump will maintain 365 psi (25 bar) standby pressure and no flow.

As voltage is supplied to activate the Pulsar solenoid valve, it will begin to flow oil and pressure will begin to increase between the control valve and the track drive motors. This pressure increase is directed against the spring loaded end of the load sense spool (through a small line from the control valve) causing it to shift in the direction of the spring tension. As the spool shifts, the yoke control piston is opened to tank. As the yoke control piston moves, the swash plate will begin to tilt and the pumping action will begin, causing the pressure in the system to increase sufficiently to operate the motor at the preset speed. When the required amount of oil is provided to operate the system at the desired speed, the pump outlet flow is restricted and pressure increases. This pressure increase is directed against the end of the load sense spool opposite the spring end. When this pressure exceeds the combination of the load pressure and the

pressure setting of the load sense spring, the load sense spool will shift against the combination. A small amount of oil is routed into the yoke control piston to reduce the pump outlet flow. This continues until the pump outlet pressure is equal to the load pressure/load sense spring combination. The yoke position will be maintained for reduced flow until the demand for oil or the load pressure changes.

If a Pulsar solenoid valve is signaled to create more flow (increased voltage) there is a pressure drop in the system. This causes the load sense spool to shift in the direction of the spring tension, opening the yoke control piston to tank, increasing the pressure and flow sufficiently to operate the motor at a higher speed.

If the motor should stall, pressure will increase in the system, causing the pressure limiter spool to shift, directing pressure oil against the yoke control piston. The swash plate will move in the decreased flow direction, reducing the output from the pump. The output from the pump will be reduced only enough to compensate for the stalled motor. All other motors will continue to operate at normal speed and pressure. When the pressure in the system drops below the maximum pressure setting (motor free to turn), the pressure limiter valve will shift, opening the yoke control piston to tank. As the yoke control piston moves, the swash plate will begin to tilt and the pumping action will resume to supply the required amount of oil. The pressure limiter is set at a maximum of 2800 psi (193 bar). The maximum output of the circuit is controlled by the corresponding electrical system.

When the control valve is shifted for forward direction of travel, hydraulic oil flows from one working port to the counterbalance valve manifold port. The oil forces the internal check valve off its' seat (in the counterbalance valve) and flows into the flow divider where the oil is equally divided to each of the outlet ports. The oil will enter the working port of each drive motor, causing each track to rotate in the forward direction. As the oil exits each drive motor, it is recombined before entering the counterbalance valve manifold. Since the track drive is equipped with double counterbalance valves, the oil flow is stopped, causing pressure to build throughout the track drive system and preventing free-wheeling of the tracks when traveling down steep embankments or loading ramps in the forward direction. A small port in the counterbalance valve directs this pressure increase to a small shuttle piston in the valve, which shifts, lifting the check valve off its' seat. This allows oil from the track drive motors to return to the opposite control valve working port, through the control valve and out to

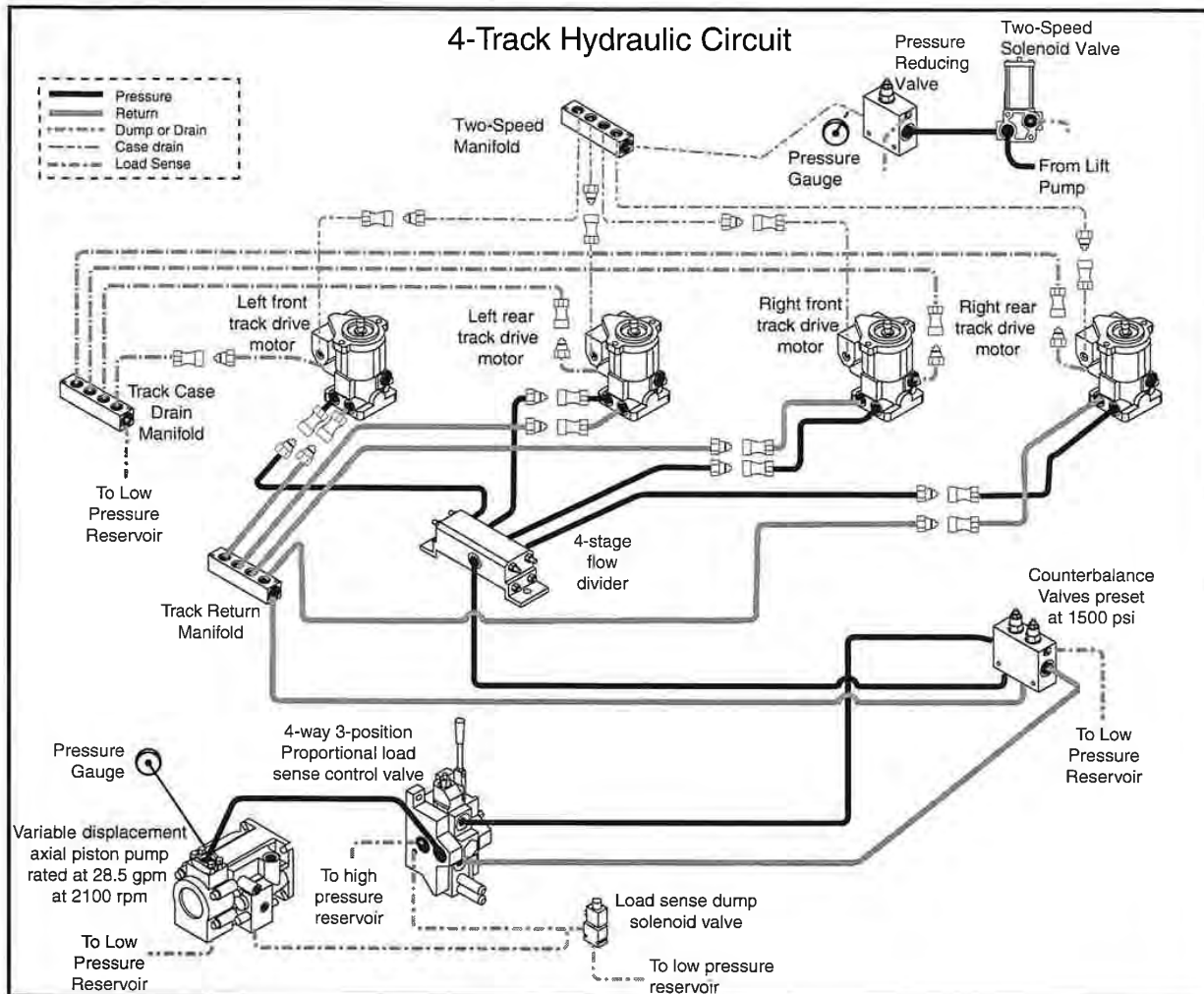
the reservoir. When the control valve spool returns to neutral, the check valve in the counterbalance valve returns to its' seat, locking the oil in the drive motors and preventing rotation.

When the control valve is shifted for reverse direction of travel, hydraulic oil flows from one working port to the opposite counterbalance valve manifold port. The oil forces the internal check valve off its' seat (in the counterbalance valve) and flows into the opposite work port of each track drive motor, causing each track to rotate in the reverse direction. As the oil exits each drive motor, it is recombined as it enters the flow divider before returning to the counterbalance valve manifold. Since the track drive is equipped with double counterbalance valves, the oil flow is stopped, causing pressure to build throughout the track drive system and preventing free-wheeling of the tracks when traveling down steep embankments or loading ramps in the reverse direction. A small port in the counterbalance valve directs this pressure increase to a small shuttle piston in the valve, which shifts, lifting the check valve off its' seat. This allows oil from the track drive motors to return to the opposite control valve working port, through the control valve and out to the reservoir. When the control valve spool returns to neutral, the check valve in the counterbalance valve returns to its' seat, locking the oil in the drive motors and preventing rotation.

Each drive motor is equipped with its' own case drain line which allows internal leakage to escape from the drive motor case. The internal leakage is used to cool and lubricate the motor before returning to the hydraulic reservoir.

High/Low Travel Speed

To achieve a high and low travel speed, the tracks are equipped with variable speed piston drive motors. For low speed travel, the drive motor swash plate is spring-loaded to a maximum displacement position, causing low speed, high torque rotation of the tracks. For high speed travel, the two-speed solenoid valve is energized to an open position, causing oil to flow through a pressure reducing valve, reducing the pressure to 300 psi (21 bar). This pressure is routed to each drive motor where it is directed against the yoke control piston, causing it to shift in the direction of the spring tension. As the yoke control piston moves, the swash plate will tilt to the minimum displacement position, causing high speed, low torque rotation of the tracks. When the two-speed valve is returned to low speed travel, the valve spool will shift, draining oil from each track drive motor yoke control piston back to the reservoir. Each spring-loaded drive motor swash plate will return to the low speed travel position.


Symptom:

Tracks will not operate. The pressure gauge indicates standby pressure.

Corrective Measures:

Open the access door to the rear of the operators console and depress the manual override lever in either direction. If the tracks will operate with the manual override lever, the problem is in the electrical drive signal to the control valve. Refer to the track electrical troubleshooting section. If the tracks will not operate with manual override lever, the problem is hydraulic. Refer to the following measures for troubleshooting information.

⚠ DANGER! ⚠

CHECK FOR ANY PERSONNEL IN OR AROUND THE AUGER, TRACKS OR TRIMMERWHEEL PRIOR TO RESETTING THE EMERGENCY STOP SYSTEM. SEVERE INJURY OR DEATH WILL OCCUR WHEN CAUGHT IN THE AUGER, TRACKS OR TRIMMERWHEEL.



Emergency stop button

1. Emergency stop button is depressed. If the emergency stop reset light is illuminated, check all emergency stop buttons on the machine making certain that they are released to the out position. Depress the emergency stop reset switch. The reset light should stop illuminating.

If the emergency stop reset light will not stop illuminating after the reset switch has been depressed, the problem may be electrical. Refer to troubleshooting the emergency stop electrical system for more information.

Note: The emergency stop system will affect all hydraulic functions on the machine except for the lift circuit.

2. Defective emergency stop solenoid coil. Refer to troubleshooting the emergency stop electrical system for more information.
3. Defective emergency stop relay. All auger, conveyor, trimmer and track systems will be affected. Refer to troubleshooting the emergency stop electrical system for more information.

Symptom:

Tracks run slower than normal. Stalls at proper relief pressure.

Corrective Measures:

! CAUTION! !

DO NOT STALL A SYSTEM WITH AN UNKNOWN RELIEF PRESSURE SETTING. IF THE PRESSURE SETTING IS TOO HIGH, SERIOUS MACHINE DAMAGE MAY OCCUR. WHEN CHECKING A RELIEF PRESSURE SETTING, TURN THE ADJUSTMENT SCREW OUT 2 OR 3 TURNS BEFORE STALLING THE SYSTEM.

1. Defective pump. Check with a flow meter if available. A good indication of a defective pump is to compare system pressure to engine rpm. To check, disconnect both drive hoses at the quick couplers. Start the engine and run it at 1000 rpm. Reset the emergency stop system. Place the network control system in the Run mode, the FNR switch in the forward position and slowly rotate the travel control knob clockwise. Note the increasing pressure on the corresponding pressure gauge. If the pressure continues to increase above 2800 psi (193 bar), immediately move the control knob back to the off position. Readjust the pressure relief valve following the instructions in the Maintenance chapter. If the pressure does not increase above 2800 psi (193 bar), rotate the control knob the maximum amount and increase the engine speed to maximum. Gradually reduce the engine speed while noting the pressure reading on the gauge. A damaged pump will not maintain relief pressure, but the pressure will drop rapidly as engine speed is reduced. A good pump will maintain approximately the same pressure as engine speed decreases. Replace or repair the pump if found to be defective.
2. Engine is not operating at maximum speed (2250 rpm). If the engine speed is low, hydraulic pump output flow will be low, causing the travel circuit, as well as all other hydraulic systems to operate slower. Increase engine speed to maximum.

Symptom:

One or more tracks stall at high pressure.

Corrective Measures:

!
!
DANGER!

CHECK FOR ANY PERSONNEL IN OR AROUND THE AUGER, TRACKS OR TRIMMERWHEEL PRIOR TO RESETTING THE EMERGENCY STOP SYSTEM. SEVERE INJURY OR DEATH WILL OCCUR WHEN CAUGHT IN THE AUGER, TRACKS OR TRIMMERWHEEL.

1. Track chain is stuck. Inspect drive and idler rollers for concrete build up or other debris and clean as necessary.



Check quick couplers

2. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler using a pipe coupling or a coupler known to be good.

Note: A defective or disconnected quick coupler may cause the motor shaft seal to rupture. If hydraulic oil leakage is evident inside the track drive gearbox, replace the shaft seal.

3. Drive motor is defective. Remove the motor from the gearbox and apply pressure to the motor. If the motor will not run (high pressure indicated), repair or replace as necessary.

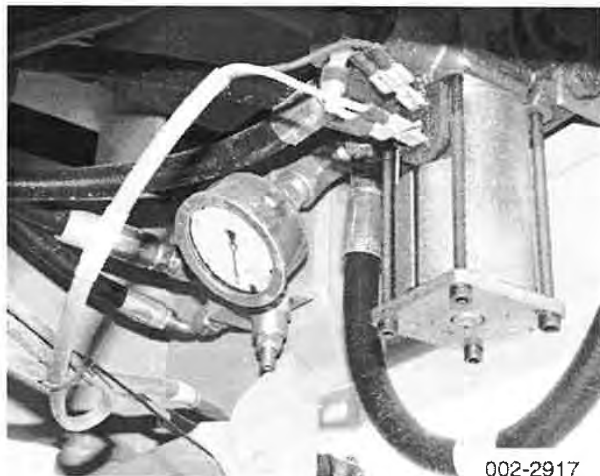
Symptom:

One or more tracks will not change speed when the high/low switch is changed.

Corrective Measures:

If the symptom affects all tracks, locate the two-speed solenoid valve. Depress the solenoid valve manual override button and check the travel speed. If the system operates at high speed, the problem is electrical. Refer to troubleshooting the track electrical system for more information. If no change is noticed, the problem is hydraulic. Refer to the following measures for troubleshooting information.

1. Machine is not stopped when the high/low switch is changed. To change from high to low speed or; from low to high speed requires that the track control knob is rotated to the "off" position. To prevent pressure spike damage to the track drive motors, the controller will not allow "on-the-go" high/low travel speed changes.
2. Defective or stuck yoke control piston. If one track is remaining at the previous speed while the other tracks are attempting to rotate at the correct speed, then the track drive motor yoke control piston may be stuck or contaminated. Remove the motor from the affected track and swap with one of the other tracks. If the problem transfers to the other track, the motor is defective and must be repaired or replaced.



Pressure reducing valve

3. Incorrect pressure adjustment for high/ low speed. Place the high/low switch in the high position and check the pressure indicated on the two speed pressure gauge located under the front of the engine. The pressure should indicate 300 psi (21 bar). If not, adjust the pressure reducing valve in or out until 300 psi (21 bar) is indicated.

Note: If the pressure adjustment is too high, damage may occur to the yoke stroking assembly in the drive motors. The pressure should not exceed 400 psi (27.5 bar).

Symptom:

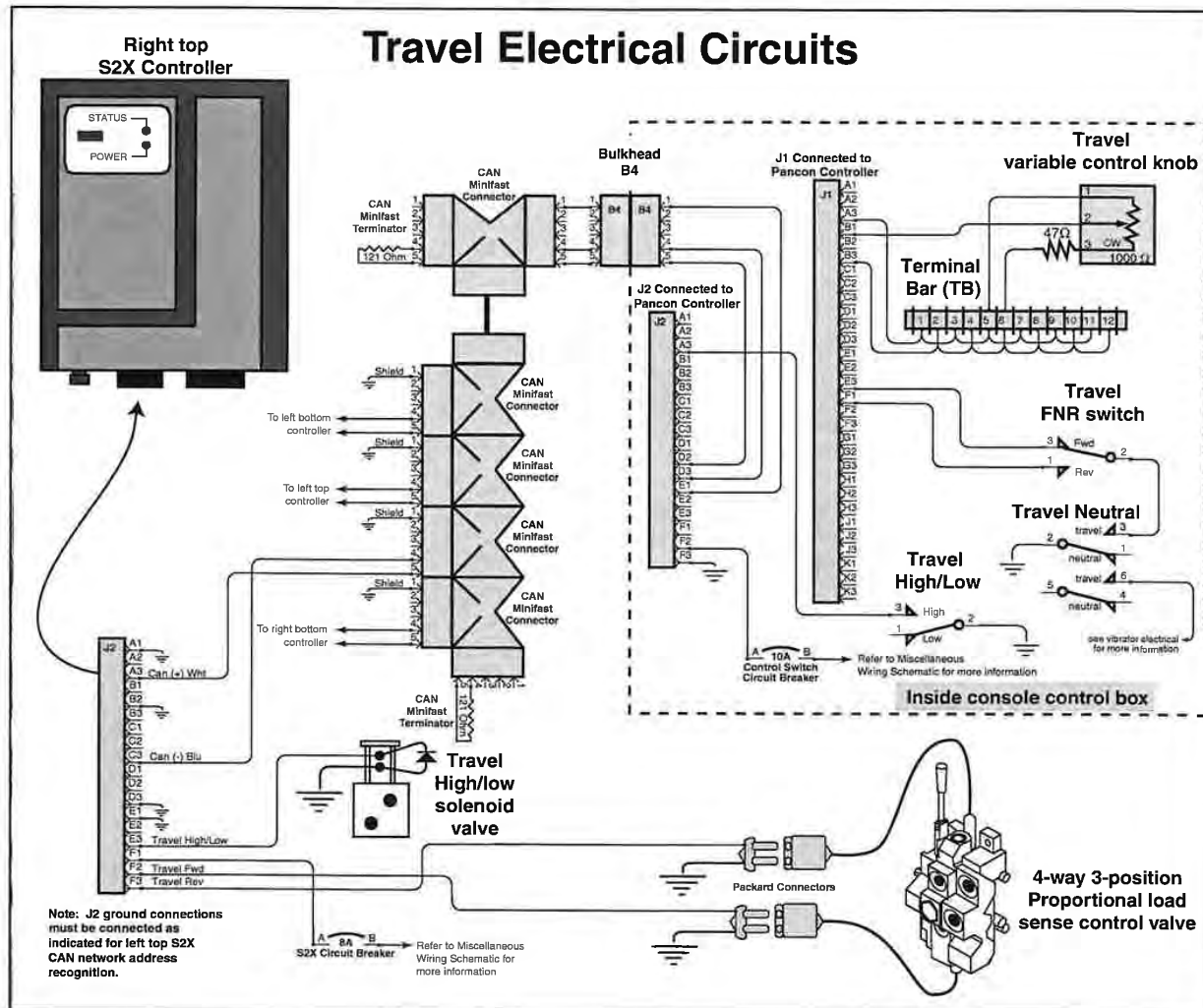
Hydraulic fluid is found in one or more of the track drive gearboxes.

Corrective Measures:

Track drive motor shaft seal is damaged. Remove the drive motor and repair the shaft seal as shown in the appropriate manufacturers drive motor repair manual.

A motor shaft seal is typically damaged by excessive back pressure inside the motor housing. Check the case drain line for any blockage or pinched lines. If quick couplers are used in the case drain line, make certain that they are connected and allow fluid to pass through. Defective quick couplers will cause excessive back pressure. Maximum case pressure should not exceed 25 psi (1.72 bar) during normal operations and should not exceed 75 psi (5.17 bar) during cold start.

13 Track Electrical Circuits

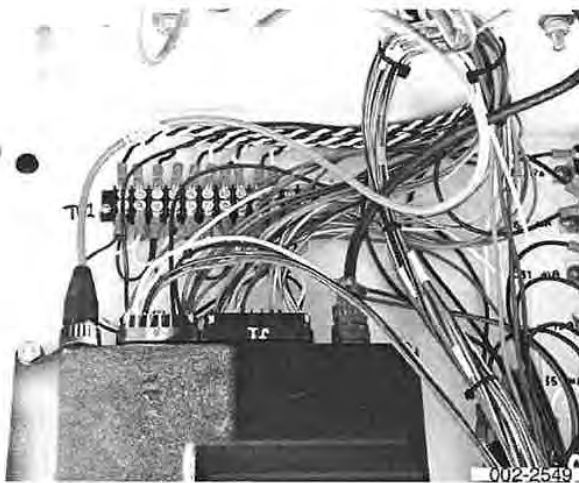


The network control system is used to electrically operate the track hydraulic proportional control valve. Two controllers are used to operate the track electrical circuit. The Pancon controller is the main computer on the machine and is located in the console control box. It receives the input information from the various sources and processes that information. In the track circuit the input devices are the travel variable control knob, the travel high/low switch and the travel FNR (forward/neutral/reverse) switch. After processing is completed, the Pancon controller sends an appropriate response signal through the CAN communication network to the appropriate S2X controller located on the front access door of the control console. The S2X controller will receive the response from the Pancon controller and will send the appropriate output drive signal to the track proportional control valve.

To make the system operational, the Pancon controller receives a 12 volt power source from a 10 amp circuit breaker and a ground connection to the machine frame. Each S2X controller on the front access door receives 12 volt power from a 10 amp circuit breaker and a ground connection to the machine frame. To operate the variable control knobs, the Pancon controller supplies 5 volts and a ground connection to the terminal bar inside the control box. The terminal bar is used to distribute the power and ground connections to the various control knobs on the control box.

From the terminal bar, 5 volts and a ground connection are provided to the travel variable control knob on pins 1 and 3. A resistor is connected into the ground wire on pin 3 to create a minimum output voltage of 0.21 volts when the control knob is turned off. The Pancon

controller recognizes this minimum voltage as the "off" position of the control knob. As the control knob is rotated clockwise, the output voltage will vary from 0.21 volts to a maximum of 5.00 volts. The control knob output voltage is routed from terminal 2 to pin B1 on the 30 pin connector attached to the Pancon controller. An adjustable threshold voltage is preset in the Pancon controller to begin rotation of the tracks. The threshold is normally adjusted to begin the rotation of the travel circuit when the control knob is rotated clockwise approximately 25% from the "off" position. Refer to the Maintenance chapter for this adjustment procedure.

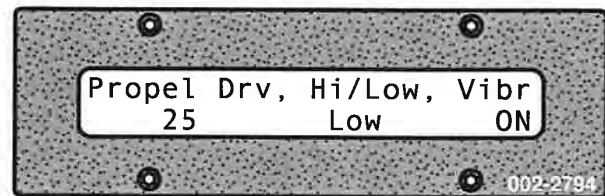


18 pin and 30 pin connectors on Pancon controller

The travel/neutral switch is used as another way to start and stop the travel of the machine. When placing the travel/neutral switch in the neutral position, the Pancon controller does not receive a ground connection, indicating a neutral travel mode. Placing the travel/neutral switch in the travel position routes a ground connection to terminal 2 on the travel forward/reverse (FR) switch. To determine direction control, the travel FR switch is positioned in the appropriate direction. A ground connection is routed through the switch, in either the forward or reverse positions, and into pins E3 or F1 on the 30 pin connector attached to the Pancon controller. If a ground connection is received on pin E3, forward rotation of the travel circuit is selected. If a ground connection is received on pin F1, reverse rotation of the travel circuit is selected. If a ground is not received on either pin E3 or F1, the Pancon controller assumes the neutral mode has been selected and will not allow an output drive signal to the proportional control valve. The Pancon controller must be in the Run mode, the circuit must be in working order and the emergency stop system must be reset

before an output signal can be sent to the appropriate S2X controller on the front access door.

The travel high/low switch is used to signal the high/low solenoid coil when high speed is selected. When the switch is in the low position, the Pancon controller does not receive a ground connection, indicating that the low speed is selected and no signal is required to the solenoid coil. When the switch is in the high position, a ground connection is routed to pin A3 on the 18 pin connector attached to the Pancon controller. The Pancon controller will send a corresponding signal to the right top S2X controller on the front access door to the console. This signal is routed through the CAN network cable between the Pancon controller in the control box and the S2X controller on the front access door. This signal is processed by the right top S2X controller and a corresponding output signal is routed from the 18 pin connector to the travel high/low solenoid coil.



Propel output drive signal

As the variable control knob output voltage increases, the Pancon controller will send a corresponding signal to the right top S2X controller on the front access door to the console. This signal is routed through the CAN network cable between the Pancon controller in the control box and the S2X controller on the front access door. This signal is processed by the right top S2X controller and a corresponding output drive signal is routed from the 18 pin connector to the proportional control valve. The output will vary from 0 to 80 percent and corresponds with the amount of variable control knob signal.

Notice: Make certain to carefully read all troubleshooting displays on the main display screen. This will indicate the number of problems that are currently affecting the machine. The general location of each problem is given on the display and will help in narrowing the area for troubleshooting.

Symptom:

All main hydraulic systems; trimmer, tracks, conveyor/ auger, auger/tamper and paving auger 2 will not operate.

Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on each control valve and move it in either direction. If the systems do not operate, the problem may be hydraulic. Refer to troubleshooting the track hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the hydraulic systems operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



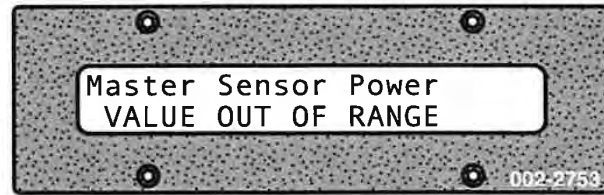
Reset the emergency stop light

1. One of the emergency stop buttons is depressed. Rotate the depressed button to the out position and depress the emergency stop reset switch on the engine control panel to reset the system.



Emergency stop reset display

2. One of the variable control knobs is not rotated to the off position or one of the FNR switches is not in the neutral position. Rotate the control knobs to the off position and place the FNR switches in the neutral position. The display should indicate the normal operating display if the emergency stop system is reset.
3. Manual override lever will not operate the tracks or other hydraulic systems. The reset light is not illuminated. This may indicate that the emergency stop manifold solenoid coil is defective or the power relay on the front access door is sticking or defective. Refer to Troubleshooting the Emergency Stop Electrical system for more information.



Sensor power short inside control box

4. Sensor power is shorted inside the control box for the variable control knobs. Disconnect the power and ground wires (twisted pairs) for each variable control knob individually until the display does not indicate the value is out of range. The control knob or the wiring connected to the control knob, that was last disconnected, is defective. Repair or replace the shorted wiring and/or the control knob as necessary.

If all wires to the control knobs have been removed from the terminal bar and the display still indicates the Master Sensor Power - Value Out Of Range; then either the wiring between the terminal bar and the 30 pin connector is shorted to ground; or the Pancon controller is shorted internally. Check the wiring for damage and good connections and repair as necessary. Replace the Pancon controller if all other connections are good.

Symptom:


Propel valve fault display

The display indicates Propel Valve Fault. The travel circuit will not operate in one or both directions.

Corrective Measures:

Place the travel FNR switch in the opposite direction and attempt to operate the circuit. If the tracks will operate and the display indicates that the problem no longer exists, then the problem is directional. Directional components include the FNR switch and wiring, the S2X output valve drives, the cables between the S2X and the control valve and the proportional solenoid coils on the control valve. Since the display indicates that the problem is located at the travel valve, the problem exists between the S2X

controller and the control valve. Refer to the following procedures to locate the problem.

1. The packard connector at the control valve is disconnected. Reconnect the cables.
2. The packard connector at the control valve is contaminated. Disconnect both packard connectors and clean the connections with an electrical contact cleaner. Reconnect after cleaning.
3. The proportional solenoid coil is defective. Disconnect the packard connector from each of the two solenoid coils and swap the cables. Reconnect the packard connectors and attempt to operate the tracks in each of the two directions. If the travel fault remains in the same direction of track rotation, the pulsar solenoid valve may be defective. Stop the engine and remove the hydraulic oil fill cap to remove any pressure that may be in the reservoir. Remove both pulsar solenoid valves simultaneously from the control valve assembly and quickly swap them to prevent excessive hydraulic oil loss. Make certain that the o-ring seal at the base of the pulsar solenoid valve stem is in place and not damaged. Replace the o-ring if necessary.

Note: A small amount of vacuum may be placed on the hydraulic reservoir to prevent oil loss when swapping the pulsar solenoid valves.

After swapping the pulsar solenoid valves and reconnecting the cables, attempt to operate the circuit. If the problem switches to the opposite direction, the pulsar solenoid valve coil is defective and must be replaced. If the problem stays in the same direction, there may be an internal problem with the control valve spool or the o-ring is missing from the base of the pulsar solenoid valve. Remove and recheck the o-ring on the pulsar solenoid valve. Replace the o-ring as necessary. Remove the valve spool to check for any contamination or corrosion. Replace or repair as necessary.

4. Defective wiring between the S2X controller and the packard connector. Remove the 18 pin connector from the S2X controller and disconnect the suspected packard connector. Using an ohm meter, check the wiring for continuity between pin F2 on the 18 pin connector and the corresponding color coded wire in the packard connector at the control valve. Check continuity between pin F3 on the 18 pin connector and the corresponding color

coded wire in the packard connector for the opposite direction at the control valve. If continuity does not exist, the wiring is defective and must be repaired or replaced.



S2X controllers mounted to access door

5. Defective S2X controller. Each of the S2X controllers are programmed the same and are interchangeable. Disconnect both connectors from the S2X controller believed to be defective and swap the controller with one of the S2X controllers known to be good. Reconnect the wiring and test. If the problem switches to a different location on the machine, the S2X controller is defective and must be replaced.

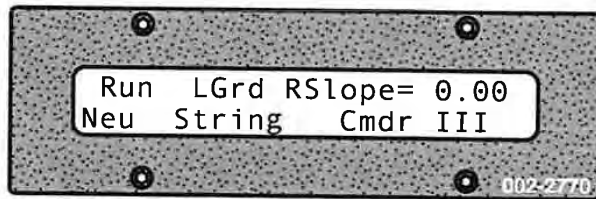
Note: The bottom right S2X controller on the access door does not operate any conveyor, auger, trimmer or track controls. Temporary operation can be resumed by swapping an S2X controller with a defective output drive to the bottom right location.

Symptom:

The tracks will not operate in one or both directions.

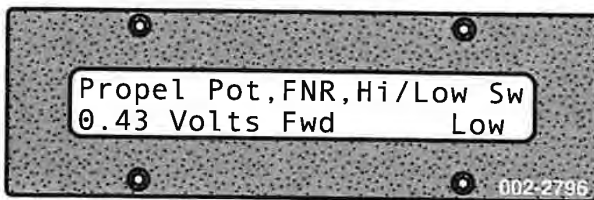
Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on the travel control valve and move it in either direction. If the tracks do not operate, the problem may be hydraulic. Refer to troubleshooting the travel hydraulic system for more information. Make certain that the emergency stop system is reset prior to operating the manual override lever. If the tracks operate using the manual override lever, the problem is electrical. Refer to the following procedures for troubleshooting information.



Run mode indicated on display

1. The network control system is not in the RUN mode. Depress the RUN/STANDBY switch to indicate RUN on the main display screen.
2. The travel/neutral switch is in the neutral position. Place the travel/neutral switch in the travel position.
3. The travel/neutral switch is defective. Remove the wire from terminal 2 of the travel/neutral switch and momentarily connect it to terminal 3 on the travel/neutral switch. If the machine will travel, the travel/neutral switch is defective and must be replaced.



Service mode display

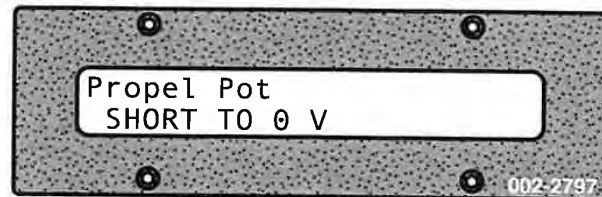
4. The forward/reverse (FR) switch or wiring is defective. Depress the SERVICE switch on the control box. Depress the NEXT switch until the propel pot display is indicated. View the position of the FR switch on the display while changing the position of the FR switch on the console.

If the display corresponds to the selected switch position, the FNR switch and wiring are operating normally.

Note: The travel/neutral switch must be in travel prior to changing the FR switch positions. The FNR indication on the display will indicate neutral when the travel/neutral switch is placed in the neutral position.

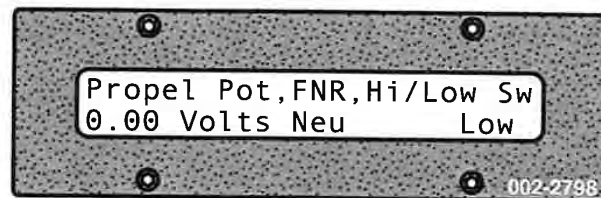
If the display does not correspond to the selected switch position, the FR switch or the wiring may be defective. Remove the wire from the center terminal of the FR switch and momentarily connect it to either terminal 1 or terminal 3 on the FR switch. If the display will now indicate the missing position, the FR switch is defective and must be replaced. If the display

still indicates a defective reading, check the wire between the J1 connector and the FR switch for tight connections and continuity. Make certain a good ground connection is present by placing a jumper wire between the machine frame and the FR switch. Repair or replace the wiring as necessary.



Defective output signal from conveyor control knob

5. Propel Pot; NOT CALIBRATED or SHORT TO 0 V is indicated on the display. This indicates that a variable output voltage is not being received by the Pancon controller.



Defective conveyor pot output voltage indicated

To test, depress the SERVICE switch on the control box. Depress the NEXT switch until the conveyor pot display is indicated. The normal voltage range should be 0.21 volts to 5.00 volts as the travel control knob is rotated clockwise. If the reading is 0.00 volts, make certain that 5.00 volts is provided to the control knob on pin 1 and a good ground connection is provided on pin 3. Make certain that the output wire between pin 2 on the control knob and pin B1 on the 30 pin connector is securely connected and check for continuity. If a good ground and 5.00 volts of power exists, the control knob is defective and must be replaced.

Symptom:

The tracks will not shift into high speed.

Corrective Measures:

Determine if the problem is electric versus hydraulic by momentarily depressing the manual override button on the solenoid valve while the machine is moving. If the tracks do not shift into high speed, the problem is hydraulic. Refer to the track hydraulic systems for

more information. If the tracks shift into high speed, the problem is electrical. Refer to the following items for troubleshooting information.

1. The travel high/low switch is in the low position. Place the switch in the high position.
2. Machine is moving when the travel high/low switch is placed in the high position. Machine travel must be stopped before the controller will allow the machine to switch to high or low speed travel.
3. The travel high/low switch is defective. Depress the SERVICE switch on the control box. Depress the NEXT switch until the propel pot display is indicated. View the position of the travel high/low switch on the display while changing the position of the travel high/low switch on the console.

If the display corresponds to the selected switch position, the high/low switch and wiring are operating normally.

If the display does not correspond to the selected switch position, the high/low switch or the wiring may be defective. Remove the wire from the center terminal of the high/low switch and momentarily connect it to either terminal 1 or terminal 3 on the high/low switch. If the display will now indicate the missing position, the high/low switch is defective and must be replaced. If the display still indicates a defective reading, check the wire between the J2 connector and the high/low switch for tight connections and continuity. Make certain a good ground connection is present by placing a jumper wire between the machine frame and the high/low switch. Repair or replace the wiring as necessary.

4. Defective solenoid coil. Remove the wiring from the terminals on the high/low solenoid valve. Using a volt/ohm meter, check for 5 ohms of resistance between the two terminals on the solenoid coil. If 5 ohms (± 2 ohms) exists, the solenoid coil is good. If 5 ohms does not exist,

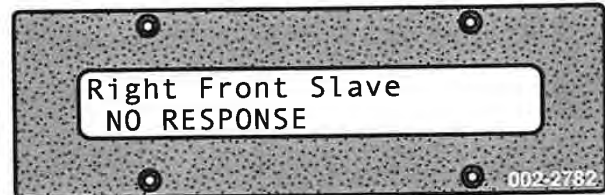
the solenoid coil is defective and must be replaced.

5. Defective wiring between the right top S2X controller and the solenoid coil. Remove the 18 pin connector from the S2X controller and disconnect the connector at the solenoid valve. Using an ohm meter, check the wiring for continuity between pin E3 on the 18 pin connector and the corresponding wire at the solenoid valve. If continuity does not exist, the wiring is defective and must be repaired or replaced.

Symptom:

The display indicates Right Front Slave No Response.

Corrective Measures:



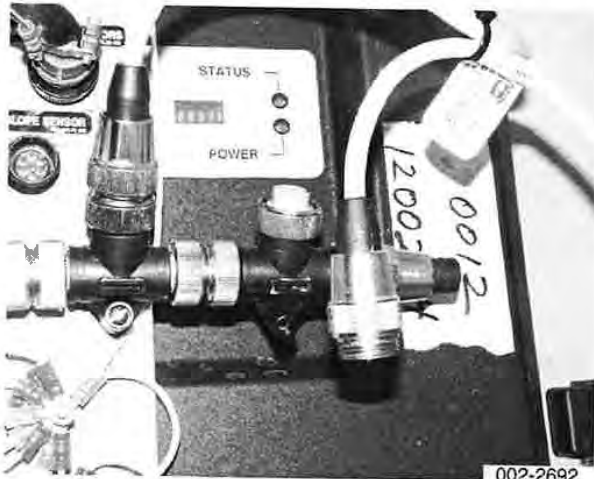
No response indicated on display

This problem indicates that the S2X is not communicating through the CAN network to the Pancon controller and the other S2X controllers. Remove the 18 pin and 30 pin connectors from the S2X believed to be defective. Swap the S2X with one of the other S2X controllers known to be good. If the problem switches to a different location on the machine, the S2X is defective and must be replaced.

If the problem remains with the right front slave (S2X), the CAN network cable connection between the 18 pin connector and the CAN minifast connector is defective and must be repaired or replaced.

Symptom:

All S2X slaves are indicating NO RESPONSE on the display.

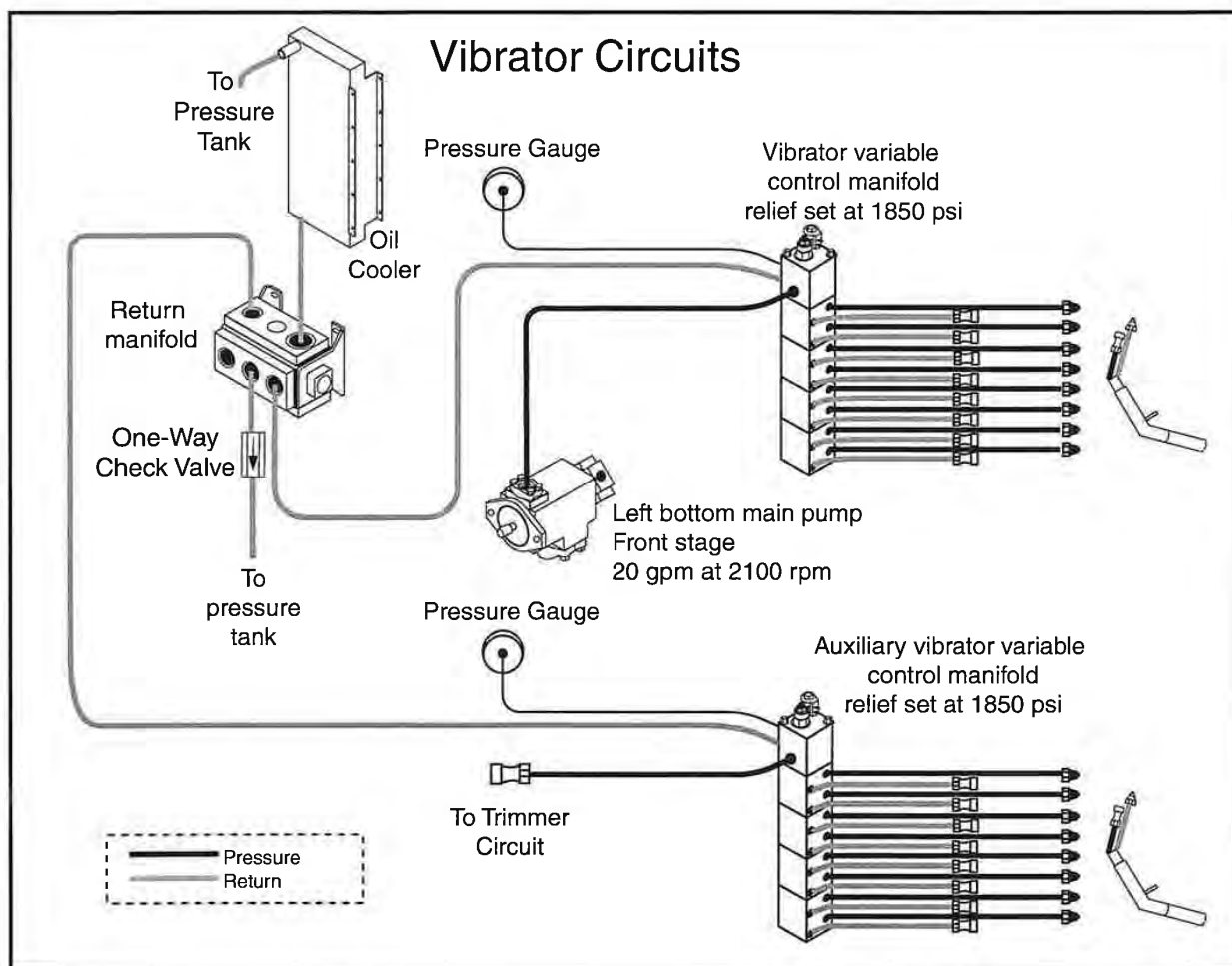
Corrective Measures:


CAN network minifast connectors and terminator

This indicates that the CAN network cables may be defective. Make certain that the CAN minifast terminators are in place on the minifast connectors as indicated in the electrical drawing.

Remove the right bottom cable connector from the end of the CAN minifast connectors on the front access door. Remove the CAN cable from bulkhead 4 on the back of the control box. Check for continuity between the bulkhead 4 cable and the disconnected CAN minifast connector on the front access door. If continuity does not exist, disconnect and recheck each of the cables in the CAN network wiring harness until the defective component is located. Repair or replace the wiring harness as necessary.

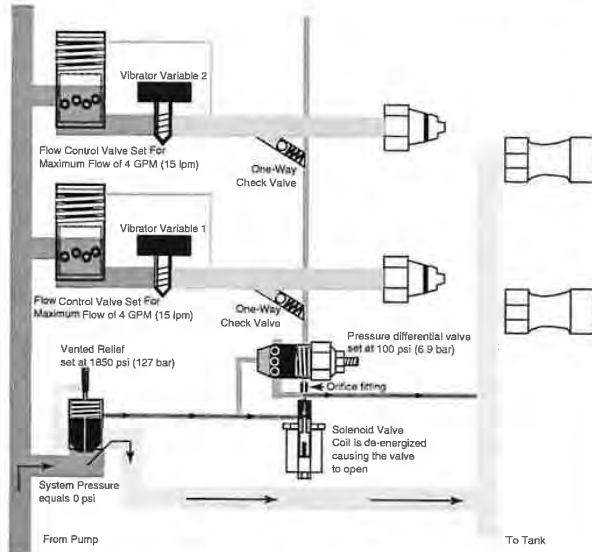
If continuity exists in the wiring harness, check continuity between bulkhead 4 and the 18 pin connector on the Pancon controller. Repair or replace the control box wiring as necessary.

14 Vibrator Hydraulic System


The vibrator circuit consists of a vane pump, a variable control manifold and the vibrators. Each machine can be configured with individual vibrator circuits as required by the contractor. A minimum number of 4 individual vibrator circuits is standard equipment on the Commander III. Thereafter, additional pairs of variable controls may be added to allow operation of 6 or 8 individual vibrators on the standard vibrator manifold.

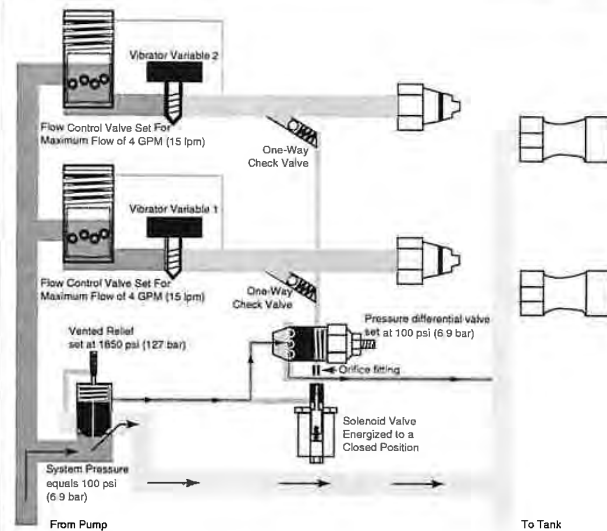
Hydraulic flow for the standard vibrator variable control manifold begins at the front stage of the left bottom pump assembly. The standard configuration of this pump is for 20 gpm (75 lpm) at 2250 rpm for 4 vibrators. Optional configurations are 27.5 gpm (104 lpm) at 2250 rpm for 6 vibrators and 33.5 gpm (127 lpm) at 2250 rpm for 8 vibrators.

As the pump is rotated, output flow is directed to the inlet port of the vibrator variable manifold where it is directed as follows:



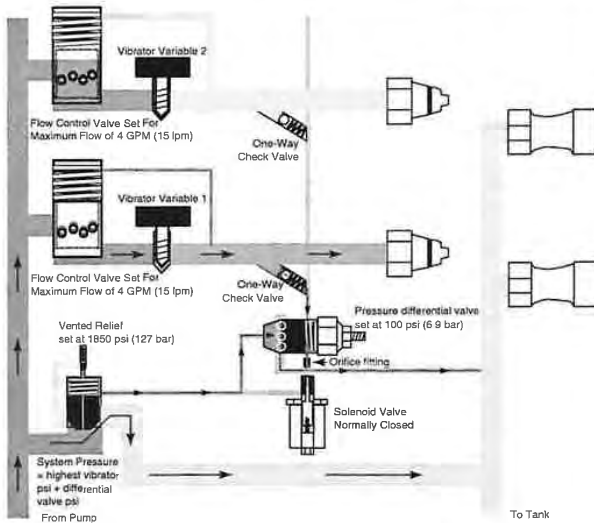
Vibrator system turned off, dumping oil to tank

As the oil enters the vibrator manifold, it is routed down a passage past the vented relief valve to each of the flow control valves along the passage and ending at the variable control needle valves. If the variable control needle valves are closed, the oil is restricted and will begin to build pressure. The vented relief valve is controlled by a solenoid valve which is normally open. Since oil can freely drain to tank from the pilot line through the solenoid valve, the vented relief will only remain closed as long as the system pressure does not increase above the spring tension inside the vented relief valve. Therefore, the pilot pressure is 0 psi, causing the vented relief cartridge to open at approximately 50 psi (3.5 bar) due to the spring tension in the relief cartridge. This may allow the vibrators, that are open to flow, to continue to slowly turn. This does not damage the vibrators.



Vibrator system turned on, dumping unused oil to tank

To operate the vibrators, the solenoid valve is energized to a closed position. The pilot line between the vented relief valve and the solenoid valve is restricted which increases pressure to close the vented relief. System pressure will increase until the relief opens at 1850 psi (127 bar). This would create heat and would eventually overheat the hydraulic oil reservoir. To prevent this, excess oil is returned to the tank at a normal operating pressure by incorporating the pressure differential valve into the pilot line between the vented relief and the solenoid valve. When the pilot line pressure between the vented relief and the solenoid valve reaches 100 psi (6.9 bar), the pressure differential valve begins to open, relieving the pressure and allowing the vented relief to open at low pressure (100 psi; 6.9 bar). In this manner, the vented relief drains any unused portion of the oil supply to tank without overheating the hydraulic reservoir.



Operating a vibrator and dumping unused oil to tank

To operate one vibrator, the variable speed control is opened, allowing oil flow to the vibrator motor. If the vibrator motor requires 200 psi (14 bar) to turn the drive shaft, the motor will not turn due to the pressure differential valve setting of 100 psi (6.9 bar). The hydraulic oil is always looking of the path of least resistance, therefore, the pressure differential valve will open at 100 psi (6.9 bar) and prevent the vibrator operation. To operate the vibrator, it is necessary to close the pressure differential valve to allow pressure build up in the system. The pilot line between each vibrator and the spring side of the pressure differential valve serves this purpose. Assuming 100 psi (6.9 bar) is already in the system due to the pressure differential valve, this pressure is sent to the vibrator when the variable speed control is opened. Since the motor will not turn, pressure builds until the 100 psi (6.9 bar) opens the check valve to the pilot line. The hydraulic oil flows through the pressure differential valve until it reaches the orifice fitting. The orifice fitting restricts the oil flow and causes pressure to build in the pilot line, closing the pressure differential valve and vented relief cartridge. As system pressure increases, the vibrator motor begins to turn at 200 psi (14 bar). The excess oil that the vibrator is not using from the pump must be returned to the tank without excess heat build up. The pressure differential valve remains closed until system pressure has increased an additional 100 psi (6.9 bar) above the working pressure of the vibrator (200 psi; 14 bar). Therefore, the pressure differential valve will open at 300 psi (21 bar) causing the unused portion of the oil supply to drain to the tank through the vented relief cartridge.

The flow control valve regulates the maximum flow to the vibrator and monitors the pressure differential

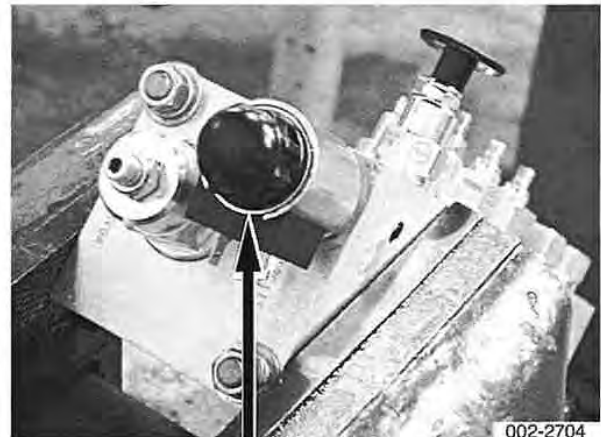
between the inlet side of the variable speed control and the outlet side of the variable speed control to maintain a consistent vibrator speed if a system pressure increase occurs. For example, if a second vibrator is turned on which requires a higher operating pressure, the system pressure would increase. The first vibrator would be effected by this system pressure increase if the flow control valve was not incorporated into the manifold. The increase in system pressure would flow more oil through the variable speed control, causing an unnecessary increase in vibrator speed. The flow control valve acts as a flow regulator as it monitors the working pressure of the vibrator and the system pressure. The individual flow control valves will open and close as the system pressure fluctuates, maintaining the vibrator speed at the level to which the vibrator variable control needle valve is adjusted.

The auxiliary vibrator manifold may be added to the machine allowing a total of 10, 12, 14 and 16 individual vibrators. The hydraulic flow for the auxiliary vibrator manifold is supplied by the trimmer hydraulic circuit. The auxiliary vibrator manifold operates in the same manner as previously discussed.

Symptom:

All vibrators will not operate. Zero pressure indicated.

Corrective Measures:



Manual override button

If the solenoid is equipped with a manual override button, depress the button. If the vibrators do not operate when depressing the manual override button, the problem is hydraulic. Refer to the following for troubleshooting procedures. If the vibrators begin operating, the hydraulic controls are working properly

and the problem is electrical. Refer to troubleshooting the vibrator electrical circuit for more information.

Note: Continued operation can be accomplished by depressing the manual override button on the solenoid valve stem, if the machine is equipped with it.

1. Vibrator variables off (fully clockwise). Rotate the variable control in the increase direction to begin operating the vibrators.
2. Vibrator off/auto switch in the "off" position. Place the switch in the "on" position.

Symptom:

Concrete surface is not vibrated in one area. Vibrator pressure indicates 1850 psi (127 bar).

Corrective Measures:

1. Defective vibrator. Make certain the vibrator is operating. If not, swap the vibrator to another circuit and try again. If the vibrator will not operate, the vibrator is defective and must be repaired or replaced. If the vibrator will operate on a different circuit, the quick couplers may be defective. Replace the quick couplers as necessary.
2. Quick couplers defective or not fully connected. Check quick couplers by replacing with quick couplers known to be good. Replace coupler if defective.

Note: If a faulty quick coupler is in the return line, it could cause the shaft seal in the hydraulic motor to rupture. Replace the seal if necessary.

Symptom:



Voids in concrete surface

001-1884

Concrete surface is not vibrated properly. Voids appear in the surface of the concrete. Normal operating pressure is indicated.

Corrective Measures:

1. Concrete mix is dry. Increase slump of the concrete mix by adding water in the truck and mixing for the required time.
2. Individual vibrator control knob is not turned up. Rotate the control knob to increase vibration.
3. Engine rpm is low. Low rpm will turn the hydraulic pump at a slower speed, decreasing the amount of hydraulic flow available to the vibrators as well as the rest of the hydraulic systems on the machine. Increase engine rpm to maximum.
4. Vibrator is filled with hydraulic oil. Remove the vibrator and repair or replace the seals as necessary.



Vibratach testing

5. Defective vibrator motor. Check the vibrator using a vibratach to check vibrations per minute (VPM). At maximum speed the vibratach should indicate over 9000 vpm's if the motor is not bypassing an excessive amount of oil. If the vibrator is not maintaining 9000 vpm's, refer to the appropriate vibrator repair manual and repair or replace the vibrator motor.
6. Vibrator flow control valve is not adjusted for 4 gpm (15 lpm). Place a flow meter in the suspect individual vibrator circuit and operate at maximum flow using the variable control knob. If the flow meter indicates a flow adjustment of less than 3.75 gpm (14 lpm), adjust the flow control cartridge to a flow setting between 3.75 and 4 gpm (14 and 15 lpm).

Note: Do not increase the hydraulic flow control cartridge setting above 4 gpm (15 lpm) as this will cause the vibrator to overspeed and cause early motor failure.

Symptom:

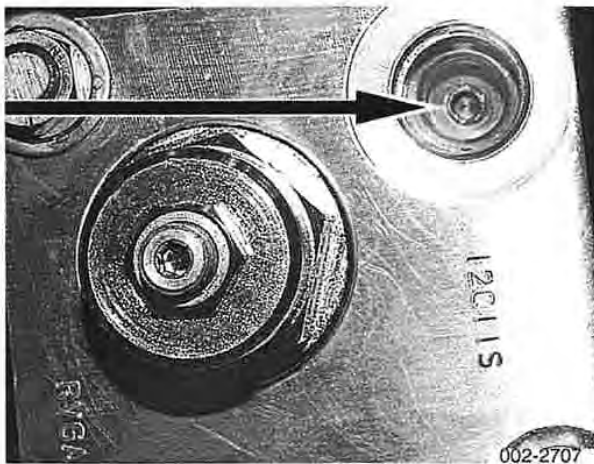
Vibrator pressure gauge indicates 1850 psi (127 bar) relief pressure. All connected vibrators are operating normally.

Corrective Measures:

1. Quick couplers are not looped on unused vibrator circuits. Make certain that all unused vibrator circuits are looped at the quick couplers or connected to a vibrator.

To test for a defective circuit, turn all variable controls off. Operate each individual vibrator circuit by turning the variable control on and note the pressure gauge reading. If a normal pressure is indicated (0 - 1500 psi; 0 - 103 bar), the individual circuit tested is good. Continue checking each individual circuit until high pressure (1850 psi; 127 bar) is indicated on the defective circuit.

2. Defective vibrator or quick coupler. Make certain that all vibrators are operating normally. One defective vibrator can cause the vibrator system to operate at 1850 psi (127 bar).



Orifice fitting location under solenoid valve

3. Pressure differential valve orifice fitting is contaminated. Remove the solenoid coil and valve stem from the vibrator manifold. Use an appropriate sized hex wrench to remove the orifice fitting from the base of the solenoid valve port in the manifold. Check for any

contamination and clean thoroughly. Make certain to count the number of turns when removing the orifice fitting so that it may be returned to its original position after cleaning. Return the solenoid valve to its original position and tighten securely.

Notice: A small amount of hydraulic oil loss will occur when removing the solenoid valve stem. Take appropriate steps to prevent contamination and dispose of the hydraulic oil as required.

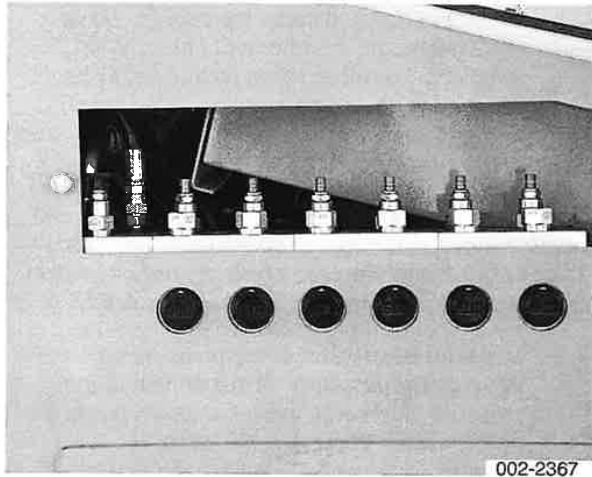
4. Mistaken adjustment of the pressure differential valve or it is defective. If adjustment of the pressure differential valve has taken place, it will be necessary to replace the valve.

Symptom:

One or more vibrators are frequently filled with hydraulic oil.

Corrective Measures:

1. Overheating vibrators by operating them out of concrete. Vibrators dissipate heat build up through the concrete surrounding the vibrator. If a vibrator is operated out of concrete for a short period of time, when the hydraulic oil is at normal operating temperature, the vibrator will overheat causing bearing and possible seal failure. Make certain to turn off individual vibrators as they are exposed from the concrete at the end of a pour. Refer to the appropriate vibrator repair manual and repair the vibrator seals and bearings as necessary.
2. Quick couplers attached to incorrect hydraulic supply lines during rebuild of a vibrator. Make certain that the small inlet port of the vibrator motor is equipped with a female quick coupler. Replace the vibrator motor shaft seal.
3. Flow restriction on the return line of the vibrator. A defective quick coupler can cause restriction against the vibrator motor shaft seal causing the seal to fail. Repair the vibrator and swap the vibrator to an alternative vibrator circuit. If the vibrator continues to experience motor shaft seal failure, the vibrator motor may require replacement.

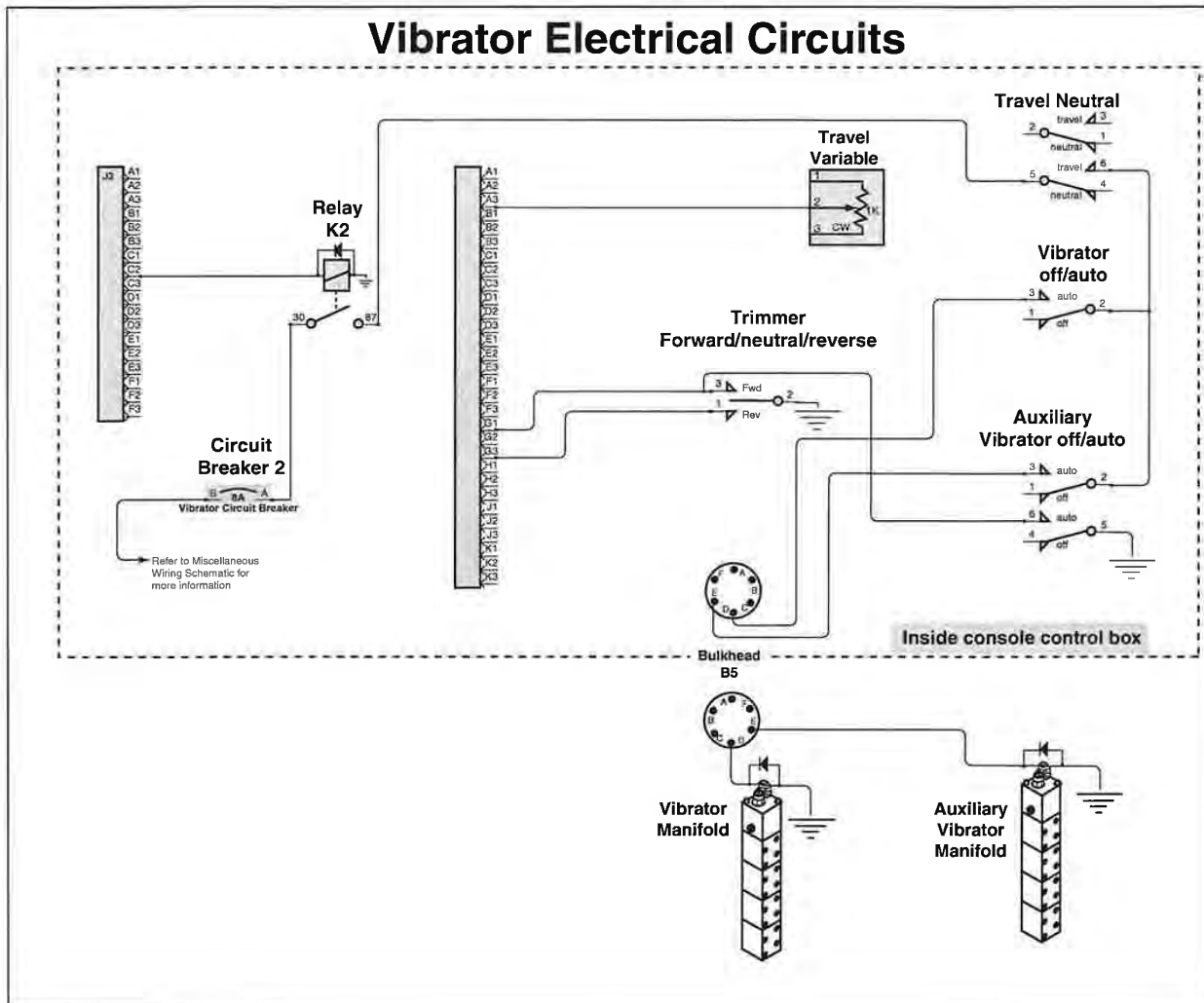


002-2367

Individual flow control cartridges

4. Defective flow control valve or incorrect adjustment. Each individual flow control valve is adjusted for a maximum flow of no more than 4 gpm (15 lpm). Insert a flow meter between the pressure and return lines of the suspect individual vibrator circuit. Operate the individual vibrator circuit at maximum speed and full engine rpm. The flow reading should be between 3.75 and 4.00 gpm (14 and 15 lpm). If not, loosen the lock nut and adjust the set screw as necessary. Tighten the lock nut securely while holding the set screw in position when adjustment is complete.

If correct adjustment is not possible, the flow control valve cartridge may be defective. Replace the valve as necessary.

15 Vibrator Electrical Circuits


The network control system is used to electrically operate the vibrator system. The Pancon controller is the main computer on the machine and is located in the console control box. It receives the input information from the various sources and processes that information. In the vibrator circuit the input devices are the travel variable control knob and the auxiliary vibrator off/auto switch.

The travel variable control knob is used to signal the Pancon controller that machine movement is to begin. This same signal is also used to indicate that the vibrator circuit should begin operation. When the control knob is turned counterclockwise to the off position, the voltage (0.21 volts) is recognized by the Pancon controller as the off position. This will stop the operation of the vibrator circuits.

The auxiliary vibrator off/auto switch is used to operate the trimmer control valve at maximum flow. This will provide the hydraulic oil required to operate the auxiliary vibrator circuit.

Note: The auxiliary vibrator manifold is connected by quick couplers to the pressure line from the trimmer control valve, providing the oil required to operate auxiliary vibrators.

When an increased voltage signal is received from the travel variable control knob the Pancon controller will send an electrical signal from the 18 pin J2 connector to energize relay K2. When the relay closes its contacts, it connects a 12 volt signal to the travel/neutral switch. The travel/neutral switch must be in the travel position to allow this 12 volt signal to continue to both vibrator off/auto switches. If the

vibrator off/auto switches are in the "off" position, the vibrators will not operate. If the vibrator off/auto switches are in the "on" position, the 12 volt signal continues through bulkhead 5 to the appropriate vibrator manifold. The normally open solenoid coil is energized to a closed position, which allows the vibrator system to begin building pressure for operation of the individual vibrators.

When the travel variable control knob is turned to the "off" position, the Pancon controller de-energizes relay K2. The 12 volt signal is disconnected to the vibrator solenoid coils and each of the vibrator manifolds is de-energized to an open position. This causes the hydraulic oil to be returned to the tank.

Note: A vibrator solenoid valve manual override button is available on year 2000 machines to allow temporary operation of a vibrator manifold if the electrical system is defective.

Symptom:

Vibrators will not operate. Zero pressure is indicated on the pressure gauge.

Corrective Measures:



Vibrator manual override button

If the solenoid is equipped with a manual override button, depress the button. If the vibrators do not operate when depressing the manual override button, the problem is hydraulic. Refer to troubleshooting the vibrator hydraulic circuit for more information. If the vibrators begin operating, the hydraulic controls are working properly and the problem is electrical. Refer to the following for troubleshooting procedures.

Note: Continued operation can be accomplished by depressing the manual override button on the solenoid valve stem, if the machine is equipped with it.

1. Vibrator off/auto switch is in the "off" position. Place the appropriate switch in the "auto" position.
2. Travel/neutral switch is in the "neutral" position. The travel/neutral switch will not allow track drive movement if it is in the "neutral" position as well as operation of the vibrators. Place the switch in the "travel" position.
3. Travel variable control knob is not turned on. Rotate the travel control knob clockwise to begin operation of the vibrators.



Vibrator solenoid coil resistance

4. The vibrator solenoid coil is defective. Check with a volt/ohm meter for 8.5 ohms of resistance. If the reading is correct the solenoid coil is good. If the reading does not exist, or is more than ± 2 ohms higher or lower than the correct reading, the solenoid coil is defective and must be replaced.
5. Defective ground wire connection. Check the wire between the vibrator solenoid coil and the frame of the machine. Repair or replace the connection as necessary.
6. Defective power wire between bulkhead 5 and the solenoid coil. Disconnect bulkhead 5 from the rear of the main control box and check continuity between pin E in bulkhead 5 and the power wire connector on the auxiliary vibrator solenoid coil. Check continuity between pin D in bulkhead 5 and the power wire connector on the

main vibrator solenoid coil. The wires must be disconnected from the solenoid coils prior to checking for continuity. If continuity is not indicated, the wiring is defective and must be repaired or replaced. If continuity does exist, check the following for more information.

7. Defective diode filter between the power and ground connections on the solenoid coil. While attempting to operate the vibrator system, touch the diode filter attach between the connectors on the vibrator solenoid coil. If it is extremely hot to the touch, the diode is shorted to ground. Make certain that the diode is installed correctly between the two terminals on the vibrator solenoid. The black wire on the diode should be connected to the same terminal with the power wire from the control box. The white wire should be connected to the grounded terminal of the vibrator solenoid coil. If this is incorrect, swap the diode end for end and reinstall.

Note: If the wiring is shorted to ground, the circuit breaker inside the control box will make a snapping sound as it automatically resets every 3-5 seconds.

A volt/ohm meter may also be used to check the diode. Place the meter leads on each of the two wires exiting the diode (diode must be removed from the solenoid coil). After checking for continuity, swap the meter leads on the diode and test again. If there is continuity in both directions through the diode, it is defective and must be replaced. If continuity exists in one direction only, the diode is good and should be installed in the correct orientation as previously described.

8. Defective wiring inside the control box. Check for loose terminal connections on the back of the vibrator off/auto switches, the travel/neutral switch and the trimmer FNR switch. Tighten any loose connections securely.

Check for 12 volts on both terminals of the circuit breaker. If 12 volts is evident on the battery side but not the auxiliary side and a snapping sound is not evident from the circuit breaker, the circuit breaker is defective and must be replaced. If a snapping sound is evident from the circuit breaker, a short to ground is located between the auxiliary side of the circuit breaker and the vibrator solenoid coil. Beginning at the vibrator solenoid coil, eliminate the individual components one by one until the short is

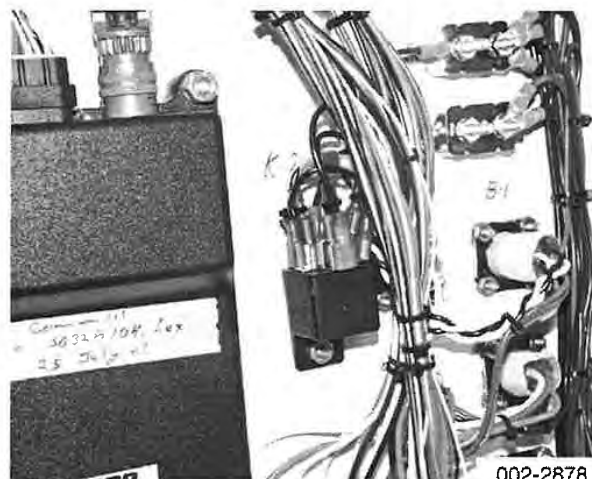
eliminated. The last component eliminated is defective and must be replaced.

If 12 volts exists on both sides, check at terminal 30 and terminal 87 on relay K2 for 12 volts. If 12 volts is evident on both sides, the relay is good. If 12 volts is evident on terminal 30 but not on terminal 87, the relay is either defective or is not being energized by the Pancon controller. Refer to corrective measure 9 for further troubleshooting procedures.

Check the travel/neutral switch for 12 volts on terminals 5 and 6 when the switch is in the "travel" position. If 12 volts exists on terminal 5 but not on terminal 6, the switch is defective and must be replaced. If 12 volts exists on both terminals, the switch is good.

Check the vibrator off/auto switches for 12 volts on terminals 2 and 3 when the switch is in the "auto" position. If 12 volts exists on terminal 2 but not on terminal 3, the switch is defective and must be replaced. If 12 volts exists on both terminals, the switch is good.

Check for 12 volts at the vibrator solenoid coil wiring. If 12 volts does not exist, the wiring between the vibrator off/auto switch and the solenoid coil is defective and must be repaired or replaced. If 12 volts does exist, the vibrator solenoid coil may be defective. Refer to corrective measure 4 for more troubleshooting information.



Relay K2

9. Defective relay K2. With the travel variable control knob turned on, check for a 12 volt signal on terminal 86. If 12 volts is evident, but 12 volts is not evident on terminal 87, the relay is

defective and must be replaced. If 12 volts is not evident, depress the Last/Next switches until the propel drive display is indicated on the controller screen. If the vibrator signal is "on", the Pancon controller is defective and must be replaced. If the vibrator signal is "off", the input signal from the travel variable control knob is defective. This is normally indicated on the display screen as "not calibrated" or "short to 0 volts". Repair or replace the components as necessary.

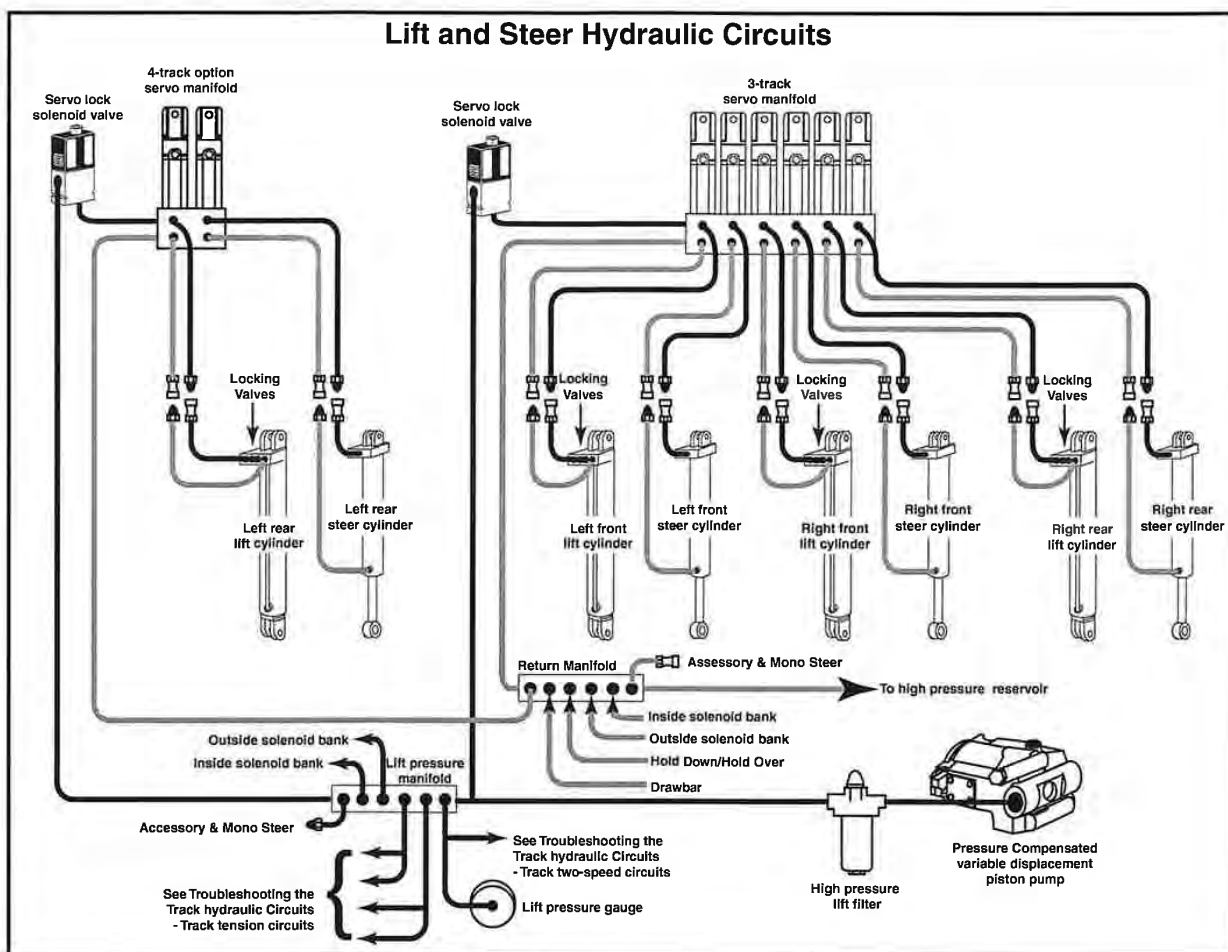
Note: Make certain all wiring connectors are connected securely.

Symptom:

Vibrators continue to operate after stopping the machine travel.

Corrective Measures:

Switch control panel is incorrectly connected causing 12 volt power to feedback into the vibrator electrical system from the switch control panel. When connecting the 3-track switch control panel to the bulkhead cables, make certain that the left front leg remotes are connected to bulkhead 4 on the switch panel. If the auto float bulkhead cable is connected from the control box to the 3-track switch control panel on bulkhead 4, the resulting 12 volt feedback will cause the vibrators to operate continuously.

16 Lift and Steer Hydraulic Circuits


The lift and steer hydraulic circuit begins at the pressure compensated variable displacement piston pump which outputs a maximum flow of approximately 21 gpm (79 lpm) at maximum rpm. Pre-filtered oil is routed from the low pressure reservoir to the inlet of the pump. A case drain line protects the case from extreme pressures by draining excess oil from the case, back to the reservoir.

The lift and steer hydraulic circuits and all other hydraulic circuits drawing an oil supply from the lift pump are either closed center systems or are receiving restricted flow. This means there is a standby pressure of 1800 psi (124 bar), but no flow until a circuit is activated. With all circuits deactivated, the pressure in the systems will build until the pressure compensator spool in the pump senses the pressure is at 1800 psi (124 bar), causing the piston pump swash plate to destroke to a no flow position. As soon as the pressure drops in the system, caused by opening one of the control valves in the circuit, the pump swash

plate will stroke causing oil to flow through the outlet port of the pump. The hydraulic oil is then routed through a non-bypass 10 micron high pressure lift filter.

The oil flow is routed from the outlet port of the high pressure lift filter to the lift pressure manifold. The lift pressure manifold distributes the oil supply to the solenoid valve banks, an accessory connection, the two speed track drive circuit, the track tension pistons, the lift pressure gauge and the servo valve manifolds.

The oil is routed from the lift pressure manifold to the servo lock solenoid valve. The solenoid valve is normally open and allows the oil to flow into the inlet port of the servo valve manifold and into each of the individual servo valves. If the solenoid valve is energized the valve will close, stopping the flow of oil to the servo manifold and preventing the operation of the lift and steer hydraulic cylinders.

When a lift servo valve receives an “up” signal from the control system, the spools in the servo valve will shift, directing the oil out through a work port in the manifold to one of the counterbalance valves on the appropriate lift cylinder. The oil forces the internal check valve off its’ seat (in the counterbalance valve) and flows into the piston (top) end of the cylinder, causing it to begin to extend. Since the cylinder is equipped with double counterbalance valves, the oil flow is stopped, causing pressure to build in the rod end of the cylinder and preventing the cylinder from extending. A small port in the counterbalance valve directs this pressure increase to a small shuttle piston in the valve, which shifts, lifting the check valve off its’ seat. This allows oil from the rod (bottom) end of the cylinder to return to the opposite servo manifold port, through the servo valve and out to the reservoir. When the servo valve spool returns to neutral, the check valve in the counterbalance valve returns to its’ seat, locking the oil in the piston (top) end of the cylinder, holding it extended.

When a lift servo valve receives a “down” signal from the control system, the spools in the servo valve will shift in the opposite direction, directing the oil out through a work port in the manifold to one of the counterbalance valves on the appropriate lift cylinder. The oil forces the internal check valve off its’ seat (in the counterbalance valve) and flows into the rod (bottom) end of the cylinder, causing it to begin to retract. Since the cylinder is equipped with double counterbalance valves, the oil flow is stopped, causing pressure to build in the piston (top) end of the cylinder and preventing the cylinder from retracting. A small port in the counterbalance valve directs this pressure increase to a small shuttle piston in the valve, which shifts, lifting the check valve off its’ seat. This allows oil from the piston (top) end of the cylinder to return to the opposite servo manifold port, through the servo valve and out to the reservoir. When the servo valve spool returns to neutral, the check valve in the counterbalance valve returns to its’ seat, locking the oil in the piston (top) end of the cylinder, holding it extended.

The purpose of the counterbalance valve in the piston (top) end, is to keep the cylinder from drifting down when the engine is running and the servo lock switch is “on”, or overnight when the engine is stopped. The purpose of the counterbalance valve in the rod (bottom) end, is to prevent the cylinder from extending when the leg is removed and lifted during the assembly of the machine into the 3-track or 4-track modes. Pressure is required to extend the cylinder (to

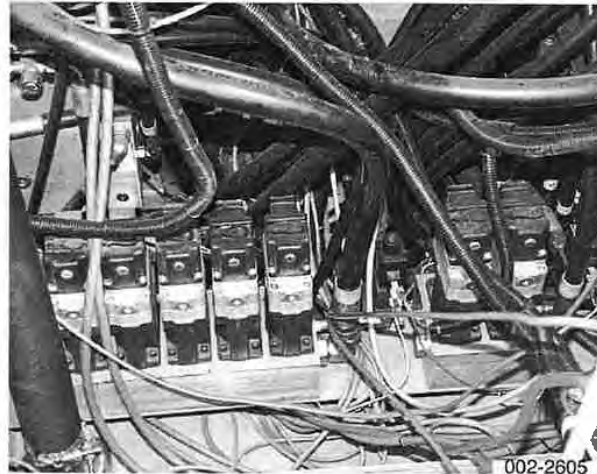
lift the machine) and to retract it (because of the counterbalance valves).

The steering circuit works in the same manner with one exception, the counterbalance valves are not required in the steering cylinders.

Symptom:

All lift and steer circuits inoperative or slow to respond.

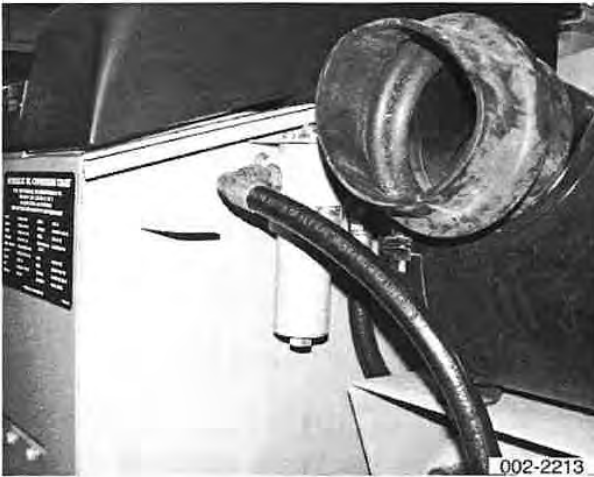
Corrective Measures:



Servo valve manual override levers

Isolate the problem, electrical versus hydraulic. If the system will not respond to the appropriate jog switch, check the system operation by moving the override lever on the top of the servo valve cover. If the system will respond to the override lever, the problem is in the electrical system. Refer to Troubleshooting the Grade and Slope Electrical Circuits or Troubleshooting the Steering Electrical Circuits for procedures to follow. If the system will not respond to the override lever, the problem is in the hydraulic circuit. Proceed as follows:

1. Servo lock switch “on”. Place the switch in the “off” position.
2. Lift pressure lower than 1000 psi (69 bar). Adjust the lift pressure as necessary following the procedures in the Maintenance chapter.



Indicator on top of high pressure lift filter

3. Plugged high pressure lift filter. If the indicator on the top of the high pressure filter is extended, it may be necessary to replace the filter. The filter is of the non-bypass type. If it becomes completely clogged, it will not allow any oil flow. Refer to the Maintenance chapter for filter replacement procedures.
4. Accessory pressure and return hoses are connected together when not in use. This will cause the hydraulic flow from the pump to be returned to the reservoir. The flow through the hoses can reduce lift pressure. Disconnect the hoses at the quick couplers.
5. Defective pump. It is possible that the lift pump may have failed, reducing the total flow to the system. If all grade and steering circuits are activated simultaneously, it could cause a pressure drop in the system, resulting in slow response. Check the pump output with a flow meter. A good indication of a defective pump is to compare system pressure with engine rpm. A good pump will maintain pressure as engine rpm is decreased. A damaged pump will not maintain pressure as engine rpm decreases. The pressure will drop rapidly. Repair or replace the pump as necessary.
6. Hoses for field installed systems coupled together, or open center valves used. If any systems that draw hydraulic oil from the lift system have been added to the machine, make certain that when the system is removed the hoses are not connected together. If the hoses are connected together, it will create a direct path for the oil to tank. Also any system that may be field installed, must utilize a closed

center valve (valve that blocks oil flow in neutral).

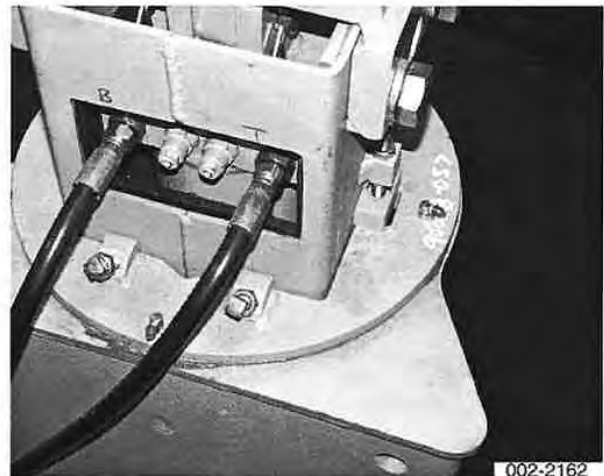
Symptom:

One lift or steer cylinder inoperative or slow to respond.

Corrective Measures:

Isolate the problem, electrical versus hydraulic. If the system will not respond to the appropriate jog switch, check the system operation by moving the override lever on the top of the servo valve cover. If the system will respond to the override lever, the problem is in the electrical system. Refer to Troubleshooting the Grade and Slope Electrical Circuits or Troubleshooting the Steering Electrical Circuits for procedures to follow. If the system will not respond to the override lever, the problem is in the hydraulic circuit. Proceed as follows:

1. Quick coupler not fully connected or defective. If both are fully connected, disconnect and check for debris. Check for a defective quick coupler by bypassing the coupler with a different set of quick couplers known to be good.



Counterbalance valves located in cylinder

2. Faulty counterbalance valve in a lift cylinder. If the machine will raise, but not lower; or lower, but not raise; suspect that the shuttle piston in the counterbalance valve is defective. Lower the machine or remove the weight from the cylinder and stop the engine. Swap the suspected valve with a valve from one of the other legs that is operating properly. If the fault moves to the other leg, the valve is defective and must be replaced.

3. Excessive leakage past spool in the servo valve or past the packing in the cylinder. Swap the servo valve with one from another circuit. If the problem transfers, the servo valve is defective and must be replaced. If the problem remains in the same circuit, suspect the cylinder. A cylinder can be checked for internal leakage by disconnecting the line on the rod end of the cylinder with the cylinder fully extended. Apply pressure to the piston end of the cylinder. If fluid flows from the open port on the rod end, the internal packing is damaged and must be replaced.

Note: It is normally easier to swap the output hoses on the rear of the servo manifold from one servo to the other, than it is to swap the servo valves. If the hoses are swapped, it will also be necessary to swap the electrical connectors on the top of the corresponding servo valves. Be certain to reconnect the hoses and the electrical connectors to their original positions after the testing is complete.



Damage caused by binding

4. Inner and outer guide tubes are binding on the lift legs. Raise the machine to maximum height and check for binding. Adjust the wear plates on the bottom of the legs as instructed in the Maintenance chapter. Lubricate the inner guide tube as instructed in the Maintenance chapter. If damage has occurred to the inner guide tube, it will be necessary to repair or replace the damaged parts.
5. One or more tracks are bogged down in loose material. Move the machine out of the material and check for proper operation. If the problem continues, it may be caused by defective steering cylinder piston packing. Fully extend

the suspect cylinder and disconnect the hydraulic line from the rod end of the cylinder. Apply hydraulic pressure to the piston end of the cylinder. If oil flows from the rod end fitting, the piston packing is defective and must be replaced.

Symptom:

Lift cylinder drifts up, or down, with the servo lock switch "off", the engine running and the control system in the "standby" mode. Will hold position with the servo lock switch "on", or the engine stopped.

Corrective Measures:

This is a good indication that the servo valve pilot may require centering. Adjust the servo pilot centering screw with a hex wrench as described in the Maintenance chapter. If the servo valve will not remain centered, it may be necessary to replace the valve.

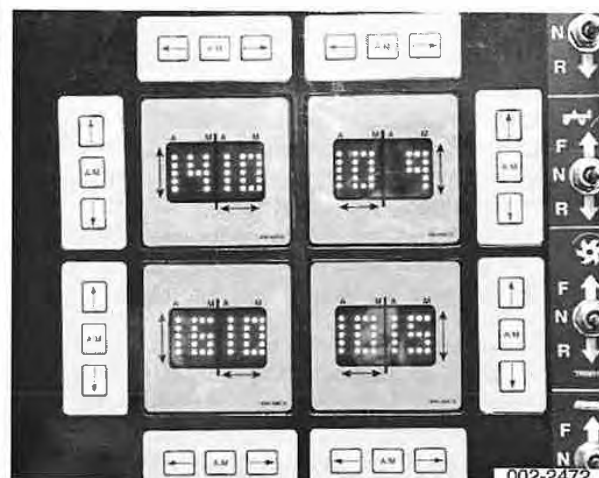
Symptom:

Gradual swales in grade.

Corrective Measures:

1. Loose guideline. Refer to the stringline chapter for appropriate stringline tension. Refer to the setup chapter for a stringline tension test procedure.

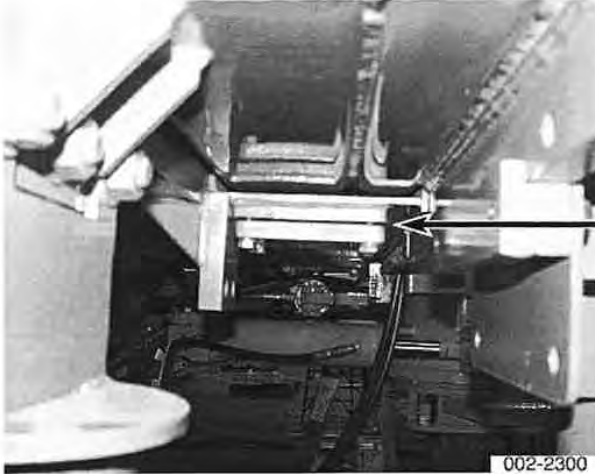
Note: Guideline tension can also cause swales in the steering control of the finished product.



Adjust the sensitivity levels

2. Low sensitivity level. Increase the sensitivity adjustment on each of the elevation legs on the

network controller. Low electronic sensitivity levels can cause the elevation legs to stroke up and down too slowly for the travel speed and terrain that the tracks are operating over.



Tension mold shift wear pads

3. Wear Pads on the mold shift tubes are loose or worn. Replace or tension the wear pads as indicated in the Maintenance chapter.



Tension right front leg wear pad

4. Wear Pads on the right front leg extend are loose or worn. This can transfer movement from the left rear corner of the machine to the right front, causing swales. Replace or tension the wear pads as indicated in the Maintenance chapter.
5. Trimmer teeth are cutting the grade high. Adjust the trimmer teeth as indicated in the Maintenance chapter.

6. Sticky servo valve. Sticky valve spools can be freed by rapidly moving the manual lever on the servo valve. If the servo valve continues to stick, repair or replacement is required.

Note: The servo valve centering adjustment will also cause the needle to hang to one side of center during operation. The centering adjustment of the servo valve usually does not affect the ability of the system to maintain proper elevation or steering control during automatic operation.

8. Worn cylinder pins or loose connections. Check all connection points and cylinder pins for excessive wear. Tighten any loose connections or replace worn components as necessary.

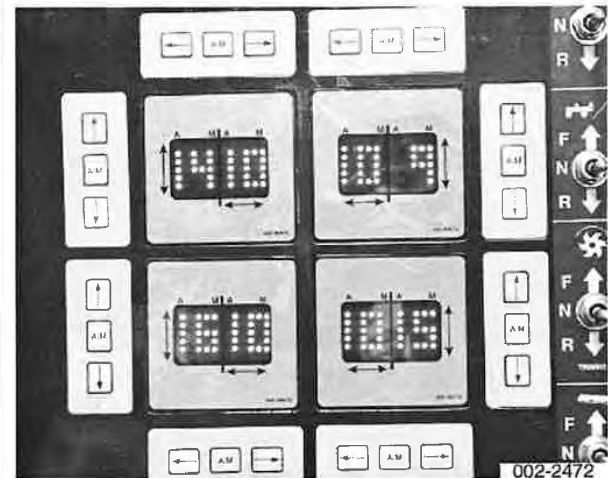
Symptom:

Steering control drifts left and right on a straight away.

Corrective Measures:

1. Loose guideline. Refer to the stringline chapter for appropriate stringline tension. Refer to the setup chapter for a stringline tension test procedure.

Note: Guideline tension can also cause swales in the grade control of the finished product.



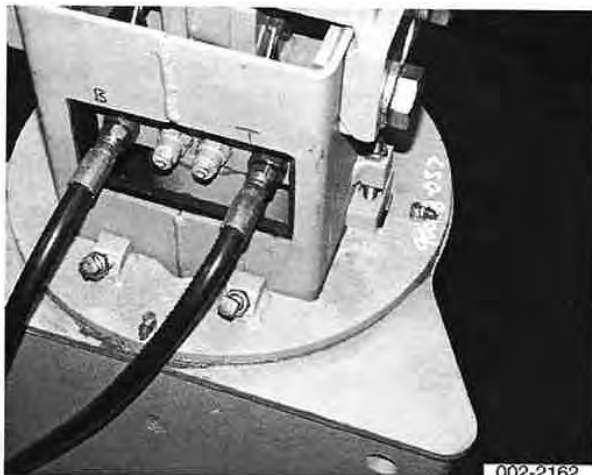
Adjust the sensitivity levels

2. Low sensitivity level. Increase the sensitivity adjustment on each of the elevation legs on the network controller. Low electronic sensitivity levels can cause the elevation legs to stroke up and down too slowly for the travel speed and terrain that the tracks are operating over.



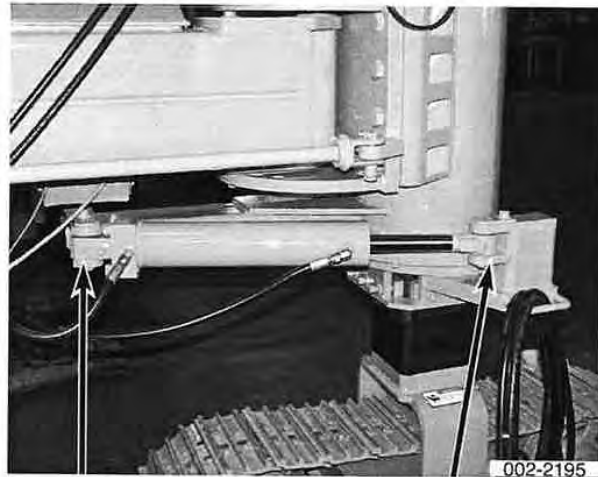
Tension right front leg wear pad

3. Wear Pads at the bottom of each leg are loose or worn. Turn the track and observe the amount of stroke required to begin turning the track in either direction. If more than 1 inch (25 mm) of cylinder stroke is required to begin turning the track in either direction it will be necessary to adjust the wear pad tension. Replace or tension the wear pads as indicated in the Maintenance chapter.



Tighten upper guide tube adjustments

4. Loose adjustments on the upper guide tube of each leg. Tighten the adjustments as indicated in the Maintenance chapter.



Worn pins and bushings

5. Worn cylinder pins and bushings. Repair or replace the cylinder pins and bushings as necessary.



Tighten track yoke bolts

6. Loose track yoke bolts. On 4-track capable machines, the track yoke is bolted to the base plate of the inner guide tube. Tighten the bolts securely to prevent excess movement.

Symptom:

Grade cylinder drifts down overnight and/or with the engine running with the servo lock switch "on".

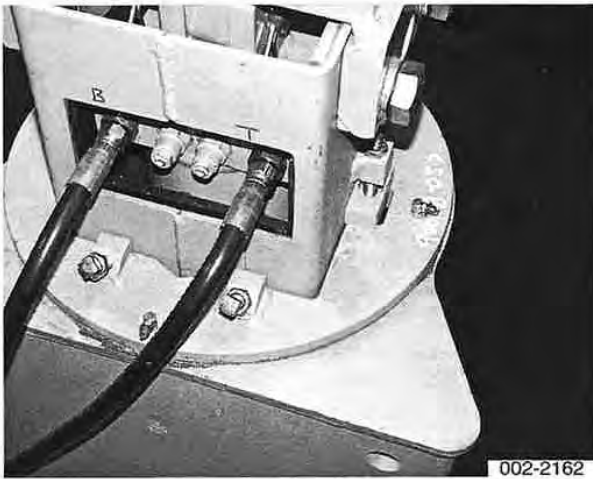
Corrective Measures:

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WARNING!

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BE CERTAIN TO COMPLETELY REMOVE ALL WEIGHT FROM THE LEG BEFORE REMOVING THE COUNTERBALANCE CARTRIDGE. IF THE CARTRIDGE IS REMOVED WITH THE MACHINE UP, HYDRAULIC OIL WILL BE EXPELLED RAPIDLY FROM THE CYLINDER AND THE MACHINE WILL DROP. SEVERE INJURY CAN OCCUR IF CONTACT IS MADE WITH FLUID ESCAPING UNDER HIGH PRESSURE.

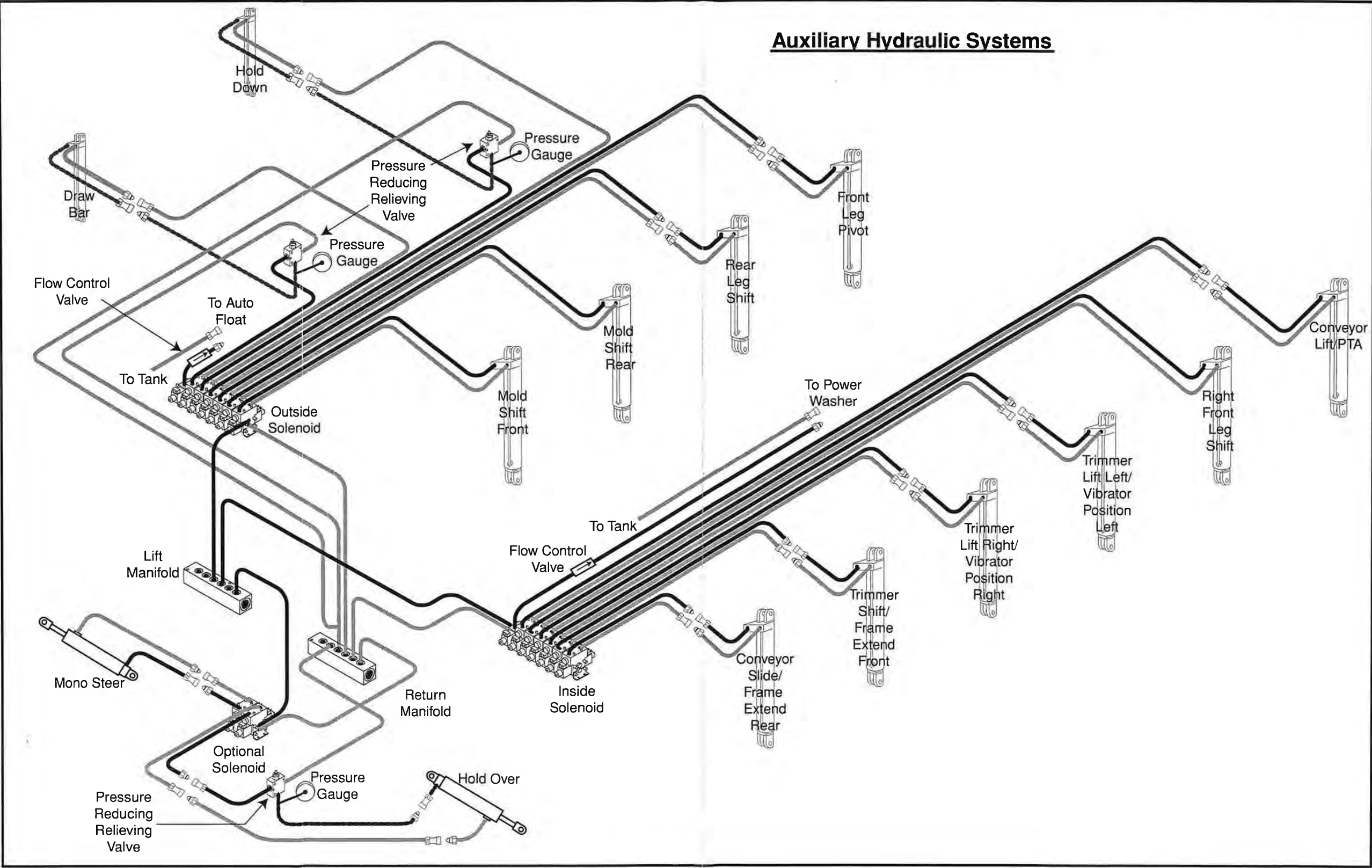


Counterbalance valves in cylinder cap

1. Counterbalance valve not holding. Raise the machine and stop the engine. Loosen the line on the left side of the cylinder cap. If a steady stream of oil flows from the loosened line, suspect that the counterbalance valve is not holding. Lower the machine as far as possible, removing all weight from the cylinder, and stop the engine. Remove the counterbalance valve cartridge from the affected circuit and swap it with a cartridge from an unaffected circuit. If the problem transfers to the previously unaffected side, the counterbalance valve is defective. Remove the valve, clean and inspect it and reinstall it. If it still does not operate properly, replace the valve.
2. Internal cylinder piston packing leaking. If no oil flows from the loosened line or the problem remains on the same cylinder after swapping the counterbalance valve cartridge, the problem is in the lift cylinder. Remove the cylinder and repair or replace it.



Commander III



17 Auxiliary Hydraulic Systems

The auxiliary circuits consist of solenoid operated hydraulic systems. The operation of these systems are the same with the exception of the hold down, hold over and drawbar circuits. Refer to the appropriate description for correct troubleshooting information.

The oil for the various solenoid operated systems is supplied by the lift pump. The oil is distributed to the solenoid valve banks from the lift pressure manifold. With each solenoid valve in the "neutral" (center) position, the oil flow is blocked by the valve spool.

Energizing the solenoid coil to the "extend" position, directs oil through the valve and out a work port. The oil forces a check valve off its' seat as it passes through the double acting lock valve (on rear of valve) and then out to the piston end of the corresponding cylinder. Since a check valve in the double acting lock valve is blocking the oil flow back to the solenoid valve from the rod end of the cylinder, pressure begins to build in the line between the piston end of the cylinder and the solenoid valve. This pressure increase acts against a shuttle piston in the locking valve, which shifts, lifting the check valve on the return side off its' seat, thus allowing the oil from the rod end of the cylinder to return through the solenoid valve and back to the pressure tank.

When the solenoid valve is shifted in the opposite direction, the oil flows through the check valve, in the opposite side of the locking valve and out to the rod end of the corresponding cylinder. Since a check valve in the locking valve is now blocking the oil flow from the piston end of the cylinder back to the solenoid valve, pressure begins to build between the rod end of the cylinder and the solenoid valve. This pressure increase works against the shuttle piston in the locking valve, which shifts, lifting the check valve on the return side off its' seat, thus allowing the oil from the piston end of the cylinder to return through the solenoid valve and back to the pressure tank. The purpose of the double acting lock valve is to prevent cylinder rod drift.

Hold Down and Hold Over Systems

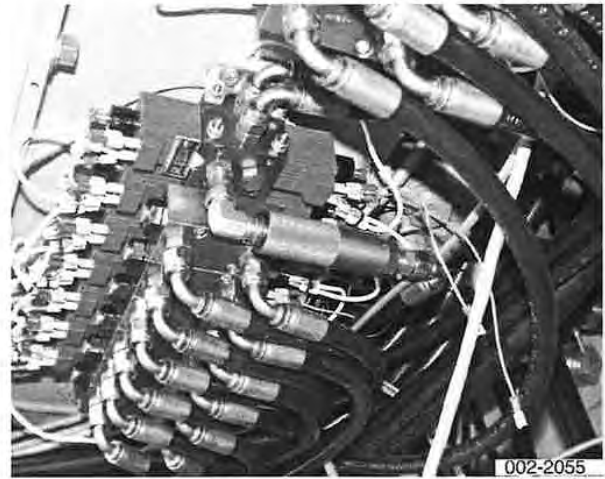
Energizing the solenoid coil to the "extend" position, directs oil through the valve, out a work port, to the inlet of the reducing-relieving valve. The reducing-relieving valve reduces the incoming pressure of 2000 psi (138 bar) down to an operator setting between 30 and 600 psi (2 and 41 bar). The oil is routed through the reducing-relieving valve to the piston end of the corresponding cylinder causing it to extend. As the cylinder begins to press against the slipform mold, pressure begins to increase in the line between the

piston end of the cylinder and the reducing-relieving valve. When the pressure reaches what the operator has preset, the flow of oil to the cylinder is halted. Oil from the rod end of the corresponding cylinder returns back to the pressure tank.

Symptom:

Cylinder will extend but not retract; or retract but not extend.

Corrective Measures:



Locking valve blocks

1. Locking valve not releasing in one direction. Check by reversing the hoses on the rear of the solenoid valve. If the cylinder will now move in the opposite direction, the locking valve is defective and must be repaired or replaced.
2. Defective quick coupler. Inspect quick couplers by bypassing couplers with pipe couplings or with a set of couplers known to be good.

Symptom:

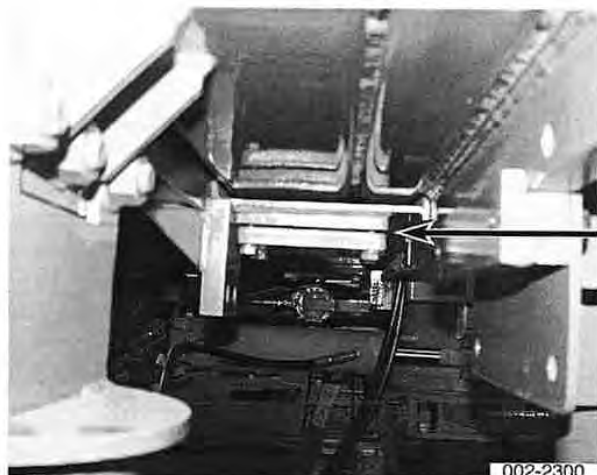
Cylinder will not extend or retract.

Corrective Measures:

1. Quick couplers disconnected. Reconnect the couplers.
2. Locking valve not releasing in one direction. If the cylinder is completely extended, or retracted and the locking valve shuttle piston is stuck, it will not release in the opposite direction. Reverse the hoses on the rear of the valve. If the cylinder will now move in the opposite

direction, the locking valve is defective and must be repaired or replaced.

3. Low lift pressure. Check the indicated pressure on the lift circuit pressure gauge. Adjust the lift pressure to 2000 psi (138 bar) if necessary, following the instructions given in the Maintenance chapter. If the lift pressure is low, the elevation circuits, steering circuits, hold over and hold down circuits will also be affected.



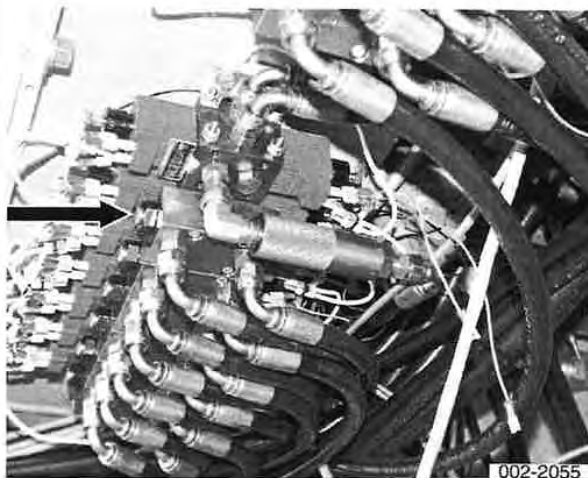
Loosen wear pads

4. Clamps tight in bottom of extension tubes. This will affect the mold shift, trimmer lift and right front leg shift. Loosen the clamps to allow extension of the tubes. Tighten the clamps when extended to prevent excess movement in the machine frame.
5. Locking pin through holes in inner and outer tubes of conveyor lift. This will affect the conveyor lift only. Remove pin and install it through the holes in inner tube only to limit how far the conveyor can be lowered.

Symptom:

Cylinder will not hold position.

Corrective Measures:



Locking valve

1. Locking valve not holding. Remove the work port lines from the defective valve and swap them with work port lines from an unaffected valve. If the cylinder holds position, the locking valve is defective. Remove the locking poppet valve from each side of the manifold and inspect for damage or contamination. Make certain that the valve spool between the two poppet valves moves freely and is clear of any contamination. Repair or replace any defective parts.
2. Internal cylinder packing leaking. If swapping the lines as previously described does not stop the cylinder from creeping, suspect the internal cylinder piston packing. To check, extend the cylinder fully. Remove the line from the rod end of the cylinder and apply pressure to the piston end. If oil flows from the open fitting on the rod end of the cylinder, the internal piston packing is defective. Repair or replace the cylinder as necessary.

Symptom:

Drawbar, hold down or hold over cylinder will retract, but will not extend.

Corrective Measures:

Pressure control valve set too low. Turn the control valve knob clockwise to increase pressure to extend the cylinder.

**Symptom:**

Drawbar, hold down or hold over cannot maintain constant pressure.

Corrective Measures:

1. Pressure control valve dirty or defective. Remove pressure adjustment cartridge and clean. Inspect and replace as necessary.
2. Defective cylinder. To check, disconnect the hose on the rod end of the cylinder, with it extended completely. Apply pressure to the piston end of the cylinder. If hydraulic fluid escapes from the open fitting on the rod end of the cylinder, the internal piston packing is leaking. Repair or replace the cylinder as necessary.

Symptom:

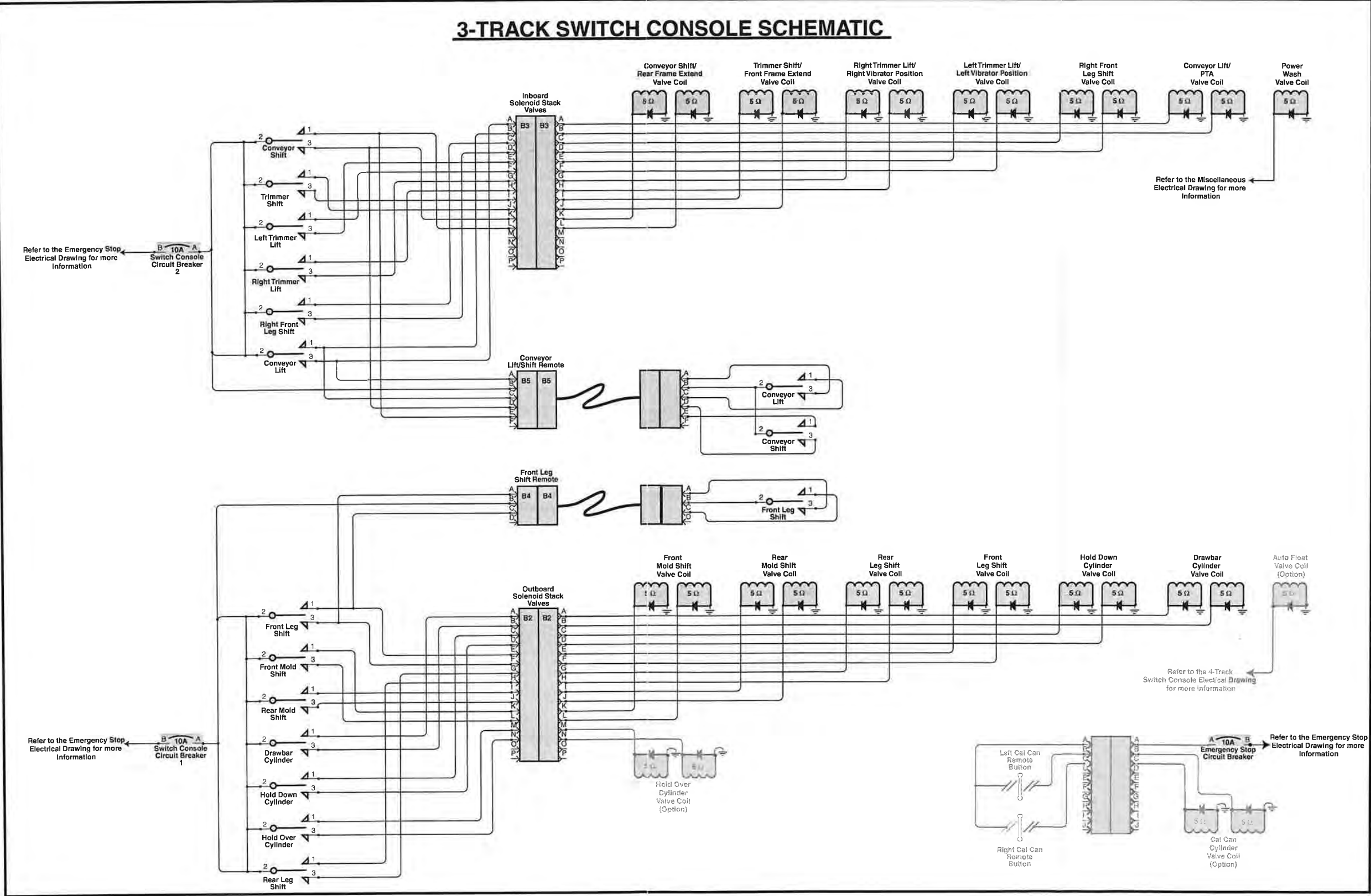
Drawbar, hold down or hold over cylinder will not extend or retract.

Corrective Measures:

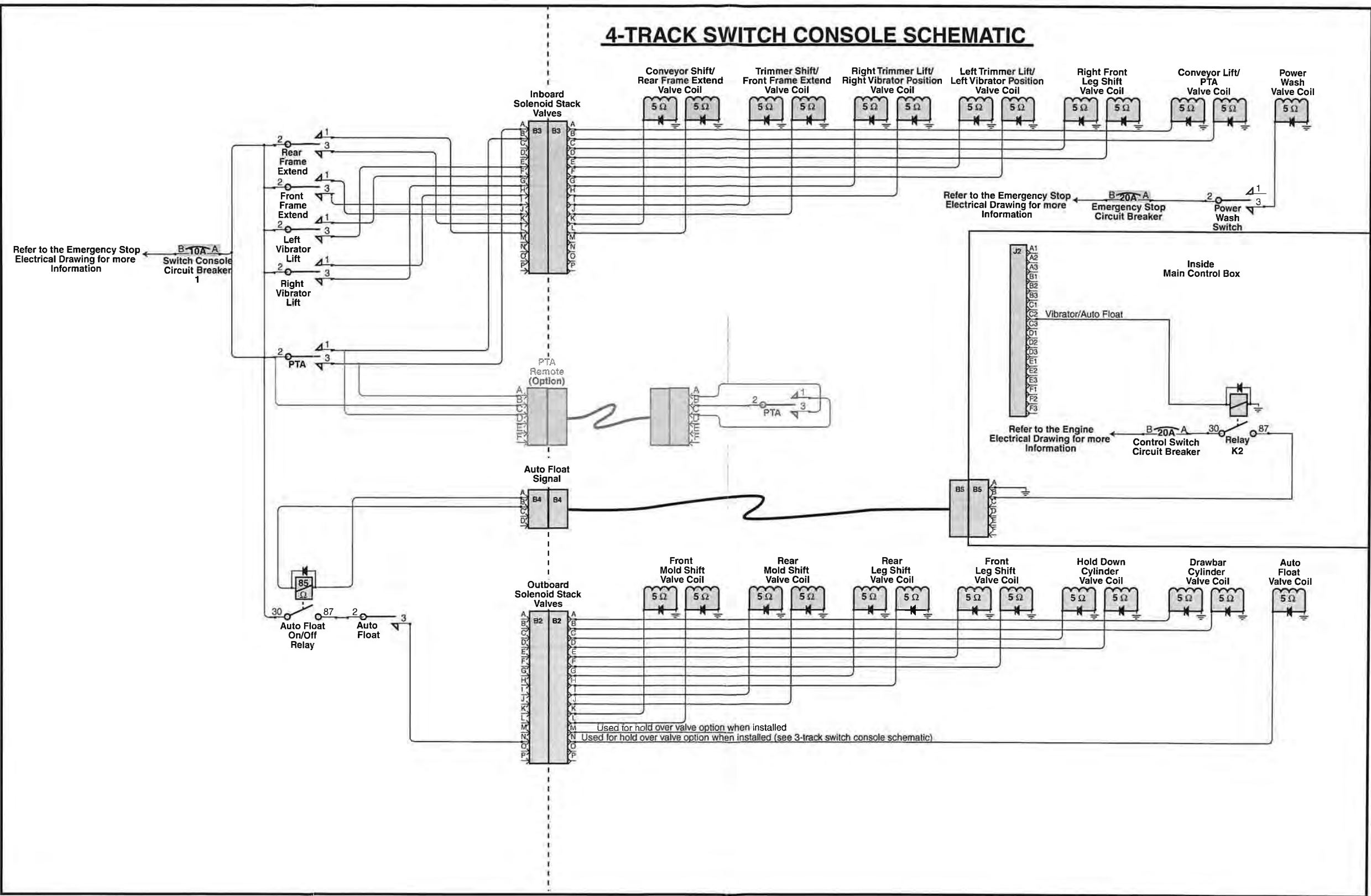
1. Control switch in the "neutral" (center) position. Move the control switch to the proper position.
2. Low pressure in the lift circuit. Check the indicated pressure on the lift circuit pressure gauge. Adjust the lift pressure to 2000 psi (138 bar) if necessary, following the instructions given in the Maintenance chapter.

Note: If lift pressure is low, the elevation cylinders, steering cylinders and auxiliary hydraulic circuits will be affected.

3-Track Switch Console Electrical Drawing



4-Track Switch Console Electrical Drawing



18 Switch Console Electrical Systems

The auxiliary hydraulic circuits are controlled by either the three-track switch console or the four-track switch console. The operation of these systems are the same. The following description is the same for all circuits which operate a hydraulic cylinder.

A 12 volt power supply is provided from the circuit breakers on the appropriate switch console to the center terminal of each control switch. When the switch is depressed in the extend position (based upon the orientation of the cylinder), a 12 volt signal is routed through the switch console bulkhead connection and to the appropriate solenoid coil. The coil is energized, causing the solenoid valve spool to shift, directing hydraulic oil to the piston end of the cylinder and causing it to extend.

When the switch is depressed in the retract position, a 12 volt signal is routed through the switch console bulkhead connection and to the appropriate solenoid coil. The coil is energized, causing the solenoid valve spool to shift, directing hydraulic oil to the rod end of the cylinder and causing it to retract.

Remote Control Units

If the electrical circuit is supplied with an operators remote control, such as the conveyor lift/shift, the front leg shift and the PTA, the circuit operates in a similar manner.

When the remote control is connected to the appropriate bulkhead, power is supplied from the switch console circuit breakers to the center terminal of each remote switch. When the switch is depressed in either direction, 12 volts is routed to the corresponding switch terminal on the switch console (terminal 1 or terminal 3). The signal is routed through the bulkhead on the switch console to the appropriate solenoid coil.

Auto Float Electrical System

The auto float is stopped and started automatically when machine travel is stopped or started. A signal originating from the network control system is routed to the switch console and energizes an on/off relay attached to the switch console.

When the travel variable speed knob is rotated clockwise, a 12 volt signal is routed to the auto float on/off relay. When energized, the relay routes a 12 volt signal from the switch console circuit breaker through the relay contacts and to the center terminal of the auto float switch. When the auto float switch is in

the "off" position, the auto float will not operate. When the switch is placed in the "on" position, the 12 volt signal is routed through the switch console bulkhead to the auto float solenoid coil. The coil is energized, causing the solenoid valve spool to shift, directing hydraulic oil to the auto float control manifold.

When the travel variable speed knob is rotated counterclockwise to the off position, the 12 volt signal to the auto float on/off relay is eliminated, causing the auto float to cease operation.

Symptom:

Cylinder will extend but not retract; or retract but not extend using the control switch.

Corrective Measures:

Isolate the problem, hydraulic versus electrical. The solenoid valves are equipped with manual override buttons extending from each valve coil. Depress the override buttons on either side of the appropriate solenoid valve. If the cylinder does not respond to the override buttons, the problem is in the hydraulic system. Refer to Troubleshooting the Auxiliary Hydraulic Circuits for procedures to follow. If the cylinder does respond to the override buttons, the problem is in the electrical system. Refer to the following for troubleshooting information.

1. Wiring is disconnected from one of the solenoid coils. Visually inspect the wiring connections on each of the solenoid coils, making certain that all wiring connections are in firm contact with the solenoid coil terminals. Reconnect or repair any loose connections.
2. Defective switch. Remove the wire from the center terminal of the appropriate switch and momentarily connect it to each of the outside terminals of the switch. If the cylinder will operate in both directions, the switch is defective and must be replaced.
3. Defective solenoid coil. Swap the wiring from the defective solenoid valve with a solenoid valve known to be good. If the switch will operate a different hydraulic circuit, the solenoid coil may be defective. To check, remove the wiring from the suspect solenoid coil and check the terminals for ohms resistance. If 5 ohms is indicated, the solenoid coil is good. If not, replace the solenoid coil.
4. Defective wiring. Check continuity of the wiring between the control switch and the solenoid coil

using an ohm meter. If continuity does not exist, repair or replace the wiring.

Symptom:

Cylinder will not extend or retract.

Corrective Measures:

1. Wiring is disconnected from both of the solenoid coils. Visually inspect the wiring connections on each of the solenoid coils, making certain that all wiring connections are in firm contact with the solenoid coil terminals. Reconnect or repair any loose connections.
2. Defective switch. Remove the wire from the center terminal of the appropriate switch and momentarily connect it to each of the outside terminals of the switch. If the cylinder will operate in both directions, the switch is defective and must be replaced.
3. Defective wiring. Check continuity of the wiring between the control switch and the solenoid coil using an ohm meter. If continuity does not exist, repair or replace the wiring.

Symptom:

Remote control will not operate.

Corrective Measures:

Depress the corresponding switch on the switch console. If the switch does not respond, refer to the preceding symptoms. If the switch does respond, refer to the following for more information.

1. Remote control is disconnected. Connect the remote control to the appropriate bulkhead.
2. Defective switch. Remove the wire from the center terminal of the remote switch and momentarily connect it to each of the outside terminals of the switch. If the cylinder will operate in both directions, the switch is defective and must be replaced.
3. Defective wiring. Check the remote wiring for any visible defects. Check continuity of the wiring between the remote control switch and the bulkhead plug connection. If continuity does not exist on one or all of the wires, repair or replace as necessary.

If continuity does exist, disconnect the remote frame cable from the rear of the switch console

and connect the remote directly to the rear of the switch console. If the hydraulic controls will respond to the remote control operation, the frame cable is defective and must be repaired or replaced.

If the remote will not respond when connected directly to the rear of the switch console, check the wiring between the switch console remote bulkhead and the corresponding switch on the switch console for continuity. If continuity does not exist, repair or replace the wiring as necessary.

Symptom:

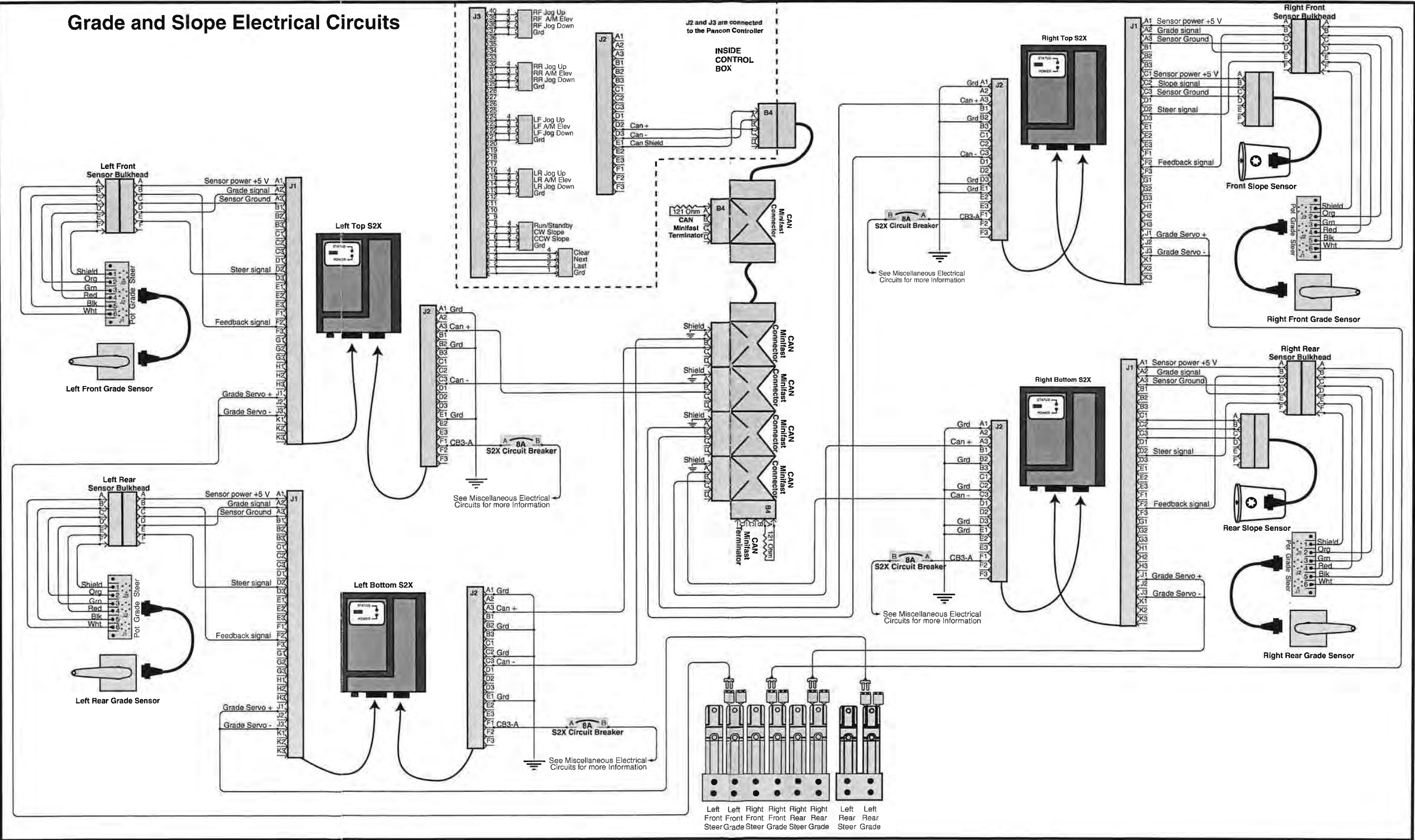
All switch console control switches will not operate.

Corrective Measures:

1. Emergency stop system not reset. Depress the emergency stop reset switch to provide 12 volt power to the switch console.
2. Defective ground connection. A common ground connection is provided to each of the solenoid valves. Remove and inspect the wiring for excessive corrosion or loose connections. Clean and inspect the wiring and tighten securely. Repair or replace any loose or damaged wiring.
3. Shorted electrical wiring. If a short exists in one of the wires, the circuit breaker will trip to prevent serious damage to all the wiring. To locate the source of the short, disconnect the wire from the center terminal of each switch connected to the affected circuit breaker. After each wire is disconnected, return power to the circuit breaker. If the circuit breaker continues to trip, remove the center terminal wire from the next switch. If the circuit breaker does not trip, the switch last disconnected is defective and must be replaced.
4. Defective circuit breaker. Remove the wires from the auxiliary side of the circuit breaker. Using a test light or volt meter, check for 12 volts on both terminals. If 12 volts exists on both terminals, the circuit breaker is good. If 12 volts exists on the battery side, but not on the auxiliary side, the circuit breaker is defective and must be replaced.

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Network Grade and Slope Electrical Drawing



19 Network Elevation and Slope Electrical

The elevation control systems are responsible for maintaining the correct elevation on all sides of the machine frame. Each elevation system consists of a sensor and a control loop on an S2X controller which is networked to the other S2X controllers on the machine, including the Pancon Controller in the control box. The side of the machine controlled by the elevation sensors is determined by which side the sensors are plugged into and by the setup parameters determined by the machine's operator. To set the parameters, the operator must depress the CALIB (calibrate) switch on the main control box. Depressing and releasing the NEXT switch will select the elevation mode on the main screen. The elevation mode is used to designate the type of sensor control the machine will be using for a particular job situation. Depressing and releasing the +/- switches will scroll through the elevation mode settings available (left elevation/right slope, right elevation/left slope, dual grade/right steer, dual grade/left steer, Leica). When the appropriate mode is selected, it will be necessary to restart the network controller to allow operation of the new parameter.

The slope control system is responsible for maintaining the correct elevation of the machine frame on the side opposite the elevation sensor controlled side. The slope system consists of a slope sensor and a control loop on an S2X controller which is networked to the other S2X controllers on the machine, including the Pancon Controller in the control box. The side of the machine controlled by the slope sensor is opposite of the side that the elevation sensors are plugged into and is determined by the setup parameters.

Elevation or Dual Elevation Operation

Whether the system is being operated with elevation control on the left or right sides, or with elevation control on both sides (dual grade), the operation of all elevation systems is identical. The main screen must be in the "run" mode to operate the elevation control circuit in the automatic mode. From the individual S2X controllers, common power (+5.0 volts) is supplied to the sensors from the J1 connector on pin A1. A common ground is supplied to the sensors from the J1 connector on pin A3. The power supply and ground connections are routed through the sensor bulkhead on the front access door and continue to the bulkhead circuit board located remotely on the machine frame. The circuit board distributes the common power supply to pin A in each of the three sensor bulkheads (grade, steer and pot). The circuit board also distributes the common ground connection to pin C in each of the

three sensor bulkheads (grade, steer and pot). When the sensor is connected to the appropriate bulkhead, it receives +5.0 volt power from pin A and a ground connection from pin C.

The sensor has a wand attached to its' shaft, which is held against the guideline by spring tension. As the machine frame moves up or down, in relation to the guideline, the wand causes the sensor shaft to rotate. As the shaft rotates, a corrective signal is sent to the corresponding S2X control loop. The sensor works within a voltage range of 1.2 volts to 3.8 volts.

When the sensor wand position (wand is oriented in the push position), in the Calibrate display, is selected as "push" and the sensor wand is rotated upward, the voltage signal to the S2X will decrease from 2.50 volts. The S2X will recognize a voltage decrease (with the "push" wand selection) as an up signal, causing the machine elevation to raise. As the sensor wand is rotated downward, the voltage signal to the S2X will increase (from 2.50 volts), indicating that the machine elevation must go down.

When the sensor wand position (wand is oriented in the pull position), in the Calibrate display, is selected as "pull" and the sensor wand is rotated upward, the voltage signal to the S2X will increase from 2.50 volts. The S2X will recognize a voltage increase (with the "pull" wand selection) as a up signal, causing the machine elevation to raise. As the sensor wand is rotated downward, the voltage signal to the S2X will decrease (from 2.50 volts), indicating that the machine must go down.

With the sensor wand centered between the roll pin stops, a 2.5 volt signal (center) is returned to the S2X through pin "B" in the sensor cable. It is routed to the bulkhead circuit board where the individual sensor signals must remain separated. The following color code indicates the color and type of signal for each wire exiting the bulkhead circuit board.

White wire	+5.0 volts supply
Black wire	Feedback pot signal
Orange wire	Ground connection
Red wire	Elevation sensor signal
Green wire	Steer sensor signal
Shield wire	Frame ground

As the signal from the elevation sensor is returned to the corresponding S2X controller, it is passed to the CAN network connection and routed to the Pancon controller in the main control box. The Pancon controller receives the elevation sensor signal and processes the information. After processing is completed, the Pancon controller returns the appropriate response signal to the S2X controller through the CAN network connection. The S2X controller will then send a variable voltage signal to the corresponding servo valve, causing the elevation control cylinder to extend or retract.

The normal working range of the sensor (1.2 volts to 3.8 volts) is reduced to approximately 1.5 volts to 3.5 volts for troubleshooting purposes. If the sensor output voltage should read between 1.2 volts to 1.5 volts, or between 3.5 volts to 3.8 volts, it will cause the "off stringline" feature to activate. When the "off stringline" feature is activated, the drive to the corresponding servo valve is shut down and the servo valve spool returns to center, holding the machine elevation in the position it was in when the feature was activated. The system can still be operated with the jog switches.

Slope Operation

A single slope sensor is operated on a 3-track or 4-track barrier setup while two slope sensors are operated on a 4-track paver setup. The slope sensor mounted near the center of the frame, will control the elevation of the machine opposite the elevation sensor controlled side. The main screen must be in the "run" mode to operate the slope control circuit in the automatic mode. From the right top and right bottom S2X controllers, common power (+5 volts) is supplied to the sensors from the J1 connector on pin C1. A common ground is supplied to the sensors from the J1 connector on pin C3. The power supply and ground connections are routed through the sensor bulkhead on the front access door and continue to the slope sensor. The shaft in the center of the slope sensor is held stationary by a pendulum weight. As the elevation controlled side of the machine moves up or down, the slope sensor rotates as the machine tilts. As the sensor rotates, a corrective signal is sent to the corresponding S2X control loop. The sensor works on a voltage range of 0.75 volts to 4.25 volts. With the sensor in the center position (machine frame level), a 2.5 volt signal (center) is sent to the S2X through pin "B" in the slope sensor cable. As the sensor is rotated clockwise (viewed from the rear), the voltage signal to the S2X will decrease (from 2.5 volts), indicating that the right side of the machine must go up. As the sensor is rotated counterclockwise, the voltage signal

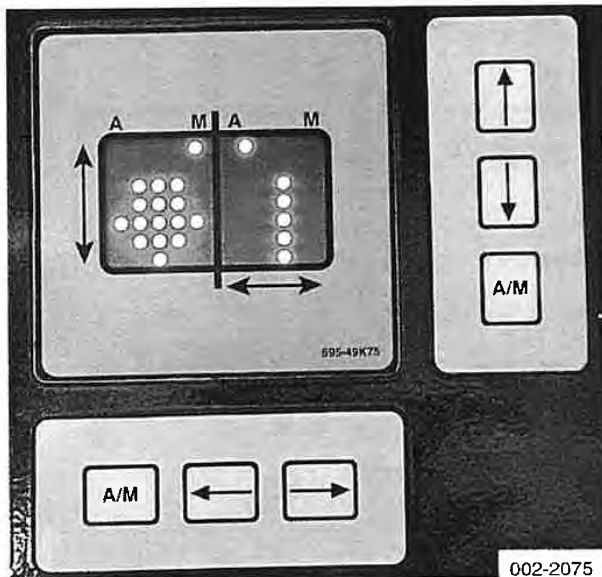
to the S2X will increase (from 2.5 volts), indicating that the right side of the machine must go down.

As the signal from the slope sensor is returned to the corresponding S2X controller, it is passed to the CAN network connection and routed to the Pancon controller in the main control box. The Pancon controller receives the slope sensor signal and processes the information. After processing is completed, the Pancon controller returns the appropriate response signal to the S2X controller through the CAN network connection. The S2X controller will then send a variable voltage signal to the corresponding servo valve, causing the slope control cylinder to extend or retract.

The slope setpoint switches are connected to the slope control loop to provide a means of adjusting the cross slope of the machine frame. With the slope setting at "0.0%" of slope, a signal is sent to the slope control loop, indicating that the machine frame must be level. The control loop receives a signal from the slope sensor indicating the present position of the machine frame. If the signal from the slope sensor does not match the slope setting signal, the appropriate S2X control loop sends a corrective signal to the appropriate servo valve, causing the slope controlled side of the machine to raise or lower until the slope sensor signal matches the slope setting signal in the control loop. The machine frame should be level, from side to side, at a 0.0% slope setting. If the slope setting is adjusted to 2% slope, a signal is sent to the slope control loop indicating a change is required. The control loop receives a signal from the slope sensor and if it does not match the slope setting signal, the S2X control loop sends a signal to the servo valve to raise or lower the slope side of the machine until the two signals match. The frame should be at the desired 2% slope after the correction is completed.

When an elevation or slope system is operating in the automatic mode, the network system measures the amount and direction of the signal from the sensor and conveys a corrective signal to the appropriate servo valve. The amount of servo valve spool movement is in proportion to the amount of corrective signal. The sensitivity setting on the control loop affects the input signal from the sensor and will change the amount of servo valve spool movement in relation to the amount of sensor movement. For example, with the sensitivity adjustment set with five (5) indicators showing, it may be necessary to move the elevation sensor wand 2 inches (50 mm) in either direction, or rotate the slope sensor approximately 6° (degrees), to get the maximum amount of servo valve spool movement.

However, with the sensitivity adjustment set with fifteen (15) indicators showing, it may be necessary to only move the sensor wand 1 inch (25 mm) in either direction, or rotate the slope sensor approximately 3° (degrees), to get the maximum amount of servo valve spool movement. The more the sensor moves off center, the faster the system will respond. The sensitivity has no affect on the manual operation of the system.



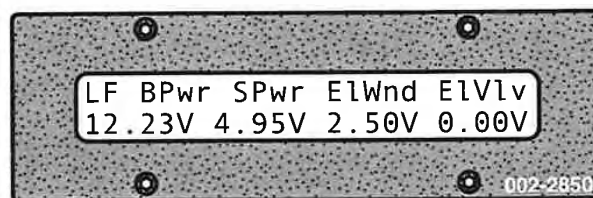
Corrective signal and null indicators

The LED indicators lights on the control loop will indicate the amount and direction of the signal from the sensor. When the lights are centered, it indicates that no correction is necessary to the system. When the LED lights form an arrow shape, it indicates a correction is required and it will remain off center until the necessary correction is made. The larger the arrow appears, the faster the system will respond. If the necessary correction is not made, the machine will continue to react until the cylinder is completely extended or retracted or until the "off stringline" feature is activated. When a jog switch is used for manual control, the servo valve spool shifts the full amount and remains there until the switch is released. The jog switches will not affect the LED meter. From the control loop, the corrective signal is sent out to the corresponding servo valve.

When the servo valve receives a corrective signal from the control loop, the spool in the servo valve will shift. The amount of servo valve spool movement will depend on the amount of corrective signal from the sensor and the sensitivity setting on the control loop. When the spool shifts, pressure oil is either routed to the piston (top) end of the elevation cylinder causing it

to extend, or to the rod (bottom) end of the cylinder causing it to retract. Return oil from the opposite side of the cylinder flows back through the servo valve to the reservoir. The more the valve spool is shifted, the faster the machine will raise or lower.

When the necessary correction has been made, the sensor signal is electrically centered, or "nulled" and a signal is sent to the control loop indicating the correction has been made. The control loop signal to the servo valve is stopped, which causes the spool to shift to the center position. This blocks the flow of oil to either end of the elevation cylinder, causing the machine to maintain its' elevation.



Elevation test display

When the test switch is depressed the main screen will indicate the test mode has been entered and depressing the LAST or NEXT switches will scroll through the test displays for each system. The main screen will change to reflect the voltage from the corresponding sensors. As the elevation sensor wand is moved, or the slope sensor is rotated, the reading on the main screen will vary around a centered voltage reading of "2.50V". The following table indicates the normal voltage range of each circuit displayed in the test mode.

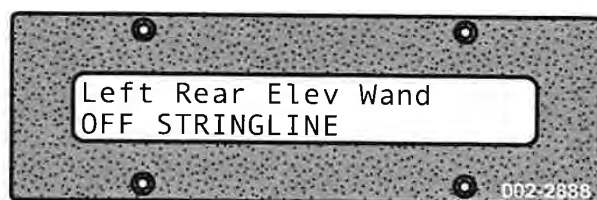
Circuit Voltage Range

Battery Power (BPwr) ..	9.0 to 16.0
Sensor Power (SPwr) ..	4.75 to 5.25
LED Power (LEDPwr) ..	4.75 to 5.25
Elevation Wand (ElWnd)	1.2 to 3.8
Steer Wand (StrWnd) ..	1.2 to 3.8
Slope sensor output	0.75 to 4.25
Feedback Pot (FdbkPot)	1.0 to 4.0
Elevation Valve (ElVlv)	0.0 to +/-4.10
Steer Valve (StrVlv)	0.0 to +/-4.10

If the sensor is not connected, the sensor reading will show approximately "0.00V". The arrow on the corresponding display will also move to center when the sensor is disconnected. To exit the test mode, depress the test switch. The system will return to the normal operating display.

Notice: To prevent damage to the network control system when working inside the main control box, a grounding strap should be connected between the machine frame and the person working on the system.

Symptom:



Off stringline display

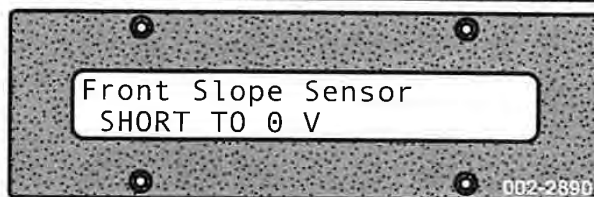
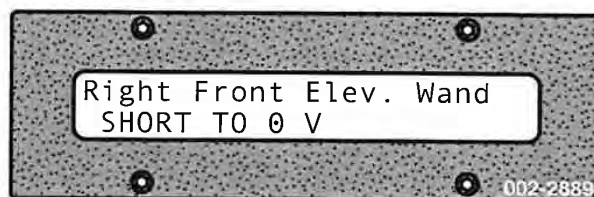
"Off Stringline" is displayed on the main screen.

Corrective Measures:

Determine which sensor is affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.

Elevation sensor wand is off the stringline. Place the wand under the stringline. If the wand is within the 1.5 to 3.5 volt operating range, the sensor will center the machine at 2.5 volts. When the sensor voltage reading is between 1.2 to 1.5 volts or 3.5 to 3.8 volts, the off stringline message is displayed and the network controller will not send a servo valve drive signal to the appropriate servo valve.

Symptom:

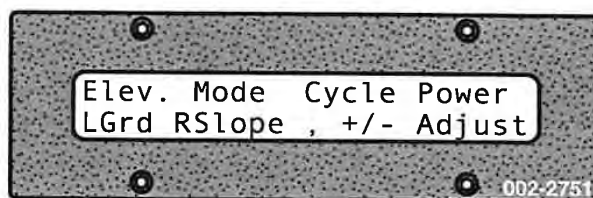


Elevation sensor fault

"Elevation Wand - Short to 0 V" or "Slope Sensor - Short to 0 V" is displayed on the main screen.

Corrective Measures:

Determine which sensor is affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.



Elevation mode display

1. The elevation mode is not selected properly for the current sensor setup of the machine. Depress the CALIB (calibrate) switch. Depress the NEXT/LAST switches until the elevation mode is selected on the main screen. Select the appropriate mode for the current setup configuration of the sensors (Left Grade/Right Slope, Right Grade/Left Slope, Dual Grade/Right Steer, Dual Grade/Left Steer).

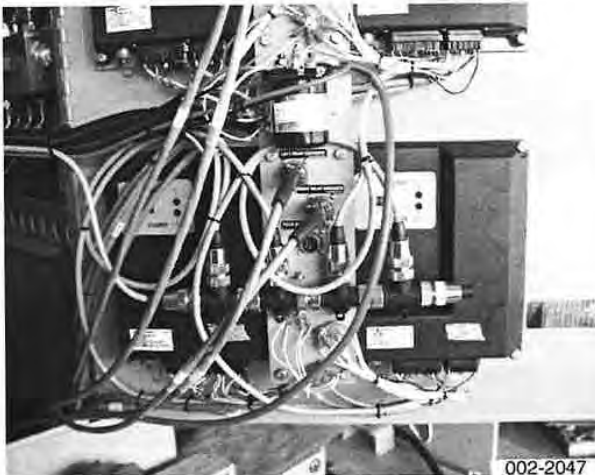


Rear wand select

2. Sensors are connected in wrong bulkheads on rear leg. Check the rear wand select screen under the CALIB (calibrate) switch. All three

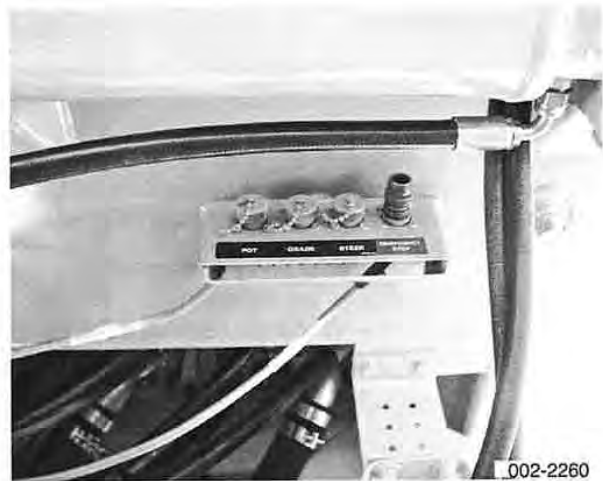
sensors (elevation, steer and pot) must be connected on the left or right bulkheads according to the display selection. This problem typically occurs on three track machines.

3. Sensor not connected or connected to wrong bulkhead. Connect the sensor to the appropriate bulkhead plug.
4. Defective sensor. Disconnect the cord from the sensor and connect it to a different sensor. If the system will now operate, the sensor is defective and must be replaced.
5. Defective sensor cable. If the system will not work after swapping the sensor, suspect the cable between the sensor and the bulkhead plug. Swap the cable between the sensor and the bulkhead plug with the cable from another sensor. If the system will now work, the cable is defective and must be repaired or replaced.



Swap frame cables

If the elevation system will not work it will be necessary to swap the frame cable on the front access door of the operators' console. If the troubleshooting display switches locations, the frame cable or the bulkhead circuit board is defective. Make certain sensors remain connected to the bulkhead circuit board.

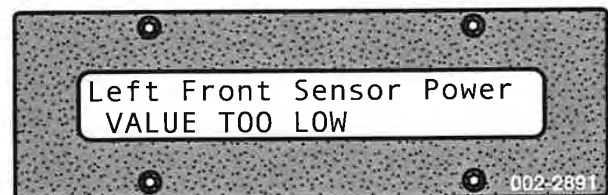


Swap bulkhead circuit boards

Remove the terminal connections on the rear of the suspect bulkhead circuit board and swap with one known to be good. Reconnect the sensors. If the troubleshooting display indicates the problem remained in the original location, the cable is defective and must be replaced. If the troubleshooting display indicates the problem switched to a different location, the bulkhead circuit board is defective and must be replaced.

6. Defective wiring between the bulkhead on the front access door and the S2X. Disconnect the J1 and J2 connectors from the suspect S2X. Remove the S2X from the access door and swap with one known to be good. If the problem remains in the same location, the wiring is defective. If the problem changes location, the S2X is defective. Repair or replace as necessary.

Symptom:



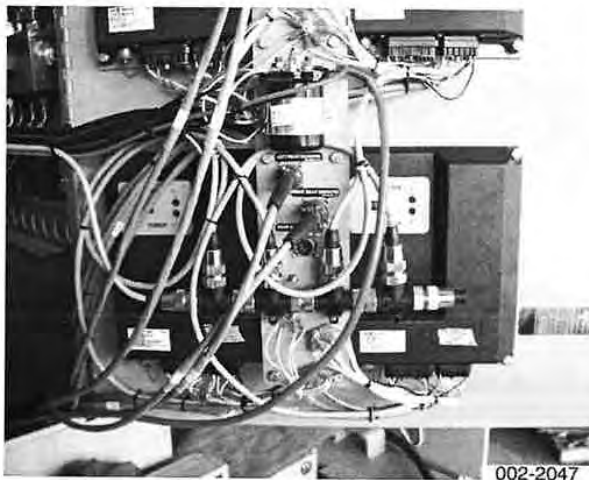
Sensor power failure

"Sensor Power - Value too low" is displayed on the main screen.

Corrective Measures:

If the sensor power supply voltage drops below 4.75 volts, the message "Sensor Power - Value too low" will appear on the main screen. This indicates a power short to ground which may occur in any of the components supplied with sensor power from an individual S2X. It is first necessary to narrow the area in which the power short is located.

Determine which sensors are affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.



Swap sensor cables

1. If the system does not operate, there may be defective wiring between the sensor bulkhead on the front access door to the sensors on the machine. The sensors affected on each leg include the steer sensor, elevation sensor and linear feedback pot in the steering cylinder. The slope sensor would be included in the troubleshooting on the right top (right front) and right bottom (right rear) S2X. To check, swap the cable bulkhead from the suspect area with one of the other bulkheads on the front access door. If the problem switches locations as indicated on the main screen, the short is located in the cable connections out to the sensors on the machine. The troubleshooting information in steps 2, 3 and 4 should be completed in the following paragraphs to eliminate the problem. Reconnect the cables in their original positions to continue.

If the sensor power failure remains in the same location after swapping the cable connections, the problem is located between the S2X and the sensor bulkhead on the front access door. The

troubleshooting information in steps 5 and 6 should be completed in the following paragraphs to eliminate the problem. Reconnect the cables in their original positions to continue.



Bulkhead circuit board

2. Defective frame cable or bulkhead circuit board. Turn the ignition switch off. Disconnect each of the sensor coil cables from the appropriate bulkhead circuit board under the machine frame. Turn the ignition switch on. If the main screen indicates "Sensor Power - Value too Low", then the short is located in the sensor frame cable or in the bulkhead circuit board. If "Sensor Power - Value too Low" is not indicated, skip to step 3.

Turn the ignition switch off. Remove the metal cover from the rear of the bulkhead circuit board mount bracket. Disconnect each of the terminal connections from the rear of the bulkhead circuit board. Turn the ignition switch on. If the main screen indicates "Sensor Power - Value too Low", then the short is located in the sensor frame cable. Replace the defective cable.

If the main screen does not indicate a sensor power failure, then the bulkhead circuit board is defective and must be replaced.

3. Defective sensor cable. Disconnect each of the sensor cables from the bulkhead under the machine frame. If the main screen does not indicate "Sensor Power - Value too Low", then the short is located in one of the sensor coil cables or in a sensor. Reconnect each coil cable one by one and recheck the main screen after each cable is connected. When the display indicates "Sensor Power - Value too Low", the short has returned to the system. Replace the

last coil cable connected to the system with one known to be good.

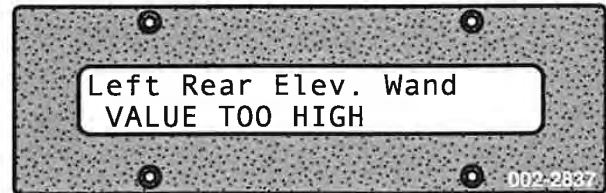
Note: An S2X provides power to 3 or 4 different sensors. Refer to the wiring diagrams for elevation and slope electrical as well as steering electrical to determine all sensors that could cause this power loss.

4. Defective sensor. If the problem still exists after replacing the sensor cable, the sensor may be defective. Swap the suspect sensor with a sensor known to be good. If the system now operates correctly, the sensor is defective. Repair or replace the defective sensor.
5. Defective S2X. Turn the ignition key off. Disconnect the appropriate J1 and J2 connectors from the S2X. Swap the suspect S2X with one of the units known to be good. Reconnect the J1 and J2 connectors. If the problem switches to a different location, the suspect S2X is defective and must be replaced.
6. Defective wiring between the S2X and the sensor bulkhead on the front access door. Check continuity between the appropriate sensor bulkhead and the J1 connector as follows:

J1-A1 Sensor BD pin A
 J1-A2 Sensor BD pin D
 J1-A3 Sensor BD pin C
 J1-D2 Sensor BD pin E
 J1-F2 Sensor BD pin B

There should be no continuity between pins, or from any pin to ground with the plug disconnected from the bottom of the S2X. If the readings are incorrect, the wiring must be repaired or replaced.

Symptom:



Elevation sensor failure

"Elevation Wand - Value too High" is displayed on the main screen.

Corrective Measures:

If the sensor signal voltage increases above 3.80 volts, the message "Elevation Wand - Value too High" will appear on the main screen. This indicates a power short between the sensor power supply and the sensor signal wiring has occurred. It is first necessary to narrow the area in which the power short is located.

Determine which sensors are affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.

1. Defective sensor cable or sensor. Disconnect the suspect sensor cable from the bulkhead under the machine frame. If the main screen indicates "Elevation wand - Short to 0 V" but does not indicate "Elevation wand - Value too High", then the short is located in the sensor coil cable or in a sensor. Swap the coil cable with one known to be good and recheck the main screen after the cable is connected. If the problem does not exist, the cable is defective and must be replaced. If the main screen indicates "Elevation wand - Value too High", the sensor is defective and must be replaced.
2. Defective sensor frame cable. If the main screen continues to indicate "Elevation wand - Value too High" after the sensor coil cable has been disconnected, the sensor frame cable may be defective. Swap the suspect sensor frame cable with one of the other frame cables known to be good. If the system now operates correctly, the sensor frame cable is defective. Repair or replace the defective frame cable.
3. Defective S2X. Turn the ignition key off. Disconnect the appropriate J1 and J2 connectors from the S2X. Swap the suspect S2X with one of the units known to be good. Reconnect the J1 and J2 connectors. If the

problem switches to a different location, the suspect S2X is defective and must be replaced.

4. Defective wiring between the S2X and the sensor bulkhead on the front access door. Check continuity between the appropriate sensor bulkhead and the J1 connector as follows:

J1-A1 Sensor BD pin A

J1-A2 Sensor BD pin D

J1-A3 Sensor BD pin C

J1-D2 Sensor BD pin E

J1-F2 Sensor BD pin B

There should be no continuity between pins, or from any pin to ground with the plug disconnected from the bottom of the S2X. If the readings are incorrect, the wiring must be repaired or replaced.

Symptom:



Elevation servo fault

"Elevation Servo Fault" is indicated on the main screen.

Corrective Measures:

Determine which servo is affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.

Isolate the problem, hydraulic versus electrical. The elevation servos are equipped with a manual override lever on the valve cover. Move the override lever both directions from center. If the machine does not respond to the override lever, the problem is in the hydraulic system. Refer to Troubleshooting the Lift and Steer Hydraulic Circuits for procedures to follow. Depress one of the jog switches on the control loop of the affected system. If the message "Servo Fault" appears on the main screen, it is an indication of a bad

coil on the servo valve, defective wiring between the corresponding S2X and the valve, or a defective S2X controller. Proceed as follows.

1. Bad coil in the servo valve. Disconnect the leads from the suspected primary coil on the servo valve and connect them to the unused secondary leads on the same servo valve. Depress the jog switch for the suspected system and observe the message on the main screen. If the system operates and the message "Elevation Servo Fault" does not appear, the primary valve coil is defective. The valve coil can be checked with an ohms meter. Check at the valve terminals (with the leads disconnected) for 15.5 ohms on the primary coil and 19.5 ohms on the secondary coil. To determine which coil is which, look at the point where the wires exit the valve (manual override lever up). The wires on the right are for the primary coil and the wires on the left are for the secondary coil. If the resistance readings are incorrect, the servo valve must be repaired or replaced.

Note: The leads for automatic elevation control connected to the primary coil may be connected to the secondary coil to continue operation.

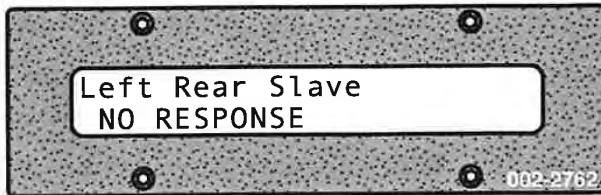
2. Defective wiring between the S2X controller and the connectors on the servo valve. Disconnect the J1 connector from the bottom of the corresponding S2X and check the continuity of the wiring between the J1 connector and the corresponding elevation servo as follows.

J1--J1 Black wire

J1-J3 White wire

If continuity does not exist, repair or replace the wiring as necessary.

3. Defective S2X controller. Turn the ignition key off. Disconnect the J1 and J2 connectors from the suspect S2X controller. Swap the controller with one of the other S2X controllers and reconnect the J1 and J2 connectors. Restart the network controller. If the main screen indicates that the servo fault is in a different location than previously noted, the S2X controller is defective and must be replaced.

Symptom:


S2X controller failure

"Slave - No Response" is indicated on the main screen.

Corrective Measures:

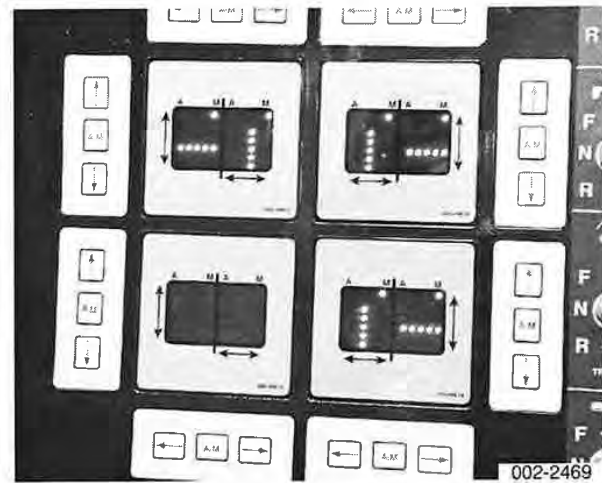
This display indicates that the corresponding S2X controller is not communicating with the Pancon controller (main control box) or with any of the other S2X controllers on the front access door. To check, swap the suspect S2X controller with one that is known to be good. If the problem switches to a different location corresponding with the suspect S2X controller, the S2X is defective and must be replaced. If the problem remains in the same location after switching the S2X controllers, the CAN network connection should be checked for continuity. Make certain that the S2X controller is supplied with a good 12 volt power source and a good ground connection.

Symptom:

No automatic control.

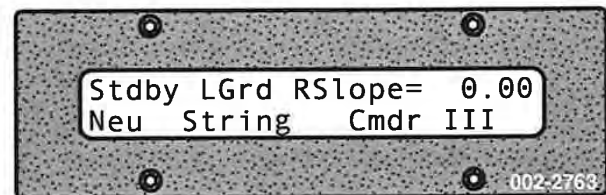
Corrective Measures:

Determine if the problem affects both the manual control as well as the automatic control by checking the operation of the system with the jog switches. If the system will not respond with the jog switches, refer to the preceding symptom. If the system will respond in manual, but not in automatic, proceed as follows.



Manual control loop mode

1. Control loop in the "manual" mode. Place the loop in the "auto" mode by depressing the A/M switch.

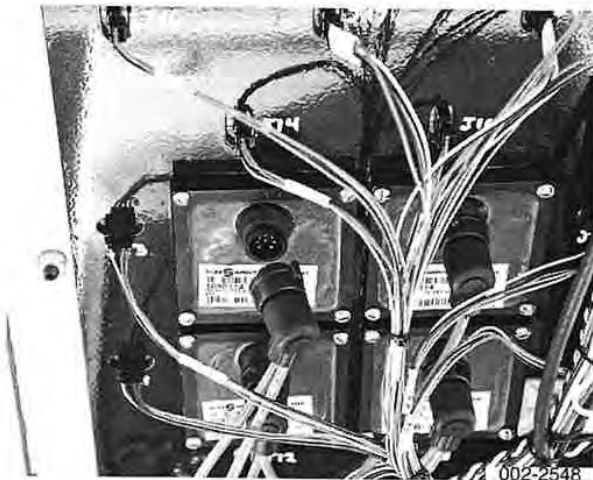


Standby mode

2. Main screen indicates "Stdby". Depress the run/standby switch to indicate the "run" mode.

Symptom:

The main screen or one of the individual LED meter displays is fogged under the screen.

Corrective Measures:


LED display replacement

Although this does not hinder the operation of the network system, the display should be replaced to prevent moisture from entering the control box. To replace the display, open the control box and remove the locking connector from the rear of the appropriate display. Loosen and remove the four screws from the corners of the display. It may be necessary to pry the display from the control box enclosure to break the silicone sealer. Thoroughly clean the area around the opening to remove all foreign material and excess silicone sealant. Place a small bead of silicone sealant around the new LED display unit and insert the unit in the proper orientation as compared to the existing displays. Insert and tighten each of the screws securely. Reattach the locking connector.



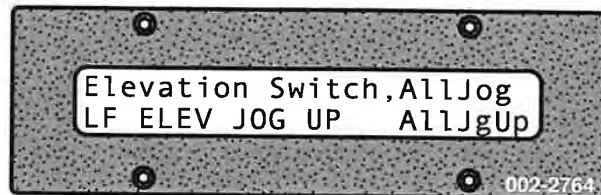
Main screen replacement

Although this does not hinder the operation of the network system, the main screen should be replaced

to prevent moisture from entering the control box. To replace the display, open the control box and remove the locking connector from the rear of the main screen. Loosen and remove the four screws from the front of the display. It may be necessary to pry the display from the control box enclosure to loosen the gasket seals. Thoroughly clean the area around the opening to remove all foreign material and gasket. Place two gasket seals around the new main screen unit and insert the unit in the proper orientation as compared to the previous display. Insert and tighten each of the screws evenly. Do not over tighten the screws as this will cause the display frame to distort and improper sealing of the gasket material may occur. Reattach the locking connector.

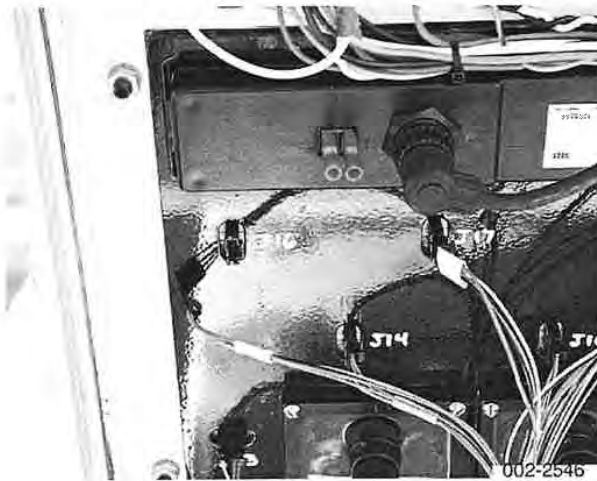
Symptom:

One or all of the switches in a switch pack does not operate.

Corrective Measures:


Service mode for testing switches

Depress the service switch under the service panel. Depress the NEXT/LAST switches to scroll to the appropriate switch test mode. Depress the defective switches. If a switch is activated and no function is displayed, the switch may be defective. Open the control panel and check for any pinched wiring to the switch pack. If no pinched wiring is visible, disconnect the suspect switches and swap connectors with another switch pack known to be good. If the switches will not operate, the switch pack is defective and must be replaced.



Switch pack replacement

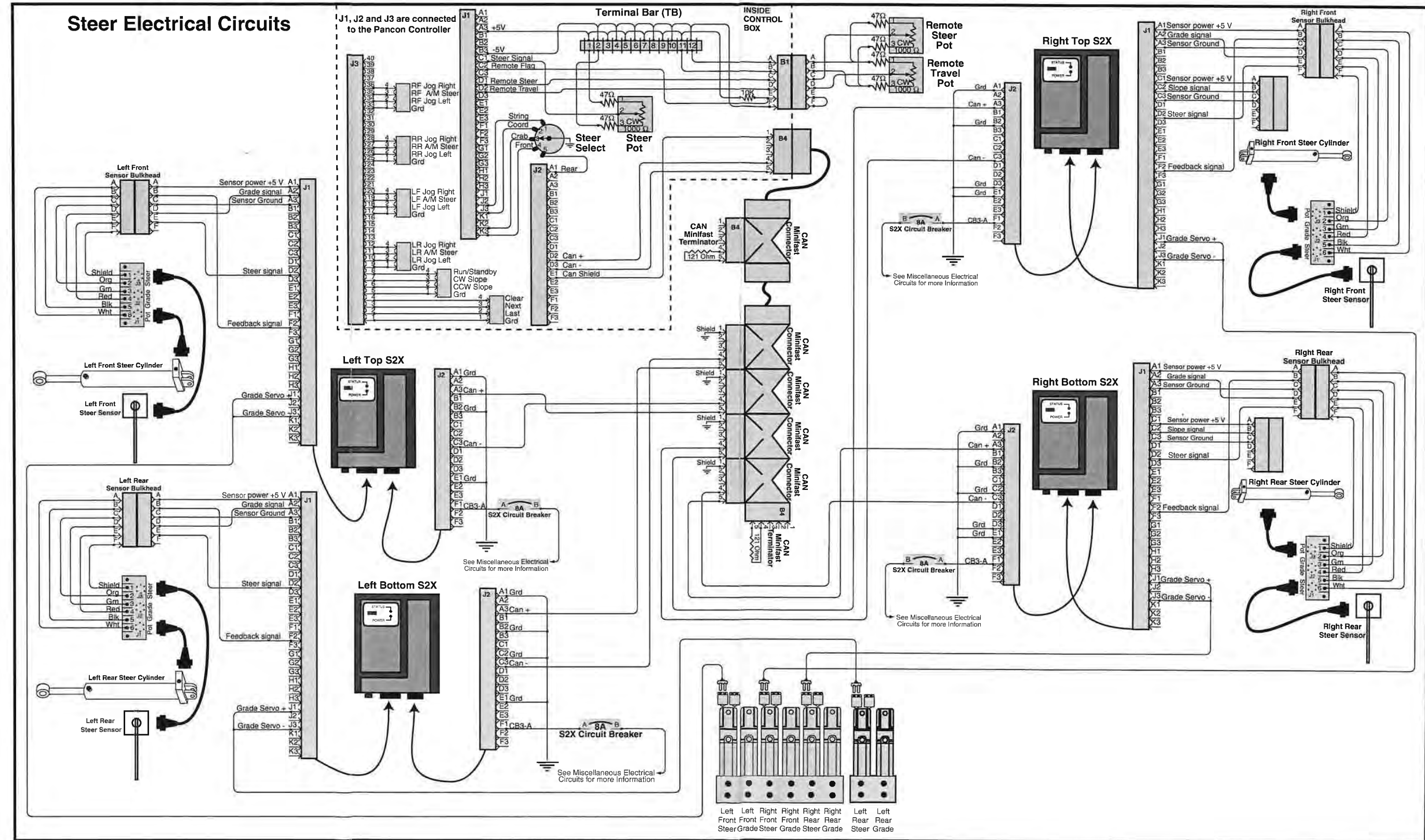
To replace the switch pack, open the control box and disconnect the wiring to the defective switch pack. Using a flat blade screw driver, place the screwdriver in the hole behind the switch pack to be removed. Support the face of the control box cover around the switch pack and strike the screw driver forcefully to dislodge the switch pack from the control panel. Peel the protective backing from the rear of the new switch pack. Place the switch pack in the proper orientation and press the switch pack firmly into position. Connect the wiring to the switch pack and close the control box. Secure the control panel. Attach the appropriate switch pack decal to the front of the new switches.



Commander III

8-102

Network Steer Electrical Drawing



20 Network Steer Electrical

The front and rear steer control systems are responsible for maintaining the correct distance between the finished product and the guideline. Each steering system consists of a sensor, a feedback pot, a servo valve and a control loop on a S2X controller which is networked to the other S2X controllers on the machine, including the Pancon controller in the control box. The side of the machine controlled by the steer sensors is determined by which side the sensors are plugged into and by the setup parameters determined by the machine's operator. To set the parameters, the operator must depress the CALIB (calibrate) switch. Depressing and releasing the NEXT switch will select the elevation mode on the main screen. The elevation mode is used to designate the type of sensor control the machine will be using for a particular job situation. Depressing and releasing the +/- switches will scroll through the elevation mode settings available (left grade/right slope, right grade/left slope, dual grade/right steer, left steer/dual grade). When the appropriate mode is selected, it will be necessary to restart the network controller to allow operation of the new parameter.

The Network controller must be in the "run" mode to operate the steering control systems in the automatic mode. The steer mode select switch on the smart steer panel must be in the "string steer" position. From each S2X, power (+5 volts) is supplied to the steering sensor and feedback pot from the J1 connector on pin A1. A common ground is supplied to the sensors from the J1 connector on pin A3. The power supply and ground connections are routed through the sensor bulkhead on the front access door and continue to the bulkhead circuit board located remotely on the machine frame. The circuit board distributes the common power supply to pin A in each of the three sensor bulkheads (grade, steer and pot). The circuit board also distributes the common ground connection to pin C in each of the three sensor bulkheads (grade, steer and pot). When the sensor is connected to the appropriate bulkhead, it receives +5.0 volt power from pin A and a ground connection from pin C.

The sensor has a wand attached to its' shaft, which is held against the guideline by spring tension. As the machine frame moves left or right, in relation to the guideline, the wand causes the sensor shaft to rotate. As the shaft rotates, a corrective signal is sent to the corresponding S2X control loop. The sensor works within a voltage range of 1.2 volts to 3.8 volts.

When the sensor wand position, in the Calibrate mode, is selected as "push" and the sensor wand is rotated

towards the guideline, the voltage signal to the S2X will decrease (from 2.5 volts), indicating that the machine must turn left. As the sensor wand is rotated away from the guideline, the voltage signal to the S2X will increase (from 2.5 volts), indicating that the machine must turn right.

When the sensor wand position, in the Calibrate mode, is selected as "pull" and the sensor wand is rotated towards the guideline, the voltage signal to the S2X will increase (from 2.5 volts), indicating that the machine must turn left. As the sensor wand is rotated away from the guideline, the voltage signal to the S2X will decrease (from 2.5 volts), indicating that the machine must turn right.

With the sensor wand centered between the roll pin stops, a 2.5 volt signal (center) is returned to the S2X through pin "B" in the sensor cable. It is routed to the bulkhead circuit board where the individual sensor signals must remain separated. The following color code indicates the color and type of signal for each wire exiting the bulkhead circuit board.

White wire	+5.0 volts supply
Black wire	Feedback pot signal
Orange wire	Ground connection
Red wire	Elevation sensor signal
Green wire	Steer sensor signal
Shield wire	Frame ground



Smart steer cylinder

The smart steer cylinder feedback pot on each track is used to control how far the track will turn for a given sensor movement. Without the feedback pot, the track would turn the maximum amount if the machine travel were stopped with the sensor sending a very small amount of corrective signal to the control loop. The control system sends a corrective signal to the servo valve, where the spool shifts a small amount, causing the track to turn. Without the feedback pot, the sensor must return to center before the necessary correction can be accomplished in the opposite direction. Since the machine must be moving for the sensor wand to return to center, the servo valve spool will remain in the shifted position, causing the track to turn completely, over-steering the system. The feedback pot measures the position of the track and sends a continuous signal to the S2X, indicating the track position. The steer signal and the feedback pot signal are passed to the CAN network where the information reaches the Pancon controller. When the steer sensor signal to the S2X indicates a turn of 1 in. (2.5 cm) to the left is necessary, the Pancon controller compares the signal from the steer sensor with the signal from the feedback pot. If the signal from the feedback pot indicates that the track is straight ahead, the two signals will not match and the Pancon controller will send a corrective signal to the appropriate S2X. The S2X will produce a signal to the servo valve to turn the track left. The deviation meter will indicate that the two signals do not match and that a correction is being called for. When the track has turned 1 in. (2.5 cm) to the left, the feedback pot signal to the S2X indicates that the track has turned. The signal from the feedback pot and the sensor now match and the Pancon controller will stop the corrective signal to the appropriate S2X causing the servo valve spool to move to center and the track will stop turning. The deviation meter will indicate that the two signals are

matched by returning to center. The track is held in this position until the sensor wand is moved, indicating that the track must now turn to a new position.

When the steering system is operating in the automatic mode, the network controller measures the amount and direction of the signal from the steer sensor and conveys a corrective signal to the appropriate servo valve. The amount of servo valve spool movement is in proportion to the amount of corrective signal. The sensitivity setting on the control loop affects the input signal from the sensor and will change the amount of servo valve spool movement in relation to the amount of sensor movement. For example, with the sensitivity adjustment set with three (3) indicators showing, it may be necessary to move the steering sensor wand 2 in. (50 mm) at midpoint on the wand in either direction to get the maximum amount of servo valve spool movement. However, with the sensitivity adjustment set with fifteen (15) indicators showing, it may be necessary to only move the sensor wand 1 in. (25 mm) at midpoint on the wand in either direction to get the maximum amount of servo valve spool movement. The more the sensor moves off center, the faster the system will respond. The sensitivity has no effect on the manual operation of the system.

An LED position indicator is used to show steering error and elevation error. A centered signal from the steering or elevation sensor is indicated by a straight line of LED indicator lights. As a sensor signal error occurs, an arrow will indicate the amount of signal error. As the arrow increases in size, it corresponds to the amount of signal error that the sensor is outputting. If the necessary correction is not made, the track will continue to turn until the track is completely turned. When a jog switch is used for manual control, the servo valve spool shifts the full amount and remains there until the switch is released and allowed to return to center. The jog switches will not affect the LED position indicator. From the S2X, the corrective signal is sent out to the corresponding servo valve.

The sensor must control the leading edge of the tracks in forward or reverse. When the forward/reverse switch on the smart steer panel is in "forward", the sensor controls the front portion of the tracks. When a left turn is necessary, the servo valve spool shifts, causing the front of the tracks to turn to the left. When the forward/reverse steer switch is in the "reverse" position, the output drive to the steering servo valve is reversed. Now, when a left turn is necessary, the servo valve spool shifts, causing the rear of the tracks to turn to the left.

Manual Steer Operation: The smart steer control system (manual steering) is used for steering the tracks when driving the machine around the jobsite. The smart steer system consists of a five position steer mode select switch and a steering control dial.



Steer mode select switch

The five position steer mode select switch is used to select the automatic steering mode or one of four manual steering modes. The "string steer" mode is selected when steering is to be controlled by the steering sensors or by the jog switches. When the system is set to one of the four manual steer modes, all tracks will turn in proportion to the manual steer knob, in the same way as they turn in proportion to the sensors.

When the steer mode select switch is in the "coordinated steer" position, the steering control knob will control the turning of the tracks. When the knob is in the center position, the tracks will be straight ahead. If the knob is turned left or right from the center position, the leading tracks will turn in the corresponding direction and the trailing tracks will turn in the opposite direction to give minimum turning radius. The more the knob is turned in either direction, the more the tracks will turn.

When the steer mode select switch is in the "crab steer" position, the steering control knob will control the turning of the tracks. When the knob is in the center position, the tracks will be straight ahead. If the knob is turned left or right from the center position, all tracks will turn in the corresponding direction, to walk the machine to the side. The more the knob is turned in either direction, the more the tracks will turn.

When the steer mode select switch is in the "front steer only" position, the steering control knob will control the turning of the two front tracks and the rear tracks will be locked straight ahead. When the knob is in the center position, the front tracks will be straight ahead. If the knob is turned left or right from the center position, the two front tracks will turn in the corresponding direction and the rear tracks will remain

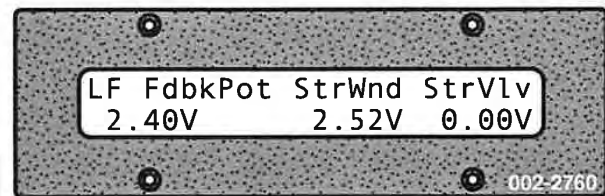
straight ahead. The more the knob is turned in either direction, the more the tracks will turn.

When the steer mode select switch is in the "rear steer only" position, the steering control knob will control the turning of the rear tracks and the two front tracks will be locked straight ahead. When the knob is in the center position, the rear tracks will be straight ahead. If the knob is turned left or right from the center position, the rear tracks will turn in the corresponding direction and the two front tracks will remain straight ahead. The more the knob is turned in either direction, the more the tracks will turn.



Manual steer knob

The manual steer knob is used to turn the tracks in any of the four manual modes. When the indicator on the knob is centered the tracks will be straight ahead. As the knob is turned either direction from center, the tracks will turn accordingly. The more the knob is turned, the more the tracks will turn. The manual steer knob has no effect on the steering when the steer mode select switch is in the "string steer" position.



Steer test display

When the test switch is depressed the main screen will indicate the test mode has been entered and depressing the LAST or NEXT switches will scroll through the test displays for each system. The main screen will change to reflect the voltage from the corresponding sensors. As the steer sensor wand is moved, or the smart steer cylinder is extended or retracted, the reading on the main screen will vary around a centered voltage reading of "2.50V". The following table indicates the normal voltage range of each circuit displayed in the test mode.

Circuit Voltage Range

Battery Power (BPwr) .. 9.0 to 16.0

Sensor Power (SPwr) .. 4.75 to 5.25

LED Power (LEDPwr) .. 4.75 to 5.25

Elevation Wand (EIWnd) 1.2 to 3.8

Steer Wand (StrWnd) .. 1.2 to 3.8

Slope sensor output..... 0.75 to 4.25

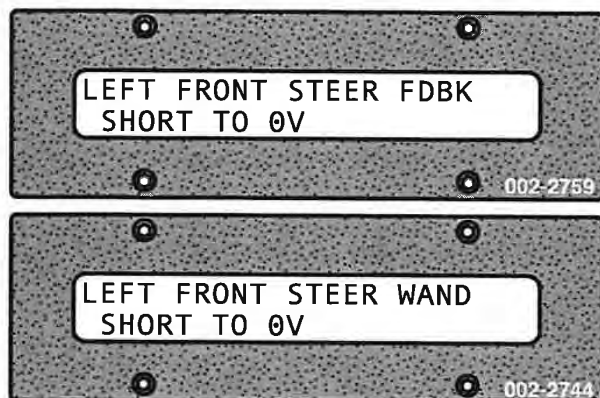
Feedback Pot (FdbkPot) 1.0 to 4.0

Elevation Valve (EIVlv) 0.0 to +/-4.10

Steer Valve (StrVlv) 0.0 to +/-4.10

If the sensor is not connected, the sensor reading will show approximately "0.00V". The arrow on the corresponding display will also move to center when the sensor is disconnected. To exit the test mode, depress the test switch. The system will return to the normal operating display.

Notice: To prevent damage to the network control system when working inside the main control box, a grounding strap should be connected between the machine frame and the person working on the system.

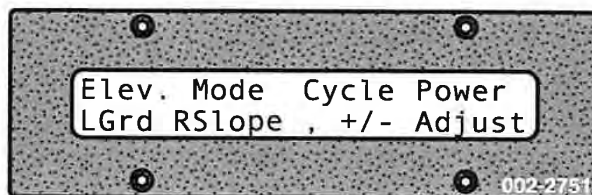
Symptom:


Steer sensor fault

"Steer Feedback- Short to 0 V" or "Steer Sensor - Short to 0 V" is displayed on the main screen.

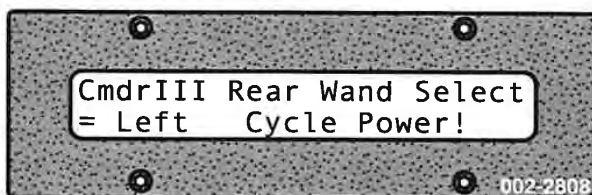
Corrective Measures:

Determine which sensor is affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.



Elevation mode display

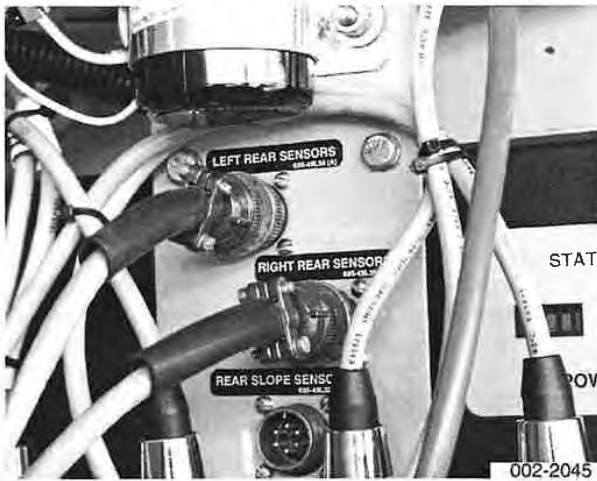
1. The elevation mode is not selected properly for the current sensor setup of the machine. Depress the CALIB (calibrate) switch. Depress the NEXT/LAST switches until the elevation mode is selected on the main screen. Select the appropriate mode for the current setup configuration of the sensors (Left Grade/Right Slope, Right Grade/Left Slope, Dual Grade/Right Steer, Dual Grade/Left Steer).



Rear wand select

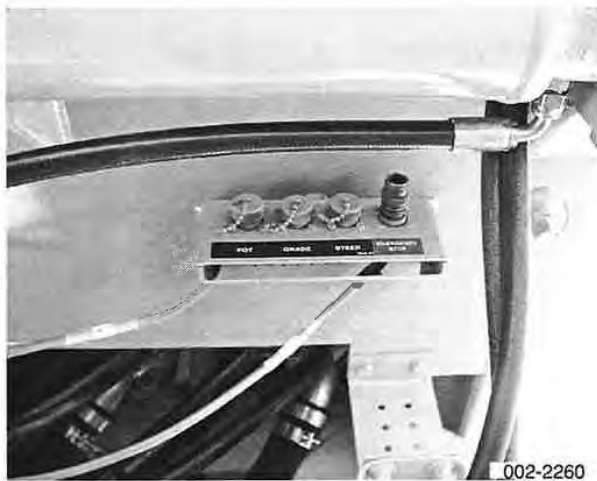
2. Sensors are connected in wrong bulkheads on rear leg. Check the rear wand select screen under the CALIB (calibrate) switch. All three sensors (elevation, steer and pot) must be connected on the left or right bulkheads according to the display selection. This problem typically occurs on three track machines.
3. Sensor not connected or not connected to the correct side of the machine. Connect the sensor to the appropriate bulkhead plug.
4. Defective sensor. If the sensor is connected and the display "Steer Wand - Short to 0 V" or "Steer Fdbk - Short to 0V" for the corresponding system is displayed on the main screen, the sensor or feedback pot may be defective. Disconnect the cord from the sensor or smart steer cylinder and connect it to a different sensor or steer cylinder. If the system will now operate, the sensor is defective and must be replaced.

5. Defective sensor cable. If the system will not work after swapping the sensor or cylinder, suspect the cable between the sensor and the bulkhead circuit board. Swap the cable between the sensor or cylinder and the bulkhead plug with the cable from another sensor or cylinder. If the system will now work, the cable is defective and must be repaired or replaced.



Swap frame cables

If the steer system will not work it will be necessary to swap the frame cable on the front access door of the operators' console. If the troubleshooting display switches locations, the frame cable or the bulkhead circuit board is defective. Make certain sensors remain connected to the bulkhead circuit board prior to swapping the cables at the access door.



Swap bulkhead circuit boards

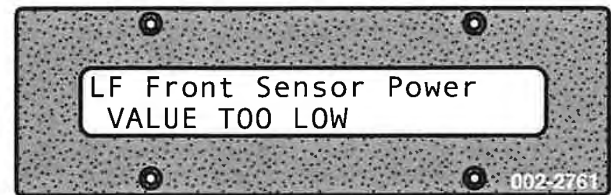
Remove the terminal connections on the rear of the suspect bulkhead circuit board and swap

with one known to be good. Reconnect the sensors. If the troubleshooting display indicates the problem remained in the original location, the cable is defective and must be replaced. If the troubleshooting display indicates the problem switched to a different location, the bulkhead circuit board is defective and must be replaced.

Note: Make certain that the wiring colors are returned to the correct terminals on the rear of the bulkhead circuit board.

6. Defective wiring between the bulkhead on the front access door and the S2X. Disconnect the J1 and J2 connectors from the suspect S2X. Remove the S2X from the access door and swap with one known to be good. If the problem remains in the same location, the wiring is defective. If the problem changes location, the S2X is defective. Repair or replace as necessary.

Symptom:



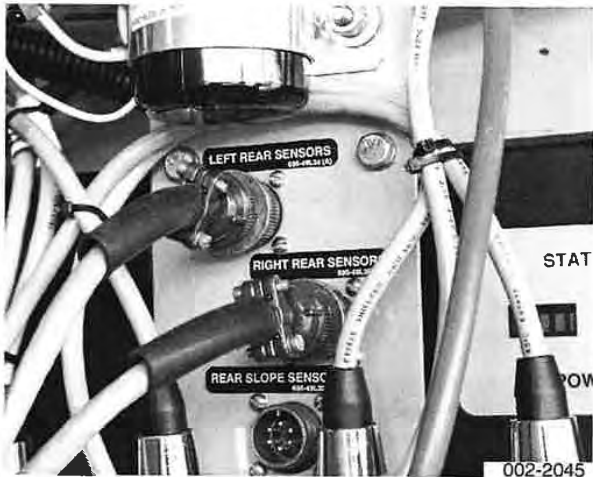
Sensor power failure

"Sensor Power - Value too low" is displayed on the main screen.

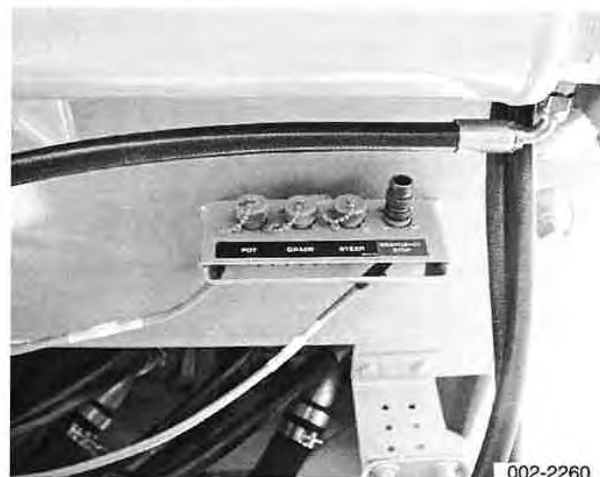
Corrective Measures:

If the sensor power supply voltage drops below 4.75 volts, the message "Sensor Power - Value too low" will appear on the main screen. This indicates a power short to ground which may occur in any of the components supplied with 5.00V sensor power from an individual S2X. It is first necessary to narrow the area in which the power short is located.

Determine which sensors are affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.



Swap sensor cables



Bulkhead circuit board

1. Defective cable to one or all sensors from an individual S2X. The sensors affected on each leg include the steer sensor, elevation sensor and linear feedback pot in the steering cylinder. The slope sensor would be included in the troubleshooting on the right top (right front) and right bottom (right rear) S2X. To narrow the defect to a smaller area, swap the cable bulkhead from the suspect area with one of the other bulkheads on the console front access door. If the problem switches locations as indicated on the main screen, the short is located in the cable connections out to the sensors on the machine. The troubleshooting information in steps 2, 3 and 4 should be completed in the following paragraphs to eliminate the problem. Reconnect the cables in their original positions to continue.

Note: If the right top or right bottom S2X's are suspect, swap the slope sensor cable on the front access door in addition to the sensor bulkhead cable.

If the sensor power failure remains in the same location after swapping the cable connections, the problem is located between the suspect S2X and the sensor bulkhead on the front access door. The troubleshooting information in steps 5 and 6 should be completed in the following paragraphs to eliminate the problem. Reconnect the cables in their original positions to continue.

2. Defective frame cable or bulkhead circuit board. Turn the ignition switch off. Disconnect each of the sensor coil cables from the appropriate bulkhead circuit board under the machine frame. Turn the ignition switch on. If the main screen indicates "Sensor Power - Value too Low", then the short is located in the sensor frame cable or in the bulkhead circuit board. If "Sensor Power - Value too Low" is not indicated, skip to step 3.

Turn the ignition switch off. Remove the metal cover from the rear of the bulkhead circuit board mount bracket. Disconnect each of the terminal connections from the rear of the bulkhead circuit board. Turn the ignition switch on. If the main screen indicates "Sensor Power - Value too Low", then the short is located in the sensor frame cable. Replace the defective cable.

If the main screen does not indicate a sensor power failure, then the bulkhead circuit board is defective and must be replaced.

3. Defective sensor cable. Disconnect each of the sensor cables from the suspect bulkhead under the machine frame. If the main screen does not indicate "Sensor Power - Value too Low", then the short is located in one of the sensor coil cables or in a sensor. Reconnect each coil cable one by one and recheck the main screen after each cable is connected. When the display indicates "Sensor Power - Value too Low", the short has returned to the system. Replace the last coil cable connected to the system with one known to be good.

Note: An S2X provides power to 3 or 4 different sensors. Refer to the wiring diagrams for elevation and slope electrical as well as steering electrical to determine all sensors that could cause this power loss.

4. Defective sensor. If the problem still exists after replacing the sensor cable, the sensor may be defective. Swap the suspect sensor with a sensor known to be good. If the system now operates correctly, the sensor is defective. Repair or replace the defective sensor.



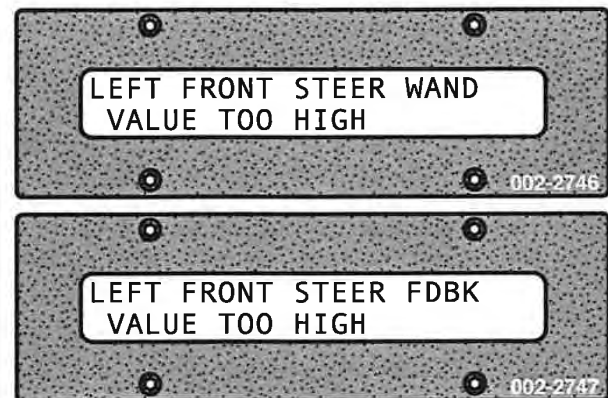
Swap S2X controllers

5. Defective S2X. Turn the ignition key off. Disconnect the appropriate J1 and J2 connectors from the suspect S2X. Swap the suspect S2X with one of the units known to be good. Reconnect the J1 and J2 connectors. If the problem switches to a different location, the suspect S2X is defective and must be replaced.
6. Defective wiring between the S2X and the sensor bulkhead on the front access door. Check continuity between the appropriate sensor bulkhead and the J1 connector as follows:

J1-A1	Sensor BD pin A
J1-A2	Sensor BD pin D
J1-A3	Sensor BD pin C
J1-D2	Sensor BD pin E
J1-F2	Sensor BD pin B

There should be no continuity between pins, or from any pin to ground with the plug disconnected from the bottom of the S2X. If the readings are incorrect, the wiring must be repaired or replaced.

Symptom:



Steer signal failure-Value too high

"Steer Wand - Value too High" or "Steer Feedback - Value too High" is displayed on the main screen.

Corrective Measures:

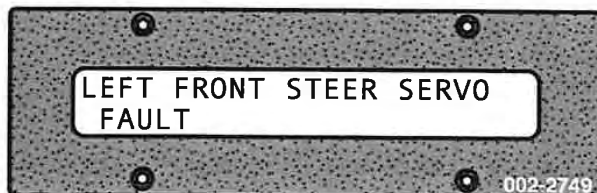
If the sensor or the feedback pot signal voltage increases above 3.80 volts, the message "Steer Wand - Value too High" or "Steer Feedback - Value too High" will appear on the main screen. This indicates a power short between the sensor power supply and the sensor signal wiring has occurred. It is first necessary to narrow the area in which the power short is located.

Determine which sensors are affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.

1. Defective sensor cable or sensor. Disconnect the suspect sensor cable from the bulkhead under the machine frame. If the main screen indicates "Steer Wand - Short to 0 V" but does

not indicate "Steer Wand - Value too High", then the short is located in the sensor coil cable or in a sensor. Swap the coil cable with one known to be good and recheck the main screen after the cable is connected. If the problem does not exist, the cable is defective and must be replaced. If the main screen indicates "Steer Wand - Value too High", the sensor is defective and must be replaced.

2. Defective sensor frame cable or bulkhead circuit board. If the main screen continues to indicate "Steer Wand - Value too High" after the sensor coil cable has been disconnected, the sensor frame cable may be defective. Disconnect the suspect sensor frame cable from the bulkhead plug on the front access door. If the system indicates "Steer Wand - Short to 0 V" but does not indicate "Steer Wand - Value too High", then the short is located in the sensor frame cable or the bulkhead circuit board. Disconnect and remove the wiring from the terminals on the rear of the suspect bulkhead circuit board. Make certain the individual wires do not touch each other or the machine frame. If the main screen indicates "Steer Wand - Value too High", the frame cable must be repaired or replaced. If the main screen indicates "Steer Wand - Short to 0V", the bulkhead circuit board is defective and must be replaced.
3. Defective S2X. Turn the ignition key off. Disconnect the appropriate J2 30 pin connector from the suspect S2X. If the main screen indicates "Steer Wand - Value too High", the S2X must be repaired or replaced. If the main screen indicates "Steer Wand - Short to 0V", the front access door wiring between the S2X and the sensor bulkheads is defective and must be repaired or replaced.

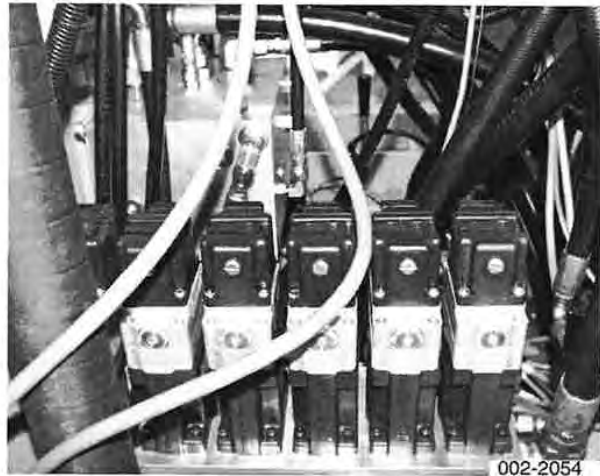
Symptom:


Steer servo fault

"Steer Servo Fault" is indicated on the main screen.

Corrective Measures:

Determine which servo is affected by the location indicated in the display message: Left Front, Right Front, Left Rear or Right Rear.



Servo valve manual overrides

Isolate the problem, hydraulic versus electrical. The steer servos are equipped with a manual override lever on the valve cover. Move the override lever both directions from center. If the machine does not respond to the override lever, the problem is in the hydraulic system. Refer to Troubleshooting the Lift and Steer Hydraulic Circuits for procedures to follow. Depress one of the jog switches on the control loop of the affected system. If the message "Steer Servo Fault" appears on the main screen, it is an indication of a bad coil on the servo valve, defective wiring between the corresponding S2X and the valve, or a defective S2X controller. Proceed as follows.

1. Bad coil in the servo valve. Disconnect the lead from the primary coil on the suspect servo valve and connect it to the unused secondary lead on the same servo valve. Depress the jog switch for the suspected system and observe the message on the main screen. If the system operates and the message "Steer Servo Fault" does not appear, the primary valve coil is defective. The valve coil can be checked with an ohms meter. Check at the valve terminals (with the leads disconnected) for 15.5 ohms on the primary coil and 19.5 ohms on the secondary coil. To determine which coil is which, look at the point where the wires exit the valve (manual override lever up). The wires on the right are for the primary coil and the wires on

the left are for the secondary coil. If the resistance readings are incorrect, the servo valve must be replaced.

Note: The leads for automatic elevation control connected to the primary coil may be connected to the secondary coil to continue operation.

2. Defective S2X controller. Turn the ignition key off. Disconnect the J1 and J2 connectors from the suspect S2X controller. Swap the controller with one of the other S2X controllers known to be good. Reconnect the J1 and J2 connectors. Restart the network controller. If the main screen indicates that the servo fault is in a different location than previously noted, the S2X controller is defective and must be replaced.
3. Defective wiring between the S2X controller and the connectors on the servo valve. Disconnect the J1 30 pin connector from the bottom of the corresponding S2X and check the continuity of the wiring between the J1 connector and the corresponding elevation servo as follows.

J1--J1 Black wire

J1-J3 White wire

If continuity does not exist, repair or replace the wiring as necessary.

Symptom:



S2X controller failure

"Slave - No Response" is indicated on the main screen.

Corrective Measures:

This display indicates that the corresponding S2X controller is not communicating with the Pancon controller (main control box) or with any of the other S2X controllers on the front access door. To check, swap the suspect S2X controller with one that is known to be good. If the problem switches to a different location corresponding with the suspect S2X controller, the S2X is defective and must be replaced.

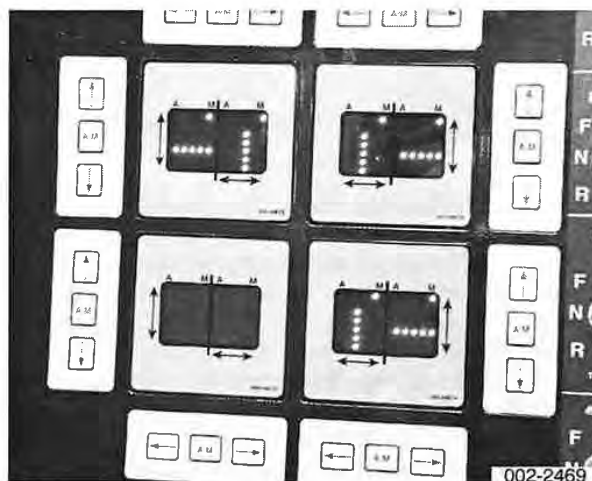
If the problem remains in the same location after switching the S2X controllers, the CAN network connection should be checked for continuity. Make certain that the S2X controller is supplied with a good 12 volt power source and a good ground connection.

Symptom:

No automatic control.

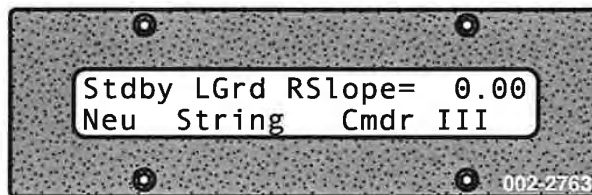
Corrective Measures:

Determine if the problem affects both the manual control as well as the automatic control by checking the operation of the system with the jog switches. If the system will not respond with the jog switches, refer to the preceding symptom. If the system will respond in manual, but not in automatic, proceed as follows.



Manual control loop mode

1. Control loop in the "manual" mode. Place the loop in the "auto" mode by depressing the A/M switch.

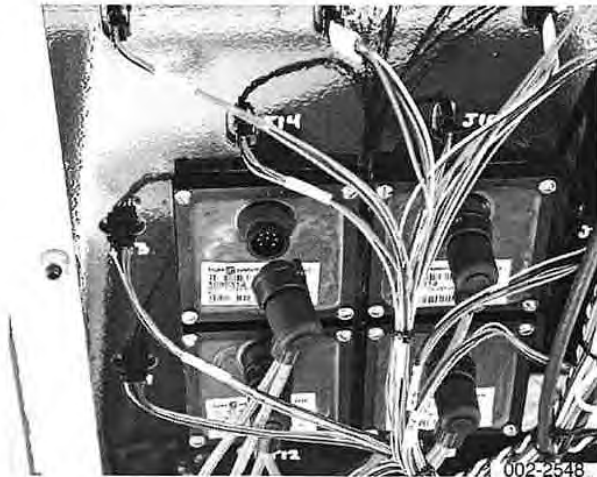


Standby mode

2. Main screen indicates "Stdby". Depress the run/standby switch to indicate the "run" mode.

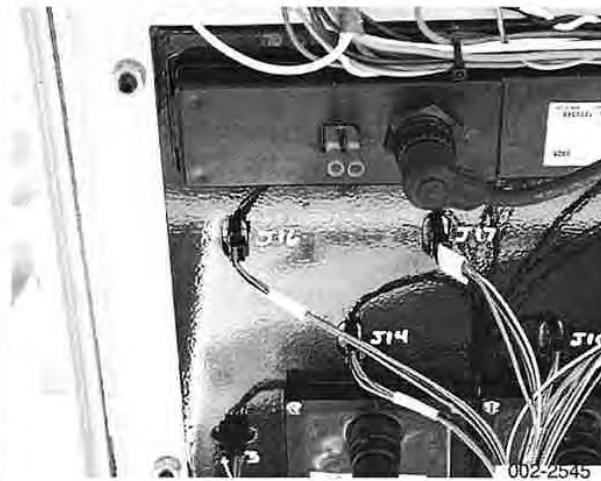
Symptom:

The main screen or one of the individual LED meter displays is fogged under the screen.

Corrective Measures:


LED display replacement

Although this does not hinder the operation of the network system, the display should be replaced to prevent moisture from entering the control box. To replace the display, open the control box and remove the locking connector from the rear of the appropriate display. Loosen and remove the four screws from the corners of the display. It may be necessary to pry the display from the control box enclosure to break the silicone sealer. Thoroughly clean the area around the opening to remove all foreign material and excess silicone sealant. Place a small bead of silicone sealant around the new LED display unit and insert the unit in the proper orientation as compared to the existing displays. Insert and tighten each of the screws securely. Reattach the locking connector.

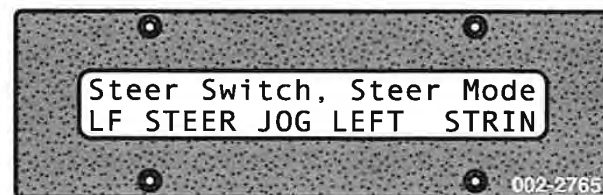


Main screen replacement

Although this does not hinder the operation of the network system, the main screen should be replaced to prevent moisture from entering the control box. To replace the display, open the control box and remove the locking connector from the rear of the main screen. Loosen and remove the four screws from the front of the display. It may be necessary to pry the display from the control box enclosure to loosen the gasket seals. Thoroughly clean the area around the opening to remove all foreign material and gasket. Place two gasket seals around the new main screen unit and insert the unit in the proper orientation as compared to the previous display. Insert and tighten each of the screws evenly. Do not over tighten the screws as this will cause the display frame to distort and improper sealing of the gasket material may occur. Reattach the locking connector.

Symptom:

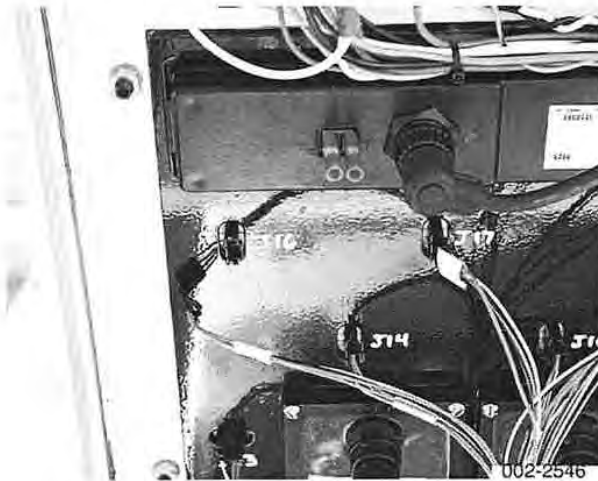
One or all of the switches in a switch pack does not operate.

Corrective Measures:


Service mode for testing switches

Depress the service switch under the service panel. Depress the NEXT/LAST switches to scroll to the appropriate switch test mode. Depress the defective switches. If a switch is activated and no function is

displayed, the switch may be defective. Open the control panel and check for any pinched wiring to the switch pack. If no pinched wiring is visible, disconnect the suspect switches and swap connectors with another switch pack known to be good. If the switches will not operate, the switch pack is defective and must be replaced.



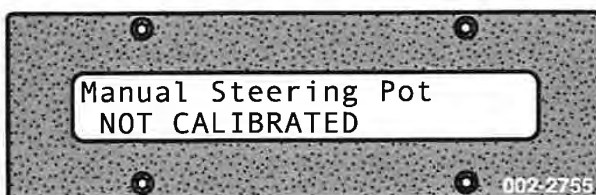
Switch pack replacement

To replace the switch pack, open the control box and disconnect the wiring to the defective switch pack. Using a flat blade screw driver, place the screwdriver in the hole behind the switch pack to be removed. Support the face of the control box cover around the switch pack and strike the screw driver forcefully to dislodge the switch pack from the control panel. Peel the protective backing from the rear of the new switch package. Place the switch pack in the proper orientation and press the switch pack firmly into position. Connect the wiring to the switch pack and close the control box. Secure the control panel. Attach the appropriate switch pack decal to the front of the new switches.

Symptom:

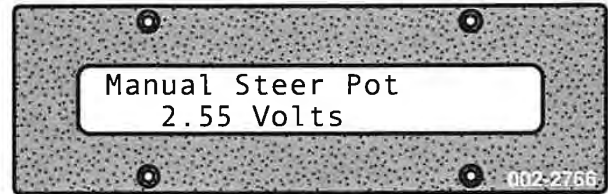
Main Screen indicates the manual steer knob is not calibrated.

Corrective Measures:



Not calibrated

This display indicates that an output signal is not being received by the Pancon controller, it will be necessary to proceed with the following steps.



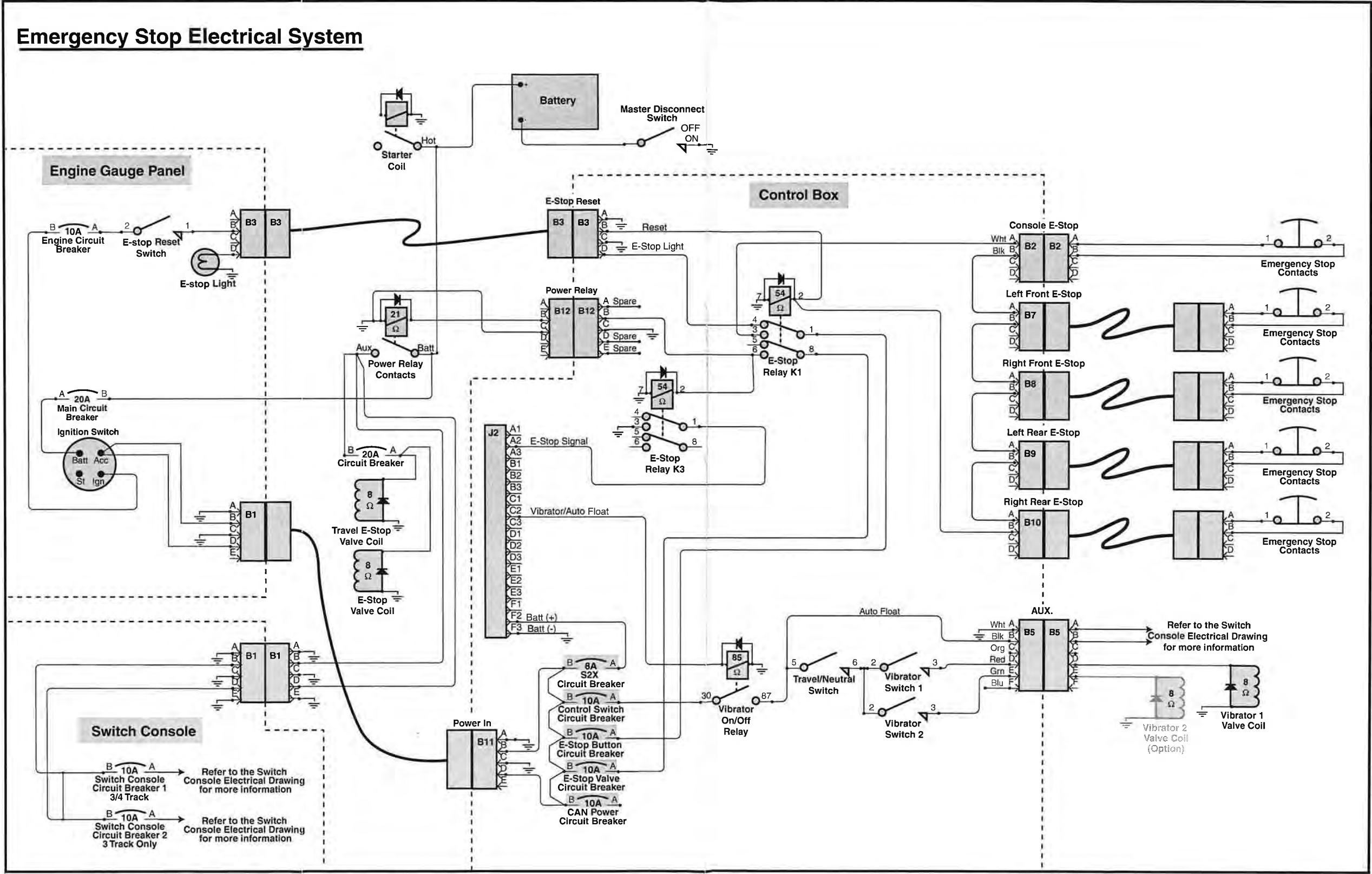
Service mode

Depress the Service button and scroll to the manual steer pot screen. Rotate the manual steer control knob fully clockwise. The voltage should change from 0.21 to 4.80 volts. If not, measure across terminals 1 and 3 on the manual steer pot for 900 to 1100 ohms of resistance. If not, replace the manual steer control pot.

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Emergency Stop Electrical Drawing

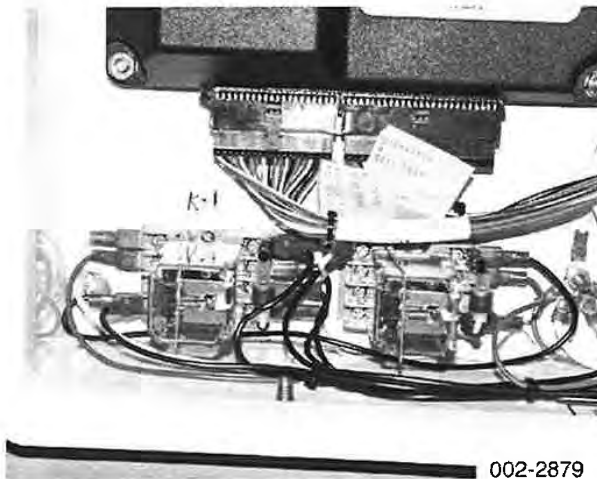
Emergency Stop Electrical System



21 Emergency Stop Electrical Systems

Power for the emergency stop system is supplied from the battery to the power relay on the front console door. Power is routed from the battery terminal of the power relay to the main circuit breaker (on the engine gauge panel). The ignition switch receives power from the auxiliary post of the main circuit breaker. When the ignition switch is turned to the "on" position, power is supplied to the engine circuit breaker (on the engine gauge panel) and to all circuit breakers in the main control box.

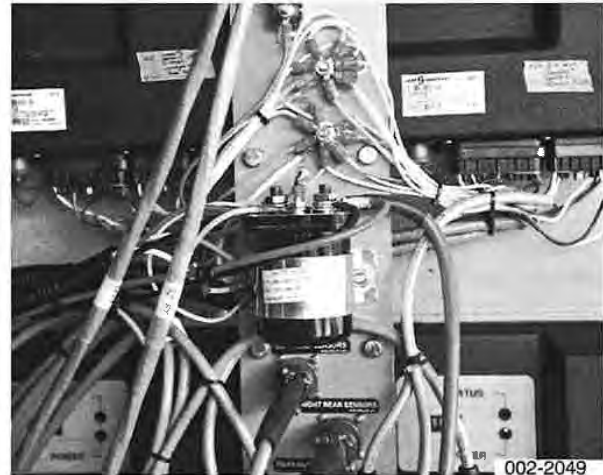
When the ignition switch is initially turned to the "on" position, the emergency stop indicator light is illuminated to indicate that the circuit is de-energized. Power to the emergency stop light is provided from the emergency stop circuit breakers inside the main control box. Power from the circuit breakers is routed to terminal 1 and terminal 8 on relay K1 inside the main control box. During initial startup, relay K1 is in the de-energized position. Terminals 1 and 4 are connected when the relay is de-energized causing power to be routed from terminal 4 to control box bulkhead three (B3). The power continues to engine gauge panel bulkhead three (B3) and illuminates the emergency stop light.



Relay K1 and K3

To operate the machine, the hydraulic systems and the electrical systems must be reset to an energized position. To energize the hydraulic system for operation, the emergency stop reset switch must be depressed momentarily to energize the emergency stop K1 relay inside the control box. The contacts in the relay will shift to supply power to the emergency stop buttons. The emergency stop buttons are connected "in-series" in the following order; (console, left front, right front, left rear and right rear). If one

emergency stop button is depressed, contact is broken and prevents operation of the machine functions. After the 12 volt signal flows through each emergency stop button, it is returned to the K1 relay coil to hold it in the energized position. This allows the operator to release the emergency stop reset switch.



Power relay

In the energized position, the K1 relay will supply power to the emergency stop buttons and energize the power relay coil and the K3 relay coil. When energized, the power relay supplies power to the three-track or four-track switch control panel and to a circuit breaker located directly above the power relay. The circuit breaker provides short circuit protection when power is supplied to the travel emergency stop solenoid coil and to the emergency stop hydraulic manifold solenoid coil. The travel and emergency stop manifold solenoid valves are energized to the closed position, causing the hydraulic controls of the travel, conveyor, auger and trimmer systems to function.



Emergency stop display

To energize the electrical system for operation, the K1 relay must be energized. Power is routed from the K1 relay to energize the K3 relay inside the control box. When energized, the K3 relay connects a ground to the Pancon controller through connector J2 on Pin A2. The ground signal indicates that the emergency stop buttons have been energized and the system is ready for operation. The controller is also programmed with

an additional safety procedure which requires that all variable control knobs and FNR switches be returned to the "off" or "neutral" position before the Pancon controller will allow operation of the control systems. The screen will indicate "E-Stop Commanded: RESET ALL SWITCHES TO NEUTRAL!" if any of the FNR switches are not in the neutral position or the variable control knobs are not turned off. When all procedures have been completed, all systems will be operational and the screen will indicate the normal operating display.

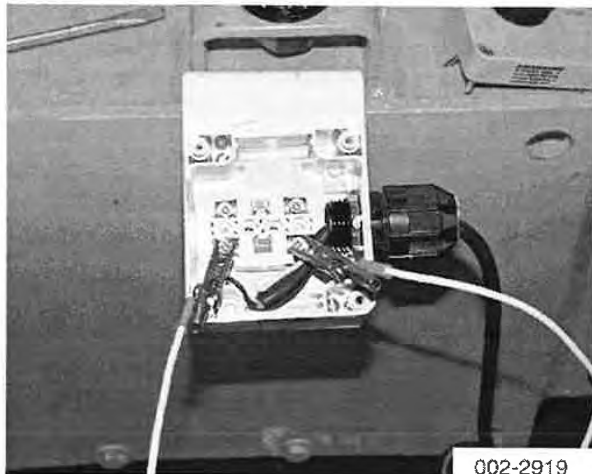
The lift hydraulic system is partially effected by the emergency stop system when the power relay is de-energized, eliminating power supply to the switch control panel. However, the manual operation of the elevation and steering controls for each leg on the machine are still functional.

Symptom:

Machine controls will not operate. Emergency stop reset light is illuminated and screen indicates E-Stop Commanded display.

Corrective Measures:

1. Emergency stop system not reset. Depress the emergency stop reset switch to reset the system.
2. Emergency stop button depressed. Release each depressed button to the out position before depressing the emergency stop reset switch.



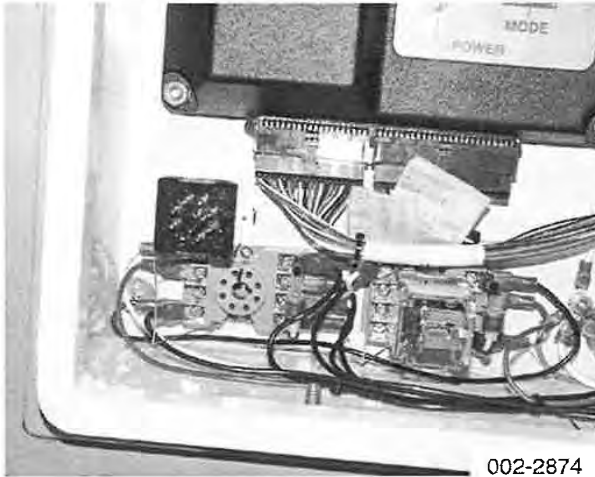
Jumper wire on E-stop switch

3. Defective E-stop switch. If one of the E-stop switches is defective, the system cannot be reset. Connect a jumper wire between the terminals on the E-stop switch on the control

panel. If the system can now be reset, the panel E-stop switch is defective and must be replaced. If the system does not reset, place a jumper between the terminals on the left front switch, then the right front switch, followed by the left rear switch and then the right rear switch (one switch at a time). If placing a jumper wire between the terminals on any of the switches will allow the system to be reset, that switch is defective and must be replaced.

4. Defective wiring to one of the emergency stop buttons. The sequence of power supply is as follows: K1 relay terminal 3 to pin A console stop button; pin B console stop button to pin A left front stop button; pin B left front stop button to pin A right front stop button; pin B right front stop button to pin A left rear stop button; pin B left rear stop button to pin A right rear stop button; pin B right rear stop button to relay K1 terminal 2. The emergency stop switch, when depressed, will also supply power to relay K1 terminal 2.

Using a voltage meter or 12 volt test light, depress and hold the reset switch while testing the wiring. Disconnect an emergency stop button at the frame cable bulkhead. Check for 12 volt power supply on pins A and B. If 12 volts is indicated on pin A, the power supply is reaching this button from terminal 3 on relay K1. This indicates that all wiring is good ahead of the button that is being tested. If 12 volts is not indicated on pin A, then a break in the 12 volt power is between relay K1 terminal 3 and the button being tested. If 12 volts is indicated on pin B, the power supply is reaching this button from emergency stop reset switch. This indicates that all wiring is good behind the button that is being tested. If 12 volts is not indicated on pin B, then a break in the 12 volt power is between relay K1 terminal 2 and the button being tested. Continue testing the wiring at each button until the defective wiring or button is located. Repair or replace the defective wiring as necessary.



Swap K1 and K3 relays

5. Defective K1 relay coil. Remove and swap the K1 relay with the K3 relay. Depress the emergency stop reset switch. If the emergency stop reset light will stop illuminating after swapping has occurred, the relay is defective and must be replaced.

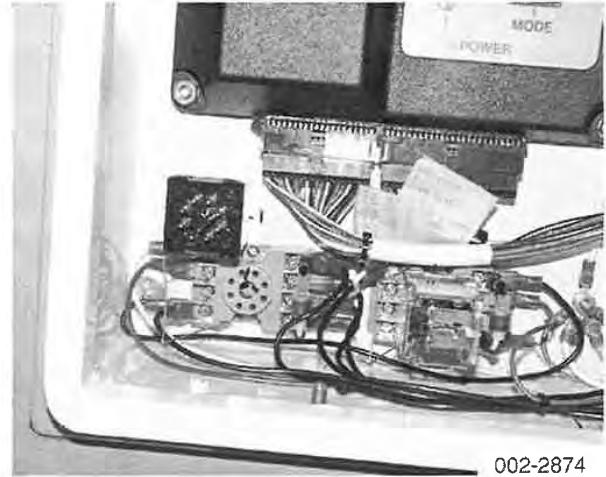
Symptom:

Machine control will not operate. Emergency stop reset light is not illuminated. Screen indicates E-Stop Commanded display.

Corrective Measures:

Open the rear access door to the control console. Locate the manual override control lever on each control valve and move it in either direction. If the hydraulic system does not operate, the emergency stop reset light may be defective. Refer to the previous symptom for troubleshooting procedures. If the hydraulic system does operate, refer to the following procedures for troubleshooting information.

1. Variable speed control knob or FNR switch has not been returned to the "off" or "neutral" position. Rotate each variable control knob to the "off" position. Place all FNR switches in the "neutral" position and when using the auxiliary vibrators, place the auxiliary vibrator off/auto switch in the "off" position.



Swap relays

2. Defective K3 relay. Swap relay K3 with relay K1 and depress the emergency stop reset switch. If the hydraulic systems do not operate using the manual override levers on the control valves, the relay is defective and must be replaced. If no change occurs, go to the following procedure.
3. Defective power or ground connection to K3 relay coil. If the K3 relay LED light is not illuminated, make certain that 12 volts is available to terminal 2 on relay K3 and a good ground connection is available on terminal 7. Temporarily use a jumper wire to test the power and ground connections. Repair damaged wiring as necessary.
4. Defective ground connection to connector J2 pin A2 on the controller. Remove the wire from terminal 1 on relay K3 and momentarily connect it to ground. If the E-Stop Commanded display no longer appears on the screen, the ground connection through the relay is defective or the relay base is defective. Repair or replace the relay base or ground wire connection on terminal 3 as necessary.

Symptom:

Travel, augers, conveyor, trimmer and switch panel controls do not operate. Emergency stop light is not illuminated.

Corrective Measures:


Check power relay voltage

1. Defective power relay. Using a volt meter or test light, check for 12 volts on the large terminals on the top of the power relay. Check for a 12 volt connection between the small power and ground terminals on the top of the power relay. If 12 volts is indicated on the small terminals but is not indicated on both of the large terminals, the power relay is defective and must be replaced.
2. Defective wiring between relay K1 and the power relay. If 12 volts is not indicated between the small terminals on the power relay, the wiring may be defective. Check continuity of the wiring between the small terminals on the relay to bulkhead 12. If continuity does not exist, the wiring is defective and must be repaired or replaced.

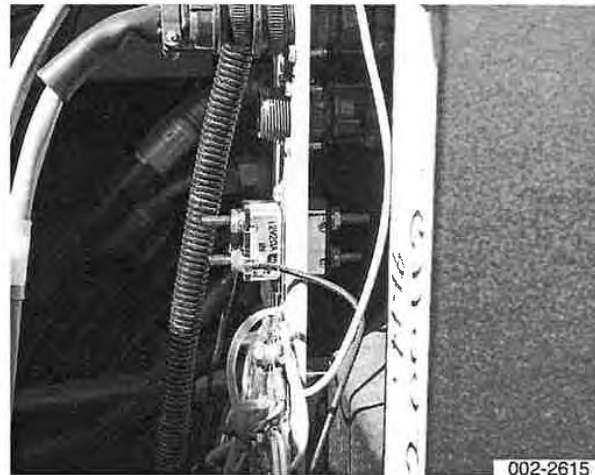
If continuity does exist, check the wiring inside the control box between bulkhead 12 and terminal 6 on relay K1. If continuity does not exist, repair or replace the defective wiring.

If continuity does exist, check continuity between terminals 6 and 8 while the relay is energized. If continuity does not exist, the relay or the relay base may be defective. Swap relay K1 and K3 and recheck.

If continuity exists between terminals 6 and 8, the relay is defective and must be replaced. If continuity does not exist, the relay base is defective and must be replaced.

Symptom:

Travel, augers, conveyor and the trimmer do not operate. The switch panel controls do operate. Emergency stop light is not illuminated.

Corrective Measures:


Emergency stop circuit breaker

Tripped circuit breaker caused by a short in one of the emergency stop solenoid coils. Disconnect both of the wires from the auxiliary side of the 20 amp circuit breaker. Check both sides of the circuit breaker for 12 volts. If 12 volts are present on the battery side of the breaker, but not the auxiliary side, the circuit breaker is defective and must be replaced. If 12 volts are present on both sides, reconnect one of the wires from the emergency stop solenoid coils. If the circuit breaker now trips, the connected wiring or solenoid coil is defective and must be repaired or replaced. If the circuit breaker does not trip, reconnect the wire from the other emergency stop solenoid coil. If the circuit breaker now trips, the wiring or solenoid coil is defective. Replace or repair the wiring or solenoid coil as necessary.

Symptom:

Travel system does not operate. The auger, conveyor, trimmer and switch panel controls do operate. Emergency stop light is not illuminated.

Corrective Measures:

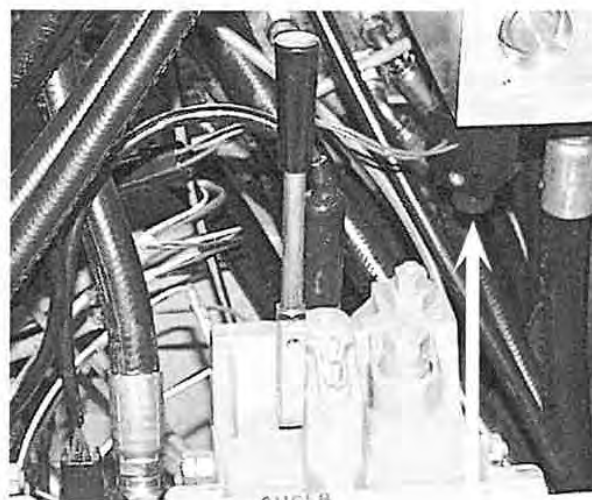

Travel emergency stop solenoid valve

Open the engine console access door and locate the travel emergency stop solenoid valve. Remove the wiring from the terminals being careful not to touch the power and ground wires together. Using a test light or volt meter, check between the power and ground wires for 12 volts. If 12 volts does not exist, the wiring may be defective. Check for any visible damage or remove the wiring from the power relay and check for continuity. If continuity does not exist, the wiring is defective and must be repaired or replaced.

If 12 volts exists, use an ohm meter to check for 8 ohms of resistance between the two solenoid coil terminals. If 8 ohms ± 2 ohms is present, the solenoid coil is good. If the ohm reading is not correct, replace the solenoid coil.

Symptom:

The auger, conveyor, trimmer and switch panel controls do not operate. Travel system does operate. Emergency stop light is not illuminated.

Corrective Measures:


Emergency stop manifold solenoid valve

Note: The solenoid valve stem may be equipped with a red manual override button on later models. Depress the red button to check for operation of the corresponding hydraulic systems.

Open the rear console access door and locate the emergency stop manifold solenoid valve. Disconnect the wiring from the solenoid coil. Using a test light or volt meter, check between the power and ground wires connected to the power relay for 12 volts. If 12 volts does not exist, the wiring may be defective. Check for any visible damage or remove the wiring from the power relay and check for continuity. If continuity does not exist, the wiring is defective and must be repaired or replaced.

If 12 volts exists, use an ohm meter to check for 8 ohms of resistance between the two solenoid coil terminals. If 8 ohms ± 2 ohms is present, the solenoid coil is good. If the ohm reading is not correct, replace the solenoid coil.

Symptom:

Emergency stop reset light continues to illuminate when depressing the reset switch. Main hydraulic systems do not function.

Corrective Measures:

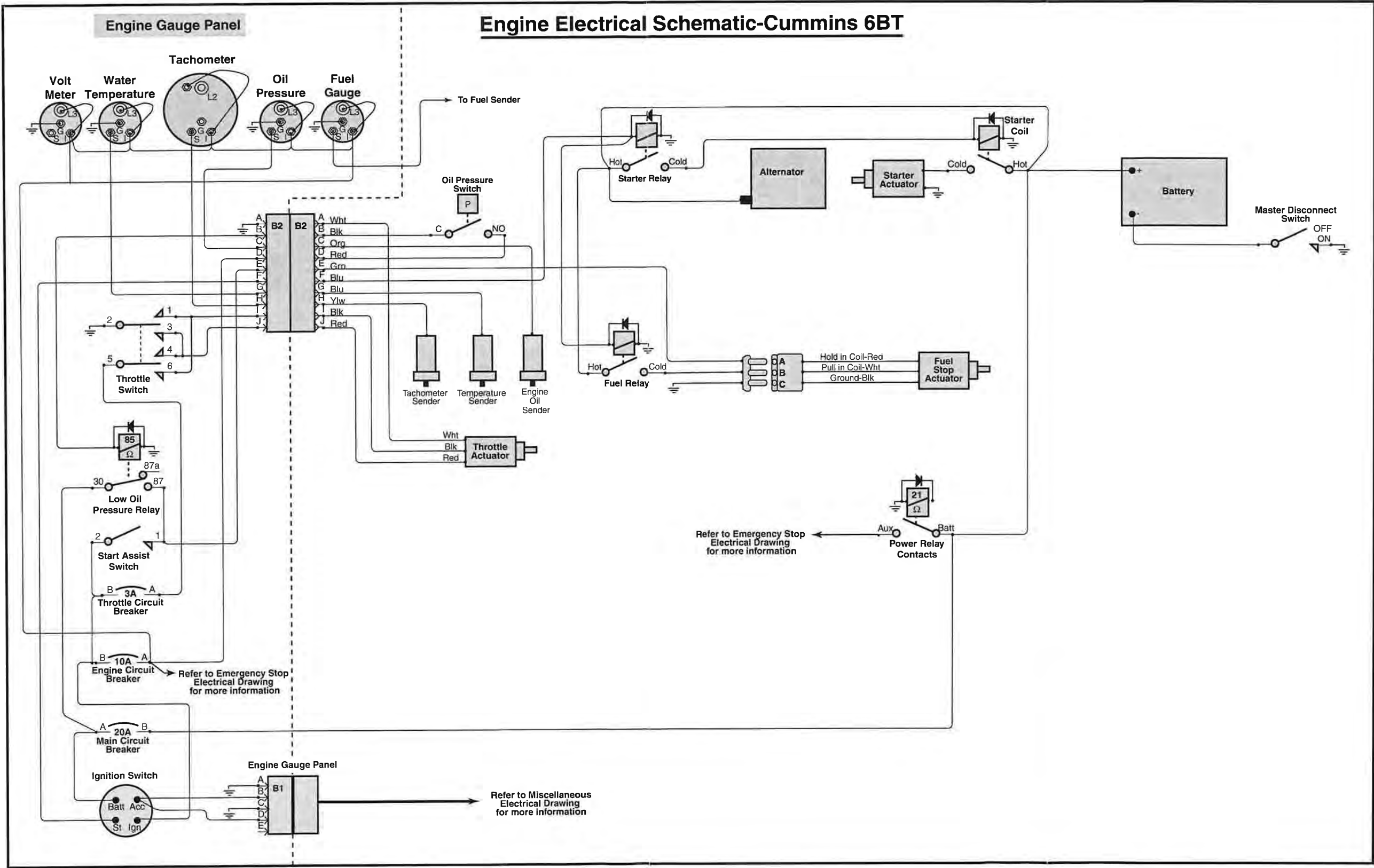
1. Defective emergency stop reset switch. Using a test light or volt meter, check the center terminal of the reset switch for 12 volts. If 12 volts exists, depress the reset switch and check terminal 1

for 12 volts. If 12 volts does not exist, the switch is defective and must be replaced.

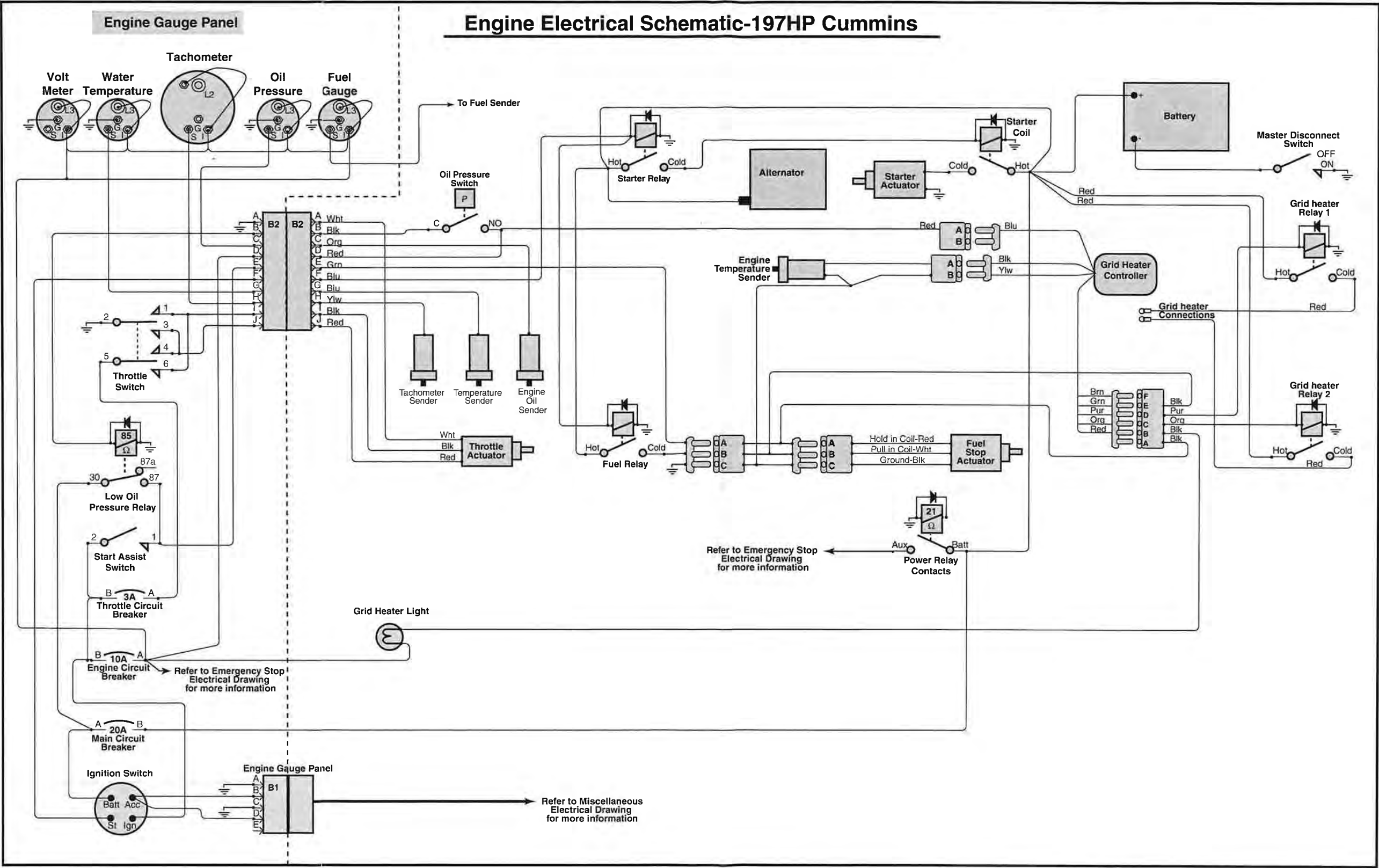
If 12 volts does not exist on either terminal, remove the wiring from the auxiliary terminal of the 10 amp engine circuit breaker. Check both sides of the circuit breaker for 12 volts. If 12 volts are present on the battery side of the breaker, but not the auxiliary side, the circuit breaker is defective and must be replaced. If 12 volts are present on both sides, check the continuity of the wire between the circuit breaker and the center terminal of the emergency stop reset switch. If continuity does not exist, repair or replace the wire.

2. Defective wiring. Open the main control box and depress the emergency stop reset switch. An LED light will illuminate inside the K1 relay if the relay coil is energized. If the LED light does not illuminate, check the continuity of the wiring between terminal 2 on the K1 relay and terminal 1 on the emergency stop reset switch. If continuity does not exist, the wiring must be repaired or replaced.
3. Defective K1 relay. Remove and swap the K1 relay with the K3 relay. Depress the emergency stop reset switch. If the emergency stop reset light will stop illuminating after swapping has occurred, the relay is defective and must be replaced.
4. Defective K1 relay base. Remove the K1 relay from the base. Check continuity between each screw terminal and the corresponding relay pin in the base. If continuity does not exist in one of the pin to terminal checks, the relay base is defective and must be replaced.

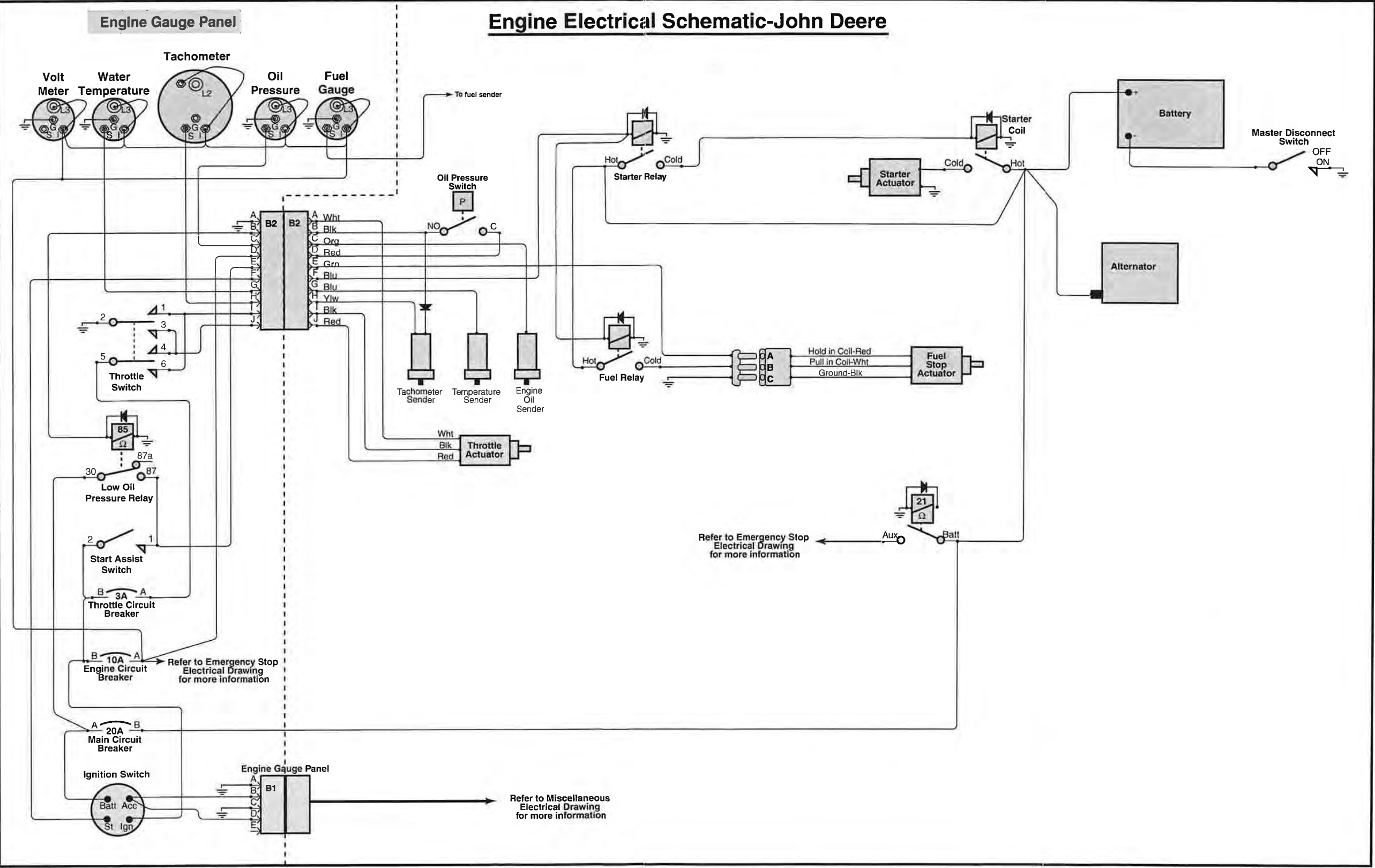
Cummins Engine Electrical Drawing

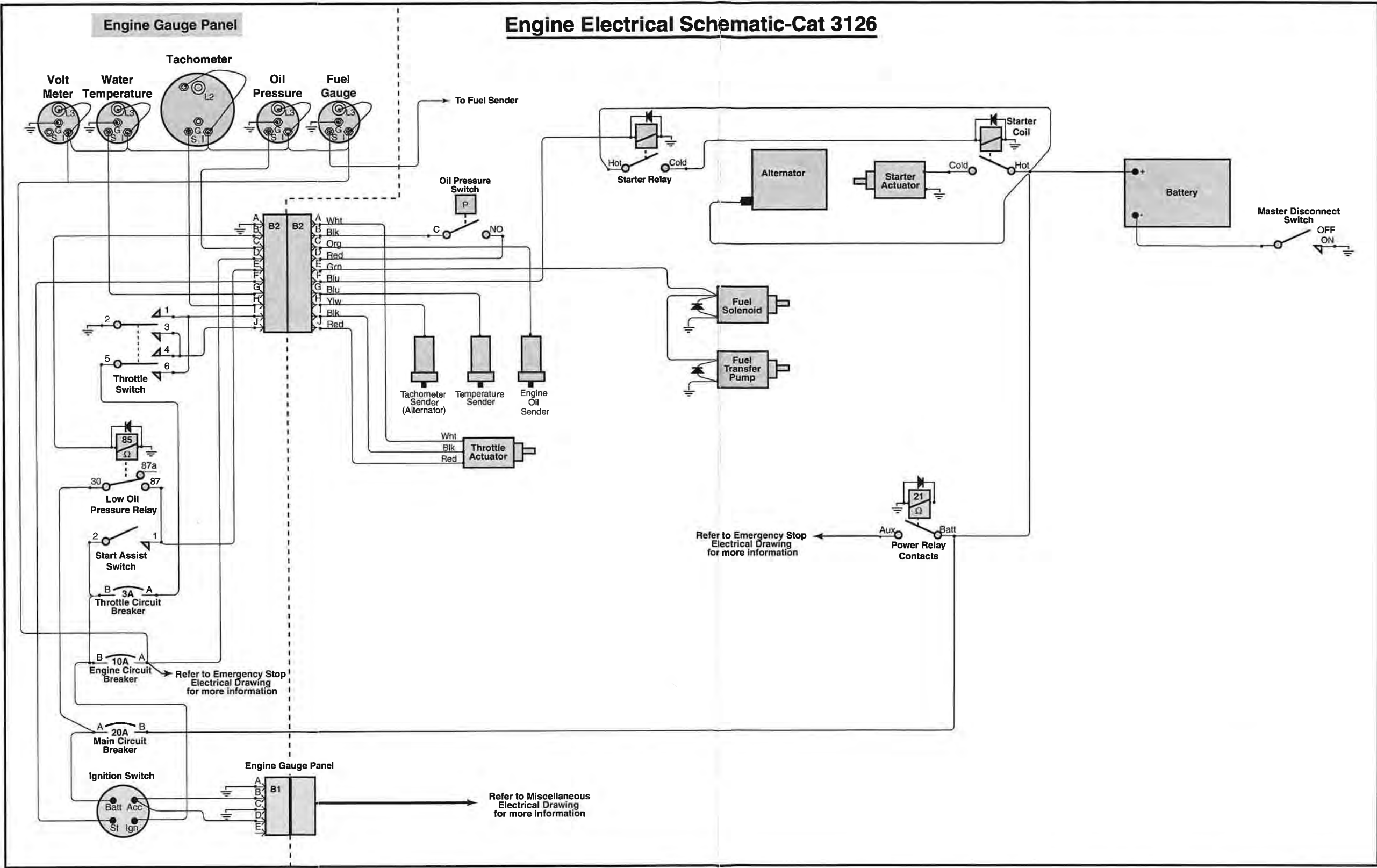


Cummins 197 HP Engine Electrical Drawing



John Deere Engine Electrical Drawing





22 Engine Electrical Systems

The engine electrical systems consist of the engine wiring, various solenoid coil wiring, the emergency stop wiring and various options available on the New Generation Commander III. The electrical systems operate on a 12 volt power supply which begins at the battery. Continuous power is supplied to the hot terminal on the starter coil and starter relay. Continuous power is also supplied to the hot terminal on the power relay and to the main circuit breaker. A 12 volt continuous supply is routed into the main control panel, through bulkhead 12, to the 10 amp power relay circuit breaker.

Ignition and low engine oil pressure description

From the 20 amp main circuit breaker, 12 volt supply is routed to the battery terminal of the ignition switch and to the hot terminal of the engine low oil pressure relay. To start the engine, the start assist switch is momentarily depressed, which energizes the hold in coil on the fuel stop solenoid. The ignition switch is turned to the start position to energize the starter relay and the fuel relay coils. With the fuel relay coil energized, the fuel stop pull-in coil is energized to allow fuel to the engine. With the starter relay energized, power is routed to the starter coil to crank the engine. After the engine is started, the ignition switch is returned to the "on" position. The starter relay and the fuel relay will de-energize causing the starter to cease operation and the pull-in coil on the fuel stop to de-energize. When the engine oil pressure has increased sufficiently to close the contacts on the engine oil pressure switch, power is routed to the engine low oil pressure relay, causing it to energize. This will cause power to be looped to the engine oil pressure switch and to the hold-in coil on the fuel stop solenoid, allowing the fuel stop solenoid to remain energized and the engine continues to operate. If low engine oil pressure occurs, the looped power through the oil pressure switch is disconnected and the fuel stop solenoid hold-in coil is de-energized, causing the engine to stop.

Engine Throttle

The engine throttle consists of a control switch and a throttle actuator. From the 10 amp engine circuit breaker, 12 volt supply is routed through a 3 amp fuse to terminal 5 on the throttle switch. A ground connection is supplied to terminal 2 on the throttle switch. When the switch is depressed to increase engine rpm, 12 volt power is routed through a loop wire on the rear of the switch between terminal 6 and terminal 1. The 12 volt power is then routed through

the bulkhead connector to the throttle actuator. The ground connection is routed through a loop wire on the rear of the switch between terminal 3 and terminal 4. The ground connection is then routed through the bulkhead connector to the throttle actuator. The throttle actuator is energized with the power signal and ground connection, causing it to extend and increasing engine rpm.

When the switch is depressed to decrease engine rpm, 12 volt power is routed from terminal 4, through the bulkhead connector to the throttle actuator. The ground connection is routed from terminal 1, through the bulkhead connector to the throttle actuator. The throttle actuator is energized in the reverse direction with the power signal and ground connection, causing it to retract and decreasing engine rpm.

Engine Grid Heater



DO NOT USE ETHER. INTAKE MANIFOLD FLAME HEATER STARTING AID HAS OPEN FLAME. ETHER MAY CAUSE EXPLOSION AND SEVERE INJURY.

Note: The engine grid heater is standard equipment only on the Cummins 197 hp engine.

The engine grid heater preheats the engine prior to cold weather cranking of the engine and post-heats the engine after start-up to aid in engine warm up and the reduction of white smoke. Preheating and post-heating are not required at engine temperatures greater than 45°F (7°C). Preheat and post-heat times increase as engine temperature decreases.

When the ignition switch is turned to the "on" position, 12 volt power is provided to the engine oil pressure switch. This 12 volt power is then routed from the terminal of the oil pressure switch to the grid heater controller. The controller will be energized and the grid heater light will illuminate. The controller will monitor a signal from the engine temperature sender which will indicate to the controller whether preheating is necessary to start the engine. If the temperature is below 45°F (7°C), both grid heater relays will be energized for up to a maximum of 30 seconds. When the grid heater relays are energized, 12 volt power is routed to two grid heater coils which will heat the engine air intake manifold. After approximately 30 seconds, the grid heater light will stop illuminating. Immediately turning the ignition to the "start" position will initiate cranking of the engine.

Post-heating occurs after the engine has started. The first cycle of post-heating will operate with both grid heaters from 10 to 20 seconds, depending upon engine temperature. The second cycle of post-heating will operate with one grid heater from 10 to 20 seconds, depending upon engine temperature. The third cycle of post-heating will operate with one grid heater for 40 seconds and alternating 50% on and 50% off. The fourth cycle of post-heating will operate with one grid heater for 106 seconds and alternating 25% on and 75% off.

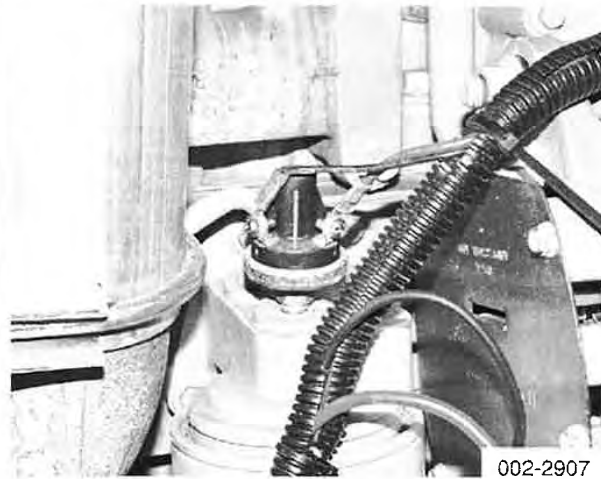
To prevent excessive drain on the batteries, the grid heater controller incorporates a battery monitoring feature. If battery voltage were to drop too low, the grid heater controller will stop the post heat cycle preventing further drain on the batteries. The battery protection feature is only activated with weak or drained batteries.

Symptom:

Engine will crank and start but will not operate after releasing the ignition switch.

Corrective Measures:

1. Start assist switch not depressed during start-up. Depress the start assist switch while cranking the engine. Continue to depress the switch after engine has started and release the switch when engine oil pressure has registered on the gauge.
2. Defective start assist switch. Place a jumper wire between terminal 1 and terminal 2 on the start assist switch. If the engine will start easily and remains in operation after removing the jumper wire, the switch is defective and must be replaced.
3. Low engine oil pressure. After the engine has started, continue to depress the start assist switch. If engine oil pressure does not register on the console gauge, stop the engine immediately. Refer to the appropriate engine manual for troubleshooting information or call the nearest engine dealer for service.



Bypass oil pressure switch

4. Defective engine oil pressure switch. If engine oil pressure is evident and the engine continues to operate while depressing the start assist switch, but stops when the switch is released, the oil pressure switch may be defective. To check remove the wire from one post on the engine oil pressure switch and connect it to the opposite post. If the engine continues to operate after releasing the start assist switch, the oil pressure switch is defective and must be replaced. Reconnect the wiring to the appropriate posts after replacement.



Check low oil pressure relay

5. Defective low oil pressure relay. If the engine fails to operate after connecting both wires to one post on the oil pressure switch, the low oil pressure relay may be defective. Leave the wires connected to one post on the oil pressure switch. Touch the low oil pressure relay and turn the ignition to the "on" position. The relay

should make an audible sound and it should be felt in the relay housing. If not, check for 12 volts between terminals 85 (+ coil) and 86 (- coil) on the relay. If 12 volts does not exist, check continuity of the wiring between the oil pressure switch and the low oil pressure relay. If 12 volts exists, check terminals 30 and 87 for 12 volts. If 12 volts exists on terminal 30 but not on terminal 87, the relay is defective and must be replaced.

Symptom:

Engine will crank, but will not start.

Corrective Measures:

1. Start Assist switch is not depressed. Depress the start assist switch. Refer to the previous symptom for additional information.
2. No fuel. Check the fuel level. Add fuel and bleed all lines prior to starting.



Check fuel relay

3. Defective fuel relay. To check, use a test light or volt meter. While cranking the engine, check for 12 volts on the cold terminal of the fuel relay. If 12 volts exists, the relay is good. If not, check the hot terminal for 12 volts. If 12 volts exists on the hot terminal but not on the cold terminal during cranking, the relay is defective.
4. Defective fuel stop actuator. Disconnect the three pin connector at the fuel stop actuator. Using an ohm meter, check for - ohms between pin A and pin C. Check for - ohms between pin B and pin C.

Symptom:

Engine will not crank.

Corrective Measures:

1. Master disconnect switch turned off. Turn the switch to the "on" position.
2. Battery is drained. Check the battery for 12 volts using a volt meter. If voltage is low or does not exist, recharge or replace the battery.
3. Loose connections between battery and ignition switch. Using a test light or volt meter, check the battery terminal on the rear of the ignition switch for 12 volts. If 12 volts does not exist, check all connections and tighten as necessary. Check the wiring for continuity if the tightened connections do not restore voltage to the ignition switch.
4. Defective ignition switch. Turn the ignition switch to the start position and check for 12 volts from the starter terminal and from the ignition terminal on the rear of the switch. If 12 volts does not exist on one or both of the terminals, the ignition switch is defective and must be replaced.



Defective starter relay

5. Defective starter relay. Place a jumper wire between the hot terminal and the small terminal with the blue wire attached to it. If the engine cranks, the relay is good. Check the wiring between the ignition switch and the starter relay for continuity. If the engine does not crank, the relay is defective and must be replaced.

6. Defective starter. Momentarily place a jumper wire between the hot terminal and the cold terminal. If the engine cranks, the starter is good. If not, repair or replace the starter.

Symptom:

Throttle will not increase or decrease engine rpm.

Corrective Measures:

1. Defective throttle switch. To check, disconnect both wires from the center terminals. Touch the wire from terminal 2 to terminal 1 and the wire from terminal 5 to terminal 4. If the throttle will operate, the switch is defective and must be replaced. Touch the wire from terminal 2 to terminal 3 and the wire from terminal 5 to terminal 6. If the throttle will operate, the switch is defective and must be replaced.
2. Defective throttle actuator. Check the engine throttle lever and throttle actuator for any visible signs of defective components.
3. Defective 3 amp circuit breaker. To check, locate the 3 amp circuit breaker on the back of the engine gauge panel. Check the fuse and replace if necessary. If the throttle will not operate, recheck the fuse. If the fuse is defective, there is a short in the throttle actuator or in the wiring between the switch and the actuator. Disconnect the wiring from the throttle actuator, replace the fuse and depress the switch in both directions. If the fuse is defective after this test, the wiring is shorted and must be repaired or replaced. If the fuse is good, the actuator is defective and must be repaired or replaced.

Symptom:

Grid heater lamp does not illuminate during cold weather start up. Engine cranks hard.

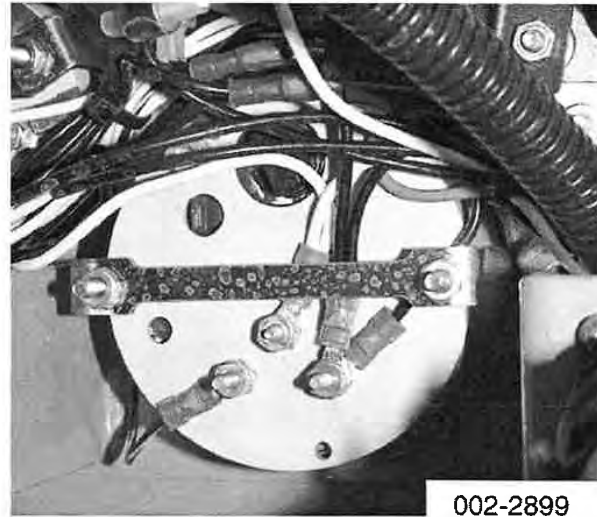
Corrective Measures:

1. Check for a defective lamp. Replace the lamp if defective.
2. Defective wiring. Check for +12 volts supplied from the engine circuit breaker. If 12 volts exist, check continuity of the black wire between the grid heater controller connector and the lamp. Repair or replace the wiring as necessary.

Contact an authorized Cummins engine service center to have the grid heater controls checked if the previous items are not defective.

Symptom:

Tachometer indicated engine overspeed at maximum throttle.

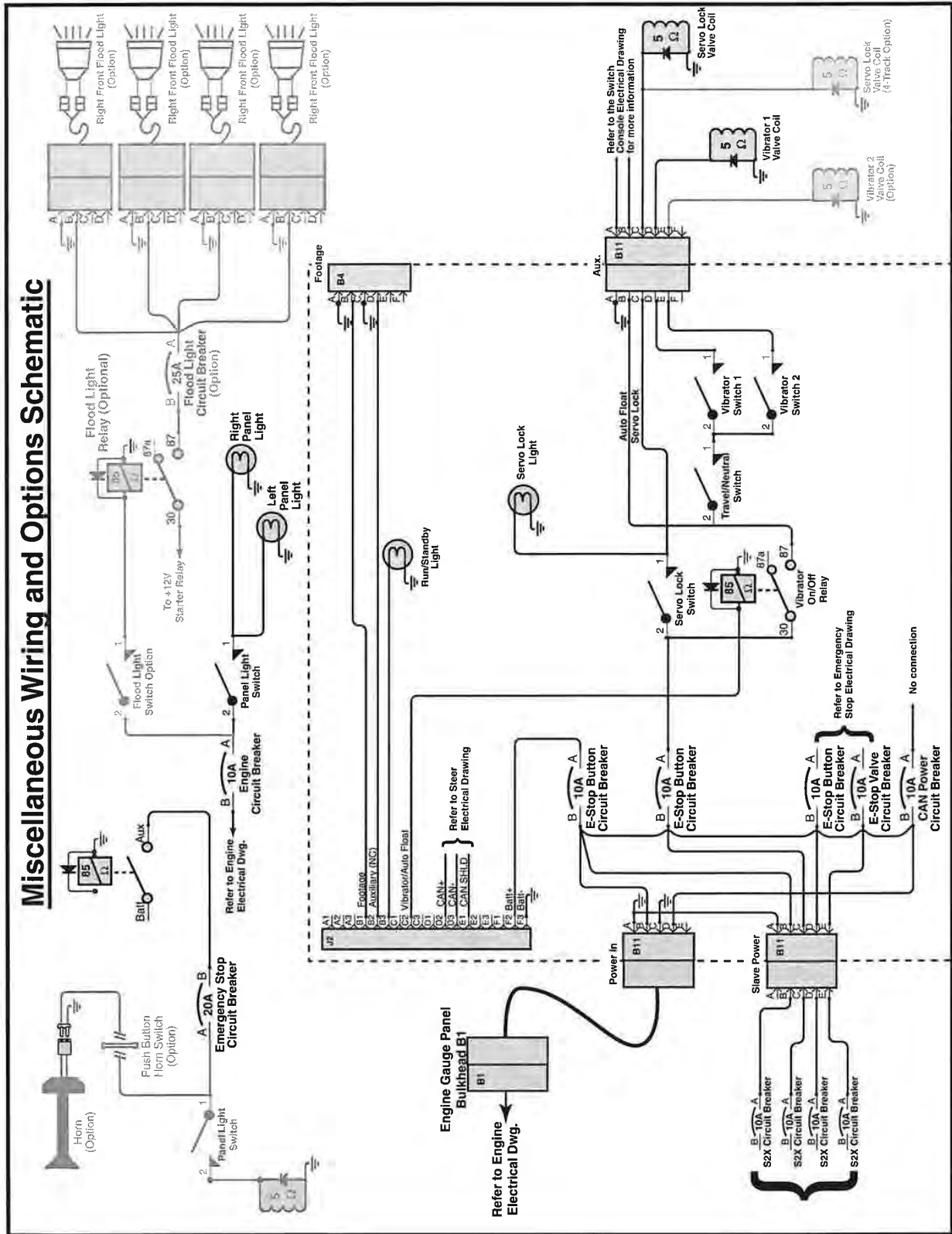
Corrective Measures:

Adjust tachometer

This is an indication that the tachometer may require adjustment. Run the engine at maximum speed. Insert a small screwdriver through the adjustment hole in the rear of the tachometer. Turn the adjustment screw until the tachometer registers the same as the factory adjustment for maximum rpm listed on the engine data tag. For most accurate adjustment, check the engine speed with a strobe or mechanical tachometer and adjust the machine tachometer accordingly.

Note: Loose fan/alternator drive belts or a defective alternator can cause faulty tachometer readings. Adjust the belts as described in the Maintenance chapter. Remove the alternator and have it checked and repaired by a qualified service center if necessary.

Miscellaneous Wiring and Options Schematic



23 Miscellaneous Wiring and Options

The miscellaneous wiring and option electrical systems include the standard machine lighting systems, the servo lock circuit, the run/standby light, the power washer electrical system, a horn option, a backup alarm option and a flood light option. As indicated, refer to the appropriate electrical drawing when further information is required for troubleshooting.

Note: All existing options and future additions may not be included in this manual. If diagnosis of an option which is not included becomes necessary, call your nearest GOMACO distributor or GOMACO for appropriate information.

The vibrator controls are indicated in this drawing because the same circuit breaker supplies power to the servo lock switch and the vibrator controls. Refer to troubleshooting the vibrator electrical system for a complete description of the vibrator electrical controls.

Power Washer

The power washer receives 12 volt supply from the emergency stop circuit breaker auxiliary post. When the power washer switch is in the "off" position, the power washer will not operate. When the switch is placed in the "on" position, 12 volts is routed to the power washer solenoid valve, causing the valve spool to shift and directing hydraulic oil to the washer drive motor. A ground connection is provided to each solenoid valve coil. A diode is connected between the power and ground terminals on each solenoid valve coil and relay coil on the machine. A diode is used to prevent electrical feedback which could cause the network control software to temporarily fail. Restarting the control system will allow operation of the machine until the solenoid coil or relay coil, with the missing or defective diode, is again energized.

Panel Lights

Panel lights are standard equipment on the machine and are located above the left and right sides of the operators console. The panel light switch receives 12 volt power from the 10 amp engine circuit breaker. When the panel light switch is in the "off" position the lights will not operate. Placing the switch in the "on" position will illuminate the lights. Each panel light is equipped with a ground connection to the machine frame.

Flood Lights

The flood light option may be added to the machine as a field installation. Included in the flood light installation is the control switch, a relay, a 25 amp circuit breaker, the cables and bulkheads and the lights. The flood light switch receives power from the auxiliary post of the engine circuit breaker. When the flood light switch is in the "off" position the lights will not operate. Placing the switch in the "on" position will illuminate the lights. From the switch, 12 volt power is routed to the flood light relay coil, causing it to be energized. When the relay is energized, the contact terminals 30 and 87 are connected, routing 12 volt power from the starter through the relay and to the 25 amp circuit breaker. The circuit breaker prevents severe damage to the wiring and will break contact between the battery and auxiliary posts when a short circuit develops on wiring connected to the auxiliary post. The circuit breaker will continue to break contact until the shorted circuit is eliminated or repaired. From the circuit breaker, 12 volt power is routed to each flood light. A maximum of five flood lights may be attached to the flood light electrical system as designed.

Symptom:

Power washer will not operate.

Corrective Measures:

Determine if the problem is electric or hydraulic. Depress the manual override button on the solenoid valve. If the system does not operate the problem is hydraulic, refer to troubleshooting the auxiliary hydraulic circuit. If the system does operate with the manual override, the problem is electrical. Proceed as follows.

1. Power washer switch is "off". Place the switch in the "on" position.
2. Emergency stop button is depressed or the emergency stop system is not reset. Reset the emergency stop system.
3. Defective power washer switch. Place a jumper wire between terminals 1 and 2 on the rear of the switch. If the power washer will function, the switch is defective and must be replaced. If the power washer will not function, check the center terminal for 12 volts. If 12 volts does not exist, refer to the following item.
4. 20 amp emergency stop circuit breaker is tripped. Remove all wires from the auxiliary post

of the emergency stop circuit breaker and depress the emergency stop reset switch. Check both sides of the circuit breaker for 12 volts. If 12 volts does not exist on the battery side, refer to troubleshooting the emergency stop electrical system for more information. If 12 volts exists on the battery side of the circuit breaker, but not on the auxiliary side, the circuit breaker is defective and must be replaced. If 12 volts exists on both sides of the circuit breaker, proceed as follows.

Reconnect one wire removed from the auxiliary side of the circuit breaker and reset the emergency stop system. If the circuit breaker trips, the wiring between the circuit breaker and the solenoid valve coil or the solenoid coil is defective. Disconnect the power wire from the solenoid coil. If the circuit breaker trips, the wiring is defective and must be repaired or replaced. If the circuit breaker does not trip, the solenoid coil is defective and must be replaced. The coil can be checked with an ohm meter for 5 ohms of resistance between the terminals with the wires removed. Replace the coil if the reading is not correct. If the reading is correct, remove and check the diode between the coil spade terminals with an ohm meter. An ohm reading will be evident in one direction through the diode, but when reversing the leads no ohm reading should be evident. If an ohm reading is evident in both directions, the diode is defective and must be replaced. The black wire in the diode is attached to the powered spade terminal while the white wire is attached to the grounded spade terminal.

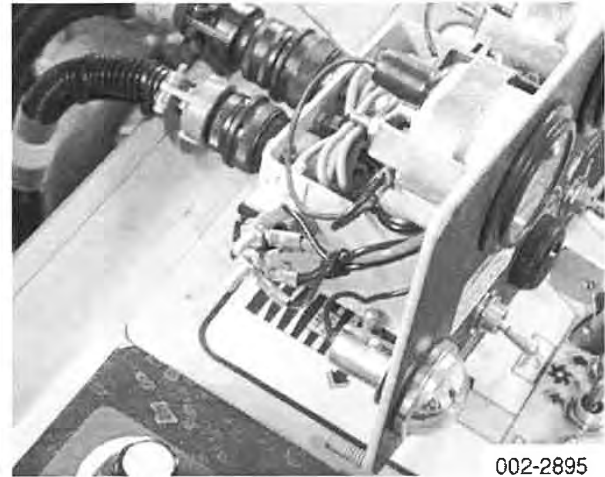
Continue reconnecting each wire to the circuit breaker auxiliary side until the defective wiring or coil is diagnosed.

Symptom:

Panel lights will not operate.

Corrective Measures:

1. Panel light switch is "off". Place the switch in the "on" position.
2. Defective lamp. Replace the defective lamp.



Engine circuit breaker

3. Circuit breaker is tripped. If the engine circuit breaker is tripped, the panel lights, the flood light option, emergency stop system, the engine throttle and the engine low oil pressure system will not function.

Remove all wires from the auxiliary post of the engine circuit breaker. Check both sides of the circuit breaker for 12 volts. If 12 volts does not exist on the battery side, refer to troubleshooting the engine electrical system for more information. If 12 volts exists on the battery side of the circuit breaker, but not on the auxiliary side, the circuit breaker is defective and must be replaced. If 12 volts exists on both sides of the circuit breaker, proceed as follows.

Individually reconnect each wire removed from the auxiliary side of the circuit breaker and return power to the engine circuit breaker. If the circuit breaker trips, the last wire reconnected contains a short. Disconnect the power wire from the switch, solenoid coil or relay coil located in the defective circuit. If the circuit breaker trips, the wiring is defective and must be repaired or replaced. If the circuit breaker does not trip, the switch, solenoid coil or relay coil is defective and must be replaced. The solenoid coil can be checked with an ohm meter for 5 ohms of resistance between the terminals with the wires removed. Replace the coil if the reading is not correct. If the reading is correct, remove and check the diode between the coil spade terminals with an ohm meter. An ohm reading will be evident in one direction through the diode, but when reversing the leads no ohm reading should be evident. If an ohm reading is evident in both directions, the diode is defective

and must be replaced. The black wire in the diode is attached to the powered spade terminal while the white wire is attached to the grounded spade terminal.

Symptom:

Flood lights will not operate.

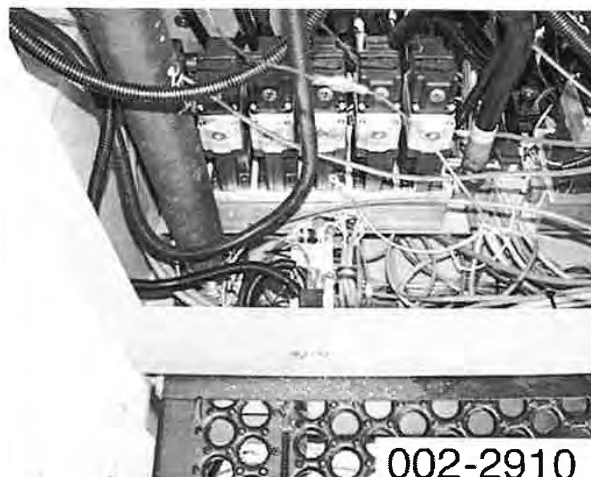
Corrective Measures:

1. Flood light switch is "off". Place the switch in the "on" position.



Flood light switch

2. Defective flood light switch. Place a jumper wire between terminals 1 and 2 on the rear of the switch. If the flood lights will function, the switch is defective and must be replaced. If the flood lights will not function, check the center terminal for 12 volts. If 12 volts does not exist, refer to the following item.
3. Engine circuit breaker is tripped. Refer to the previous symptom, Panel lights will not operate, for more information.



Flood light relay and circuit breaker

4. Defective relay. Place a jumper wire between terminals 30 and 87. If the flood lights will operate, the relay is defective and must be replaced. If the flood lights will not operate, check for 12 volt power on terminal 30 using a volt meter. If 12 volts does not exist, check the wiring between the starter 12 volt post and terminal 30 on the relay. If 12 volts does exist, the flood light circuit breaker or wiring may be defective.
5. Flood light circuit breaker is tripped. Remove all wires from the auxiliary post of the engine circuit breaker. Check both sides of the circuit breaker for 12 volts. If 12 volts does not exist on the battery side, the wiring between the flood light relay and the circuit breaker is defective and must be repaired or replaced. If 12 volts exists on the battery side of the circuit breaker, but not on the auxiliary side, the circuit breaker is defective and must be replaced. If 12 volts exists on both sides of the circuit breaker, proceed as follows.

Individually reconnect each wire removed from the auxiliary side of the circuit breaker and return power to the circuit breaker. If the circuit breaker trips, the last wire reconnected contains a short. The flood light that is not illuminated may be shorted or the wiring between the circuit breaker and the light is shorted. Disconnect the bulkhead plug for the defective flood light. If the flood lights will not operate, the wiring between the circuit breaker and the bulkhead connection is defective and must be repaired or replaced. If the flood lights will operate, reconnect the bulkhead plug and disconnect the spade connectors at the defective flood light. If the

flood lights will not operate, the wiring between bulkhead connection and the spade connectors is defective and must be repaired or replaced. If the flood lights will operate, the flood light is defective and must be repaired or replaced

Symptom:

The servo lock will not operate.

Corrective Measures:

1. Servo lock switch is "off". Place the switch in the "on" position.
2. Defective servo lock switch. Place a jumper wire between terminals 1 and 2 on the rear of the switch. If the servo lock will function, the switch is defective and must be replaced.
3. Circuit breaker is tripped. If the control switch circuit breaker is tripped, the vibrators and auto float systems will not function.

Remove all wires from the auxiliary post of the engine circuit breaker. Check both sides of the circuit breaker for 12 volts. If 12 volts does not exist on the battery side, refer to troubleshooting the engine electrical system for more information. If 12 volts exists on the battery side of the circuit breaker, but not on the auxiliary side, the circuit breaker is defective and must be replaced. If 12 volts exists on both sides of the circuit breaker, proceed as follows.

Individually reconnect each wire removed from the auxiliary side of the circuit breaker and return power to the circuit breaker. If the circuit breaker trips, the last wire reconnected contains a short. Refer to troubleshooting the vibrator electrical system if the short is located in that circuit.



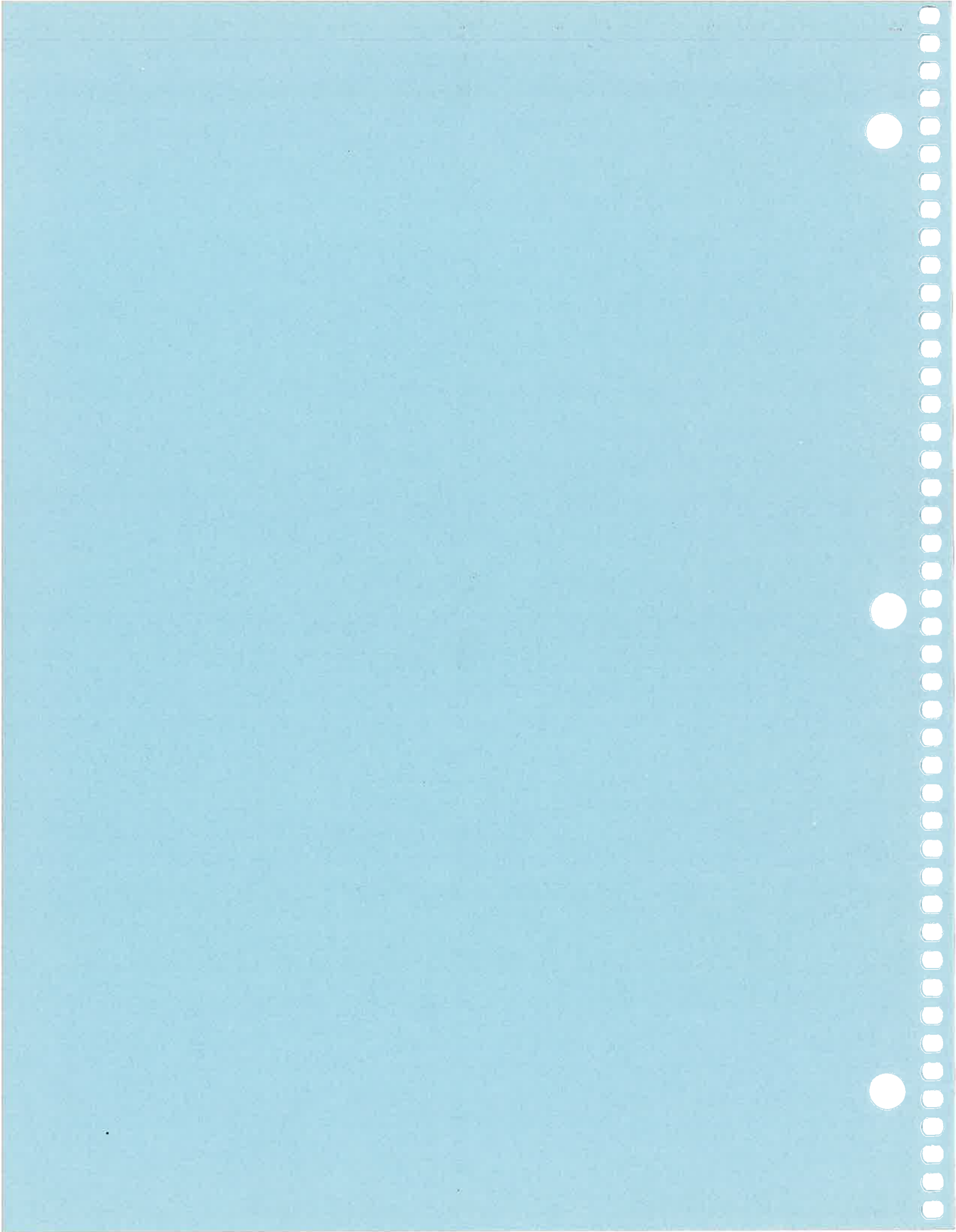
Testing solenoid coil resistance

002-2882

Disconnect the power wire from the servo lock solenoid coil. If the circuit breaker trips, the wiring is defective and must be repaired or replaced. If the circuit breaker does not trip, the solenoid coil is defective and must be replaced. The coil can be checked with an ohm meter for 8 ohms of resistance between the terminals with the wires removed. Replace the coil if the reading is not correct. If the reading is correct, remove and check the diode between the coil spade terminals with an ohm meter. An ohm reading will be evident in one direction through the diode, but when reversing the leads no ohm reading should be evident. If an ohm reading is evident in both directions, the diode is defective and must be replaced. The black wire in the diode is attached to the powered spade terminal while the white wire is attached to the grounded spade terminal.

CHAPTER IX STRINGLINE SET-UP

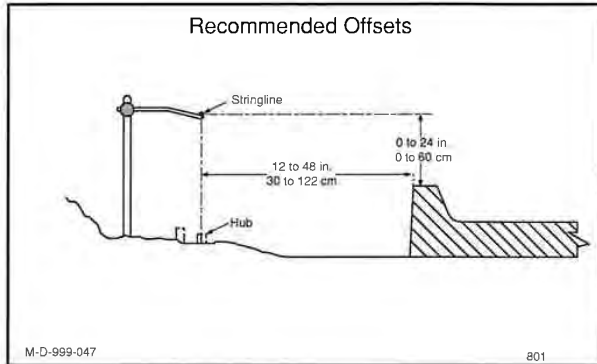
01 Content of Chapter	9-1
02 Setting Straight Line	9-1
03 Setting Line for Radii	9-4
04 Positioning Stringline for Cross Slope Changes	9-5
05 Setting the Line Under the Machine	9-6



CHAPTER IX STRINGLINE SET-UP

01 Content of Chapter

This chapter contains detailed instructions on setting the stringline which the machine follows for straight work, radius work and for slope changes. Accurate placement of the stringline assures maximum control to meet strictest tolerances. Any deviation in the stringline will affect final line and grade.



Recommended Offsets

The recommended distance between the stringline and the edge of the finished product is 12 to 36 in. (30 to 91 cm). The recommended distance the stringline should be placed above the top edge of the finished product is 0 to 24 in. (0 to 60 cm). The distances will be determined by job conditions and the type of pour.

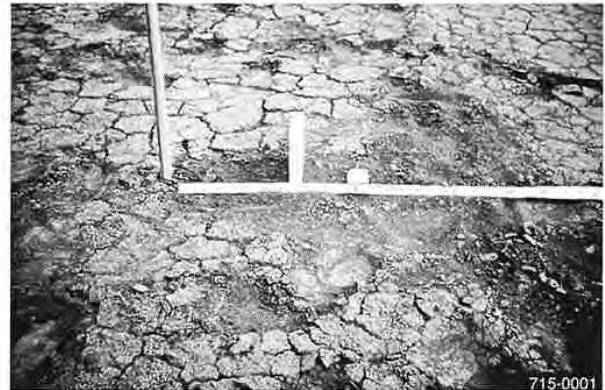
02 Setting Straight Line



Assemble line holder rod to stake

Assemble the line holder rods and clamps and place a rod and clamp on each stake.

Note: This should be done before the stake is driven, as the head of the stake will spread, preventing the placement of the clamp on the stake.



Set stakes behind hub

Drive one stake and rod assembly approximately 1 ft. (30 cm) behind each grade hub, as near vertical as possible. Stakes should not be placed over 50 ft. (15.2 m) apart, with 25 ft. (7.6 m) intervals recommended. If stakes are not driven as near vertical as possible, line will be affected when grade is adjusted, or grade will be affected when line is adjusted.

Drive one stake and rod assembly 15 to 20 ft. (4.6 to 6.1 m) before the first and past the last grade hub, if possible, to allow room to maintain line and grade prior to the beginning point and past the finish point of the job.



Set winch

Assemble the winches by placing the crank handle on the drive shaft and securing it in place with the self locking nut.

Drive a stake approximately 4 ft. (1.2 m) beyond the first stake. Place the hole in the winch mounting plate down over the stake and fasten the winch in place by tightening the setscrew. Drive a second stake through the slot in the mounting plate and secure the winch to this stake by driving the wedge plate (on the underside) in tight.

Note: The winch should be set at the same height as the finished line.



Attach line to winch drum

Attach the end of the stringline to the winch drum. Winch approximately 5 ft. (1.65 m) of line onto the drum. Insert a bar into the center of the spool of line and uncoil as much as is needed. It is recommended that one winch be used to tension no more than 1000 ft. (305 m) of line.

⚠ CAUTION! ⚠

THE METAL INSERTS IN THE CENTER OF THE LINE SPOOL MAY CAUSE PERSONAL INJURY IF THE LINE IS UNCOILED BY PLACING FINGERS IN CENTER OF SPOOL.



Attach line to anchor stake

Drive a stake at an angle approximately 4 ft. (1.2 m) beyond the last stake and attach the line. Attach the line at the same height as the finished line will be. It is recommended that the excess line not be cut loose, unless necessary.



Check line for tension

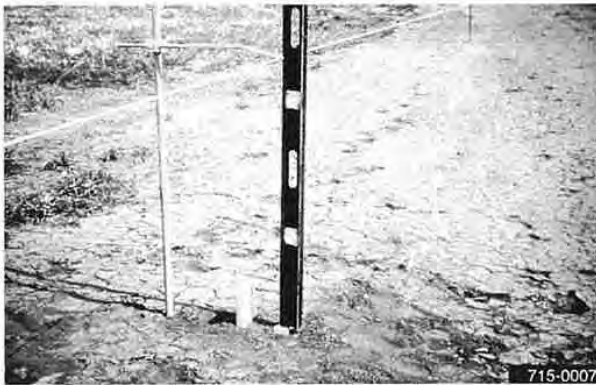
Winch the line tight enough to eliminate any slack that would affect line and grade. To check, attempt to twist the line. If it can be twisted more than 45 degrees, it is too loose.



Place line in holder notch

Place the line in the notches at the end of each line holder rod. The hole in the end of the line holder rod is at a right angle (90°) to the holder. The slot cut down into the hole is at approximately a 5° angle to the hole. This provides a hook to hold the line in the hole. Position the line holder rod at a right angle (90°) to the stringline so the hooks will hold the line in the hole.

Note: Do not place the line in the holder rod notch until the line has been winched tight. The line could catch in the holder rod notch and affect tensioning.



Plumb line over hub

Using a level, plumb up from the locating mark on the top of the grade hub and adjust the line in or out as needed to position the line directly above the grade hub. Tighten the adjusting screw in the clamp securely.



Set line for fills

Adjust the stringline elevation by measuring up to the line from the locating mark on the top of the grade hub. For fills, add the required amount of fill to the distance between the line and the finished product. to give the distance the line must be set above the grade hub. A fill indicates that the finished product will be above the top of the grade hub by the amount indicated.

FOR EXAMPLE: If the line is to be 2 ft. (60 cm) above the top of the finished product and the grade stake calls for a fill of 0.50 ft. (15 cm), the distance between the grade hub and the line would be 2.5 ft. (75 cm). This would cause the finished product to be 0.50 ft. (15 cm) above the grade hub.



Set line for cuts

To adjust the line for cuts, subtract the required amount of cut from the distance between the line and the finished product to give the distance the line is to be set above the grade hub. A cut indicates the finished product will be below the top of the grade hub by the amount indicated.

FOR EXAMPLE: If the line is to be 2 ft. (60 cm) above the top of the finished product and the grade stake calls for a cut of 0.25 ft. (7.6 cm), the distance between the grade hub and the line would be 1.75 ft. (52.4 cm). This would cause the finished product to be 0.25 ft. (7.6 cm) below the top of the grade hub.



Eyeball line for imperfections

After the line has been completely adjusted, check it by sight to locate any deviations in the line, or to adjust stakes that are set in between grade hub locations. Adjust the line as necessary.

03 Setting Line for Radii



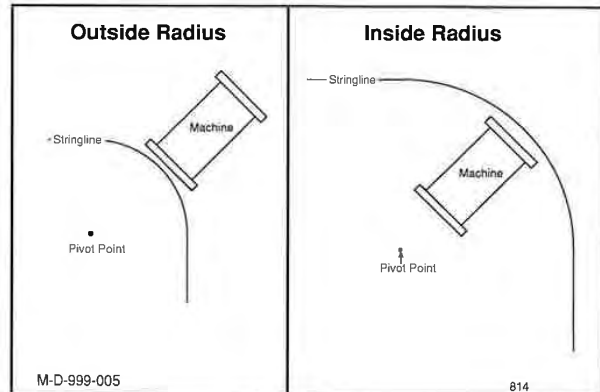
Stringline set for radius

To set the line for a radius, drive a stake at the radius hub. Measuring out from this point, drive stakes and rod assemblies at the correct distance from the radius hub.

FOR EXAMPLE: If a 25 ft. (7.6 m) outside radius is being set and the finished product line is to be 4 ft. (1.2 m) from the line, set the stakes at 20 ft. (6.1 m) and the line at 21 ft. (6.4 m) from the radius point. If a 35 ft. (10.7 m) inside radius is being set and the finished product line is to be 4 ft. (1.2 m) from the line, set the stakes 40 ft. (12.2 m) from the radius point and the line 39 ft. (11.9 m).

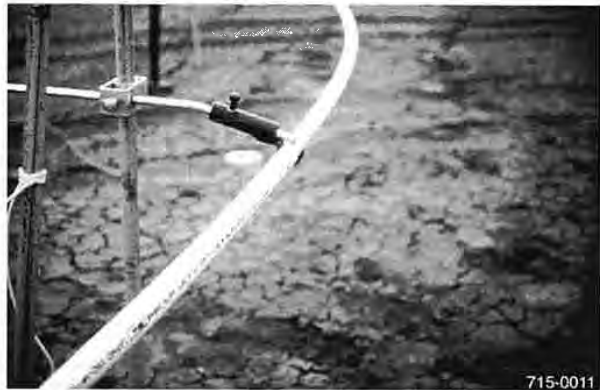
To determine the distance to set between the stakes, divide the radius by ten. Thus in a 25 ft. (7.6 m) radius, the stakes would be placed no more than 2.5 ft. (76 cm) apart. Place the stringline in the holder rod notches and adjust the line and grade as necessary to give a smooth looking radius.

Note: When paving around a radius, the material line may move towards the radius point. It may be necessary to "dry run" the paving equipment and reset the line in, or out, to achieve the correct line.



Comparison of inside and outside radii

An outside radius is when the machine is on the side of the line opposite the radius point; an inside radius when the machine is on the same side of the line as the radius point.



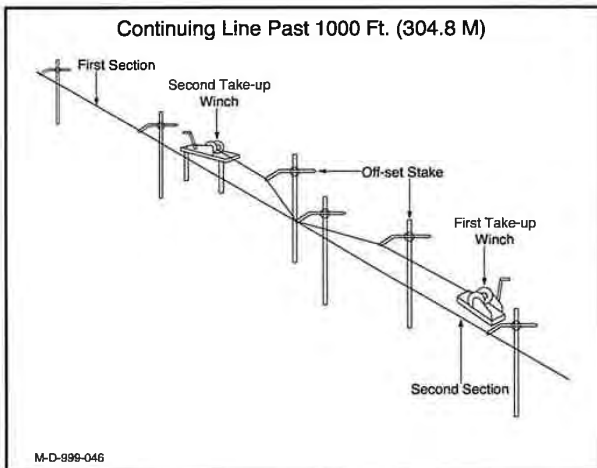
Plastic pipe in holder

To make a smooth radius and use less stakes and rods, use 3/4 in. (2 cm) plastic tube. Drive the radius stakes 4 to 5 ft. (1.2 to 1.5 m) apart. Make a special bracket such as the one shown in photo 715-0011 and slide it over the end of the line holder rod. Place the plastic tube into the holder and slide the bracket onto the holder so the end of the line holder rod will hold the tube in the holder. Tighten the setscrew.



Start of plastic pipe radius

Drive a stake and line holder rod assembly approximately 4 ft. (1.2 m) before the start of the radius. Place the stringline in the notch in the holder and adjust for line and grade as previously described. Attach the end of the line to an anchor stake, set 1 ft. (30 cm) behind the main line, so the end of the line is slightly higher than the main line. Extend the tubing from the beginning of the radius to the stake set ahead of the starting point. Secure the end of the tube to the top of the stringline with tape, so the machine side of the tube is even with the side of the stringline. Adjust the tube so the bottom edge of it is at the same grade as the stringline and the edge of it is the proper offset distance from the radius point. Set the finish end of the radius in the same manner.



Continuing line past 1000 ft.

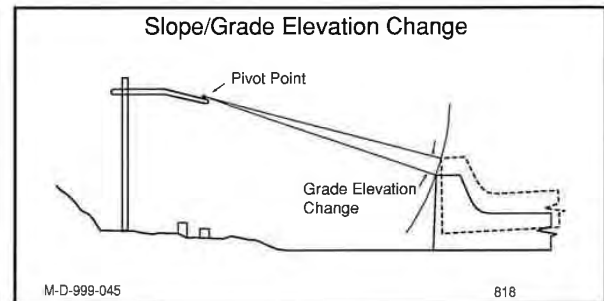
To continue the stringline past 1000 ft. (305 m), place a winch assembly between the last two stakes of the first section, in line with the stakes. Attach the second section of line to the winch and uncoil the line as required. Winch the line tight. Place the second line in the notch of the last line holder rod in the first section and continue setting the line in the normal manner.

Note: It may be necessary to tie the two lines together with small pieces of string or tape, to hold them both in the notch in the end of the line holder rod.

To assure sensor wand clearance, drive an offset stake on either side of the last stake in the first section. Adjust the offset line holders to hold the line back from and slightly above the main line.

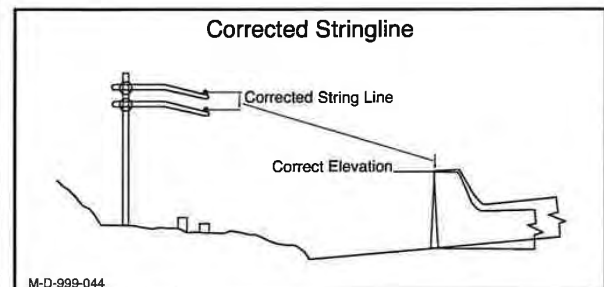
04 Positioning Stringline for Cross Slope Changes

When setting stringline through a super elevation, or any location involving a slope change, a correction in the height of the stringline is usually necessary. Stringline elevation correction is directly related to and proportional to the amount of cross slope change and the distance the stringline is from the material placement line.



Slope/grade elevation change

Automated trimmers and pavers pivot around the stringline. The stringline acts as a pivot point when cross slope is changed. As slope is increased or decreased, grade elevation is affected. At those locations where slope changes are required, it is recommended that the stringline height be changed to compensate. When the stringline is on the left side of the machine and the amount of slope is increased, the stringline should be lowered, and the line should be raised as the amount of slope is decreased. When the stringline is set under the machine and the slope is increased, the line must be raised, and must be lowered when the slope is decreased.



Corrected stringline

To determine the amount of grade correction necessary for a given amount of slope change, measure the distance from the stringline to the material placement line. Multiply this distance by the total amount of slope change. The result is the amount of grade change necessary.

FOR EXAMPLE: If the stringline is located 3 ft. (91 cm) from the concrete line and the total amount of slope change is 4%, multiply as follows:

Multiply 4% (.04) x 3 ft. (91 cm)

.04 x 3 ft. (91 cm) = 0.12 ft. (3.64 cm) correction required.

Raise or lower the stringline as required. If the amount of slope is being increased, the stringline must be lowered and if the slope is being decreased, the stringline must be raised. It is recommended to start the stringline adjustment at the beginning of the slope transition and make even adjustments at each grade stake. The maximum amount of stringline adjustment should be attained at the high point of the transition.

FOR EXAMPLE: If a slope change of 4% is required over 100 ft. (30.5 m), adjust the line 1/4 of the total amount necessary at each of the four grade stakes in that 100 ft. (30.5 m). The total amount of adjustment would be made at the high point, which would be 0.12 ft. (3.64 cm). The first stake prior to, or after, the high point would be adjusted 0.09 ft. (2.37 cm), the second one prior to, or after, the high point would be adjusted 0.06 ft. (1.82 cm) and the third one prior to, or after the high point would be adjusted 0.03 ft. (0.91 cm). Adjust the line in this manner on both sides of the transition high point.

05 Setting the Line Under the Machine

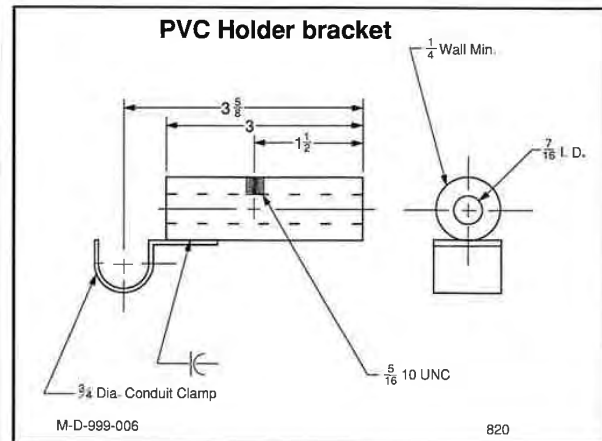


Setting line on a solid surface

When setting the line for under the machine, when pouring parapet wall, special holders must be made that will not tip over. There is a variety of ways to make

holders. Some will weld a 12 in. (30 cm) piece of 3/4 in. (2 cm) shaft to a plate of steel and others will insert a shaft into a pail of fresh concrete and allow the concrete to harden. It is recommended to set the line approximately 8 to 9 in. (20 to 23 cm) above the grade surface.

The line is normally set 5 ft. (1.5 m) from the front face of the wall base. Measure from the reference point and set the line accordingly. After the line is set, adjust it by sight for any deviations. It is recommended to draw a line around the base plates, so if they are moved, they can be returned to the exact same place.

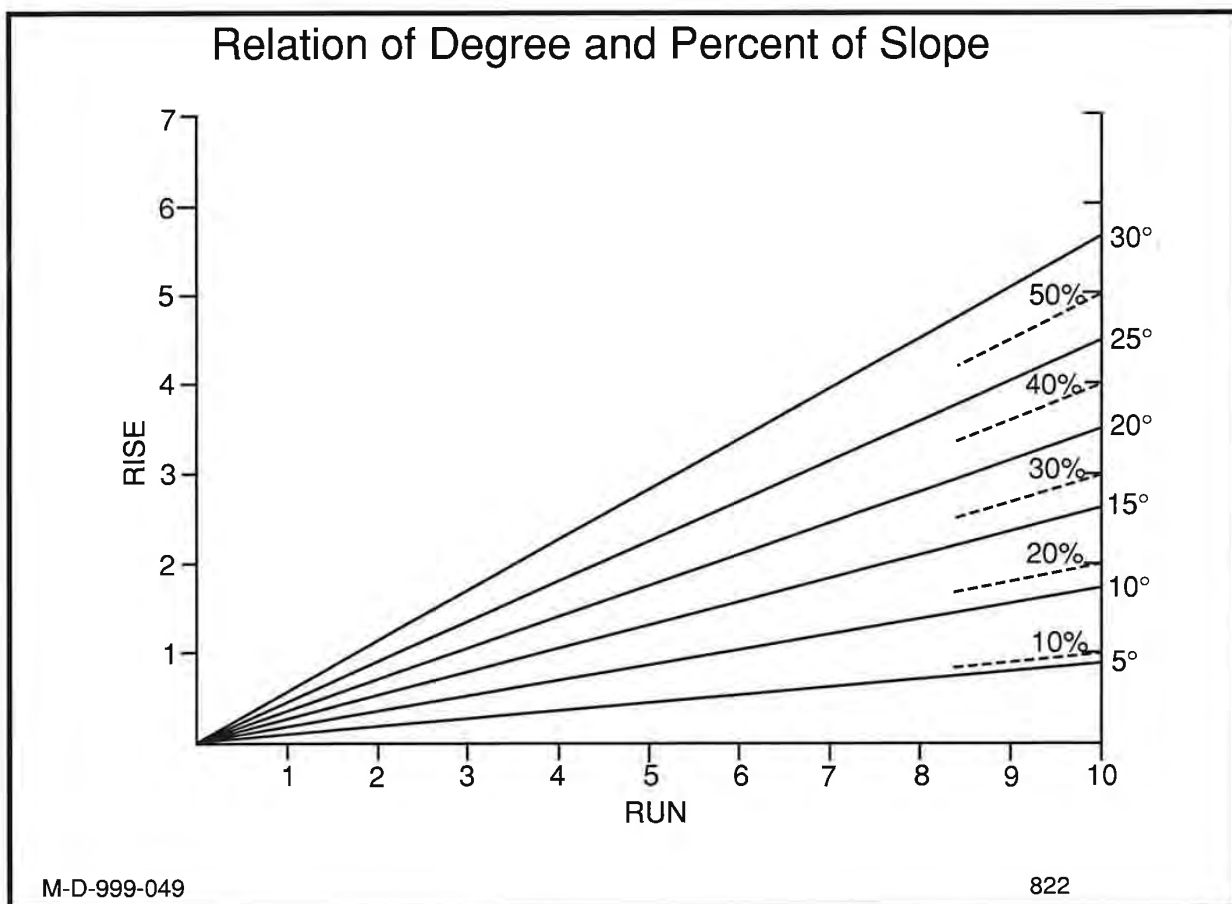


Plastic tube holder drawing

Percent Slope	Inches Per Foot	Inches Per 10 Ft.	Inches Per 11 Ft.	Inches Per 12 Ft.	Inches Per 13 Ft.	Inches Per 14 Ft.
0.13%	1/64"	5/32"	11/64"	13/16"	13/64"	7/32"
0.26%	1/32"	5/16"	11/32"	3/8"	13/32"	7/16"
0.52%	1/16"	5/8"	11/16"	3/4"	13/16"	7/8"
0.78%	3/32"	15/16"	1-1/32"	1-1/8"	1-17/32"	1-5/16"
1.04%	1/8"	1-1/4"	1-3/8"	1-1/2"	1-5/8"	1-3/4"
1.56%	3/16"	1-7/8"	2-1/16"	2-1/4"	1-7/16"	2-5/8"
2.08%	1/4"	2-1/2"	2-3/4"	3"	3-1/4"	3-1/2"
3.13%	3/8"	3-3/4"	4-1/8"	4-1/2"	4-7/8"	5-1/4"
4.17%	1/2"	5"	5-1/2"	6"	6-1/2"	7"

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821



M-D-999-049

822

GUIDE TO METRIC CONVERSION

	TO CONVERT U.S.	TO METRIC	MULTIPLY BY
LENGTH	inches (in)	millimeters (mm)	25.400
	inches (in)	centimeters (cm)	2.540
	feet (ft)	meters (m)	0.305
	yards (yd)	meters (m)	0.914
	miles	kilometers (km)	1.609
AREA	square feet (sq ft)	square meters (m ²)	0.093
	square yards (sq yd)	square meters (m ²)	0.836
VOLUME	cubic inches (cu in)	cubic centimeters (cm ³)	16.387
	cubic feet (cu ft)	cubic decimeters (dm ³)	28.317
	cubic feet (cu ft)	cubic meters (m ³)	0.028
	cubic yards (cu yd)	cubic meters (m ³)	0.764
CAPACITY (fluid volume)	gallon (gal)	Imperial gallon (Canadian)	1.2009
	gallons, Can. (gals)	liters	4.546
	gallons, U.S. (gals)	liters	3.785
VOLUME RATE OF FLOW	cubic feet per minute (cfm)	cubic decimeters per second (dm ³ /s)	0.472
	gallons per minute Can. (gpm)	cubic decimeters per second (dm ³ /s)	0.076
	U.S. (gpm)	(dm ³ /s)	0.063
WEIGHT	ounces (oz)	grams (g)	28.349
	pounds (lb)	kilograms (kg)	0.453
	tons	tonnes	0.907
PRESSURE/ STRESS	pounds per square inch (psi)	bar (bar)	0.069
	(psi)	Kilopascal (kPa)	6.900
POWER	horsepower (hp)	kilowatts (kW)	0.746
ENERGY	foot-pounds (ft-lb)	joules (J)	1.356
TEMPERATURE	degrees Fahrenheit (°F)	degrees Celsius (°C)	(°F-32) x 0.556

CALIFORNIA Proposition 65

WARNING

**Diesel engine exhaust and
some of its constituents
are known to the State of
California to cause cancer,
birth defects, and other
reproductive harm.**

695-48M50



GOMACO

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