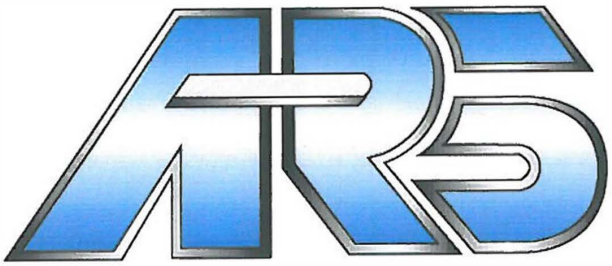


APPLIED RECOVERY SYSTEMS

RST-500

PUCK MAKER START-UP PROCEDURE

1. Empty hoppers of chips to be compressed into top of machine ***there should be no scrap parts or other materials emptied into the Puck Maker***
2. Main Power on
3. Main Motor on (the fault light will flash for 10 seconds then will turn off when the motor starts)
4. Home Position Light must be on (if not turn Manual-O-Auto switch to Manual and retract Main Cylinder, retract Gather Cylinder, and Close Door Cylinder.*** All Manual switches for cylinders must be in O or center position when actively moving it.***)
5. Turn Manual-O-Auto switch to Auto and machine will run automatically until out of material, then it will shut off

Ser. Nbr [redacted]

RST 500 Briquetter

ARS, Inc.
P.O. Box 20785
Waco, TX 76702-0785
Ph: 254-666-0144
Fax: 254-666-8265

PLC File name S001051

2. SUMMARY REFERENCE DATA FOR MACHINE

RST 500

Power Unit:	Model # 35-02040	(Wilson)
Main Cylinder:	Model # CU 080 IH 3 0550 4 NC N P 14.500 5000 5000 PSI Bore: 8.00" Rod: 5.50" Stroke: 14.50"	(Parker)
Gather Cylinder:	Model # 02.5.ME5SPS61 11.000 5000 PSI Bore: 2.50" Rod: 1.38" Stroke: 11.00"	(Parker)
Door Cylinder:	Model # 03.2.ME5SPS61 4.000 5000 PSI Bore: 3.25" Rod: 1.38" Stroke: 4.00"	(Parker)
Control Panel:	Model # 36-02040	(Wilson)

A.R.S. S/N: RST 500 - 1054
1051

3. UTILIZATION AND MAINTENANCE OF HANDBOOK

THE OPERATING HANDBOOK

This operation handbook is to be used by the personnel who have to install, operate, adjust, service, clean, repair, and transport the machine and by the owner.

This operation handbook is to be used to point out the use of the machine according to the technical performance and project requirements. It gives instructions about the movement, installation, adjustment, utilization, maintenance, and spare parts.

This operation handbook is to be placed in a dry and covered location near the machine.

The user can request a new operation handbook, if needed, from the manufacturer.

The operation handbook is in conformity with the current technical expertise at the moment of the construction of this machine.

The manufacturer can update the operation handbook without notice.

The manufacturer is not responsible for problems resulting from the following conditions:

a) Improper use of the machine
b) Improper installation
c) Improper delivery of material to the machine
d) Maintenance deficiencies
e) Unauthorized modifications
f) Use of unauthorized spare parts
g) Improper operation or maintenance of the machine
h) Uses for which the machine was not designed

The user can get in touch with the manufacturer to obtain further information.

4. SCHEDULED USE OF THE MACHINE

4.1 The machine is to be operated for the uses for which it was designed. **4.2** The operator of the machine is to be trained in advance. The person who performs the maintenance is to be a semi-skilled operator.

4.3 The optional accessories that can be used are the following:

1) Fluid Collection pump
2) Hopper Level switch

The instructions are in the operation handbook.

The machine collects and presses, without any binding material, wastes and scrap, as well as liberating fluid components from those mediums.

In order to reduce the volume and obtain briquettes that can be smelted.

The machine can operate independently, or can be supplied by an automatic plant.

4.4.1 THE MACHINE CANNOT WORK IN AN EXPLOSIVE ATMOSPHERE.

The machine should be placed in a site with sufficient ventilation in order to avoid drifting dust, as well as providing adequate cooling.

Take note that dust (with a diameter less than 400 microns) of organic materials, in large quantities, may generate an explosive mixture.

Therefore, please maintain a clean work site.

4.5 The technical characteristics are the following:

LENGTH (minus conveyor)	8'-0"
WIDTH (minus conveyor)	5'-4"
HEIGHT (minus conveyor)	5'-5"
INFEED HOPPER DIAMETER	4'-0"
INFEED HOPPER HIEGHT	2'-10"
INFEED HOPPER VOLUME (Cu.Yds.)	1.5
MAXIMUM DIA. OF BRIQUETTES	2-3/4"
MAXIMUM LENGTH OF BRIQUETTES	3"
MAXIMUM WORKING PRESSURE	4,000 psi
WEIGHT OF MACHINE (Lbs.)	4500 lbs.

4.6 The materials that can be processed are limited to the following: mild steel turnings, non-ferrous metal chips, plastic chips, cast iron borings copper chips, brass chips, sawdust, and grinding swarf. It is harmful for the machine to work with larger pieces or other types of materials.

5. TECHNICAL DESCRIPTION OF THE MACHINE

The machine is composed of:

5.1 Main Frame with Power Unit

5.2 Gathering Box

5.3 Main Cylinder and Press Rod

5.4 Material Hopper and Feed

5.5 Control Panel

5.6 Accessories

5.7 Liquids Collection System

5.8 Product Conveyor

5.1 MAIN FRAME WITH POWER UNIT

The frame is composed of a rectangular frame with four legs and a power unit. The power unit consists of a hydraulic oil reservoir, a hydraulic pump, a main motor, the main valve block, logic, directional, and various staging and unloading valves.

ON THE BASE FRAME ARE MOUNTED:

5.1.0 A hydraulic power unit with an oil level gauge, discharge plug, and a tank filling point for the hydraulic tank.

5.1.1 An air filter for tank ventilation.

5.1.2 An oil level switch that shuts down the unit when the level is under the minimum value.

5.1.3 A separate oil cooling unit, including a filter canister assembly with an electric switch to indicate a blocked filter

5.2 GATHERING BOX SET

This set PRELOADS the material into the compression chamber It is composed of the following parts:

5.2.1 A fixed chamber to collect the material.

5.2.2 A movable platen to gather the material.

5.2.3 A hydraulic cylinder to move the platen.

5.2.4 Two limit switches, one determines the position of the platen "closed/forward" and the other, (adjustable) for the position of the platen "open/ back".

5.3 MAIN CYLINDER, PRESS ROD, AND DOOR

This equipment has to PRESS the material in order to obtain a good briquette with a diameter of 2-3/4" and a standard length of 3".
This equipment is composed of the following items:

5.3.1 A hydraulic main cylinder, with an 8" bore.

5.3.2 A movable press rod connected to the main cylinder rod end.

5.3.3 A flange, also connected at the rod end, which monitors the position of the press rod through the three main press limit switches.

5.3.4 A compression chamber, with a movable door, where the briquette is formed against in the closed/down position, and is in the open/up position during briquette ejection.

5.4 MATERIAL HOPPER FEED MECHANISM

This apparatus rotates the material toward the gather chamber. This is composed of:

5.4.1 A cylindrical hopper fixed to the deck of the machine to contain the loose material, and a revolving agitator.The agitator is indexed upon each retraction of the main cylinder by means of an escapement mechanism below the hopper. As the agitator rotates, the material is swept into the gathering box for pre-compression.

5.5 CONTROL PANEL

This apparatus is composed of the following parts:

5.5.1 A NEMA 4/12 Control panel.

5.5.2 An internal panel where all auxiliary electrical components are contained. For their description, see the electrical schematic and the parts list.

5.5.3 An external control button panel composed as follows:

MAIN DISCONNECT SWITCH with door lock
This manual control turns on (I) or off (O) the power when the machine is stopped.
This is not to be used to stop the machine, but only to isolate the control apparatus from the power source.
The door lock prevents the opening of the door when the switch is on (I).

ATTENTION

Access to the internal panel is not permitted when the electric line is live. Personnel must lock out main disconnect prior to opening the control panel. Even with the control panel locked out there is high voltage present at the disconnect.

RED PUSH BUTTON **EMERGENCY STOP**

WITH MECHANICAL BLOCK-ALWAYS ON

If pushed, the machine stops immediately.
To re-start the machine, it is necessary to release the Emergency Stop Switch. This is used only when the machine needs to be stopped to avoid dangerous situations. The switch should not be used to stop the machine under normal circumstances.

LIGHTED SELECTOR SWITCH **MAIN MOTOR**
This switch turns the main motor on. The switch has a green light when the motor is energized. When the switch is turned on a fifteen second warning horn and light will go off to warn that the machine is starting. After fifteen seconds the motor will start and the machine will be energized. This will also start the product conveyor automatically.

HOME LAMP

This lights (green) when the main cylinder is fully retracted, the gather cylinder is fully retracted and the door is closed. It indicates that the machine is ready to operate in automatic operation.

SELECTOR SWITCH **MANUAL-O-AUTO**

AT 3 POSITIONS

If it is rotated to the right, it lets the machine work automatically if the cylinders are initially in the home position.
If it is rotated to the left, it controls the starting of the machine on the manual cycle.
In the middle position, the machine is in "idle" and the oil flows from the pump to the tank.

FAULT LAMP

This red lamp blinks when the machine is starting up. It stays steady when:

1. Oil High Temperature is reached.
2. Oil Low Level is reached.
3. Cooler motor overload is tripped.
4. Take away conveyor motor overload is tripped.
5. Main motor starter is tripped.

If the machine has stopped and this light is on, check the temperature and oil level gauge. If the oil temperature is high, let the machine cool before re-starting and check that the cooler is unblocked and whether or not the cooler motor starts.

If the temperature gauge is below 150°F, check the oil level. If the level is below the sight gauge, add oil through the filler to bring the oil level up. Note**: Always filter oil when adding to tank.**

If the temperature is below 150°F and the oil level is visible in the sight gauge then the problem is electrical. Have a qualified electrician check the circuit breakers.

SELECTOR SWITCH **GATHER CYLINDER**
AT 3 POSITIONS **RETRACT – 0 - EXTEND**

This switch is used to momentarily move the gather cylinder when the machine is in manual mode. Retract, energizes the cylinder to open the gather box. Extend, energizes the cylinder to make the initial compression on

the material, and 0 is the resting place for the switch when the machine is operated automatically.

SELECTOR SWITCH
AT 3 POSITIONS

MAIN CYLINDER
RETRACT – 0 - EXTEND

This switch is used to momentarily move the main cylinder when the machine is in manual mode. Retract, energizes the cylinder to move rearward toward the home position. Extend, energizes the cylinder to make the compression on the material, and 0 is the resting place for the switch when the machine is operated automatically.

SELECTOR SWITCH
AT 3 POSITIONS

DOOR CYLINDER
RETRACT –0- EXTEND

This switch is used to momentarily move the door cylinder when the machine is in manual mode. "Retract" energizes the cylinder to raise (open) the door. "Extend" energizes the cylinder to lower (close) the door**. Note: DOOR WILL NOT CLOSE UNLESS THE MAIN CYLINDER IS RETRACTED PAST THE "FULL EXTEND" PROXIMITY SWITCH.**

SELECTOR SWITCH
AT 2 POSITIONS

FLUID COLLECTION
OFF ON

This switch is used to energize the automatic fluid pump. If this switch is off, the float switch will not energize the pump. The off position is to be used when changing out a collection vessel.

SELECTOR SWITCH AT 3 POSITIONS	**HOPPER LEVEL INCL. – 0 – EXCL.**

NOTE: OPTIONAL FOR MACHINE PROVIDED WITH MATERIAL LEVEL SENSOR

If it is rotated to the left, it controls the automatic cycle with the level gauge.
If it is rotated to the right, it controls the starting of the pump and the automatic cycle without the level gauge.
If it is rotated to the middle position (O), the machine stops.
This is the normal stop of the machine during the automatic cycle.

ACCESORIES

The machine can be provided with the following:

5.5.4 PRODUCT CONVEYOR

This accessory elevates the product to a container supplied by the customer. The conveyor starts whenever the main pump is energized.

5.5.5 LIQUID COLLECTION AND SUMP PUMP

This accessory collects the fluid that is squeezed from the material; the sump pump moves the liquid to a customer supplied collection container. The sump is controlled by a level switch and is enabled whenever the main power and fluid collection switches are on.

6. MACHINE HANDLING

The recommended method of lifting and placing the machine is by use of a crane. A forklift of appropriate capacity and fork length may also be used,

however, attention should be given to balance and placement of any lifting blocks and forks to avoid injury to personnel and/or other damages.
The weight is approximately 4500 Lbs.

7. INSTALLATION AND ASSEMBLY OF THE MACHINE

The machine must be installed in a dry place; temperature must be over 50 degrees Fahrenheit.

7.1.1 FOUNDATION

The machine needs no special foundation.
The machine has to be placed on a level floor.

7.2 POWER INPUT

The control cabinet of the machine must be connected to a 3 phase electric system with the correct voltage and overload ratings.
The cable must comply with IEC 332-3 Standards.

The Emergency Stop Circuit **IS NOT TO BE** protected by fuses, **IS NOT TO BE** isolated or interrupted but **IS TO BE** connected directly to the Emergency Stop control input terminal.

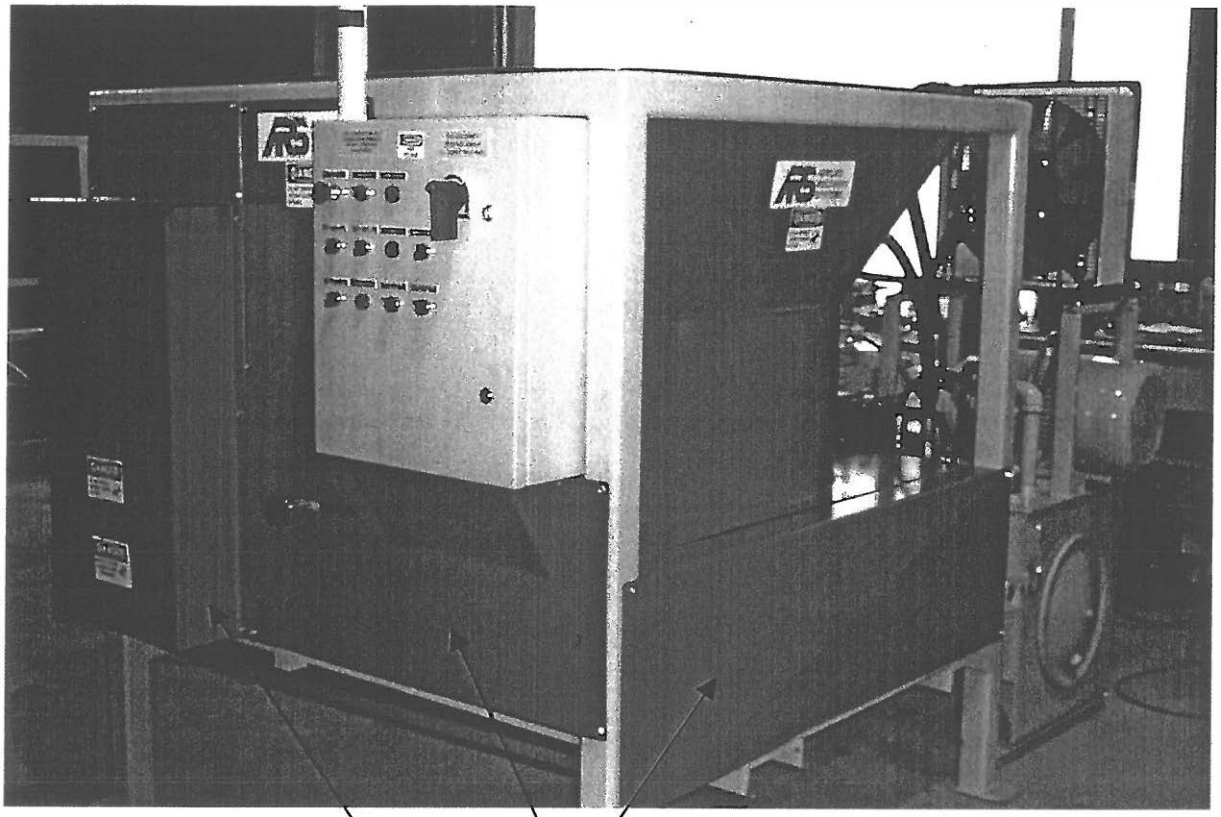
7.1.2 TAKE –AWAY CONVEYOR

An umbilical cord is provided to wire in the take-away conveyor. With power locked out, the conveyor motor should be wired and checked for proper rotation by a qualified electrician.

8. SAFETY PROTECTION

The machine is provided with a set of guards to provide protection against all risks due to moving components.
Each protective cover is marked with a small warning sticker "Danger-This machine starts automatically".
The covers should be removed only when the machine is stopped and locked out.
Operating the machine, without protective covers, IS NOT PERMITTED.

FIGURE 8 A



Fixed Protection of Door Cylinder

Fixed Protection of hoses and escapement mechanism

9. OPERATING INSTRUCTION STANDARDS AND SETTING UP OF THE MACHINE

9.1 Functional cycles

9.2 Adjustments and standards

9.3 Beginning and end of production

9.1 Functional cycles

The functional cycle of the machine is:

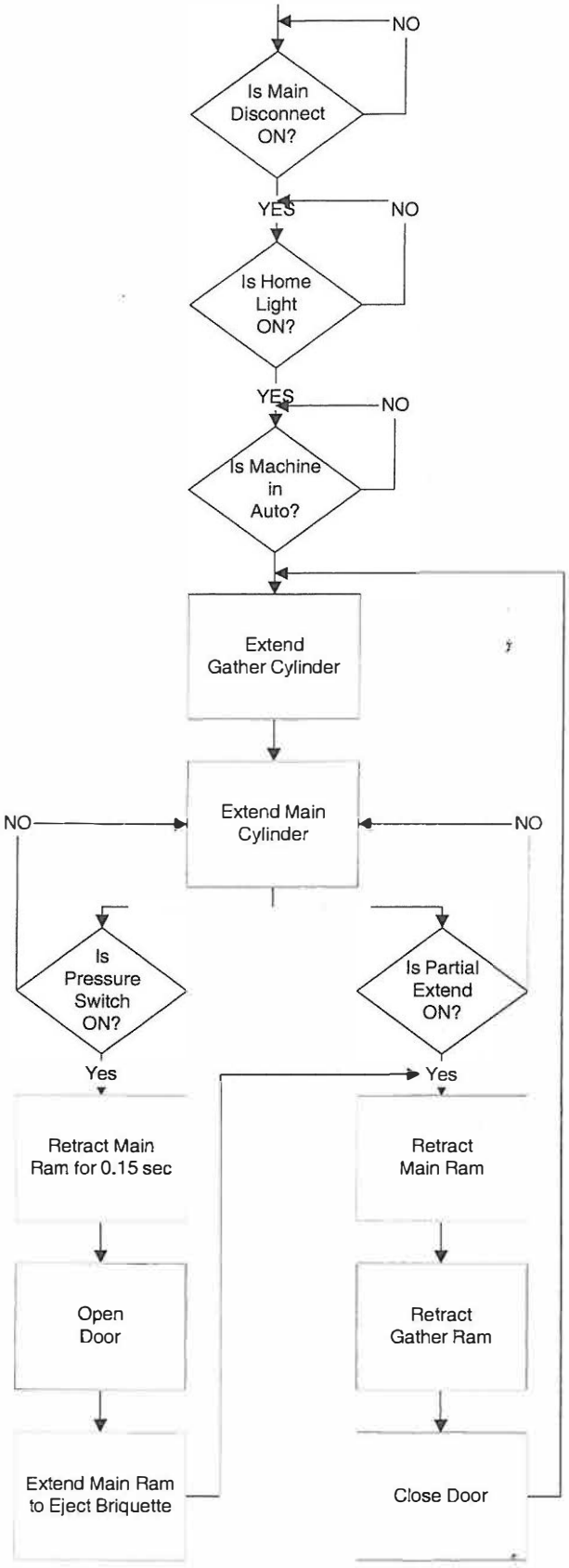
9.1.1 AUTOMATIC CYCLE
9.1.2 MANUAL CYCLE
9.1.1 AUTOMATIC CYCLE

9.1.1.A CYCLE BEGINNING

Main Disconnect Switch in the On position
Motor switch on (clockwise)
Switch on LEVEL GAUGE INC. **position**
Manual-O-Auto Switch in the O position
If the home light (green) is on, then the machine is ready for automatic cycle. If the green light is not on, the machine must be switched to Manual and the main ram must be fully retracted, the door must be closed, and the gather cylinder must be retracted to light the home position light.

DESCRIPTION OF THE AUTOMATIC CYCLE
The following sequence diagram shows the automatic cycle sequence. Note: If the machine does not see high pressure before it sees the partial extend proximity switch on the main press, it continues to gather material before ejecting a briquette.

FLOW CHART AUTOMATIC MODE



If a problem does occur, please get in touch with the manufacturer, specifying serial number and model of the machine. Please let the manufacturer know the exact position where the main cylinder, gather cylinder and door stopped during the automatic cycle as well as the pressure on the gauge.

9.1.1.B MANUAL STOP OF THE CYCLE

Rotate the Manual-0-Auto selector to 0 position.
To stop the cycle, under emergency only push EMERGENCY STOP.

9.1.1.C GENERAL REGULATIONS

It is very important to follow this regulation: to stop the machine place the "MAN-0-AUTO" selector to 0 position, allow machine to return to home position, and turn off the motor.

9.1.1.D AUTOMATIC STOP OF THE CYCLE

If the machine is provided with a level gauge, the cycle stops automatically when the level of material descends under the sensor.
The cycle re-starts automatically when the level of material goes above the blade or sensor.
Standard on all machines, however, there is a "no material shut-down" feature in the operating program that will automatically stop the machine if a briquette is not produced in 5 minutes while in the automatic mode. To restart after a "no material shut-down", turn the "MAN-0-AUTO" switch to "0", the machine will then restart and return to the home position. At that point, it may be switched into "AUTO", and resume production.

9.1.2 MANUAL CYCLE

The manual cycle is used only to stop the machine in the event of an electrical or hydraulic problem. It is used to check if the main, gather, and the door cylinders work properly, after starting the pump motor:
Turn the "MAN-0-AUTO switch to "MANUAL".
Operate each cylinder with the respective "RETRACT/EXTEND" switch to check operation, making sure the limit switches correctly control cylinder movements. Note that the door cylinder will not extend (close) unless the main cylinder is retracted past the "full extend" proximity switch.

To make a briquette in "MANUAL" mode:

Begin with the machine in the "HOME" position:
MAIN and GATHER cylinders fully retracted, DOOR cylinder fully extended (closed).

a) Extend the GATHER cylinder
c) Extend the MAIN cylinder until it is stopped by the HIGH PRESSURE SWITCH
d) Retract the MAIN cylinder about 1 inch
e) Retract (open) the DOOR cylinder
f) Fully extend the MAIN cylinder to eject the briquette
g) Bring the cylinders back to "HOME" position

9.2 REGULATION AND ADJUSTMENT OF THE MAXIMUM WORKING PRESSURE

The machine is factory set at the appropriate pressures.
ADJUST ONLY IF THESE SETTINGS ARE INCORRECT:
If required, adjust according to the following rules:

9.2.1 ADJUSTMENT OF THE BRIQUETTE STRENGTH

Adjust the Main Cylinder Max.Pressure Switch,(PS2).
Do not exceed 4000 PSI on the gauge. (See fig. 2 B)

9.2.2 ADJUSTMENT OF THE GATHER BOX CYLINDER CLOSING

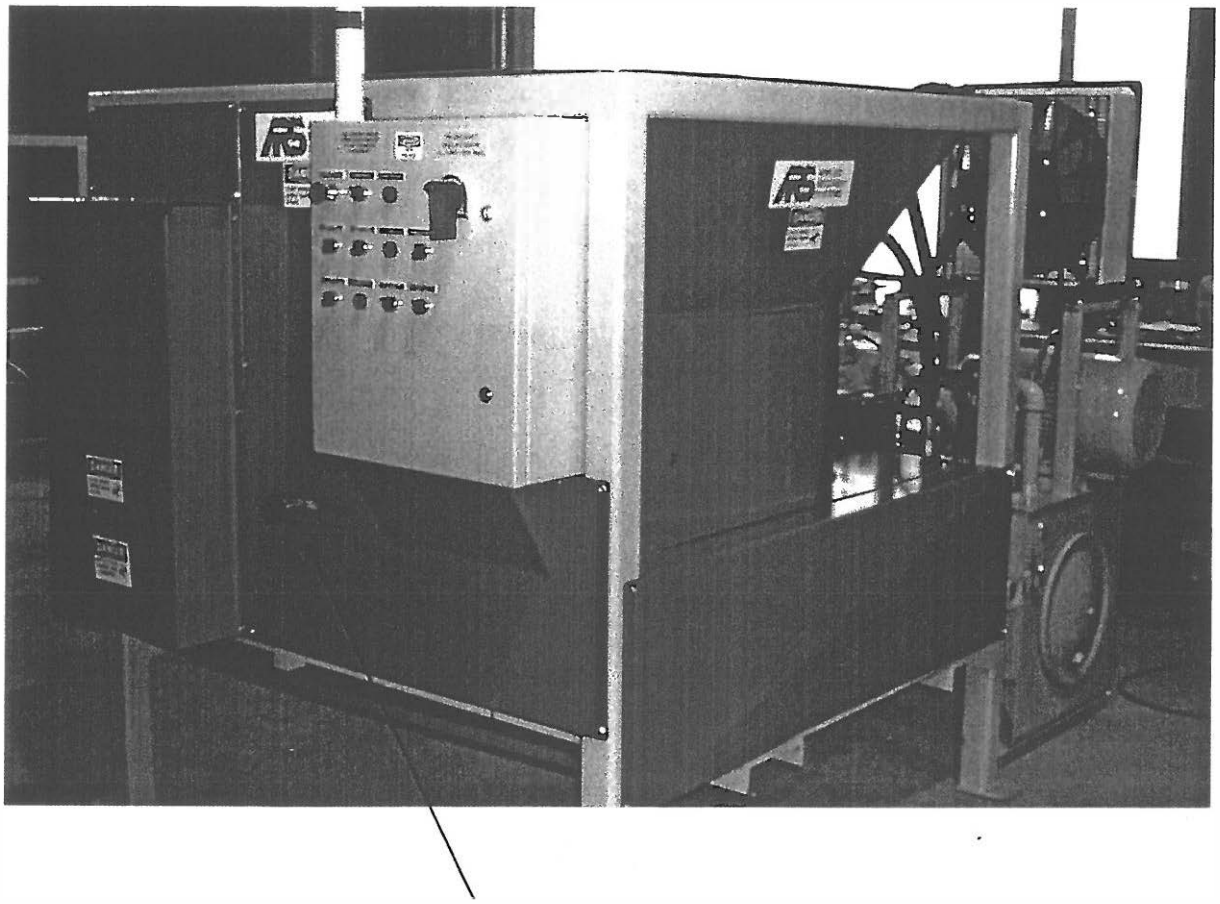
Adjust the High Pressure Gather Switch, (PS1).
Do not exceed 1500 to 1750 PSI on the gauge. (See fig 2 A)

9.2.3 ADJUSTMENT OF THE BRIQUETTE LENGTH

Adjust with the "retract" limit switch at the Gather cylinder. (Fig. 9A)
Puck size is determined by volume. To adjust feed, loosen the knob and move it to the left to decrease volume, or to the right to increase volume. As a rule, the denser,(or smaller) chip size will use a smaller volume to compact a 3" briquette, while less dense material requires a greater volume for the same 3" size briquette. To facilitate lighter materials, the machine is equipped with a selectable control that adds an additional gather stroke per machine cycle.

NOTE: IT IS VERY IMPORTANT THAT THE BRIQUETTE BE MAXIMUM 3".

FIGURE 9A



GATHER CONTROL KNOB

10. INSTRUCTION FOR MAINTENANCE

10.1 Initial checks:

Check that the fuses and the switches are good.
Check the voltage at the disconnect.
Check the oil level in the tank.
Check that the pump and cooler motors turn clockwise.

10.2 Periodic checks:

10.1.1. Daily

By the end of a day's work, clean the machine and the workplace.
Check the oil level contained in the tank through the sight gauge. Correct any improprieties before next operation.

10.2.2. Every month

Check the air and oil filters and replace them if necessary. It is recommended to replace them after six months of operation.

10.2.3 Every 1000 working hours

Replace the oil in the tank. Quantity: 60 gal.
Use the same type of oil.
ROL – LI/46 4 DEGREES ENGLER ANTI-FOAMING, ANTI-RUST, ANTIOXIDANT AND WITH:

1) A LOW FREEZING POINT
2) A GOOD EMULSIFIER
3) A GOOD VISCOSITY RATING

FIGURE 1 **CONTROL PANEL**

FIG. 2A POWER UNIT DESCRIPTION

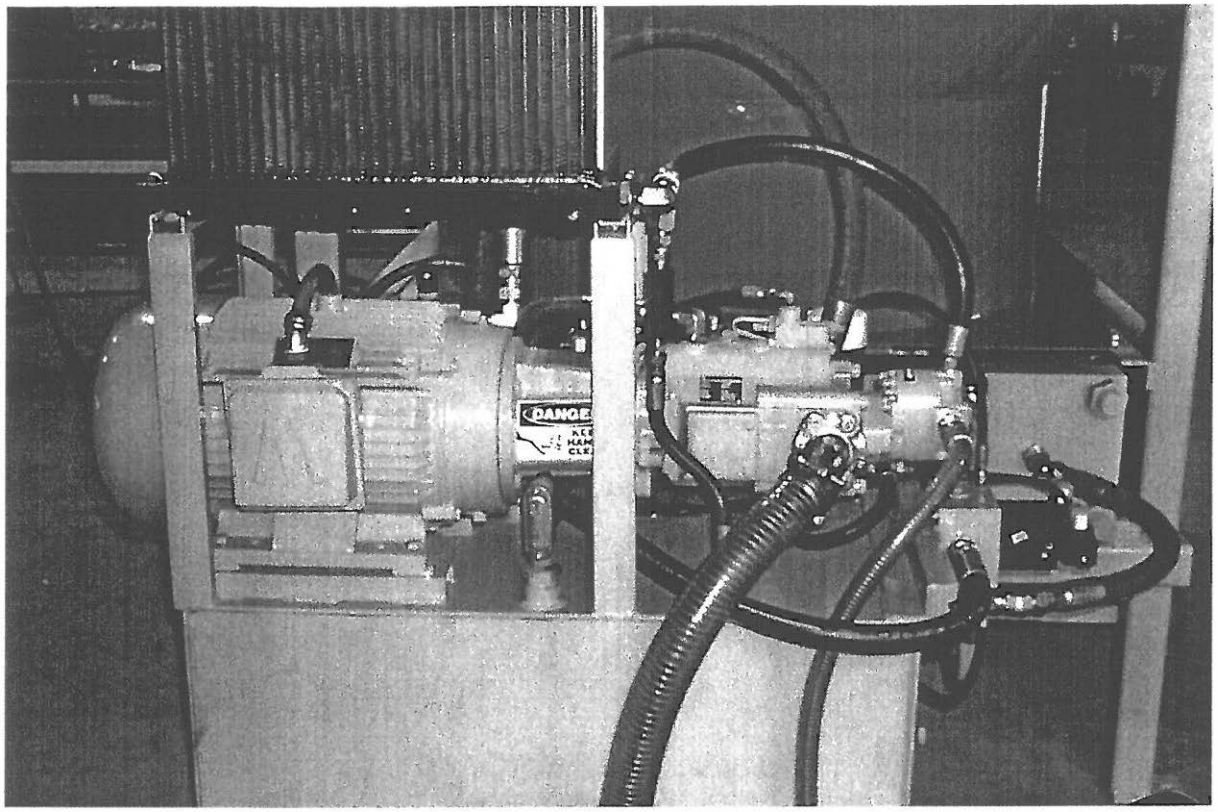
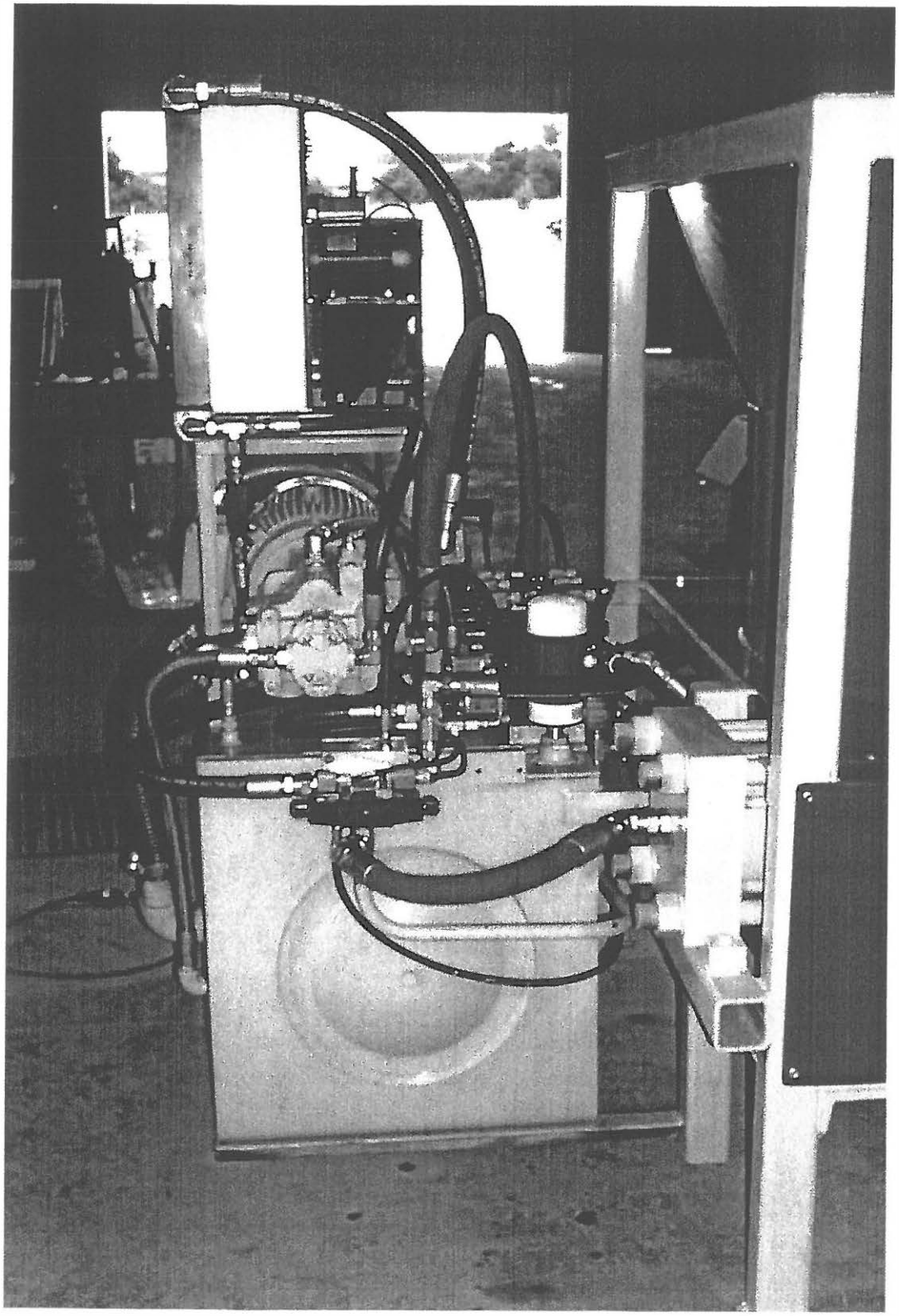


FIG. 2B POWER UNIT DESCRIPTION



12. General Safety Rules

* **THE INSTRUCTION BOOK WITH SAFETY REGULATIONS MUST BE AVAILABLE AT ALL TIMES TO THE OPERATING PERSONNEL.**

* **THE MACHINE MAY ONLY BE STARTED AND OPERATED BY DULY INSTRUCTED PERSONNEL.**

It is important that all personnel making service and adjustments to the machine are thoroughly instructed in the safety regulations, operation and maintenance of the equipment.

The electric system contains highly dangerous voltage. All work on the electric system must be performed by an authorized electrician.

* **IT IS PROHIBITED TO START THE MACHINE IF SAFETY GUARDS ARE REMOVED.**

All fixed safety guards must be firmly assembled and fastened. All safety guards and inspection doors that can be opened have fasteners which require tools to remove. Make regular inspections of the fastening and function of these fasteners.

* **IT IS PROHIBITED TO STAY INSIDE, ON OR UNDER THE BRIQUETTER OR CONVEYORS WHEN IN OPERATION.**

* ***THE MAIN SWITCH MUST BE TURNED OFF AND POWER LOCKED OUT WHEN MAINTENANCE OR SERVICE IS BEING PERFORMED.***

Before making any service, adjustments or other work on the briquetter or conveyors, the main switch must be turned off and locked out. Each person working on the equipment must have an individual lock and key for the main switch. **It is strictly forbidden to be in, on, or under the equipment unless power has been turned off and locked out.**

* **IT IS PROHIBITED TO USE THE BRIQUETTER FOR PRESSING MATERIAL THAT MIGHT CAUSE DAMAGE TO THE OPERATING PERSONNEL, THE MACHINE, OR THE ENVIRONMENT.**

It is prohibited to use the briquetter for pressing material that might cause explosion, fire, corrosion or other damages to the machine, the operating personnel, or the environment. When pressing dusty material, the personnel should use breathing protection.

* **Caution!! Risk of fire and skidding in case of an oil spill. Avoid accidents by wiping up oil spills immediately.**
* **Smoking is not allowed around the machine due to the risk of fire. A dusty environment is always a risk of fire.**

* CARE AND MAINTENANCE

Make regular checks of controls of temperature and pressure in the hydraulic system. Too high temperature or too high pressure might cause damage to personnel and equipment. Keep the work area around the machine clean. Avoid damage to safety guards and safety details. If damage should arise on parts that might affect the security of the machine, they should be corrected immediately. Use only genuine parts or parts that have been approved by Applied Recovery Systems, Inc.

* ALTERATIONS OF THE PLANT

No alterations, mechanical, hydraulic or electrical may be made to the plant without a written consent from Applied Recovery Systems, Inc.

Do not change the placement of the switching equipment. Always place the control panel of the briquetter where you have a good survey of the start/stop of the briquetter. Be sure emergency stops are easily accessible.

Applied Recovery Systems, Inc.
for
Leupold
s/n RST 500-1054
03/04/2003

Processor Information

Processor Type: Bul.1762 MicroLogix 1200 Series C

sor Name: 5001051

Total Memory Used: 526 Instruction Words Used - 153 Data Table Words Used

Total Memory Left: 5170 Instruction Words Left

Program Files: 3

Data Files: 9

Program ID: e55a

Program File List

Name	Number	Type	Rungs	Debug	Bytes
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	1	SYS	0	No	0
	2	LADDER	70	No	2554

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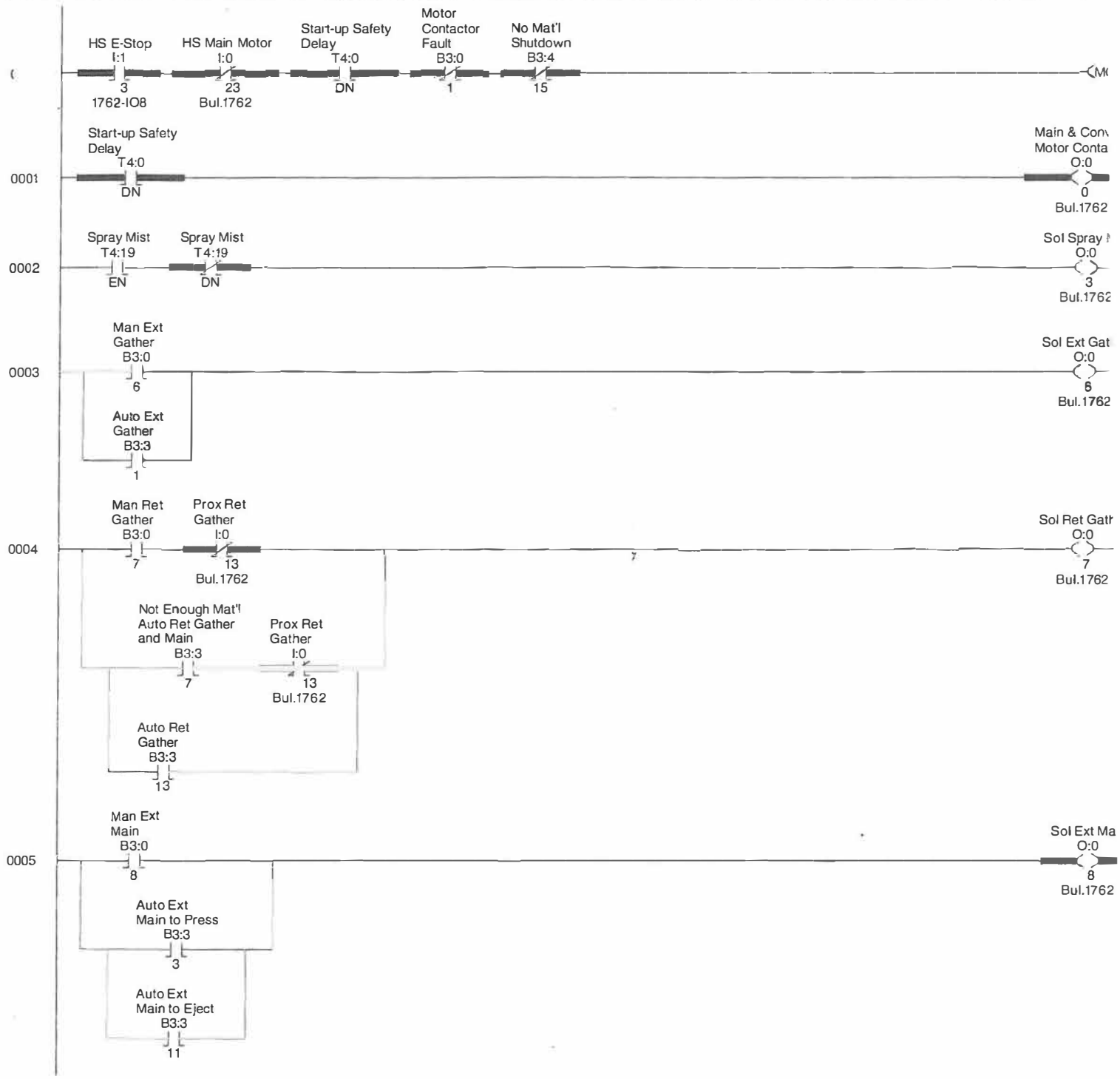

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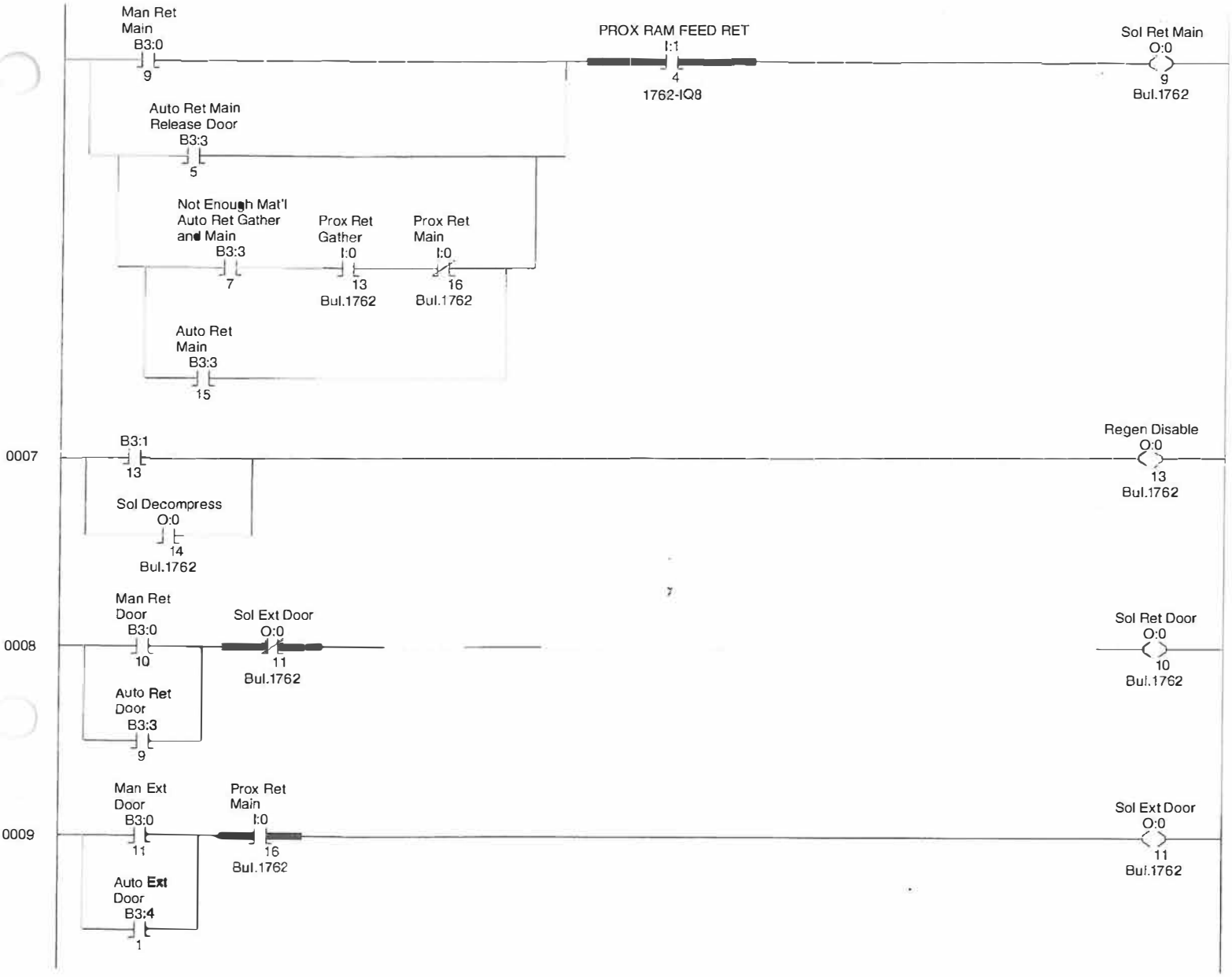

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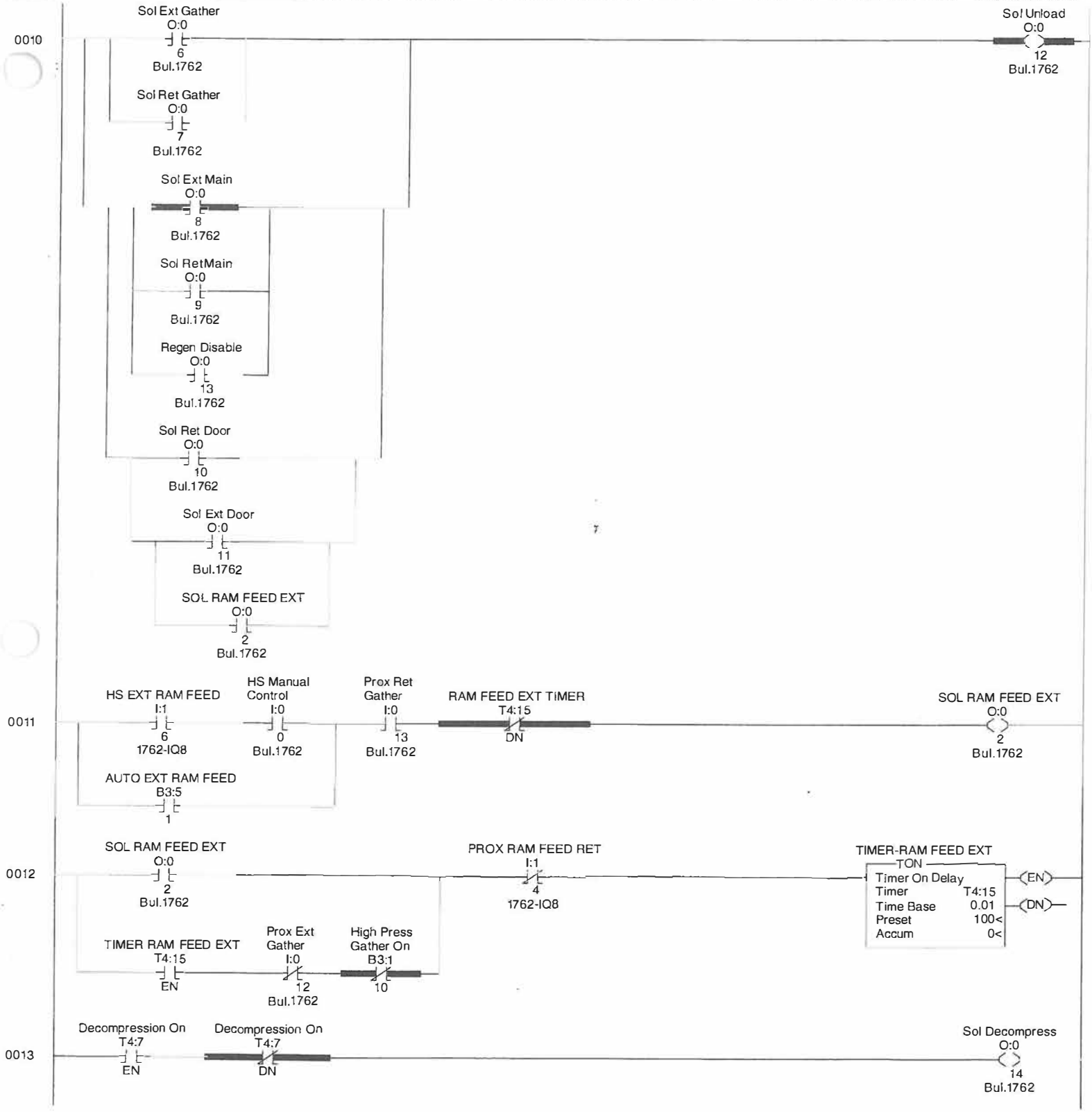

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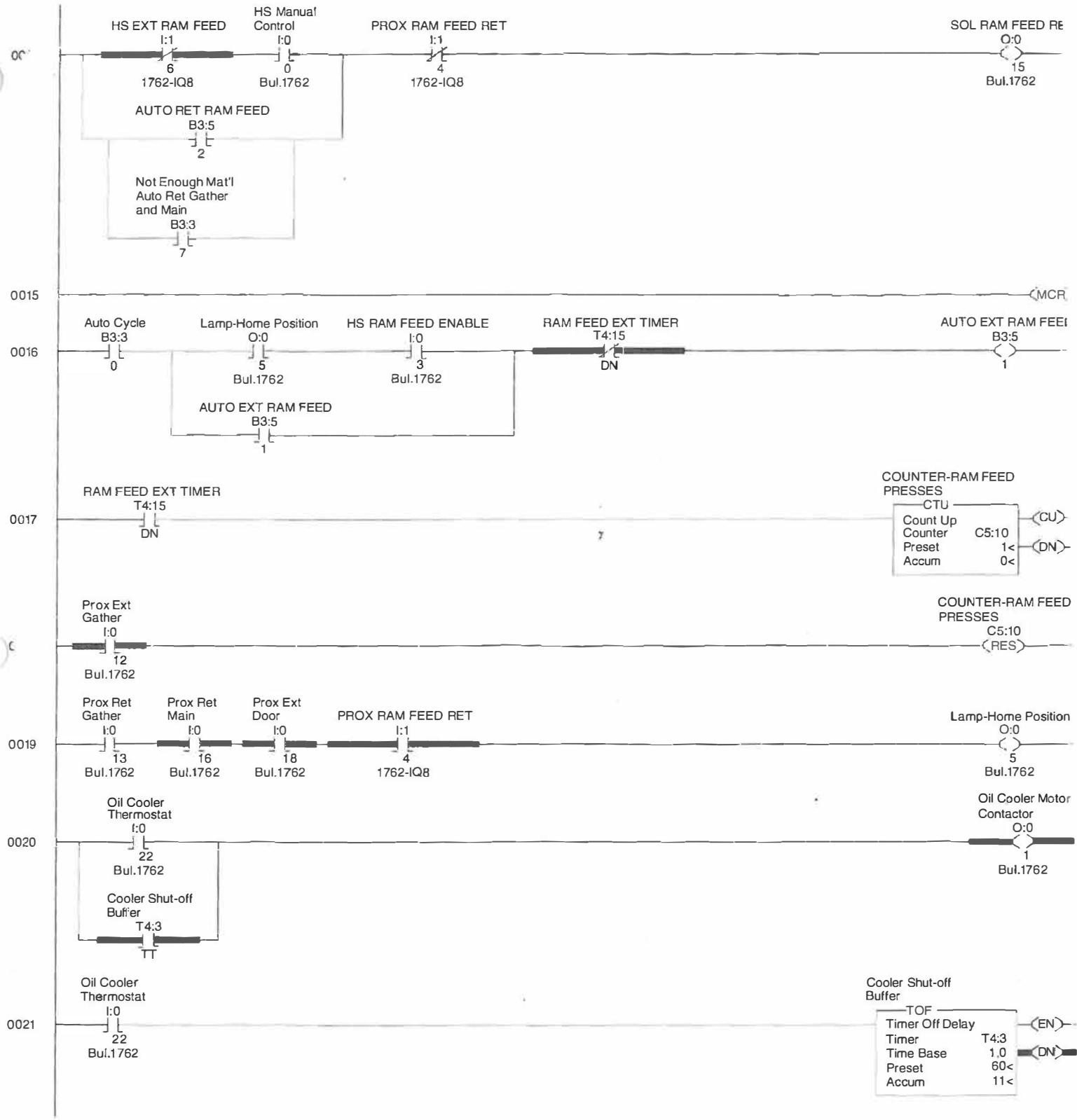

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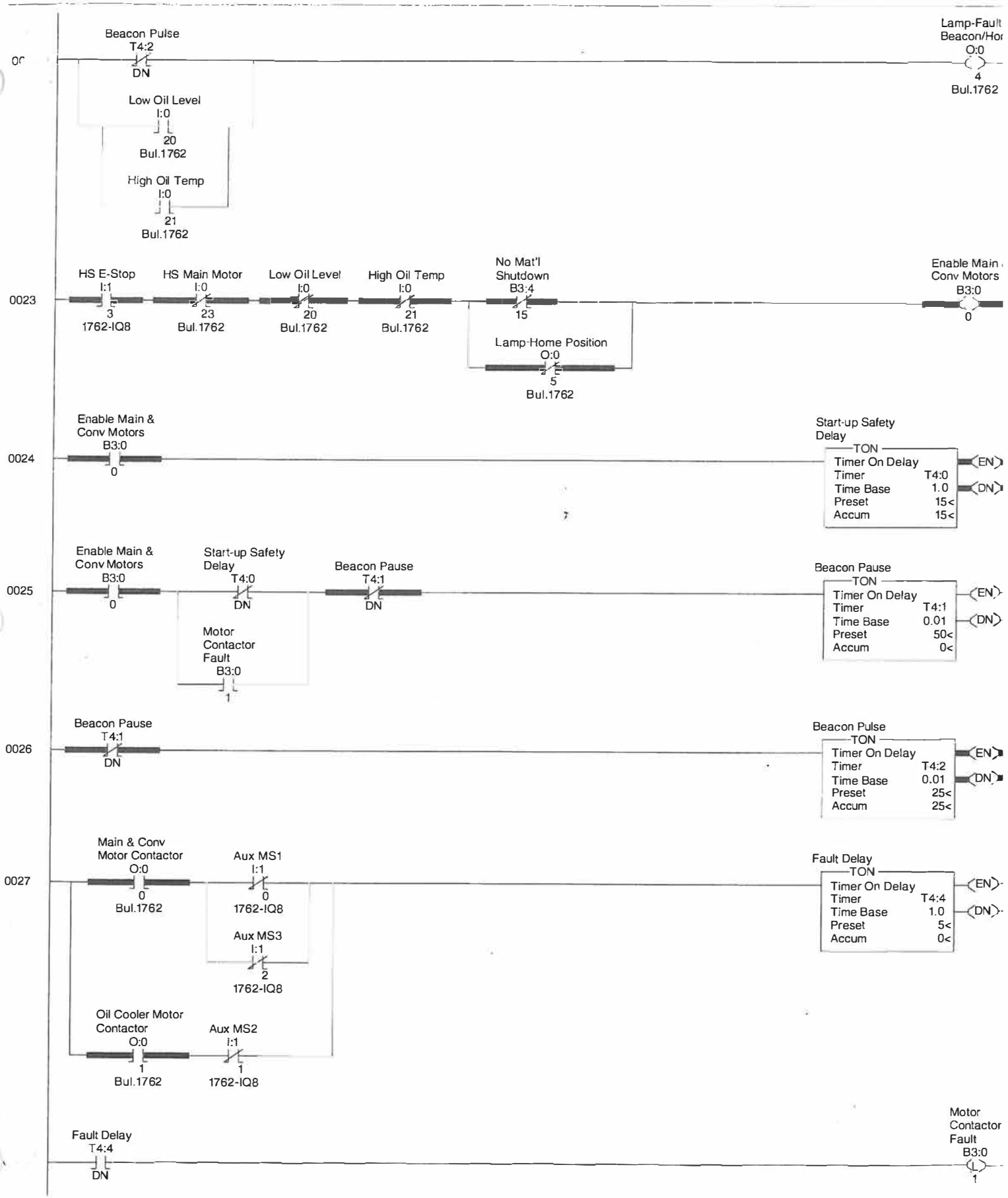

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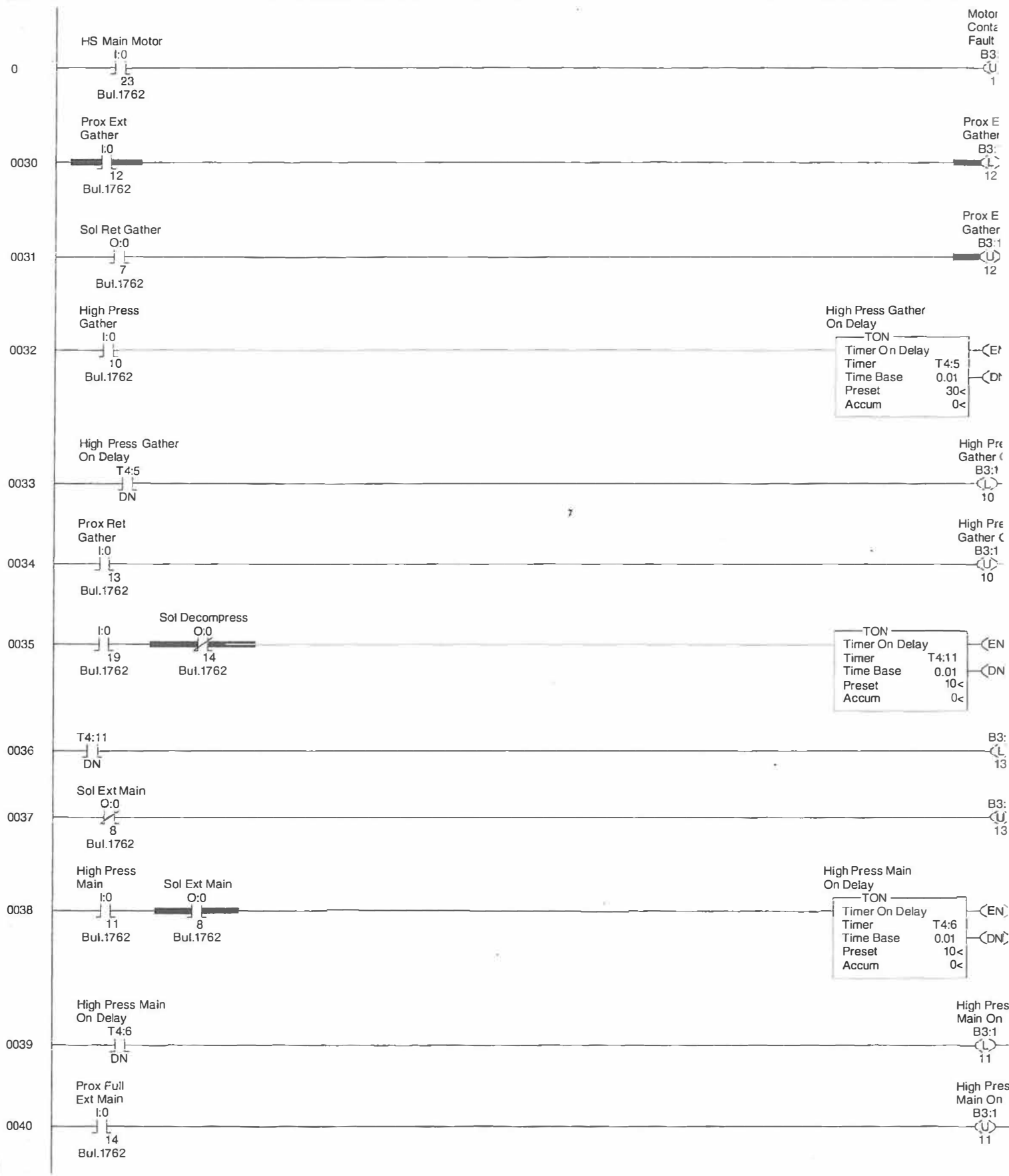

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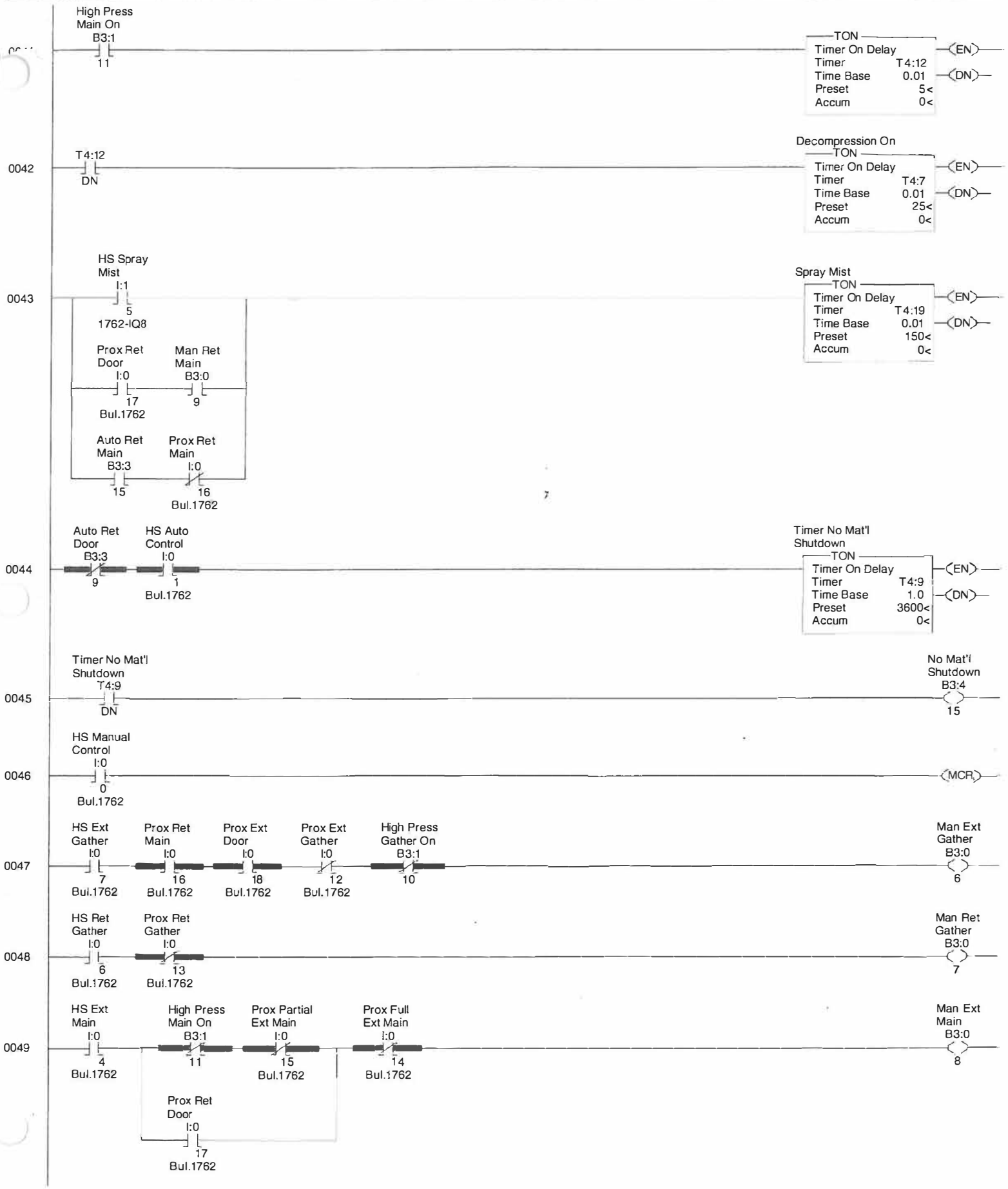

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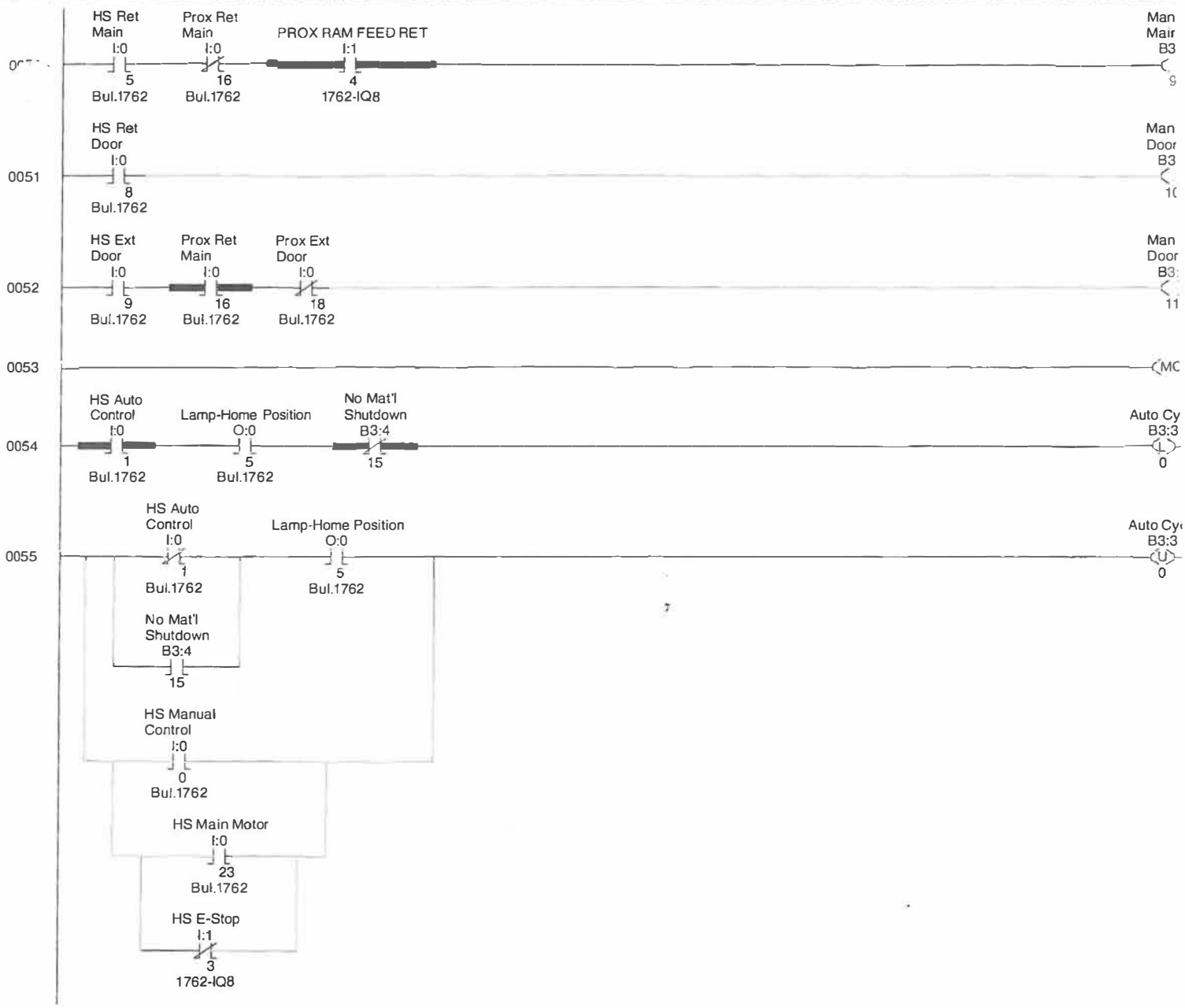
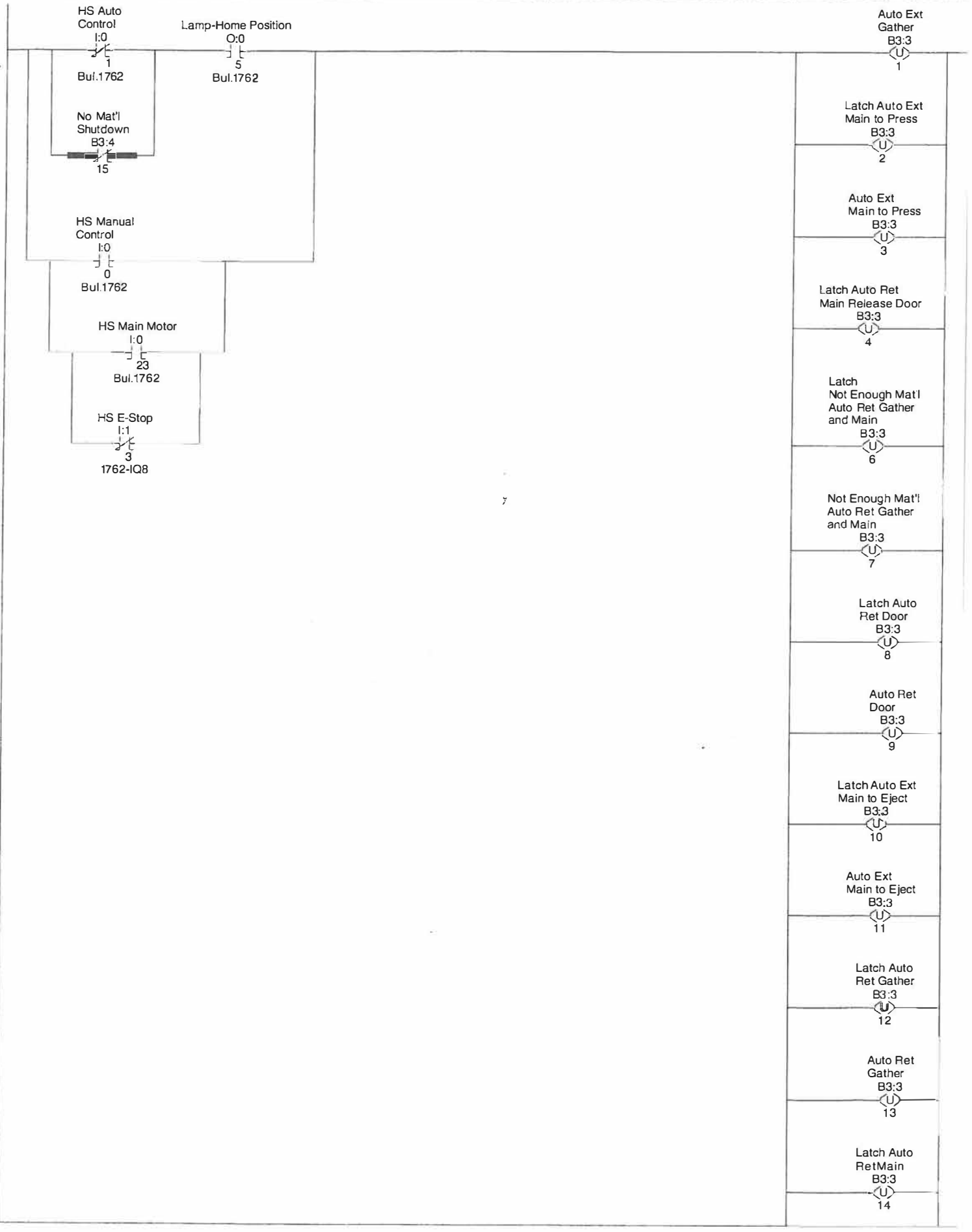


LAD 2 - --- Total Rungs in File = 77



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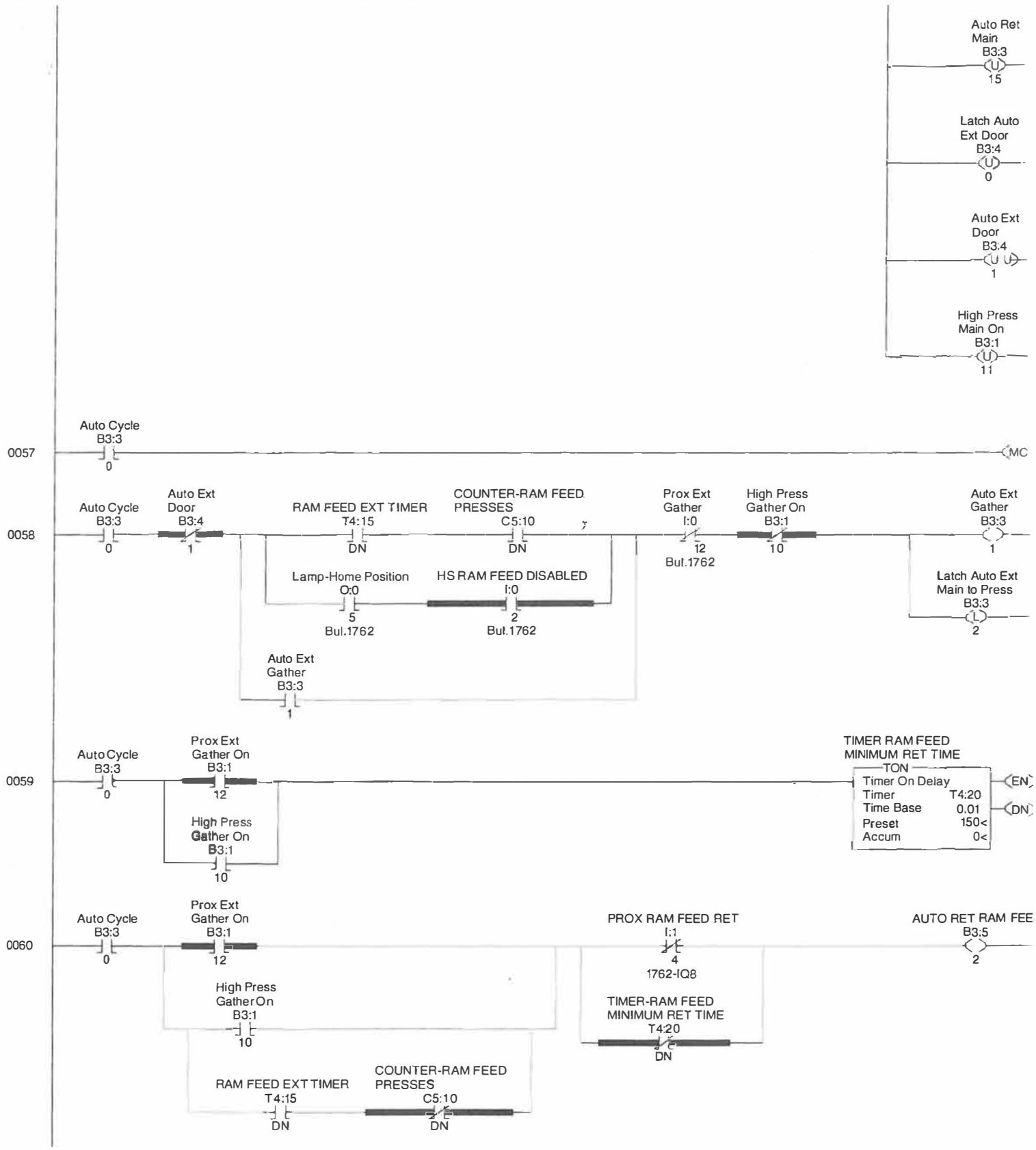

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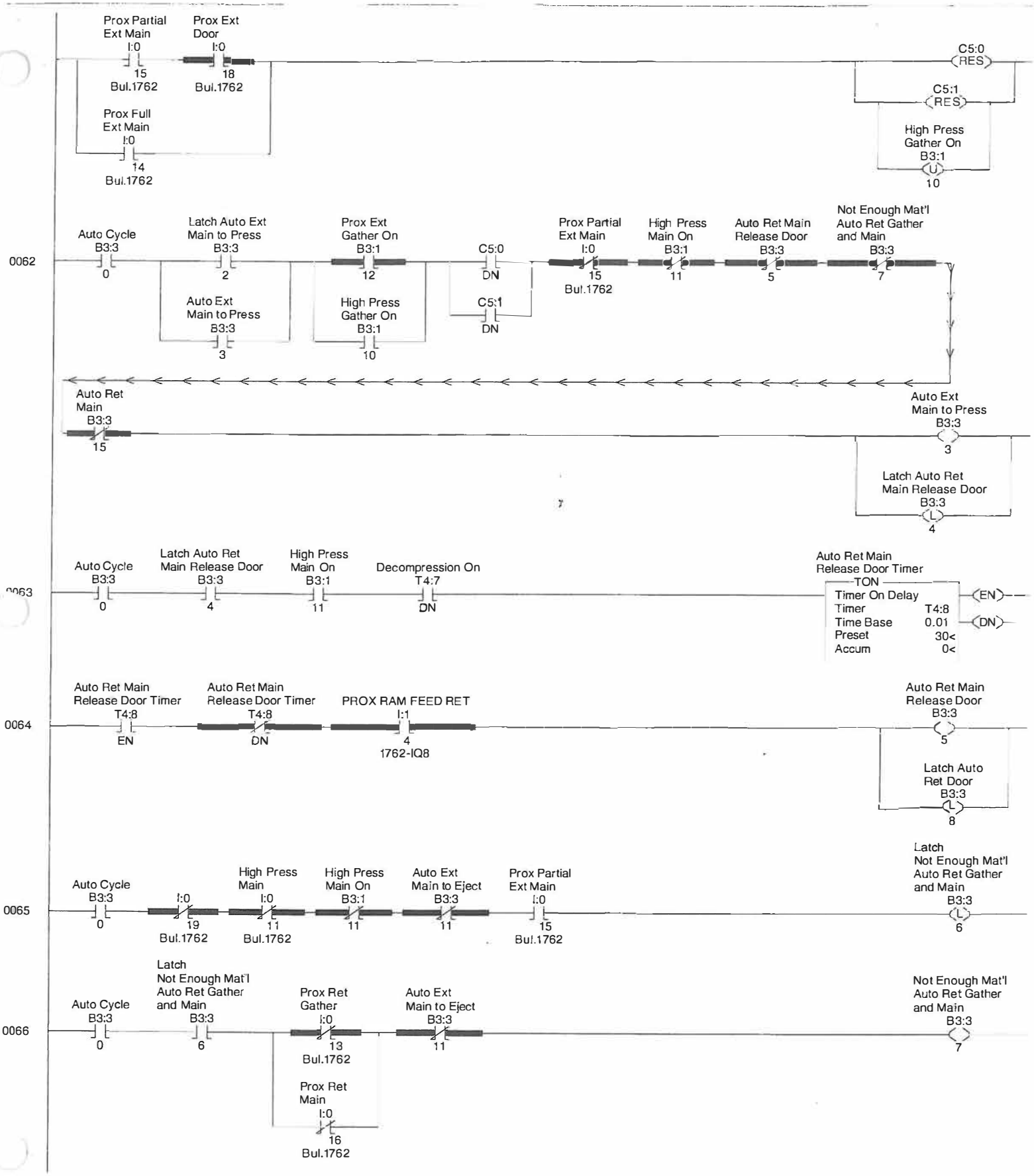

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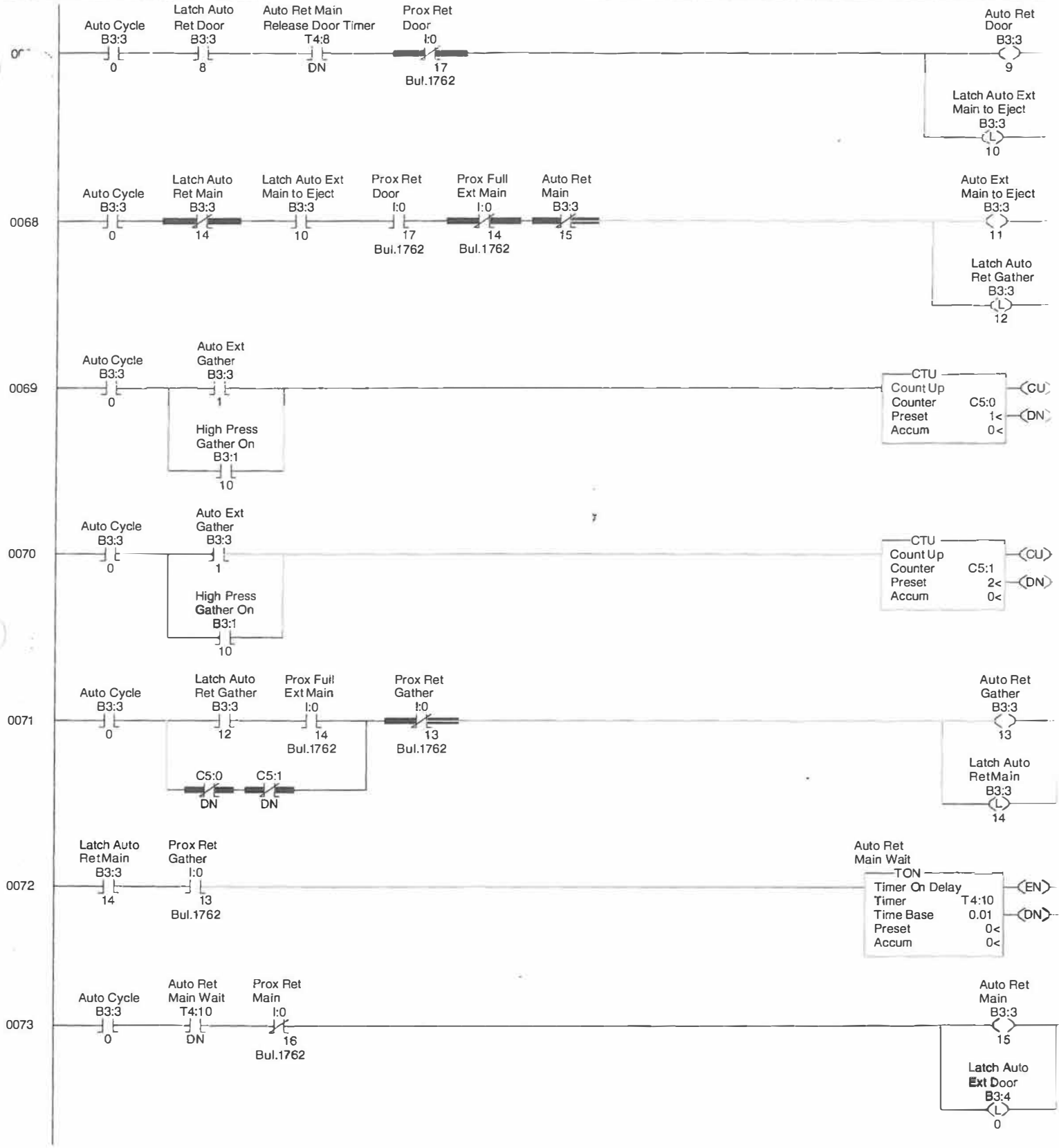

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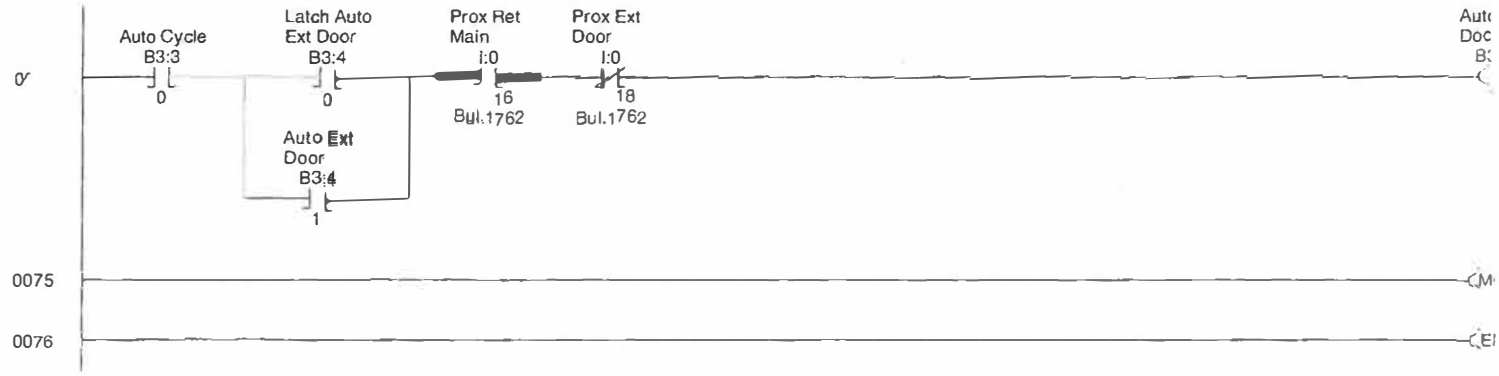
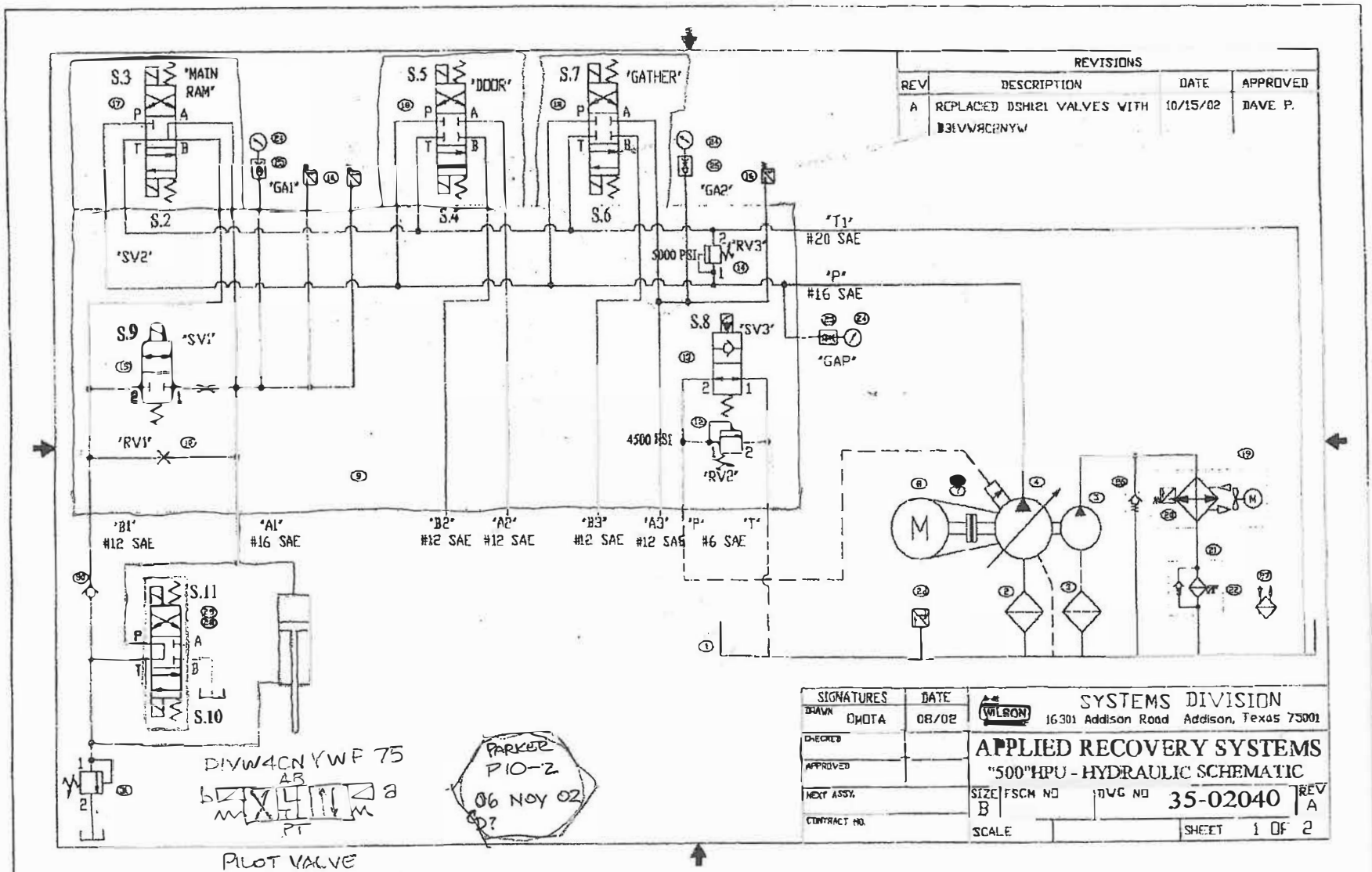




REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A	REPLACED DSH121 VALVES WITH D3IVW8CRNYW	10/15/02	DAVE P.

SIGNATURES	DATE
DRAWN DHOTA	08/02
CHECKED	
APPROVED	
NEXT ASSY.	
CONTRACT NO.	

WILSON SYSTEMS DIVISION
16301 Addison Road Addison, Texas 75001

APPLIED RECOVERY SYSTEMS
"500"HPU - HYDRAULIC SCHEMATIC

SIZE B | FSCM NO | DWG NO 35-02040 | REV A
SCALE | SHEET 1 OF 2

COMPLETE MODEL # D3IVW8C2NYWF 75 (REGEN VALVE, PILOT + SWING)

Please read and save this Replacement Parts Manual. Read this manual and the General Operating Instructions carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. The Safety instructions are contained in the General Operating Instructions. Failure to comply with the safety instructions accompanying this product could result in personal injury and/or property damage! Retain instructions for future reference.

Teel® Electric Motor-Driven Pumps

Refer to Specifications Information and Replacement Parts Manual for product specific information

Safety Guidelines

This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols:

⚠ DANGER ***Danger indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.***

⚠WARNING ***Warning indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.***

⚠ CAUTION ***Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.***

NOTE: ***indicates important information that, if not followed, may cause damage to equipment.***

Unpacking

When unpacking the unit, inspect carefully for any damage that may have occurred during transit. Check for loose, missing or damaged parts. (See pump exploded view and Replacement Parts List.) **Do not attempt to assemble or operate pump if any parts are missing or damaged. Determine that all parts are properly installed.**

General Safety Information

1. Know the pump application, limitations, and potential hazards.

⚠WARNING ***Pump should only be used with liquids compatible with pump component materials.***

Do not use to pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in flammable and/or explosive atmospheres.

When pumping hazardous or dangerous materials, use only in room or area designated for that purpose. For your protection, always wear proper clothing, eye protection, etc. in case of any malfunction. For proper handling techniques and cautions, contact your chemical supplier, insurance company and local agencies (fire dept., etc.). Failure to comply with this warning could result in personal injury and/or property damage.

2. Make certain that the power source conforms to the requirements of your equipment.
3. Provide adequate protection and guarding around moving parts.
4. Disconnect power before servicing. If the power disconnect is out of sight, lock in the open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock!
5. Release all pressure within the system before servicing any component.
6. Drain liquids from the system before servicing.
7. Secure the discharge line before starting the pump. An unsecured discharge line will whip, possibly causing personal injury and/or property damage.
8. Check hoses for weak or worn condition before each use. Make certain that all connections are secure.
9. Periodically inspect pump and system components. Perform routine maintenance as required (See Maintenance section).
10. Provide a means of pressure relief for pumps whose discharge line can be shut off or obstructed.
11. **Personal Safety:**
    a. Wear safety glasses at all times when working with pumps.
    b. Wear a face shield and proper apparel when pumping hazardous chemicals.
    c. Keep work area clean, uncluttered, and properly lighted; replace all unused tools and equipment.
    d. Keep visitors at a safe distance from the work area.
    e. Make workshop childproof - with padlocks, master switches, and by removing starter keys.
12. This unit is not waterproof and is not intended to be used in showers, saunas, or other potentially wet locations. The motor is designed to be used in a clean dry location with access to an adequate supply of cooling air. Ambient temperature around the motor should not exceed 104°F (40°C). For outdoor installations, motor must be protected by a cover that does not block airflow to and around the motor. This unit is not weatherproof nor is it able to be submersed in water.
13. When wiring an electrically driven pump, follow all electrical and safety codes, as well as the most recent United States National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

⚠WARNING ***Risk of electric shock!***

ENGLISH

ESPAÑOL

FRANÇAIS

Printed in U.S.A.
01615
0197/043/VCPVP

TEEL®

Electric Motor-Driven Pumps

Installation (continued)

4. Install both a union and a gate valve (not furnished) on the discharge side of the pump for service convenience.

⚠ CAUTION ***Do not use a globe or other restricting type of valve at the discharge. Globe valves seriously restrict the capacity of the pump; however, restricting the discharge of a centrifugal pump will not overload the drive motor.***

5. It is recommended that a foot-valve be used on the suction line to assure quick priming and that a suitable suction strainer be attached to the suction line so that large pieces of foreign material are not drawn into the pump.

6. **WIRING:** For proper electrical connections, refer to the diagram located on the nameplate or inside the terminal of the motor. Make sure the connections are correct for the voltage being supplied to the motor. Connections should be made with flexible conduit to minimize vibration transmission.

   Whenever possible, the pump should be powered from a separate branch circuit of adequate capacity to keep voltage drop to a minimum during starting and running. For longer runs, increase wire size in accordance with the Wire Selection Guide.

   Select the voltage to be used, either

   a. Single phase - 115V or 230V

   b. Three-phase - 230V or 460V

   Check motor wiring to verify which voltage the motor is currently wired for. If the wiring must be changed to conform to a specific voltage requirement, then the motor should be wired according to recommendations of wiring diagrams located on motor nameplate or wiring compartment cover. Make sure unit is properly grounded. A motor to be used with single-phase power cannot be used with three-phase power and vice versa. If unsure about the above information or the wiring diagrams, consult an electrician familiar with motor wiring.

⚠WARNING ***A wrong connection can burn out the pump motor, cause an electrical short, or produce an electrical shock. Failure to follow the above warning can result in property damage and/or personal injury. Always wire the motor with a three-wire system, ensuring that a ground wire runs to a good electrical ground such as a grounded water system or conduit. Also, ensure that a good electrical ground is provided at the supply end of the line. Connections should be made with flexible conduit to minimize vibration transmission.***

7. Do not operate pump dry. Mechanical seal damage will result.

8. Install any auxiliary components (e.g. pressure switch, time).

Operation

SELF-PRIMING PUMPS

It is necessary to prime the pump before initial start up. Prime the pump by filling the casing with liquid through the top fill plug, the discharge port, or by installing a pipe tee at the discharge of the pump. (When installing a tee, use the horizontal leg of the tee as the pump discharge and place a pipe plug in the vertical leg. This procedure will help facilitate priming later.)

NON-PRIMING PUMPS

1. The casing and suction piping must be filled with liquid before the unit can begin pumping. In order to completely fill casing with liquid, entrapped air in casing must be vented. This is accomplished by momentarily loosening or removing the top drain plug located on the casing.

⚠ CAUTION ***Do not run pump dry as permanent damage to the mechanical seal will result.***

2. Activate the unit.

IMPORTANT: Power supply should be applied momentarily to the pump at first and the direction of rotation checked. When viewing the rear of the motor (opposite the pump end), the motor shaft should be rotating clockwise. If it is not, disconnect power and re-check wiring to motor. (See "Installation" section.)

To change rotation on three-phase models, interchange any two incoming line (power) leads. Other models, consult driver information that came with driver.

NOTE: Never shut off discharge or restrict suction flow while the pump is operating. It may take up to 5 minutes for a **SELF-PRIMING** pump to prime if long horizontal/vertical lines are used. If pump has not picked up prime in 2 minutes, re-prime piping and casing after letting unit cool down for 5 minutes. Re-check all suction connections making sure pipe compound has sealed all connections. Initial priming may take 2 to 3 tries to prime successfully.

⚠ CAUTION ***The proper impeller (motor) rotation is CCW facing the front of the pump. Wrong rotation will give low performance, low head, and could damage unit and/or injure personnel.***

3. On initial start-up (after 15 minutes running time), check power consumption to be sure motor is not overloaded.

4. If motor is overloaded, install a valve on discharge to increase back pressure. Close the valve until pump motor is below full nameplate, or within Service Factor (SF) amps.

Models 4RC26 thru 4RC29 and 4XZ18 thru 4XZ27

Operation (Continued)

3. Familiarize yourself and others with all controls and use of this pump. Learn how to stop pump/motor quickly in an emergency.

Maintenance

⚠WARNING ***Make certain that the unit is disconnected from the power source before attempting to service or remove any component. Failure to do so could result in electrical shock.***

1. Pump should be checked periodically (weekly, monthly) for proper operation, depending on hours of operation. If the system has changed since the pump was installed, or if the pump is operating noisily or erratically, then the pump should be removed and examined. It should be repaired and parts replaced as is necessary.

IMPELLER REPLACEMENT

1. Disconnect the power supply.
2. Remove the pump assembly from the tank or reservoir.
3. Remove the volute or cover plate (Ref. No. 16) by removing the machine screws (Ref. No. 17). Be careful not to damage gasket/o-ring (Ref. No. 15) (Suction-type pumps only).
4. Remove impeller screw (Ref. No. 14) and flat washer (Ref. No. 13) from the center of the impeller (Ref. No. 12). It may be necessary to hold impeller or drive shaft (Ref. No. 5) to remove the impeller screw.
5. Impeller will slide off drive shaft. Some slight prying with a screwdriver may be required to break the impeller loose. Keep shims for reassembly.
6. Replace impeller by sliding onto drive shaft. Slot in impeller hub must line up with drive pin installed in drive shaft.
7. Install impeller screw and impeller washer. Spin impeller slowly by hand. If impeller rubs on machined surface, shim the impeller out in 0.010" increments until no rubbing is present. (Shims included with replacement impeller.)
8. Replace volute, or cover plate and gasket/o-ring (Suction-type pumps).
9. Secure to pump body (Ref. No. 11) with screws.

SHAFT SEAL REPLACEMENT (SUCTION-TYPE PUMPS ONLY)

REMOVAL OF OLD SEAL

1. Disconnect the power supply.
2. Remove the pump assembly from the tank or reservoir.
3. Remove impeller as described in "Impeller Replacement " section.

NOTE: Remove fan cover (Ref. No. 20) and fan (Ref. No. 19) if motor is so equipped.

4. Remove screws (Ref. No. 4) holding motor body (Ref. No. 1) to pump body (Ref. No. 11).
5. Support pump body. Lightly tap on exposed ears of motor body until motor body is free from pump body.
6. (Except 4RC26) Remove screws (Ref. No. 9) holding bearing retaining tabs (Ref. No. 10) to pump body.
7. Lightly tap on end of drive shaft (Ref. No. 5) until lower bearing (Ref. No. 7) is dislodged from its bore. Remove drive shaft assembly from pump body.
8. (4RC26 only) Remove shaft seal (Ref. No. 8) from its bore in pump body.
9. (Except 4RC26) Remove seal seat (Ref. No. 8) from its seal cavity in pump body. Slide seal head (Ref. No. 8) off drive shaft.

INSTALLATION OF NEW SEAL

1. (4RC26 only) Clean seal cavity in pump body. Wet the outside diameter of the seal with soapy water. Squarely press new seal into bore until it is fully seated.
2. (Except 4RC26) Thoroughly clean seal seat cavity in pump body. Clean drive shaft.

⚠ CAUTION (Except 4RC26) ***The precision lapped faces on the mechanical seal are easily damaged. Handle your replacement seal carefully. Do not touch the carbon/ ceramic seal faces.***

3. (Except 4RC26) Wet the rubber portion of the new seal seat with a light coating of soapy water. Use a clean cardboard washer of the same diameter as the seat to protect ceramic surface. With a piece of pipe or dowel rod firmly press the seal seat squarely into the bore until fully seated. Avoid scratching the white ceramic face.
4. (Except 4RC26) Dispose of cardboard washer. Check again to see that ceramic surface is free of dirt and all foreign particles.
5. (Except 4RC26) Wet inside diameter of seal head with soapy water. Slide seal head onto drive shaft until it seats.

NOTE: A short "run-in" period may be required to provide complete leakproof seal operation.

6. Replace drive shaft, take care not to damage seal when sliding drive shaft into pump body. Press drive shaft bearing into pump body.
7. (Except 4RC26) Replace bearing retaining tabs, fasten with screws.
8. Replace motor body onto drive shaft upper bearing until motor body is seated on pump body. Fasten with two screws.
9. Replace impeller as described in "Impeller Replacement" section.

NOTE: Replace fan and fan cover if motor is so equipped.

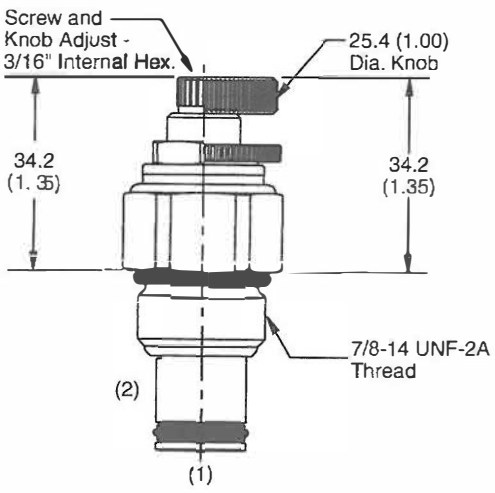
TEEL®

Replacement Parts List

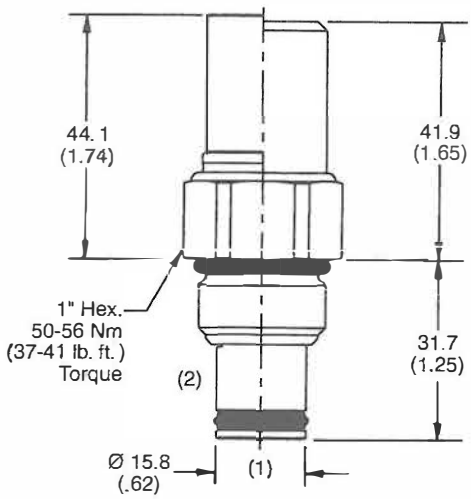
Ref. No.	Description	Part Number for Models: 4RC26 & 4XZ18	4RC27 & 4XZ19	4RC28 & 4XZ23	4RC29 & 4XZ24	4XZ20	4XZ21	4XZ22	4XZ25	4XZ26	4XZ27	Qty.
1	Motor body 1 PH	5340-002-00	5350-002-00	5340-002-00	5350-002-00	–	–	–	–	–	–	1
	3 PH	5341-002-00	5351-002-00	5341-002-00	5351-002-00	5360-002-00	5370-002-00	5371-002-00	5360-002-00	5370-002-00	5371-002-00	
2	Box cover	5340-350-00	5340-350-00	5340-350-00	5340-350-00	5340-350-00	5340-350-00	5340-350-00	5340-350-00	5340-350-00	5340-350-00	1
3	Machine screw	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	* #10-32x1/4"	1
4	Machine screw	* #12-24x3/4"	* 1/4-20x1"	* M5x0.8x25mm	* 1/4-20x1"	* #12-24x5"	* #12-24x6¼	* #12-24x6¼	* #12-24x5"	* #12-24x6¼	* #12-24x6¼	3
5 †	Drive shaft	340-140-00	5350-140-00	5380-140-00	5390-140-00	5360-140-00	5370-140-00	5370-140-00	5400-140-00	5410-140-00	5410-140-00	1
6 ▲	Ball bearing	*10x30x9	*15x35x11	*10x30x9	*15x35x11	* 15x35x11	* 15x35x11	* 15x35x11	* 15x35x11	* 15x35x11	* 15x35x11	1
7 ▲	Ball bearing	*12x32x10	*15x35x11	*12x32x10	*15x35x11	* 17x40x12	* 17x40x12	* 17x40x12	* 17x40x12	* 20x47x14	* 20x47x14	1
8	Shaft seal	5340-300-00	5350-160-00	–	–	5360-160-00	5360-160-00	5360-160-00	–	–	–	1
9	Machine screw	–	* #12-24x3/8"	–	–	* #12-24x3/8"	* #12-24x3/8"	* #12-24x3/8"	* #12-24x3/8"	* #12-24x3/8"	* #12-24x3/8"	2
10	Retainer tabs	–	5350-090-00	–	–	5350-090-00	5350-090-00	5350-090-00	5350-090-00	5350-090-00	5350-090-00	2
11	Pump body	5340-001-00	5350-001-00	5380-001-00	5390-001-00	5360-001-00	5370-001-00	5370-001-00	5400-001-00	5410-001-00	5410-001-00	1
12	Impeller	5340-010-00	5350-010-00	5340-010-00	5350-010-00	5360-010-00	5370-010-00	5371-010-00	5360-010-00	5370-010-00	5371-010-00	1
13	Impeller washer	5340-400-00	5350-400-00	5340-400-00	5350-400-00	5350-400-00	5350-400-00	5350-400-00	5350-400-00	5350-400-00	5350-400-00	1
14	Impeller screw	* #10-32x3/8"	* #12-24x1/2"	* #10-32x3/8"	* #12-24x1/2"	* #12-24x1/2"	* #12-24x1/2"	* #12-24x1/2"	* #12-24x1/2"	* #12-24x1/2"	* #12-24x1/2"	1
15	Cover seal	5340-301-00	5340-301-00	–	–	5360-301-00	5370-301-00	5370-301-00	–	–	–	1
16	Cover	5340-020-00	5350-020-00	5380-020-00	5390-020-00	5360-020-00	5370-020-00	5370-020-00	5400-020-00	5410-020-00	5410-020-00	1
17	Cover screw	* #12-24x3/8"	* #12-24x1/2"	–	–	* #12-24x5/8"	* #12-24x5/8"	* #12-24x5/8"	–	–	–	6
		–	–	* #10-32x3/4"	* #12-24x1"	–	–	–	* #12-24x1¼"	* #12-24x1¼"	* #12-24x1¼"	3
18	Lock washer	* #12	* #12	–	–	* #12	* #12	* #12	–	–	–	6
19	Fan	–	–	–	–	5360-120-00	5360-120-00	5360-120-00	5360-120-00	5360-120-00	5360-120-00	1
20	Fan cover	–	–	–	–	5360-121-00	5360-121-00	5360-121-00	5360-121-00	5360-121-00	5360-121-00	1

(*) Standard hardware item – available locally.
(†) Includes 2 bearings (Ref. Nos. 6 & 7).
(▲) ID x OD x width (mm).

Dimensions Millimeters (Inches)



Screw/Knob Version



Fixed Cap/Tamper Resistant Version

THIRD-ANGLE PROJECTION

Ordering Information

RDH101	5	50		–		–		
10 Size Direct Acting Relief Valve	Adjustment Style	Pressure Range	Seals		Optional Pressure Setting		Body Material	Port Size

Code	Adjustment Style / Kit No.
F	Fixed style, preset at factory.
K	Knob Adjust (717784-10)
S	Screw Adjust
T	Tamper Resistant Cap (718083)

Code	Pressure Range
10	6.9 - 69 Bar (100 - 1000 PSI) Standard Setting: 34.5 Bar (500 PSI) @ crack pressure, approximately 100 cc/min (6.1 in³/min)
20	6.9 - 138 Bar (100 - 2000 PSI) Standard Setting: 69 Bar (1000 PSI) @ crack pressure, approximately 100 cc/min (6.1 in³/min)
30	13.8 - 207 Bar (200 - 3000 PSI) Standard Setting: 103.5 Bar (1500 PSI) @ crack pressure, approximately 100 cc/min (6.1 in³/min)
50	13.8 - 345 Bar (200 - 5000 PSI) Standard Setting: 172.4 Bar (2500 PSI) @ crack pressure, approximately 100 cc/min (6.1 in³/min)

Code	Seals / Kit No.
Omit	"D"-Ring / (SK10-2)
N	Nitrile / (SK10-2N)
V	Fluorocarbon / (SK10-2V)

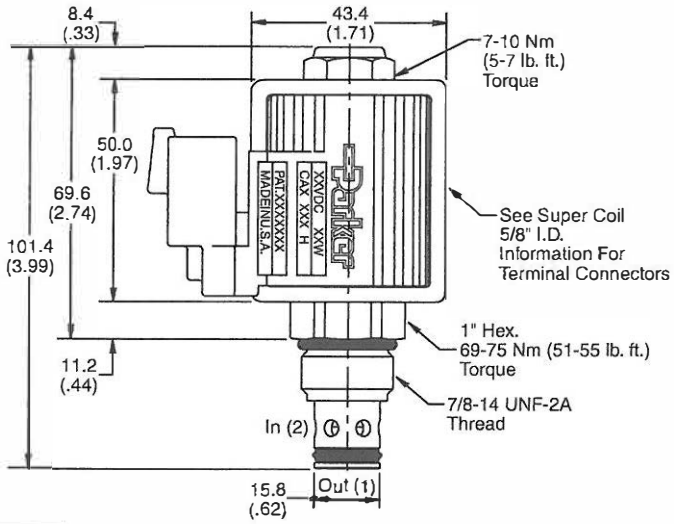
Optional Pressure Setting
Pressure ÷ 10 i.e. 235 = 2350 PSI (Omit if standard setting is used) Setting Range: 100 to 5000 PSI All settings at crack pressure, approximately 100 cc/min (6.1 in³/min)

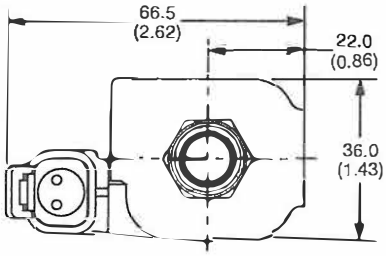
Code	Body Material
Omit	Steel
A	Aluminum

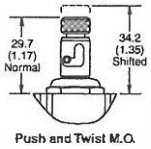
Code	Port Size	Body Part No.
Omit	Cartridge Only	
6T	SAE-6	(810-2-*6T)
8T	SAE-8	(810-2-*8T)

** Add "A" for aluminum, omit for steel.*

Dimensions Millimeters (Inches)







Ordering Information

DSH102	C				U	A120	D		–		?
10 Size Solenoid Valve	Style	Override Option	Seals	Screen	Coil Type	Coil Voltage	Coil Termination	Diode		Body Material	Port Size

Code / Style	
C	Normally Closed
N	Normally Open

Code	Override Options
Omit	None
T	Push & Twist (N.C. & N.O.)

Code	Seals / Kit No.
Omit	"D"-Ring / (SK10-2)
N	Nitrile / (SK10-2N)
V	Fluorocarbon / (SK10-2V)

Code	Screen
Omit	None
S	Screen

Code	Coil Type
Omit	Without Coil
SP*	Super Coil - 28 Watts
U	Unicoil - 20 Watts

**Recommended*

Code	Coil Voltage
Omit	Without Coil
D012	12 VDC
D024	24 VDC
A120	120/110 VAC, 60/50 Hz
A240	240/220 VAC, 60/50 Hz

SP* Coil	Coil Termination	U Coil
Omit	Without Coil	Omit
C	Conduit With Leads	C
D	DIN Plug Face	D
A	Amp Jr. Timer†	–
S	Dual Spade†	–
W	Dual Screw†	–
L	Dual Lead Wire†	W
H	Molded Deutsch†	–

**Recommended*
†DC Only

Code	Diode
Omit	None
R	Diode

Code	Body Material
Omit	Steel
A	Aluminum

Code	Port Size	Body Part No.
Omit	Cartridge Only	
4P	1/4" NPTF	(B10-2-*4P)
6P	3/8" NPTF	(B10-2-*6P)
8P	1/2" NPTF	(B10-2-*8P)
6T	SAE-6	(B10-2-*6T)
T6T	SAE-6	(B10-2-T6T)†
8T	SAE-8	(B10-2-*8T)
T8T	SAE-8	(B10-2-T8T)†
6B	3/8" BSPG	(B10-2-6B)†

** Add "A" for aluminum, omit for steel.*
† Steel body only.