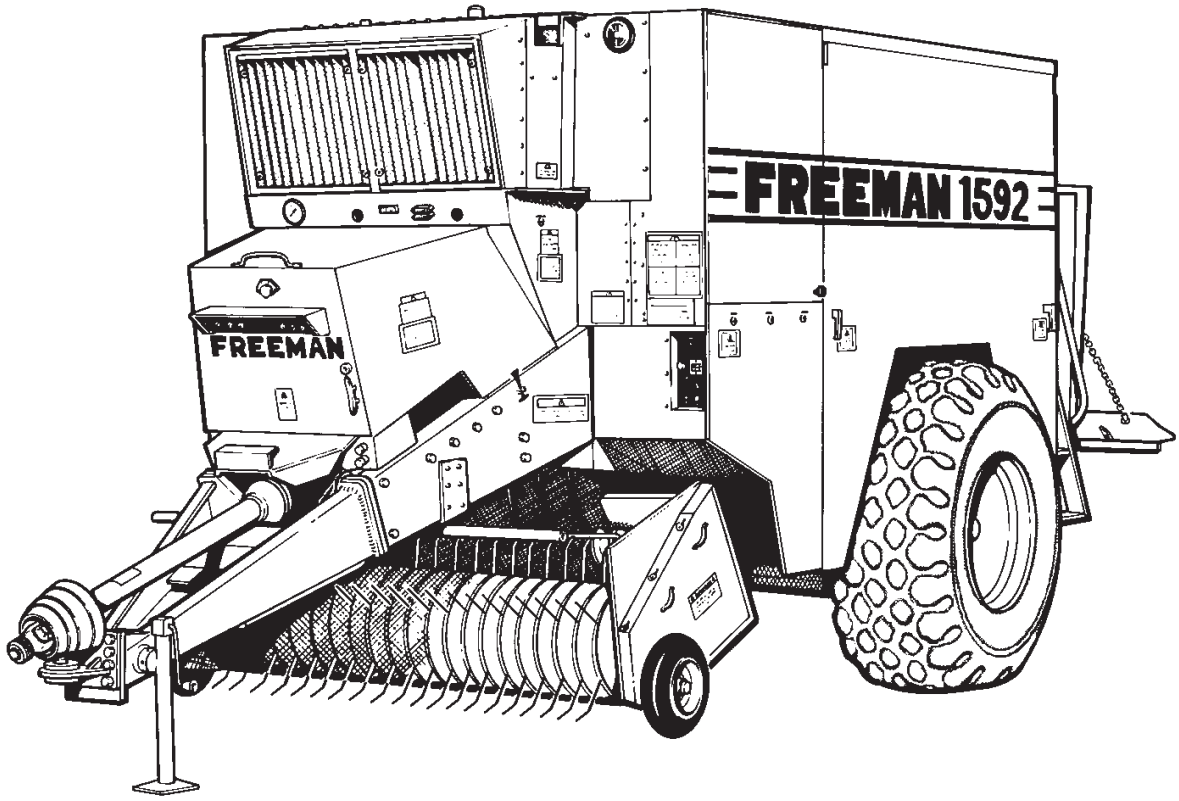
FREEMAN
A Division of Allied Systems Company

BIG BALER
1592



Electrical / Hydraulic Guide
Trouble Shooting Manual

S/N: 501-615

PB00000210

A Product of
Allied Systems COMPANY
Sherwood, Oregon USA

⚠ WARNING

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.

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer, birth defects, and other reproductive harm. Wash hands after handling.

Other chemicals in this vehicle are also known to the State of California to cause cancer, birth defects, and other reproductive harm.

FN1592 / CR1034

ELECTRICAL / HYDRAULIC GUIDE

TROUBLE SHOOTING MANUAL

DRAFT COPY 5/98

SERIAL # 501-
101-

TABLE OF CONTENTS

SAFETY REMINDER

1. Shut off tractor, disengage PTO, and lock tractor transmission and/or brakes before adjusting, lubricating, cleaning or servicing the baler.

2. Keep hands, feet, and clothing away from power driven parts.

3. Avoid wearing loose clothing which can be caught in moving parts.

4. Use appropriate signs or warning lights when operating on public roadways.

5. Make certain everyone is clear of and off the baler before operating any part of the machine.

6. Always use lights for night work.

7. Keep all shields in place and in serviceable condition.

8. Do not go near any equipment until all moving parts are stopped.

9. Do not go under any raised components until they are safety blocked or chained in position.

10. Carry a 2A-10B fire extinguisher at all times.

11. Keep the diagnostic control cable in a safe location away from power driven parts at all times.

12. Remember safety is only a word until it is put into practice.

ELECTRICAL INFORMATION GUIDE

CONTENTS

BALER CONTROL CIRCUIT

The Baler Control Circuit consists of twelve limit switches, four relays and the necessary wiring to carry electric current from one point to the other. The limit switches serve to communicate the position of mechanical machine components to the control panel. In the control panel, electrical signals from the limit switches set or release relays, which further direct electric current to actuate hydraulic components. The hydraulic components provide the power to place mechanical components into motion. Once a mechanical component is set in motion, the limit switches communicate new information to the control panel. Figure 1 shows the routing of the harnesses relative to the components of the electrical system.

The information provided on the following pages is intended to assist service personnel in understanding the various functions of the baler and the electrical circuits involved in their operation. Diagrams explain the basic components of the electrical system to present information that will make it easier to read the schematics when troubleshooting the baler. Supplemental information on electrical components is given in Appendix A. A complete set of wiring diagrams is given in Appendix B.

Electrical Schematics

The schematics in figures 2-7 show the electrical circuits of the baler at rest.

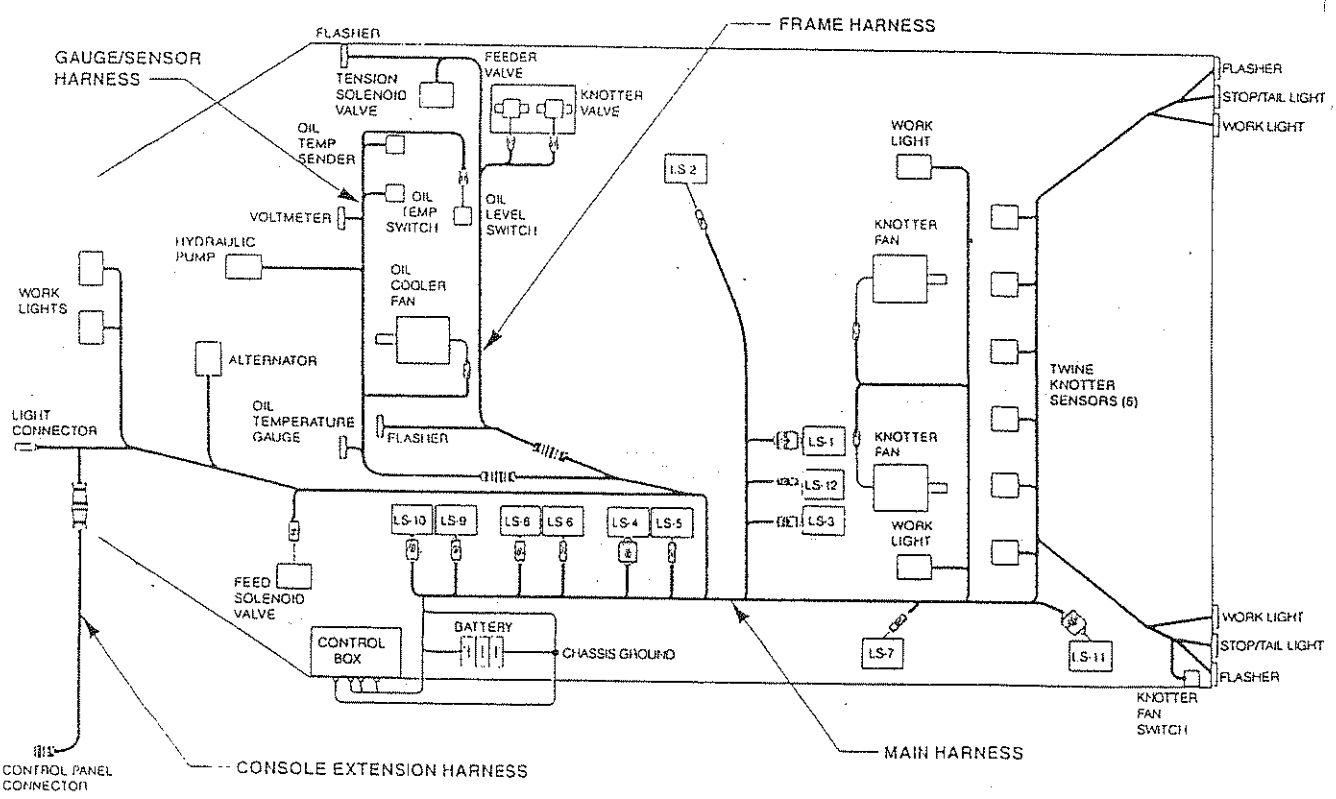


Fig. 1 Layout of Harnesses and Components on the Baler

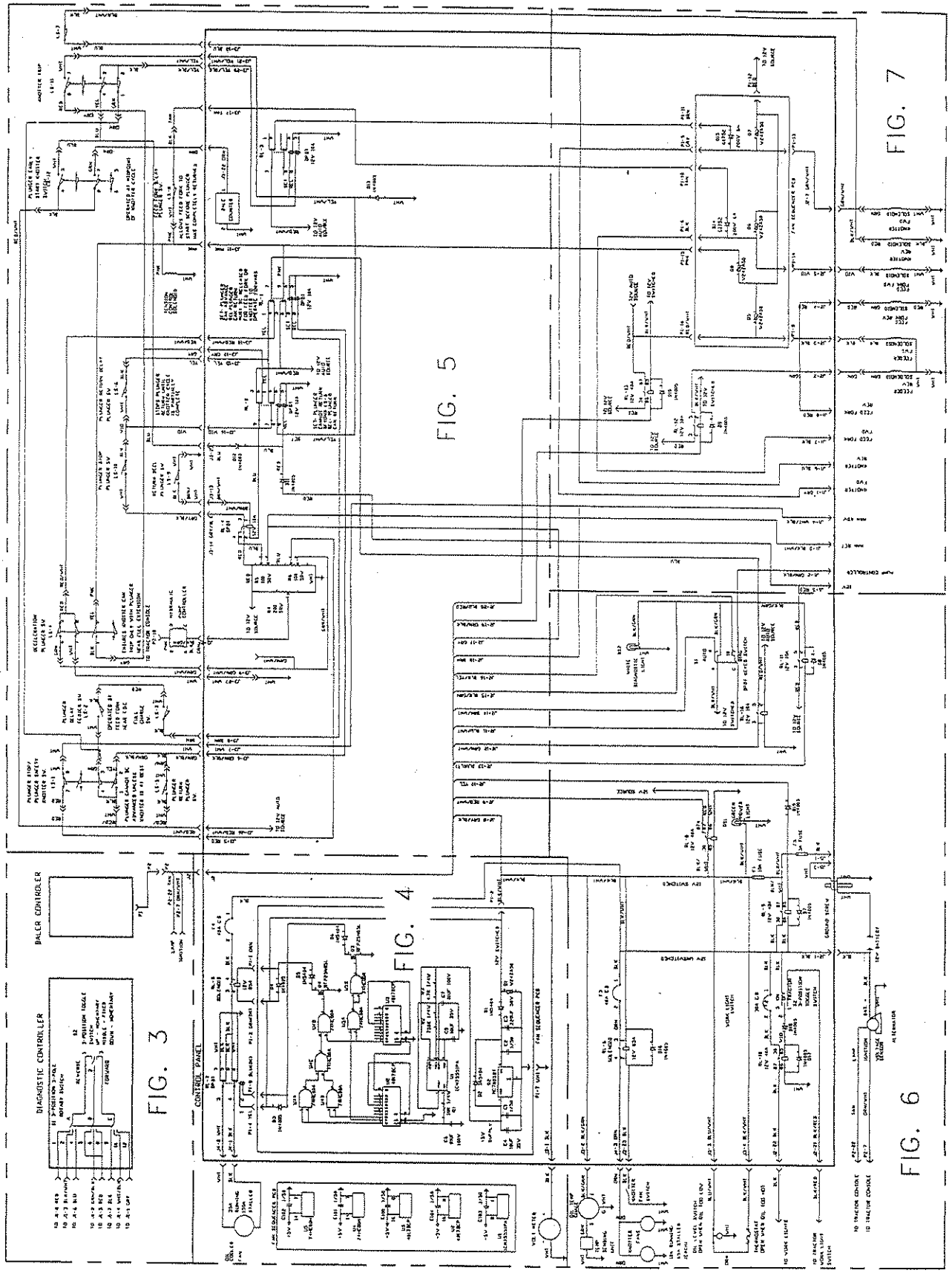


Fig. 2 Electrical Schematic of Entire Baler

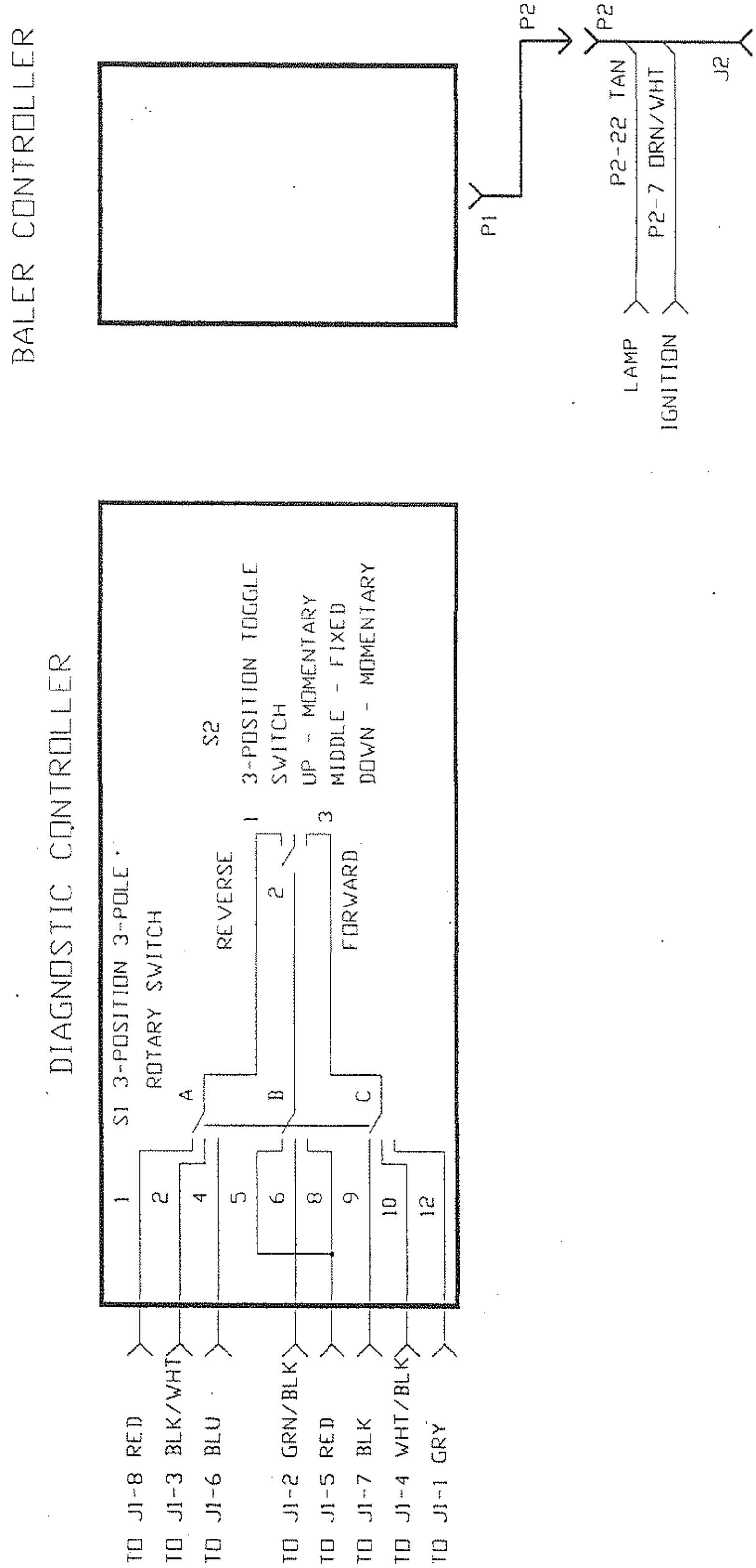


Fig. 3 Electrical Schematic of Manual Pendant

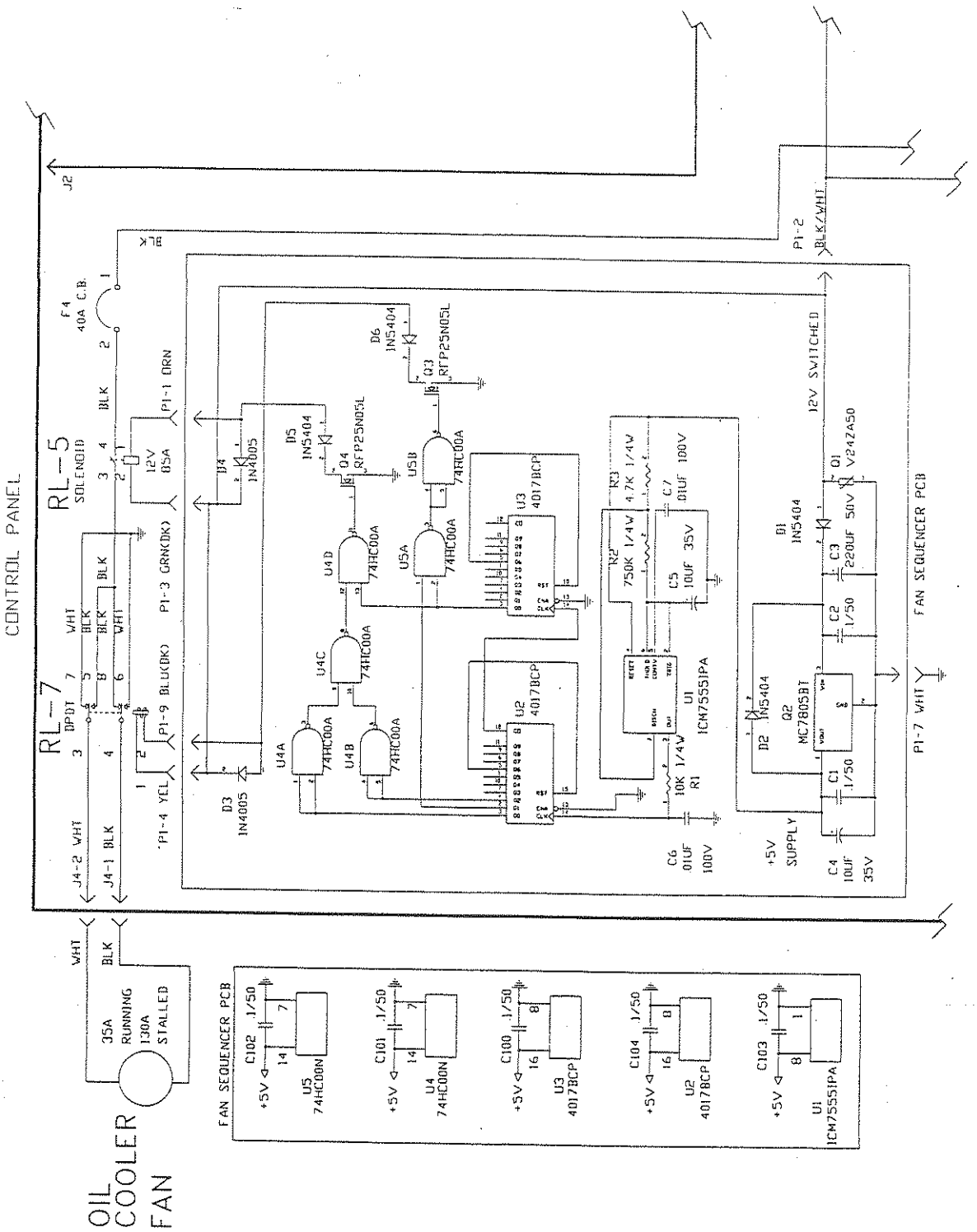


Fig. 4 Electrical Schematic of Cooling Fan Circuit and Voltmeter

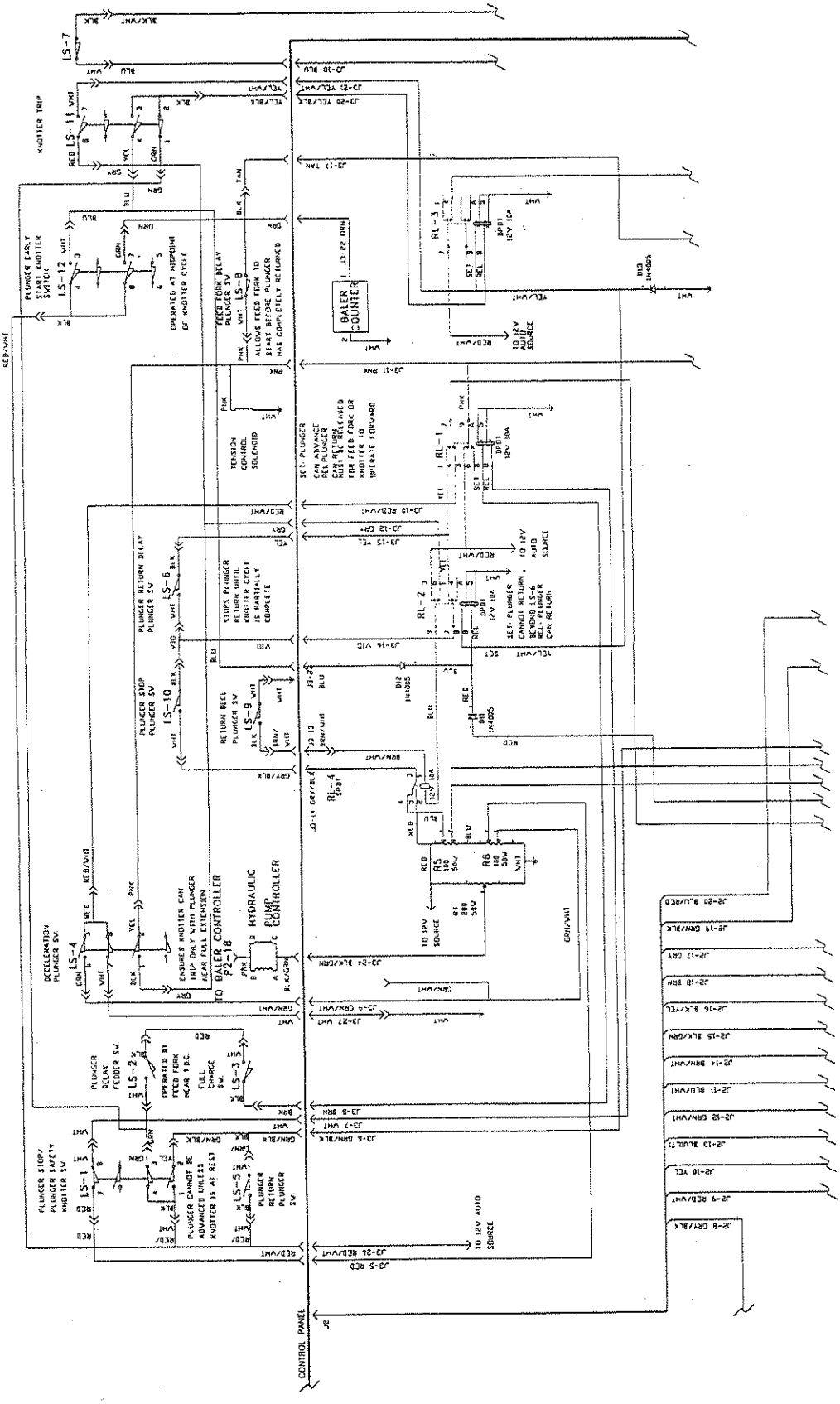


Fig. 5 Electrical Schematic of Baler Function Control Circuits

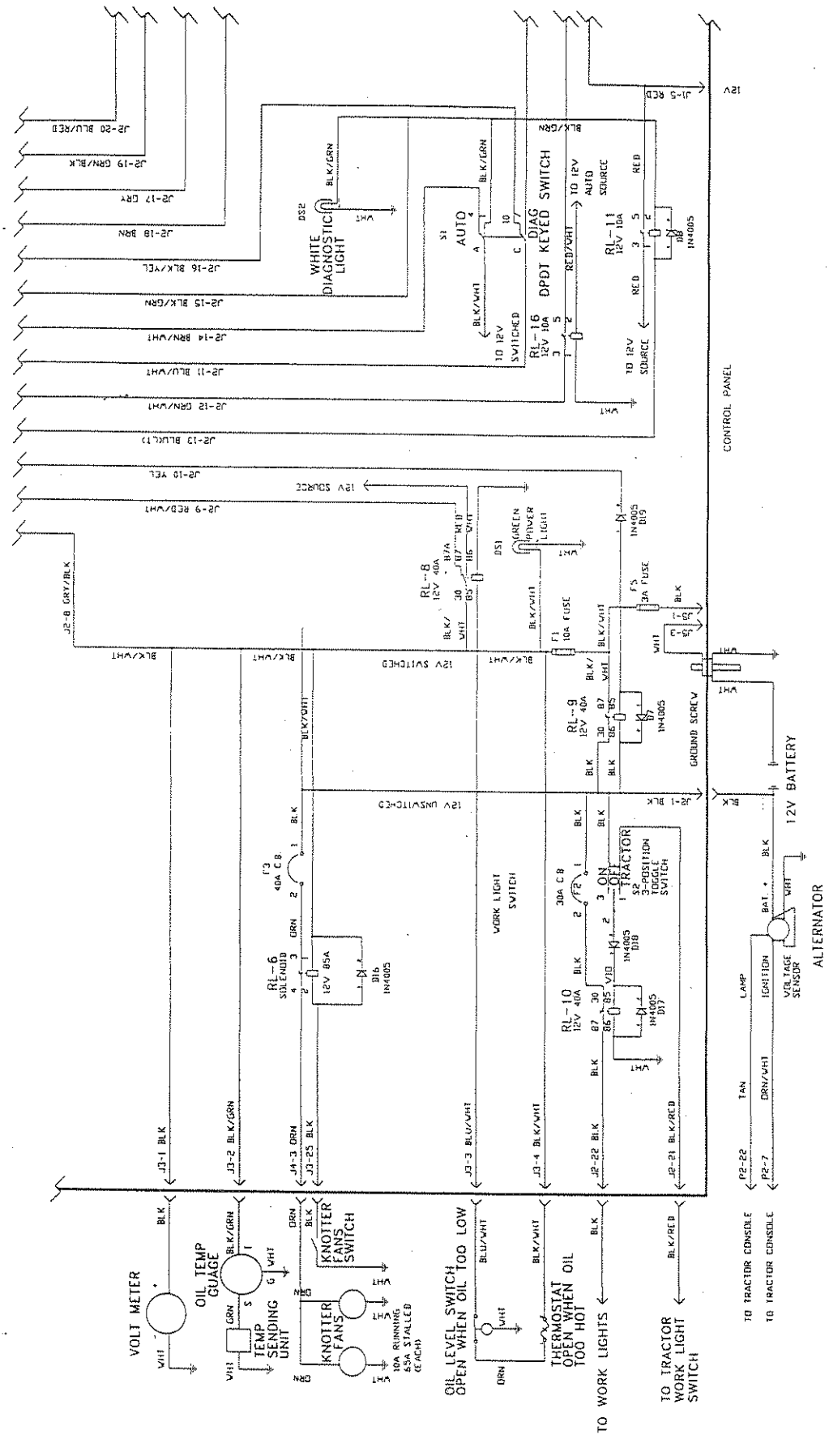


Fig. 6 Electrical Schematic of Main Power and Lighting/Fan Circuits

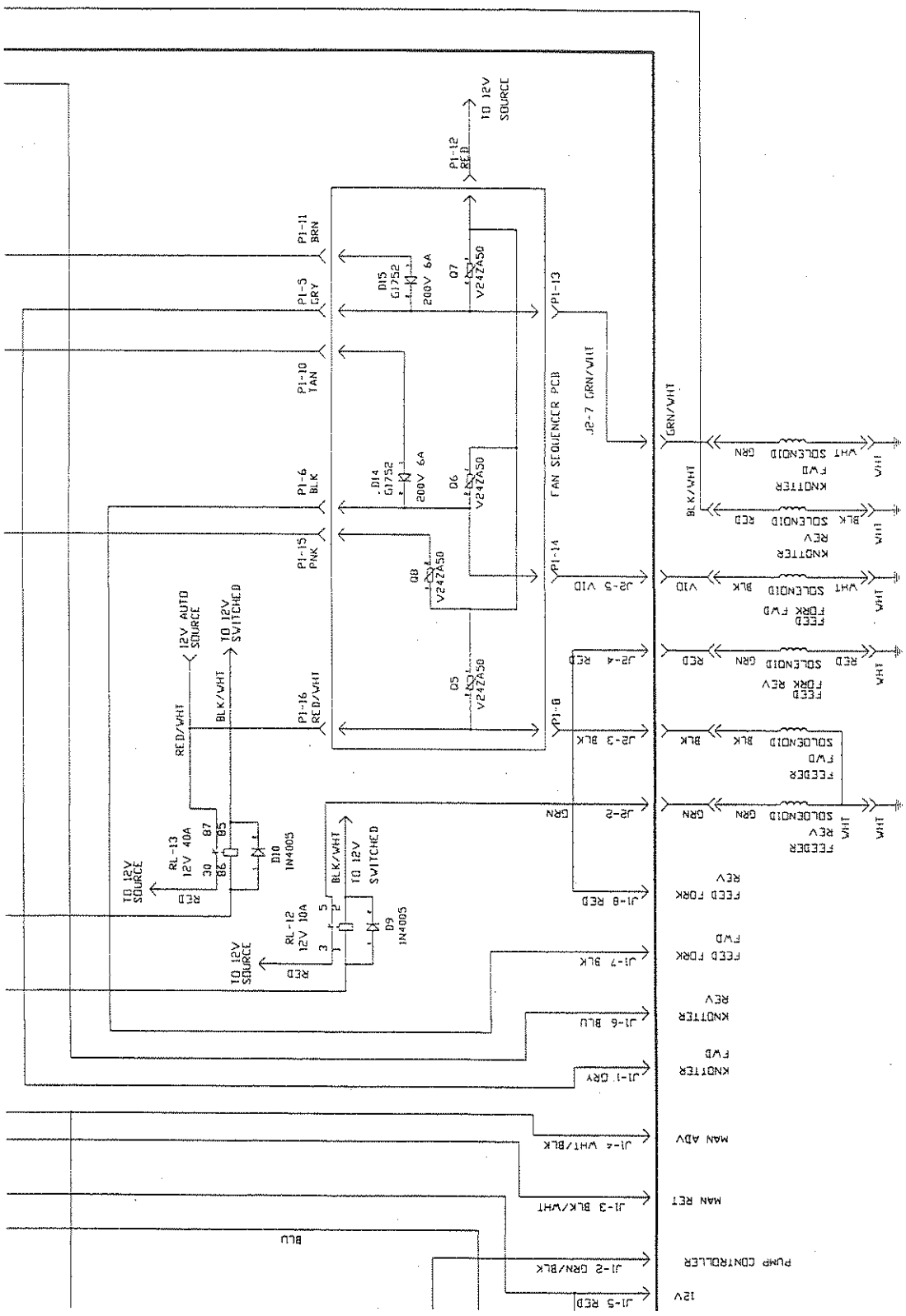


Fig. 7 Electrical Schematic of Auto Source and Protection Circuits

LIMIT SWITCH INFORMATION

Limit Switches (LS) are lever-actuated switches with either four or eight posts. Standard symbols are used to represent these limit switches. Fig. 8 illustrates a limit switch in the released position. The symbol for this position shows the switch as normally closed. Fig. 9 shows the same switch as operated. The symbol is illustrated to show the open position.

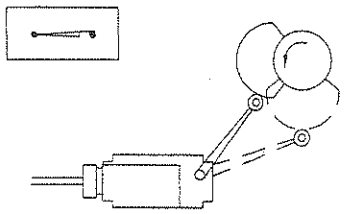


Fig. 8 Deactivated Switch

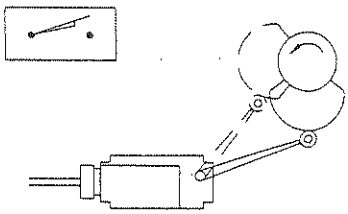


Fig. 9 Activated Switch

Multiple Contact Switches

The limit switches used on the baler are multiple contact switches. Multiple contact switches may have both normally open and normally closed contacts. Fig. 10 illustrates a symbol for a multiple contact switch. Each limit switch has a diagram of the contact positions on the body of the switch.

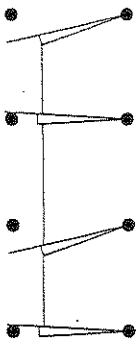


Fig. 10 Multiple Contact Limit Switch Diagram

LIMIT SWITCH DESCRIPTION

Figures 11-19 show the limit switches as they appear on the machine in the activated position and give a description of their function.

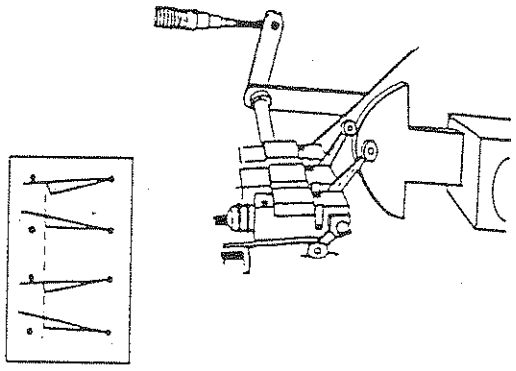


Fig. 11 LS-1 - "Knotter Stop / Ram Safety Knotter Switch

Limit switch No. 1 is operated by a cam mounted to the needle yoke drive shaft. When operated this switch tells the system that the needle yoke and knotter are in the home position.

Another primary function is to stop the needle yoke in the rest position at the end of the cycle. The only way that the needles and the ram would be out of time, is for LS-1 to be out of adjustment. For adjustment information, see the Maintenance Manual.

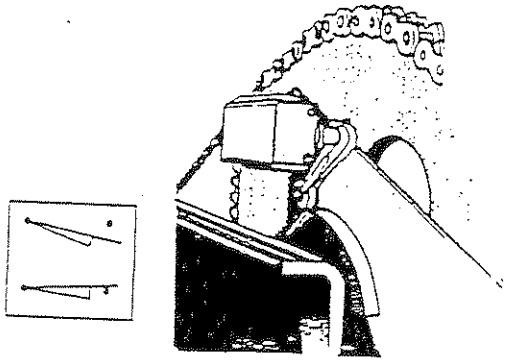


Fig. 12 LS-2 - Ram Delay / Feed Fork Switch

Limit Switch No. 2 is operated by a cam mounted to the Feed Fork drive sprocket. When operated this switch tells the system that the feed fork is at its highest position in the chamber. For adjustment information, see the Maintenance Manual.

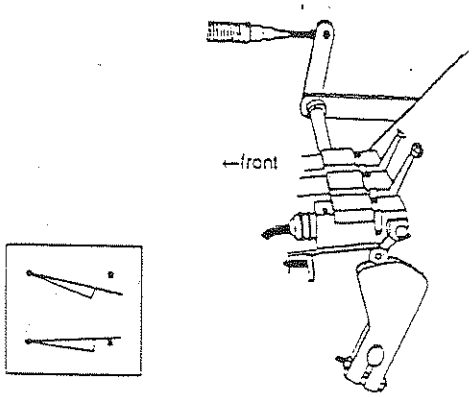


Fig. 13 LS-3 Full Charge Switch

Limit switch No. 3 is operated by a cam mounted to the feed sensor paddle shaft. When operated this switch tells the system that an adequate amount of material is ready to be pressed into the forming bale. For adjustment information, see the Maintenance Manual.

When LS-1, LS-2, and LS-3 are operated in combination, the feed fork will stop, holding the crop up into the chamber and the ram will compress it into the forming bale.

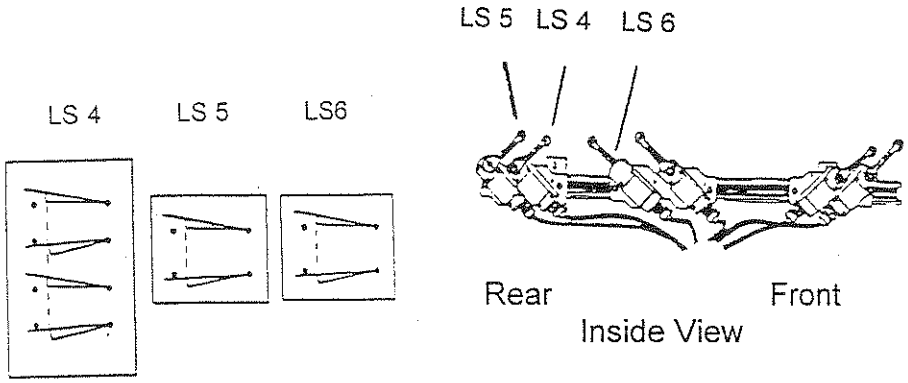


Fig. 14 LS-4, LS-5, LS-6 - Ram Advance Decelerate Switch – Ram Return Switch – Ram Return Delay Switch

Limit Switch No. 4 is operated by the ram near the end of the advance stroke. When released, this switch signals the main hydraulic system to slow down. There are two other functions that LS 4 is responsible for. One is to close the circuit between Relay 1 and LS-11 which arms the tie cycle circuit. This allows a tie cycle to start the instant that the ram starts to retract. The second is to tell the pump to decelerate the ram until it reaches LS-6 after the initial full speed retract that occurs during the first part of a tie cycle. For adjustment information, see the Maintenance Manual.

Limit Switch No. 5 is operated by the ram at the end of the advance stroke. When released this switch directs current to release Relay 1. With Relay 1 released the ram can retract. For adjustment information, see the Maintenance Manual.

Limit Switch No. 6 is operated by the ram shortly after the return stroke begins. During a tie cycle LS-6 stops the ram on the return stroke if the system has not been told by LS-12 that the knotter has completed more than half of its cycle. Once LS-12 has been tripped full speed ram retract will resume. For adjustment information, see The Maintenance Manual.

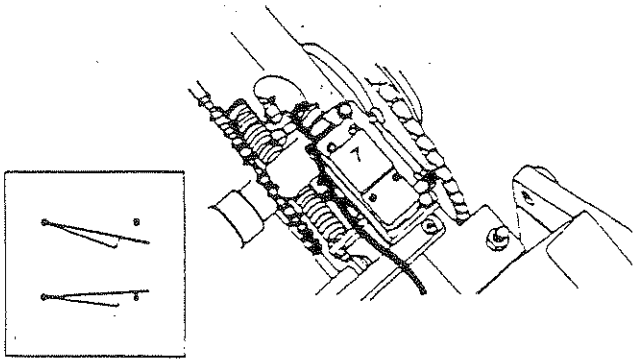


Fig. 15 LS-7 - Knotter Reverse Safety Switch

Limit Switch No. 7 prevents the bill hooks from turning in reverse in Diagnostic Mode. A cam mounted on the knotter drive sprocket operates the switch. For adjustment information, see the Maintenance Manual.

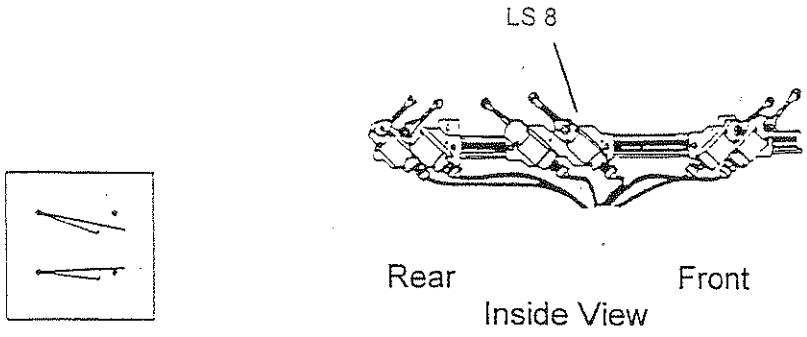


Fig. 16 LS-8 - Feed Fork Delay Ram Switch

Limit Switch No. 8 is operated by the ram approximately halfway through the return stroke. This starts the feed fork operation before the ram has fully returned.

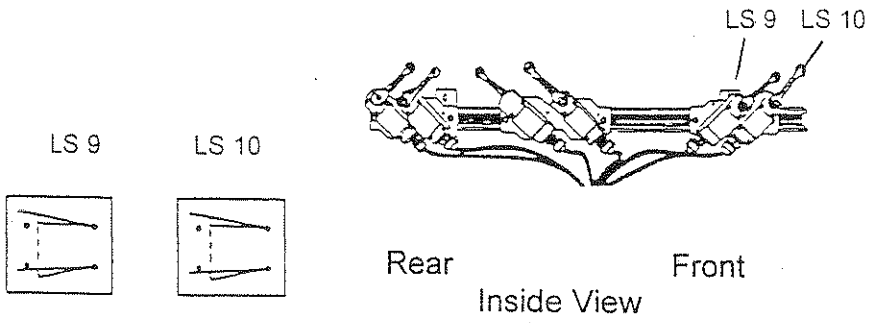


Fig. 17 LS-9, LS-10 - Ram Return Decelerate Switch - Ram Return Stop Switch

Limit Switch No. 9 is operated by the ram near the end of the return stroke. When operated, LS-9 sets Relay 4 which causes the ram to retract slower before stopping. For adjustment information, see the Maintenance Manual.

Limit Switch No. 10 is operated by the ram at the end of the return stroke. When operated this switch cuts off current to stop the ram . For adjustment information, see the Maintenance Manual.

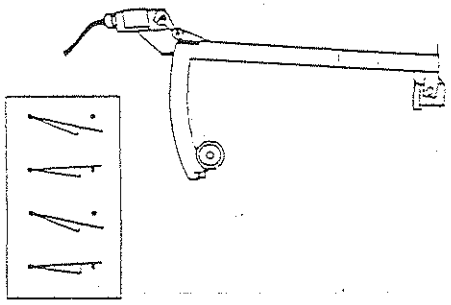


Fig. 18 LS-11 Knotter Trip Switch

Limit Switch No. 11 is operated by the bale length metering arm. This switch allows current to reach Relay 3. When armed by LS-4 on the extend stroke preceding a tie cycle, relay 3 provides the signal starting a tie cycle. For adjustment information, see the Maintenance Manual.

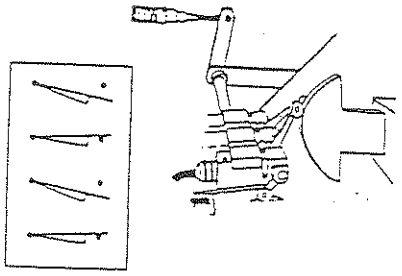


Fig. 19 LS-12 Ram Early Start Knotter Switch

Limit Switch No. 12 is operated by a cam mounted on the needle yoke drive shaft. When operated this switch allows the ram to continue to return during a tie cycle past LS-6. Another function of LS-12 is to signal the bale counter to add one to the total.

BALER CONTROLLER

The Baler Controller as seen in Figure 20 is provided as a means of monitoring and controlling the baler from the operators seat in the tractor. The following sections describe the features of the Baler Controller and their functions.

Note: This controller is not a field serviceable item. To locate the nearest service provider, contact manufacturer.

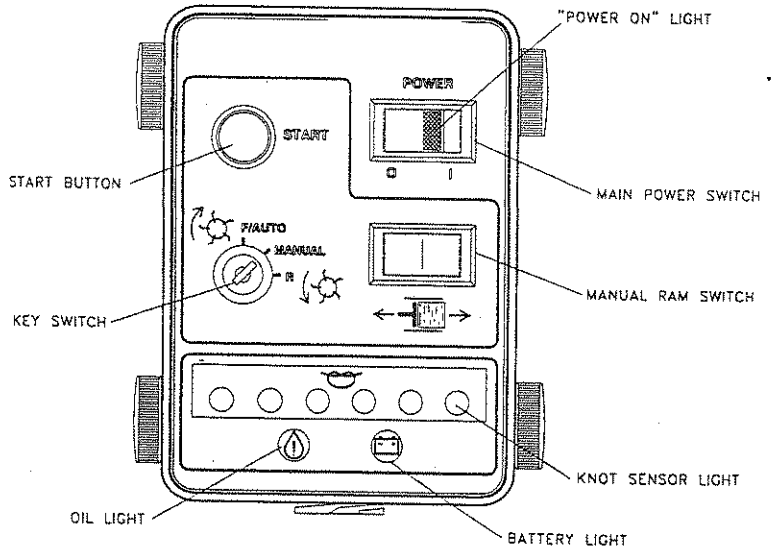


Fig. 20 Baler Controller and Features

Switches

The main Power Switch on the Baler Controller allows electrical power to be sent to all systems on the machine except the Lighting system which is connected directly to the baler's battery and the tractor. If the Baler Controller is not properly connected to the wiring harness, the main power circuit will not be completed and the baler will not function.

A 3-position "Auto-Fwd/Manual/Reverse" keyed switch allows the operator to switch baler operation modes.

NOTE: If the feeder is not actually plugged, switch the Baler Controller key from Auto to Manual mode and allow the feeder to coast to a stop before reversing it.

A START button is required to begin baler operation after the Baler Controller has been switched from Manual to Auto-Fwd mode.

A 3-position "Manual Ram" switch can be used to operate the ram manually provided the Baler Controller is in Manual mode. Note: the Control Panel must still be set to Auto mode.

Indicator Lights

A green light inside the Power Switch will illuminate when the main power circuit has been closed.

Six amber knot sensor lights will illuminate to monitor the knot tying process after the knotters have cycled. (see Knot Sensors)

A red Oil light will be lit if a hot oil or a low level situation has occurred. Note: the baler's hydraulic functions will not operate in this condition.

A red Battery light will be lit if the charging system is not operational. (see Charging System)

CONTROL PANEL

The control panel provides a central location for housing relays, switches, resistors and other electrical components that control the various functions of the baler. Three circuit breakers and one fuse protect the electrical components. Fig. 21-23 show views of the Control Panel's external and internal components.

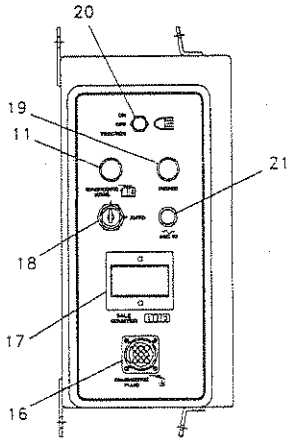


FIG. 21 Front View

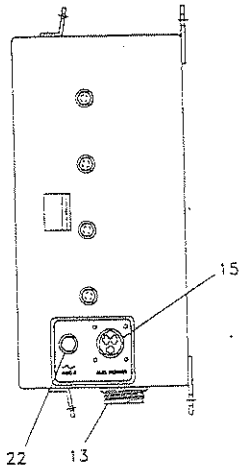


FIG. 22 Rear View

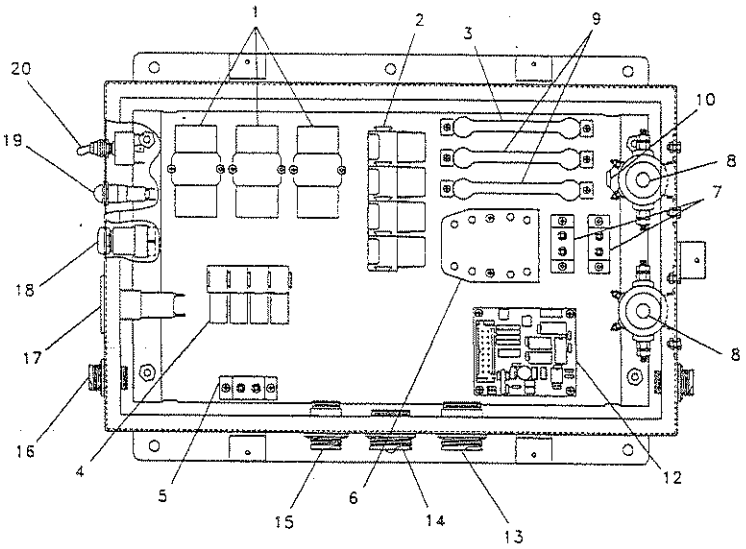


FIG. 23 Side View

Fuses

A 10-amp fuse (Ref. 21; Fig. 21) on the front of the Control Panel protects the power supply circuit. Check the fuse for continuity. Do not substitute, use only a 10-amp fuse.

A 3-amp fuse (Ref. 22; Fig. 22) is standard on the rear of the Control Panel to protect the auxiliary power circuit. Check the fuse for continuity. Use only a 3-amp fuse unless told otherwise by manufacturer (due to optional equipment installed).

Indicator Lights

A green "power" light (Ref. 19; Fig 21) will be lit when the Baler Controller is properly connected and the Power Switch is turned on.

A white "diagnostic" light (Ref. 11; Fig. 21) will be lit when the key switch has been turned to Diagnostic mode and power is available.

Relays

Relays are either standard or magnetic latching type. Each relay is contained in a plastic body that plugs into a socket similar to the one shown in figure 24.

A standard relay (Ref. 2, 4 & 6; Fig. 23) is actuated (set) only when the magnetic coil is energized. Figure 24 illustrates a standard relay in the set position (voltage applied).

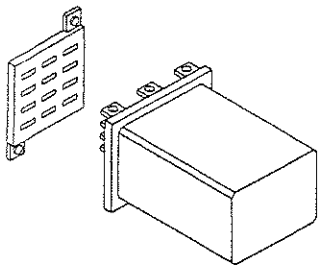


Fig. 24 Relay Body and Socket

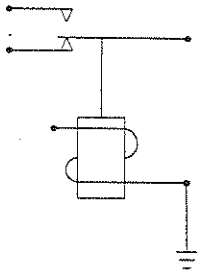


Fig. 25 Standard Relay

Magnetic Latching Relay

A magnetic latching relay (Ref. 1; Fig. 23) requires current to set and release the relay. If no current is applied to a magnetic latching relay, the contacts stay in the last position. If current is applied to both the set and released sides of the relay at the same time, the contacts will favor most recent position. Fig. 26 illustrates the magnetic latching relay and the symbol used to represent it. The dotted lines drawn between the coil and contacts represent a mechanical link between the contacts.

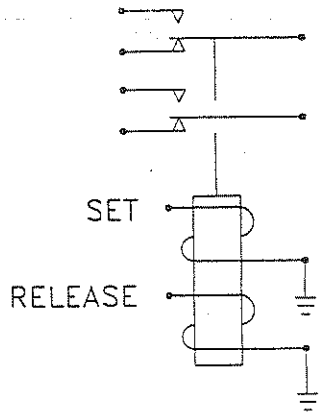


Fig. 26 Magnetic Latching Relay

Resistors

Three resistors are located in the main control panel (Ref. 3 & 9; Fig. 23). These resistors control the voltage of the signal sent to the Main Pump controller which will set the ram speed. The top resistor has a 200 ohm value. This resistor provides the primary resistance in the circuit and should not require adjustment. The middle and bottom resistors each have a 100 ohm value. They regulate voltage (speed) during the decelerated modes of operation. Sliding contacts on each resistor to the right or left (Fig. 19) will increase or decrease the voltage and therefore the speed of the ram. On resistors with two sliding contacts, the right contact controls voltage in AUTO mode and the left contact controls voltage in MANUAL / DIAGNOSTIC mode. For proper adjustment of the sliding contacts, see "Ram Speed Adjustment" in the Maintenance Manual.

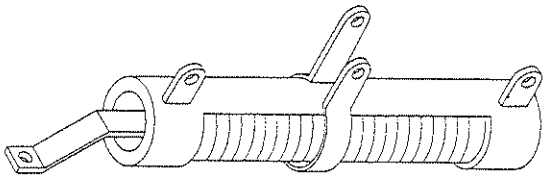


Fig. 27 200 ohm Resistor with Single Sliding Contact

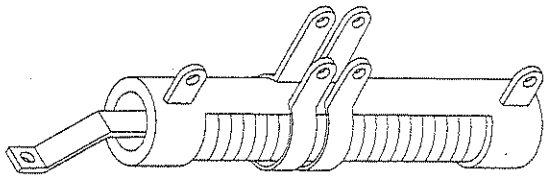


Fig. 28 100 ohm Resistor with Dual Sliding Contacts

Switches

A two-position keyed switch (Ref 18; Fig. 21 & 23) to change the Control Panel from Automatic mode to Diagnostic mode. Note that in Diagnostic mode the baler will only respond to the Diagnostic Controller.

A three-position "On/Off/Tractor" light switch (Ref. 20; Fig. 21) to control work lights for nighttime baling. (see LIGHTING SYSTEM for description of operation)

SWITCHES ON THE BALER

A two-position "On/Off" switch near the service ladder controls the knotter fans.

Work lights over the knotters have toggle switches.

SOLENOIDS

Wire wound solenoid coils are used to actuate the following hydraulic components.

The Feed Fork and the Knotter Control Valves
The Hydrostatic Pump
The Tension Control Valve
The Pickup/Feeder Valve

SENDING UNITS

The hydraulic oil is monitored at the oil reservoir by three components.

1) A sending unit provides a variable output to the temperature gauge.
2) A thermostatic switch completes the circuit to relay 8 which sends current to the control circuit. An oil temperature above 220° F will open the switch breaking the circuit causing the baler to shut down.
3) A float-type oil level switch is connected in series with the thermostatic switch. The power to the control circuit will also be disconnected if a low oil condition exists.

Note: A warning light will be turned on at the Baler Controller when the oil temperature/level circuit is open at either switch 2 or 3.

CHARGING SYSTEM

Electrical current for the baler is provided by a standard automotive type 12 volt battery located on the left hand side near the control panel. Voltage is maintained by a 140-amp automotive type alternator mounted on the main drive unit. Operating voltage is internally regulated at 14.5 volts.

FANS

Oil Cooling Fan

During the baling process heat is created in the hydraulic system. This heat must be dissipated to assure the hydraulic oil retains its power transmitting and lubricating properties. While the baler is operating, oil circulates through a heat exchanger. An electric cooling fan forces air across the heat exchanger anytime the main power switch on the Baler Controller is on. A sequencer allows the fan motor to reverse automatically to dislodge chaff from the front cover screens. The fan will operate for 6 minutes in a forward direction to draw air through the heat exchanger. The sequencer removes power to the fan motor for 10 seconds to allow the fan to stop rotating. Power is then supplied to operate the motor in reverse for 10 seconds. Again, power is removed for 10 seconds to allow the fan to stop rotating. The fan starts again and operates in a forward direction for another 6 minutes. This cycle is repeated as long as the main power switch is on.

Knotter Fans

Knotter Fans are powered by two 12v electric motors. Current is supplied directly from the battery to a relay. Current from the main power switch activates the relay, which allows current to flow to a switch near the service ladder and on to the fans. The fan circuit is protected by a 40 amp circuit breaker.

Note: for extended periods of troubleshooting with the "Power" on and the PTO disengaged, the fans should be disabled. Disconnecting the lower front connector under the Control Panel will disable all three fans.

GAUGES

A temperature gauge (Ref. B; Fig. 29) monitors oil temperature by means of a sending unit mounted in the oil reservoir. A volt meter (Ref. A; Fig. 29) indicates voltage available to the baler control circuit and the cooling circuit.

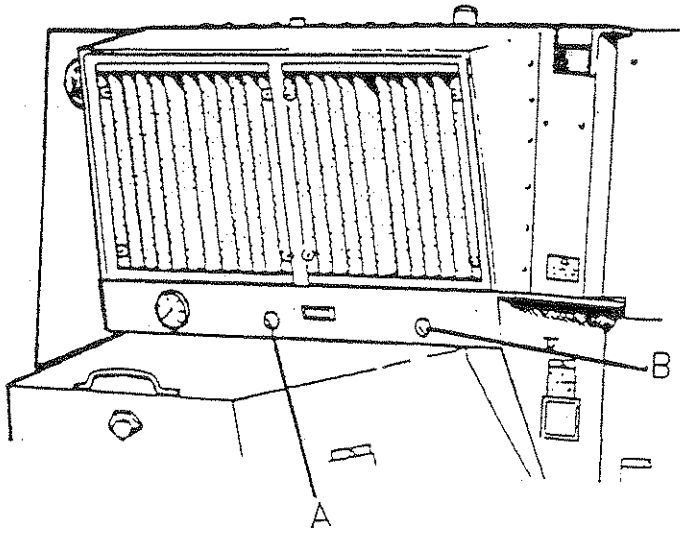


Fig. 29 Electronic Gauge Location on the Front Dash Panel

KNOT SENSORS

The Knot Sensor system has six indicator lights located on the Baler Controller, which receive current from the main power switch. Each time a bale is tied, a switch on each of the knot sensors is closed completing the circuit and causing the indicator lights to illuminate. As the bale is pushed through the chamber a securely tied knot will trip the knot sensor mechanism and open the circuit causing the light to go out

LIGHTING SYSTEM

Two separate lighting systems provide illumination for nighttime baling and for travel on public roadways.

The 4 work lights and the knotter lights receive current from the baler electrical system. A switch on the control panel provides power to these lights. Moving the switch to "on" will send current to relay 10 and turn lights on directly from the control panel. The lights will remain on until the switch is moved to "off". Some tractors equipped with a seven terminal electrical outlet have terminal 2 connected to the work light switch in the cab. Moving the switch to "tractor" will allow power from terminal 2 on a tractor to activate relay 10 in the control panel and turn the lights on. This allows the operator to operate the baler's lights from the cab. Make sure the baler work lights are off before transporting the baler on a public roadway.

Brake, Tail, Turn and Hazard lights receive current from the seven terminal plug on the main harness connected to the tractor. Some tractors equipped with a seven-terminal electrical outlet have terminal 4 connected to an auxiliary power circuit. If so, the brake lights will be on whenever the tractor key is on. If this is undesirable, the wire to terminal 4 can be removed from the plug attached to the main baler harness and taped back out of the way. DO NOT CUT THIS WIRE! Make sure that the taillights are still operated by terminal 6 for travel on public roadways.

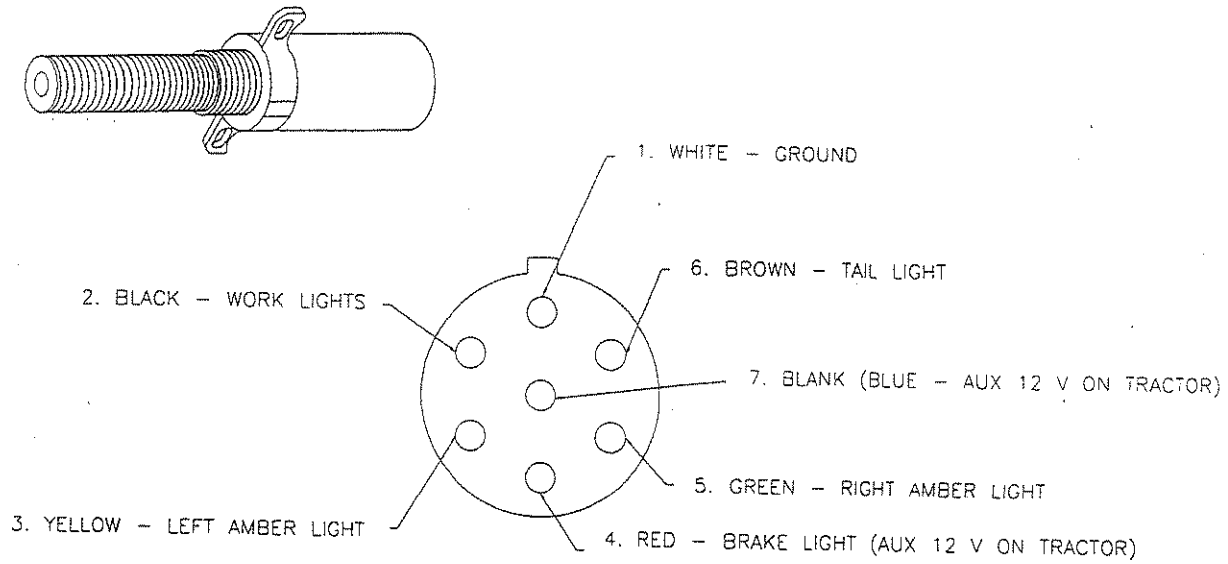


Fig. 30 Seven terminal plug

ELECTRICAL OPERATION

The control circuit in figure 7 has been redrawn to show current flow (shaded areas) during the different baler functions. To troubleshoot a problem, find the schematic relating to the status of the baler's components (ie. ram extending, retracting, tying, etc...). Then trace the shaded circuit to identify points that can be tested for voltage or continuity to locate a faulty or misadjusted component.

Ram Advance / Decelerated Advance

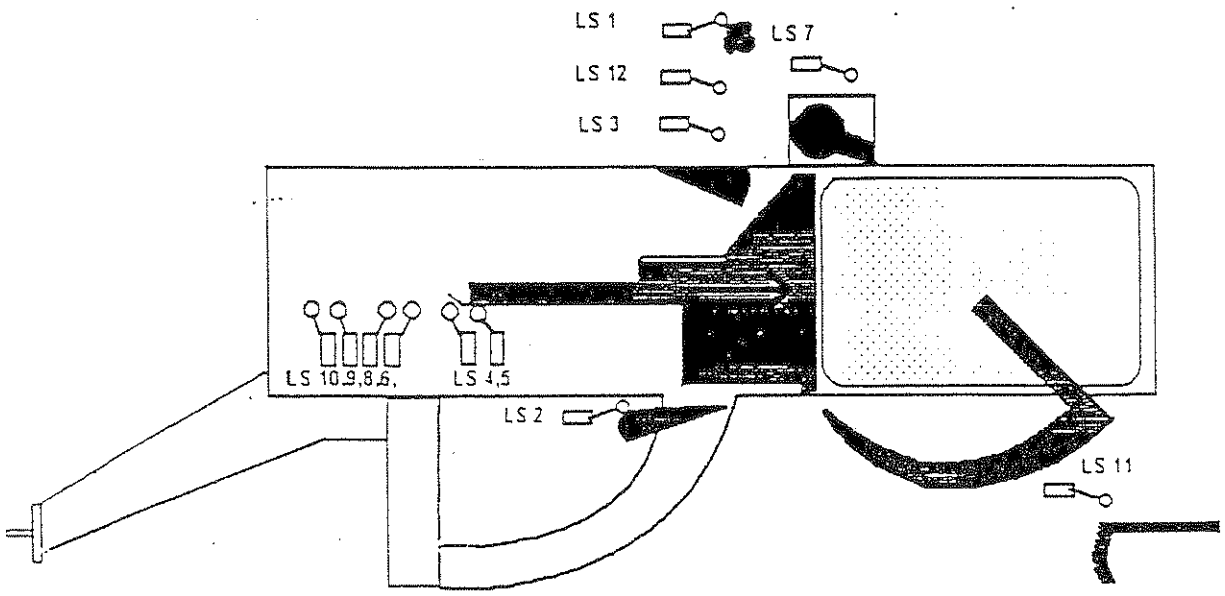


Fig. 31 LS-4 is released and ram is advancing at reduced speed

As the ram advances, the following switches are released in sequence:

A. LS-10 is released
B. LS-9 is released. Relay 4 is set but has no affect
C. LS-8 is released.
D. LS-6 is released.
E. LS-3 is released as ram pushes material past the sensor paddles allowing them to drop.
F. LS-4 is released. This causes the ram to slow to about 25% of full speed (see hydraulic section for description of 50% speed)

Reducing the speed of the ram near the fully extended position allows more force to be applied to the material being compressed.

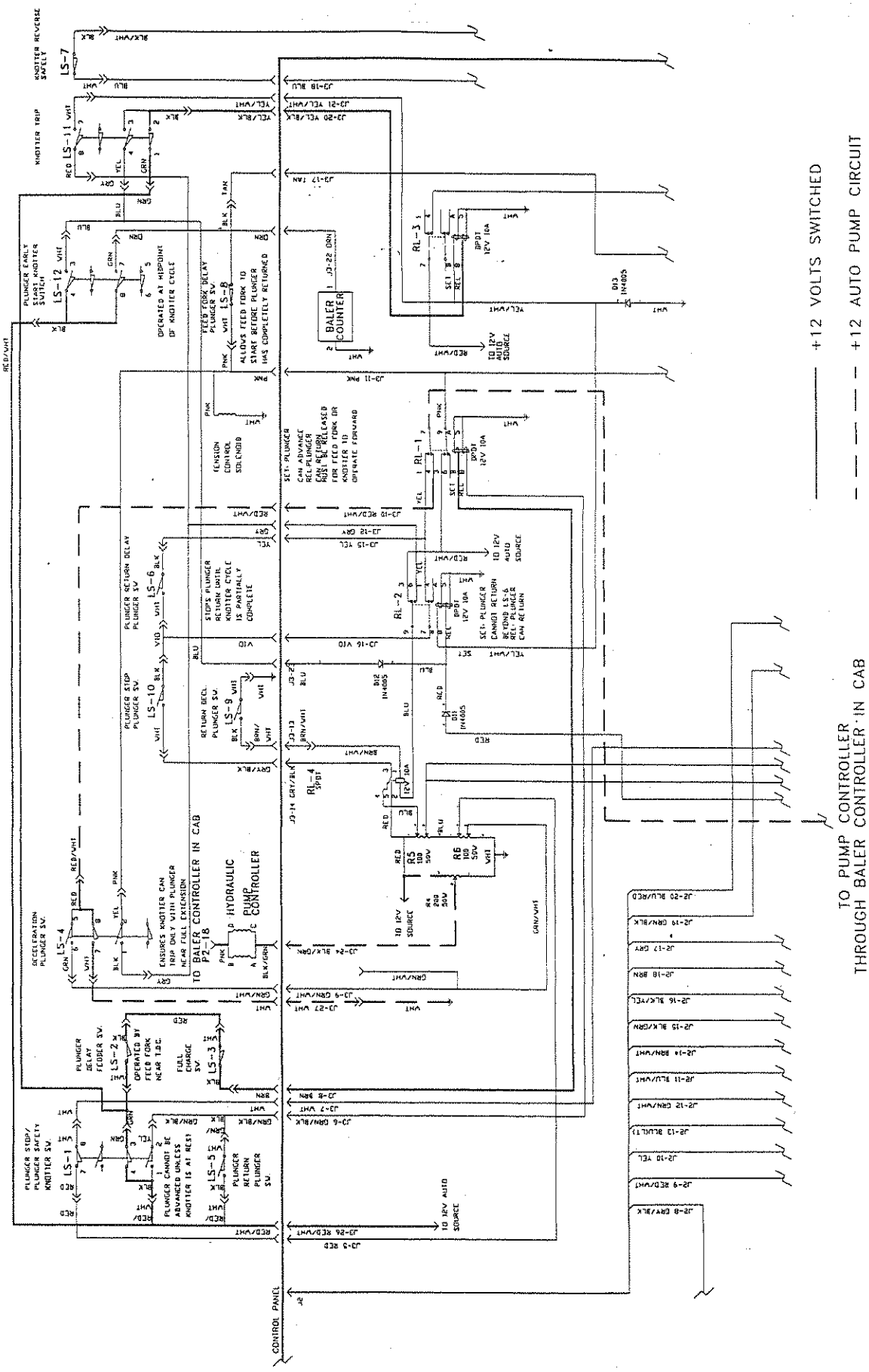


Fig. 32 Schematic - Ram extending at full speed

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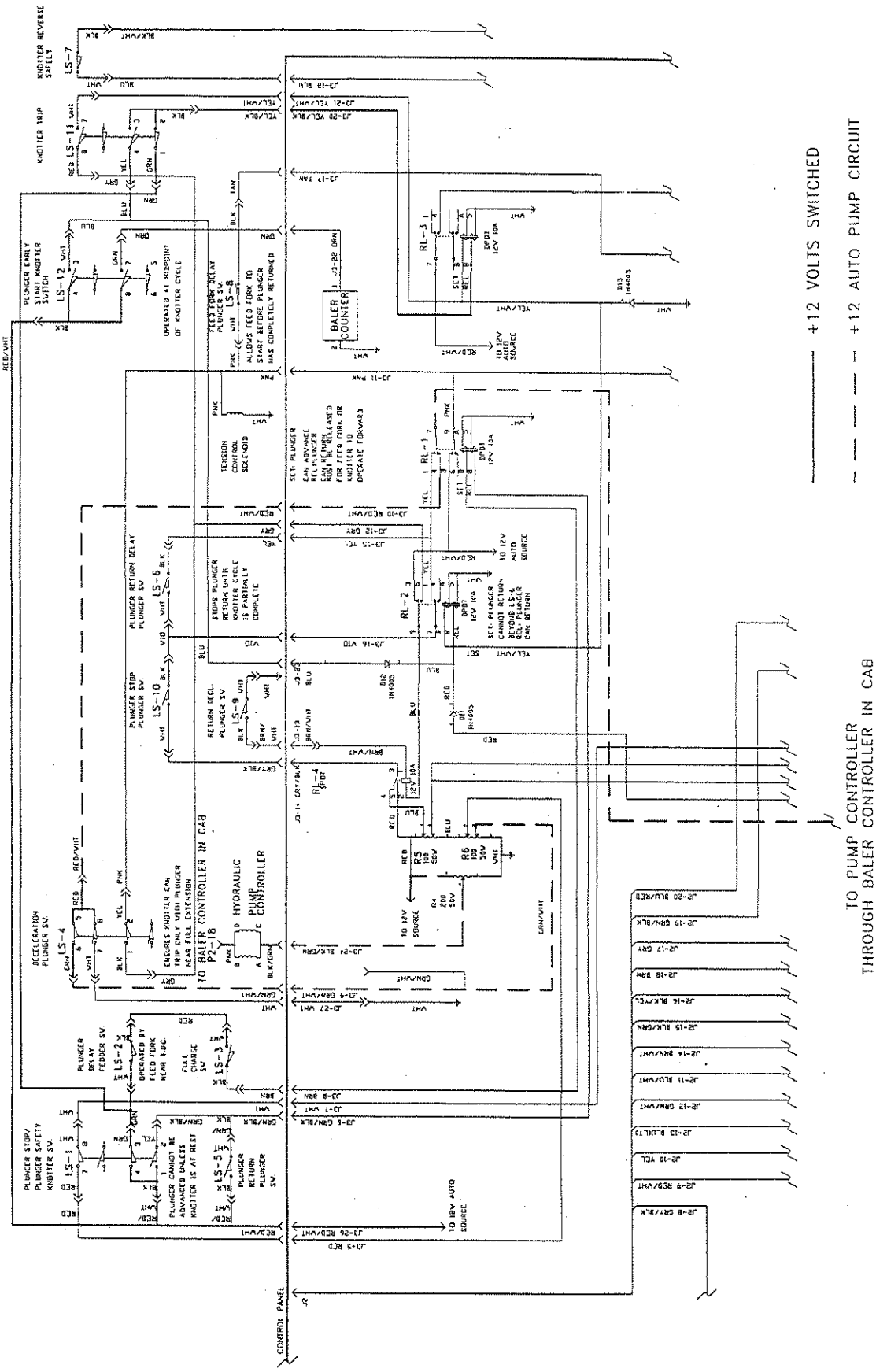

Fig. 33 Schematic - Ram extending at reduced speed

Ram Fully Advanced

LS-5 is released. This provides voltages to release Relay 1. When Relay 1 is released the ram can begin to retract at full speed.

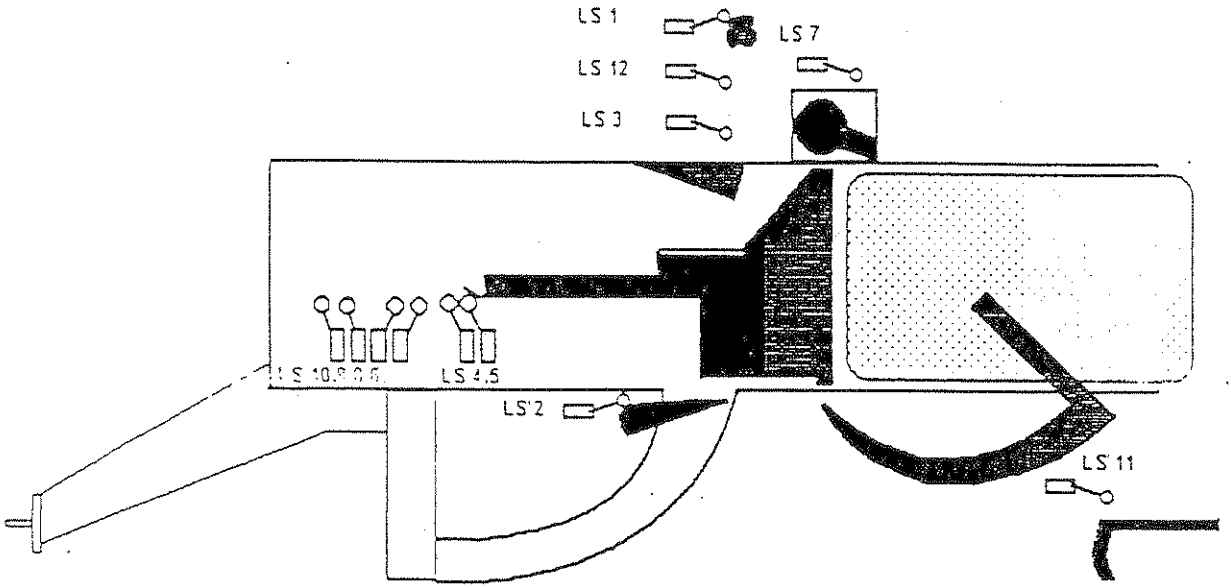

Fig. 34 LS-5 is released. Ram is at the end of it's stroke.

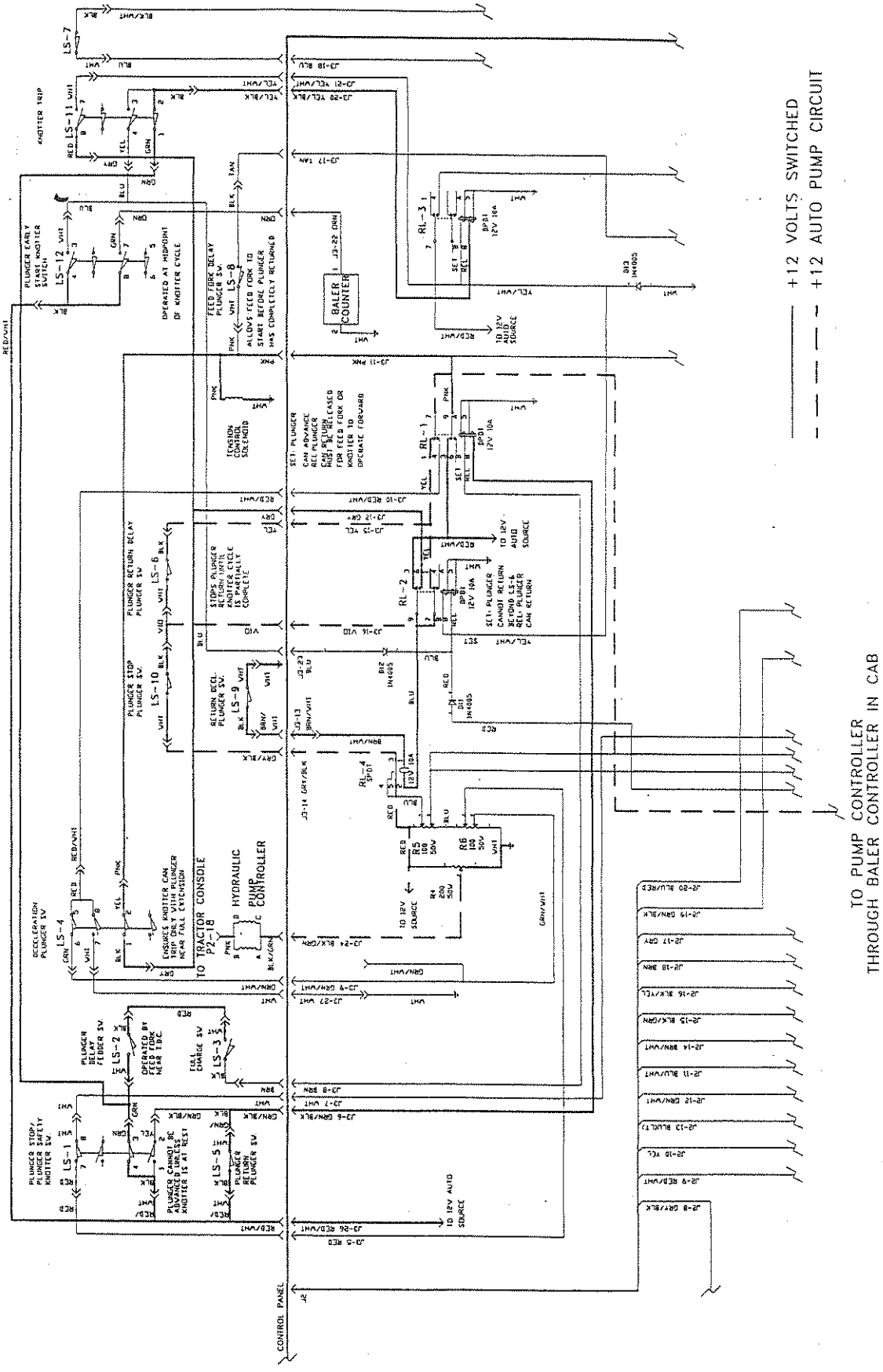

Fig. 35 Schematic - Ran is fully extended, starting full speed retract

Ram Decelerated Retract

Near the end of the retract stroke LS-9 is operated. This opens the circuit to Relay 4 and causes the ram to slow to about 25% of full speed. This prevents the ram from bottoming out when it reaches the end of the stroke.

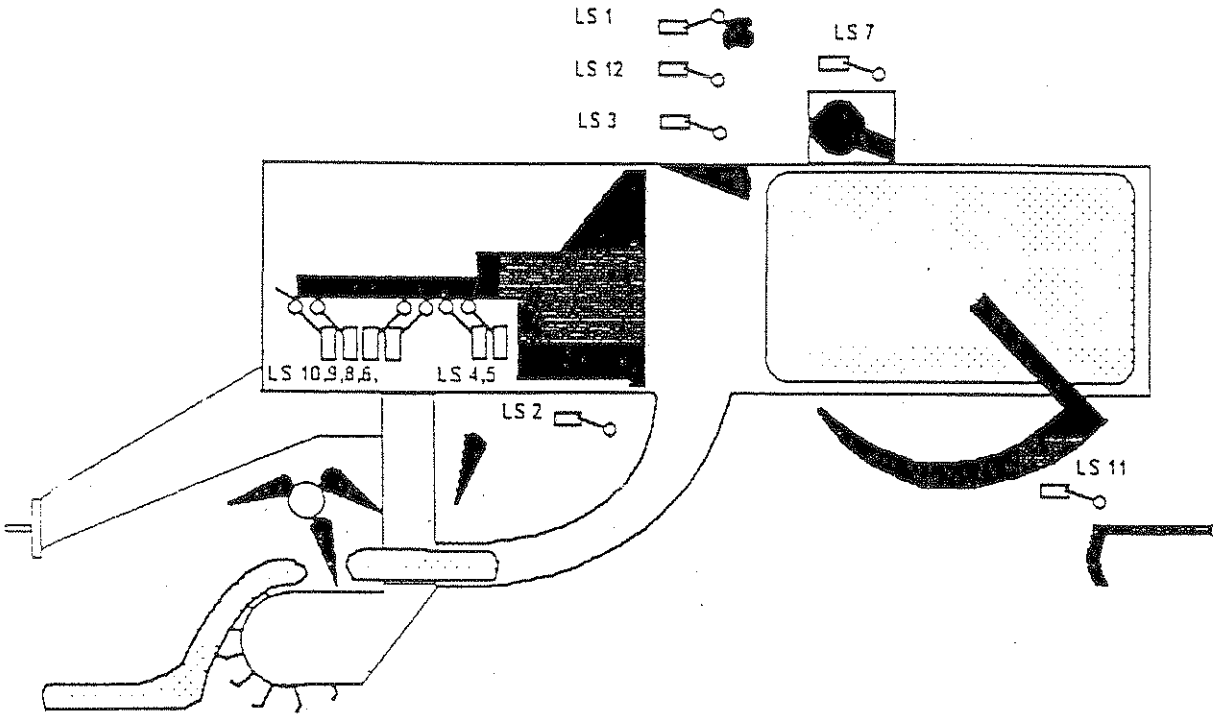

Fig. 36 Ram fully retracted

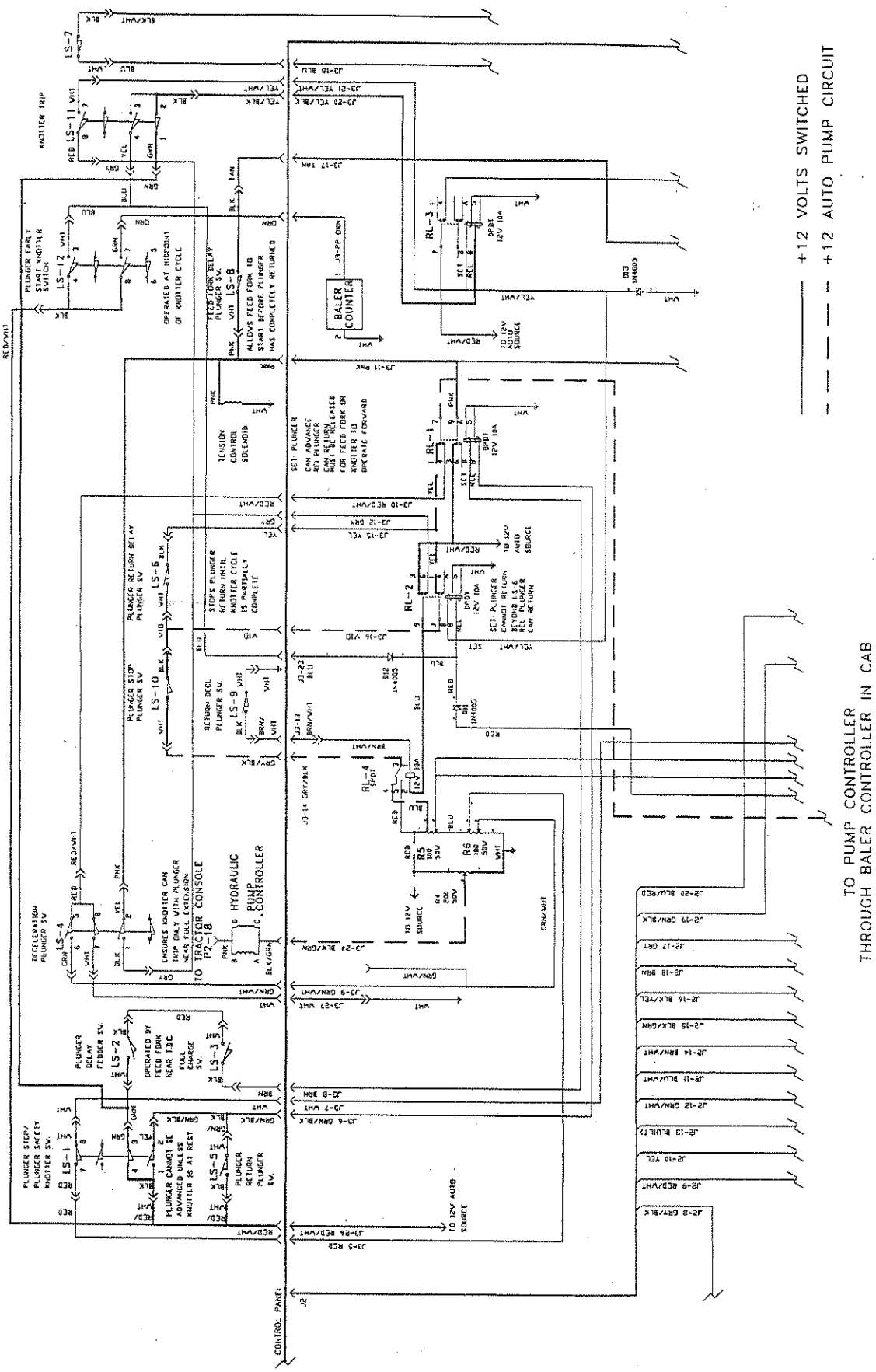

Fig. 37 Schematic - Ram retracting at slower speed, nearly fully retracted

Ram Return Stop

LS-10 is operated. This stops the ram retract. Material will again be delivered to the bale chamber by the feed fork.

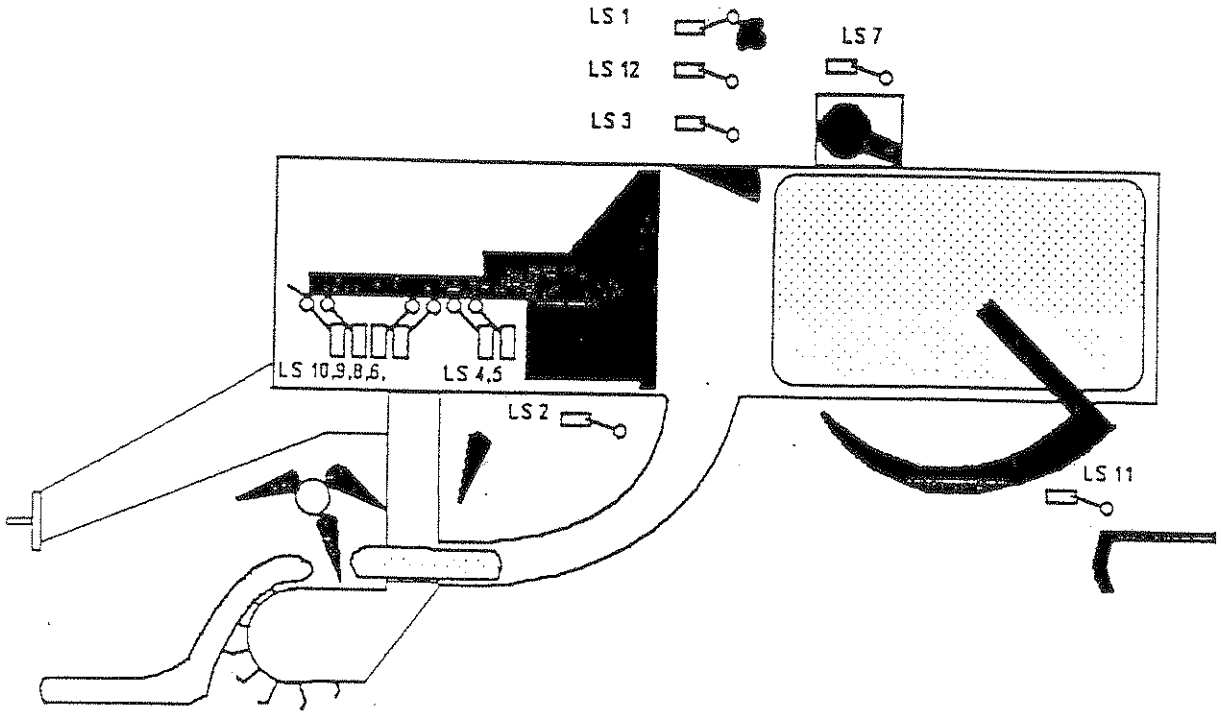

Fig. 38 The feed crank delivers the product to the feed chute

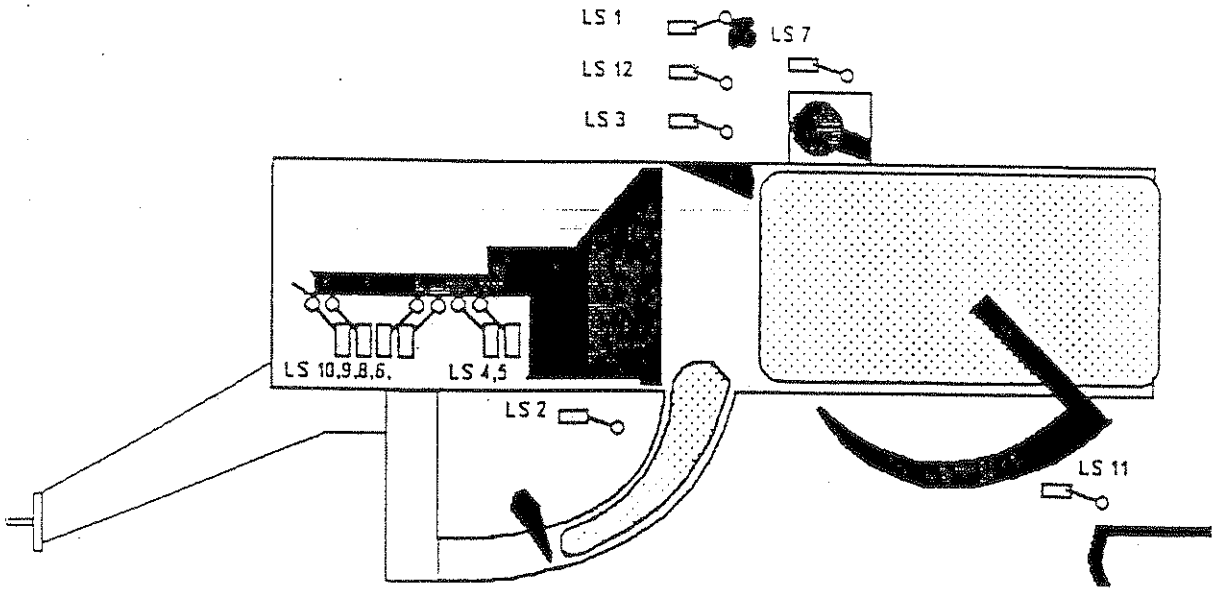

Fig. 39 Material in the feed chute is moved to the chamber by the feed fork

ELECTRICAL SEQUENCE OF RAM STROKE DURING TIE CYCLE

The sequence begins with the ram in the home position. The needle yoke must also be in the home position. This places LS-1 in operated condition to provide voltage to LS-2.

Begin Ram Advance

A. As material is fed into the baler the feed fork fills the chamber until the Charge Sensor paddles are raised and LS-3 is operated.
B. The Feed Fork will operate LS-2 at the top dead center position. Voltage supplied through LS-1 passes through LS-2 and LS-3 to set Relay 1.
C. When Relay 1 is set, the Feed Fork stops, and the ram begins to advance at full speed.

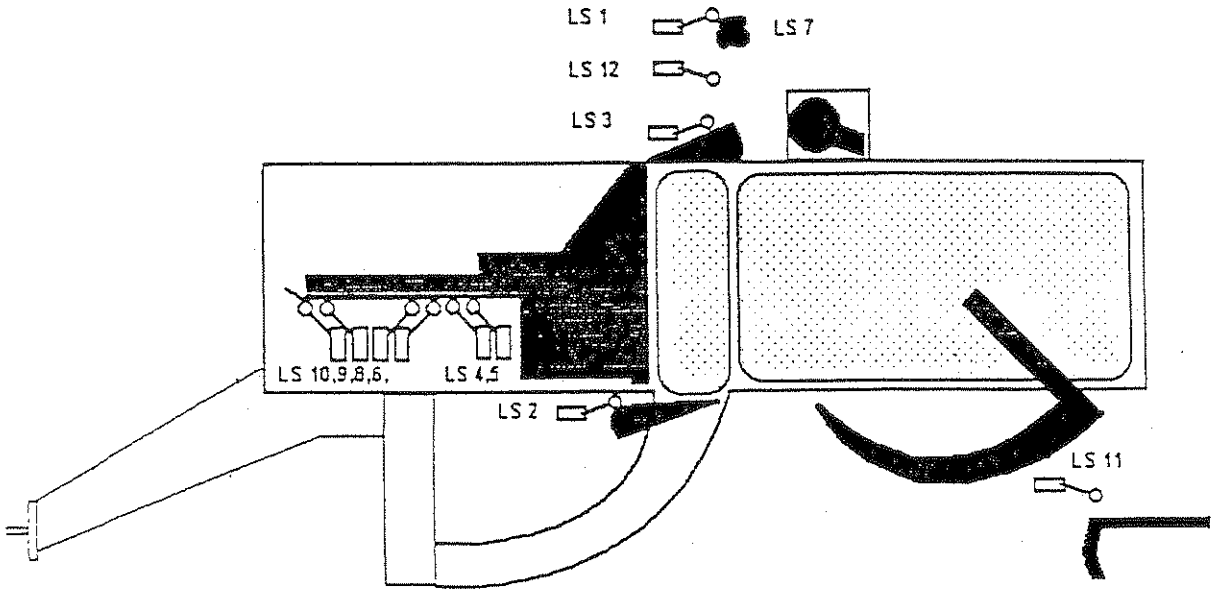

Fig. 40 The feed fork fills the chamber until the charge sensor paddles are raised and LS-3 is operated

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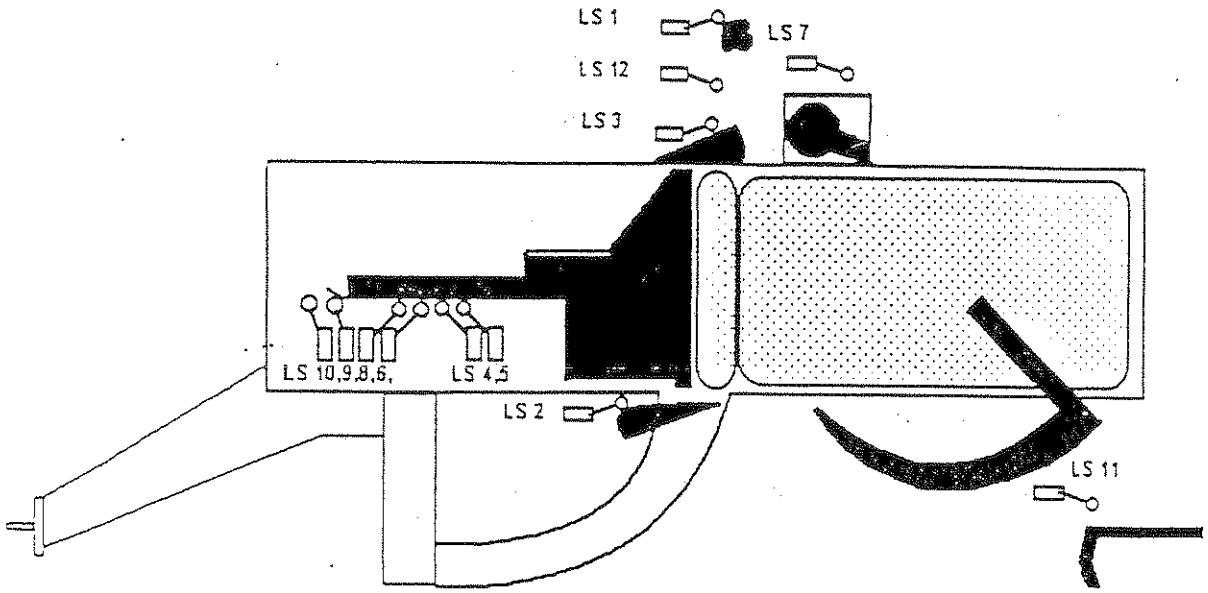


Fig. 41 Ram extending, compressing product

Meter Arm Operates LS-11 During Ram Advance

At some point during ram advance the rotating meter wheel raises the meter bar enough to operate LS-11. LS-11 closes a portion of the circuit that activates the knotter. The operation of the knotter can occur only when the ram reaches the fully extended position.

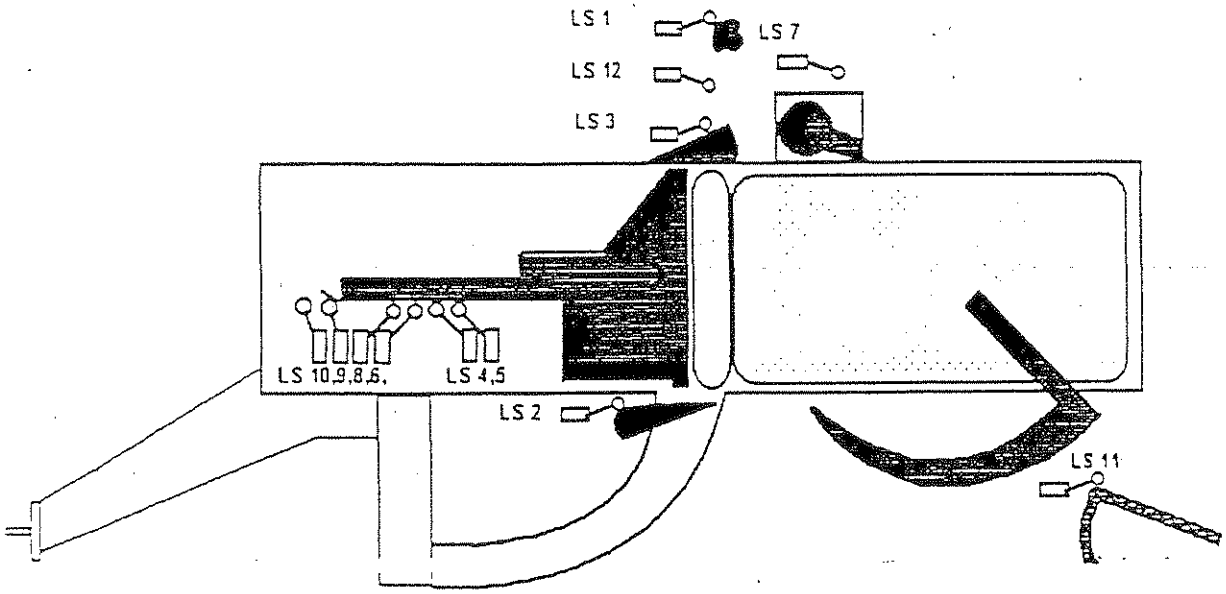


Fig. 42 Ram advancing moving bale which raises meter arm to trip LS-11

Ram Advance / Decelerated Advance During Tie Cycle

As the ram advances, the following switches are released in sequence:

A. LS-10 is released.
B. LS-9 is released. Relay 4 is set but has no affect.
C. LS-8 is released.
D. LS-6 is released.
E. LS-3 is released as ram pushes material past the sensor paddles allowing them to drop.
F. LS-4 is released. This causes the ram to slow to about 25% of full speed. The circuit between Relay 1 and 3 is completed when LS-4 is released but no voltage is applied.

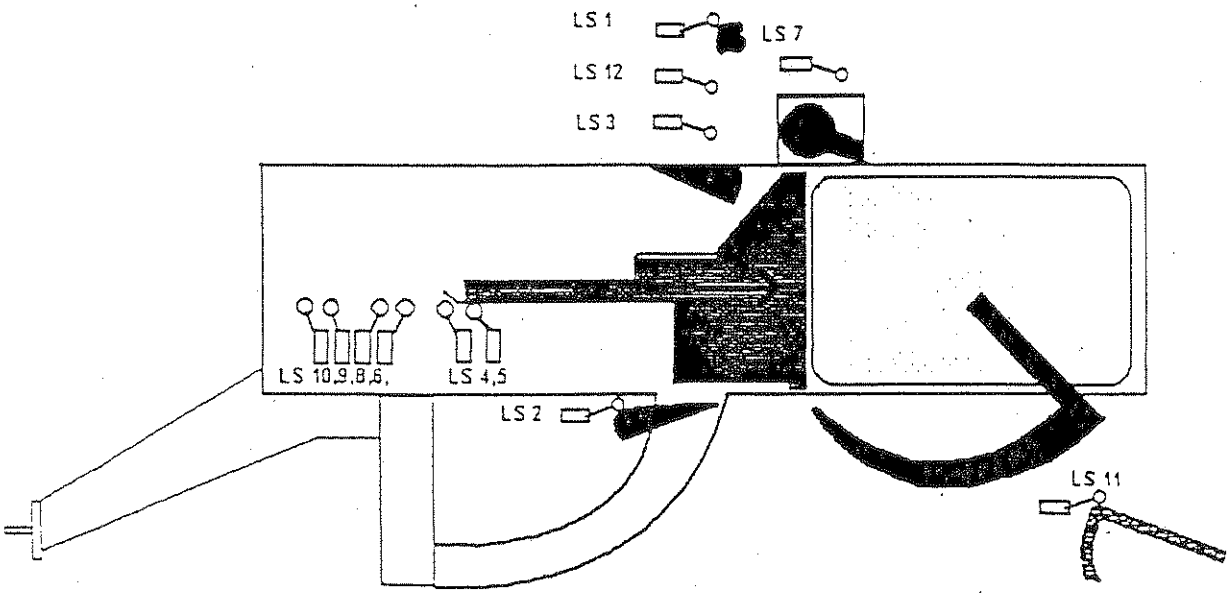


Fig. 43 Plunger advances to prepare for tie cycle

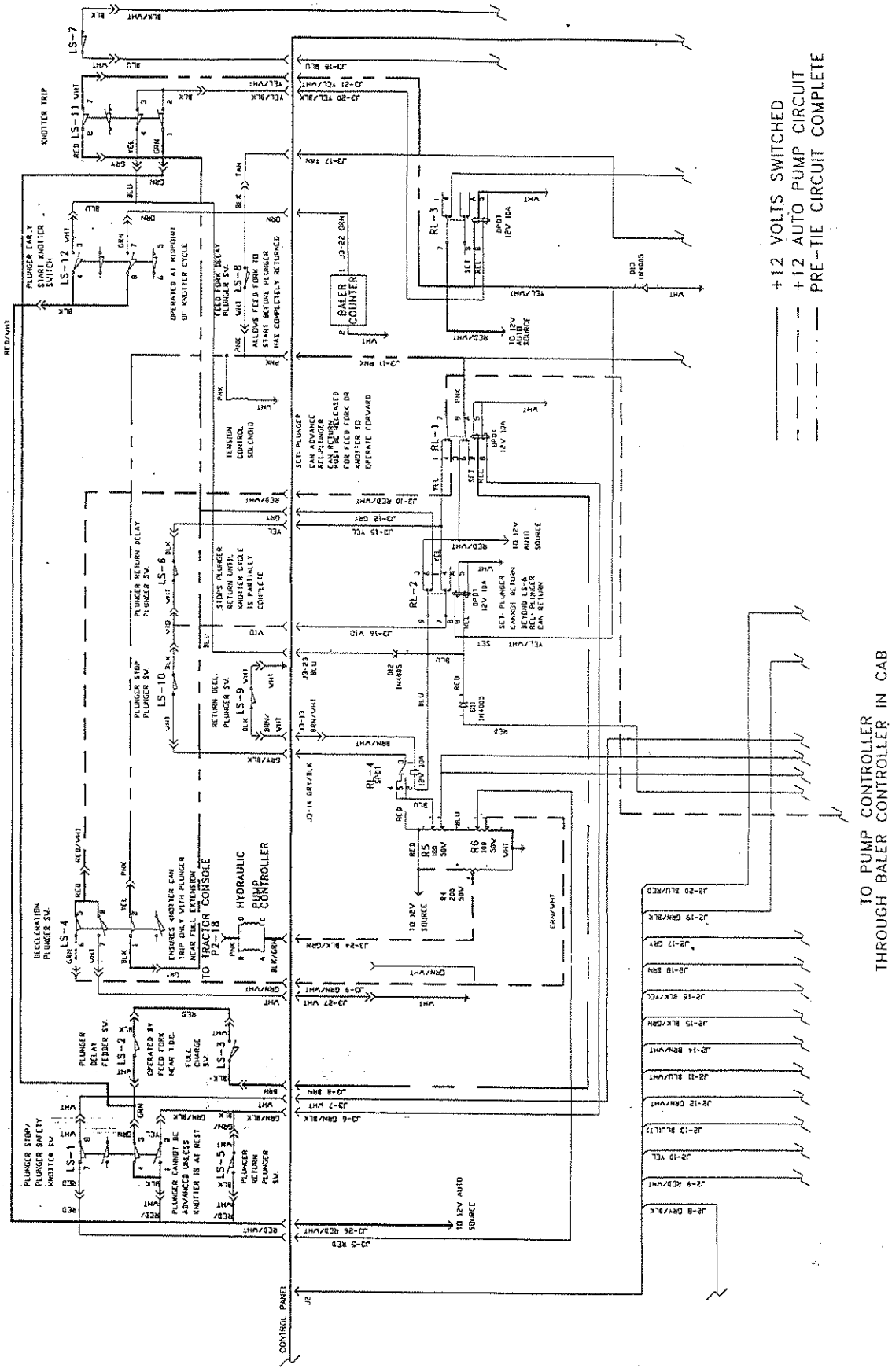


Fig. 44 Schematic – Ram advance before tie cycle. Note how LS-11 has set up RL-3 for power from RL-1 when RL-1 releases at end of stroke

Ram Fully Advanced

A. LS-5 is released. This provides voltage to release Relay 1.
B. When Relay 1 is released, the ram can begin to retract at full speed. Also, as Relay 1 is released, voltage is applied through LS-4 and LS-11 to set Relay 3.
C. When Relay 3 is set, the knotter is activated.

The circuit is designed to protect against accidental operation of the knotter drive. Unlike mechanical balers, the needles are not tied directly to the motion of the ram and therefore cannot come out of time with the ram. Several factors combine to assure the needles cannot be "baled" during normal baler operation.

Note: Severe misadjustment of LS-1 can lead to the needles stopping while still in the chamber. This may lead to "baling" the needles. The ram itself cannot bend or shear off the needles due to slots in the ram face, but the hay being pushed by the ram can. It is critical to adjust LS-1 as required by the Maintenance Manual and NEVER operate the ram with the needles in the chamber unless the chute, and chamber area have been cleared of crop material.

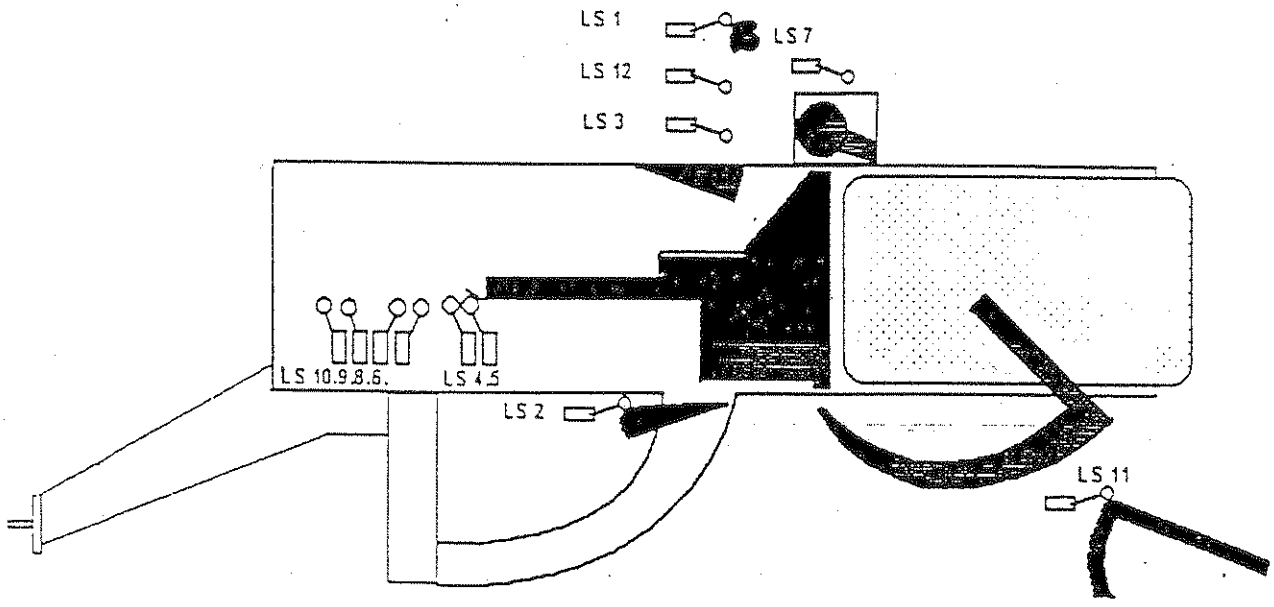


Fig. 45 Ram fully advanced – start of tie cycle

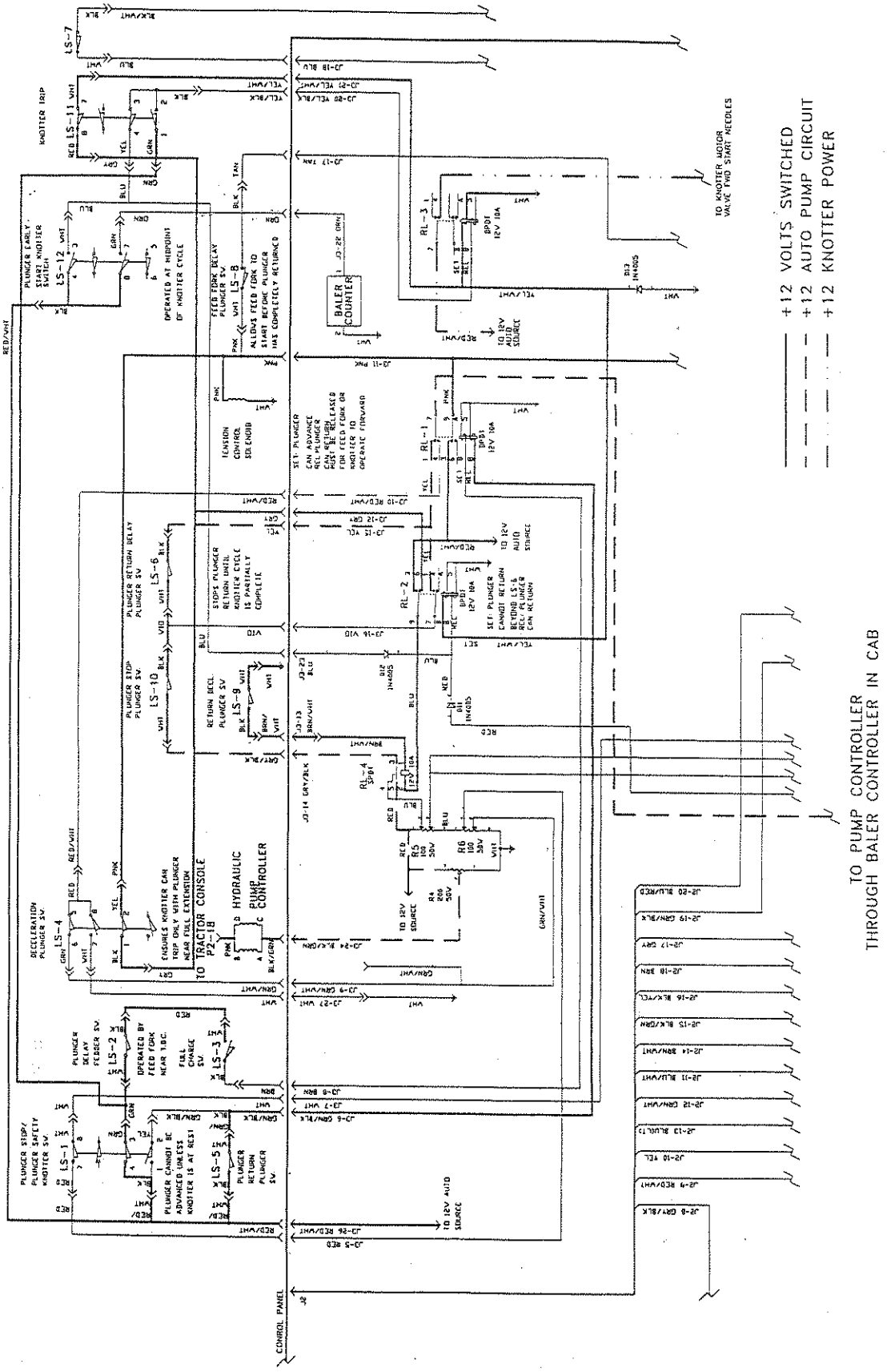


Fig. 46 Schematic – LS-5 released RL-1 sending power to knotters through RL-3 and ram in full speed retract

Ram Retract During First Half of Tie Cycle

As the needle yoke moves away from the home position, LS-1 is released. This provides current to relay 1 to hold it in the released position. The meter arm is reset and LS-11 is released. The knotter continues to operate because Relay 3 is magnetically latched in the set position. As the ram retracts, the following switches are operated in sequence:

A. LS-5 is operated
B. LS-4 is operated which slows ram retract to about 25% of full speed
C. LS-6 is operated. This stops ram retract until the knotter has completed half of the tie cycle and LS12 is released.

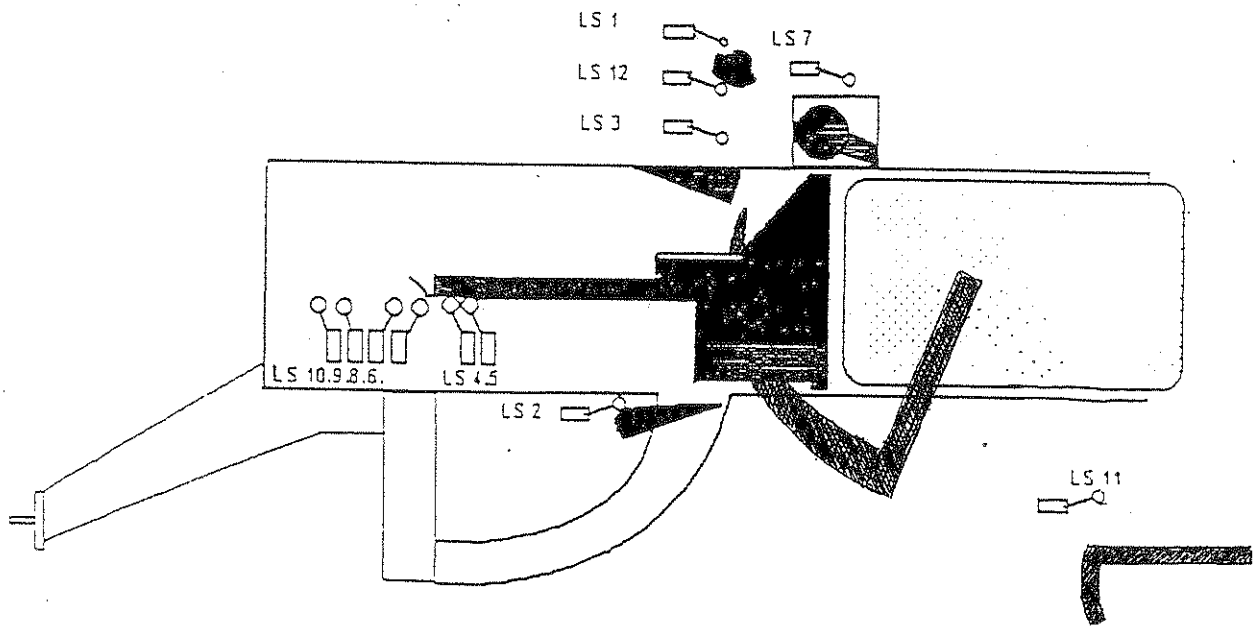


Fig. 47 Ram at LS-6 waiting for knotters to complete ½ cycle and trip LS-12

The purpose of stopping the ram on the return stroke before the knotter has completed the first half of its cycle is to keep the hay pressure off the needles. Another purpose is to keep the ram from operating LS-8, which would start the feed fork while the knotters are operating. The machine is designed so that neither the needles or the feed fork are moving at the same time since both hydraulic motors are supplied from the same source (see FEED FORK / NEEDLE YOKE DRIVE).

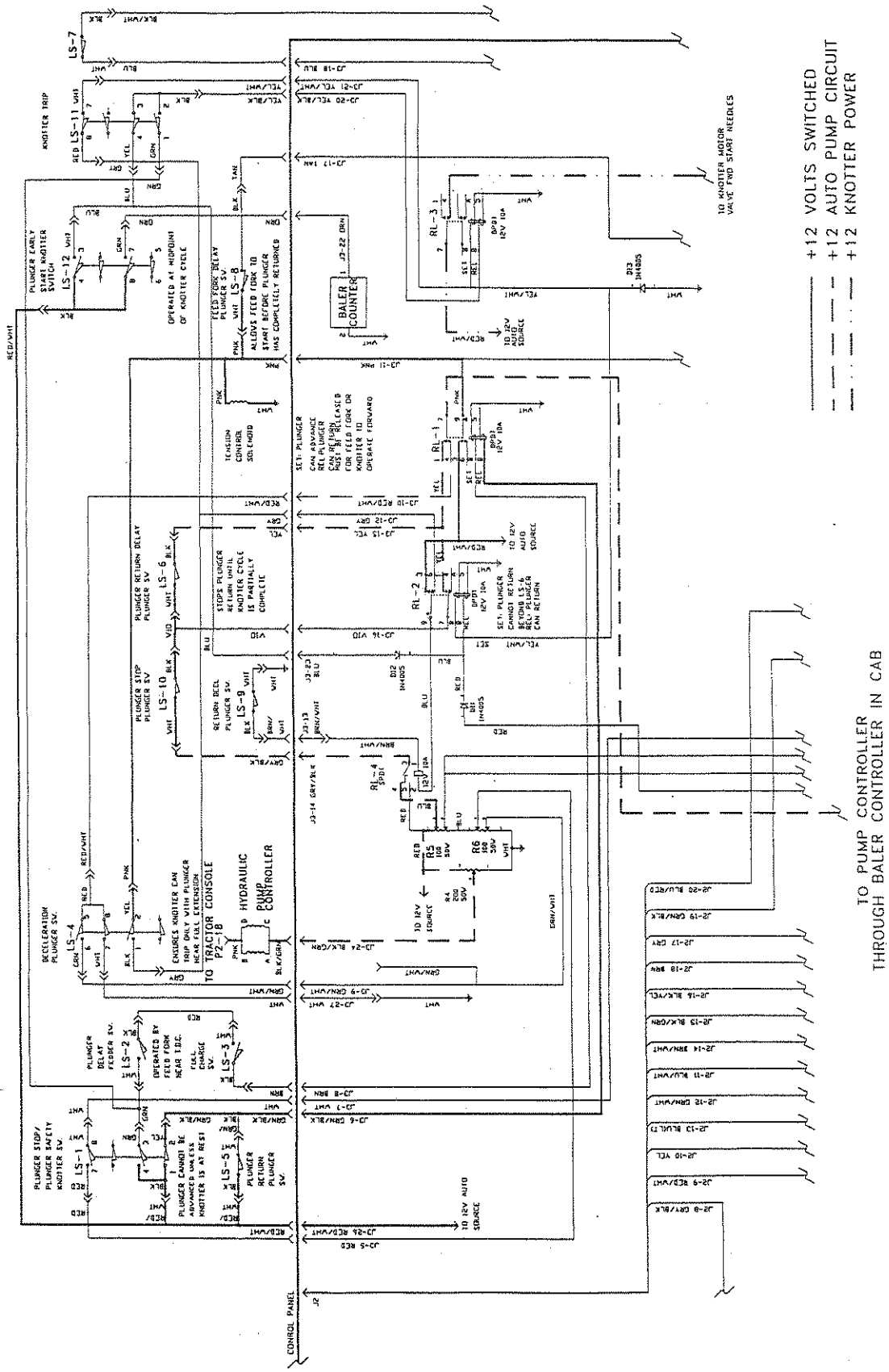


Fig. 48 Schematic – Ram in decelerated retract until LS-6 is opened by ram, knotters are moving

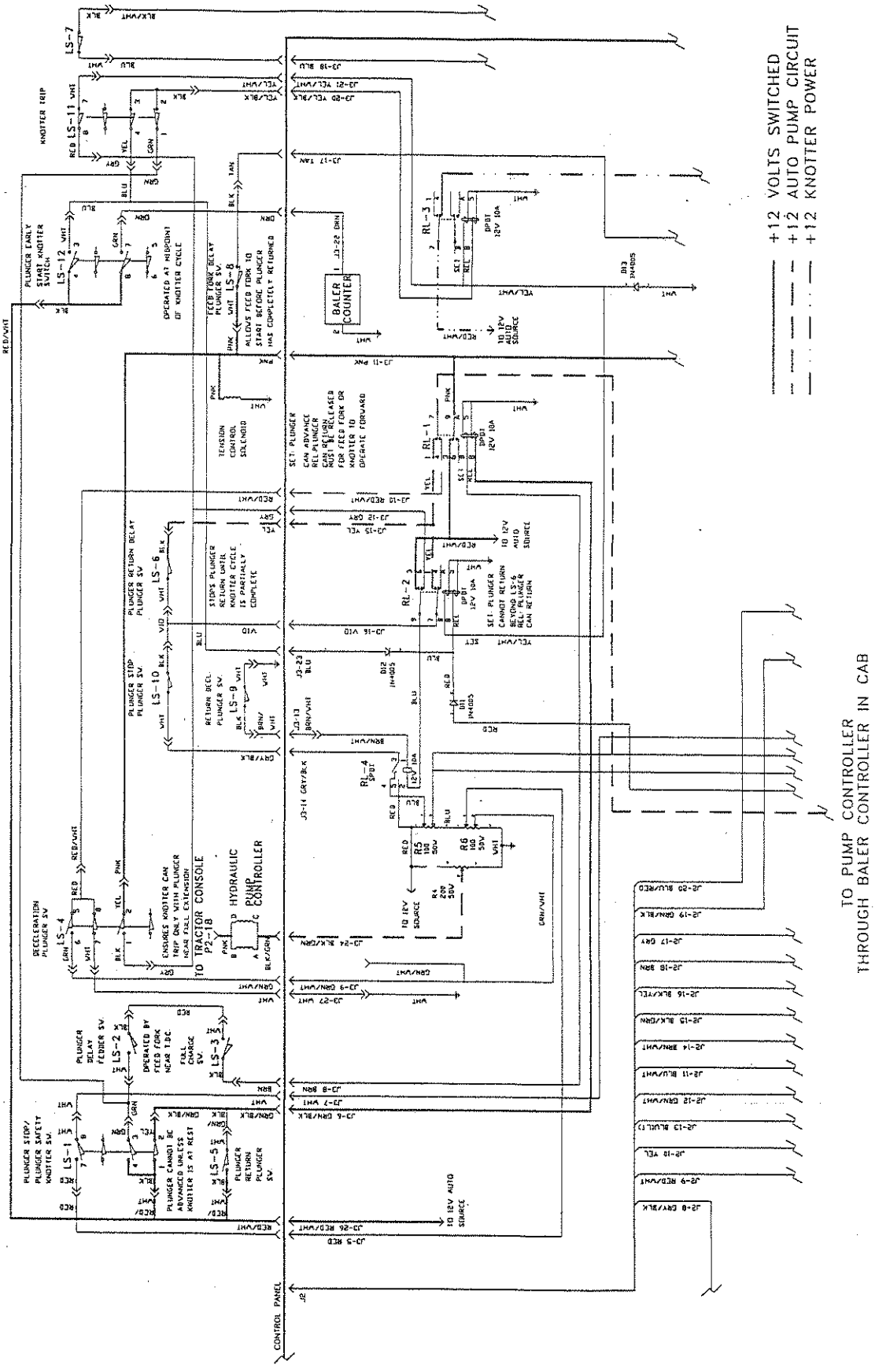


Fig. 49 Schematic – Ram stopped by LS-6, waiting for LS-12 to send power to release RL-2, setting RL-4, which will start full speed retract again.

Resume Ram Retract

Halfway through the tie cycle, LS-12 is operated which releases relay 2 and allows the ram to return at full speed. LS-12 also allows current to reach the bale counter. Note: if LS-11 sticks in place, LS-12 will also reset RL-3 and stop knotters (see dotted/dashed line in Fig. 49).

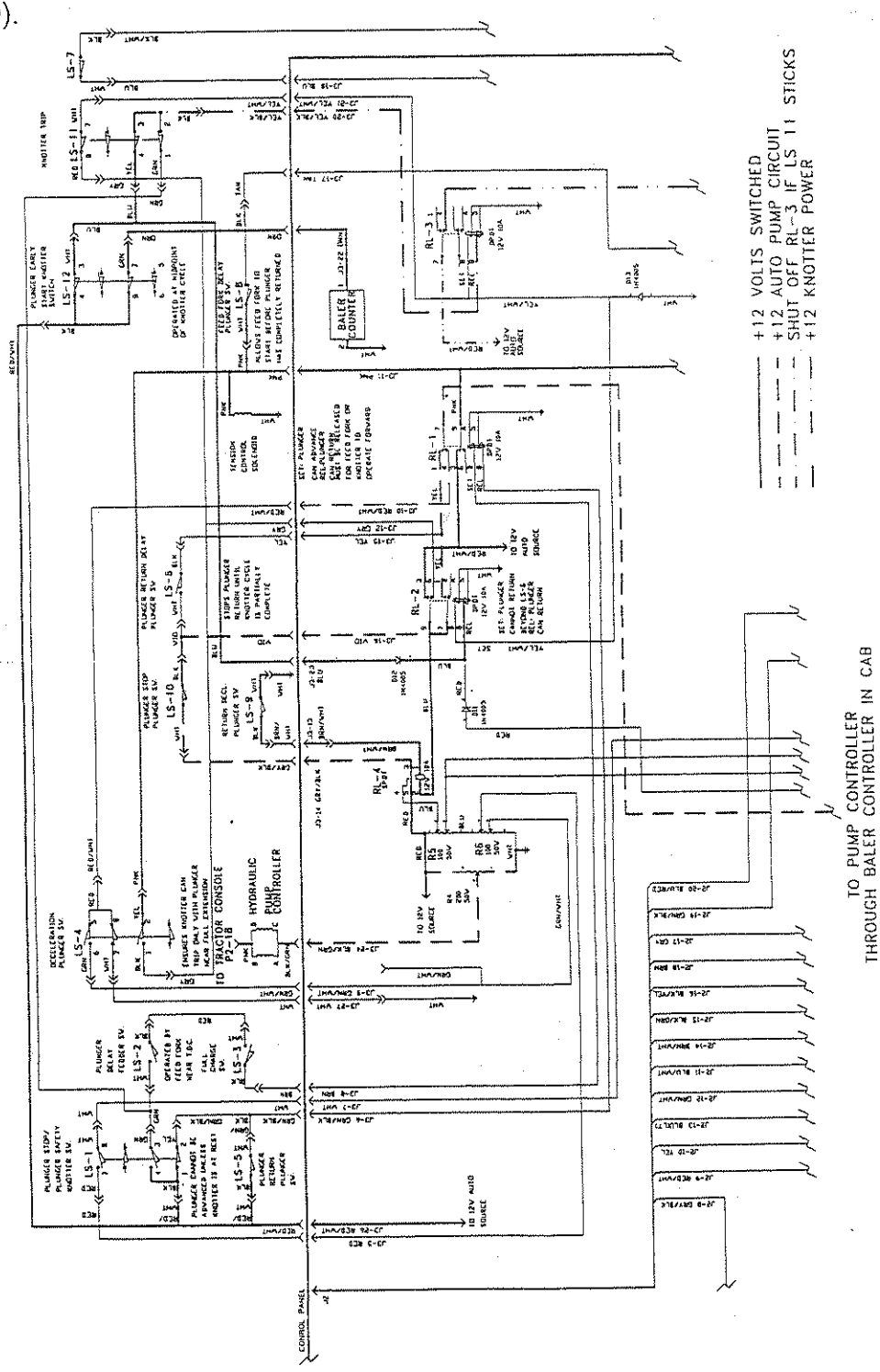


Fig. 50 Schematic - LS-12 has operated RL-1, full speed retract, knotter still moving

Ram Retract During Last Half of Tie Cycle

A. The Knotter continues to cycle until LS-1 is operated. This releases RL 3 and stops the knotter.
B. LS-8 is operated which causes the Feed Fork to start.
C. LS-9 is operated. This opens the circuit to release Relay 4 and causes the ram to slow to about 25% of full speed.

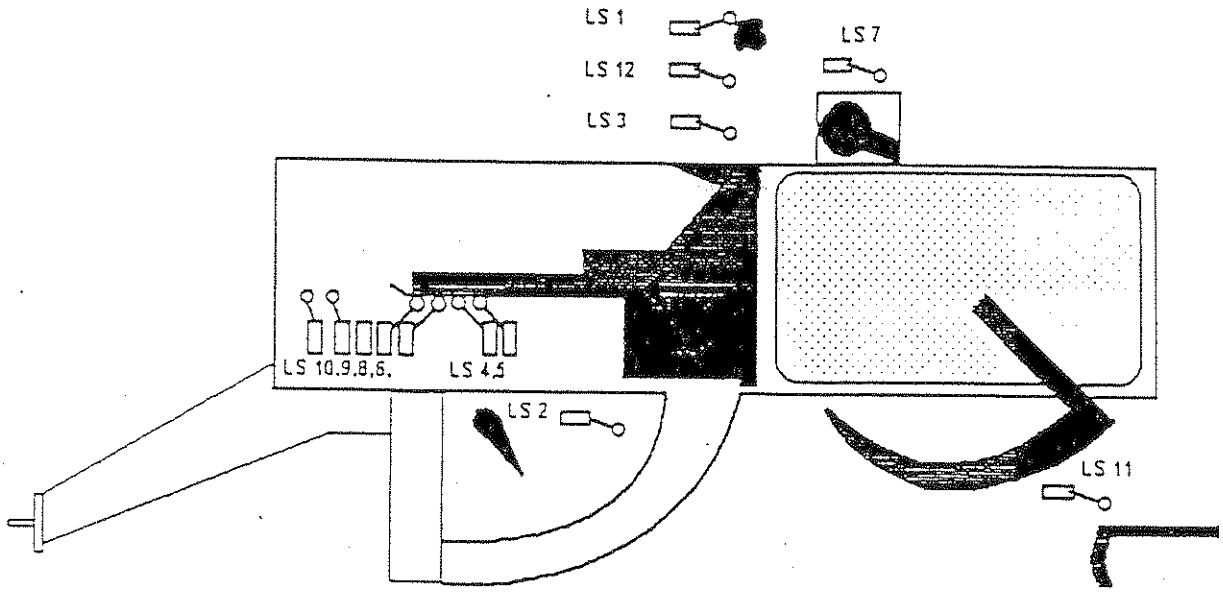


Fig. 51 Needles are at home position and LS-8 is operated by ram allowing feed fork to start.

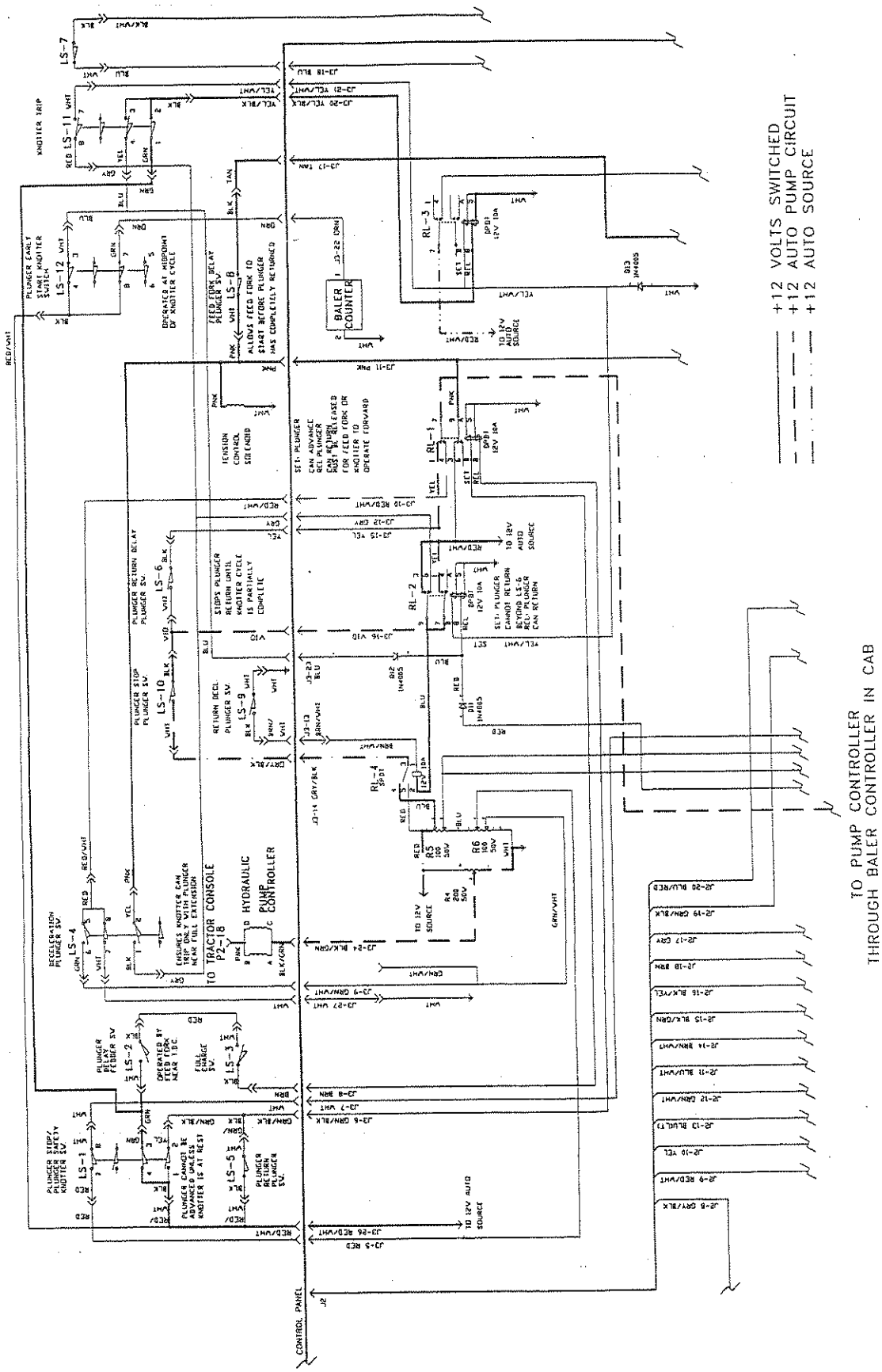


Fig. 52 Schematic – LS-8 has started feed fork and LS-9 has tripped ram into decelerated retract mode

Ram Fully Retracted

LS-10 is operated. This stops the ram retract.

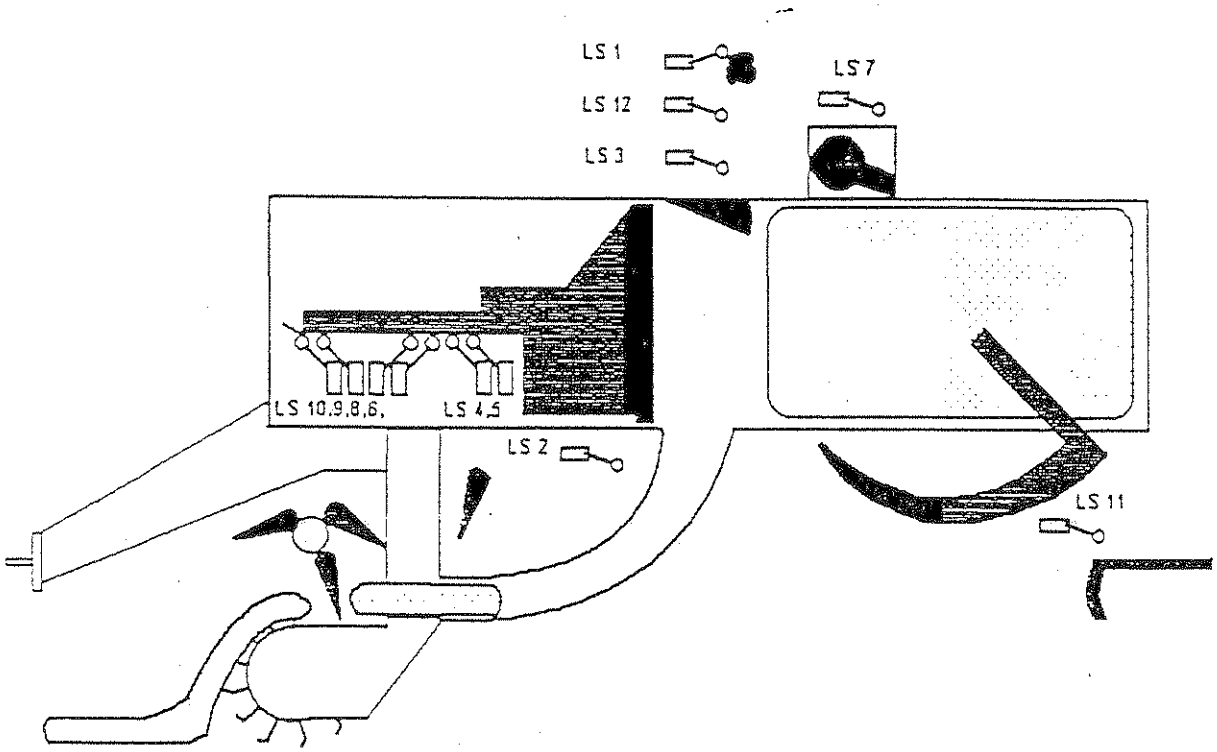


Fig. 53 LS-10 is operated, ram is fully retracted, feeder system moving product into the chamber again.

MANUAL/DIAGNOSTIC CIRCUIT ACTIVITY

Operating the control circuit in the Manual/Diagnostic mode eliminates the control functions of all the limit switches except LS-1 and LS-7. Information can be gained in trouble shooting the baler by operating the various components in the Manual/Diagnostic mode. The basic requirements for operation of the control circuit are a power source and oil in good condition. With these needs met, Manual/Diagnostic operation of the components is possible.

Manual/Diagnostic Ram Operation

The Ram can be operated in Manual mode from the Baler Controller or in Diagnostic mode with the Diagnostic Controller. LS-1 provides protection for the needles. The ram will not advance in Manual/Diagnostic or Automatic mode if LS-1 is not operated. If the ram fails to advance for any reason check the condition of LS-1. Manual/Diagnostic retract of the ram is not affected by LS-1.

Diagnostic Feed Fork and Knotter Operation

The Feed Fork and knotter can be operated with the ram in any position. LS-7 prevents the knotter from being operated in reverse at those points where the bill hook would rotate.

HYDRAULIC INFORMATION GUIDE

CONTENTS

RAM DRIVE SYSTEM

HYDROSTATIC PUMP

The hydrostatic pump is a variable displacement axial piston pump. A swash plate controls displacement by varying the stroke of each piston. Pump output is controlled by a hydro-mechanical controller, which is governed by an electrical signal. The hydrostatic pump has two sections. The main section providing up to 80 gpm at 1000 PTO rpm at full stroke, and the charge pump. The charge pump provides oil to operate the hydro-mechanical controller, push oil through the cooling circuit, and makeup for any losses through the pump's case drain. Charge pump relief pressure is set at 400 PSI.

ELECTRONIC PUMP CONTROLLER

The electronic pump controller uses an electrical solenoid operate a spring centered servo valve, which ports hydraulic pressure to either side of a double acting servo piston. The servo piston rotates the cradle swashplate to vary the pump's displacement from one direction to the opposite direction.

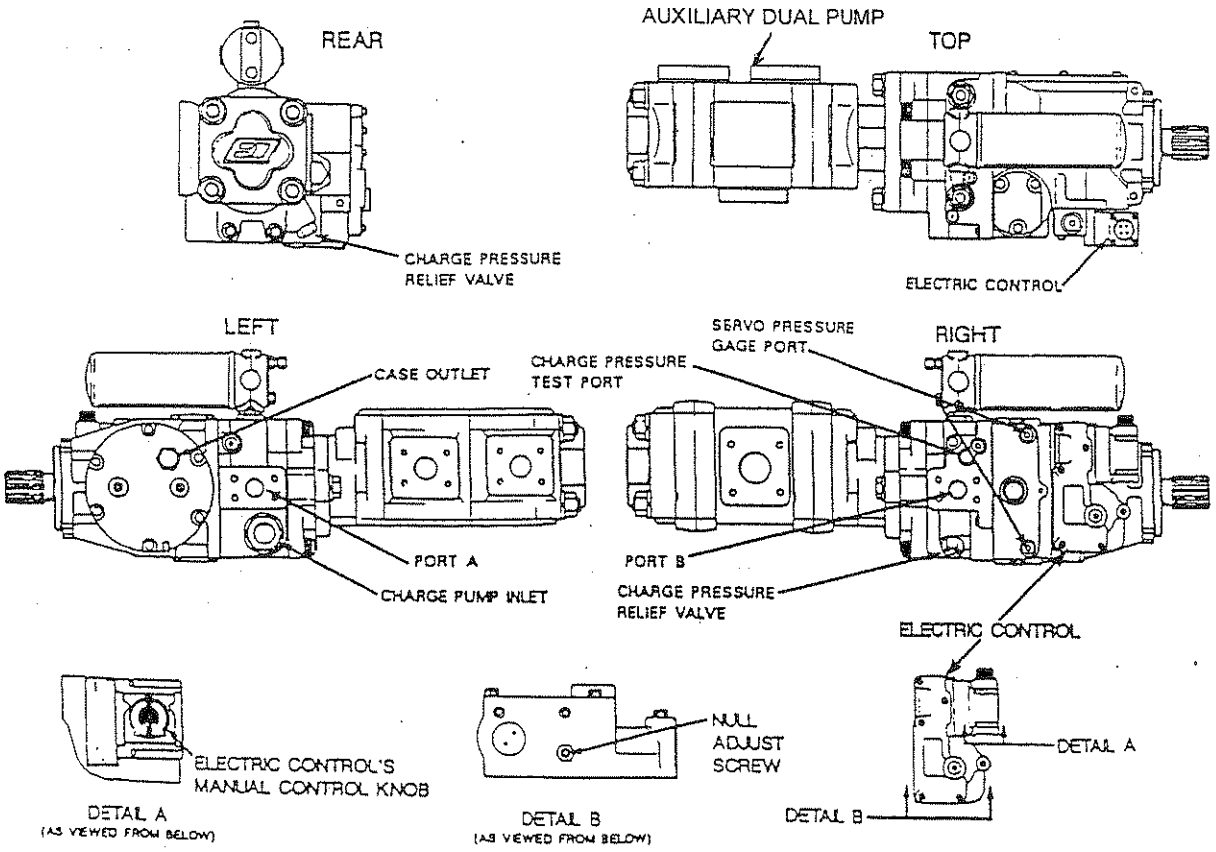


Fig. 54 Views of Hydrostatic, Charge, and Dual Pumps

During normal baling the control circuit automatically activates the controller. Manual/Diagnostic operation is possible with the use of the Manual switch on the Baler Controller or with the Diagnostic Controller when connected. On the pump itself is a mechanical manual override control (Detail A; Fig. 54). Do not use this control for any purpose other than testing the system. Ensure the needles are in the home position before activating the manual override control.

MISUSE MAY CAUSE SERIOUS EQUIPMENT DAMAGE.

Ram Valve

The ram valve assembly contains control valves 2 through 12. These valves control the flow of hydraulic fluid and regulate pressures. These valves are cartridge type making them easily serviceable. Five ports, A - E, are provided on the ram valve assembly for the installation of test gauges.

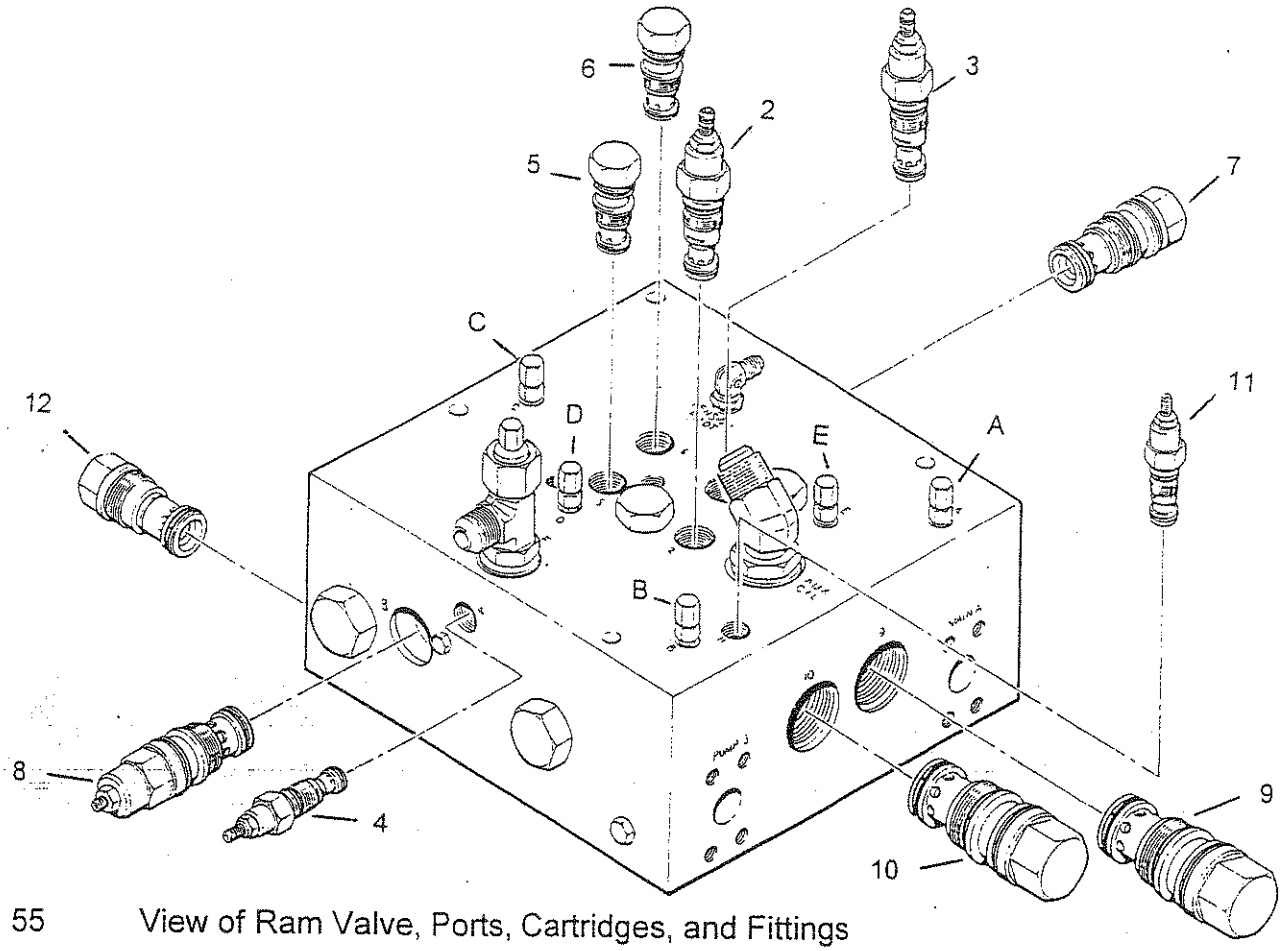


Fig. 55 View of Ram Valve, Ports, Cartridges, and Fittings

Gauge Ports
A: Charge pressure
B: Main system retract pressure
C: Ram rod end pressure
D: Remote charge pressure
E: Make-up cylinder pressure

Valve Cartridges

2: Ram drive system relief valve, retract: sets maximum pressure for ram retract.
3: Ram drive system relief valve, extend: sets maximum pressure for ram extend.
4: Charge pump remote relief: sets charge pressure while pump is in stroke.
5: Remote charge flow valve, extend: connects remote charge relief to low pressure side of loop during ram extend.
6: Remote charge flow valve, retract: connects remote charge relief to low pressure side of loop during ram retract.
7: Piloted closed check valve: Allows free flow for regenerative extension. Piloted closed for ram retract.
8: Regenerative valve: Piloted to open at 1500 PSI during ram extend. Controls regenerative extension.
9: Make-up cylinder discharge valve: connects make-up cylinders to low pressure side of loop during ram retract. Allows them to fill.
10: Make-up cylinder discharge valve: connects make-up cylinders to low pressure side of loop during ram advance. Allows them to discharge.
11: Flow control valve: controls closing rate of make-up cylinder discharge valve.
12: Ram retract check valve: supplements check valve in regenerative valve.

Logic Valves

Valve cartridges 5, 6, 9 and 10 are Logic type switching valves. Logic valve cartridges are unbalanced poppet, two-way valves with a third port to control poppet operation. The unbalanced poppet can be operated: A) directly by pressure at either work port, or B) by pilot pressure from an external source.

NOTE: Because of their unbalanced poppet design, the operation of these cartridges is pressure dependent. The opening and closing movements of the poppet are functions of the force balances on three areas - port 1, port 2, and port 3.

The illustration below shows a representation of the valve. The illustration supports the following explanation.

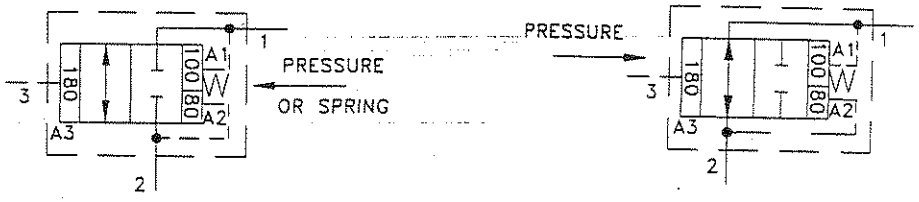


Fig. 56 Logic Valve Shifted Closed Fig. 57 Logic Valve Shifted Open

Pressure at port 1 or port 2, acting on areas A1 or A2, plus the bias spring force, tends to close the valve or add to the closing force. Pilot pressure at port 3, acting on area A3, tends to open the valve. Pilot-to-open switching cartridges close when the sum of the forces from area 1, area 2, and the spring are greater than the forces affecting the

surface area at port 3. When port 3 is vented, the valve will close and remain closed regardless of the pressure at port 1 or port 2 due to the spring.

When pilot pressure is applied at port 3, this pressure, acting on A3 (minus the bias spring force), tends to open the valve. The valve may be closed by venting port 3 to tank, or by introducing a proportionately higher pressure at port 1 or port 2.

RAM DRIVE SYSTEM OPERATION

RAM EXTEND, PHASE 1

Electric current from the Control Panel actuates the Pump Controller and directs full pump output to the base end of the ram cylinder. The ram cylinder begins to extend. As the cylinder extends, fluid from the rod end is forced out. This fluid is routed back to the base end through the No. 7 check valve. This is called regenerative extension. The regenerative process allows for faster cylinder extension at low output pressure. At the same time, fluid from the base end of the make up cylinders is forced out and returned to the suction side of the pump. Pilot pressure from the base end of the main cylinder opens the remote charge flow valve No. 5. Charge pressure can now flush oil from the circuit for cooling and filtering. Charge system relief pressure is now regulated by the charge pump remote relief valve No. 4 (instead of charge pump main relief).

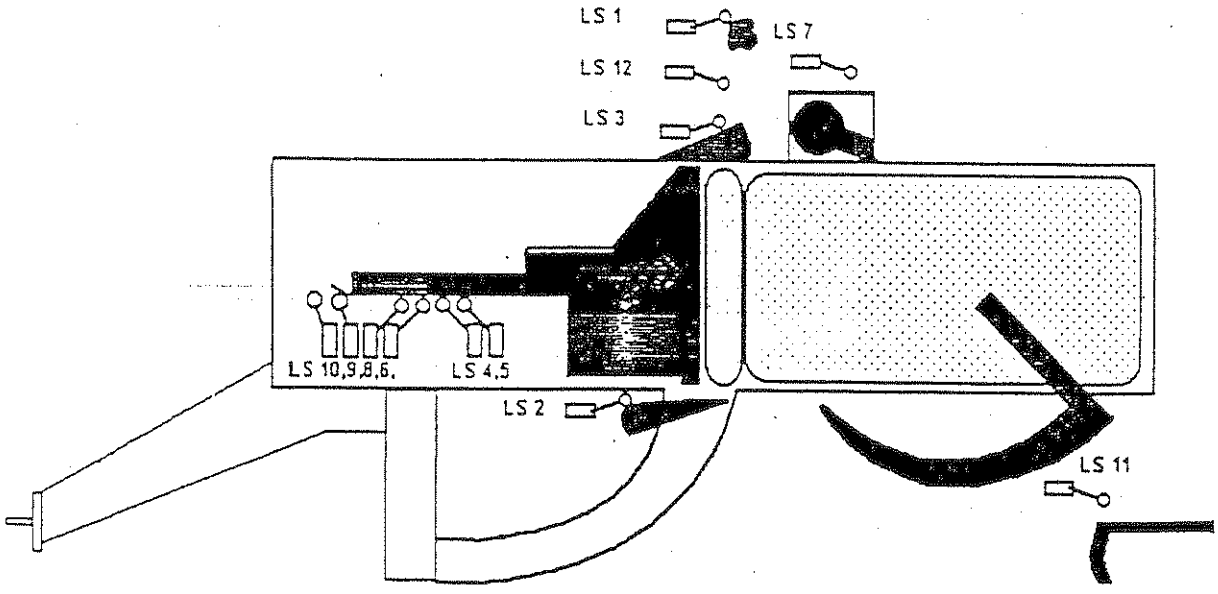


Fig. 58 Ram extending, has not compressed enough to generate 1500 psi

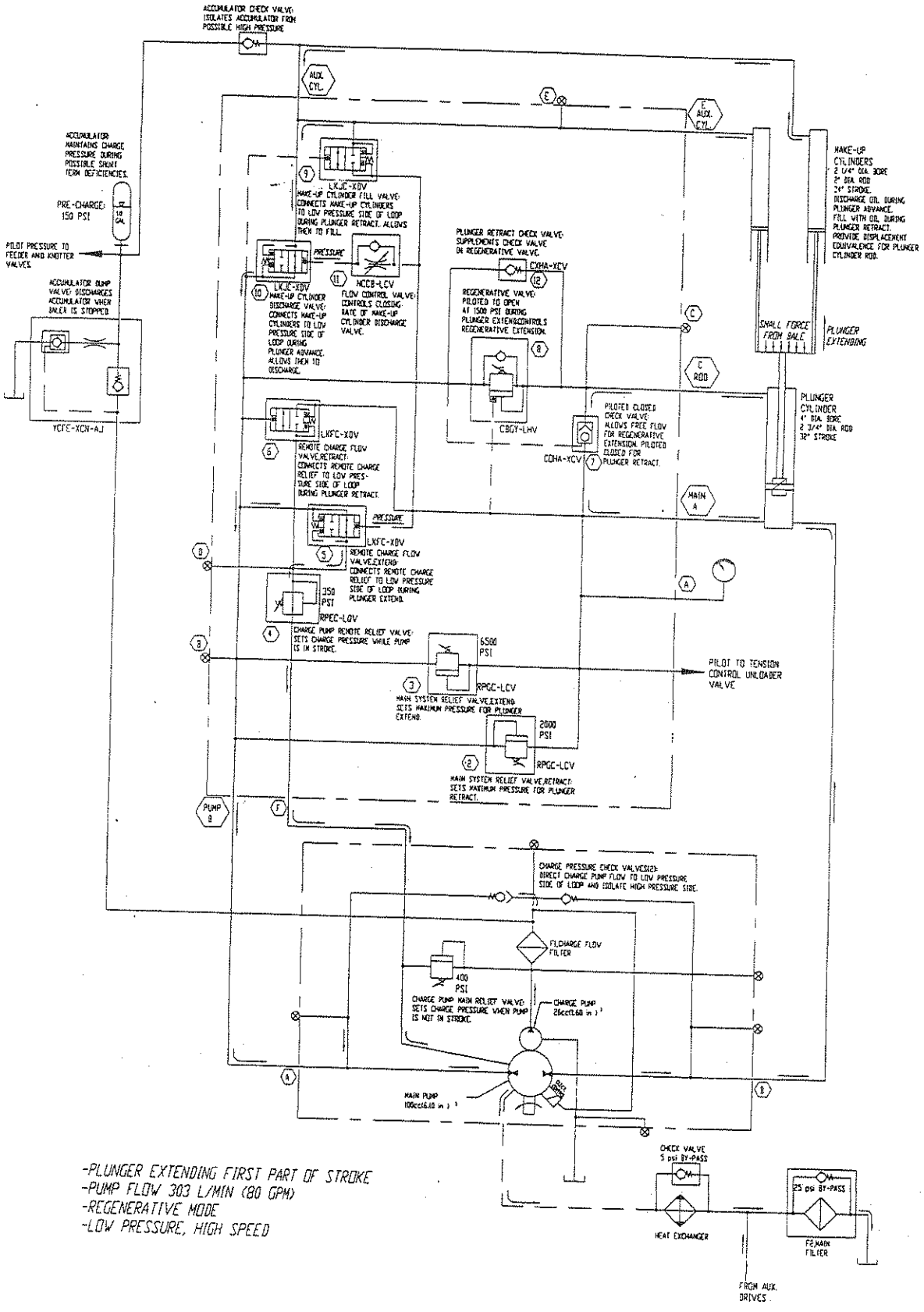


Fig. 59 Schematic - Ram Extending in Phase 1

RAM EXTEND PHASE 2

As the ram advances to compress the product, more pressure is applied to the base end of the ram cylinder. When the pressure reaches 1500 PSI, Regenerative valve No. 8 is piloted open. This allows rod end fluid to return to the suction side of the pump. Pressure differential between the base end and the rod end closes check valve No. 7. Near the end of the stroke, the main electrical control circuit signals the controller to reduce pump output. This enables the pump to exert higher pressure while requiring less horsepower. Pressure required to compress the crop will be relieved in two ways. The unloader valve pressure setting may allow the tension rails to open (see TENSION CONTROL SYSTEM) or the 6500 PSI limit may be reached and oil passed through main system relief valve No. 3. The main cylinder continues to extend until the control circuit signals the pump controller to stop output to the base end of the ram cylinder.

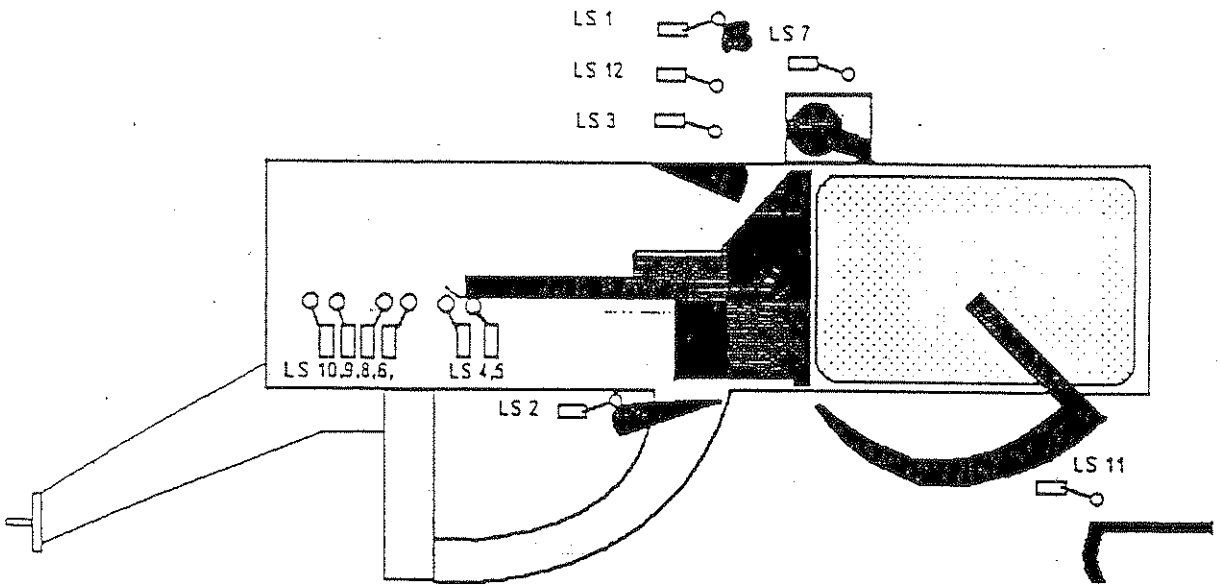
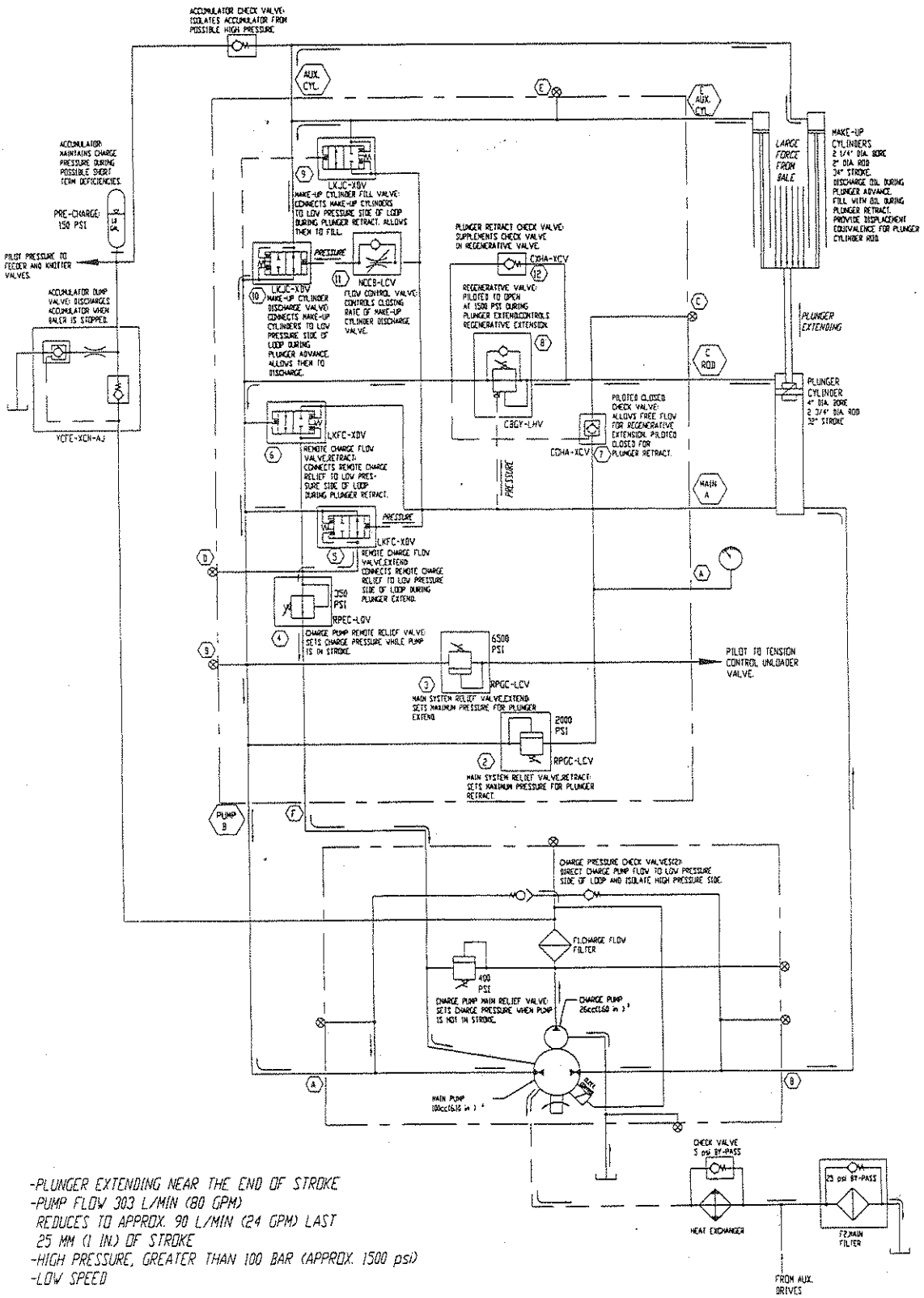


Fig. 60 Ram compressing product with up to 6500 psi available at cylinder



-PLUNGER EXTENDING NEAR THE END OF STROKE
-PUMP FLOW 303 L/MIN (80 GPM)
REDUCES TO APPROX. 90 L/MIN (24 GPM) LAST 25 MM (1 IN.) OF STROKE
-HIGH PRESSURE, GREATER THAN 100 BAR (APPROX. 1500 psi)
-LOW SPEED

Fig. 61 Schematic - Ram Extending in Phase 2

RAM RETRACT PHASE 1

The main electrical control circuit signals the controller to direct pump output to the rod end of the ram cylinder. In the first phase of ram retract the compressed product exerts force against the ram. The force is great enough that pressure at the inlet side of the pump is greater than pressure at the outlet side. This results in the pump acting as a motor until the pressures equalize.

In the beginning stage of ram retract, pressure on the base end is high. The Make up cylinder discharge valve No. 10 remains opens as during ram advance. Output from the pump fills the make up cylinders and the rod end of the ram cylinder. Oil flow to the ram cylinder passes through the check valve in the regenerative valve No. 8 (see fig 63). Maximum pump output of 80 gallons per minute is divided, half going to the makeup cylinders and half going to the rod end of the ram cylinder. Charge pump flow circulates through Charge Flow valve No. 5 and relief pressure is regulated by the remote relief No. 4.

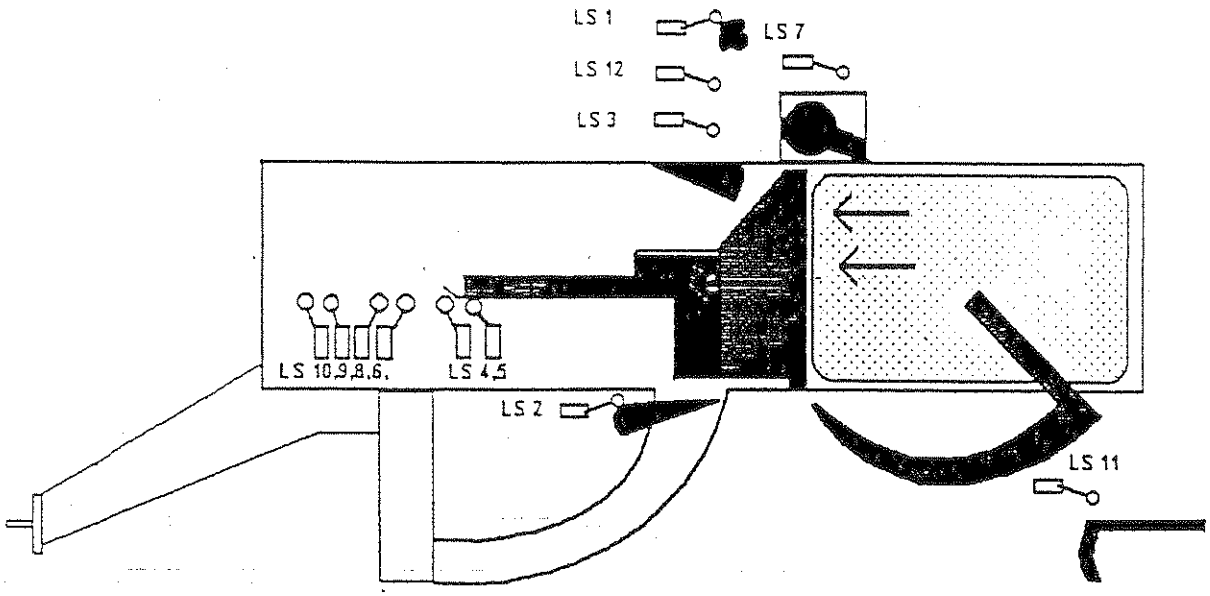


Fig. 62 Ram retracting with pressure of product pushing on ram face

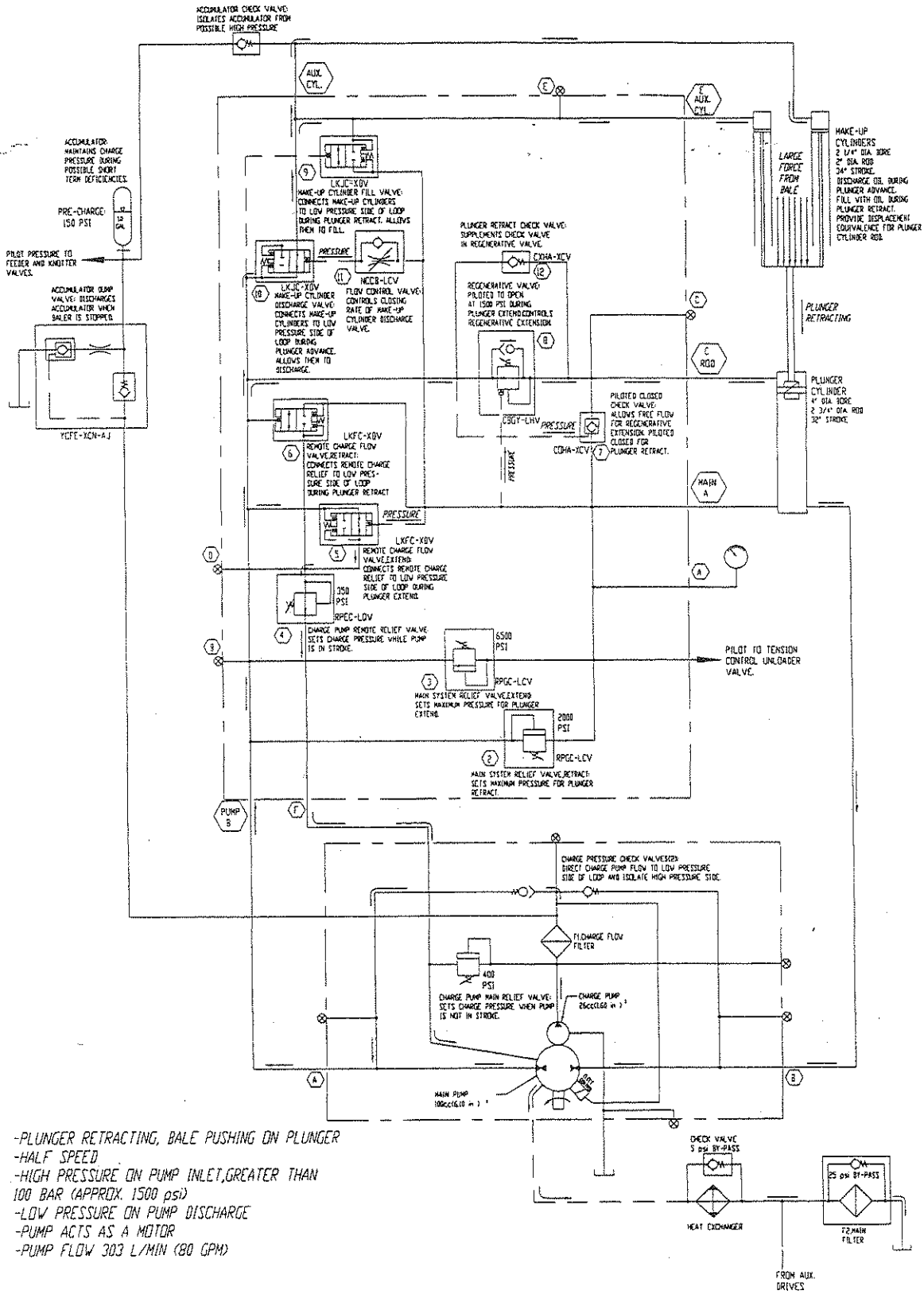


Fig. 63 Schematic – Ram Retracting in Phase 1

RAM RETRACT PHASE 2

In phase 2 of ram retract, pump output pressure becomes higher than pressure on the inlet side. Pump output flows to the rod end of the ram cylinder through the check valve in the regenerative valve No. 8 and check valve No. 12 (see fig 65). Low pressure on the base end of the ram cylinder has allowed discharge valve No. 10 to close. At the same time, make up cylinder fill valve No. 9 opens. This connects the base end of the ram cylinder to the make up cylinders. Full pump output of 80 gallons per minute is directed to the rod end of the ram cylinder. Oil flow from the base end of the ram cylinder is divided, half going to the inlet side of the pump and half going to the make up cylinders. Charge pump flow is directed from the base end of the ram cylinder through the remote charge flow valve No. 6. Pressure is regulated by the charge pump remote relief valve No. 4. At the end of the ram stroke, the main electrical control circuit signals the pump controller and pump output is stopped.

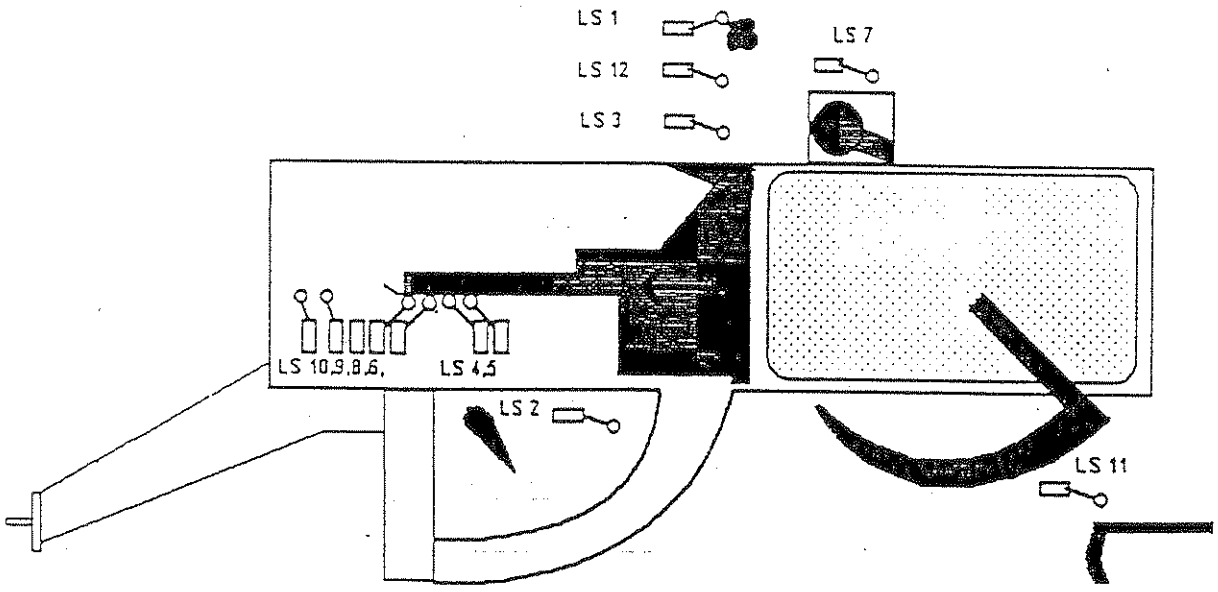
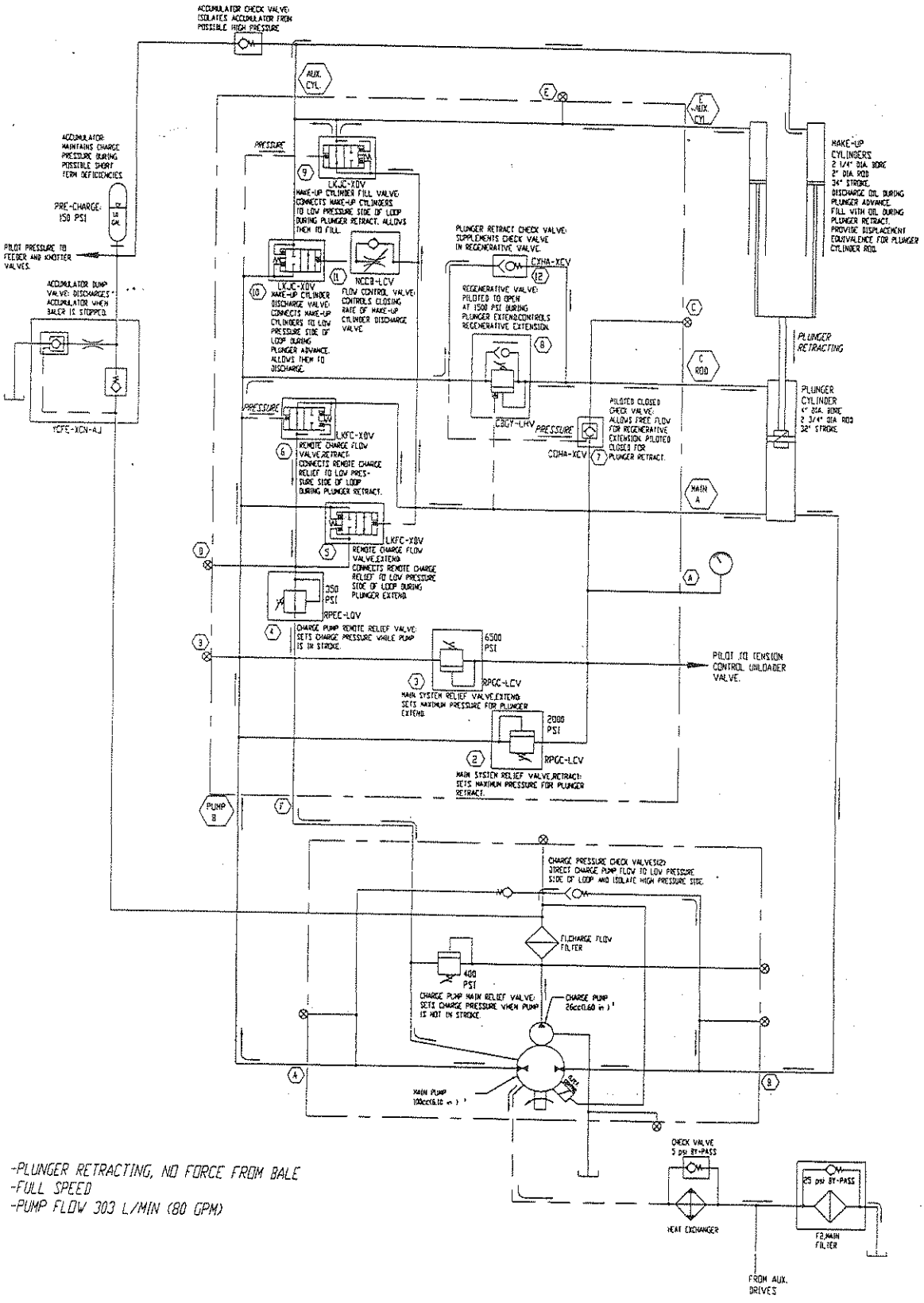


Fig. 64 Ram retracting at full speed without back pressure



-PLUNGER RETRACTING, NO FORCE FROM BALE
-FULL SPEED
-PUMP FLOW 303 L/MIN (80 GPM)

Fig. 65 Schematic – Ram Retracting in Phase 2

HYDRAULIC MOTOR DRIVE SYSTEM

The hydraulic motor drive system schematic is shown in Fig. 66.

DUAL PUMP

The pickup, feeder systems, and the knotter system are all powered by an auxiliary dual pump coupled to the rear of the hydrostatic pump (see figure 54). This unit contains two separate positive displacement pumps that are rated at 1.47 cubic inches per revolution. At 1000 PTO rpm, each pump will produce 20 gpm of flow. The front pump provides flow to the pickup / feed crank drive system. The rear pump provides flow to the feed fork / knotter valve block.

PICKUP / FEED CRANK DRIVE

Solenoid Valve

The pickup / feed crank drive motor receives directional flow from a 3 position solenoid operated open center spool valve. This valve is operated by an electric current controlled by the key switch on the baler controller. A 5000 PSI relief valve cartridge is integrated into the valve assembly. This should be set at 3200 PSI in the "Reverse" direction. Too high of a relief setting will cause premature wear on the mechanical components.

Hydraulic Motor

The pickup / feed crank drive motor is a 15.0 cubic inch per revolution motor. It will run at 308 rpm with 20 gpm supplied by the dual pump. This results in the feed crank turning at 162 rpm after the sprocket reduction.

FEED FORK / NEEDLE YOKE DRIVE

Solenoid Valves

Two piloted spool valves are used to control the forward and reverse motion of the feed fork and needle yoke drive motors. A smaller solenoid operated spool valve is stacked on top of the larger spool valve. The pilot pressure, taken from the ram valve, is directed through solenoid operated spool valve to either side of the larger spool valve. This shifts the larger valve and directs the flow from the pump to the forward or reverse ports on the motor.

The valve assemblies rely on the same pump to provide flow to each motor. The baler has been designed so that only one system will be operating under high pressure at any given time. If both systems tried to operate simultaneously off the same 20 gpm pump, the motor with the least load would stall out.

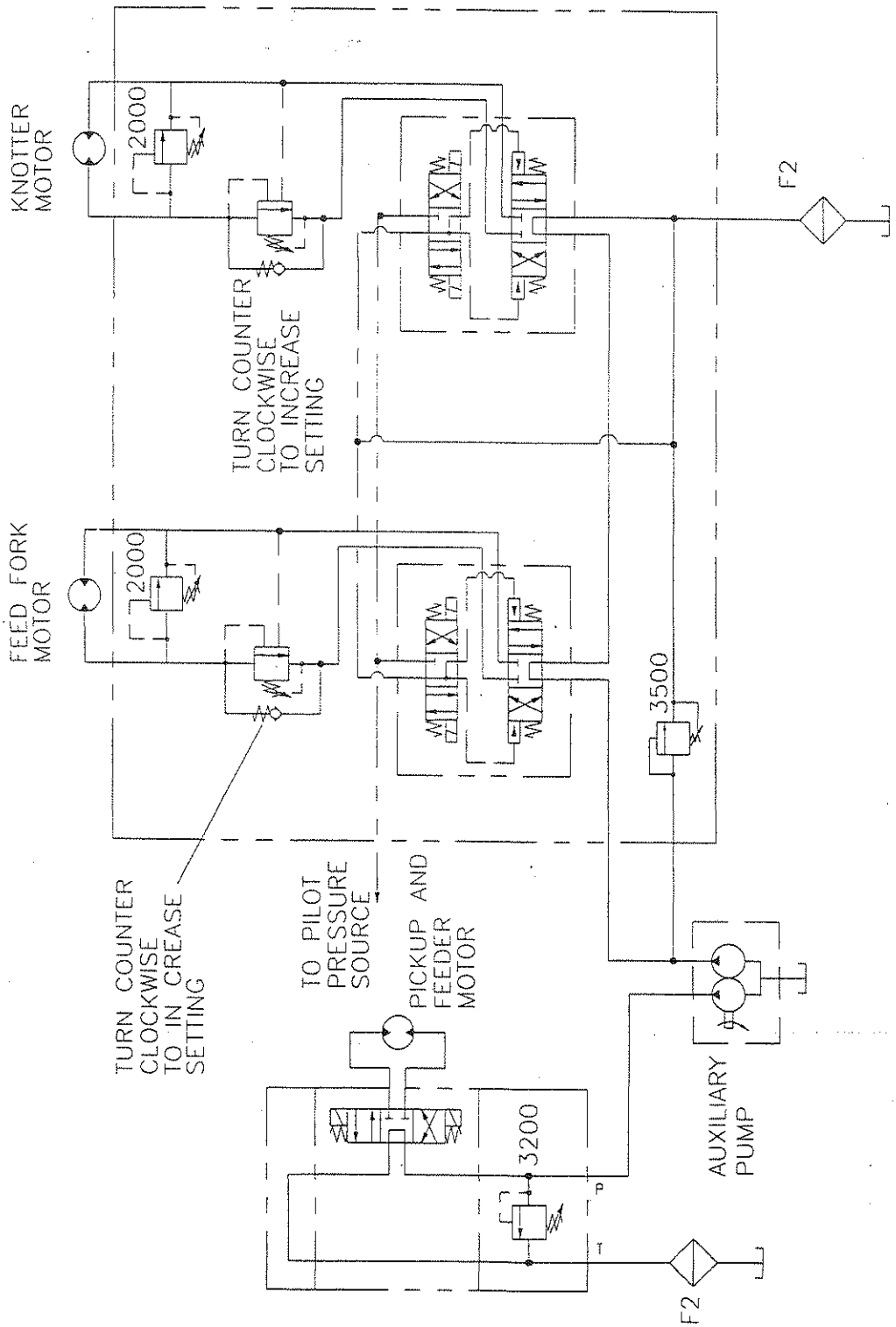


Fig. 66 Schematic – Hydraulic Motor Drive Systems

Counter Balance Valves

Both the feed fork and the needle yoke are large, unbalanced assemblies. Counterbalance valves are used on the low pressure side of the motor circuit to prevent the assembly from overunning the motor. This provides a smooth motion to both the feed fork and needle yoke.

Relief Valves

There are three relief valves controlling the pressures of the feed fork and needle yoke drives.

A single relief valve set at 3500 psi controls the pressure when either motor is turning forward.

A relief valve set at 2000 psi on each motor circuit controls the reverse pressure for each motor.

Hydraulic Motors

The feed fork drive motor is a 23.8 cubic inch per revolution motor. It will run at 192 rpm with 20 gpm supplied by the dual pump. This results in the feed fork turning at 56 rpm after the sprocket reduction.

The needle yoke drive motor is a 19.0 cubic inch per revolution motor. It will run at 241 rpm with 20 gpm supplied by the dual pump. This results in the needle yoke drive shaft turning at 47 rpm after the sprocket reduction.

TENSION CONTROL SYSTEM

The tension control system controls the density of the bales by adding or relieving pressure from the tension cylinders as required to keep a constant but adjustable ram pressure. The schematic of the tension control system is shown in figure 67.

Pump

The tension system is powered by a 0.22 cubic inch per revolution positive displacement pump. It will provide 3 gpm at 1000 PTO rpm.

Tension Control Valves

Five valves make up the tension control valve assembly

The tension bypass valve allows oil to flow to tank during low rpm conditions in order to prevent excessive oil heating within the tension control pump. The pumps internal leakage during low rpm operation keeps it from generating 2150 psi to open the relief valve. As the rpm is increased the orifice causes pilot pressure to increase and gradually shift the valve to a full open condition where oil is not returned directly to tank.

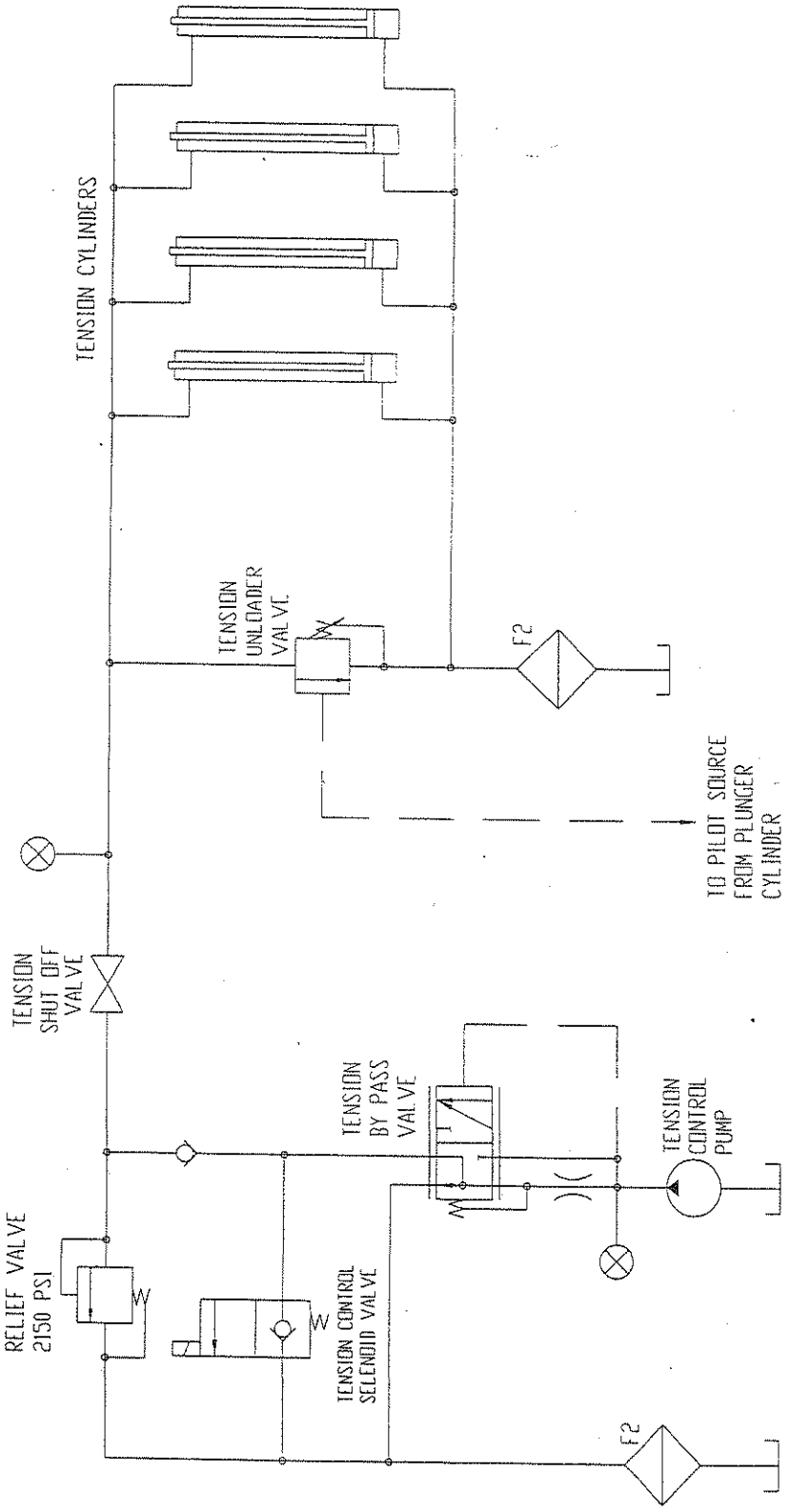


Fig. 67 Schematic – Tension Control System

The tension control solenoid valve allows oil to pass to tank when activated. The solenoid is activated whenever the power switch is on provided that ram is not extending. When the ram extends, the valve is deactivated, causing 2150 psi to be maintained by the relief valve.

A check valve is used to keep the pressure built up during the ram extend stroke from dropping when that ram retracts and the solenoid valve is passing flow to the tank.

A relief valve set at 2150 psi is used to limit the pressure available to the tension cylinders.

A manual tension shut off valve allows the operator to isolate the tension unloader valve and the cylinders from the control system.

Unloader Valve

The tension unloader valve is used to "unload" pressure from the cylinders during the ram extend stroke. The valve receives a pilot signal from the ram cylinder as it extends. When the ram pressure exceeds the adjustable spring force on the unloader valve, the valve opens. As the valve opens, the pressure built up by the tension pump and the force of the bale on the tension cylinders is relieved. This allows the bale to be pushed past the tension rails. As the bale is allowed to move, the ram cylinder pressure drops causing the unloader valve to close again. The constant opening and closing of the unloader valve maintains a uniform ram cylinder pressure as it compresses the bale.

Tension Cylinders

Two double acting cylinders with a 3.5" bore and a 16" stroke are used to force the side tension rails to squeeze the forming bale.

Two double acting cylinders with a 4" bore and a 8" stroke are used to force the top tension rails to squeeze the forming bale.

TROUBLE SHOOTING GUIDE

CONTENTS

SAFETY REMINDER

1. Shut off tractor, disengage P.T.O, and lock tractor transmission and/or brakes before adjusting, lubricating, cleaning or servicing the baler.

2. Keep hands, feet and clothing away from power driven parts.

3. Avoid wearing loose clothing, which can easily be caught in moving parts.

4. Use appropriate signs or warning lights when operating on public road ways.

5. Make certain everyone is clear of and off the baler before operating any part of the machine.

6. Always use lights for night work.

7. Keep all shields in place and in serviceable condition.

8. Do not go near any equipment until all moving parts are stopped.

9. Do not go under any raised components until they are safely blocked or chained in position.

10. Carry a 2A-10B fire extinguisher at all times.

11. Keep the diagnostic control cable in a safe location away from power driven parts at all times.

12. Remember safety is only a word until it is put into practice.

INTRODUCTION

The following information has been assembled to provide the service person some guidelines to follow in solving any problems which might occur while operating the baler.

The baler is a high density mechanical baler operated by an electrically controlled hydraulic system. To efficiently troubleshoot problems, it is important to gather information that will narrow the possibilities of the cause of a malfunction. Three categories should be considered when problems are encountered.

1. Is the problem mechanical?
2. Is the problem electrical?
3. Is the problem hydraulic?

The process of gathering information regarding a malfunction may require more than one person. An observer may be necessary in determining how the functions of the baler are occurring. Make sure all observers maintain a safe distance from the machine and are informed as to what components may be moving.

It is very important to have accurate information about the baler operation to assist in the problem solving process. For any problem first determine exactly what functions of the baler, if any, are operating correctly. Carefully study the information on the following pages. The major components of the baler, how and when they can operate are described in the text to follow.

When attempting to solve a problem the service person can use the baler as it's own testing instrument. To do this however requires a thorough knowledge of the baler's functions.

TROUBLESHOOTING TOOLS

Active troubleshooting of baler components requires the use of the tools and resources listed below.

1. Operators manual, Maintenance manual, Parts manual, Electrical and Hydraulic Information and Troubleshooting Manual.
2. Hand held volt/ohm meter.
3. Hydraulic pressure test gauges.
4. Lightweight string or twine.
5. Replacement electrical components (fuses, limit switches, relays).

USING SCHEMATICS AND DIAGRAMS

Electrical and Hydraulic schematics are provided in the Electrical and Hydraulic Information Guide. Descriptions and diagrams of the electrical and hydraulic components are also provided to help read the schematics.

The electrical schematic shows the path of electrical current to the various electrical components. The schematic also identifies components and their locations, wire routing and proper connections. To assist in the process of troubleshooting, test points can be identified on the electrical schematic. These are points in the Control Panel or at harness connections where voltage or continuity can be checked. To locate points within the Control Panel, open the cover of the Control Panel and study the decal inside (see Appendix D). Schematics of the main control circuit are give for each general function. The circuit paths are highlighted to help determine what components require voltage or which circuits require continuity for proper functioning.

The hydraulic schematics show the paths that fluid flows to operate individual hydraulic components. Hydraulic components that direct or regulate fluid flow are also shown. Main system hydraulic pressure test ports are identified on the hydraulic schematic. Other hydraulic pressure test ports are described and shown in the Maintenance Manual and in Electrical and Hydraulic Information Guide.

MAJOR SYSTEMS AND THEIR FUNCTIONS

A great deal of time can be saved in the process of troubleshooting if the service person understands the major systems of the baler and how they contribute to the total operation. Through a process of elimination, the systems that function correctly or incorrectly can be identified. The following information describes major systems and the activity which can occur within each of these systems.

Operation of Mechanical Components

Power from the tractor PTO shaft is transmitted through the PTO slip clutch to the mechanical drive unit to operate the main hydraulic pump and the auxiliary pump. The mechanical drive unit also includes an alternator to maintain electrical system voltage and a small hydraulic pump to provide pressure for the density control system. The auxiliary system includes two separate pumps. The front section of the pump provides fluid to operate the knotter and feed fork. The rear section of the pump body provides hydraulic fluid to operate the feeder crank and pickup.

Any time the flywheel on the main drive unit is turning at a sufficient RPM (100 rpm and up), the baler can be set into motion using the Baler Controller or the Diagnostic Controller. The alternator will rotate but will not charge unless the main power switch is turned on. The density system pump will operate and if PTO R.P.M. is sufficient, will pressurize the hydraulic cylinders which control the restriction rails.

NOTE: At low RPM, the density pump output is not applied to the cylinders. The system includes a bypass valve which prevents overheating of the pump at low RPM.

THE FOLLOWING CONDITIONS CAN OCCUR WITH THE TRACTOR PTO ENGAGED AND OPERATING AT APPROXIMATELY 500 RPM.

1. Components of the main drive unit will rotate.
2. Density pressure will be applied to the restriction rails.

Operation of Electrical Power Supply System

Electrical power for the baler control circuit is provided by a 12-volt battery. All of the functions of the baler require electrical power to operate. Electrical power from the 12-volt battery is provided directly to the work lights. A manual switch allows the operator to turn the work lights on or off. Electrical power is provided to the control circuit by the power switch on the Baler Controller. Moving the power switch to the ON position at the Baler Controller allows power to reach the control circuit if the following conditions exist.

1. There must be sufficient volume of oil in the reservoir.
2. The oil temperature must be below 220° F.
3. The Baler Controller is properly connected to the wiring harness of the baler.

THE FOLLOWING CONDITIONS CAN OCCUR IF 12-VOLT POWER IS AVAILABLE.

1. The work lights will operate from the control panel (or tractor control if so equipped).
2. The power on light will illuminate on both the Baler Controller and the Control Panel when the main power switch is in the ON position.
3. With the power switch in the ON position, the voltmeter will register system voltage, and then oil temperature gauge will register. The alternator indicator light will illuminate if the alternator is not charging. When the tractor PTO is engaged, the alternator will no longer illuminate. NOTE: PTO speed may have to be increased to full operating speed (1000 RPM) in order to excite the alternator depending on battery condition. If a high temperature or a low level condition exists, the red warning light will illuminate on the Baler Controller. If a knot sensor has not been tripped by a knot, one or more amber lights will be lit on the Baler Controller.
4. With the tractor PTO engaged and the power switch in the ON position, hydraulic pressure is not applied to the restriction rails.

Operation of Control Circuit in "Diagnostic" mode, Tractor PTO Operating

Power is available to the control circuit through the power supply circuit. By plugging in the Diagnostic Controller to the control panel, power can be applied to operate the ram, the feed fork or the knotter.

1. The flow of power to operate the ram is limited only by LS-1, the ram stop, and ram safety knotter switch. This prevents the ram from being advanced if the knotter is out of the home position. The ram can be retracted unaffected by the limit switches and relays in the control circuit.
2. The feed fork can be operated in forward or reverse and is not affected by any switches or relays in the control circuit.
3. The knotter can be operated in forward or reverse except where the reverse safety switch (LS-7) prevents reverse operation of the knotter where the billhooks would rotate.

Operation of Control circuit in AUTO mode, Tractor PTO operating

Power is available to the control circuit through the power supply circuit. With the Man/Auto switch in the AUTO position, pressing the Start Button will supply power to the control circuit and set the machine into motion. In the AUTO mode, the switches and relays in the control circuit can monitor and perform the necessary functions to bale a crop according to the baler's design.

TROUBLE SHOOTING / VISUAL INSPECTION OF COMPONENTS

MECHANICAL COMPONENTS

For any malfunction, check mechanical components first. If necessary, make adjustments to assure that mechanical components are in good operating condition. Check the following mechanical components and their condition. Listed with each component is a possible problem, or number of problems, that could occur due to the failure of that component.

CAUTION: Stay clear of the baler when operating in either Diagnostic or Auto mode. Disengage tractor PTO Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Feed Sensor

The feed sensor is manually activated by the charge of material pushed into the bale chamber by the feed fork. When the feed sensor is raised a sufficient amount, a cam on the sensor shaft activates the ram. The feed sensor is spring loaded and will return to its rest position as the ram compresses the charge of material. Foreign material can cause the feed sensor to stick and become inoperative. If the feed sensor does not raise, the ram will not be activated. If the feed sensor does not return, the ram will stall at the end of its stroke and will not return until the feed sensor is returned to the rest position.

Limit Switch Arms

The position of most of the baler's mechanical components is communicated to the control circuit through several limit switches. The limit switches are mechanically operated. Check all the limit switch lever arms and the cam or component that operates the lever arm. Foreign material can cause a limit switch arm to stick and cause a malfunction. Breakage of a lever arm may also cause a malfunction. Loose lever arm clamping screws may cause a malfunction even though the lever arm and switch appears intact. Proper adjustment of LS-1 is critical to prevent the cam from pushing the lever down, instead of forward. Refer to Maintenance Manual for proper adjustment.

Knotter Brake

The knotter brake helps hold the needle yoke in its rest position. Should the brake fail to hold the needle yoke in position, the ram may not operate. Limit switch #1 is operated by the needle yoke in the home position and prevents damage to the needles.

Feeder Drive Chain

A drive chain connects the feeder motor to the feeder crank. A failure of this chain will prevent the operation of the feeder crank and the pickup.

Pickup Drive Chain

A drive chain connects the feeder crank to the pickup drive clutch assembly. Any time the feeder operates, the pickup can operate provided the drive chain is intact.

Pickup Drive Clutch

A slip clutch protects pickup components from damage due to overloading, mechanical failure or contact with foreign objects. A worn or mis-adjusted pickup clutch can cause sluggish operation and stalling of the pickup. If the feed crank is operated in reverse to clear a plug, the pickup drive clutch should overrun to keep the pickup from operating in reverse.

Power Take-Off Clutch/Main Drive Belts

A mis-adjusted PTO clutch or loose and/or broken drive belts can cause sluggish operation of the baler. When repairing a PTO clutch, make sure that the spring set is appropriate for the machine. A number code on the spring set can be used for identification.

Feed Fork Drive Chain

A drive chain connects the feed fork drive motor to the feed fork crank shaft. Failure of this chain will prevent operation of the feed fork. A loose chain can cause rough or noisy operation of the feed fork.

Needle Yoke/Knotter Drive Chains

A drive chain connects the needle yoke/knotter drive motor to the needle yoke drive shaft. A second chain connects the needle yoke drive shaft to the knotter shaft. Failure of the needle yoke drive chain will prevent operation of both the needle yoke and the knotter. Failure of the knotter drive chain will prevent operation of the knotter, but the needle yoke will still operate. Timing of the knotter drive chain in relation to the needle yoke is critical to the tying process. Follow instructions in the Maintenance manual for knotter timing.

Main Pump Coupling

The main pump coupling connects the flywheel shaft to the main hydraulic pump. Loose components within this coupling may cause vibration or noise. A failure of this coupling will prevent the operation of the pickup, feeder, feed fork, ram and knotter. The electrical charging system and the bale density system will continue to function.

ELECTRICAL COMPONENTS

In event of any malfunction, check the following electrical components.

Power Switch in the ON Position

Power Indicator Lights ON

The power indicator lights illuminate on the Baler Controller and the Control Panel if power is available to the power supply circuit.

Main Harness Connections

Check the connections of the harness to the Baler Controller and the Control Panel. Make sure they are in good condition, free of debris and moisture, and firmly connected.

Battery Voltage

With the power switch ON, check the voltage reading on the gauge located in the dash panel. The power supply and control circuits must have a minimum of 12 volts to operate. Confirm battery voltage by checking the battery with a voltmeter.

Fuse

A 10-amp fuse protects the power supply circuit. Check the fuse for continuity. Do not substitute, use only a 10-amp fuse.

Warning/Inidicator Lamps

Check for illumination of warning lights on the Baler controller. A red light indicates that the oil level is too low or the oil temperature is too hot. The red light, if illuminated, confirms that power is not available to the control circuit to operate the baler.

Check for illumination of the Power ON indicator lamp as mentioned earlier. Check the alternator indicator lamp. If it illuminates when the tractor PTO is engaged and operating at 500 to 1000 rpm, it indicates that a malfunction exists in the charging circuit. A failure of the charging circuit will eventually lead to a low voltage condition. The power supply and control circuit must have 12 volts to operate correctly. Check alternator output voltage with a hand-held voltmeter connected to the battery. Operate the baler at 1000 rpm. With the power switch in the ON position, turn on the baler work lights and the knotter blower fans. Check the voltage reading on the meter. The

charging system should maintain approximately 14 volts if operating correctly. If the battery voltage is below 10 volts, the alternator may need to be excited by a pair of jumper cables hooked to a 12 volt source before the alternator will resume charging.

Oil Temperature Gauge

With the power switch in the ON position, check the temperature reading on the oil temperature gauge. Oil temperature above 220° F will cause the red warning light to illuminate, and 12-volt power will not be available to the control circuit. Another mechanical temperature gage is located on the fill level indicator at the rear of the oil reservoir. This gage can be used to check for high temperatures if the gage on the dash panel is inoperable.

Electrical Connections

Check for satisfactory connections at the battery and the wiring harness throughout the machine. Make sure they are in good condition, free of debris and moisture, and firmly connected. Also open the control panel and check for loose connections on relay terminals and other electrical components. Carefully check the relays for proper installation in their receptacles. Check the sliding contacts on the three main resistors. Make sure that the contacts and their screws are not touching each other or any other part of the Control Panel. Check connections underneath the dash panel.

Take care to avoid shorting across any of the connections. If probing is necessary, use a wooden or plastic stick or a pencil. When using probes on a multimeter, be sure that the terminal in question is the only one touching the probe.

HYDRAULIC COMPONENTS

Check the following hydraulic components should a malfunction occur.

Ram Pressure

While operating the baler, note the ram pressure reading on the dash panel. Ram pressure will be indicated each time the ram extends to compress the product being baled.

CAUTION: Stay clear of the baler when operating. Keep all others away while the baler is operating.

Density Pressure Shut-Off Valve

For normal baling, make sure the density pressure shut-off valve is in open position. If the valve is closed, no pressure will be applied to the restriction rails.

CAUTION: Stay clear of the baler when operating. Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Hydraulic Oil

Check hydraulic oil level. A sight gauge is installed on the front of the hydraulic reservoir. Low oil level will prevent power from reaching the control circuit.

Hydraulic Hoses

Check all hydraulic hoses and lines for leaks.

CAUTION: Always use a piece of cardboard or wood to search for suspected pressurized hydraulic leaks. NEVER use hands; escaping fluid under pressure can penetrate skin.

Hydraulic Cylinders

Check main cylinder for leaks. Check restriction rail cylinders for leakage.

TROUBLESHOOTING CHECKLIST

Tractor PTO Engaged, Main Drive Unit Operating

Confirm that the main drive unit is operating. Check for slipping clutches or belts by rapidly increasing tractor PTO RPM from an idle. Listen carefully to the sound of the baler as the speed of the drive unit increases. If clutches or belts are slipping, there may be a noticeable difference in the rate at which tractor engine speed increases compared to the rate at which baler speed increases. If slipping clutches or belts are suspected, adjust according to the instructions in the Maintenance Manual.

CAUTION: Stay clear of the baler when operating. Keep all others away while the baler is operating.

Feeder Crank Operating, Pickup Operation

Confirm proper operation of the feeder crank and pickup valve. The feeder crank and pickup should operate when the key on the Baler Controller is switched to Auto mode and the Start button has been depressed. The pickup should stop and the feed crank should reverse when the key on the Baler Controller is turned from AUTO to MANUALI and then momentarily held in the Reverse mode. The pickup should not operate in reverse due to the overrunning on the pickup drive.

NOTE: If the feeder is not actually plugged, DO NOT immediately switch the Baler Controller key from Auto to Reverse mode. Allow the feeder to coast to a stop before reversing it.

CAUTION: Stay clear of the baler when operating. Keep all others away while the baler is operating.

If the feeder or pickup does not operate, check:

Feed crank and pickup valve harness connection, feeder drive chain, hydraulic oil level, hydraulic lines, dual pump output, mechanical drive unit operation, and main pump coupler.

Electrical Control Circuit

CAUTION: Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Perform the inspection as described earlier.

1. Power Switch in the "ON" Position
2. Power Indicator Lights "ON"
3. Main Harness Connections
4. Battery Voltage

5. Fuse
6. Warning/Indicator Lamps
7. Oil Temperature Gauge
8. Electrical Connections

If the inspection does not reveal a problem, the main power supply circuit can be checked.

Checking the Main Power Supply

If the:

"Power On" light does not illuminate at the Bale Controller, first disconnect the harness from the Baler Controller. Check continuity between pins 10 and 23 with the switch ON. If continuity does not exist, the Power Switch needs to be replaced. The Baler controller is a non-serviceable item and needs to be sent for repairs. (contact manufacturer for repair/warranty information) If continuity exists the "Power On" light may be burned out.

"Power On" light does not illuminate at the Control Panel, remove the cover from the Control Panel and check for 12 volts between the blk/wht wire at the green light and ground. If voltage exists, the bulb is burned out and needs replacing. The control circuit should still be able to close.

If voltage does not exist at the light (check fuse and replace with 10-amp fuse only) check terminal 87 on Relay 9 (blk/wht wire) for 12 volts. If not 12 volts at 87, check at terminal 30. If 12 volts at 30, check for 12 volts across terminals 85 and 86. If positive results at all places, remove and test relay 9, replace if inoperable (see parts book for number). If still not getting power at terminal 87, recheck wires and harnesses for loose connections or broken wires using an ohm-meter for continuity checks.

"Power On" are lights on but baler won't start, and it is determined that low oil level or hot oil is not a factor, check for 12 volts at terminal 87 on RL-8 *(TB4-2)*. If 12 volts at 87, the baler should be able to start.

If no voltage at 87, check for continuity between terminals 30 and 85 on RL-8. If no continuity, check continuity across the terminals of the thermostatic switch and the oil level switch (disconnect harness first). If both sending units test positive, check connections and harness and for loose or broken wires.

If continuity exists between 30 and 85, 12 volts should exist at terminal 85 on RL-8 *(JB4-6)* . Check for 12 volts across 85 and 86. If 12 volts, remove and test relay 8, replace if inoperable (see parts book for number).

If all of the above check out but the baler won't start, continue to check the "Auto" source power.

Checking "Auto" Source Power

With the power switch "ON", the mode selector in the "AUTO", 12 volts should be available to terminal 30 and 85 on RL-13. If not, check main power supply circuit.

After START is pressed, check for 12 volts across 85 and 86 on RL-13. If 12 volts does not exist, check to see if RL-13 is bad (replace if necessary, see parts book for number). If RL-13 is good, recheck wire harness connections for continuity. If the problem is not apparent in the harness, the baler requires repair. The Baler controller is a non-serviceable item and needs to be sent for repairs. (contact manufacturer for repair/warranty information)

Needle Yoke/Home Position

The needle yoke must be in the home position before the ram can advance. A cam on the needle yoke drive shaft operates LS-1 to allow 12 volts to be available to LS-2 and LS-3.

Check the position of the needle yoke and confirm that LS-1 is operated. Adjust LS-1 according to the instructions listed in the Maintenance manual.

With the tractor PTO disengaged, the power switch ON, the mode selector in AUTO and START pressed, disconnect the harness at LS-2. Check voltage at the green wire on the baler side *(JB 2-8)*. A 12-volt reading
confirms that power is available through LS-1. (Remember, START must have been pressed for power to get through LS-1.)

If 12 volts are not present at LS-2, disconnect the harness to LS-1 and check for voltage at the red/wht wire on the baler side. If 12 volts are present, power is available to LS-1. LS-1 may be mis-adjusted or faulty, test and repair as necessary.

If 12 volts are not present at LS-1, the 12 volt "AUTO" Source must be checked.

Feed Sensor/Feed Fork Operation

The feed sensor is manually activated by a charge of material pushed into the bale chamber by the feed fork. When the feed sensor is raised a sufficient amount, LS-3 is operated and when the feed fork reaches top dead center to operate LS-2, the ram is activated. The feed sensor is spring loaded and will return to its rest position as the ram advances to compress to charge of material.

Feed Fork

Confirm the correct operation of the feed fork. The feed fork should operate anytime the tractor PTO is operating, power switch is on, the mode selector is in AUTO, and START has been pressed. Only when the ram is advancing, will the feed fork stop.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

If the feed fork does not operate correctly in AUTO mode, switch to the diagnostic mode and use the Diagnostic Controller to operate the feed fork. Operating the feed fork in the diagnostic mode provides power directly to the feed fork solenoid valve without any affect from components of the control circuit.

If the feed fork still does not operate using the Diagnostic Controller, check electrical connections to the feed fork solenoid valve.

CAUTION: Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Check for hydraulic power. Operate the tractor PTO at 250 rpm. If hydraulic pressure is available, the feed fork can be manually activated by depressing the manual control pin on the end of the feed fork solenoid valve. This will help to confirm if failure of the feed fork is due to an electrical or hydraulic problem.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

To check the power supply to the feed fork in the AUTO mode, disengage the tractor PTO and shut off tractor engine and wait for all motion in baler, including flywheel, to cease. Turn the power switch on. Select AUTO. Press START. Check for 12 volts at terminal 9 on RL-1 *(TB 2-2)*. Voltage at this point confirms that power is available from the contacts of Relay 1. Voltage can also be checked between the pink wire leading to LS-8 and ground.

Check for 12 volts at location 10 on the circuit board connection *(TB 2-3)* in the lower rear corner of the Control Panel. Voltage at this point confirms that power is available through LS-8. If power is not available at location 10, check LS-8 and related wiring.

Feed Sensor

Check the operation of the feed sensor. With the main power switch in OFF, manually lift the feed sensor and listen for the audible "click" of LS-3 being operated. Observe the operation of the activating cam and the lever arm. Correct adjustment of the feed sensor is described in the Maintenance Manual.

Check the feed sensor for freedom of operation throughout the entire range of its travel. Foreign material can cause the feed sensor to stick and become inoperative. If the feed sensor does not raise, the ram will not be activated. If the feed sensor does not return, the ram will stall at the end of its stroke and will not return until the feed sensor is returned to the rest position.

Check the operation of LS-2. LS-2 must operate correctly for power to reach LS-3. With the tractor PTO disengaged, power ON, mode selector in AUTO, and START pressed, operate LS-2 manually using a string to hold the lever arm in the operated position. Disconnect the harness at LS-3 and check for voltage in the red wire on the baler side *(JB 2-10)*. If voltage is not available, LS-2 or related wiring may be defective.

Check the operation of LS-3. With the tractor PTO disengaged and the power switch OFF, connect the leads of an ohm meter to the wires on the harness leading to LS-3. Raise the feed sensor manually or operate the limit switch lever arm. When LS-3 is operated, there should be continuity. If no continuity exists, LS-3 may be defective.

Check for 12 volts. Use a string to tie the lever arm of LS-2 in the operated position. Confirm that the needle yoke is in the home position and LS-1 is operated. Turn the power switch on, select AUTO, and press START. Manually operate the feed sensor or LS-3 and check for voltage in the control panel at terminal B on RL-1 *(TB 2-4)*. If LS-1,2, and 3 are operated 12-volt power should be available at B.

Ram Advance

With the baler operating in AUTO, if the feed sensor has operated LS-3 and the feed fork has operated LS-2, 12 volt power is available to set relay 1. When relay 1 is set, the ram can advance. If the ram fails to advance, make the following checks.

Confirm that all the components previously discussed are operating correctly.

Check ram operation in MANUAL (or DIAGNOSTIC) mode. If the ram will advance and retract in the manual mode, the pump controller is receiving power. If the ram will not advance, there may be a problem with the main pump controller. Make sure the needle yoke is in the home position to operate LS-1. Refer to the Needle Yoke/Home position section for information on LS-1. At this point in troubleshooting, it may be useful to check the hydrostatic pump for output by operating the pump controller manually.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

CAUTION: Before proceeding with any check of the controller and pump output, confirm the position of the needle yoke. It must be in the rearmost position with the needles out of the chamber. If these precautions are not taken, severe equipment damage will occur.

Locate the manual control knob on the hydrostatic pump. It is located on the lower right-hand side of the pump. With the tractor PTO engaged and running at 500 rpm, operate the manual controller on the pump. Turn the knob in one direction to advance the ram and in the opposite direction to retract the ram. If the ram will not operate with the manual control, there is a problem with the hydrostatic pump. If the ram will operate with the manual control, the problem is electrical in nature.

With the tractor PTO disengaged, all motion including flywheel has ceased, power switch on, mode selector in AUTO, and START pressed, use string to hold LS-2 in the operated position and operate LS-3 momentarily. Relay 1 should now be set. Check for ground at terminal 7 on RL-1 and at terminal 5 on RL-16.

Note: if the machine were operating, terminal 7 on RL-1 would read ground during full speed operation, and 3 volts in the slower modes triggered by LS-4 and LS-9.

If a ground does not exist at 5 on RL-16, check for ground at terminal 3. If a ground exists at 3 and not at 5, RL-16 may be faulty or AUTO power circuit may need checking.

Check continuity from terminal 3 on RL-16 to pin 20 on the balers harness plug at the baler hitch. If continuity doesn't exist, there is a break in the harness. If continuity exists, check continuity from pin 20 and pin 18 on the baler controller plug. If continuity exists, there is a break in the harness. If continuity does not exist, the Baler Controller may need repairs. The Baler controller is a non-serviceable item and needs to be sent for repairs. (contact manufacturer for repair/warranty information).

With the tractor PTO disengaged, power switch on, mode selector in AUTO, and START pressed, use string to hold LS-2 and LS-3 in the operated position. Check for 12 volts at terminal B on RL-1 *(TB 2-8)*. Voltage at this point confirms that power is available through LS-1, LS-2 and LS-3 to set Relay 1.

Check that Relay 1 is set. Use an ohm-meter to check for continuity between terminal 4 and 7 on RL-1 *(TB 3-10 and TB 4-6)*. Continuity between these two points confirms that relay 1 is set. If there is no continuity, replace the relay or correct faulty electrical connections.

Check for continuity between terminal 4 on RL-1 and ground. If no continuity exists, check LS-4 and related wiring.

Ram Retract

When the ram advances in the auto mode, it is because relay 1 is set and current is directed through the pump controller to ground in the direction necessary to cause the ram to advance. As the ram reaches the end of its stroke, LS-5 is released. This provides 12 volts to release relay 1. When relay 1 is released, the flow of current through the pump controller is reversed and the ram will retract. If the ram fails to retract, note of some of the following conditions.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Note the position of the ram . Is it fully extended or partially retracted?

Check the main system pressure. With the tractor PTO operating, power switch ON, mode selector in AUTO, and START pressed, note the pressure reading on the gauge.

If the ram is stalled (indicated by an extreme horsepower draw) and the pressure reading is high, relay 1 probably has not been released.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Check the feed sensor to see if it has returned to the rest position. Movement of the paddles should be free except for spring resistance. Refer to the Feed Sensor/Feed Fork section.

Check the operation of relay 1 and its electrical connections. With the tractor PTO disengaged, power switch ON, mode selector in AUTO, and START pressed, check for voltage at terminal 8 on RL-1 *(TB 2-4)*. A 12-volt reading at this point would indicate that power is available to release relay 1. If power is not available at terminal 8, disconnect the harness to LS-5 and check for voltage at the red/wht wire on the baler side *(TB 1-9)*. A 12-volt reading at this point would indicate that power is available to LS-5. Check LS-5 for proper operation.

If the ram is not stalled and main system pressure is zero, the problem may be in the electrical circuit that operates the controller.

Check the operation of the ram in the manual mode using the manual control pendant. If the ram will operate, it confirms that power is reaching the controller and the controller is functional. Check LS-10 and its related wiring. With an ohm meter, check for continuity between terminal 7 on RL-1 and terminal 3 on RL-4 *(TB 4-6 and TB 3-5)*. Continuity between these two points confirms circuit between relay 1 and relay 4. (see

If the ram is partially retracted (approx. 9" from the fully extended position) a problem may exist with relay 2 and LS-6. During a tie cycle, the ram cannot return past LS-6 unless relay 2 has been released.

CAUTION: Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspection, adjusting, or servicing baler.

Disconnect the harness from LS-11 and check for 12 volts at the blue wire on the baler side *(TB 2-9)*. If 12 volts exists, power is available to release relay 2. If no voltage is present, check the operation of LS-12 and its related wiring. Relay 2 may be defective or have a bad electrical connection. Check that LS-6 is operating correctly.

Check the ram operation in the MANUAL (or DIAGNOSTIC). If the ram will advance and retract in the manual mode, it confirms that the pump controller is receiving power. If the ram will not advance, there may be a problem with the hydrostatic pump controller. Make sure the needle yoke is in the home position to operate LS-1. Refer to the Needle Yoke/Home position for information on LS-1. At this point in

troubleshooting, it may be useful to check the hydrostatic pump for output by operating the controller manually.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

CAUTION: Before proceeding with any check of the controller and pump output, confirm the position of the needle yoke. It must be in the rest position with the needles out of the chamber. If these precautions are not taken, severe equipment damage will occur.

Locate the manual control knob on the hydrostatic pump. It is located on the lower right-hand side of the pump. With the tractor PTO engaged, operate the manual controller on the pump. Turn the knob in one direction to advance the ram and in the opposite direction to retract the ram . If the ram will not operate with the manual control, there may be a hydraulic system failure. If the ram will operate with the manual control, the problem may be electrical in nature.

Knotter Operation

At some point during ram advance, the rotating meter wheel raises the meter bar enough to operate LS-11. LS-11 closes a portion of the circuit that activates the knotter. The operation of the knotter can occur only when the ram reaches the fully extended position. When the ram reaches the fully extended position, LS-5 is released providing voltage to release relay 1 just as on a normal ram stroke. Because LS-11 is operated, power from relay 1 is applied to set relay 3. With relay 3 set, the knotter is activated.

If the knotter will not operate, check the following possibilities.

CAUTION: Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspection, adjusting or servicing baler.

With the tractor PTO disengaged, power switch on, mode selector in the AUTO position, and START pressed, use strings to hold LS-2 and LS-3 in their operated positions. Check for 12 volts at terminal "B" on RL-1 *(TB 2-8)*. Voltage at this point confirms that power is available through LS-1, LS-2, and LS-3 to set Relay 1.

Confirm that the ram is fully extended, LS-5 is released, and LS-11 is operated by the meter bar. If the ram is stopped in the fully extended position, follow troubleshooting steps in the Ram Return section. If the ram returns and the knotter fails to operate, make the following checks.

Check for operation of the knotter in the diagnostic mode. If the knotter operates using the Diagnostic Controller, it confirms that the solenoid valve and wiring is OK. If the knotter will not operate in the diagnostic mode, check if hydraulic pressure is available to operate the knotter. The knotter control valve can be manually activated by

depressing the manual control pin on the end of the feed fork solenoid valve. This will help to confirm if failure of the knotter is due to an electrical or hydraulic problem.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Operate the tractor PTO at 500 rpm and use the Diagnostic Controller to position the ram in the fully extended position.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Disengage the tractor PTO and shut off the tractor. Manually position LS-11 in the operated position. The meter bar can be raised to operate LS-11 or the lever arm of LS-11 can be held in the operated position with a piece of string.

With the tractor PTO disengaged, power ON, mode selector in AUTO, and START pressed, check for 12 volts at terminal 9 on RL-1 *(TB 2-2)*. If voltage is available at 9 on RL-1, it confirms that relay 1 is released. Check for 12 volts at terminal 6 on RL-2 *(TB 3-3)*. If voltage is available at 6 on RL-2, power from relay 1 is available through LS-4. Check for 12 volts at terminal B on RL-3 *(TB 3-2)*. If voltage is available at terminal B on RL-3, it confirms that power is available through LS-11 and RL-3 should be set. Check for 12 volts at terminal 4 on RL-3. If not, check RL-3 and the AUTO Source circuit. If voltage exists at terminal 4 on RL-3, check for voltage at location 11 and at location 13 on the circuit board connector in the lower rear corner of the Control Panel. If voltage exits at 11 but not at 13 the circuit board is defective. The circuit board is a non-serviceable item and the Control Panel needs to be sent for repairs. (contact manufacturer for repair/warranty information).

Density System

The density system is pressurized by a small hydraulic pump mounted on the main drive unit. If the tractor PTO is operating at a sufficient speed and the power switch is off, the density system will apply pressure to the restriction rails. Pressure from the density pump is not applied to the restriction rails at a low PTO rpm. A bypass valve diverts flow back to the to prevent possible damage to the pump due to overheating. During operation of the baler in the auto mode, pressure is applied to the restriction rails only during ram advance. If a problem with the density system is suspected perform the following checks.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion to cease before inspecting, adjusting, or servicing baler.

Check the density pump drive belt. Adjust according to the instructions listed in the Maintenance manual

Check the manual shut-off valve. A shut off valve is located below the density pressure regulator valve on the right-hand front corner of the machine. This valve must be open to allow pressure to reach the restriction rails.

Check the operating pressure of the density system. Install a 5000 psi gauge to the gauge port at the bottom of the density system regulator valve assembly. Operate the tractor PTO at at least 500 rpm. With the power switch "OFF", the restriction rail cylinders should apply force to the restriction rails. Pressure reading when operated as described above should be 2150 psi. If maximum obtainable pressure is not 2150 psi check for internal leakage in the restriction rail cylinders. The pressure regulator valve, bypass valve, or pump could also be faulty.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Check the operation of the density system unloader valve. Have an observer watch the restriction cylinders as the baler is operating. If the system is operating correctly, the restriction cylinders will apply pressure to the restriction rails as the ram advances. When the ram pressure reaches a predetermined point (set by adjustment of the unloader valve), density pressure will be released. As the baler operates, this process appears as a sort of breathing action of the restriction rails. If this does not occur, the unloader valve could be faulty.

CAUTION: Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Check the operation of the density control solenoid. The density control solenoid is energized when the baler is operating in the AUTO mode and the ram is not advancing. Anytime the density control solenoid is energized pressure is NOT applied to the restriction rails.

With the tractor PTO disengaged, power switch on, the selector switch in AUTO, and START pressed, check for 12 volts at the pink wire *(TB 4-11)* to see if power is available to the solenoid. If 12 volts does not exist, check voltage at terminal 9 on RL-1. If no power at RL-1, check the Auto Source circuit.

Check for 12 volts across the solenoid coil, If not 12 volts, then check continuity from the white wire to ground. If continuity exists and 12 volts exists across the coil, the solenoid is defective.

HYDRAULIC CIRCUIT

HYDROSTATIC CHARGE PRESSURE

The charge pump supplies cool fluid to the hydrostatic pump, provides pilot pressure to other systems, and supplies fluid to operate the displacement controller. Charge pump flow exits the system and circulates through a heat exchanger before being filtered and returning to the reservoir. The charge system maintains 350 to 400 psi on the entire system. Charge system oil circulates through the charge flow filter, the 400 psi charge system relief and back to the reservoir. Charge pressure is utilized as pilot pressure to activate the Feed Fork and Knotter directional valves. Insufficient charge pressure can cause several problems. Check charge pressure according to the procedure listed in the Maintenance manual.

HYDRAULIC OIL COOLING SYSTEM

Components to inspect if baler overheats.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor PTO. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler, including flywheel, to cease before inspecting, adjusting, or servicing baler.

Check heat exchanger. Remove any dirt or obstructions which would restrict cooling air flow.

Check cooling fan operation. Ensure fan is operating in the correct direction and in proper sequence. See page 13.

Check main system charge pressure. Check charge pressure while ram is in stroke (advancing or retracting). Charge pressure should be approximately 50 psi lower while pump is in stroke. This pressure difference gives flushing and cooling of oil in the ram drive circuit. Adjust the remote charge relief valve if necessary to obtain this pressure differential.

Inspect the following main valve cartridges and cartridge seals.

Cartridge no. 2, main system retract relief valve.
Cartridge no. 3, main system advance relief valve.
Cartridge no. 6, remote charge flow valve.
Cartridge no. 7, piloted closed check valve.
Cartridge no. 9, make up cylinder fill valve.

Check Feed Fork Counter Balance Valve Adjustment
If the feed fork counterbalance is set too high, it can contribute to overheating.

To check or adjust the counterbalance setting, baler hydraulic oil temperature must be at least 170° F. Install a 3500 psi gauge on gauge port A on the feed fork/knotter

manifold. Operate the baler in AUTO mode at 700 PTO rpm. Note the reading on the gauge as the feed fork operates. The gauge should fluctuate from about 600 psi as the feed fork comes up, to about 400 psi as the feed fork goes down.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Adjust the counterbalance valve only high enough to:

1. Prevent free falling of the feed fork.

2. Reduce "chattering" of feed fork. As the feed fork starts when cycling the ram , it is acceptable to chatter to occur for about 1/2 revolution.

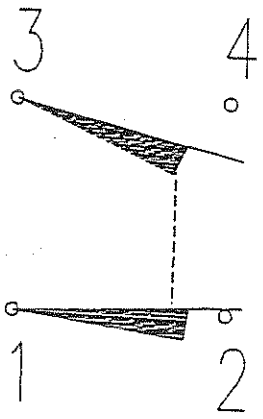
The feed fork counterbalance valve is located on the left front, top corner of the Knotter and Feed Fork manifold. To increase the counterbalance setting, turn the adjusting screw counterclockwise. To decrease the setting, turn the adjusting screw clockwise.

Check the main cylinder piston seal for leakage.

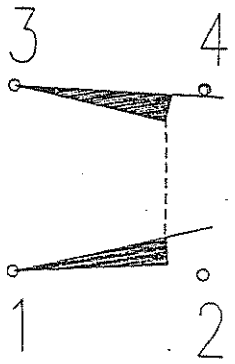
CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

To check main cylinder leakage, operate the baler in manual mode and fully extend the ram . Shut off tractor and disengage tractor PTO. Disconnect the hydraulic line from the rod end of the ram where it connects to the main valve assembly. Cap the open port on the main valve. Position the open hydraulic line from the ram so any oil leakage can be contained in a bucket. Operate the baler in MANUAL at low PTO rpm. Using the manual control pendant, briefly operate the ram in the advance mode. Observe any oil flow from the rod end hydraulic line. Without operating the ram , observe any oil flow from the rod end line. Oil flow in excess of approximately 1/2 cup per minute may be considered excessive.

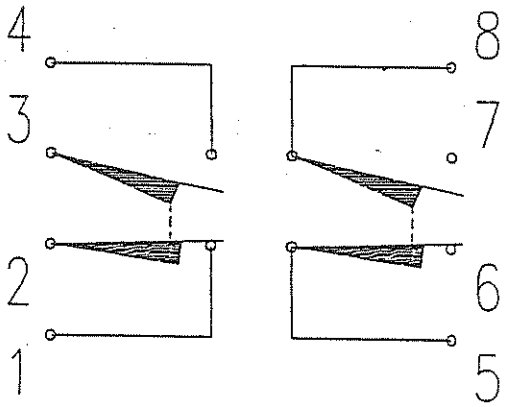
APPENDICES



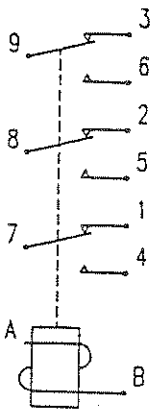
FOUR POST LIMIT SWITCH
Shown in tne *non-operated* position. Terminals 1 & 2 are the normally closed terminals, and terminals 3 & 4 are normally open terminals.



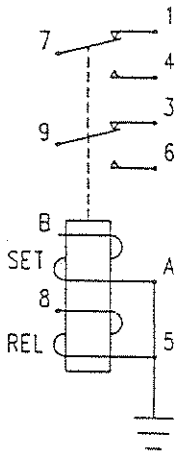
FOUR POST LIMIT SWITCH
Shown in the *operated* position. Terminals 1 & 2 are the normally closed terminals, and terminals 3 & 4 are the normally open terminals.



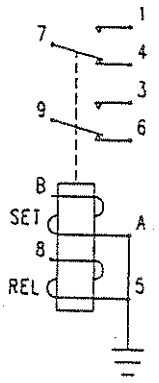
EIGHT POST LIMIT SWTICH
Shown in the non-operated position. Terminals 1 &2, 5 & 6 are the normally open terminals, and terminals 374, 7&8 are the normally open terminals.



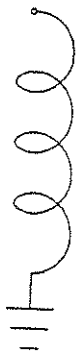
STANDARD RELAY
Shown in the non-operated, or released, position. When 12 volts and a ground are supplied to the coil (A & B) the relay will set, or close. When either the 12 volts or ground are taken away, the relay will release.



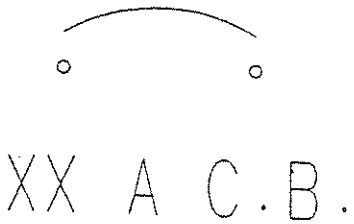
MAGNETIC LATCHING RELAY
Shown in the released position. When 12 volts are applied to the set coil (terminal B) the relay is set, or latched. A magnet in the coil holds the relay latched. When the voltage is removed from terminal B, the relay will stay set until voltage is applied to the release coil (terminal 8).



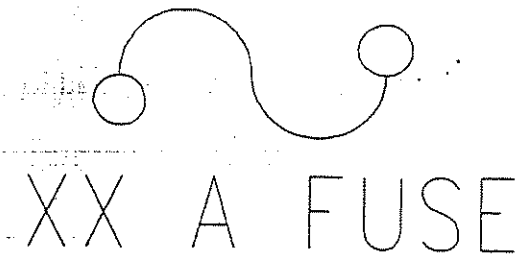
MAGNETIC LATCHING RELAY
Shown with the set coil energized. The relay will continue to stay set until 12 volts are applied to the release coil (terminal 8).



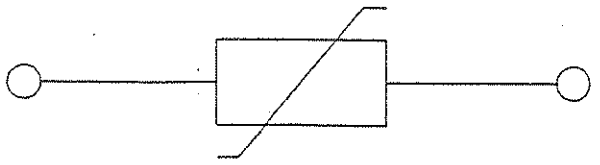
SOLENOID VALVE
When 12 volts are applied, the solenoid would be energized. The valve would then open (if normally closed) and allow oil to flow to the motor, cylinder or whatever is in the circuit.



CIRCUIT BREAKER
The XX would be replaced by the amperage of the circuit breaker. The A stands for amps.



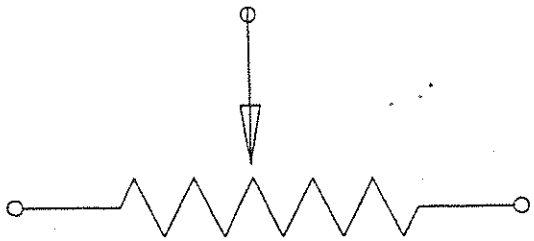
FUSE
The XX would be replaced by the amperage of the fuse. The A stands for amps.



VARISTOR / SURGE SUPPRESSER
Similar to a diode, except that the varistor will only pass voltage in excess of the predetermined setting.

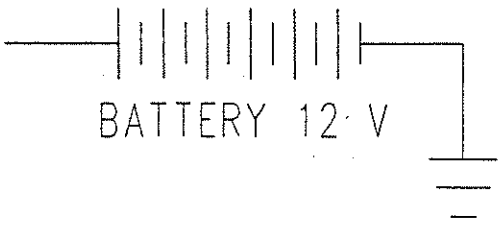
XX DEGREES

THERMOSTAT
The XX would be replaced by the the degrees Fahrenheit that the thermostat would open. Depicted by the arrow pointing up (opens on rising temperature) and the conacts in the thermostat are closed. As shown, the temperature is below the setting.

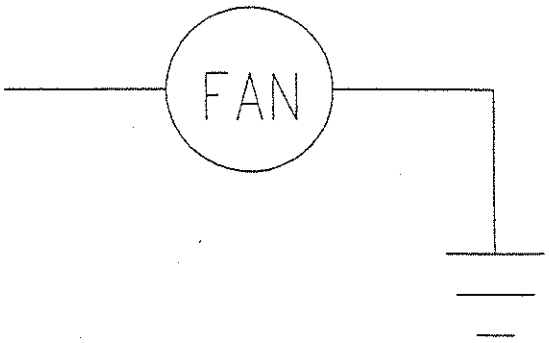


XX Ω
XX W

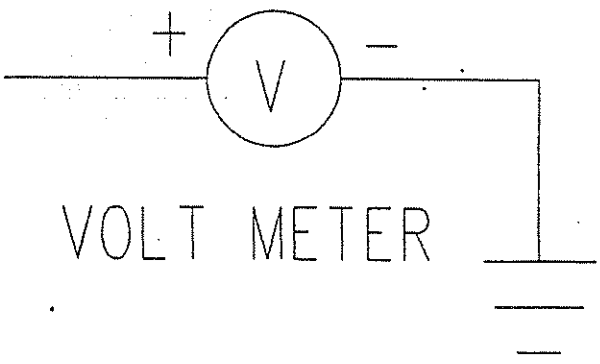
ADJUSTABLE RESISTOR
Depicted by the arrow and three point connection. The resistor is a device that has electrical resistance and is used to control voltage. The XX would be replaced by the OHM's and WATT's of the resistor.



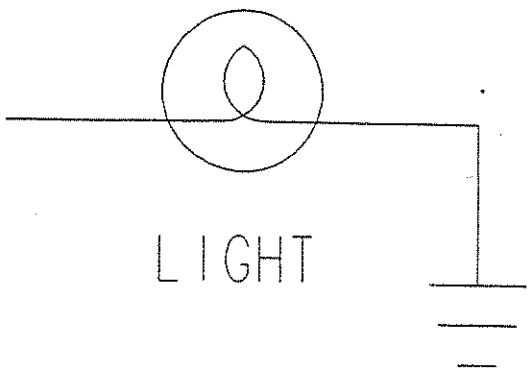
BATTERY
As drawn, the battery is a 12 volt automotive / industrial type.



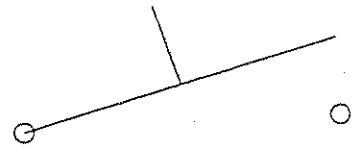
FAN
Either a cooler or knotter fan motor that runs on 12 volt DC.



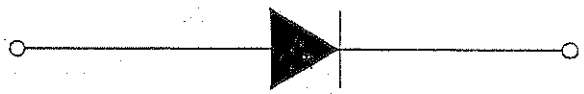
VOLTMETER
Measures the voltage present in a circuit. Usually found measuring voltage output from an alternator or battery.



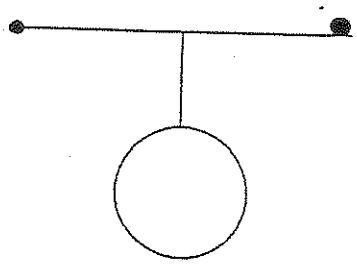
LIGHT
This could indicate either an indicator light that is either an LED or regular bulb style. Work lights and road lights can also be depicted as shown.



MANUALLY OPERATED SWITCH
Two positions, either open or closed. Switch shown open.



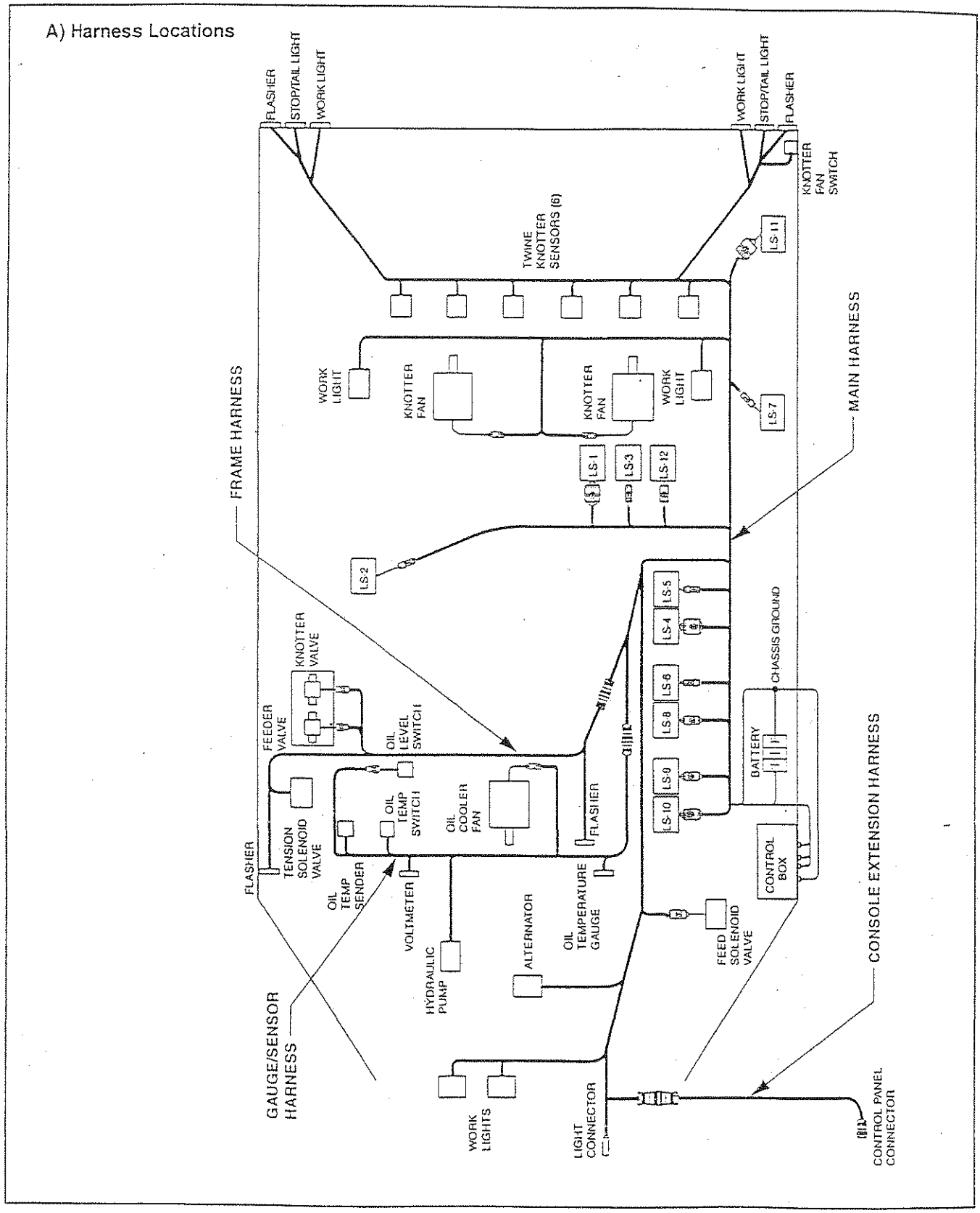
DIODE
An electrical device that will allow current to pass through itself in one direction only. Current will pass through in the direction of the arrow. Similar to a check valve in a hydraulic circuit.



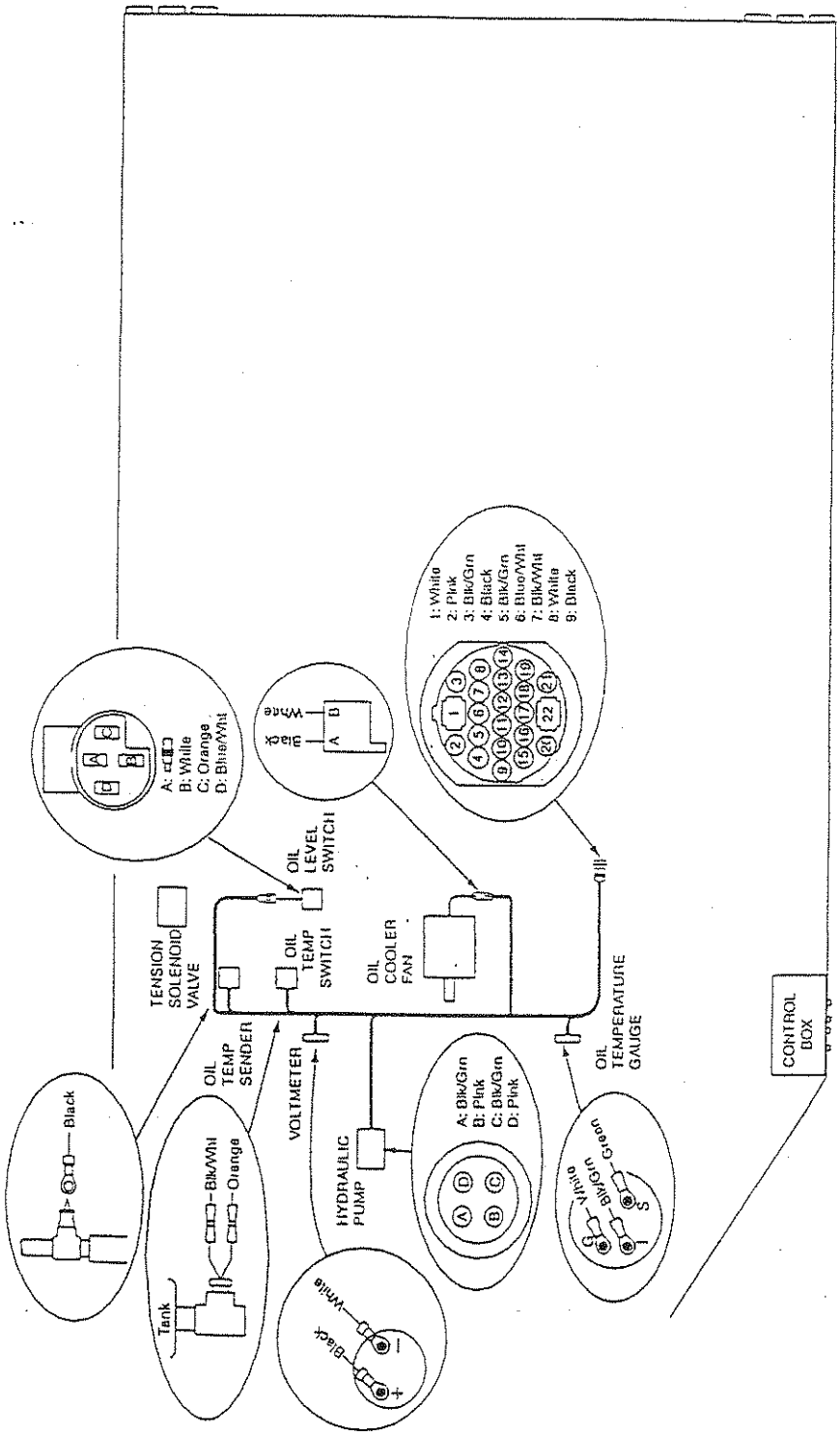
OIL LEVEL SWITCH
The switch is shown closed and as the tank is full of oil. The switch will open when the oil level drops.

APPENDIX B – WIRING DIAGRAMS

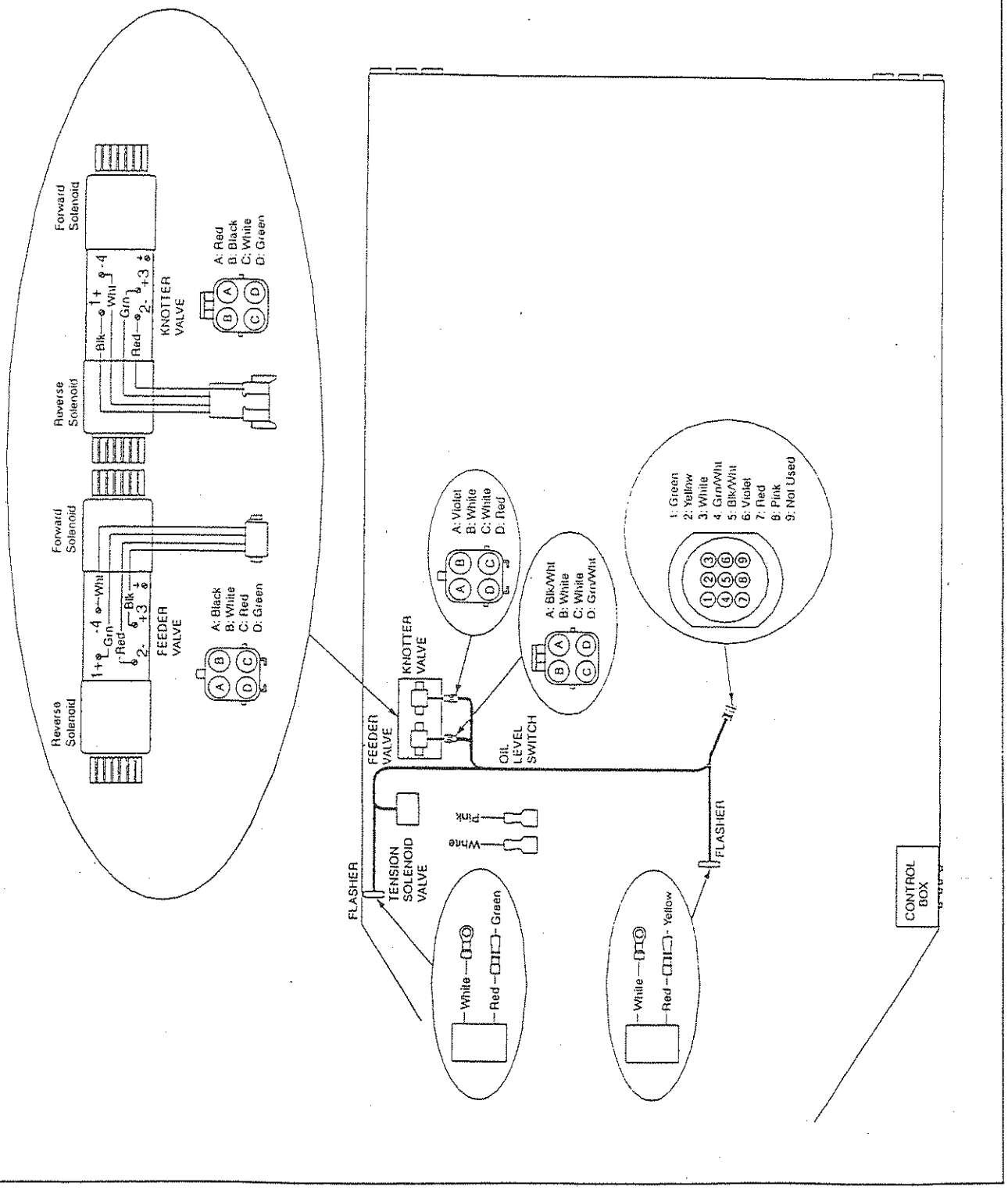
A) Harness Locations



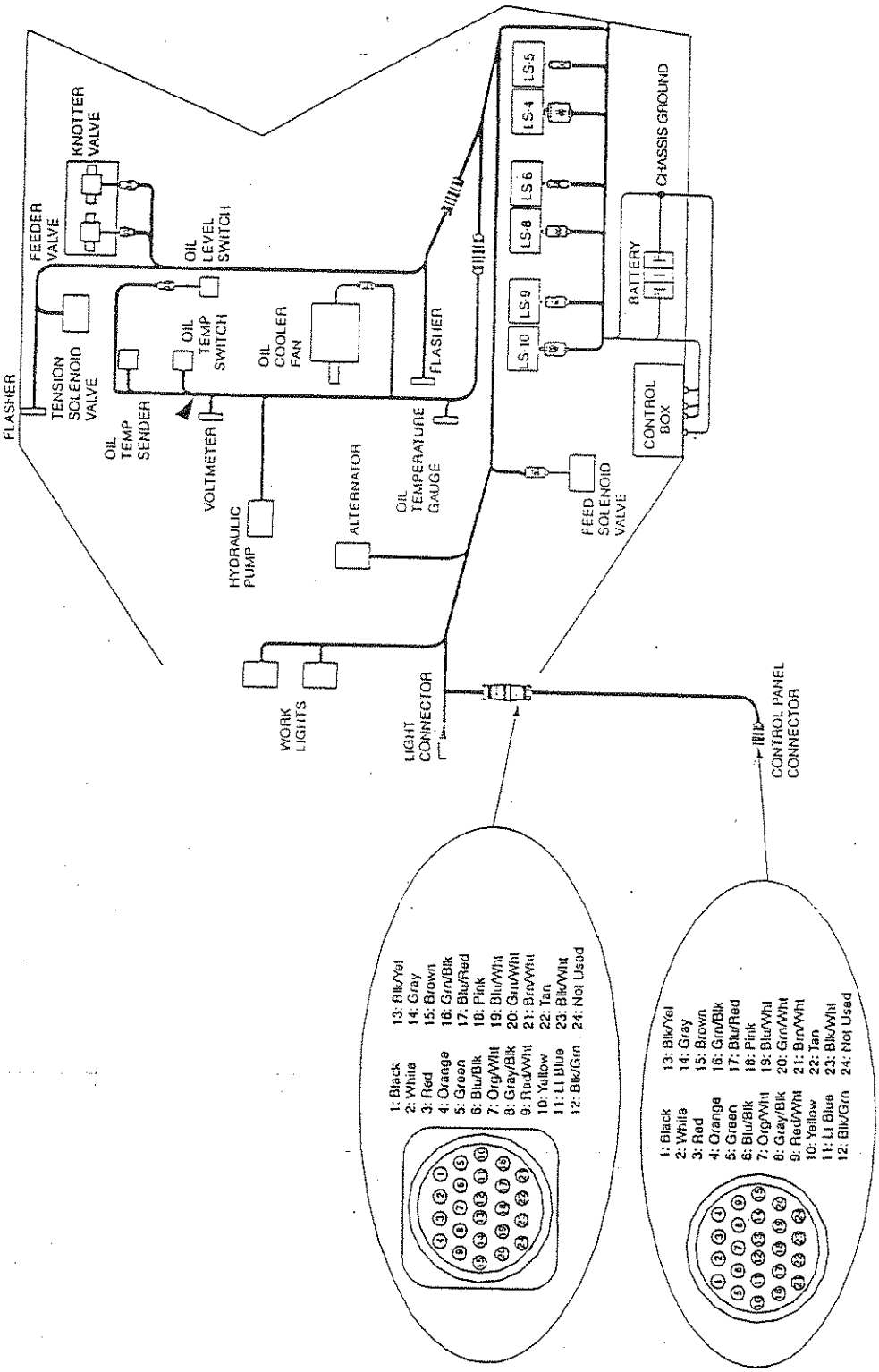
B) Gauge/Sensor Harness - Connections

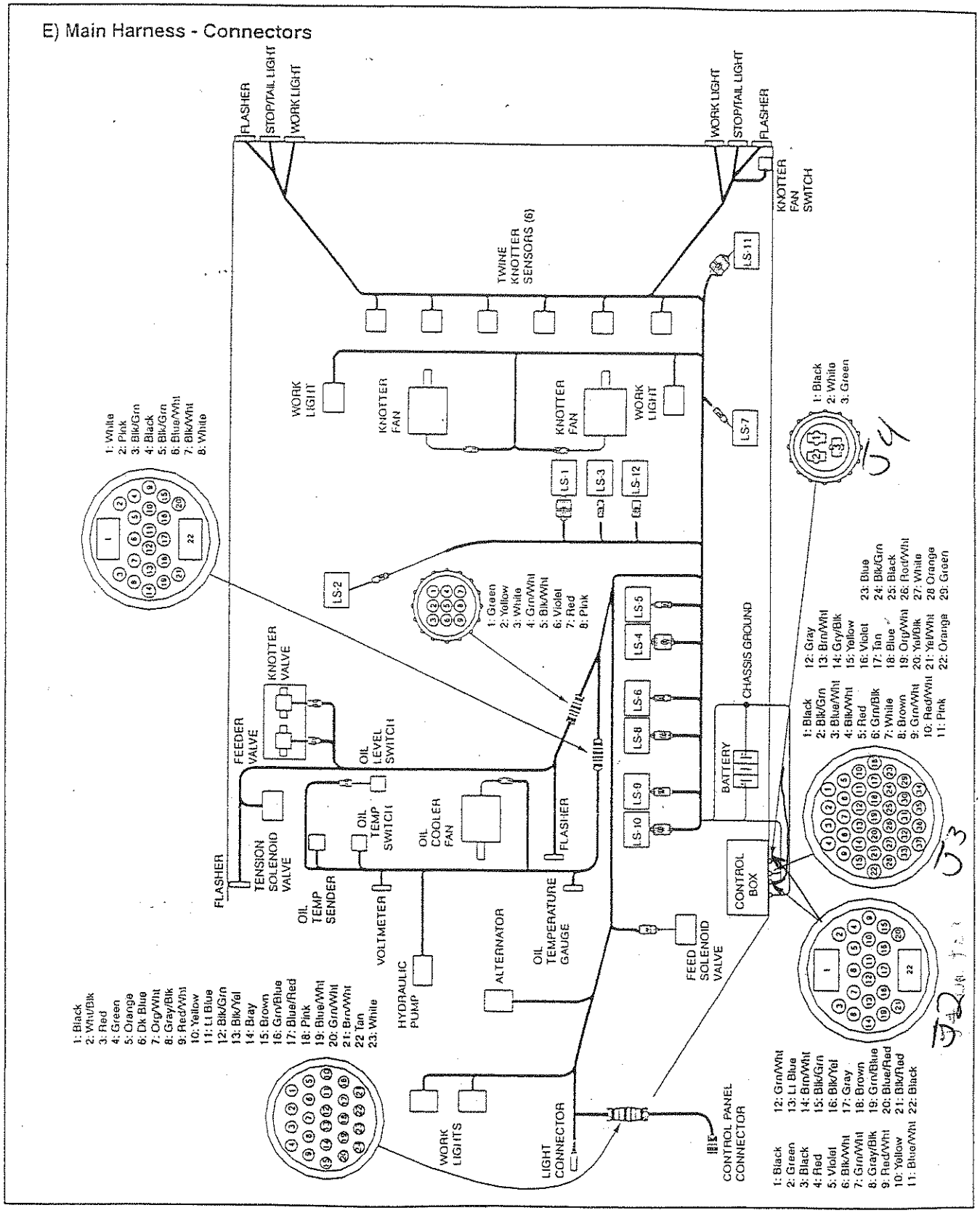


C) Frame Harness - Connections

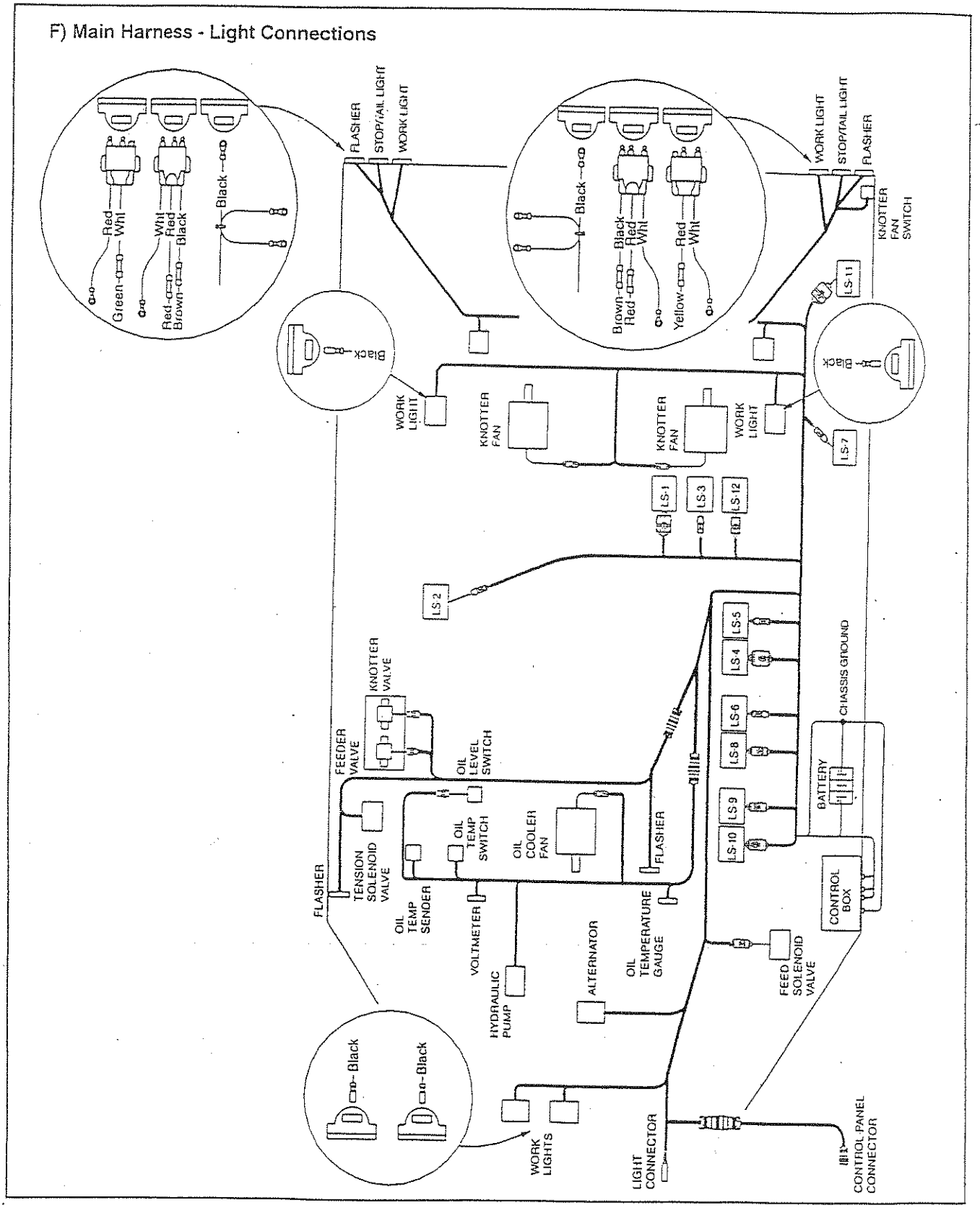


D) Console Extension Harness - Connections

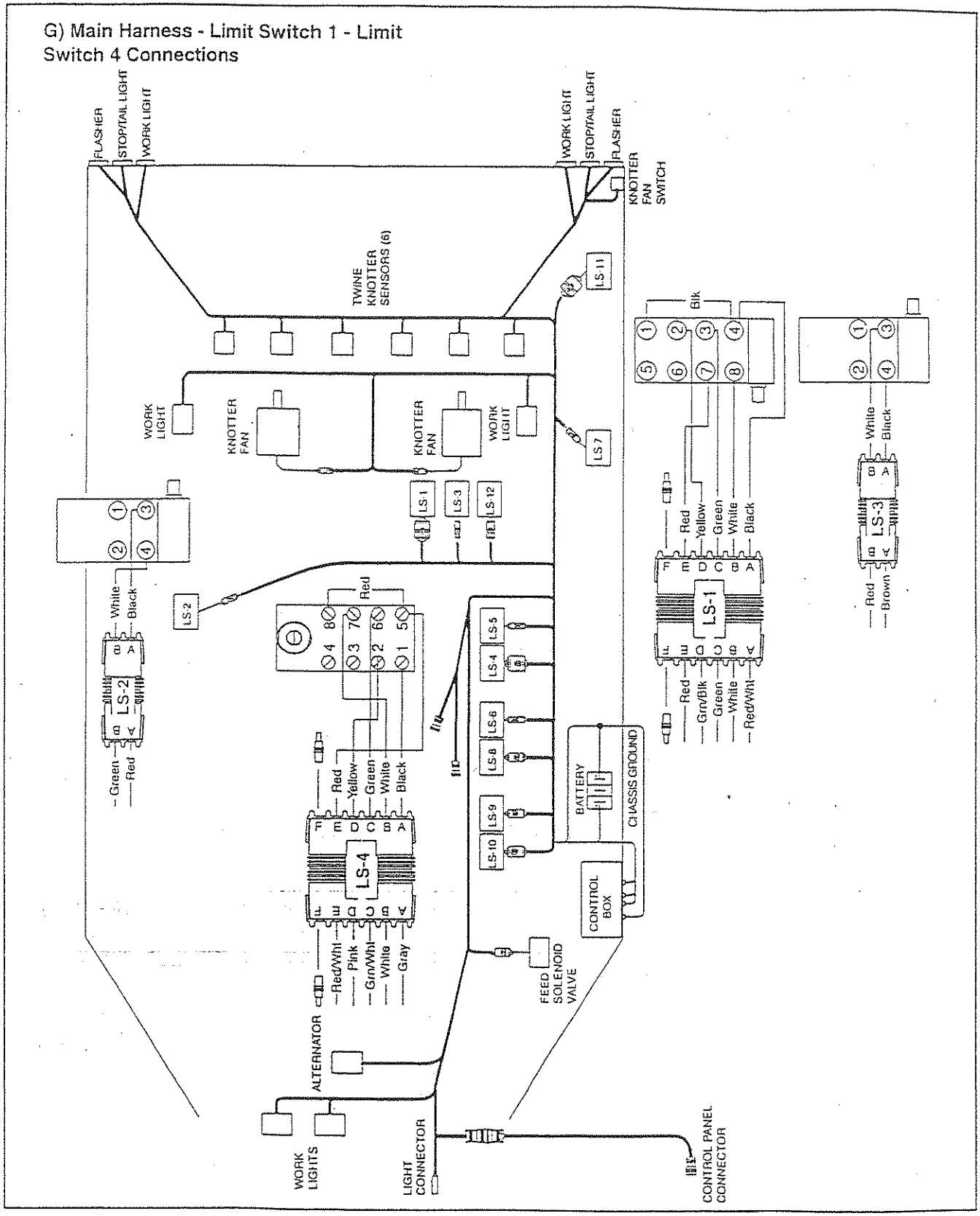



E) Main Harness - Connectors
FLASHER
STOP/TAIL LIGHT
WORK LIGHT
TWINE KNOTTER SENSORS (6)
KNOTTER FAN SWITCH
WORK LIGHT
KNOTTER FAN
LS-1
LS-3
LS-12
LS-2
LS-11
LS-7
KNOTTER VALVE
FEEDER VALVE
OIL LEVEL SWITCH
OIL TEMP SENDER
OIL TEMP SWITCH
OIL COOLER FAN
TENSION SOLENOID VALVE
VOLTMETER
HYDRAULIC PUMP
ALTERNATOR
OIL TEMPERATURE GAUGE
FEED SOLENOID VALVE
LS-4
LS-5
LS-6
LS-8
LS-9
LS-10
BATTERY
CHASSIS GROUND
CONTROL BOX
WORK LIGHTS
LIGHT CONNECTOR
CONTROL PANEL CONNECTOR
1: White
2: Pink
3: Blk/Grn
4: Black
5: Blk/Grn
6: Blue/Wht
7: Blk/Wht
8: White
1: Green
2: Yellow
3: White
4: Grn/Wht
5: Blk/Wht
6: Violet
7: Red
8: Pink
1: Black
2: White
3: Green
U4
1: Black
2: Blk/Grn
3: Blue/Wht
4: Blk/Wht
5: Red
6: Grn/Blk
7: White
8: Brown
9: Grn/Wht
10: Red/Wht
11: Pink
12: Gray
13: Brn/Wht
14: Gry/Blk
15: Yellow
16: Violet
17: Tan
18: Blue
19: Org/Wht
20: Yel/Blk
21: Yel/Wht
22: Orange
23: Blue
24: Blk/Grn
25: Black
26: Red/Wht
27: White
28 Orange
29: Green
U3
1: Black
2: Wht/Blk
3: Red
4: Green
5: Orange
6: Dk Blue
7: Org/Wht
8: Gray/Blk
9: Red/Wht
10: Yellow
11: Lt Blue
12: Blk/Grn
13: Blk/Yel
14: Bray
15: Brown
16: Grn/Blue
17: Blue/Red
18: Pink
19: Blue/Wht
20: Grn/Wht
21: Brn/Wht
22 Tan
23: White
1: Black
2: Wht/Blk
3: Red
4: Green
5: Orange
6: Dk Blue
7: Org/Wht
8: Gray/Wht
9: Red/Wht
10: Yellow
11: Lt Blue
12: Blk/Grn
13: Blk/Yel
14: Bray
15: Brown
16: Grn/Blue
17: Blue/Red
18: Pink
19: Blue/Wht
20: Grn/Wht
21: Brn/Wht
22 Tan
23: White
1: Black
2: Green
3: Black
4: Red
5: Violet
6: Blk/Wht
7: Grn/Wht
8: Gray/Blk
9: Red/Wht
10: Yellow
11: Blue/Wht
12: Grn/Wht
13: Lt Blue
14: Brn/Wht
15: Blk/Grn
16: Blk/Yel
17: Gray
18: Brown
19: Grn/Blue
20: Blue/Red
21: Blk/Red
22: Black

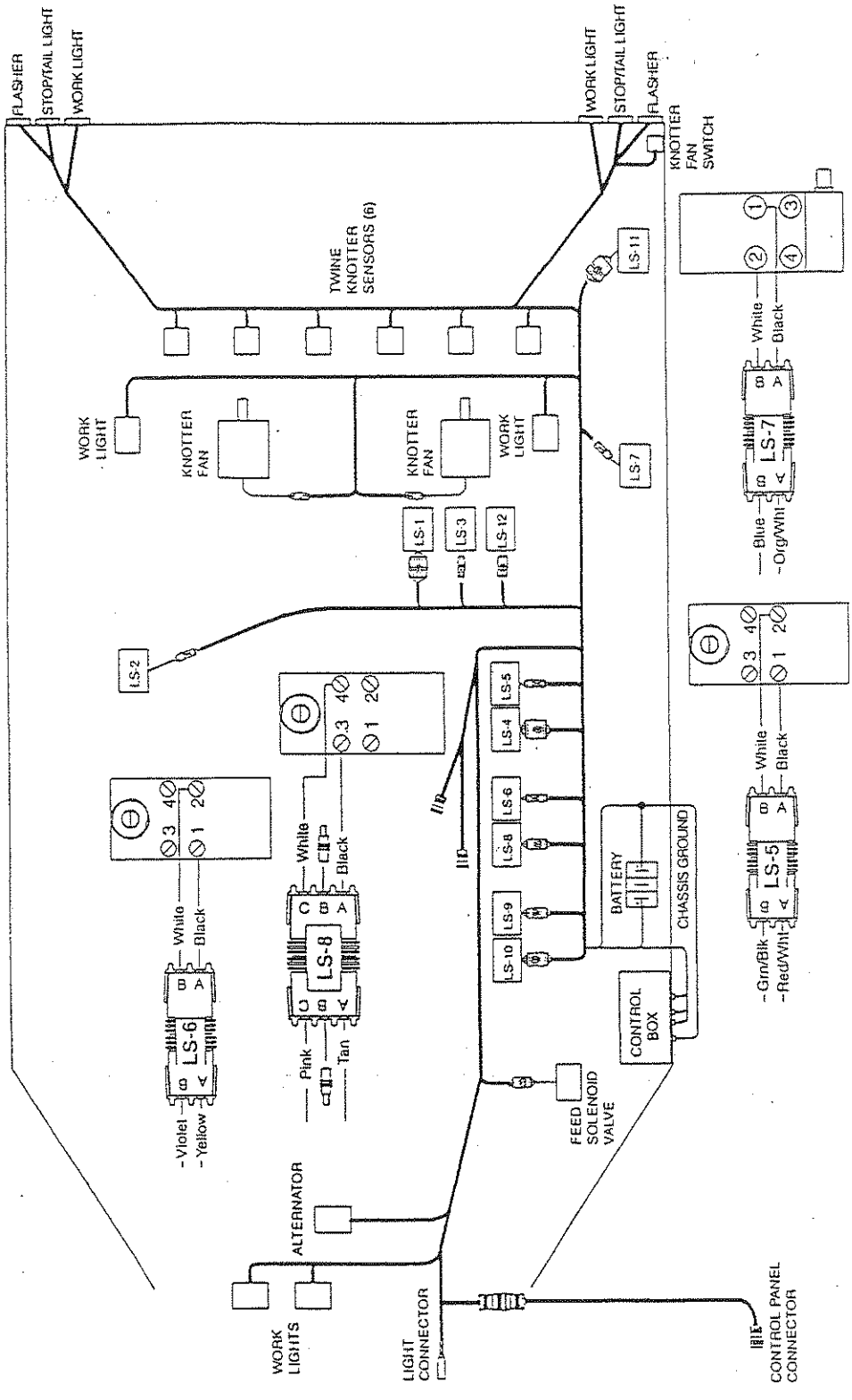
F) Main Harness - Light Connections



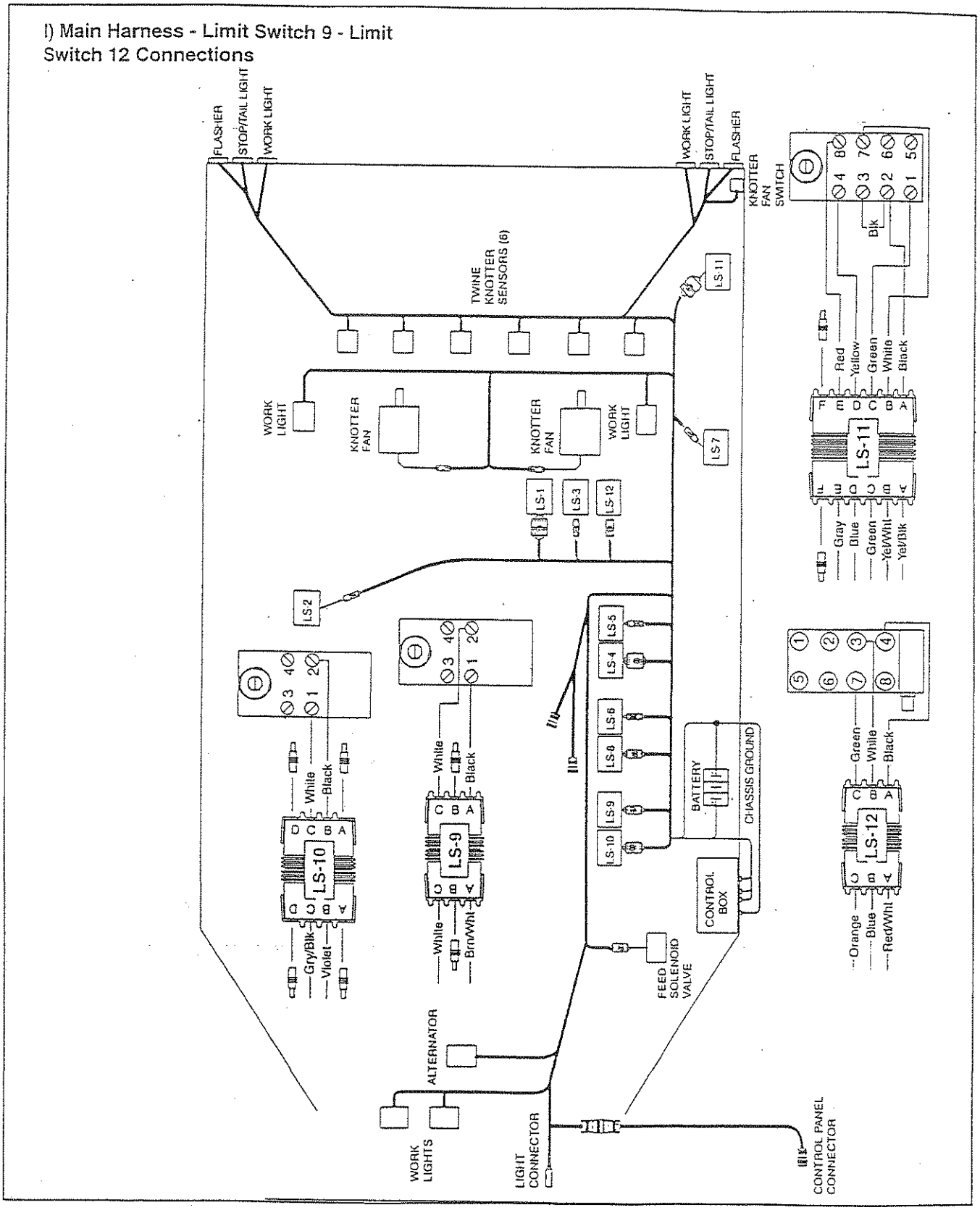
G) Main Harness - Limit Switch 1 - Limit Switch 4 Connections



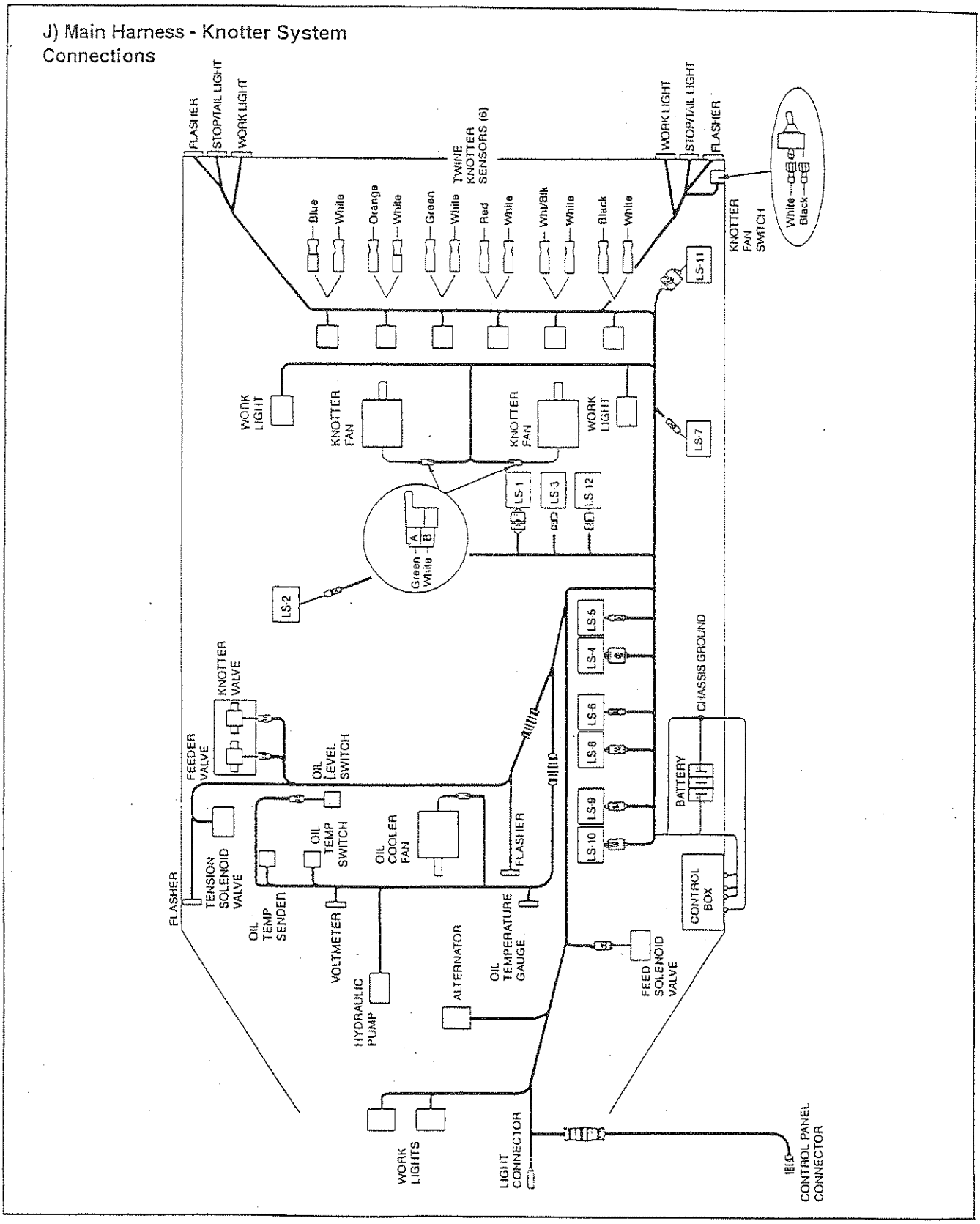
H) Main Harness - Limit Switch 5- Limit Switch 8 Connections



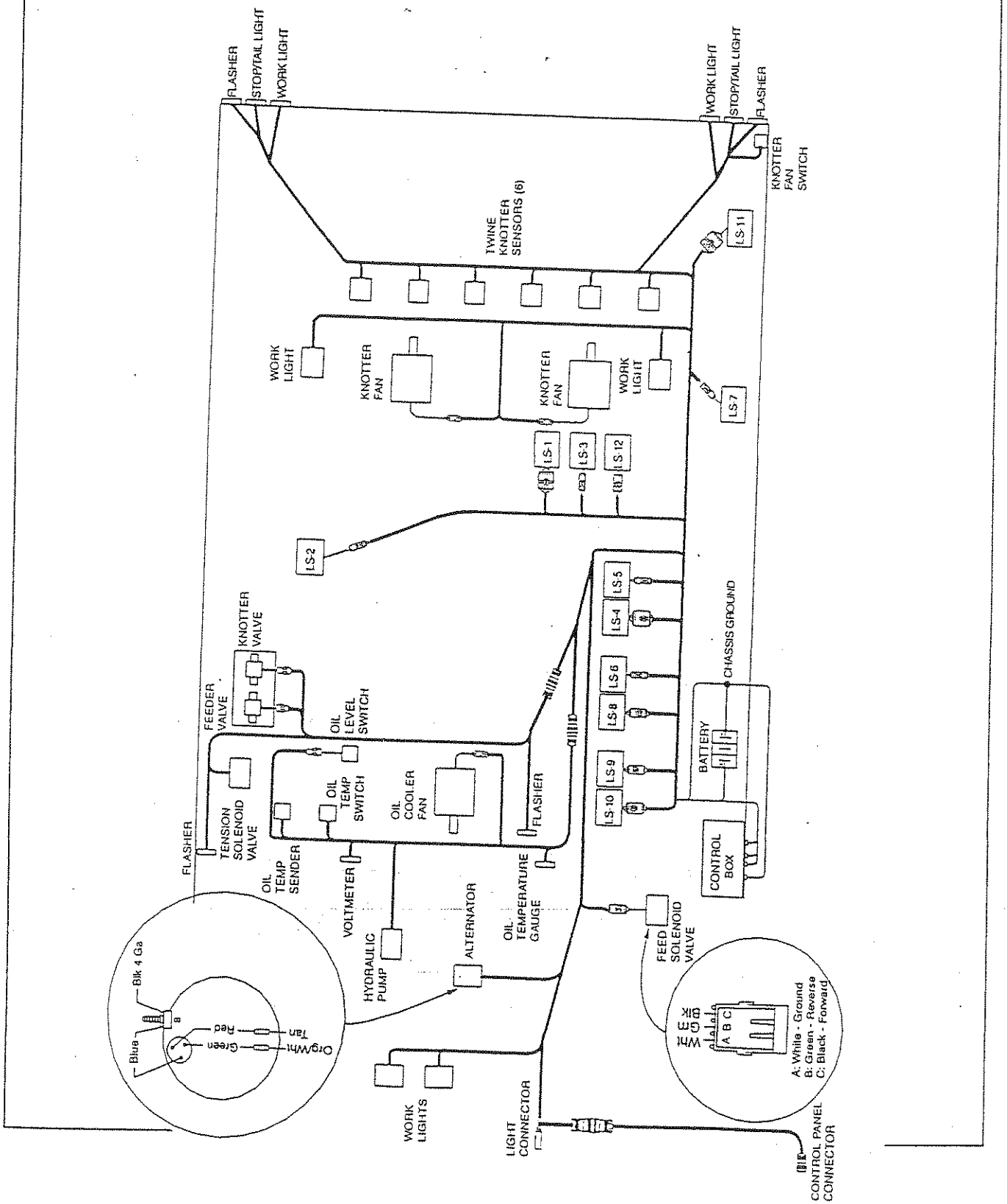
I) Main Harness - Limit Switch 9 - Limit Switch 12 Connections



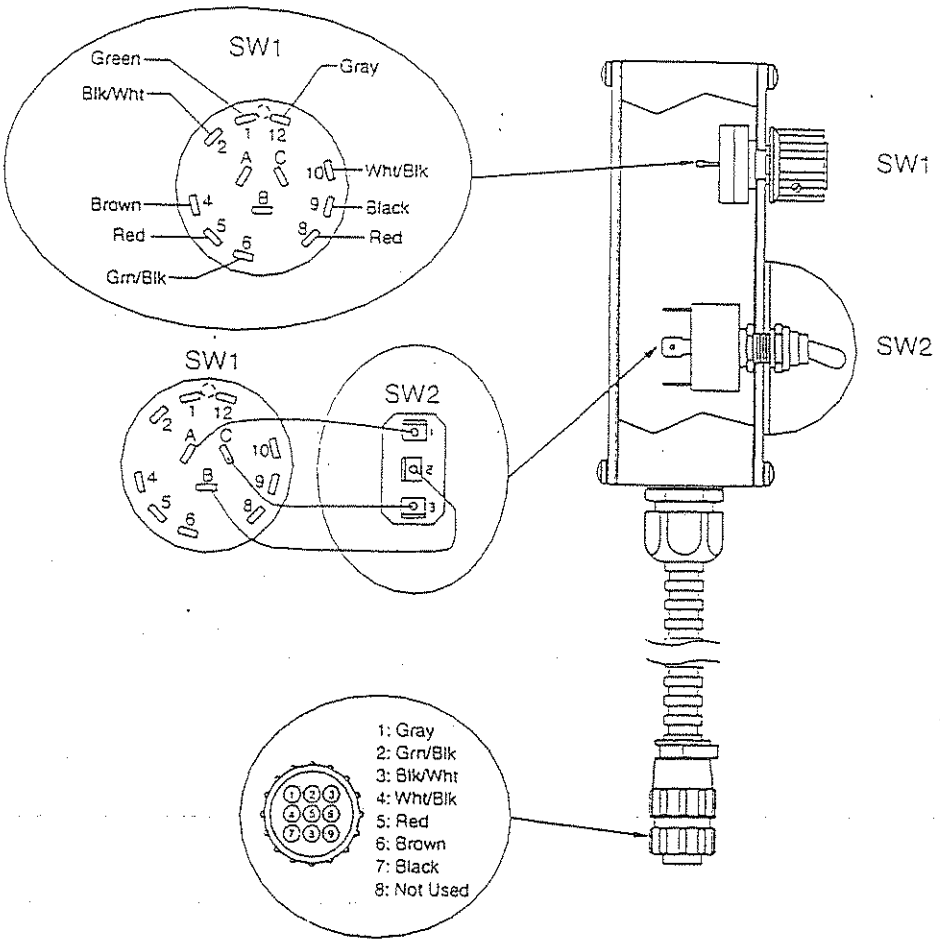
J) Main Harness - Knotter System Connections



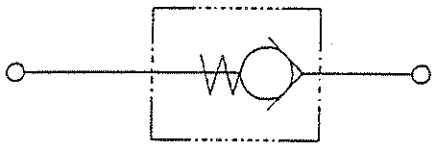
K) Main Harness - Alternator and Feed Solenoid Valve Connections.



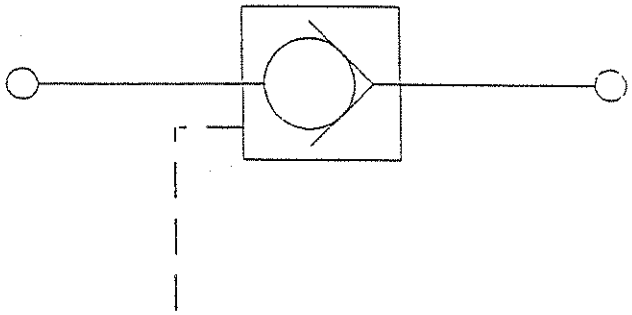
L) Diagnostic Controller Connections



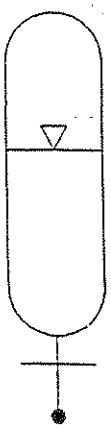
APPENDIX C – DESCRIPTIONS OF HYDRAULIC COMPONENTS



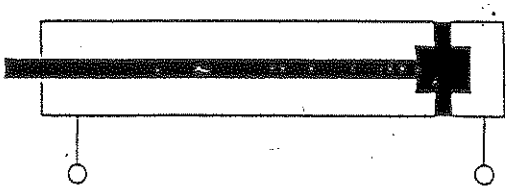
CHECK VALVE
Shown closed, oil is able to pass through the check valve as it overcomes the spring pressure and opens the valve. In this view, oil would be able to flow down, and would not flow up. Spring pressure can vary. Generally the spring pressure is 5 psi unless other wise noted.



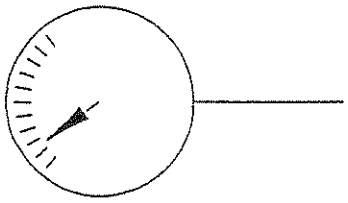
PILOTED CLOSED CHECK VALVE
In this check valve pilot pressure from some external source is holding the valve closed. In order for the valve to open, it must overcome the pilot pressure holding the valve closed.



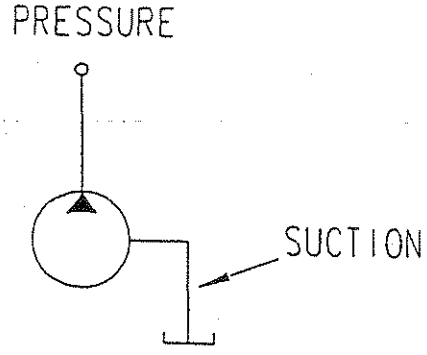
ACCUMULATOR
A container which stores hydraulic oil under pressure as a source of hydraulic power, or a pressurized reservoir that will quickly fill any voids in a system. The inverted triangle in the upper half indicates gas pressure.



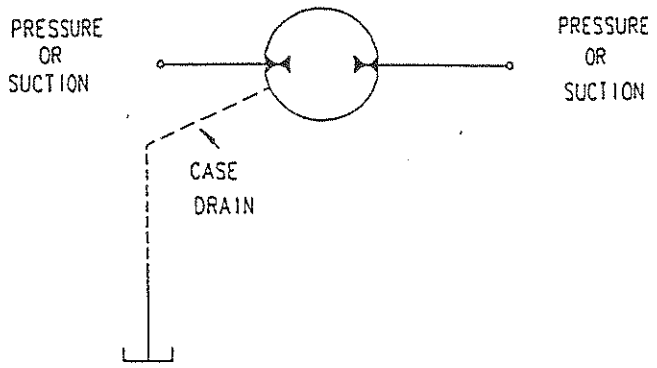
HYDRAULIC CYLINDER
Double acting shown in it's retracted position. The butt end port is on the right and rod end port is on the left. A single acting cylinder would have only one port.



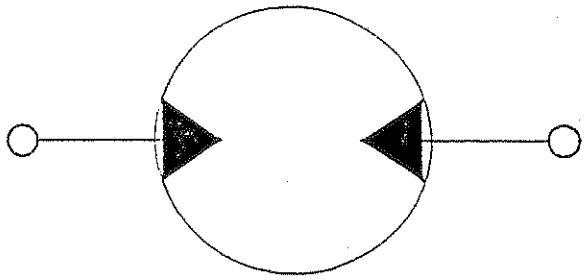
HYDRAULIC GAUGE
Most gages read from left to right, clockwise, with 0 pressure at approximately the 7 o'clock position.



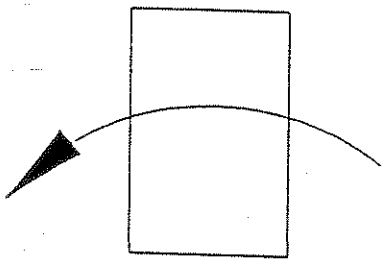
HYDRAULIC PUMP
This would be a fairly simple pump. Either tension system or a charge pump. The triangle pointing out indicates a pump.



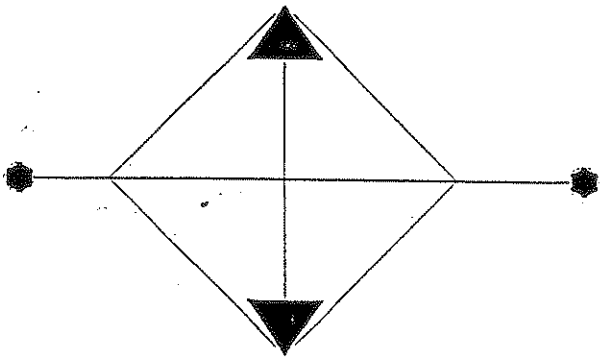
HYDROSTATIC PUMP
The triangles pointing towards each other represent that the pump could, and does opeate as a hydraulic motor at times. This is a bi-directional variable displacement pump.



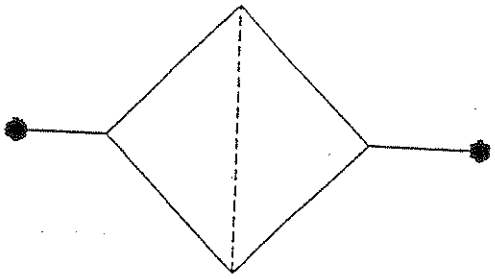
HYDRAULIC MOTOR
Different from a pump symbol by showing arrows pointing inward. Two arrows mean that this motor can operate in forward or reverse.



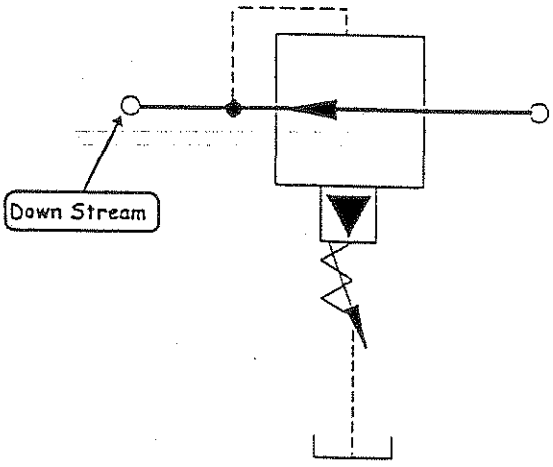
MECHANICAL ROTATION
This symbol represents mechanical rotation (usually a shaft). It is used to show mechanical input to a pump, or mechanical output by a motor. The arrow shows shaft rotation as viewed from the shaft end.HYDRAULIC TANK
Also called the reservoir. Generally has 0 pressure, but may have a breather that maintains 10 psi to the system.



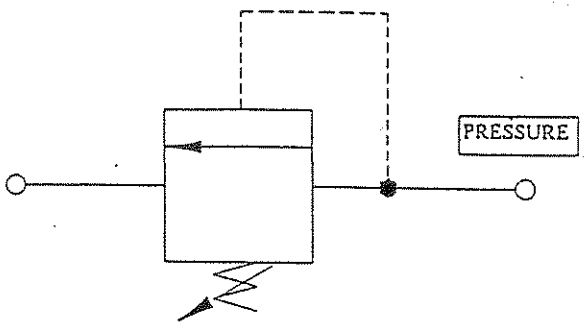
OIL COOLER
The cooler, or heat exchanger, uses air flow to cool the oil. The arrows pointing outward indicate the direction of heat dissipation.



FILTER
This symbol stands for either a filter or a strainer. A filter usually is placed downstream of a pump or motor and will collect much smaller particles than a screen.

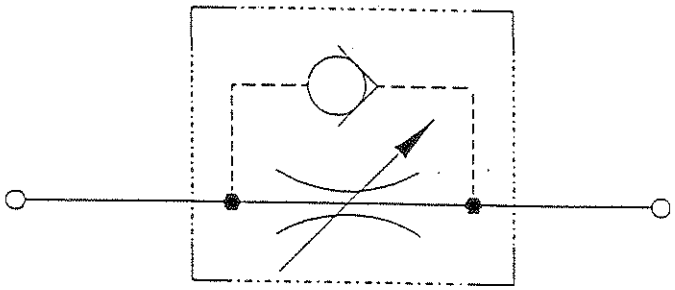


PRESSURE REDUCING VALVE
This valve is used to control the downstream pressure from exceeding the pressure setting of the valve. As shown, the valve is open and the downstream pressure is below the valve setting.



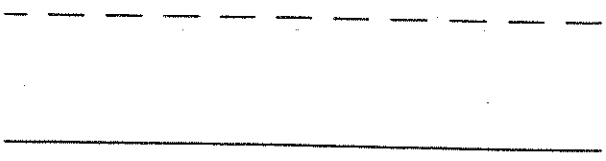
RELIEF VALVE

Shown in the non-operated, closed, position. The hydraulic system pressure has not reached the relief valve setting. If it does, the valve will open and the excess pressure is diverted to the tank, or low pressure side of the system. Heat is also generated as oil flows past a relief valve.



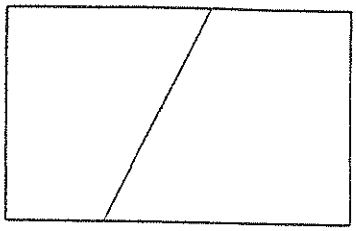
ADJUSTABLE FLOW CONTROL VALVE

This valve would only control or limit the flow in one direction on account of the check valve. Adjustment is depicted by the arrow going through the orifice at an angle.

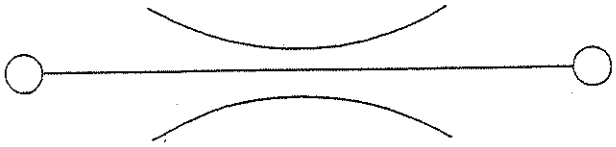


LINES

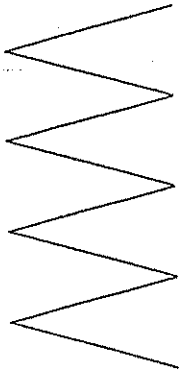
A dashed line represents a pilot or drain line. The solid line is the working line, either suction or pressure.



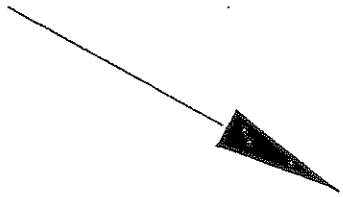
ELECTRIC SOLENOID
This symbol is for a single wound electric solenoid.



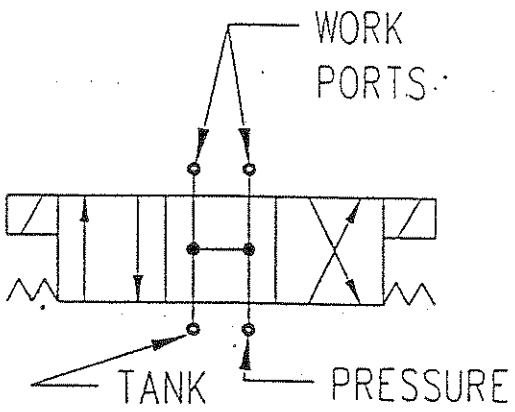
ORIFICE
A restricted passage in the circuit. This one is non-adjustable. Usually used to limit flow or create a pressure differential.



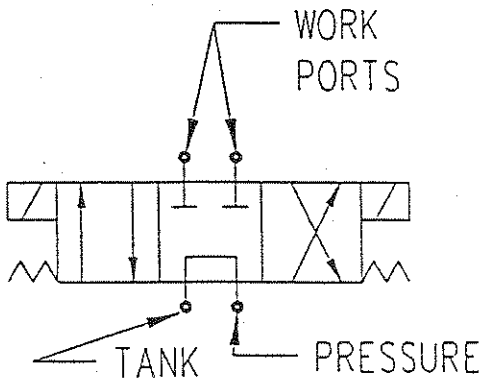
SPRING
Generally, springs are used to hold, or help hold, valves open or closed.



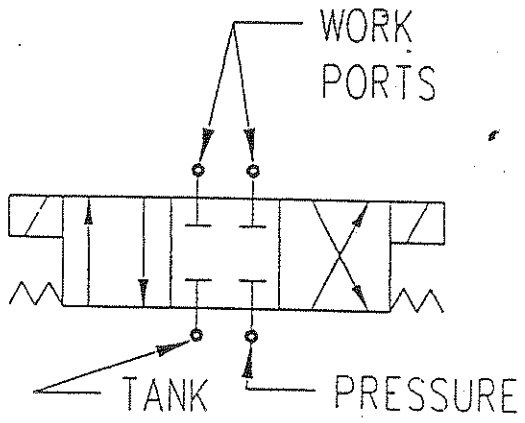
ARROW
An arrow running through an orifice, valve, spring, or pump means that it is adjustable or variable.



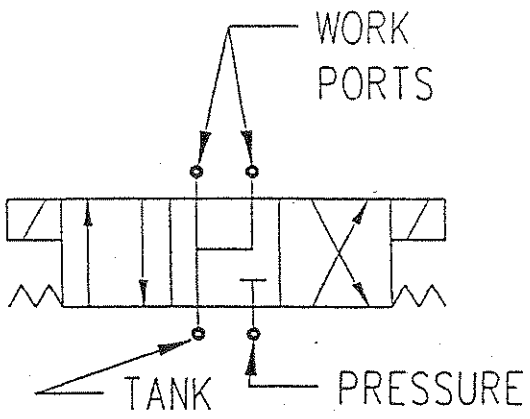
OPEN CENTERED SOLENOID VALVE



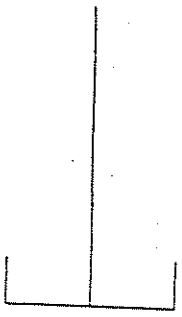
TANDEM CENTER SOLENOID VALVE



CLOSED CENTER SOLENOID VALVE



FLOAT CENTERED SOLENOID VALVE



TANK
This symbol stands for the tank, or reservoir.

APPENDIX D – TERMINAL LOCATION CHART FOR CONTROL PANEL