



**GALLAND  
HENNING**  
High Density Baling Solutions

# Operations Manual

Model - 16DC

**GALLAND HENNING NOPAK, INC.  
OPERATION & MAINTENANCE MANUAL**

FOR

SERIES DC & DCS BALING PRESSES

MODEL 16DC BALING PRESS

PREPARED FOR:

**BAGPAK Polska Sp. z o. o**

03-285 Warszawa, ul. Kondratowicza 18/183

Zakład w Stalowej Woli:

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CUSTOMER P.O. NUMBER: BP2014-GH01

GH SERIAL NUMBER H-2026

CONTRACT NO. 1470116

MANUFACTURED BY GALLAND HENNING NOPAK, INC  
1025 SOUTH 40TH STREET  
WEST MILWAUKEE, WI 53215 USA  
16DC BALER s/n H-2026  
400V~ / 50HZ / 3~ / 43 FLA~  
LARGEST MOTOR 25HP / 34 FLA~  
DOCUMENT NUMBER D-19549.E16  
YEAR OF CONSTRUCTION: 2014

IT IS THE RESPONSIBILITY OF THE INSTALLER OF THIS EQUIPMENT TO PROVIDE SUITABLE SUPPLY WIRING. CONSULT THE MANUFACTURERS IDENTIFICATION LABEL ON THE MACHINE TO DETERMINE VOLTAGE AND AMPERAGE REQUIREMENTS WHEN DETERMINING THE WIRING SIZE (mm<sup>2</sup>).

- The supply wiring must be approved for use in the country in which this equipment is installed or bear the <HAR> mark.
- A separate bi-color ground wire that is green in color with a yellow stripe must be run in the hard-pipe conduit along with the supply wiring.
- The conduit must be grounded in accordance with the National wiring rules and regulations of the country where installed.
- The fittings installed where the service wiring enters the body of the panel must not reduce the panel Ingress Protection rating.

## SUBJECT: WARNING LABELS

The following warning labels have been affixed to this baler and the definitions given below:



ELECTRICAL HAZARD: VOLTAGES EXCEED 30V- OR 60V DC



DANGER - CRUSH HAZARD FROM ABOVE



READ MANUAL BEFORE OPERATING MACHINERY



LOCKOUT IN DE-ENERGIZED STATE BEFORE SERVICING



WEAR HEARING PROTECTION



LIFT POINT

SUBJECT: WARNING LABELS (cont.)



SLIP HAZARD



DO NOT OPERATE WITHOUT GUARDS IN PLACE



CRUSH HAZARD FROM RIGHT



CRUSH HAZARD FROM BOTH SIDES

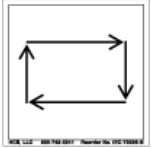


CRUSH HAZARD FROM ABOVE



REPLACE FUSE WITH ONE OF PROPER RATING

SUBJECT: WARNING LABELS (cont.)



AUTOMATIC CYCLE



CYCLE START



MASTER RESET



EMERGENCY STOP



POWER ON



GROUND



PHYSICAL EARTH

**DANGER**

***DO NOT REMOVE, COVER OR OBLITERATE THESE LABELS. FAILURE TO COMPLY WITH THESE WARNINGS CAN LEAD TO SERIOUS INJURY OR DEATH.***

# ***SECTION I - INTRODUCTION***

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## PREFACE

This manual kit consists of five (5) sections of text - each having its own table of contents; as well as a group of blueprints (See Drawing List), vendor bulletins and a copy of the logic program printout.

These sections are:

I - Introduction, which contains a description of text format and use, numerous data tables, and illustrations for which there are coded references through out the text.

II - Operation, which contains operating instructions and process descriptions.

III - Machine Systems, which contains independent descriptions of machine components and their functions.

IV - Maintenance, which provides general procedures for servicing, trouble shooting, and repairing.

V - Parts, which provides parts list, parts identifications, parts ordering, and recommended spare parts.

VI - Logic Program, which is a print out of the computer program used to operate the machine.

VII - Vendor Bulletins, which are a collection of O.E.M. bulletins providing in-depth parts and service date on original equipment hardware.

VIII - Drawings, which are blueprints used in locating various sections of the machine for service, repair and trouble shooting.



## HOW TO USE THIS MANUAL

DECALS - Are identified and tabulated on the CONTROL DATA TABLE. Use them to identify parts. See the DECAL CHART for a pictorial view.

CODES - Such as 22-DL refer to details which are tabulated.  
Example:

22 - DL	
	_____See Drawing List Table
_____	Line #22

On line 22 of the DRAWING LIST TABLE you will find the title and number of a drawing which applies to your machine.

OTHER NOTIFICATIONS - Call your attention to details which must be observed where applicable:

- NOTES . . . . . Modify or supplement preceding descriptions.
- WARNINGS . . . Alert you to harmful procedures you must avoid.
- CAUTIONS . . . Urge you to consider the consequences before acting.
- DANGER . . . . Personnel are extremely vulnerable to physical harm or death.

REFERENCES - At the beginning of the hydraulics chapter and of the electrical chapter (both in Section III) are references to manual supplements pertaining to those subjects.

## INSTALLATION BLUEPRINTS\* (LIST)

HYDRAULIC DIAGRAM	D 19569Y16 (25-DL)
ELECTRICAL DIAGRAM	D 19549E16 (12-DL)
PRESS PARTS	D 11793J16 (31-DL)
PNEUMATIC DIAGRAM	B- 15685Y12 (26-DL)
PUMPING UNIT ASSEMBLY	D 19332J12 (34-DL)
SIDE HOPPER ASSEMBLY	D- 183DC16
SAFETY GUARD ASSEMBLY	D- 19551J16 (36-DL)
BULK HOPPER ASSEMBLY	N/A
WEIGH HOPPER ASSEMBLY	D- 18849J16

\*These as well as additional blueprints are supplied with the service manual kit.

## OIL RECOMMENDATIONS

Galland Henning uses the following brands of anti wear hydraulic oil to test the baler. The general specification is ISO 11158 Type HM. These brands of hydraulic oil meet all manufacturers' specifications. We recommend using these brands or their equivalent. Follow manufacturer's instructions for safe handling of oil. To eliminate the potential for a slip hazard all spills must be cleaned up immediately.

SUPPLIER	BRAND
Benzoil	Petrolube 32
Mobile	DTE 25
Conoco Phillips	Megaflow AW 32

OIL TANK CAPACITY - See baler specification sheet.

## ABBREVIATIONS 16-DC

The following is a list of abbreviations used throughout this manual and related drawings.

1AF	#1 RAM (1st Compression Cylinder) ALMOST FORWARD
1F	#1 RAM (1st Compression Cylinder) FORWARD
1R	#1 RAM (1st Compression Cylinder) RETRACTED
2R	#2 RAM (2nd Compression Cylinder) RETRACTED
AVE	AVERAGE
BM	BALE MADE
CCW	COUNTERCLOCKWISE
CD	CONTROL DATA (TABLE)
COMP	COMPRESSION
CR	CONTROL RELAY
CS	CYCLE START
CW	CLOCKWISE
CYL	CYLINDER
D	DIVERTER
DC	DUAL COMPRESSION
DECOMP	DECOMPRESSION
DL	DRAWING LIST (TABLE)
DP	DIVERTER POSITION
EJ	EJECT
GC	GATE CLOSED
GO	GATE OPEN
GPM or gpm	GALLONS PER MINUTE
WHD	HOPPER DOWN
HDC	BULK HOPPER DOOR CLOSED
WHU	HOPPER UP
LS	LIMIT SWITCH
MAN	MANUAL
P	PUMP
PC	PROGRAMMABLE CONTROLLER
PS	PRESSURE SWITCH
PSI or psi	POUNDS PER SQUARE INCH
R	REVERSE
RPM	REVOLUTIONS PER MINUTE
RV	RELIEF VALVE
SOL	SOLENOID
TCR	CONTROL RELAY (TIMED)
V	VALVE
VB	VENDOR BULLETIN TABLE
WS	WEIGH SCALE

NOTE: two or more abbreviations are frequently used in conjunction to form a decal.

EXAMPLE: LS1F = LIMIT SWITCH #1 RAM FORWARD



DESCRIPTION: CUSTOMER'S DRAWING LIST  
CUSTOMER: BAGPAK Polska

MODEL: 16DC  
SERIAL: H-2026

CODE	DESCRIPTION	DRAWING NO.
1-DL		
2-DL		
3-DL	CONTROL LOGIC PROGRAM	LP - 251
4-DL		
5-DL	COVER CYLINDER	D-12119.X36
6-DL		
7-DL		
8-DL		
9-DL	COVER LIMIT SWITCHES	C-174-DC16
10-DL		
11-DL		
12-DL	ELECTRICAL DIAGRAM	D-19549E16
13-DL		
14-DL		
15-DL	FIRST (1st) COMPRESSION CYLINDER	C-5171SK
16-DL	FIRST (1st) COMPRESSION LIMIT SWITCHES	B-173-DC16
17-DL	FOUNDATION	C-195-DC16
18-DL		
19-DL	GATE SAFETY GUARD	C-12023.J10
20-DL	GATE CYLINDER	C-11764.X34
21-DL	GATE LIMIT SWITCHES	D-172-DC16
22-DL	GENERAL ARRANGEMENT	D-11792.J16
23-DL		
24-DL		
25-DL	HYDRAULIC SCHEMATIC	D-19569Y16
26-DL	PNEUMATIC DIAGRAM	B-15685Y12
27-DL		
28-DL		
29-DL		
30-DL	OPERATOR'S CONSOLE	SEE 12 DL
31-DL	PRESS PARTS LIST	D-11793.J16
32-DL		
33-DL	PUMPING UNIT LAYOUT	D-18850.J16
34-DL		
35-DL	PRESS PLUMBING	D-18867.J16
36-DL	SAFETY GUARD ASSEMBLY	D-19551J16
37-DL		
38-DL	SECOND (2ND) COMPRESSION CYLINDER	B-5172-SK-A
39-DL	SECOND (2ND) COMPRESSION LIMIT SWITCH	D-172-DC16
40-DL	SIDE HOPPER LIMIT SWITCH ASSEMBLY	N/A
41-DL	SOLENOID IDENTIFICATION / LOCATION	SEE 12 DL
42-DL		
43-DL		
44-DL		
45-DL		
46-DL		
47-DL		

# ***SECTION II - OPERATION***

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## **OPERATOR ORIENTATION**

ORIENTATION: Use the General Arrangement drawing to gain visual recognition of the following principal working parts:

- GATE
- #1 CYLINDER
- #2 CYLINDER
- BULK FEED HOPPER\*
- SIDE HOPPER\*

To find more detail on these components, refer to the drawing list in Section I.

APPLICATION: This baler has been designed to perform a specific baling process, i.e. baling skeletons, trim, cups and can bodies. Baling of any other materials will be considered a non standard application. The proper order of the process begins with measuring and loading (see Bulk Hopper or Side Hopper) and is followed by compressing and ejecting (see Automatic Sequence Outline).

NOTE: Some equipment described in the following sections is optional and may not be part of your system.

## **DISCLAIMERS**

Nonconforming Use: Galland Henning shall not be responsible for any damage which may occur as a result of noncompliance with all safety precautions or non standard applications.

Alterations to baler: Galland Henning shall not be responsible for any damage which may occur as a result of modifications (regardless of their nature) which have been made to the baler without written authorization from our factory.

## **PROCEDURES/SAFETY PRECAUTIONS**

INITIAL START UP: Before the initial start up is performed, the user is advised to first, verify "start up readiness" by completing the "pre start up check list" and then becoming thoroughly acquainted with this manual and the accompanying drawings. Particular attention should be paid to the following articles of this manual:

- Safety Precautions
- Hydraulic System Starting Procedures
- Manual Operation
- Automatic Operation
- Bulk Feed Hopper Operation\*
- Side Hopper Operation\*

## PROCEDURES/SAFETY PRECAUTIONS (cont.)

SAFETY PRECAUTIONS: Any and all personnel working with or performing service to this machine must observe the following safety procedures:

- This machine should be operated only by individuals who have been thoroughly instructed in its proper use.
- Work on or about the machine must never be done in a hasty or disorderly manner.
- When two or more personnel are working on or about the baler, each individual must be aware of the location and activity of all others present.
- Stay absolutely clear of all pinch, shear, and press points while power is on.
- Do not attempt to circumvent safety guards or safety interlocks.
- Hearing protection must be worn when working on or near this machine.
- Use a step ladder to access components that are out of reach. Do not climb on this machine.
- Immediately clean any oil that may have accumulated on the floor, failure to do so may create a slipping hazard.

In addition to the above precautions:

- ABSOLUTELY NO ONE should reach or climb into the baling chamber, either through the GUARD DOOR or the GATE while the pumping unit is operating.
- LOCK MAIN DISCONNECT IN "OFF" POSITION before performing work inside the baling chamber or on or about other pinch, press, and shear points or moving parts.
- PROVIDE POSITIVE SUPPORT for SIDE HOPPER\*(optional), and GATE if they are to be worked on or about while in the raised position.
- MAINTENANCE PERSONNEL AND ELECTRICIANS who are not familiar with normal baler operation should not attempt to trouble shoot problems unless an experienced operator is present.
- THINK FIRST Do not manually override directional valves, control relays, or switches without fully evaluating the consequences first.
- TAKE PRECAUTIONS to protect personnel and equipment when baler or baler components are being operated in a non routine manner.



## PROCEDURES/SAFETY PRECAUTIONS (cont.)

- TROUBLE SHOOTING OR TESTING should be performed only by individuals who are familiar with the systems that control the operation of this machine.
- LOCK AIR SUPPLY IN “OFF” POSITION before working on the pneumatic system, hopper door or hopper diverter gate.

\*Optional feature, may not apply if not furnished by Galland Henning Nopak.

## CONTROLS

MODE OPTIONS: This baler is designed for two modes of operation, Manual and Automatic. The Manual Mode is primarily for servicing and “readying” the baler for automatic use. The Auto Mode is the normal mode for baling. Automatic loading via the BULK HOPPER\* permits continuous cycling. Use of the side hopper\* will interrupt bulk hopper operation. Baler must be cycled to return to continuous operation.

MODE CONTROLS: All of the operator’s controls are located on the OPERATOR’S CONSOLE (See Console Guide). Some controls are operative only in “manual” while others are operative only in “auto”. The baler must be powered up before either set of mode controls is operative. Side hopper control is operative in either mode.

BALER POWER UP for operation in either mode is accomplished by satisfying the following conditions:

1. “EMERGENCY STOP” push buttons must be pulled “out” to engage control power. Control power and machine processing can be terminated at any time by depressing any of these buttons. Emergency Stop buttons are located on main control cabinet, operators console, and near the baler gate.
2. “HAND” “OFF” “AUTO” Keyed selector must be in the “HAND” position.
3. OPERATE “MASTER RESET” push button to engage and/or restore control circuit power.
4. Operate “MOTOR START” push button to start electric motor.

**NOTE:** Auto mode controls will be operative only if the mode selector switch is in the “AUTO” position and the initial starting conditions are satisfied. If auto operation is desired and the dataliner does not display the message “ENGAGE AUTO MODE”, proceed to Section II-6 “Baler not Ready”.

Monitor the position of each ram by observing the Dataliner.

CAUTION: The hydraulic pump is directly coupled to the electric motor. Whenever the motor is running the pumping units are active.

EVEN AT LOW PRESSURE THE HYDRAULIC CYLINDERS HAVE THE POTENTIAL TO DO GREAT BODILY HARM. OBSERVE ALL SAFETY PRECAUTIONS WHENEVER THE PUMP/ELECTRIC MOTOR IS IN OPERATION.

\* Optional feature, may not apply if not furnished by Galland Henning Nopak.

### **GENERAL OPERATING CONDITIONS**

OPERATING TEMPERATURE: This equipment will operate correctly in its intended ambient, at a minimum between 41°F (5°C) and 104°F (40°C).

RELATIVE HUMIDITY: This equipment will operate correctly within an environment at 50% RH, 104°F (40°C). Higher RH may be allowed at lower temperatures. Measures should be taken by the Purchaser to avoid the harmful effects of occasional condensation.

ALTITUDE: This equipment will operate correctly up to 3280 feet (1000m) above mean sea level.

TRANSPORTATION AND STORAGE: This equipment will withstand, or has been protected against, transportation and storage temperatures of -13°F (-25°C) and 131°F (55°C) and for short periods up to 158°F (70°C). It has been packaged to prevent damage from the effects of normal humidity, vibration and shock.

### **FORESEEABLE MISUSE**

**THIS EQUIPMENT IS NOT DESIGNED FOR COMPACTING CONTAINERS THAT CONTAIN FLAMMABLE, TOXIC, RADIOACTIVE OR BIOHAZARDOUS MATERIAL. EXAMPLES OF ITEMS THAT SHOULD NOT BE BALED IN THIS MACHINE INCLUDE (BUT NOT LIMITED TO) AEROSOL CANS, SOLVENT CANS, MEDICAL WASTE, MUNITIONS AND ELECTRICAL DEVICES.**

## MANUAL MODE

The MODE SELECTOR switch on the operator's console must be in the "HAND" position in order to operate the cylinders using the selector switches. The only exceptions are:

- The Bulk Feed Hopper Door\* (auto only)
- The Side Hopper\*

(See Bulk Feed Hopper or Side Hopper operations for details)

STARTING THE MOTOR The motor is started by the "MOTOR START" push button. Motor will stop/not start whenever the mode selector switch position is in "OFF" or when the "MOTOR STOP" or "EMERGENCY STOP" buttons are activated.

NOTE: Motor will stop / not start if GUARD DOOR is opened / not closed.

NOTE: Your console may contain additional features for the operation of auxiliary systems. Consult your Engineering Department for details.

MOTOR "ON" light (when "on") indicates the motor is running.

MANUALLY OPERATING THE CYLINDERS - Operate the desired cylinder(s) by turning the appropriate selector switch on the OPERATOR'S CONSOLE. For safety purposes, the action of each cylinder is restricted as follows:

- 1) #1 RAM...cannot advance unless the #2 RAM is fully retracted.
- 2) #2 RAM...cannot advance unless the GATE is fully closed or fully open.
- 3) GATE...cannot close unless the #2 RAM is fully retracted.
- 4) BULK FEED HOPPER DOOR\*...(No Manual Control) cannot open unless baler is in the auto mode and baler is "ready" and "cycled in auto".
- 5) SIDE HOPPER...cannot operate unless #1 and #2 RAMS are retracted, GATE is closed, and BULK FEED HOPPER\* is not dumping to baler.

WARNING: Pressing of material in the charging box by the #1 ram POSITIVELY MUST NOT be done unless gate is closed and the #2 RAM is fully retracted. Serious damage to the baler could result if this precaution is not adhered to.

\* Optional feature, may not apply if not furnished by Galland Henning Nopak.

## AUTOMATIC MODE

THE AUTOMATIC MODE When the baler is in the “AUTO” mode, all ram operating levers are inoperative with the exception of the BULK FEED HOPPER DOOR\* and the SIDE HOPPER\*, which can be operated in the “AUTO” mode under special circumstances. (See Bulk Feed Hopper and Side Hopper operation sections for details).

AUTOMATIC SEQUENCE OUTLINE (of bale making stages) Once the auto cycle is initiated, the baler will perform each of the bale making stages automatically in the following order:

- 1) 1st compression (#1 RAM advances to end of forward stroke). (If the #1 Almost Forward Limit Switch, LS1AF, is reached before PS3 is actuated #1 RAM may retract to allow more material to be dropped into the baler.)
- 2) 2nd compression (#2 RAM advances until PS1 is actuated).
- 3) Bale made (PS1 actuates when pressure reaches max.).
- 4) Decompression (#1 & #2 RAMS retract briefly).
- 5) GATE opens.
- 6) Bale eject (#2 RAM advances to end of forward stroke, PS2 is actuated).
- 7) Cylinders return home in the following order:
  - a. #2 RAMS retracts completely.
  - b. GATE closes.
  - c. #1 RAMS retracts completely.
- 8) Cycle ends when #1 RAMS is fully retracted. At this time the baler is said to be “READY” and “CYCLED IN AUTO”.

NOTE: See Complete Automatic Sequence for detailed description of each “stage” listed above.

If the baler is not equipped with a BULK HOPPER\* than each subsequent cycle must be initiated by the operator.

During the automatic operation, the normal function of the BULK FEED HOPPER\* is to automatically measure and dump (when full) one load of scrap (per baling cycle) into the baling chamber when the baler is “ready” and “cycled in auto” and to initiate a new automatic baling cycle. Thus, the baler and bulk hopper (together) will operate in tandem automatically and continuously. The 1st compression ram is set to make several gathering cycles before the 2nd compression ram is actuated. Consult Galland Henning Nopak for further information.

To prevent the baling chamber from being over loaded and possibly jammed, the electrical controls are designed so that the BULK FEED HOPPER\* will not perform its normal function (see Hopper Operation for additional details) if the continuous automatic cycling of the machine is interrupted. For that reason, it is always necessary to begin the initial automatic cycle by pressing the “CYCLE START” button. After the baler has completed this initial “auto” cycle, the BULK FEED HOPPER\* will resume its normal function. The message “BULK FEED HOPPER WAITING FOR MATERIAL” will be displayed while the hopper is collecting material and the baler is “READY” and “CYCLED IN AUTO”.

## **AUTOMATIC MODE (cont.)**

OPERATION IN AUTO MODE - To operate in auto turn the MODE SELECTOR switch to the “HAND” position, and start the pumps by pushing the “MOTOR START” button. Then turn the mode selector to the “AUTO” mode.

Note: Motor will not start if the GUARD DOOR is not closed.

START THE AUTO CYCLE by depressing the “CYCLE START” button.

WARNING: Do not operate baler unattended in auto mode before BULK HOPPER\* and 1st Comp. Recycle Counter is adjusted to produce desired bale size. See NORMAL BALES.

NOTE: Cycle will not start if baler is not “ready” & hopper\* door is closed.

BALER READY - The baler must be “ready” for the “CYCLE START” push button to be operative. If the message “PRESS CYCLE START” is not displayed, then the baler is not “ready”.

### **INITIAL STARTING CONDITIONS**

BALER NOT READY - If the baler is not ready, check the display on the OPERATOR’S CONSOLE to see which of the following initial conditions have not been met. The automatic cycle cannot be started unless all of these conditions are met:

- 1) #1 RAM “retracted”
- 2) #2 RAM “retracted”
- 3) GATE “closed”
- 4) SIDE HOPPER\* down and GUARD DOOR closed

NOTE: If abbreviations used are unfamiliar, see ABBREVIATIONS. If any of the initial conditions (1 thru 4) have not been met, turn the selector switch to the “HAND” position, restart pumps (if necessary), and bring rams to their proper starting positions, then repeat the initial steps for starting the auto cycle.

\* Optional feature, may not apply if not furnished by Galland Henning Nopak.

## COMPLETE AUTOMATIC SEQUENCE

CYCLE ON (STARTED) - The initial automatic cycle begins when the baler is “ready” and the “CYCLE START” button is depressed and held until the #1 Ram begins to advance.

1ST COMPRESSION STAGE - As soon as the “CYLCE START” button is depressed SOL 1RA is energized and the #1 Ram will advance. As the #1 Ram advances it will de actuate switch LS1RR and the message “#1 RAM ADVANCING” will be displayed. (If the pressure to advance #1 Ram is below approximately 800 psi (55 Bar), the counterbalance allows the #1 Ram to advance at high speed and reduced force. If the pressure raises above approximately 800 psi (55 Bar), the #1 Ram will advance at a slower speed but at full force.) The #1 Ram will continue to advance until it actuates switch LS1RF and SOL-1RA is de-energized, at which time the 1st compression stage ends. The “#1 RAM ADVANCING” message will stay on until #2 Ram starts advancing.

NOTE: If the baling chamber is loaded with too much scrap, the force required to compress the scrap will exceed the capability of the hydraulic system and the #1 RAM will not reach its forward position (limit switch LS1RF) and the baler will stall during the 1st compression stage. Displaying “#1 RAM STALLED”

DANGER: DO NOT ATTEMPT TO FORCE COMPLETION OF THE 1st COMPRESSION STAGE BY INCREASING THE HYDRAULIC PRESSURE LIMIT OR BY MANUALLY ACTUATING THE #1 RAM FORWARD LIMIT SWITCH “LS1RF”, AS EITHER OF THESE PRACTICES COULD RESULT IN SERIOUS DAMAGE TO THE BALER AS WELL AS CREATE POTENTIAL SAFETY HAZARDS.

NOTE: In order to obtain a larger size bale the automatic operation is provided with a counter that will cause the 1st compression ram to return to its starting position to gather more scrap before finishing the baling cycle. If the pressure on the #1 Ram is above approximately 800 psi (55 Bar) when the ram reaches the LS1RAF the cycle will be completed, the bale will be ejected, and the counter will be reset. The counter is accessible through the PLC program only.

2ND COMPRESSION STAGE - The 2nd compression stage begins when the 1st Compression Stage ends. At this time the #2 Ram will advance (SOL2F is energized). As the #2 Ram advances, it deactivates switch LS2R, and the message “#2 RAM ADVANCING” will be displayed. The #2 Ram will continue to advance until bale made pressure, 2400 psi (165 Bar), is reached, at which time the “BALE MADE” message is displayed. The #2 Ram stops advancing and the 2nd compression stage ends (#2 RAM position is variable).

BALE MADE - The “BALE MADE” message will be displayed upon completion of the 2nd compression stage (PS1 actuated). When the “BALE MADE” message is displayed, the baler has completed the bale making stages and is ready to begin the decompression stage.

NOTE: From the viewpoint of the control circuit logic; the bale is considered to be “made” only during the 2nd Compression Stage. If the box is overcharged and the baler is stalled in the 1st Compression Stage, the “BALE MADE” message would not be displayed even though a bale had been formed. The automatic baling sequence will be canceled and the oversized bale will have to be removed manually. (See Abnormal Bales - Oversized)

## COMPLETE AUTOMATIC SEQUENCE (cont.)

DECOMPRESSION - Decompression removes the load imposed on the working parts of the system during the compression stages of bale making. It begins the moment the bale is “made” and progresses in the following order:

- #1 AND #2 RAMS RETRACT BRIEFLY SOL 1RR and SOL 2RR are energized, then de energized for either a measure of time (#2 RAM) or distance (#1 RAM). This allows the rams to back away from the bale and relieves the forces exerted on the gate.
- At this time the decompression stage is completed and the GATE will open.

NOTE: Insufficient decompression will result in a “side load” on the Gate which prevents the opening of the gate.

GATE OPENS - The GATE opens (SOL GO is energized) when the decompression stage is finished. As the gate opens, it leaves limit switch LSGC and rises to its fully open position, actuating LSGO and de-energizing SOL GO. “BLAE IS EJECTING” message will display.

BALE EJECT STAGE This stage begins when the LSGO is actuated and “BALE EJECTING” message will be displayed. The #2 Ram advances (SOL 2RA is energized) to the end of its stroke, pushing the newly formed bale ahead of it through the open gate. Once the #2 Ram has reached the end of its forward stroke, hydraulic pressure will build rapidly in the blind end of the #2 cylinder. When “eject” pressure is reached it will actuate Pressure Switch PS2, 1000 psi (69 Bar), and SOL 2RA is de energized, “CYCLE ENDING” message will display. The Bale Eject Stage ends at this time and the #1 and #2 Rams “return home” to their initial starting positions.

CYLINDERS RETURN HOME - When the Eject Stage ends the rams will return to their initial starting positions in the following order:

- 1) The #2 Ram retracts (SOL 2RR is energized) until it actuates LS2RR.
- 2) The Gate closed (SOL GC is Energized) until it actuates LSGC.
- 3) The #1 Ram retracts (SOL 1RR is energized) until it actuates LS1RR.

NOTE: Under certain circumstances the newly formed bale may cling to the #2 Ramhead and be pulled back into the baling chamber as the #2 Ram retracts. SEE ABNORMAL BALES - STICKERS, Page II-11.

**DANGER: DO NOT ATTEMPT TO FREE THE BALE DURING THE AUTO CYCLE. FIRST TURN THE “MODE SELECTOR” SWITCH TO THE “HAND” POSITION, THEN REMOVE BALE. SEE SAFETY PRECAUTIONS.**

CYCLE ENDS - The auto cycle ends when the initial starting conditions are satisfied.

BALER READY (again) and CYCLED IN AUTO - All of the cylinders will be in their starting positions at this time.

DIVERT TO BALER - The automatic Bulk Hopper will “divert to baler” if not already in “BALER POSITION.

## COMPLETE AUTOMATIC SEQUENCE (cont.)

SUBSEQUENT CYCLES - Once a "CYCLED IN AUTO" condition is achieved the "AUTO START BALER ONLINE" push button is depressed and each subsequent cycle will be initiated automatically when the BULK HOPPER completes its normal function. The baler will continue to operate in this manner until it is stopped or the mode is changed by the operator.

NOTE: Subsequent cycles may be initiated manually at this time ("Baler Ready" and "Cycled in Auto") by depressing the "BALER CYCLE START" push button. The "AUTO START BALER ONLINE" pushbutton must be depressed after the cycle to have Bulk Hopper initiated cycles.

CAUTION: If the bulk hopper which is full when the automatic cycle ends, the hopper will immediately empty into the baler and start the next baler cycle.

NOTE: Operation of the side hopper (optional) will cancel the "Cycled in Auto" latch mentioned above. Subsequent baler cycles must be initiated by the operator.



## WEIGH HOPPER OPERATION

The BULK HOPPER \* (optional) is an electrically controlled and pneumatically operated gravity box. Its purpose is to accumulate and automatically unload a “fixed” quantity of scrap.

With the BULK HOPPER in operation, the quantity of Scrap is determined by a high level sensor switch LSHF that detects the level of scrap in the hopper.

HOPPER FULL - Once the hopper is full it will cycle in the following sequence:

- The HOPPER DOOR will open when solenoid (SOL WHO) is energized via LSHF (hopper full limit switch, photo eye).
- The hopper door will remain open approximately five (5) seconds after which time the solenoid hopper will de energize and the hopper door will close.
- The automatic press cycle will begin (with the #1 RAM extending) as soon as the hopper door is closed and LSHDC (hopper door closed limit switch) is actuated

OPEN HOPPER DOOR (via push button) only in auto mode when baler is “ready” and “cycled in auto” otherwise hopper will not dump to baler. Hopper door will close after a 4 to 10 second delay. Auto cycle will begin when hopper door has closed.

NOTE: An air supply of at least 80 psi (5.5 Bar) must be maintained at the bulk hopper manifold inlet to keep the bulk hopper door closed.

\* Optional feature, may not apply if not furnished by Galland Henning Nopak.

## SIDE HOPPER OPERATION

The SIDE HOPPER \* (optional) is manually operated by a double acting ram. It can be used when the baler is operating in either the manual mode or the auto mode provided the following conditions are met:

Baler is “ready”. See Baler Ready Baler Not Ready.

Guard is closed (LSSHGDC is actuated).

SIDE HOPPER UP - The side hopper will rise only while the side hopper selector switch is on provided the above conditions are met.

SIDE HOPPER DOWN - The side hopper can be lowered at any time (provided pumps are operating) by choosing hopper “down” on the selector switch. To stop descent, release the down selector.

SIDE HOPPER SPEED CONTROL - See VALVES, FLOW CONTROL

START CYCLE - To start the auto cycle after using the side hopper, depress the “CYCLE START” push button. Be sure that the PIVOT SCREEN is closed. If the pivot screen is not closed the auto cycle will not begin.

NOTE: The BULK HOPPER cannot “dump to baler” when the side hopper is in use nor until a subsequent auto cycle is completed. To avoid a possible “hopper jam up”. Only use side hopper when bulk hopper is not full.

DANGER: Be sure all personnel and equipment stand clear of the side hopper when it is in use.

\* Optional feature, may not apply if not furnished by Galland Henning Nopak.

## ALARM SYSTEM

MALFUNCTION ALERT - A horn located in the control panel and a beacon mounted to the control panel will alert personnel to system malfunctions. Whenever this horn sounds, inspect the operator's console to determine the cause.

- **“LOW OIL”** condition: If the level of the hydraulic oil drops below the lowest visible level on the sight gauge (mounted on the tank) the malfunction alert will activate and the “LOW OIL” message will be displayed and hydraulic pump/motor will be turned off.

- **“OIL HIGH TEMPERATURE”** condition: If the temperature of the oil exceeds 150°F (66°C), a malfunction alert will activate, the “OIL HIGH TEMP” message will be displayed, and the hydraulic pump/motor will be turned off. The motor cannot be started again until the oil has cooled to the reset point of the temperature switch.

ALARM SILENCE - The horn can be silenced immediately by pushing the “ALARM SILENCE” push button. The message indicating the cause of the alarm and the beacon will remain on until the mode selector switch is put into “HAND” mode. The alarm will sound again after approximately 2 minutes if not switched out of “AUTO” mode.

ALARM TESTING - To test the alarm put the machine into Maintenance Mode (see Maintenance Mode in the Controls section). Press the ALARM TEST key (F6). The red beacon light will illuminate and the audible alarm will sound to indicate that the alarm system is working properly.

## ABNORMAL BALES

The baler is capable of consistently producing bales of uniform dimensions and density provided that both the quantity and characteristics of each load of scrap is uniform. Irregularities in bale shapes usually occur in the form of a “fin”. Bales with large fins are called “chair” bales. Fins are most likely to form under the following conditions:

- TOO MUCH CLEARANCE between the 1st compression side of #2 Ram head face plate and the face of the #1 Ramhead. If this clearance cannot be reduced by repositioning limit switch LS1F then replace worn face plate(s). See Maintenance Liner Plates.
- TOO MUCH CLEARANCE (i.e. wear) between the remaining edges of #2 Ramhead face plate and adjacent liner plates. Replace worn parts as needed. See Maintenance - Liner Plates.

NOTE: Small fins may be unavoidable if scrap is very light gauge.

- STICKERS may cling to the #2 Ramhead as it retracts into the baling chamber after EJECT is complete, especially if the bales are small or light in weight and “finned”.

**DANGER: DO NOT ATTEMPT TO EXTRACT A “CLINGING” BALE WHILE THE AUTO CYCLE IS IN PROGRESS. INSTEAD, TURN THE “MODE SELECTOR” SWITCH TO THE “OFF” POSITION AND CONSULT THE SAFETY PRECAUTIONS. BE SURE TO OBSERVE ALL NECESSARY PRECAUTIONS BEFORE REACHING INTO THE BALING CHAMBER.**

- **OVERSIZED BALES ...** An oversize bale shall mean any bale that is large enough to cause the baler to stall. In the event an oversize bale is formed, it will be necessary to turn the mode selector switch to the “HAND” position, restart the pump, open the gate, and determine if the bale will fit through throat of the gate before attempting to push it out with the #2 Ram.

**WARNING:** Do not attempt to force an oversize bale through the throat of the gate. Serious damage to the baler could result. Oversized bales as such must be removed through the top of the baler by other means.

## **BALE DENSITY**

Bale density should not vary noticeably provided the scrap is uniform in characteristics and the maximum working pressure is properly maintained.  
See PRESSURE SWITCHES PS1

## **BALE SIZE - REGULATING**

Two of the bales three dimensions are fixed and are approximately equal to the height and width of the #2 Ramhead's face-plate. The fixed dimensions are determined by the confines of the baling chamber with the #1 Ram fully forward. The third (3rd) dimension (i.e. the length of the bale) is variable.

Under normal circumstances, the length of a bale will vary only if the weight/or characteristics of the loads vary (i.e. the more loads the bigger the bale.)

To regulate the size of a bale the number of bulk hopper dumps must be changed. This can only be done within the logic program.

OPTIMUM BALE SIZE must be determined by user, but in no case should a load be so large as to prevent full extension of the #1 Ram during the 1st Compression Stage.

### **Changing the number of 1st Compress Cylinder Cycles**

The baler is programmed to cycle the 1st Compression Cylinder several times before forming the bale. The number of these cycles can be changed from the operator's station without having to access the program in the PLC. The method for doing this is as follows.

1. With the baler's power on turn the key switch to the OFF position.
2. Go to the MAINTENANCE screen on the HMI.
3. Press and hold the "F8 ENTER COUNT" pushbutton for more than 5 seconds.
4. After releasing the button "MAINT." should appear in the mode display in upper right corner.
5. Press the "F3 CYCLES PER BALE" to the ADVANCE the count number. (Note: In this mode the display updates very slowly. It may take several seconds before the number changes.)
6. Each time the "F3 CYCLES PER BALE" button is pushed the count increases by 1 until it reaches 9 and then returns to 1.
7. Switching the key switch to the HAND or AUTO position will exit this mode.

# ***SECTION III - MACHINE SYSTEM***

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## HYDRAULIC PRINCIPLES & TERMINOLOGY

HYDRAULIC FORCE When a non compressible fluid, such as hydraulic oil, is forced into a closed space it exerts the same force on all surfaces it contacts. This force is called “pressure” and it is measured in pounds per square inch, abbreviated “psi”. In this manual, pressure is given in both psi and (Bar).

HYDRAULIC PRESSURE Will occur whenever there is resistance (also called the load) to the flow of the fluid. Pressure in a closed space into which a flow is continuously forced will increase continuously and without limit until the space expands or until the flow ceases or escapes.

HYDRAULIC ACTION Will cause the weakest surface to move first. The motion will occur when the total hydraulic force exceeds the resistance of the surface on which it acts. Total hydraulic force is usually measures in pounds or tons and it is the product of the pressure (psi) multiplied by the area (square inches) of the surface on which it acts.

HYDRAULIC COMPONENTS The hydraulic system consist of static and dynamic mechanical devices which have been designed to make use of hydraulic principles.

STATIC DEVICES have NO moving parts. They include hoses, pipes, fittings, manifolds, tanks etc.

DYNAMIC DEVICES have moving parts. There are three basic groups of dynamic devices. They are:

- 1) PUMPS which transform the power from the primary source, such as electric motor, to hydraulic force by generating an unyielding flow of hydraulic fluid.
- 2) VALVES which control the hydraulic action by determining the direction of the flow of the hydraulic fluid.
- 3) ACTUATORS such as cylinders, which convert hydraulic force into useful work by absorbing the flow of hydraulic fluid.

HYDRAULIC CIRCUITS are formed when these static and dynamic devices are coupled together to perform work. Separate tasks or operations require and are performed by separate circuits.

THE HYDRAULIC SYSTEM consists of many individual hydraulic circuits. Several individual circuits may share a single pump or flow path or other device provided it does not interfere with the function of any single circuit.

HYDRAULIC SYSTEM CONTROL The control of the system as a whole is accomplished by controlling the individual components. Some components are controlled by electrical signals while others are controlled by hydraulic pressure. For particular component control explanations see the appropriate component description on the following pages.

PRESSURE REGULATION Pressure is controlled by directing the flow of hydraulic fluid from regions of high resistance to regions of low resistance. If the flow is continuously forced into a space which can no longer expand, pressure will reach a dangerous level and components will fail. Therefore, system pressure limits must be established and maintained.

## HYDRAULIC PRINCIPLES & TERMINOLOGY (cont.)

**DANGER:** PRESSURIZED HYDRAULIC FLUID ESCAPING FROM THE SYSTEM CAN CAUSE BODILY HARM. DO NOT EXPOSE ANY BODILY PARTS TO JETTING OIL LEAKS.

**NOTE:** For a more detailed description of pressure regulation look under VALVES, UNLOADING RELIEF.

HYDRAULIC FLUID is of course necessary for the system to operate. The type of fluid and its cleanliness is critical to the performance and the life of the system. For more details see Oil Recommendations.

**NOTE:** Further descriptions of these components (identification, function, control and adjustments) are given on the following pages of this section.

## PNEUMATIC PRINCIPLES

Some baler options are operated by pneumatic (air) components. For all practical purposes the principles are similar to hydraulic principles except that air is compressible and generally not suitable for operation at pressures in excess of 250 psi (17 bar).

This pneumatic system is designed to run properly at a range of 80-120 psi (5.5 - 8.2 bar). The required air flow rate is 3 SCFM @ 120 psi (5.1m<sup>3</sup>/hour @ 8 bar).



## START UP PROCEDURES FOR HYDRAULIC SYSTEMS

**WARNING** To qualify for warranty eligibility, all start up, operating and maintenance procedures must be adhered to.

**DANGER: STARTING NEW AND UNFAMILIAR EQUIPMENT CAN PRESENT UNFORESEEN HAZARDS. Be sure to observe the SAFETY PROCEDURES as outlined in the OPERATION SECTION.**

The following steps should be taken whenever a new, repaired or previously idle hydraulic system is started.

1) Be sure that all exposed cylinder rods are free of rust and abrasions especially if machine has been idle for prolonged periods. Any rust or abrasion should be removed with emery cloth and oil and wiped clean.

2) Check the oil level of the reservoir. (For system capacity, See **BALER SPECIFICATIONS**.) Oil level should be within limits indicated on the sight gauge. Low oil levels will hinder heat dissipation and permit excessive condensation in the tank. Pump damage may also occur.

NOTE: For oil type and specification see **OIL RECOMMENDATIONS**

3) Check for proper direction of pump rotation.

If the direction of rotation is opposite of that which is desired, change motor wiring accordingly.

To determine the proper direction of rotation examine the pump cover housing (opposite the shaft end) and locate the "rotational" arrow. This arrow indicates the proper direction of rotation\* as seen from the viewer's position.

**\*IMPORTANT NOTE:** Pumps are normally specified having "right hand" (clockwise) rotation as viewed from the shaft end. However certain applications require "left hand" rotation: Such as when pumps are mounted at both ends of the "prime mover" (motor). Left hand pumps are identified by an "L" stamped on the model identification tag located on the pump cover housing.

4) Be sure the pump housing is filled with oil by discounting the drain line from the pump housing and filling with clean new oil. The pump should prime itself immediately if the following conditions exist:

A) Pump is rotating in the proper direction.

B) All pump inlet connections are absolutely air tight.

C) Oil level is adequate and is of the proper type and viscosity.

D) There is no load on pressure (outlet) port of pump when started. A pump should not be started against a load or a closed centered valve.

## START UP PROCEDURES FOR HYDRAULIC SYSTEMS (cont.)

If a pump does not prime, jog (start stop) it intermittently. It may be necessary to loosen a downstream (pressure side) fitting to purge trapped air.

WARNING: Do not run a pump which will not prime or is cavitating.

If the pump is noisy (producing a gurgling or crackling sound), air could be mixed with the oil. For possible cause and remedy see TROUBLE SHOOTING TIPS, NOISY PUMP in the MAINTENANCE section.

5) Set all relief valve pressure limit, RV1 2,600 psi (180 Bar).

NOTE: For detailed instructions on setting relief valves look under VALVES UNLOADING RELIEF in this section.

6) With machine in the manual mode (mode selector switch in the hand position) fully extend and retract all cylinders several times. This will fill the cylinders and piping with hydraulic oil.

NOTE: It may be necessary to adjust limit switch positions to achieve the desired travel of each cylinder. For limit switch positions see LIMIT SWITCHES in this section.

7) Set pressure switches as follows:

NOTE: For detailed instructions on setting pressure switches look under PRESSURE SWITCHES.

- PS1...BALE MADE...2,400 psi (165 Bar) maximum, or a lessor pressure to reduce bale density.
- PS2...BALE EJECTED...1,100 psi (75 Bar).
- PS3...RECYCLE PRESSURE...900 psi (62 Bar).
- PS4...#1 RAM FORWARD HOLD...1200 psi (83 Bar)

\*On new machines, these components are pre set prior to shipping. They should be inspected periodically to assure that proper limits are maintained. Replacements are not pre set and must be adjusted during installation.

## PUMP TERMINOLOGY

PUMP VOLUME: The output volume of a pump under working conditions will differ, disregarding efficiency factors, from the nominal rate (as specified by the O.E.M.) if the pump's actual speed differs from the nominal speed:

$$\text{Actual Rate} = \frac{(\text{nominal rate}) \times (\text{actual R.P.M.})}{(\text{nominal R.P.M})}$$

BALANCED: The term "balanced" characterizes the distribution of hydraulic forces at work on the revolving parts of the pump during operation. This "balance", which is achieved by design, permits high pressure operation while eliminating shaft and bearing side loads.

CAVITATION: A condition that occurs in a pump when inlet suction causes the oil to become gaseous. The sudden collapse of gaseous oil in the high pressure zone of the pump creates "implosive" shock waves that "pit" the pump's critical internal surfaces.

FIXED DISPLACEMENT: Refers to the displaced volume of a non-adjustable pump.

VARIABLE DISPLACEMENT: Refers to the displaced volume of an adjustable output pump.

LOAD(ED) & UNLOAD(ED) Refers to an operating pumps "output" (or work status) condition, and is governed by an unloading type valve located between the pumps outlet port and the first component(s) of the working system.

- "Loaded" If the pumps output is directed to the "system" for the purpose of performing work, it is said to be "loaded"

NOTE: This term applies even if no work is actually performed for example: The output may be "loaded" to a series of directional valves, which in turn direct the output back to the tank. Effective output pressure in this case is near zero.

NOTE: This condition is also true when the output is directed to the tank as a "relief condition", which occurs when a "loaded" pumps output encounters work resistance in excess of a safe limit. Effective output pressure in this case is equal to the maximum operating limit of the relief valves setting.

- "Unloaded" If the pumps output is directed to the tank (but not as a "relief" condition) instead of the system the pump is said to be "unloaded". Effective output pressure in this case is near zero.

NOMINAL RATE: Refers to the pump's rate of delivery at a specified R.P.M. as represented by the pump's manufacturer.

OUTPUT: The product of a working pump, often measured in G.P.M. (gallons per minute).

SHAFT END: The coupling or shaft end of a pump.

VANE PUMP: Refers to a pump which utilizes blades (vanes) to propel the hydraulic oil. The vanes are driven (rotationally) by the pump shaft and a radial slotted hub (rotor) which contains them. Each slot in the rotor is occupied by a vane and permits the tip of that vane to follow the contour of the eccentric inner surface of the stationary "cam ring". The shaft, rotator vane and cam ring assembly is sandwiched by a ported wear plate and a ported pressure plate.

## PUMP TERMINOLOGY (cont.)

In the simplest sense a vane type pump operates like a motor driven non stop revolving door which pulls in the flow on one side (“low” or “inlet” pressure side) while pushing out the flow on the other side (“high” or “outlet” pressure side). The “pulling” and “pushing” of the pump is created as the revolving parts of the pump (vanes) sweep through regions of increasing and decreasing volume formed by the spinning rotor and the stationary cam ring and the ported plates which contain them.

PISTON PUMP: (Axial, variable displacement) This pump uses reciprocating pistons moving in a rotating block to draw in fluid at the inlet and push fluid out at the outlet. A variable swash plate mounted on a yoke allows the stroke of the pistons to be varied from zero stroke for a no flow condition, to its maximum stroke for full flow.

The pump is pressure compensated, which means that as the output pressure increased, the flow rate of the pump (piston stroke) is decreased automatically. By reducing the flow as the pressure is increased, less horsepower is required to drive the pump, so a smaller motor can be used on the system while still reaching the required pressure and supplying a high flow rate of low pressure.

## PUMP DATA

This equipment uses a “variable displacement” axial piston pump, referred to as P1.

ADJUSTMENTS: The piston pump, P1, has a horsepower limiter which is factory set, and a pressure compensator which limits the maximum system pressure.

CONTROL: Starting and stopping are performed by the operator using the “STOP” & “START” push buttons on the operator’s console.

OUTPUT CONTROL: Refer to this subheading under the description of the P1-pump.

P1 pump - Maximum operating pressure 3,000 psi (207 Bar). The pressure compensator should be set to 2500 psi (172 Bar), slightly higher than the pressure switch PS1 setting. The pump also has a maximum limit stop, which is left at full stroke.

FUNCTION: P1 provides full fluid power to all hydraulic actuators.

OUTPUT CONTROL: P1 is loaded whenever any of the cylinders are in motion.

SAFETY (PRESSURE) RELIEF: Over pressure protection for P1 is provided by RV1.

NOTE: For a description of Valve RV1 when and how it unloads P1 see VALVES, RELIEF.

## **VALVES**

(General Description)

Several different types of valves are used on this machine, each being designed and used for a particular application. The type of valve and its most common application is implied by the valve's common name (a "pressure relief" valve is used to relieve excessive pressure). With a little experience it is possible to visually recognize valve types by their external features as most valves of a similar type resemble each other in appearance. Recognition of valve types and knowledge of their typical applications are indispensable tools to those responsible for maintaining this equipment.

Although there are several different types of valves used on this machine, each valve is alike in the sense that it controls the direction and/or volume of flow using a "piston" or "spool." The "piston" or "spool" either opens and/or blocks passages between the valve's ports as it assumes different positions within the bore of the valve body.

Control of the piston (or spool) position (within the valve) results in controlling the direction, force, and in some cases the speed of the ram or other actuator which the valve is said to control.

There are several methods for controlling the position of a valve's piston (or spool), most of which are discussed briefly under VALVE CONTROL.

## VALVE CONTROL

Valve control can be accomplished by a mechanical, electrical or hydraulic actuating force which is commonly referred to as a “signal”. For the sake of simplicity, the valve’s piston (or spool) shall be referred to as the “valve element”.

SOLENOID OPERATED The valve element is shifted when an electromagnetic force (produced by an energized solenoid) acts on the valve element via an armature and pushrod device. The electric current is controlled by a pressure switch, limit switch, control relay, or a PLC. The solenoid method of actuation is used when only a small amount of force is needed to shift the valve. See MANUALLY SHIFTING A VALVE

PILOT OPERATED The valve element is shifted when a hydraulic force (or lack of it) acts on the valve element either directly or via a pilot piston. Pilot pressure is used when shifting the valve element requires more force than can be provided by the solenoid alone.

SOLENOID CONTROLLED PILOT OPERATED VALVES All pilot operated directional valves on this machine are two stage valves; a main stage and a pilot stage. The pilot stage is a small solenoid operated valve which supplies the pilot pressure necessary to shift the valve element of the main stage.

SOLENOID CONTROLLED RELIEF VALVES which “load” and “unload” the pumps are arranged in a similar fashion (a main relief stage and a pilot stage). Energizing the solenoid results in pressurizing the pilot section which enables the pump to be loaded. When the solenoid is de-energized the pilot section is vented to tank, unloading the main stage.

DIRECT ACTING Positioning of the valve element is determined by the amount of pressure within the valve body at either the outlet or inlet port, or by the differential pressure between them.

PILOT PRESSURE Internally or externally supplied pressure, controlled by the pilot section, used to shift the main valve element. Externally supplied pilot pressure is supplied to the valve through the “X” port shown on the hydraulic diagram. Similarly, an external pilot drain is shown as the “Y” port.

MANUALLY SHIFTING A VALVE All the solenoid operated valve on this machine can be manually overridden by locating the “plunger” in the appropriate end of the solenoid housing and depressing the plunger with a suitable tool.

**CAUTION: Don’t override a valve solenoid without first fully evaluating the consequences. Be sure to alert any personnel in the machine’s immediate vicinity.**

## BASIC VALVE TYPES

As mentioned earlier, each type of valve is designed for a particular application. However, valves can be identified as being one of the following basic types:

DIRECTIONAL CONTROL VALVES These valves start, stop and direct the flow. They control the loading and unloading of pumps (via solenoid controlled relief valve) and the extension and retraction of cylinders. A brief description of each directional valve on this machine can be found under VALVE DIRECTIONAL. Each solenoid controlled pilot operated directional valve is also designated (in these applications) by the solenoid(s) that operate it.

- CHECK VALVES are a type of directional valve which permit flow in one direction only.

- VENT VALVES The term “vent” characterizes an application of a directional valve which is used either to exhaust (vent) or block the port or chamber of yet another valve such as a relief valve. The “loading” and “unloading” of a pump is usually accomplished through the combined action of a vent valve and a relief valve.

PRESSURE CONTROL VALVES limit the pump and circuit pressures, and reduce pressure spikes. A brief description of each pressure control valve on this machine can be found under VALVE, UNLOADING RELIEF.



## VALVE TERMINOLOGY

The following terms apply specifically to valves used on this machine.

INFINITE POSITIONING This term characterizes a type of valve in which the piston (or spool) is free to assume any of an infinite number of possible positions (within the valve body) between fully open and fully closed. A typical application would be a pressure relief valve where the piston's position varies with the degree of relief required.

FINITE POSITIONS This term characterizes a valve in which the piston (or spool) can assume one of only a limited number of predetermined positions (usually two or three). The interconnected ports are either fully open or fully closed.

NEUTRAL (normal) POSITION This term refers to the position the piston (or spool) will assume when at rest or idle (not being acted upon by a control signal).

THREE POSITION (3 position) VALVE is a valve in which the piston (spool) can assume one of only three possible positions which would be as follows assuming the spool axis is oriented horizontally:

- 1) SHIFTED (energized) left
- 2) UNSHIFTED (neutral) position
- 3) SHIFTED (energized) right

TWO POSITION (2 position) VALVE is a valve in which the spool can assume one of only two possible positions. Either of which may be the normal or "unshifted" position.

FOUR WAY (4 way) VALVE is a type of directional valve which alternately pressurizes and exhausts two of its ports simultaneously ( while one port serves as an inlet for pressurized flow the other port serves as an outlet for discharge flow and vice versa).

THREE WAY (3 way) VALVE is a type of directional valve which alternately pressurizes and exhausts a single port.

OPEN CENTER CROSSOVER This term refers to a type of directional control valve in which pressure in the working lines is relieved while the spool assumes its neutral position.

CLOSED CENTER CROSSOVER This term refers to a type of directional control valve in which pressure in the working lines is captured while the spool assumes (and remains in) its neutral position. A ram controlled by a valve of this type will resist being "forced" from its desired position as the valve shifts. This is a feature of the #1 Ram directional valve on 16-DC balers. Its use eliminates the need for a pilot operated check valve at the cylinder's blind end without which the #1 Ram would slip from its fully forward position during the 2nd compression stage of bale making.

MAIN STAGE See "Solenoid Controlled Pilot Operated Valves" under VALVE CONTROL.

PILOT STAGE See "Solenoid Controlled Pilot Operated Valves" under VALVE CONTROL.

## VALVE TERMINOLOGY (cont.)

BALANCED PISTON This term characterizes a type of relief valve in which the valve's main piston divides the valve bore into two distinct chambers; an upper or "control" chamber and a lower or "load" chamber. During operation the hydraulic force acting on the "control" side of the piston equals or "balances" the force acting on the "load" side until a pre set pressure limit is reached. When this limit is reached and/or exceeded the control chamber is ventilated (i.e. pressure is relieved) and the resulting imbalance causes the piston to "shift" (leave its normal position).

## VALVES - RELIEF

This is a direct acting valve that limits the maximum operating pressure in the system. When the system pressure reaches the relief valve setting, the valve's piston shifts to allow excess pump output to be vented directly to the tank line.

NOTE: This system uses a pressure compensated variable displacement pump which reduces its own output as the pressure reaches the compensator's setting. The relief valve is a backup for the pressure compensator on the pump and should only open momentarily to relieve any pressure spike in the system. The relief valve setting should be approximately 200 psi above the compensator's setting.

SETTING: Place keyed selector switch in the "HAND" mode and start pump:

- 1) Loosen adjusting screw locking nut on RV1 and turn the adjust screw in several turns.
- 2) Loosen the adjusting screw locking nut on the pump compensator screw\*\*.
- 3) Advance the #2 cylinder forward against the gate and hold.
- 4) Turn pump maximum pressure adjusting screw in until the system pressure is approximately 50 psi (3.4 Bar) above the desired relief valve setting.
- 5) Turn adjusting screw on RV1 until the desired setting is reached, not exceeding 2600 psi (180 Bar) and tighten locknut.

CAUTION: Do not run pump in this mode for a long period of time because it will over load the motor.

- 6) Adjust maximum pressure adjusting screw setting down to its operating setting, 2400 psi (165 Bar) max and tighten locknut.
- 7) Retract the #2 cylinder.

The diverter valve acts to both block and flow of oil to tank and as a reduced pressure relief valve for the gate, the cover lock (when used) and the side hopper (optional) circuits.

SETTING: Place keyed selector switch in the "HAND" made, start pump:

- 1) Loosen adjusting screw locknut on the diverter valve.
- 2) Manually shift the solenoid on the diverter valve and hold.
- 3) Adjust the pressure to 1200 psi (83 Bar) using the adjusting screw, and tighten locknut.
- 4) Release the solenoid on the diverter valve.

\*To manually "override" a solenoid operated valve: Locate the "plunger" in the appropriate end of the solenoid housing and depress it with a suitable tool.

\*\*The hex head bolt (on the manifold side of the pump) is the compensator screw and adjusts the maximum pressure of the pump; the long threaded rod on the opposite side of the compensator is the maximum volume stop.

## PRESSURE SWITCHES

The purpose of a pressure switch is to translate a hydraulic signal into an electrical signal. This is achieved by the interaction of a small hydraulic actuator directly with an electrical switch. The (slight) motion of the actuator (which results in an “open” or “closed” electrical element) occurs only when pressure rises above (or falls below) the selected “operating point”.

PS-1... BALE MADE: Operating point - 2,400 psi (165 bar)/ Reset point 2200 psi (150 bar).

FUNCTION: To signal that a bale has been made, which halts #2 cylinder’s forward movement.

PS-2...BALE EJECT: Operating point 1100 psi (75 bar)/ Reset point 950 psi (65 bar).

FUNCTION: To signal the baler that the bale has been ejected.

PS-3...RECYCLE #1 CYLINDER: Operating point 900 psi (62 bar)/ Reset point 800 psi (55 bar).

FUNCTION: To signal the baler the maximum amount of material is in the baling chamber and that it to finish the baling cycle.

PS-4...#1 RAM FORWARD HOLD: Operating point 1200 psi (83 Bar).

PRESSURE SWITCH: Typical.

CONTROL (method of actuation) Hydraulic fluid (piped from the pump discharge circuit to the switch) acts on a strain gage mechanism which signals the pressure switch. When the pressure reaches the set point, the switch signals the PLC that the set point has been reached. The set point is adjusted by push buttons on the front of the switch.

SETTING THE PRESSURE SWITCH:

- A. Pressing both push buttons simultaneously and for 10 seconds, locks or unlocks the set points for the switch.
- B. Pressing the “Mode / Enter” push button steps the switch through its different functions. When the desired parameter is reached, pressing the “Set” push button will display current setting of that parameter. If the switch is unlocked, this value can be changed by pressing and holding the “Set” push button for 5 seconds, the setting will flash and then start stepping through its range. Releasing and pressing the button now will allow you to manually step the switch through the range. When the desired setting is reached, pressing the “Mode/Enter” button sets the switch to the new setting and return the switch to the function display. When the maximum setting is reached it will start over, looping back to the lowest setting.
- C. When the switch is in the function mode, if no switches are pushed for 5 seconds, the switch will return to the operating mode.

## PRESSURE SWITCHES (cont.)

D. The switch functions are as follows:

SP1: switch #1 on set point

rP1: switch #1 off set point

dS1: delay of switch #1 on set point

OU1: output of switch #1 (see specification sheet)

dAP: rise time damping, typical (see specification sheet)

Repeat for switch #2; SP2, rP2, dS2, and OU2.

E. Pressure switch should be locked after set points have been adjusted, see step "A."

REPAIR-REPLACE (pressure switches) - For information on procedures refer to the Efactor bulletin. There are no user serviceable parts in the switch.

## LEVEL / TEMPERATURE SWITCH

The purpose of the level / temperature switch is to monitor the level and temperature of the oil in the hydraulic tank.

PS-1...LSOLS : OIL LEVEL LOW WARNING ... Set point - 2000 (20 in.)  
rP1...reset point - 1800 (18 in.)

FUNCTION: To signal that the oil level is getting low.

PS-2...LSOLL : OIL LEVEL LOW SHUTDOWN ... Set point 1000 (10 in)  
rP2...reset point - 920 (9.2 in)

FUNCTION: Shut down baler because of low oil.

PS-3...LSOE: OIL TEMPERATURE WARNING ... Set point - 135°F (57°C)  
rP3...reset point - 130°F (54°C)

FUNCTION: To signal that the baler's oil temperature is rising.

PS-4...LSOHT: OIL HIGH TEMPERATURE SHUTDOWN ... Set point - 155°F (68°C)  
rP4...reset point - 150°F (66°C)

FUNCTION: Shut down baler because of high oil temperature.

### SWITCH:

CONTROL (method of actuation) Sensor in the hydraulic fluid. When the level or temperature reaches the set point, the switch signals the PLC that the set point has been reached. The set point is adjusted by push buttons on the front of the switch.

### SETTING THE SWITCH:

A. Pressing both push buttons simultaneously and for 10 seconds, locks or unlocks the switch for setting the control points.

B. Pressing the "Mode / Enter" push button steps the switch through its different functions. When the desired parameter is reached, pressing the "Set" push button will display current setting of that parameter. If the switch is unlocked, this value can be changed by pressing and holding the "Set" push button for 5 seconds and the setting will flash and then start stepping through its range. Releasing and pressing the button now will allow you to manually step the switch through the range. When the desired setting is reached, pressing the "Mode/Enter" button sets the switch to the new setting and return the switch to the function display. When the maximum setting is reached it will start over, looping back to the lowest setting.

## LEVEL / TEMPERATURE SWITCH (cont.)

C. When the switch is in the function mode, if no switches are pushed for 5 seconds, the switch will return to the operating mode.

D. The switch functions are as follows:

SP1: switch #1 on set point

rP1: switch #1 off set point

dS1: delay of switch #1 on set point

OU1: output of switch #1 (see operating instructions)

OP: (see specification sheet)

cOP: (see operating instructions)

MEDI: (see operating instructions)

OFS: (see operating instructions)

Repeat for switches #2; #3, & #4.

E. Switch should be locked after set points have been adjusted, see step "A."

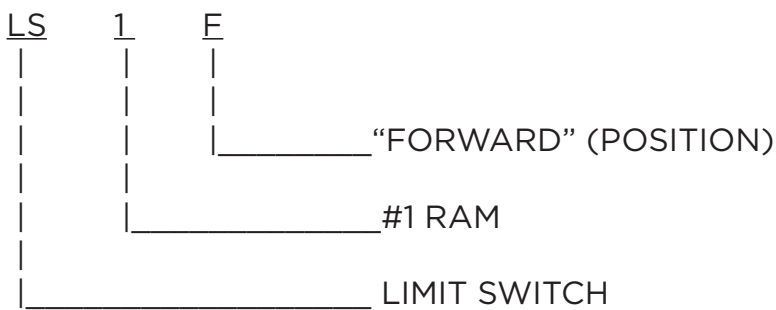
See switch operating instructions for more information.

## LIMIT SWITCHES

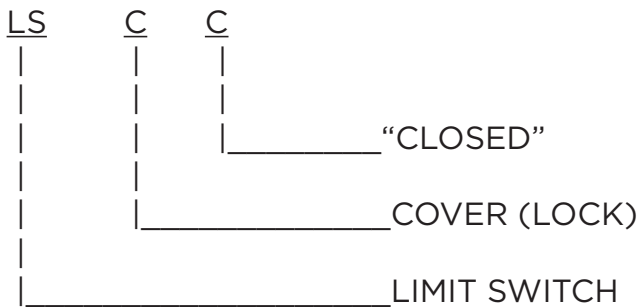
The purpose of the electronic / electrical limit switch is to “make” or “break” an electrical signal in response to the “presence” or “absence” of a moving object at the location of the switch. To accomplish this the switch “actuator” is placed in the path of the moving cam.

IDENTIFICATION ...Each switch on this machine is labeled (and abbreviated) after both the name and the position of the part it monitors.

### EXAMPLE 1



### EXAMPLE 2



To identify and/or locate the limit switches on this machine, refer to the “List of Drawings” and select the appropriate limit switch assembly drawing.

NOTE: Because the limit switch is exposed to “moving” parts it is vulnerable to damage and misadjustment. Consequently it immediately becomes a prime suspect in the event of a machine malfunction.

ADDITIONAL NOTE: Wherever possible, a switch’s “positioning” should provide adequate deceleration of moving parts to stop the ram just as it reaches the end of its travel, except LS1F. #1 ram must always fully extend to make a clean “no fin” bale.



## LIMIT SWITCHES (cont.)

Limit switches on this baler are either a mechanical type, or a proximity sensor.

- 1) The “mechanical” type limit switch is actuated when its lever is “tripped” by a moving part of the machine.
- 2) Proximity sensor switch is activated when a metal target enters the sensor’s field.

NOTE: Mechanical type limit switches are to be positioned so that, during use, their actuators are not forced beyond their allowable “over travel”. Otherwise, damage to the switch will result.

Proximity sensors are positioned within  $\frac{3}{4}$ ” of target to activate.

Most limit switches have both a normally open (N.O.) and a normally closed (N.C.) contact set. When the limit switch is activated the N.O. contacts will be held closed and the N.C. contacts will be held open.

For additional information on these switches see the appropriate vendor bulletins.

### LSGC: LIMIT SWITCH GATE CLOSED

<u>OPERATION</u>	The N.O. contacts switch will close when the gate is fully closed, and will remain closed until the gate begins to open.
<u>FUNCTION</u>	See Electrical diagram and/or program.
<u>POSITION</u>	The switch must be positioned so that it will stop the closing gate before it contacts the bottom liner plate. Allow a clearance of approximately 1/16 inch.

### LSGO: LIMIT SWITCH GATE OPEN

<u>OPERATION</u>	The N.O. contacts will close when the gate is fully open and reopens when the gate begins to close.
<u>FUNCTION</u>	See Electrical diagram and/or program.
<u>POSITION</u>	The switch must be positioned so that the switch actuates and the gate will stop opening when the gate cylinder rod is within 1/8 inch of the end of its fully retracted position stroke. (Bottom of gate should clear the #2 Ram head by approximately 1/2 inch).

## LIMIT SWITCHES (cont.)

### LS1RR: LIMIT SWITCH #1 RAM RETRACTED (back)

<u>OPERATION</u>	The N.O. contacts will close when the #1 Ram is fully retracted (when the target trolley cam on the end of the trolley rod “trips” the switch lever)
<u>FUNCTION</u>	See Electrical diagram and/or program.
<u>POSITION</u>	The switch must be positioned so that it will actuate (and stop reversing the #1 Ram) just as the face of the ram head recedes from lower inside edge of the #1 wiper, (the ram head should not protrude into the box).

### LS1AF: LIMIT SWITCH #1 RAM ALMOST FORWARD

<u>OPERATION</u>	The N.O. contacts will close when the #1 ram is approximately 4” before the LS1RF. This is when the
<u>FUNCTION</u>	To energize an input signal to the PLC when the #1 ram is 4” before the LS1RF.
<u>POSITION</u>	The switch must be positioned so it will activate after the front of #1 ram head clears the shear knives.

### LS1RF: LIMIT SWITCH #1 RAM FORWARD

<u>OPERATION</u>	The N.O. contacts will close when the #1 ram is fully forward.
<u>FUNCTION</u>	To energize an input signal to the PLC when the #1 ram is forward. See Electrical diagram and/or Program.
<u>POSITION</u>	The proximity sensor must be positioned so that it will actuate, and stop the advancing of the #1 ram just as the face of the #1 ram head comes within 1/32” of #2 ram head.

## LIMIT SWITCHES (cont.)

### LS2RR: LIMIT SWITCH #2 RAM RETRACTED (BACK)

OPERATION The N.O. contacts will close when the #2 ram is fully retracted.

FUNCTION To energize an input signal to the PLC when the #2 ram head is retracted. See Electrical Diagram and/or Program.

POSITION The switch must be positioned so that it will actuate (and stop reversing the #2 ram) just as the face of the ram head leaves the baling chamber box.

### LSMG: LIMIT SWITCH MAIN GUARD DOOR CLOSED

OPERATION This is a 3 wire safety switch that is wired in series with the E-Stop switches. The contacts are used to function as part of the safety interlock system and will shut the baler down if the door is opened. When the door is open a message "CECK E-STOPS AND GUARD DOOR" will be displayed on the HMI. The contacts will close when the DOOR is closed.

FUNCTION See Electrical diagram and/or program.

# ***SECTION IV - MAINTENANCE***

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## MAINTENANCE

This machine is the product of many years of specialization in hydraulic engineering, application and scrap processing “ know how”. The simplicity and balance of its design assures maximum possible life of each component while providing continuous and dependable service.

Maximum utilization of the machine, however, can be achieved only if the user designs and implements (from the moment of start up) a maintenance program which provides lubrication, cleaning and inspection/adjustment on a regular basis.

Failure to provide this kind of maintenance can result in rapid and abnormal deterioration of the machine’s load bearing components. In turn, this may unexpectedly cause a partial or even total machine disablement. To avoid this likelihood use the following maintenance guideline to establish a program tailored to the environment of your machine and the frequency of its use.

### MAINTENANCE GUIDELINES

Performing routine maintenance (in accordance with the following guidelines) will require intermittent machine operation to provide easy access to all service areas. Because the machine is not invulnerable to abuse which may occur at the hand of an inexperienced operator, we recommend the maintenance be performed by, or with the assistance of, someone familiar with its operation either through this manual or other experience.

### INSPECTION PROCEDURE

LUBRICATION: A good grade of multipurpose grease will suffice for those points with grease fitting, and unless specified otherwise, 20 30 weight machine oil for the remainder.

#### DESCRIPTION

#### INTERVALS

Air lubricator (See PNEUMATIC OILS, this section)	Weekly
1st compression limit switch trolley	Weekly
Gate guide bars (2)	As Needed
Gate wear bars (2)	As Needed
Motor bushing	Biannually
Motor couplings	Biannually
Press box liner plates (2)	As Needed
Side hopper hinge	As Needed

NOTE: See appropriate section for details also see FOOTNOTES of “Guidelines”

## INSPECTION PROCEDURE (cont.)

**HYDRAULIC OIL:** Maintaining an adequate level of hydraulic oil that is properly filtered is critical to the life of hydraulic components:

<u>DESCRIPTION</u>	<u>INTERVALS</u>
Oil filter inspect "Tells All" (3)	Daily
Oil filter clean/replace (3)	As Needed
Oil level inspect (4)	Daily
Oil temperature monitor (4)	Daily
Test low oil level alarm (5)	Annually
Analyze oil (chemically) for contamination	Annually

**CLEAN UP:** Keep the following areas free of debris for the protection of personnel and equipment:

Walkways around machine	Daily
Limit switches and cams	Daily
Pinch and shear points	Daily
Exposed cylinder rods	Daily

Degrease machine periodically Do not allow oil and residue to accumulate.

**INSPECT and/or ADJUST** the following using procedures given in the appropriate component description in other sections of this manual:

Pneumatic relay timers	Biannually
Cylinder packings (7) (9)	Weekly
Limit switches(cams, actuators & mounting plates)	Monthly
Flow control valves (bulk hopper & side hopper)	Monthly
Pressure switch operating points	Monthly
Liner plates (6)	Weekly
Face plates (6)	Weekly
Gate guide & wear bars for galling and/or excessive wear	Weekly
Pin and/or bushing "walk" (cover & side hopper)	Weekly
Alarm system test	Annually
Divert to Rear test(See WEIGH HOPPER OPERATION)	Weekly
Cycle Time monitor (See TIME CHART, this section)	Monthly
Indicator lights (Replace when faulty)	As Needed
Leaks (7)	Weekly

## INSPECTION PROCEDURE (cont.)

**FASTENERS:** Tighten the following items as indicated:

<u>DESCRIPTION</u>	<u>INTERVALS</u>
Cylinder tension rods	Daily
Cylinder rod eye	Daily
Hinge bearing blocks	Daily
Hinge pin set screw	Monthly
Hose & pipe fittings (7)	Monthly
Liner & face plates	Monthly
Ram head to ram rod (#1 & #2 Rams)	Monthly
Press box joints (side, base & end frames)	Monthly

### FOOTNOTES:

- (1) Based on one (1) 8 hour shift/day.
- (2) Use any weight clean waste oil if scrap has no oil or other lubricating residue.
- (3) See FILTER MAINTENANCE and 28 VB.
- (4) See HYDRAULIC OIL RECOMMENDATIONS (this section)
- (5) Remove switch from tank to test.
- (6) Inspect for damage and/or excessive wear. Excessive wear of liner and face plates results in wedging of material between ram heads and liner plates See ABNORMAL BALES.
- (7) Do not over tighten joints where persistent leaks develop. Instead, look for possible signs of joint, fitting or other component failure. To detect piston by pass, allow oil to cool. Then conduct the following test:
  - Run ram to end of stroke.
  - Manually override directional valve to maintain pressure.
  - Examine cylinder discharge line for sudden temperature rise.
- (8) Cushion decelerate rod action at end of stroke may need readjustment after cover repairs are performed. (See NOPAK Cylinder Maintenance (VENDOR SECTION)
- (9) See NOPAK bulletins VENDOR SECTION if piston packings need replacement.
- (10) To tighten ram head to ram rod, remove ram face plate.

NOTE: See appropriate section for details also see reference tables DL Drawing List, VB Vender Bulletin, General Specifications.

## INSPECTION PROCEDURE (cont.)

### AUTO CYCLE TIME CHART

Use this chart as reference when monitoring your machine's performance. Substantial variation exhibited by your machine will indicate abnormal performance.

NOTE: This chart represents "empty" cycle times. The durations of 1st & 2nd compression stages will increase variably with the size and characteristics of the load being baled.

<u>OPERATIONAL STAGES</u>	<u>SPLIT</u>	<u>TOTAL</u>
Cycle start	:00	:00
to Cover closed	:02	:02
to #1 Ram fully forward (with regen)*	:08	:10
to bale made	:13	:23
to decompression finished & gate opened	:05	:28
to eject finished	:06	:34
to #1 Ram fully retracted*	:09	:43
to #2 Ram fully retracted	:08	:51
to gate closed	:03	:54
to cover opened (fully)	:06	:60 Cycle ends.

For additional information on 16DC specifications see BALER SPECIFICATIONS in the INTRODUCTION section.



## OIL RECOMMENDATIONS

Galland Henning uses the following brands of anti wear hydraulic oil to test the baler. These brands of hydraulic oil meet all manufacturers' specifications. We recommend using these brands or their equivalent.

<u>SUPPLIER</u>	<u>BRAND</u>
Benzoil	Petrolube 32
Mobile	DTE 24

OIL TANK CAPACITY: See BALER SPECIFICATIONS (Section 1)

OIL TEMPERATURE RANGE: The following limits are based on an ambient air temperature range between 60°F and 90°F (16°C and 32°C).

Start 60°F (16°C).  
Run 100°F 140°F (38°C - 60°C) maximum.

NOTE: If the running temperature should exceed the maximum limit given, the system should be thoroughly inspected to determine the cause, and the appropriate corrective action should be taken. See TROUBLE SHOOTING TIPS in the Maintenance section for possible causes of excessive heat generation.

### PNEUMATIC OIL RECOMMENDATIONS (Hopper option)

To insure maximum performance, valves should be supplied with clean lubricated air. We recommend use of an airline filter and lubricator, both of ample flow capacity, installed as close as possible ahead of the valve and cylinder. DO NOT USE oils having any detergent additives. Following is a representative list of oil refiners and their particular brands:

<u>SUPPLIER</u>	<u>BRAND</u>
Cities Service Oil Co.	Citgo Pacemaker XD32
Exxon	Teresstic #33
Gulf Oil Co.	Harmony #32
Shell Oil Co.	Tellus #32 Turbo #32
Mobile Oil Co.	Vectra Light
Standard Oil of Ohio	Chevron OC Turbine Oil #9
Texaco	Regal R. & O. #32
Union Oil Company	Turbine Oil #150

OIL MAINTENANCE In addition to taking all customary precautions to prevent oil contamination (see FILTER MAINTENANCE), the user just also periodically analyze the oil to detect contamination which will occur through normal wear and tear.

OIL CONTAMINATION The oil must be considered contaminated when it no longer meets the minimum requirements of the application; and unsuitable for continued use.

## OIL RECOMMENDATIONS (cont.)

OIL ANALYSIS Consult your oil manufacturer's representative to establish test intervals and procedures. The test should be made with an oil sample taken from the system at normal operating temperature; and it should evaluate the following:

- Viscosity
- pH
- Particle content
- Water content
- Air content

NOTE: Be sure to record test results for future reference.

OIL CHANGES must be made whenever the oil is unsuitable for continued use.

NOTE: Be sure to inspect/clean tank bottom to prevent residues or sediment from contaminating new oil.

## FILTER MAINTENANCE

1. Set up a filter maintenance schedule and follow it diligently.
2. Inspect filter elements that have been removed from the system for signs of failure which may indicate the need for shortening the service interval and the possibility of other system problems.
3. Do not return to the system any fluid which has leaked out.
4. Always keep the supply of fresh fluid covered tightly.
5. Use clean containers, hoses, and funnels when filling the reservoir.
6. Use common sense precautions to prevent entry of dirt into components that have been temporarily removed from the circuit.
7. Make sure that all clean out holes, filler caps, and breather cap filters on the reservoir are properly fastened.
8. Do not run system unless all normally provided filtration devices are in place.
9. Make certain that the fluid used in the system is of a type recommended by the manufacturers of the system of components.

Relative sizes of particles and comparison of dimensional units.

## ADDITIONAL NOTES ON MAINTENANCE

**CYLINDERS:** Check the gland assemblies of all hydraulic rams and see that the packings, gland rings and bushings are in good shape with no excessive leakage. The molded type packing used in this equipment should not be subjected to mechanical pressure by the gland ring, nor should it be permitted to move back and forth. This packing functions on the self sealing principle, and therefore the space in the gland bore should merely be long enough to hold the packing firmly in place.

**RAM HEADS:** The wearing shoes\* under the ram heads should be watched and replaced promptly when they become worn. This is important in order to keep the rams and cylinders in proper alignment.

**LINER PLATES:** The life of the liner plates will vary according to intensity of operation and type of material processed. In some cases the larger plates in the first compression part of the box have been known to last several years. The smaller liner plates in the high pressure end of the box take the heaviest wear and will need replacement more often. The box liner plates are easily removed by first taking off the ramhead face plates and then fully retracting the #1 and #2 Rams.

**LIMIT SWITCHES:** It may be necessary to reposition certain (stroke limiting) limit switches, such as LS1R, LS2R, LSGC to prevent the cylinder's pistons from bottoming out (and causing excessive system "shock") which may occur as components friction decreases and ram stopping distance increase.

## TROUBLE SHOOTING PROCEDURE

If you suspect the nature of the failure, refer to the appropriate trouble shooting guide:

NOTE: Use the same general procedures for pneumatics as for hydraulics.

If the cause of the failure is not evident, it will be necessary to determine which one (or more) of the machine's components may be at fault. This often requires a "trial and error" approach in which several possible causes are identified. At times this can be a tedious process regardless of the complexity/simplicity of the actual failure. To avoid "going in circles" while investigating/eliminating suspects, use the following guide lines:

- (1) Always describe the symptom as clearly and concisely as possible.
- (2) Compare your description (of the symptom or trouble) to those given in the TROUBLE SHOOTING guides and investigate course(s) suggested by the closest matching description.
- (3) Devise a method to test the suspect component. Use the appropriate component description(s) in this text to devise tests and analyze results, and determine if the component is "ok" or "not ok".
- (4) Disassemble and inspect/repair (or simply replace) components which exhibit faulty behavior.
- (5) Repeat steps 1 thru 4 until normal operation is achieved.

NOTE: One effective method to accomplish step #3 is to swap "suspect parts with "like" parts. If the symptom migrates with the swap the suspect part is proven defective.

TO IDENTIFY PARTS See Parts IDENTIFICATION Section V.

## **REPAIRS**

Timely and conscientious repairs/overhauls are necessary to prevent compounding of component failures which are likely to occur if the machine is allowed to run partially disabled. To avoid this, correct component failure immediately. Refer to the appropriate **VENDOR BULLETIN** when detailed instructions are needed. Also see **PARTS IDENTIFICATION**.

**WARNING:** Be sure to observe all safety procedures as outlined in the **OPERATION SECTION**.

## **FACTORY ASSISTANCE**

If you would like factory assistance, don't hesitate to call our Service Department. Be sure to mention the model number and serial number of your machine (See the title page of this manual).

## TROUBLE SHOOTING TIPS

### NOISY PUMP

<u>CAUSE</u>	<u>ACTION</u>
AIR LEAKING INTO SYSTEM	<ol style="list-style-type: none"><li>1. Check oil level, intake must be below surface of oil.</li><li>2. Check pipe and tubing connections.</li></ol>
AIR BUBBLES IN INTAKE OIL	<ol style="list-style-type: none"><li>1. Check oil level and return line position.</li><li>2. If oil level is low or return line to reservoir is installed above oil level, air bubbles will form in oil in reservoir.</li></ol>
CAVITATION AT PUMP INLET	<ol style="list-style-type: none"><li>1. Restricted intake line</li><li>2. Plugged air vent in reservoir.</li><li>3. Check strainers in intake line.</li><li>4. Oil viscosity too high.</li><li>5. Pump overheated</li></ol>
WORN PUMP	<ol style="list-style-type: none"><li>1. See vendor overhaul manual.</li><li>2. Check gaskets and packings.</li><li>3. Replace worn parts.</li><li>4. Check oil may be dirty</li></ol>
STUCK PUMP VANES, VALVES,	<ol style="list-style-type: none"><li>1. Use solvent to clean parts and dry thoroughly before reassembling.</li><li>2. If stuck due to corrosion and rust, replace parts.</li><li>3. Check for dirty oil.</li></ol>
FILTER OR STRAINER TOO DIRTY	<ol style="list-style-type: none"><li>1. Clean filter or strainer.</li><li>2. Be sure original filter has not been replaced by one of smaller capacity.</li></ol>
PUMP OUT OF LINE WITH MOTOR	<ol style="list-style-type: none"><li>1. Check alignment. Misalignment may be caused by temperature variation.</li></ol>
PUMP PICKING UP AIR AROUND SHAFT OR HEAD PACKING	<ol style="list-style-type: none"><li>1. Replace packings.</li><li>2. Grease pump fitting.</li></ol>
EXCESSIVE PRESSURE	<ol style="list-style-type: none"><li>1. Check relief valve setting.</li><li>2. Check for line restriction.</li></ol>

## TROUBLE SHOOTING TIPS (cont.)

### PUMP NOT DELIVERING OIL

<u>CAUSE</u>	<u>ACTION</u>
PUMP SHAFT TURNING IN WRONG DIRECTION	1. Shut down immediately. Check motor connections.
INTAKE CLOGGED	1. Check line from reservoir to pump. 2. Be sure filters or strainers are not clogged.
LOW OIL LEVEL low level of oil.	1. Check oil level in reservoir. Intake line must be below level of oil.
AIR LEAK IN INTAKE	1. If air is going through pump, it will be noisy. Pour oil over suspected joints, if noise stops, you have found the leak.
PUMP SHAFT SPEED TOO LOW	1. Check recommended speed by manufacturer. 2. Check driving motor.
OIL TOO HEAVY	1. If oil is too heavy, pump cannot pick up prime. 2. Drain and fill with oil of the right viscosity.
MECHANICAL TROUBLE, WORN PUMP	1. Disassemble pump, inspect parts, broken shaft, and follow manufacturer's loose couplings recommended to the letter



## TROUBLE SHOOTING TIPS (cont.)

### OVERHEATING IN SYSTEM

<u>CAUSE</u>	<u>ACTION</u>
OIL VISCOSITY TOO HIGH	1. Check oil recommendations.
INTERNAL LEAKAGE TOO HIGH	1. Oil viscosity may be too low. Check oil recommendations. 2. Check wear and loose packings. 3. Check temperature of oil.
EXCESSIVE DISCHARGE PRESSURE	1. Check oil viscosity recommendations. 2. Check relief valve setting.
POORLY FITTED PUMP UNITS	1. Poorly fitted parts may cause undue friction. Be sure all parts are in alignment.
OIL COOLER CLOGGED	1. If oil cooler passages are clogged, try blowing out with solvents.
LOW OIL LEVEL	1. If oil supply is low, less oil will be available to carry away just as much heat. This will cause a rise in oil temperature. Be sure it is up to proper level.

## TROUBLE SHOOTING TIPS (cont.)

### LOW PRESSURE IN SYSTEM AND ERRATIC ACTION

<u>CAUSE</u>	<u>ACTION</u>
VALVES, PISTON, ETC. STICKING OR BINDING	<ol style="list-style-type: none"><li>1. Check for mechanical deficiencies such as misalignment of a shaft, worn bearings, etc.. Replace worn parts.</li><li>2. Check oil for signs of dirt, oil sludge, varnishes, etc. caused by oil deterioration. Clean parts and replace oil.</li></ol>
CYLINDERS NOT OPERATING PROPERLY	<ol style="list-style-type: none"><li>1. Re adjust relief valve or unloading valve setting.</li><li>2. Check for worn pump.</li><li>3. Check for sticking valves.</li><li>4. 4/way valve not shifting.</li><li>5. Leak in system check piping.</li><li>6. Leak inside cylinder check piston assembly replace.</li><li>7. Low oil level in reservoir.</li><li>8. Rod end packing too tight.</li></ol>
RELIEF VALVE	<p>(A) LARGE PISTON STUCK REPLACE OPEN. (B) SMALL HOLE IN LARGE PISTON PLUGGED. (C) PISTON OR VALVE SEAT IN COVER DAMAGED. (D) DIRT BETWEEN PISTON AND HEAD. (E) RELIEF VALVE CHATTER.</p> <ol style="list-style-type: none"><li>1. Disassemble valve and clean parts. Replace damaged and worn parts</li></ol>
RELIEF VALVE SETTING TOO LOW	<ol style="list-style-type: none"><li>1. Block discharge line beyond relief valve and check line pressure with pressure gauge.</li><li>2. Re adjust pressure setting or valve with new gauge.</li></ol>
RELIEF VALVE STUCK OPEN	<ol style="list-style-type: none"><li>1. Disassemble valve and clean.</li><li>2. Stuck valve may indicate dirty oil or deteriorated oil. Change if necessary.</li></ol>
LEAK IN SYSTEM	<ol style="list-style-type: none"><li>1. Check all tubing and piping for leaks.</li></ol>
BROKEN, WORN, OR STUCK	<ol style="list-style-type: none"><li>1. Install pressure gauge and block. System just beyond relief valve. If no pressure is developed and relief valve is alright look for mechanical trouble. Replace worn and broken parts per manufacturers' recommendations.</li></ol>

## TROUBLE SHOOTING TIPS (cont.)

### LOW PRESSURE IN SYSTEM AND ERRATIC ACTION

<u>CAUSE</u>	<u>ACTION</u>
INCORRECT CONTROL VALVE SETTING	<ol style="list-style-type: none"><li>1. Check control valve piston and cylinders. Replace worn parts.</li><li>2. If open center directional control valves are set at neutral position, oil will return to reservoir.</li></ol>
SLUGGISHNESS WHEN A MACHINE IS FIRST STARTED	<ol style="list-style-type: none"><li>1. Oil too thick at starting temperature. Run Temperature. Run pump for a few minutes; oil may thin out. If oil does not thin out, replace oil with lower pour point lighter viscosity. Under severe conditions, immersion heaters may be required.</li></ol>
4/WAY VALVE NOT SHIFTING	<ol style="list-style-type: none"><li>1. Electrical trouble on solenoid operated valves shift solenoid by hand. If valve operates, call electrician to check circuit.</li><li>2. Pilot pressure too low on pilot pressure operated valves. Check manufacturer's recommendations.</li><li>3. Main valve spool sticking disassemble valve. Clean up spool and bore with crocus cloth, if necessary, to free spool.</li></ol>
FIN ON BALE OR CHAIR TYPE BALES	<ol style="list-style-type: none"><li>1. Excessive material in charging box.</li><li>2. Check for excessive wear on liner plates or shoes.</li></ol>
BENT RAMS OR CYLINDER RODS	<ol style="list-style-type: none"><li>1. Baling with gate open or not fully closed.</li><li>2. All rams not fully retracted when baling cycle begin.</li></ol>
EXCESSIVE LEAKS ON ROD END OF CYLINDER	<ol style="list-style-type: none"><li>1. Worn rod end packing replace with new packing.</li><li>2. Check for score marks on rod. Too severe score marks, replace rod or ram.</li></ol>

## GENERAL MAINTENANCE INSTRUCTIONS FOR ALL GALLAND HENNING NOPAK, INC. BALERS

### EFFECTS OF DIRT IN HYDRAULIC SYSTEM

Dirt is responsible for a majority of malfunctions and unsatisfactory performance. Below is a partial list of what dirt can do to hydraulic components.

#### Pumps:

1. Erodes wear plates.
2. Causes sticking of vanes, creating erratic actions
3. Cause the vanes to wear out the cam ring.
4. Wears out rotor slots.
5. Increases shaft journal and bearing wear.
6. Increases gear wear with resultant inefficiency.
7. Increases piston and sleeve wear with resultant

#### Relief valves:

1. Causes chatter
2. Accumulated dirt causes relief valve to fail safe, pressure becomes erratic which affects function of entire system.
3. Causes seat wear in relief valve.

#### Directional valves:

1. Causes plugged orifices.
  2. Causes wear to spool and housing lands creating excess leakage.
  3. Dirt deposits cause spools to stick with resultant solenoid failure.
- Sticking valves can cause excessive shock loads, damaging hose, piping, fittings and other components.

#### Check valves:

1. Dirt causes erosion of orifices changes flow characteristics.

#### Cylinders:

1. Dirt causes excessive wear of:
  - (A) Cylinder rod
  - (B) Packing
  - (C) Bore of cylinder
2. Malfunction of cylinder cushions.

**GENERAL MAINTENANCE INSTRUCTIONS  
FOR ALL GALLAND HENNING NOPAK, INC. BALERS (cont.)**

Fluid:

1. Dirt acts as a catalyst, breaks down molecular structure causing gummy residue (vanish).
2. Dirt in the tank attracts additives and changes composition of the fluid.

System:

1. Hydraulic system malfunctions due to dirt can result in:
  - (A) Serious damage to equipment
  - (B) Safety hazards
  - (C) Insufficient pressures

**KEEP HYDRAULIC SYSTEMS CLEAN!**

# SECTION V - REPAIR PARTS

## TABLE OF CONTENTS

### COMPLETE PARTS LIST

BALER INSTALLATION.....	D-18862.J16
1ST COMPRESSION CYLINDER.....	C-5171SK
2ND COMPRESSION CYLINDER.....	B-5172SK
COVER CYLINDER.....	C12119.X36
ELECTRICAL.....	D-19549.E16
GATE CYLINDER ASS'Y.....	C-11764.X34
HYDRAULIC SCHEMATIC.....	D-19569.Y16
LIMIT SWITCH ASS'Y 1ST COMPRESSION CYL.....	B-173-DC16
LIMIT SWITCH ASS'Y 2ND COMPRESSION CYL.....	D-172-DC16
LIMIT SWITCH ASS'Y GATE.....	D-172-DC16
PRESS PARTS.....	D-11793.J16
PRESS PLUMBING.....	D-18867.J16
PUMPING UNIT.....	D-19332.J12

# EC Declaration of Conformity

We GALLAND HENNING NOPAK INC.  
of 1025 South 40th Street  
West Milwaukee, WI 53215

*in accordance with the following Directive(s):*

2004/108/EC	EMC Directive
2006/42/EC	Machinery Directive
2009/EN 60204-1	Safety of Machinery

*hereby declare that:*

**Equipment** Dual Compression Heavy Duty Balers  
**Model Numbers** 10DCS, 12DC, 16DC, 17DCS, 30DC, 40DCS, 60DC, 80DC

*is in conformity with the applicable requirements of the following documents*

<b>Ref. No.</b>	<b>Title</b>
EN 55011:2009/A1:2010	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement.
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) Part 6-2: General Standards-Immunity for Industrial Environment
EN 61000-6-4:2007	Electromagnetic Compatibility (EMC) Part 6-4: General Standards-Generic standards-Emission standards for industrial environments.
EN ISO 12100:2010	Safety of Machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)

**I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications and is in accordance with the requirements of the Directive(s)**

Signed by: .....

Name: Bart Mitchell  
Position: President

Done at GALLAND HENNING NOPAK INC.  
1025 South 40th Street  
West Milwaukee, WI 53215

On March 31,2014



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