



BESSE-MATIC

**MULTI-SPADE-13/14/16
W/LSC SIDE SHIFTER**



**Operation/Maintenance Manual
466362F0504US**

December 2005 • US\$250

 **World Headquarters**

801 Johnson St. • Alpena, Michigan, 49707 • U.S.A.
Phone (989) 354-4111



COMPANY NAME:

SERIAL NUMBER:

ASSEMBLY NUMBER:

WIRING DIAGRAM NUMBER:

INSTALLATION DRAWING NUMBER:



BESSER-MATIC MS-13/14/16

TABLE OF CONTENTS

TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF ILLUSTRATIONS	iv
BESSER-MATIC MS-13 SPECIFICATIONS	v
BESSER-MATIC MS-14 SPECIFICATIONS	vii
BESSER-MATIC MS-16 SPECIFICATIONS	ix
SAFETY BULLETIN	xi
SAFETY SIGNS	xii
OVERALL DIMENSIONS	xvi
SECTION 1 MACHINE DESCRIPTION	1-1
1.1 HOW A BESSER-MATIC MULTI-SPADE WORKS.....	1-1
1.2 MULTI-SPADE ASSEMBLY (RIGHT HAND SYSTEM SHOWN).....	1-2
1.3 SIDE SHIFTER AND RACKVEYOR (RIGHT HAND SYSTEM SHOWN).....	1-3
1.4 CONVEYORS (RIGHT HAND SYSTEM SHOWN).....	1-4
SECTION 2 MACHINE INITIAL SET-UP	2-1
2.1 LOADER SIDE.....	2-1
2.2 UNLOADER SIDE.....	2-9
2.3 RACKVEYOR AND SIDE SHIFTER (LOADER SIDE).....	2-17
2.4 RACKVEYOR AND SIDE SHIFTER (UNLOADER SIDE).....	2-19
SECTION 3 GRAPHIC CONTROL STATION	3-1
3.1 MANUAL CONTROLS.....	3-1
3.2 PROGRAMMING KEYS.....	3-3
3.3 MAIN MENU.....	3-4
3.4 SELECTION SCREEN.....	3-5
3.5 AUTOMATIC SCREEN.....	3-8
3.6 MANUAL CONTROL SCREENS.....	3-14
3.7 FAULT SCREENS.....	3-20
3.8 INPUT/OUTPUT STATUS.....	3-22
3.9 TIMER ADJUSTMENT.....	3-23
3.10 PRODUCTION REPORT.....	3-24
3.11 DATA TABLE ACCESS.....	3-25
3.12 COUNTER ACCESS.....	3-34
3.13 BESSER-MATIC SETUP SCREEN.....	3-35
3.14 INTRANET LINK.....	3-36
SECTION 4 OPERATING THE MACHINE	4-1
4.1 OPERATING IN AUTOMATIC MODE.....	4-1
4.2 OPERATING IN MANUAL MODE.....	4-1



SECTION 5 MAINTENANCE..... 5-1

- 5.1 BALL JAC MAINTENANCE 5-1
- 5.2 DODGE GEAR BOXES 5-5
- 5.3 CONE DRIVE GEAR BOXES (2 TURN GEAR MOTORS ON SPADE) 5-6
- 5.4 TORQUE LIMITER 5-7
- 5.5 BESCOSHEAR BRAKES 5-8
- 5.6 DAILY SERVICE SCHEDULE 5-11
- 5.7 WEEKLY SERVICE SCHEDULE 5-12
- 5.8 MONTHLY SERVICE SCHEDULE 5-14
- 5.9 QUARTERLY SERVICE SCHEDULE 5-15
- 5.10 LUBRICANT SPECIFICATIONS 5-15

SECTION 6 TROUBLESHOOTING 6-1

- 6.1 LOADER/UNLOADER SPADE FAULT SCREEN 6-1
- 6.2 POSSIBLE MECHANICAL FAULT 6-2

APPENDIX A ELECTRICAL A-1



BESSER-MATIC MS-13/14/16

LIST OF TABLES

SECTION 5 MAINTENANCE	5-1
Table 5.1 BALL JAC LUBRICANTS.....	5-2
Table 5.2 BALL JAC TROUBLESHOOTING CHART.....	5-4
Table 5.3 TIGEAR LUBRICATION AMOUNTS	5-5
Table 5.4 QUANTIS LUBRICANT RECOMMENDATIONS	5-5
Table 5.5 BESCOSHEAR BRAKES TROUBLESHOOTING CHART.....	5-10



BESSER-MATIC MS-13/14/16

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS	i
Figure A. BESSER-MATIC MS-13/14/16 DIMENSIONS	xvi
Figure B. OPERATOR ORIENTATION	xvii
SECTION 1 MACHINE DESCRIPTION	1-1
Figure 1.1 MULTIPLE-SPADE ASSEMBLY	1-2
Figure 1.2 SIDE SHIFTER AND RACKVEYOR.....	1-3
Figure 1.3 CONVEYORS.....	1-4
SECTION 2 MACHINE INITIAL SET-UP	2-1
Figure 2.1 PROXIMITY SWITCH PRS-2A.....	2-1
Figure 2.2 PROXIMITY SWITCH PRS-28	2-1
Figure 2.3 LIMIT SWITCH PRS-1 WITHOUT GENEVA DRIVE.....	2-2
Figure 2.4 LIMIT SWITCH LS-55.....	2-2
Figure 2.5 LIMIT SWITCH PRS-1 WITH GENEVA DRIVE	2-2
Figure 2.6 FRAME ACTUATORS ON LOADING SIDE (VIEWED FROM ABOVE).....	2-3
Figure 2.7 GENEVA DRIVE ADJUSTMENT	2-4
Figure 2.8 TURN SWITCHES.....	2-5
Figure 2.9 STABILIZER SWITCHES	2-5
Figure 2.10 MULTIPLE LIMIT SWITCH (MLS).....	2-6
Figure 2.11 CAM CONFIGURATION (APPROXIMATE).....	2-6
Figure 2.12 SWITCH PRS -22 ADJUSTMENT.....	2-7
Figure 2.13 SWITCH PRS -12 ADJUSTMENT.....	2-7
Figure 2.14 SWITCH PRS -13 ADJUSTMENT.....	2-8
Figure 2.15 SWITCH PRS -23 ADJUSTMENT.....	2-8
Figure 2.16 PRS-42 AND PRS-43.....	2-9
Figure 2.17 ROLLOVER SWITCHES	2-10
Figure 2.18 FRAME ACTUATORS ON UNLOADING SIDE (VIEWED FROM ABOVE).....	2-11
Figure 2.19 TURN SWITCHES.....	2-12
Figure 2.20 STABILIZER SWITCHES	2-12
Figure 2.21 MULTIPLE LIMIT SWITCH (MLS).....	2-13
Figure 2.22 CAM BOX CONFIGURATION (APPROXIMATE)	2-13
Figure 2.23 SWITCH PRS -24 ADJUSTMENT.....	2-14
Figure 2.24 SWITCH PRS -31 ADJUSTMENT.....	2-14
Figure 2.25 SWITCH PRS -35 ADJUSTMENT.....	2-15
Figure 2.26 SWITCH PRS -32 ADJUSTMENT.....	2-15
Figure 2.27 SWITCH PER-68.....	2-16
Figure 2.28 ROLLER GUIDES.....	2-17
Figure 2.29 RACKVEYOR AND SIDE SHIFTER SWITCHES	2-18
Figure 2.30 RACKVEYOR	2-18
Figure 2.31 SIDE SHIFTER.....	2-20
SECTION 5 MAINTENANCE	5-1
Figure 5.1 EXPLODED VIEW OF A TYPICAL ASSEMBLY (VIEWS ARE ILLUSTRATIVE ONLY)	5-1
Figure 5.2 TORQUE LIMITER (Not used on all systems)	5-7
Figure 5.3 LUBRICATION.....	5-8
Figure 5.4 TEST SET-UP ELECTRICAL SCHEMATIC.....	5-9



BESSER-MATIC MS-13 SPECIFICATIONS

TOTAL WEIGHT: 27,198 Lbs [10976 Kg]

APPROXIMATE WEIGHT OF EACH COMPONENT:

Accumulators (2):	2500 Lbs [1134 Kg] each
Frame:	2000 Lbs [900 Kg]
Unloading conveyors (3):	1250 Lbs [568 Kg] each
Front delivery conveyors (2)	1250 Lbs [568 Kg] each
Loaders / Unloaders (2)	3000 Lbs [1364 Kg] each
Pallet return conveyors (2)	500 Lbs [227 Kg] each
Rackveyor total	5050 Lbs [2295 Kg]
Side shifter:	2250 Lbs [1021 Kg]
Front section:	1000 Lbs [455 Kg]
Center section:	1800 Lbs [818 Kg]
Panel assembly:	1400 Lbs [635 Kg]
Graphic control station:	325 Lbs [148 Kg]
Items shipped loose:	3000 Lbs [1361 Kg]

MINIMUM HYDRAULIC PRESSURE: 850 psi [58 bar]

MACHINE SPEED: Up to 10 cycles per minute

PRODUCTION CAPACITY: Up to 11 pallets high with 26" X 18 1/2" [660mm X 470mm] pallets
3000 lbs. maximum Accumulator load
Other pallet heights and pallet sizes available and will vary from customer to customer.

OPERATING CONDITIONS:

Besser machinery and equipment is designed to comply with the essential health and safety regulations (EHSR) that apply to directives which are applicable to an industrial environment.

Buyer shall utilize this equipment in a manner consistent with its design and only in an industrial environment.

OPERATING RANGES:

Here are the normal operating ranges for machine sensors (limit, proximity) and control devices contained within the control panels.

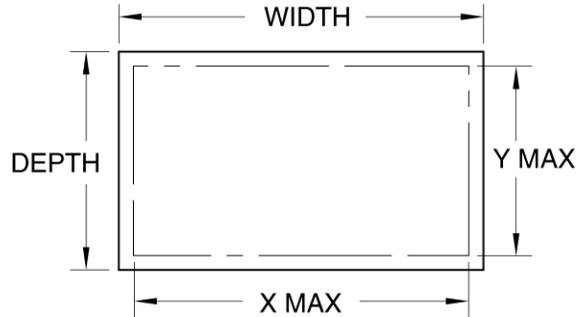
Ambient operating temperature range: 32° to 131°F [0° to 55°C]

Humidity range: 5 to 95% (non-condensing)

Line voltage: 85 to 132 Volts - AC 50/60 Hz



PALLET REQUIREMENTS:



WIDTH & DEPTH = Actual size of steel pallet.

XMAX & YMAX = Maximum production area of steel pallet.

WIDTH	DEPTH	THICK.	X	Y	PALLET NO.
26.0" [660mm]	18.50" [470mm]	.313" [8.0mm]	25.0" [635mm]	17.50" [445mm]	470750F0001
26.0" [660mm]	20.50" [521mm]	.313" [8.0mm]	25.0" [635mm]	19.50" [495mm]	470750F0002
26.0" [660mm]	26.00" [660mm]	.313" [8.0mm]	25.0" [635mm]	25.0" [635mm]	470750F0003
29.0" [737mm]	18.50" [470mm]	.313" [8.0mm]	28.0" [711mm]	17.50" [445mm]	470750F0004
29.0" [737mm]	20.50" [521mm]	.313" [8.0mm]	28.0" [711mm]	19.50" [495mm]	470750F0005

Table A. BESSER-MATIC MS-13 STEEL PALLET SPECIFICATIONS



BESSER-MATIC MS-14 SPECIFICATIONS

TOTAL WEIGHT: 49,475 Lbs [22488 Kg]

APPROXIMATE WEIGHT OF EACH COMPONENT:

Accumulators (2):	3600 Lbs [1636 Kg] each
Frame:	2500 Lbs [1136 Kg]
Unloading conveyors (3):	1650 Lbs [750 Kg] each
Front delivery conveyors (2)	1500 Lbs [682 Kg] each
Loaders / Unloaders (2)	4500 Lbs [2045 Kg] each
Pallet return conveyors (2)	925 Lbs [420 Kg] each
Rackveyor total	15 860 Lbs [7209 Kg]
Rackveyor front section:	2760 Lbs [1255 Kg]
Rack indexer:	4600 Lbs [2091 Kg]
Side shifter:	8500 Lbs [3864 Kg]
Panel assembly:	1400 Lbs [635 Kg]
Graphic control station:	420 Lbs [191 Kg]
Items shipped loose:	3500 Lbs [1591 Kg]

MINIMUM HYDRAULIC PRESSURE: 850 psi [58 bar]

MACHINE SPEED: Up to 10 cycles per minute

PRODUCTION CAPACITY: Up to 11 pallets high with 38 1/2" X 18 1/2" [978mm X 470mm] pallets
6000 lbs. maximum Accumulator load
Other pallet heights and pallet sizes available and will vary from customer to customer.

OPERATING CONDITIONS:

Besser machinery and equipment is designed to comply with the essential health and safety regulations (EHSR) that apply to directives which are applicable to an industrial environment.

Buyer shall utilize this equipment in a manner consistent with its design and only in an industrial environment.

OPERATING RANGES:

Here are the normal operating ranges for machine sensors (limit, proximity) and control devices contained within the control panels.

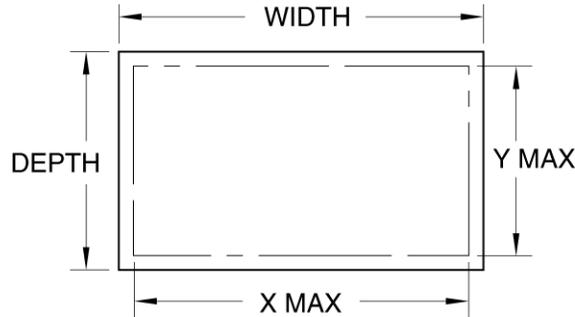
Ambient operating temperature range: 32° to 131°F [0° to 55°C]

Humidity range: 5 to 95% (non-condensing)

Line voltage: 85 to 132 Volts - AC 50/60 Hz



PALLET REQUIREMENTS:



WIDTH & DEPTH = Actual size of steel pallet.

XMAX & YMAX = Maximum production area of steel pallet.

WIDTH	DEPTH	THICK.	X	Y	PALLET NO.
37.0" [940mm]	21.654" [550mm]	.315" [8mm]	36.0" [914mm]	20.654" [525mm]	470750F0007
37.0" [940mm]	18.500" [470mm]	.375" [10mm]	36.0" [914mm]	17.500" [445mm]	470750F0008
37.0" [940mm]	20.500" [521mm]	.375" [10mm]	36.0" [914mm]	19.500" [495mm]	470750F0009
37.0" [940mm]	26.000" [660mm]	.375" [10mm]	36.0" [914mm]	25.000" [635mm]	470750F0010
37.5" [953mm]	18.500" [470mm]	.375" [10mm]	36.5" [927mm]	17.500" [445mm]	470750F0011
38.5" [978mm]	18.500" [470mm]	.375" [10mm]	37.5" [953mm]	17.500" [445mm]	470750F0012
38.5" [978mm]	20.500" [521mm]	.375" [10mm]	37.5" [953mm]	19.500" [495mm]	470750F0013
38.5" [978mm]	26.000" [660mm]	.375" [10mm]	37.5" [953mm]	25.000" [635mm]	470750F0014
39.375" [1000mm]	18.500" [470mm]	.375" [10mm]	38.375" [975mm]	17.500" [445mm]	470750F0015
39.375" [1000mm]	20.500" [521mm]	.375" [10mm]	38.375" [975mm]	19.500" [495mm]	470750F0016
39.375" [1000mm]	25.984" [660mm]	.437" [11mm]	38.375" [975mm]	24.984" [635mm]	470750F0018

Table B. BESSER-MATIC MS-14 STEEL PALLET SPECIFICATIONS



BESSER-MATIC MS-16 SPECIFICATIONS

TOTAL WEIGHT: 66,350 Lbs [30,160 Kg]

APPROXIMATE WEIGHT OF EACH COMPONENT:

Accumulators (2):	7000 Lbs [3175 Kg] each
Frame:	10,000 Lbs [4536 Kg]
Unloading conveyors (3):	4000 Lbs [568 Kg] each
Front delivery conveyors (2)	2500 Lbs [1814 Kg] each
Loaders / Unloaders (2)	11,000 Lbs [4990 Kg] each
Pallet return conveyors (2)	1500 Lbs [680 Kg] each
Rack conveyor	
Front section:	2500 Lbs [1134 Kg]
Indexer:	6500 Lbs [2948 Kg]
Side shifter:	10,000 Lbs [4536 Kg]
Panel assembly:	1400 Lbs [635 Kg]
Graphic control station:	250 Lbs [113 Kg]
Hydraulic power unit:	1500 Lbs [680 Kg]
Items shipped loose:	5000 Lbs [2268 Kg]
Pallet rollover:	3000Lbs [1361Kg]

MINIMUM HYDRAULIC PRESSURE: 850 psi [58 bar]

MACHINE SPEED: Up to 10 cycles per minute

PRODUCTION CAPACITY: Up to 10 pallets high with 52" or 55" or 57" X 18 ½ or 20 ½"
[1321mm or 1397mm or 1448mm X 470mm or 521mm] pallets
10,000 lbs. maximum Accumulator load

OPERATING CONDITIONS:

Besser machinery and equipment is designed to comply with the essential health and safety regulations (EHSR) that apply to directives which are applicable to an industrial environment.

Buyer shall utilize this equipment in a manner consistent with its design and only in an industrial environment.

OPERATING RANGES:

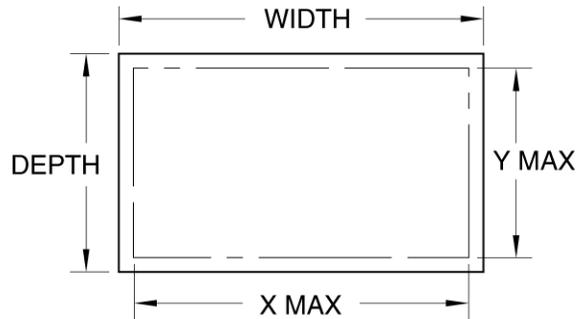
Here are the normal operating ranges for machine sensors (limit, proximity) and control devices contained within the control panels.

Ambient operating temperature range: 32° to 131°F [0° to 55°C]

Humidity range: 5 to 95% (non-condensing)

Line voltage: 85 to 132 Volts - AC 50/60 Hz

PALLET REQUIREMENTS:



WIDTH & DEPTH = Actual size of steel pallet.

XMAX & YMAX = Maximum production area of steel pallet.

WIDTH	DEPTH	THICK.	X	Y	PALLET NO.
52.0" [1321mm]	18.5" [470mm]	.625" [16mm]	51.0" [1295mm]	17.5" [445mm]	470750F0021
52.0" [1321mm]	19.5" [495mm]	.625" [16mm]	51.0" [1295mm]	18.5" [470mm]	470750F0022
52.0" [1321mm]	20.5" [521mm]	.625" [16mm]	51.0" [1295mm]	19.5" [495mm]	470750F0023
55.0" [1397mm]	18.5" [470mm]	.625" [16mm]	54.0" [1372mm]	17.5" [445mm]	470750F0024
55.0" [1397mm]	20.5" [521mm]	.625" [16mm]	54.0" [1372mm]	19.5" [495mm]	470750F0025
52.0" [1321mm]	18.5" [470mm]	.625" [16mm]	51.0" [1295mm]	17.5" [445mm]	470750F0027
52.0" [1321mm]	20.5" [521mm]	.625" [16mm]	51.0" [1295mm]	19.5" [495mm]	470750F0028
55.0" [1397mm]	18.5" [470mm]	.625" [16mm]	54.0" [1372mm]	17.5" [445mm]	470750F0029
55.0" [1397mm]	20.5" [521mm]	.625" [16mm]	54.0" [1372mm]	19.5" [495mm]	470750F0030

Table C. BESSER-MATIC MS-16 STEEL PALLET SPECIFICATIONS

SAFETY BULLETIN

This notice is issued to advise you that some previously accepted shop practices may not be keeping up with changing Federal and State Safety and Health Standards. Your current shop practices may not emphasize the need for proper precautions to insure safe operation and use of machines, tools, automatic loaders and allied equipment and/or warn against the use of certain solvents or other cleaning substances that are now considered unsafe or prohibited by law. Since many of your shop practices may not reflect current safety practices and procedures, particularly with regard to the safe operation of equipment, it is important that you review your practices to ensure compliance with Federal and State Safety and Health Standards.

IMPORTANT

The operation of any machine or power-operated device can be extremely hazardous unless proper safety precautions are strictly observed. Observe the following safety precautions:

-  Always be sure proper guarding is in place for all pinch, catch, shear, crush and nip points.
-  Always make sure that all personnel are clear of the equipment before starting it.
-  Always be sure the equipment is properly grounded.
-  Always turn the main electrical panel off and lock it out in accordance with published lockout/tag-out procedures prior to making adjustments, repairs, and maintenance.
-  Always wear appropriate protective equipment like safety glasses, safety shoes, hearing protection and hard hats.
-  Always keep chemical and flammable material away from electrical or operating equipment.
-  Always maintain a safe work area that is free from slipping and tripping hazards.
-  Always be sure appropriate safety devices are used when providing maintenance and repairs to all equipment.
-  Never exceed the rated capacity of a machine or tool.
-  Never modify machinery in any way without prior written approval of the Besser Engineering Department.
-  Never operate equipment unless proper maintenance has been regularly performed.
-  Never operate any equipment if unusual or excessive noise or vibration occurs.
-  Never operate any equipment while any part of the body is in the proximity of potentially hazardous areas.
-  Never use any toxic flammable substance as a solvent cleaner.
-  Never allow the operation or repair of equipment by untrained personnel.
-  Never climb or stand on equipment when it is operational.

It is important that you review Federal and State Safety and Health Standards on a continual basis. All shop supervisors, maintenance personnel, machine operators, tool operators, and any other person involved in the setup, operation, maintenance, repair or adjustment of Besser-built equipment should read and understand this bulletin and Federal and State Safety and Health Standards on which this bulletin is based.



SAFETY SIGNS

Sign	Description	Required
1	All Panels	1
2	Mixer	4
3	Concrete Products Machine	1
	Depalleter	2
4	Mixer	2
5	Skiploader	4
6	Skiploader/Mixer Platforms	8
7	Skiploader/Mixer Platforms	8
8	Vertical: Pallet Transport System	2
	Horizontal: LSC-40A/LSC-100	6
	Pallet Transport System	4
9	Besser-Matic	4
10	Besser-Matic	4
11	Skiploader	4
12	All Panels	1
13	Overhead Block Transfer	4
14	Block Pusher	2
	Pallet Transfer System	4
15	Concrete Products Machine.....	2
16	Conveyors	12
17	Cuber	8
18	Cuber	3
	Block Turnovers	2
	Slat Conveyors	2

**To order safety decals, contact your local Besser representative
 or the Besser Central Order Department.**

Thank you!



1 **113258F0606**
Hazardous Voltage / Arc Flash
Width 6 inch
Height 6 inch



2 **113237F0410**
Mixer Blade Hazard
Width 4 1/2 inch
Height 10 1/4 inch



3 **Vertical: 113240F0307**
Crush Hazard
Width 3 1/2 inch
Height 7 1/2 inch
Horizontal: 113239F0604
Crush Hazard
Width 6 5/8 inch
Height 4 inch



4 **114692F1006**
Nip Points
Width 5 3/4 inch
Height 9 1/2 inch



5 **114688F0906**
Crush Hazard
Width 6 1/4 inch
Height 9 1/2 inch



6 **114689F0804**
Fall Hazard
Width 4 1/2 inch
Height 7 3/4 inch



7 **114690F0805**
 Falling Objects
 Width 4 3/4 inch
 Height 8 inch



8 **Vertical: 113244F0410**
 Crush Hazard
 Width 4 1/2 inch
 Height 10 inch
Horizontal: 113245F1005
 Crush Hazard
 Width 10 inch
 Height 5 3/4 inch



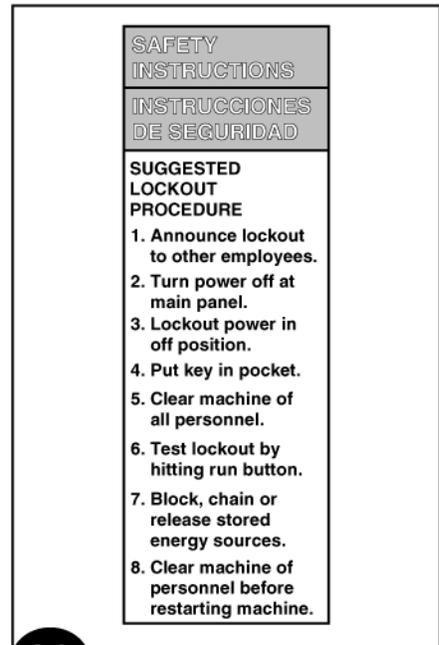
9 **113242F0409**
 Crush Hazard
 Width 4 1/2 inch
 Height 9 5/8 inch



10 **113243F0410**
 Falling Objects
 Width 4 1/2 inch
 Height 10 inch



11 **114691F1006**
 Shear and Fall Hazards
 Width 5 3/4 inch
 Height 9 3/4 inch



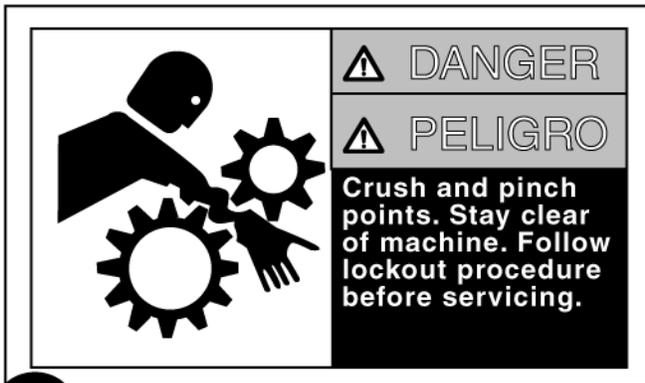
12 **1132490410**
 Safety Instructions Decal -
 Suggested Lock-out Procedure
 Width 4 inch
 Height 10 inch



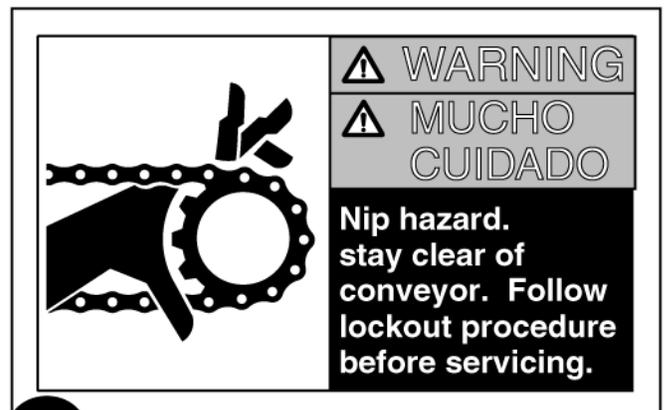
13 113238F1005
Crush Hazard
Width 10 inch
Height 5 3/4 inch



14 113248F1006
Crush Hazard
Width 10 inch
Height 6 inch



15 113241F0605
Crush and Pinch Points
Width 6 5/8 inch
Height 4 inch



16 113246F0704
Nip Hazard
Width 7 inch
Height 4 1/2 inch



17 113247F1006
Crush Hazard
Width 10 inch
Height 6 inch



18 113250F1006
Crush and Pinch Hazard
Width 10 inch
Height 6 inch

OVERALL DIMENSIONS

(ref. installation print #5):

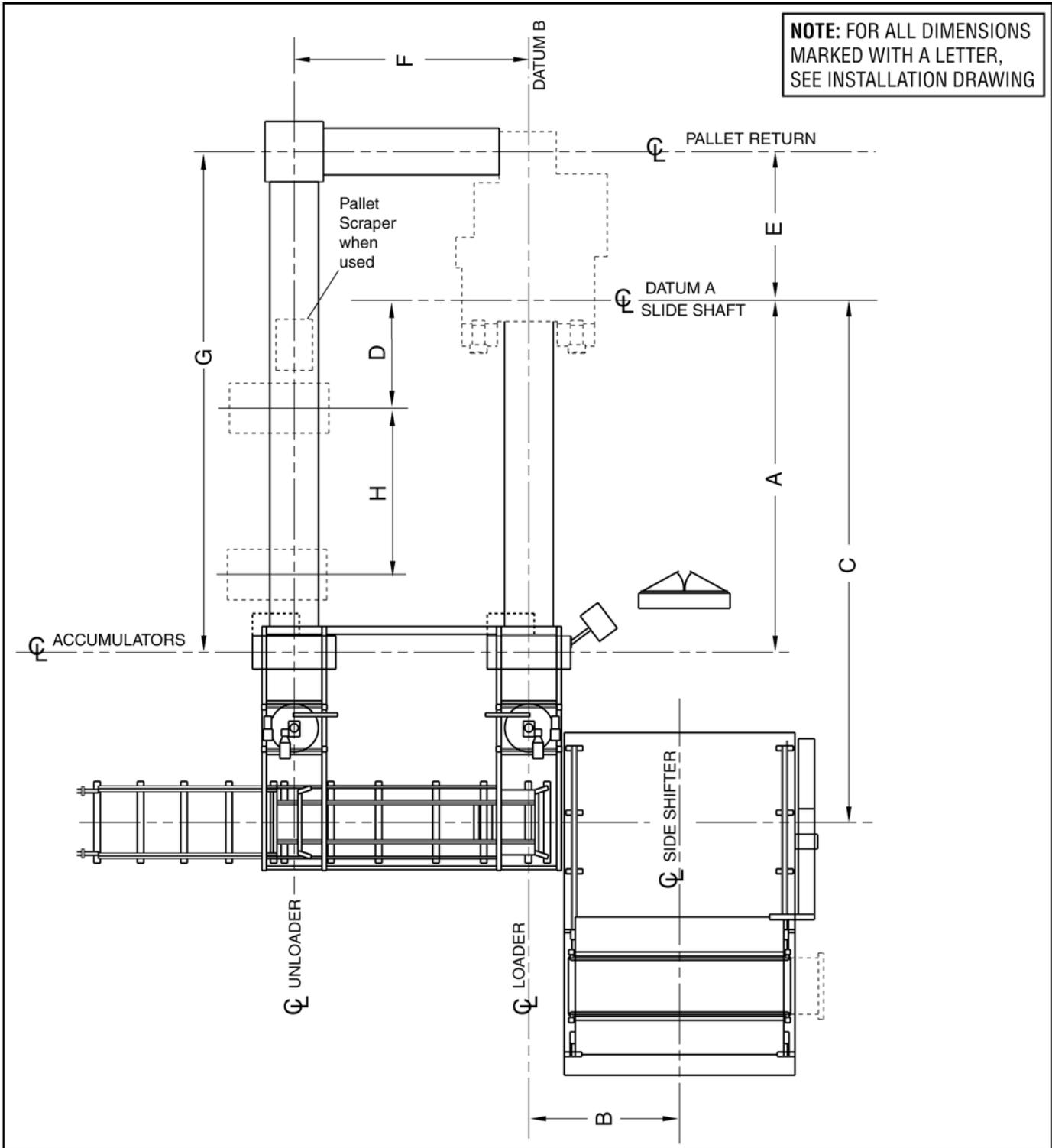


Figure A. BESSER-MATIC MS-13/14/16 DIMENSIONS

OPERATOR ORIENTATION:

Seen from behind, facing the Concrete Product Machine, the machine shown below is a right hand machine. This means the loading of new units is done from the right side. The sides loading and unloading, as mentioned throughout this manual, are as shown here.

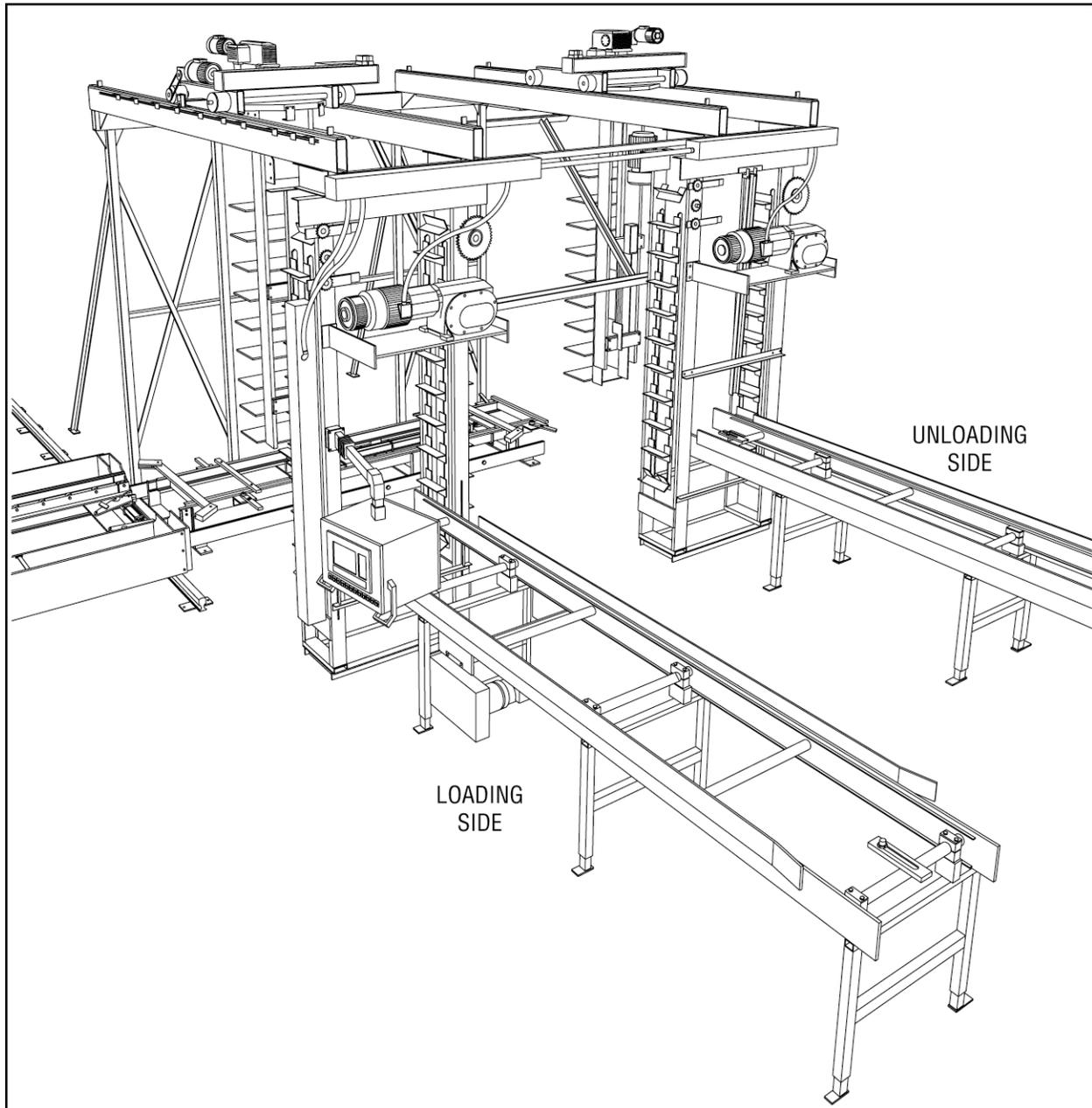


Figure B. OPERATOR ORIENTATION



SECTION 1 MACHINE DESCRIPTION

1.1 HOW A BESSER-MATIC MULTI-SPADE WORKS

The Besser-Matic Multi-Spade is extremely versatile. It is designed to fit into all plant layouts and can handle the output of all Besser concrete products machines. It is built solid with heavy duty components and the most current technology available.

The Besser-Matic gently loads and unloads concrete products onto and off of racks, automatically. The Besser-Matic handles paving stone, architectural units and solids as well as it handles standard units.

The machine is comprised of two separate accumulators each equipped with a spade loader or unloader. The loader accumulator of the Besser-Matic receives pallets of green units from the front delivery conveyor of the concrete products machine.

The spade loader moves in and elevates to pick up a load. Once the loader spade is full, the spade rotates 180 degrees and moves forward, gently depositing the pallets of green units into a rack. The spade then rotates 180 degrees and returns to the accumulator for another load of green concrete units.

Simultaneously, the spade unloader of the Besser-Matic retrieves cured pallets of units from the racks, rotates 180 degrees, travels forward and deposits the pallets into the unloader accumulator, which in turn sets the pallets one at a time onto the unloading conveyor.

When the loader and unloader spades have filled or emptied their respective bays, the rack conveyor indexes to the next bay or to the next rack.

1.2 MULTI-SPADE ASSEMBLY (RIGHT HAND SYSTEM SHOWN)

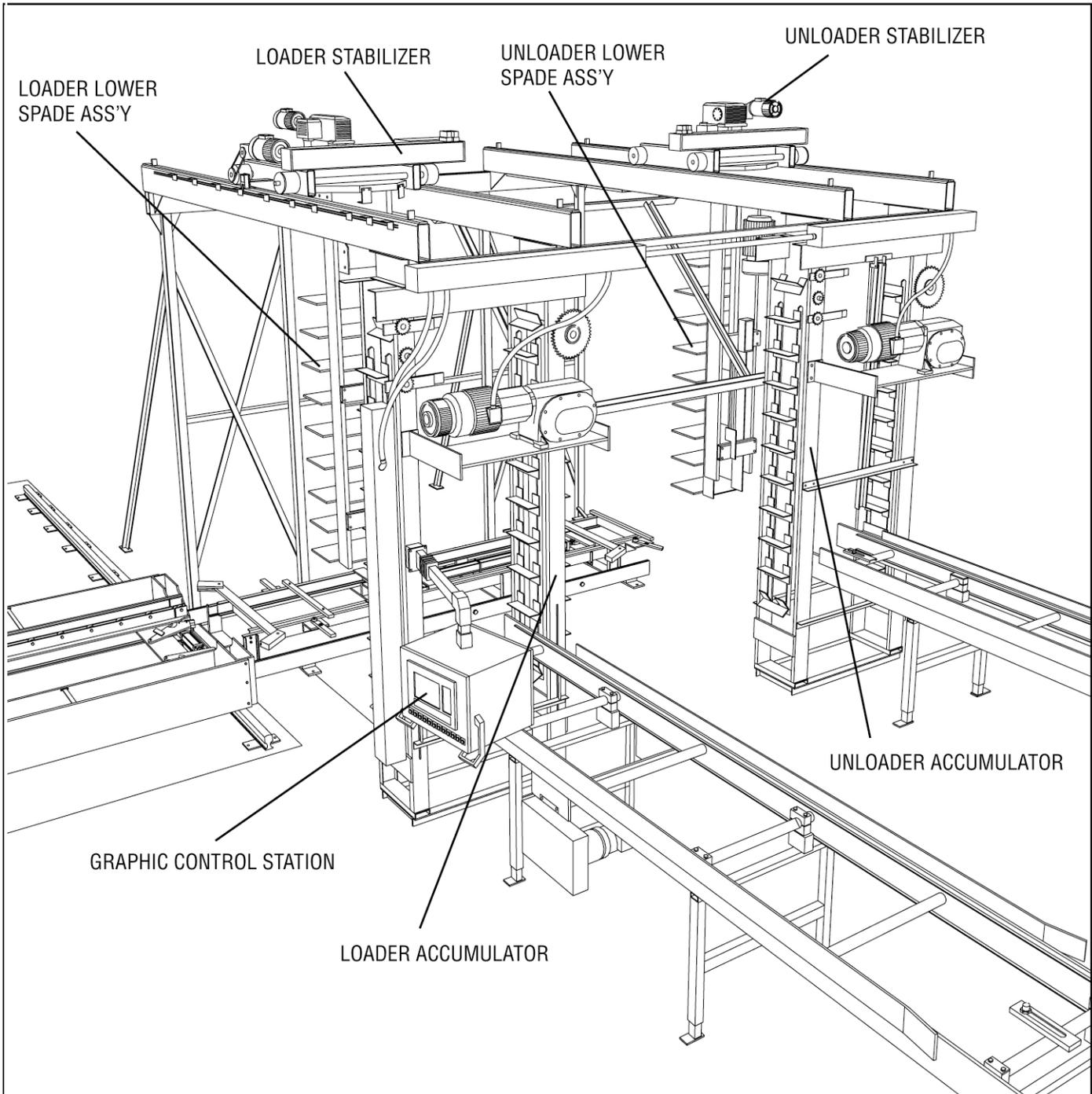


Figure 1.1 MULTIPLE-SPADE ASSEMBLY

1.3 SIDE SHIFTER AND RACKVEYOR (RIGHT HAND SYSTEM SHOWN)

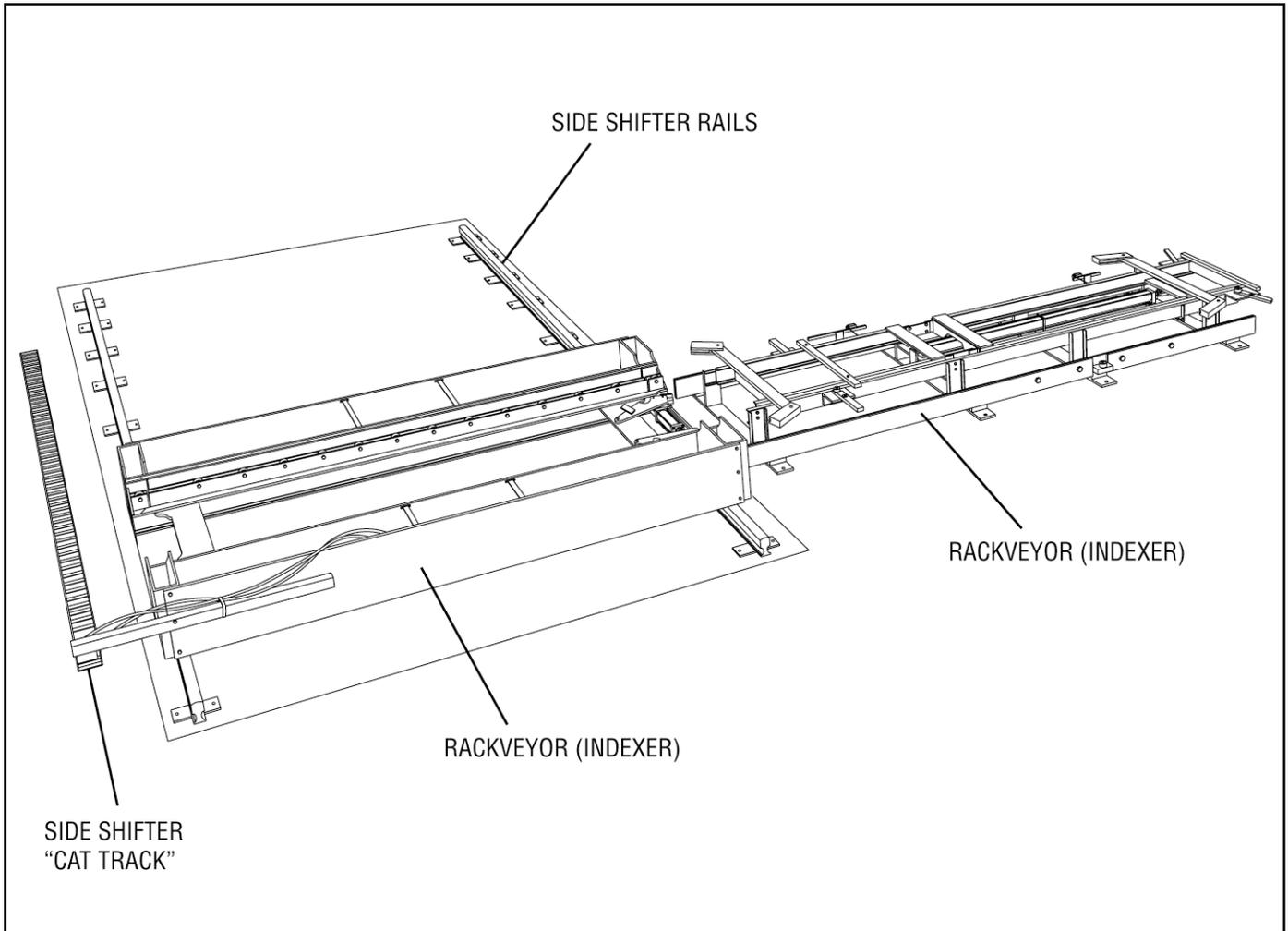


Figure 1.2 SIDE SHIFTER AND RACKVEYOR

1.4 CONVEYORS (RIGHT HAND SYSTEM SHOWN)

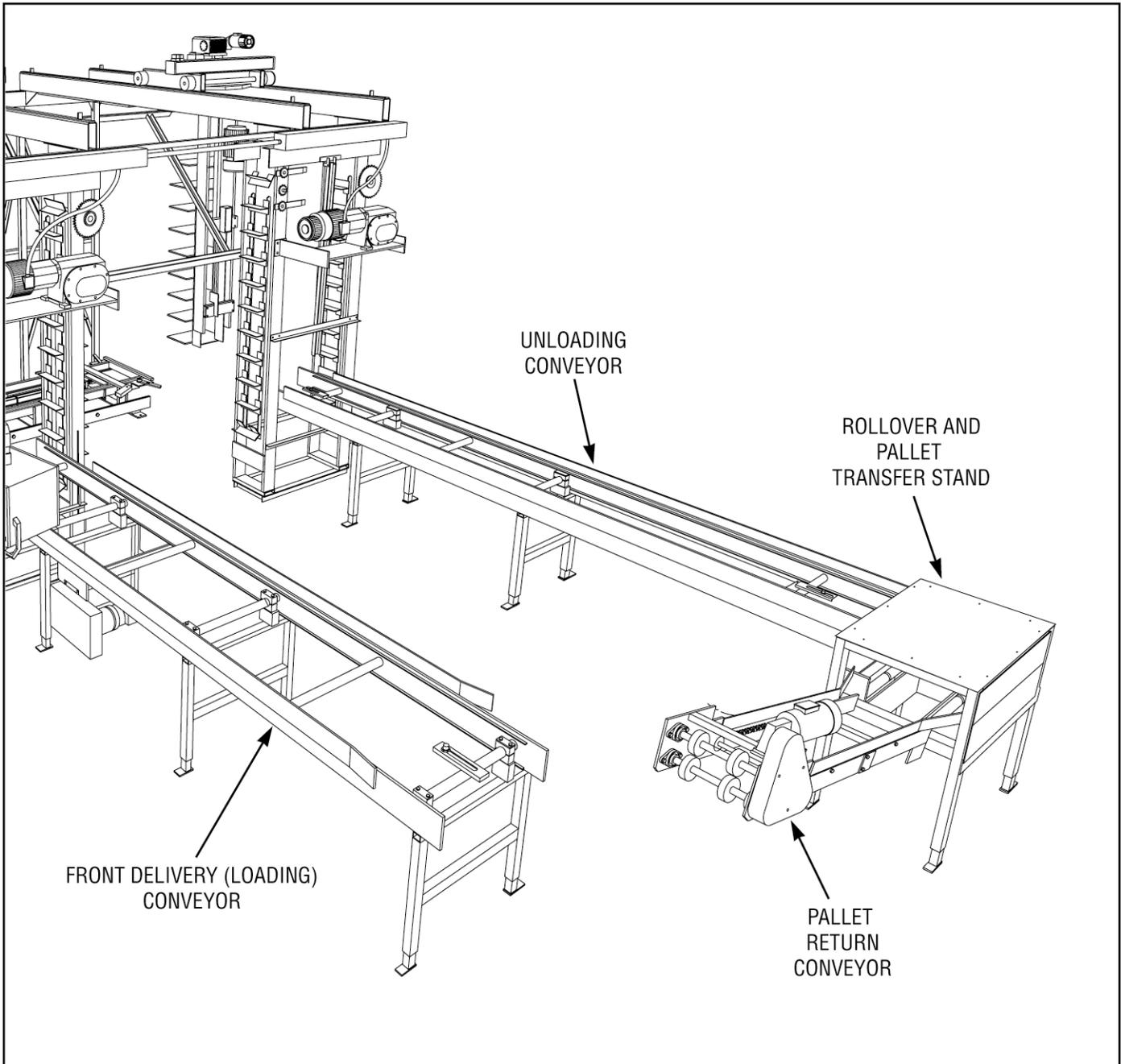


Figure 1.3 CONVEYORS

SECTION 2 MACHINE INITIAL SET-UP

This section explains how to set up the Besser-Matic Multi-Spade. It will take the operator step by step through the final adjustments on the machine. Follow this section carefully. If you are also installing a Rack Transporter System such as a LSC-75, you should follow instructions for both these systems simultaneously. Make sure the machine has been installed properly as shown in the installation manual.

2.1 LOADER SIDE

NOTE: All switches must be adjusted in manual mode (see section 4.2)

2.1.1 Front Delivery Conveyor Set-Up (Concrete Product Machine End)

1. Set delivery height of the front delivery conveyor (refer to sheet 6 of the Installation drawing).
2. Proximity switch (PRS-2A) should be adjusted 1/4" [6.3mm] below the bottom of pallet sitting on chain.

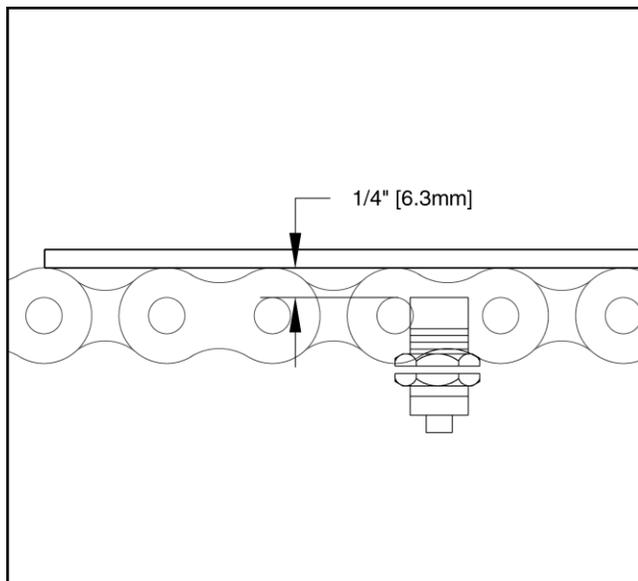


Figure 2.1 PROXIMITY SWITCH PRS-2A

2.1.2 Front Delivery Conveyor Set-Up (Accumulator End)

1. Switch (PRS-28) should be adjusted 1/4" [6.3mm] below the bottom of pallet. (Figure 2.2)
2. Switch must be adjusted so pallet is in pick-up position when switch is released.

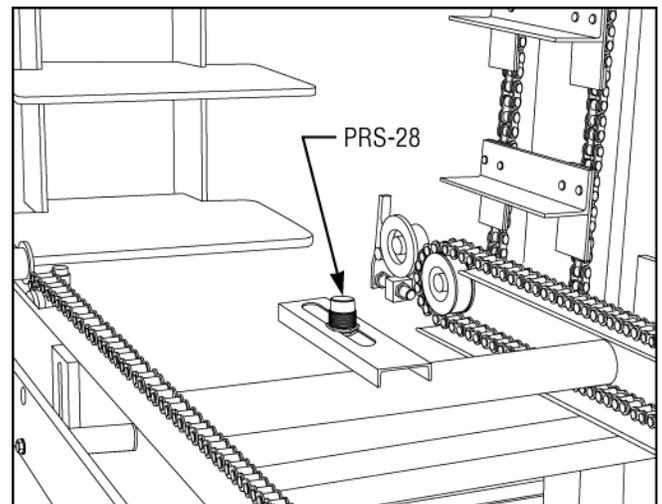


Figure 2.2 PROXIMITY SWITCH PRS-28

2.1.3 Position for Shelf Angle Home Switch on the Accumulator

PRS-1 is located on the side of the Accumulator and senses the shelf angle in order to stop the Accumulator just before it reaches the pallet.

1. Adjust PRS-1 switch so that shelf angle is stopped when top of angle is 1/4" [6.3mm] below bottom of pallet or as close as possible to provide smooth pallet pick-up. See Figure 2.3.
2. Run to next shelf angle to verify the position of the switch.



Figure 2.3 LIMIT SWITCH PRS-1 WITHOUT GENEVA DRIVE

2.1.4 Position for Full Load Switch on Accumulator

LS-55 is a safety switch on top of the Accumulator. It should be adjusted 2" [51mm] above the highest product on the top shelf.

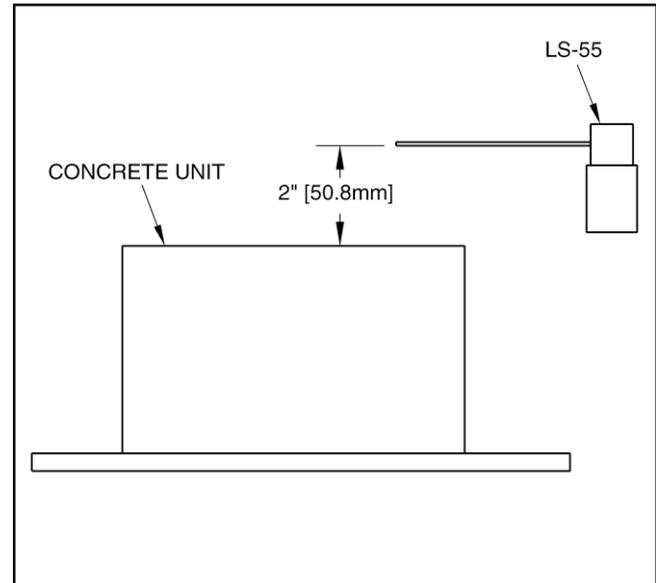


Figure 2.4 LIMIT SWITCH LS-55

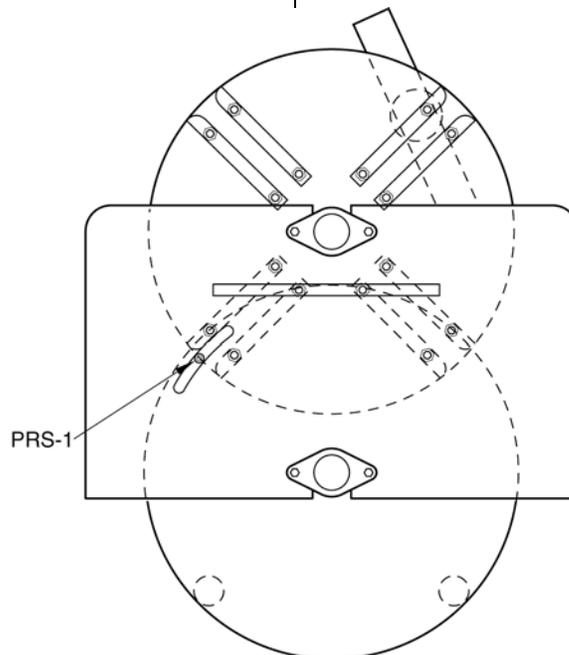


Figure 2.5 LIMIT SWITCH PRS-1 WITH GENEVA DRIVE

2.1.5 Location of Frame Actuators

Actuators on MS-13/14/16 frame are positioned along the track and will trip a switch located on the moving stabilizer. When this switch is tripped, the loading spade stops. It will stop once in the loader Accumulator, once at the entrance of the loader Accumulator, once at center and several times inside the rack. How many times it stops in the rack is dependent on your rack depth. For example, if you have a 4 pallet deep rack system, the loader spade will stop 4 times inside the rack. To adjust frame actuators, see Figure 2.6 and follow the steps.

1. Locate actuator for center-in/center-out.
2. Locate actuator to position pallet in rack (depends on how deep system is).
3. Set all actuators according to dimensions shown in Figure 2.6 and on frame drawing supplied.

NOTE: Final adjustments will have to be made when spade actually goes through its cycle (either on manual or automatic runs).

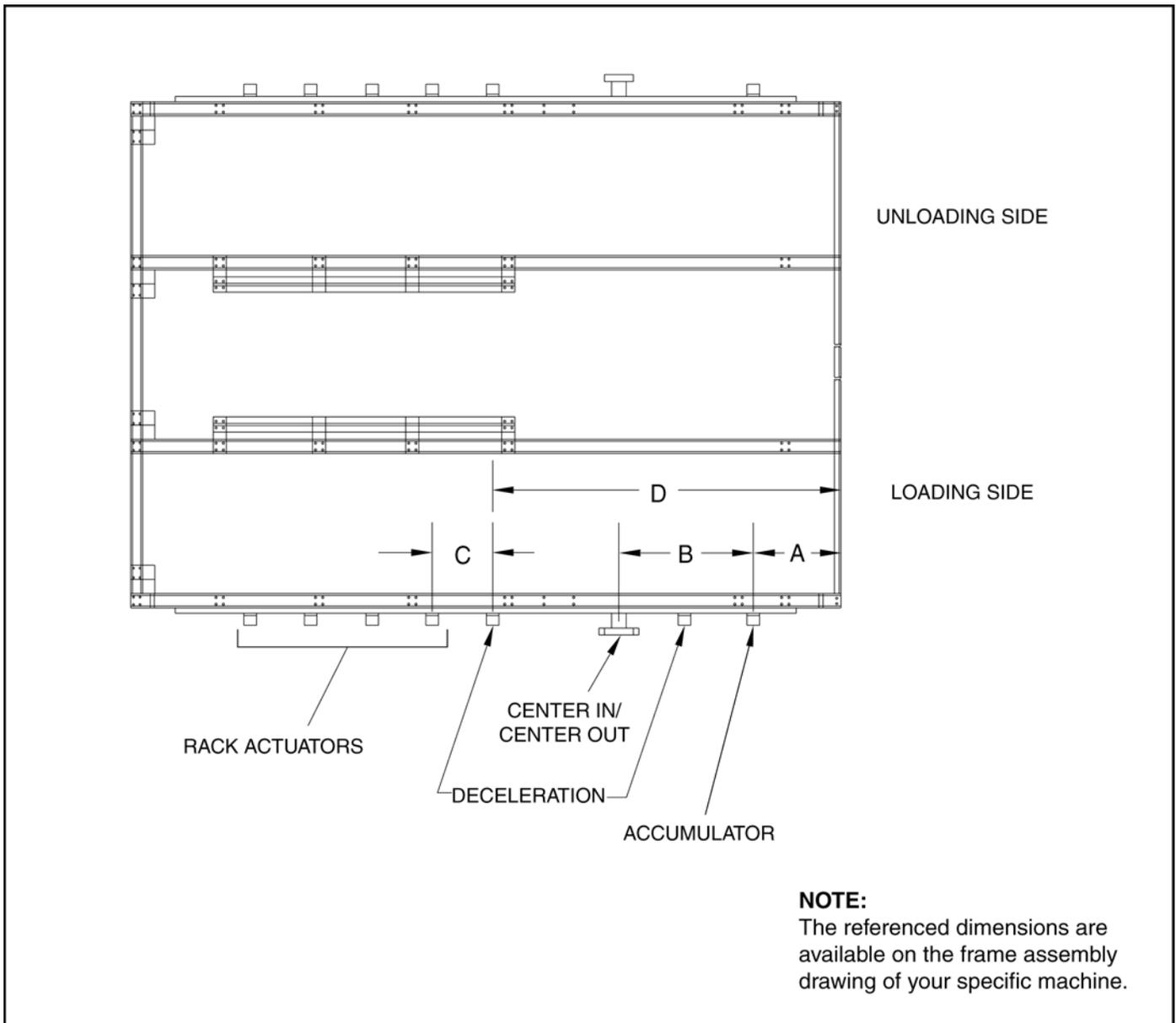


Figure 2.6 FRAME ACTUATORS ON LOADING SIDE (VIEWED FROM ABOVE)

2.1.6 Adjustment of Geneva Drive

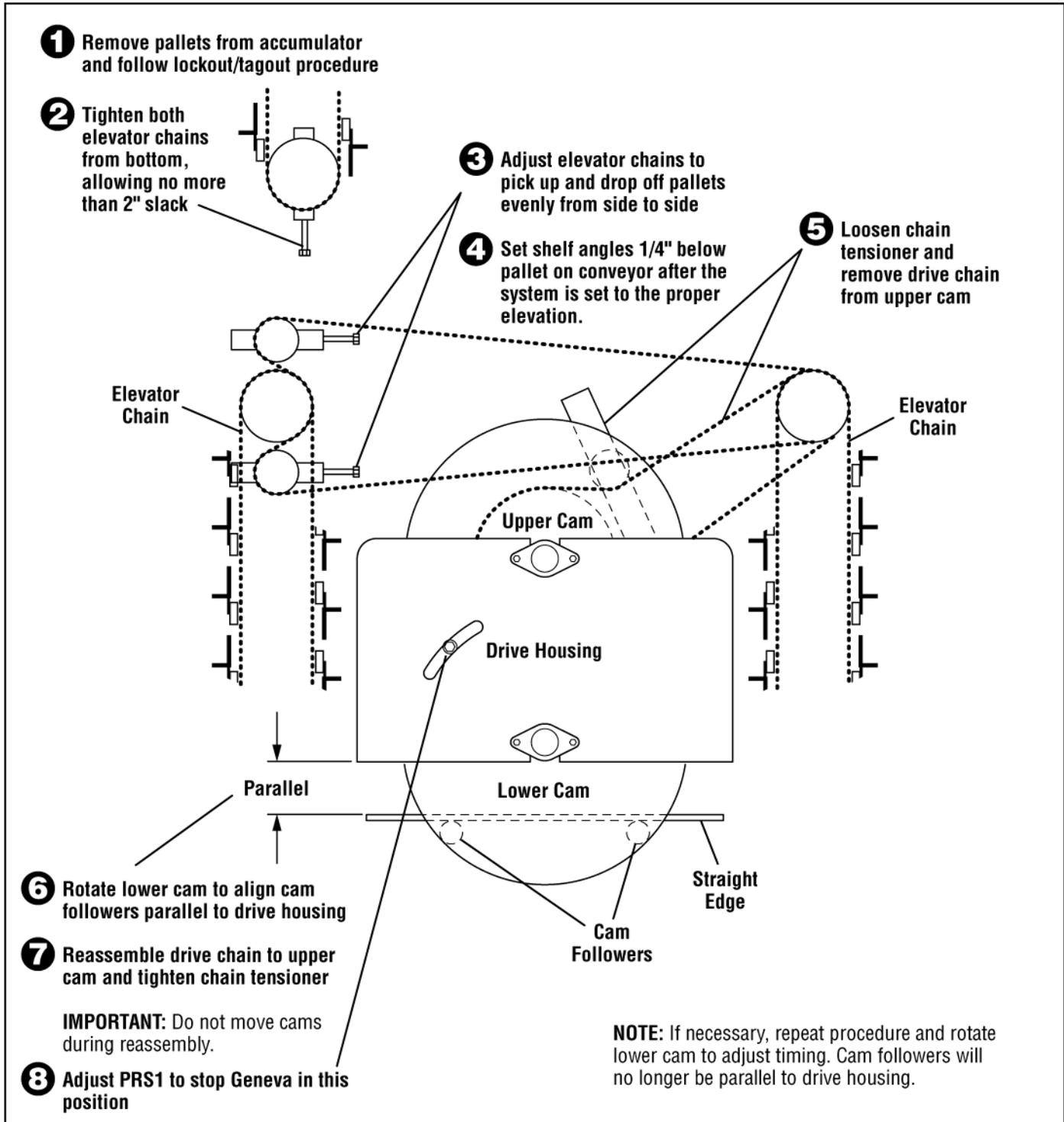


Figure 2.7 GENEVA DRIVE ADJUSTMENT

2.1.7 Adjust Spade Switches

The spade stabilizer has 8 switches: 2 safety proximity switches, 4 turn proximity switches, 1 frame actuator proximity switch and 1 center in/center out limit switch. All of these switches are illustrated in Figure 2.9 below and need to be adjusted as follows:

1. Adjust switch LS-19 to make sure it trips on frame center in/out actuator.
2. Adjust proximity switch PRS-16 to be actuated by frame actuators along the track. Switch should be adjusted 1/4" [6.3mm] above highest frame actuator. Run the spade on manual along the frame to test the switch. Use screen to monitor switch. It should turn ON when switch is above each frame actuator. If not, adjust switch lower.
3. Adjust safety switch PRS-51 1/4" [6.3mm] above frame track.

NOTE: Left Hand shown. For Right Hand, PRS7 and PRS7A change locations with PRS8 and PRS8A.

4. There is one 180° turn switch at each end of stabilizer, PRS-7 and PRS-8. These proximity switches should be adjusted 1/4" [6.3mm] from actuator (Figure 2.8 below). Both these switches are adjustable sideways through slots. Adjust both 180° turns so spade aligns perfectly with Accumulator and rack center line.

NOTE: Spade should turn toward the inside of frame.



Figure 2.8 TURN SWITCHES

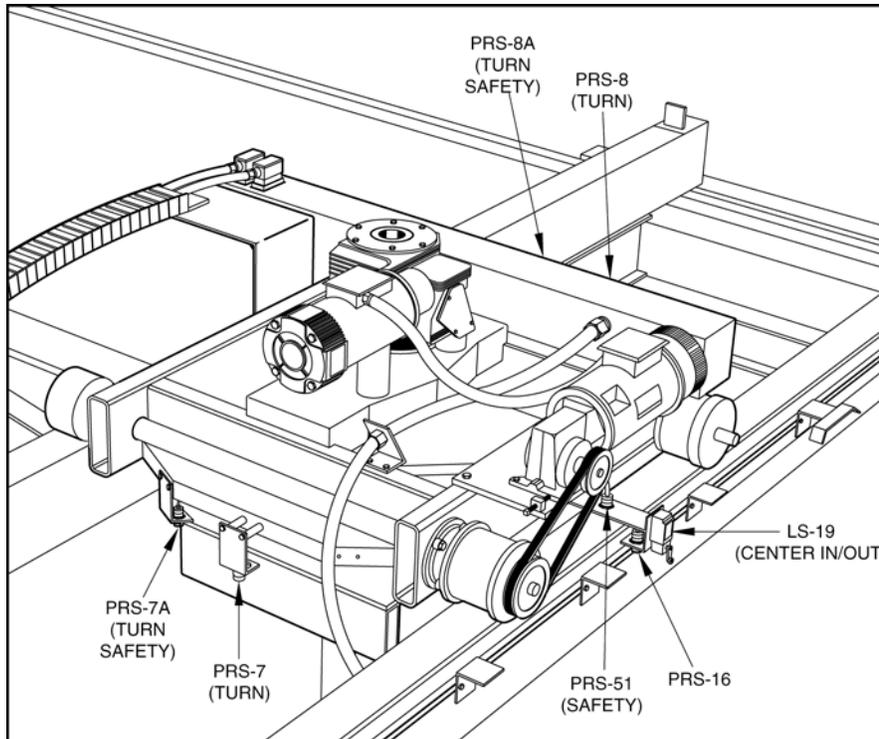


Figure 2.9 STABILIZER SWITCHES



2.1.8 Adjust Multiple Limit Switches (MLS) Loader

A MLS (Figure 2.10) is located on the loader spade. 5 switches control the up and down movement of the lower spade. It is important to adjust the cams so that switches are actuated at a precise location. Figure 2.11 below identifies all 5 switches in the switch box.

1. Determine if your system is an “up to rack” system or a “down to rack” system. An “up to rack” system is a system where lower spade goes from the Accumulator up to the rack. A “down to rack” system is a system where lower spade goes from the Accumulator down to the rack.
2. Make sure all cams trip switches properly. Screen should indicate when switch has been tripped. (refer to Section 5, function F3 - input/output). It is important to adjust cams knowing up or down direction.
3. Refer to Figure 2.11 below to identify switch direction and approximate cam locations. Remember that these cam locations are approximate; they will need to be adjusted as shown here.

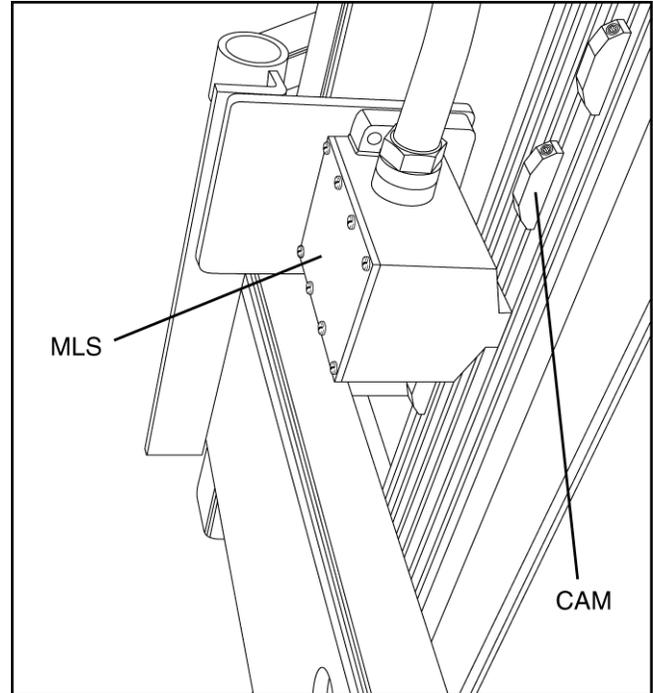


Figure 2.10 MULTIPLE LIMIT SWITCH (MLS)

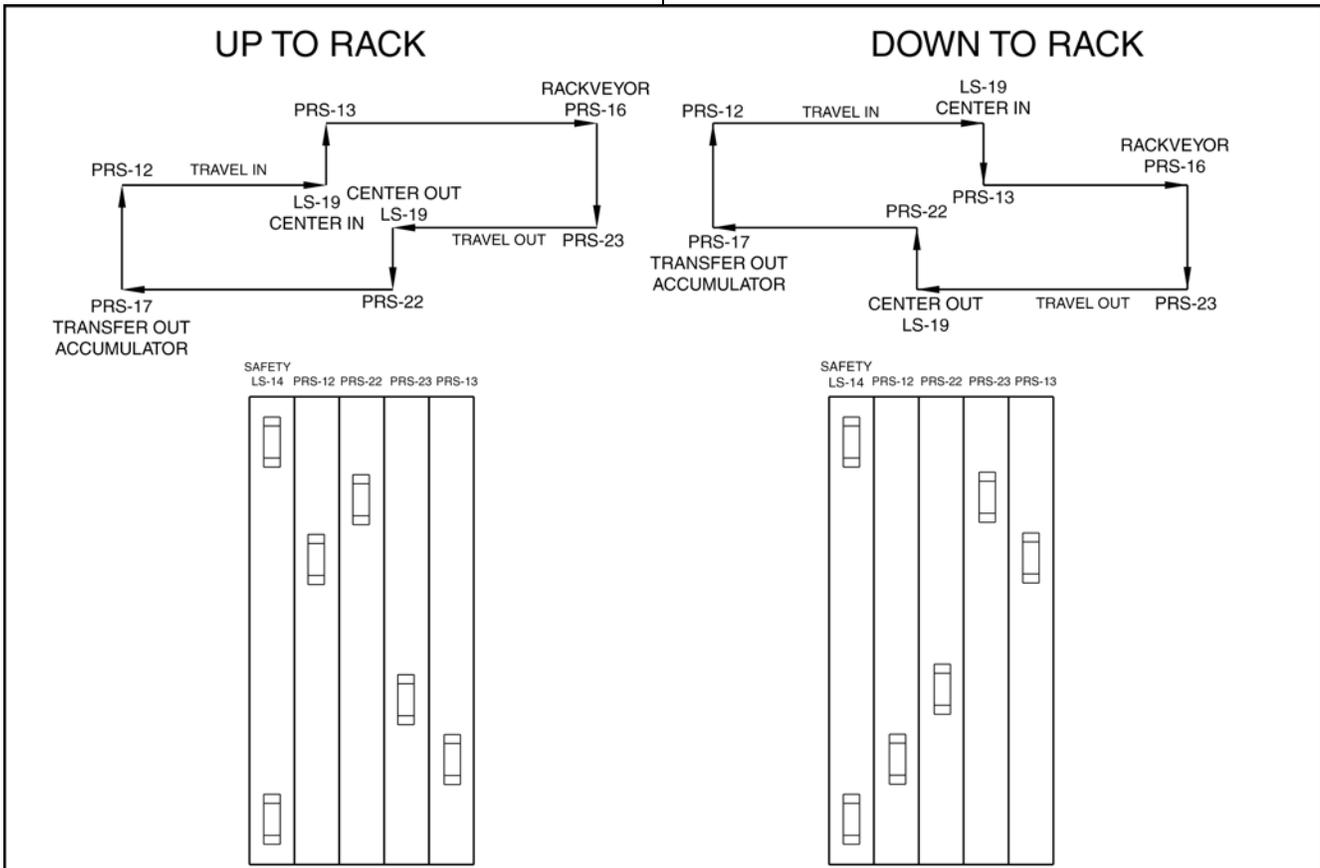


Figure 2.11 CAM CONFIGURATION (APPROXIMATE)

4. Manually move the spade (see section 4.2) until it reaches the Accumulator but does not enter. Move spade up and down until the spade shelf is 1/2" [12.7mm] below the pallet as presented in Figure 2.12. Then, move cam until switch PRS-22 is actuated (screen will indicate that switch has been tripped).

NOTE: After moving cam to desired position, carefully tighten cam so it does not move.

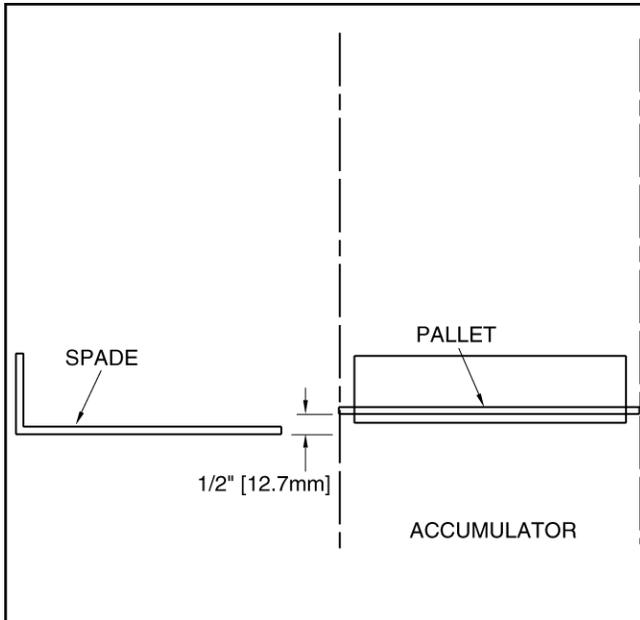


Figure 2.12 SWITCH PRS -22 ADJUSTMENT

5. Manually move the spade (see section 4.2) into the Accumulator. Then move spade up and down until bottom of pallet is 1/2" [12.7mm] above shelf angle (see Figure 2.13). Then, move cam until switch PRS -12 is actuated (screen will indicate that switch has been tripped).

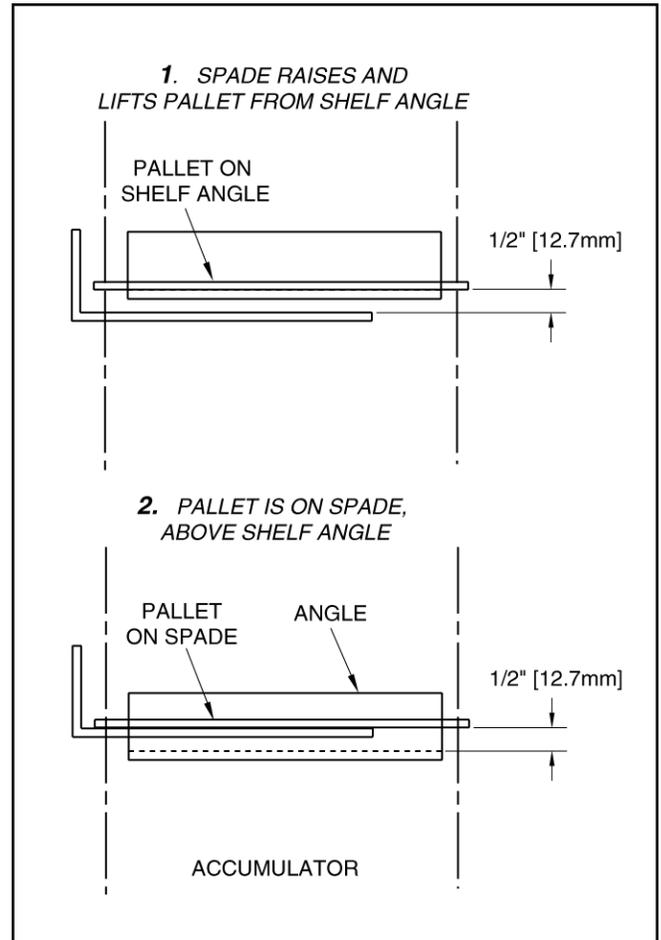


Figure 2.13 SWITCH PRS -12 ADJUSTMENT

6. Manually move the spade (see section 4.2) until it reaches the rack but does not enter. Then move spade up and down until bottom of pallet is 1/2" [12.7mm] above rack shelf (see Figure 2.14). Then move cam until switch PRS -13 is actuated (screen will indicate that switch has been tripped).

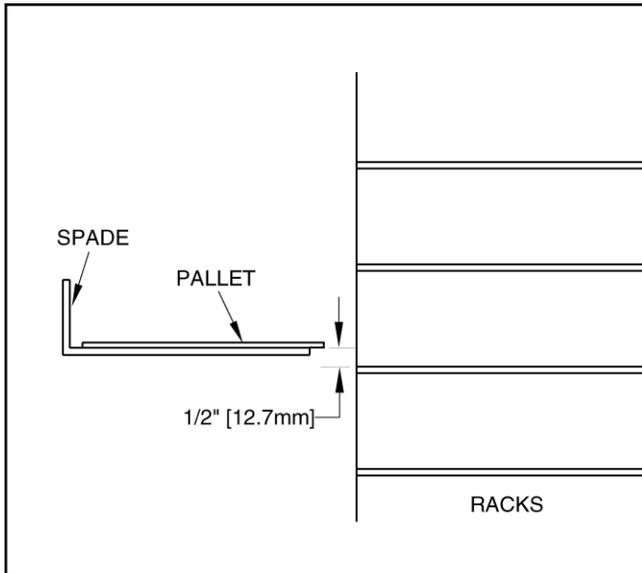


Figure 2.14 SWITCH PRS -13 ADJUSTMENT

7. Manually move the spade (see section 4.2) inside the rack bay. Then move spade up and down until top of empty spade is 1/2" [12.7mm] below pallet laying on rack shelf (see Figure 2.15). Then move cam until switch PRS -23 is actuated (screen will indicate that switch has been tripped)

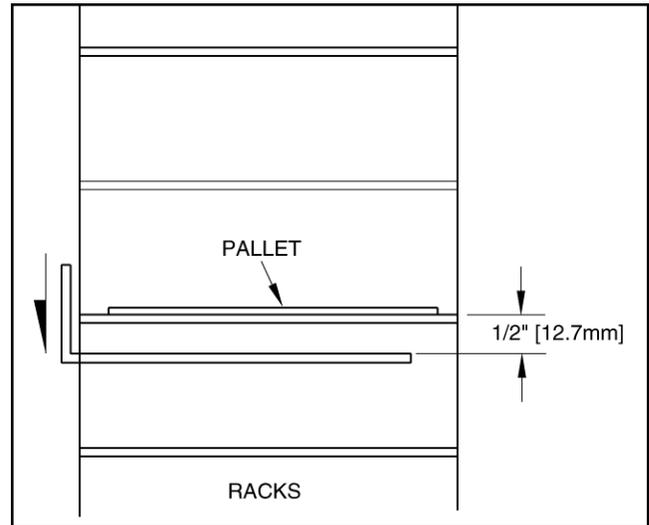


Figure 2.15 SWITCH PRS -23 ADJUSTMENT

8. Adjust safety switch LS-14 (with red dot) 1" [25.4mm] above top of highest stroke (1" [25.4mm] above extreme position) and 1" [25.4mm] below lowest stroke (lower extreme).

2.2 UNLOADER SIDE

2.2.1 Accumulator Switches

1. Adjust PRS-95 so that the top of the shelf angle on Accumulator is 1/2" [12.7mm] below the bottom of pallet sitting on conveyor.

2.2.2 Unloading Conveyor Switches

1. All switches on unloading conveyor should be adjusted 1/4" [6.35mm] below the bottom of the pallet sitting on chain.
2. Adjust PRS-42 (Figure 2.16) so that pallet is clear of Accumulator conveyor when switch is tripped and released, if PRS-43 is not covered.
3. Adjust PRS-43 (Figure 2.16) 1/4" [6.3mm] below pallet sitting on chain. PRS-43 is a safety switch. If PRS-43 is tripped, Accumulator will not move.
4. Adjust PER-202, PRS-30 and PRS-9 on Depalleter. Refer to Depalleter manual.

PER-202 is a photoelectric eye switch that senses across the depalleter to detect block on pallet in Depalleter.

PRS-30 stops pallet on unloading conveyor if PRS-9 is covered by pallet.

PRS-9 will stop pallet in center of Depalleter. Adjust switch so pallet is stopped at center line of Depalleter.

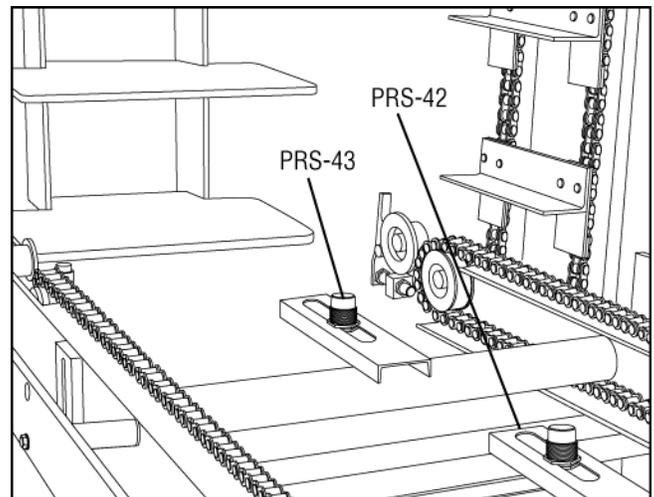


Figure 2.16 PRS-42 AND PRS-43

2.2.3 Rollover Switches

1. Adjust PRS-641 so that it indicates that pallet is completely into the rollover system. This will start rollover. Also adjust switch 1/4" [6.35mm] below pallet sitting on chain. See Figure 2.17.
2. Adjust PRS -642 home switch so rollover stops at point where it can receive pallet in slot and drop pallet off.

NOTE: Adjust switch with no pallet in rollover.

3. Adjust PRS-643 proximity-switch so it is tripped after rollover is 1/4" [6.35mm] below pallet. It indicates that the rollover is clear and a new pallet can be rolled. See Figure 2.17.

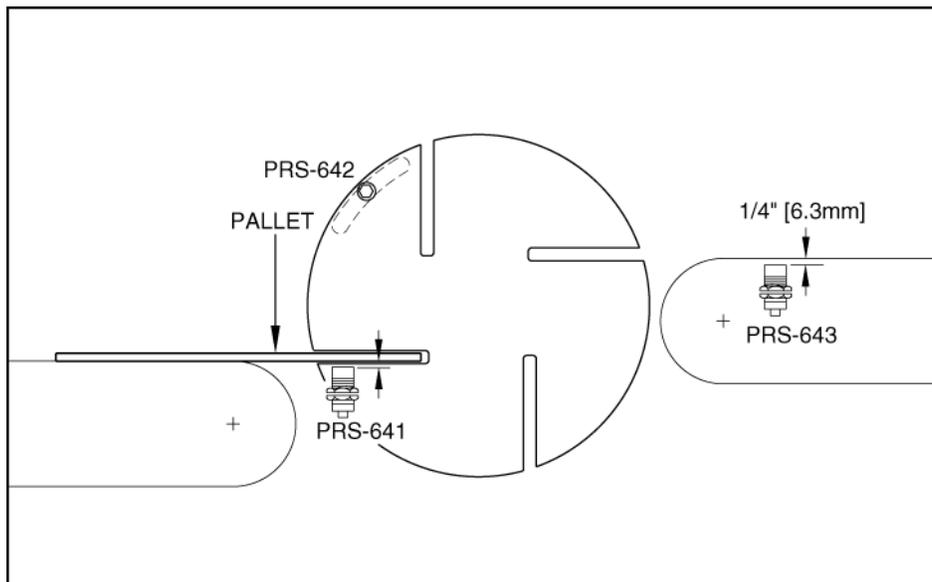


Figure 2.17 ROLLOVER SWITCHES

2.2.4 Location of Frame Actuators

Actuators on MS-13/14/16 frame are positioned along the track and will trip a switch located on the moving stabilizer. When this switch is tripped, the unloading spade stops. It will stop once in the unloader Accumulator, once in the center and several times inside the rack. How many times it stops in the rack is dependent on your rack depth. For example, if you have a 4 pallet deep rack system, the unloader spade will stop 4 times inside the rack. Use frame assembly drawing along with the written instructions below to adjust frame actuators:

1. Locate actuator for center-in / center-out (shown below).
2. Locate actuator to position pallet in rack (depends on how deep system is).
3. Set all actuators according to dimensions shown in Figure 2.18 below and on frame drawing supplied.

NOTE: Final adjustments will have to be made when spade actually places pallets in rack as it goes through its cycle (either on manual or automatic runs).

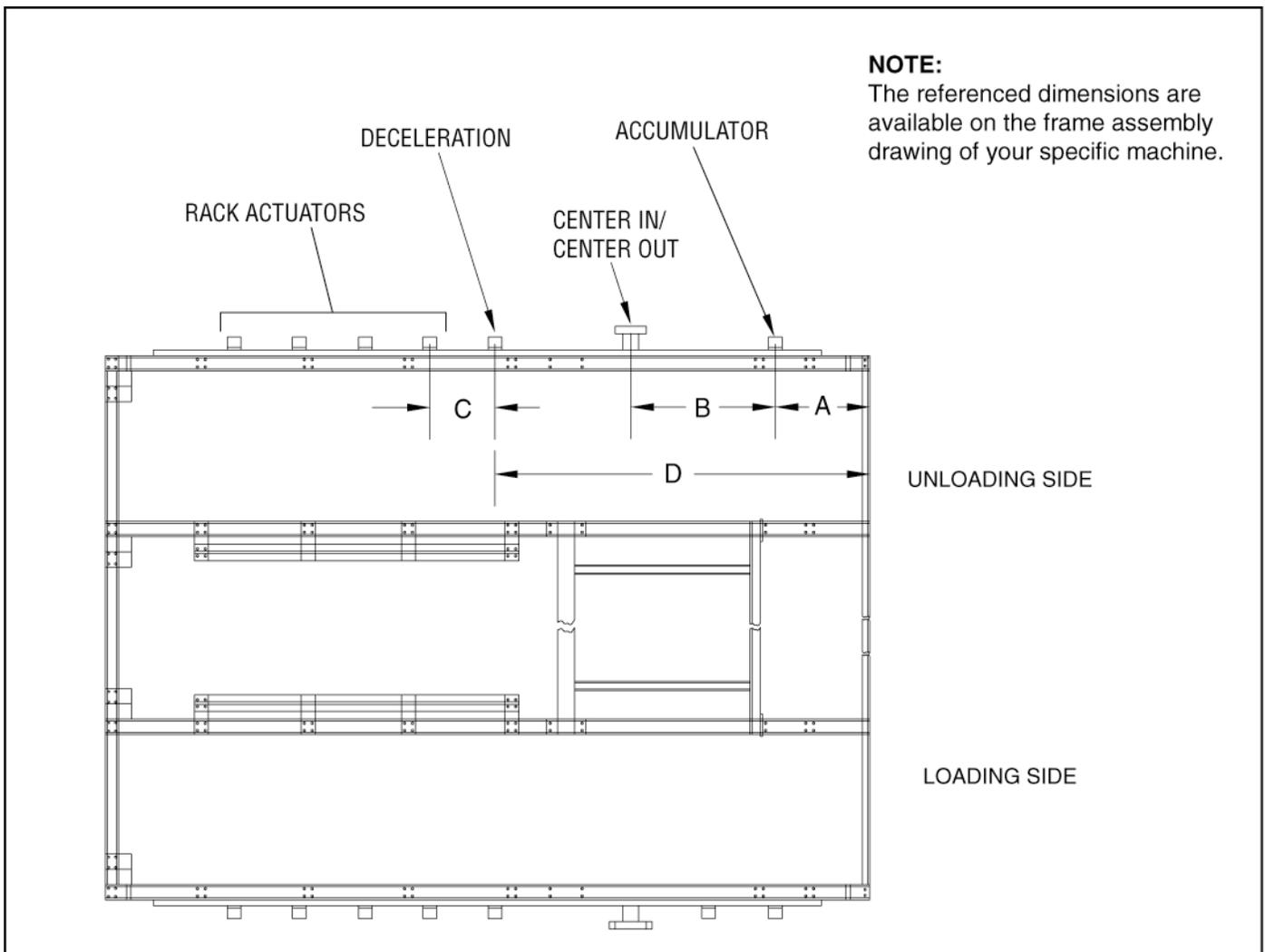


Figure 2.18 FRAME ACTUATORS ON UNLOADING SIDE (VIEWED FROM ABOVE)



2.2.5 Adjust Spade Switches

The spade stabilizer has 8 switches: 2 safety proximity switches, 4 turn prox-switches, 1 frame actuator proximity switch and 1 center-in/center-out limit switch. All of these switches are illustrated in Figure 2.20 below and need to be adjusted as follows:

1. Adjust switch LS-26 to make sure it trips on frame center in/out actuator.
2. Adjust proximity switch PRS-25 to be actuated by frame actuators along the track. Switch should be adjusted 1/4" [6.3mm] above highest frame actuator. Run the spade on manual along the frame to test the switch. Use screen to monitor switch. It should turn ON when switch is above each frame actuator. If not, adjust switch lower.
3. Adjust safety switch PRS-52 1/4" [6.3mm] above frame track.
4. There is one 180° turn switch at each end of stabilizer, PRS-47 and PRS-48. These proximity switches should be adjusted 1/4" [6.3mm] from actuator (Figure 2.19). Both

these switches are adjustable sideways through slots. Adjust both 180° turns so spade aligns perfectly with Accumulator and rack center line.

NOTE: Spade should turn toward the inside of frame.



Figure 2.19 TURN SWITCHES

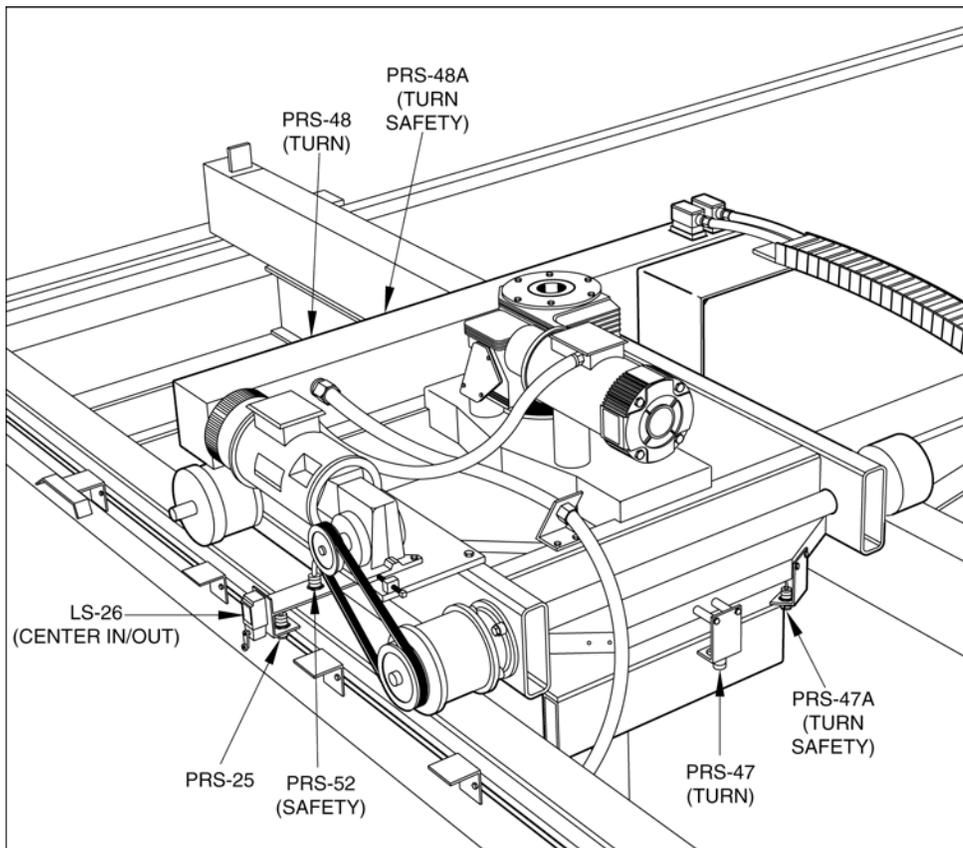


Figure 2.20 STABILIZER SWITCHES

2.2.6 Adjust Multiple Limit Switches (MLS) Unloader

A MLS (Figure 2.21) is located on the unloader spade. 5 switches control the up and down movement of the lower spade. It is important to adjust the cams so that switches are actuated at a precise location. Figure 2.22 below identifies all 5 switches in the switch box.

1. Determine if your system is an “up to rack” system or a “down to rack” system. An “up to rack” system is a system where lower spade goes from the Accumulator up to the rack. A “down to rack” system is a system where lower spade goes from the Accumulator down to the rack.
2. Make sure all cams trip switches properly. Screen should indicate when switch has been tripped. (refer to Section 3, function F3 - input/output). It is important to adjust cams knowing up or down direction.
3. Refer to Figure 2.22 below to identify switch direction and approximate cam locations. Remember that these cam locations are approximate; they will need to be adjusted as shown here.

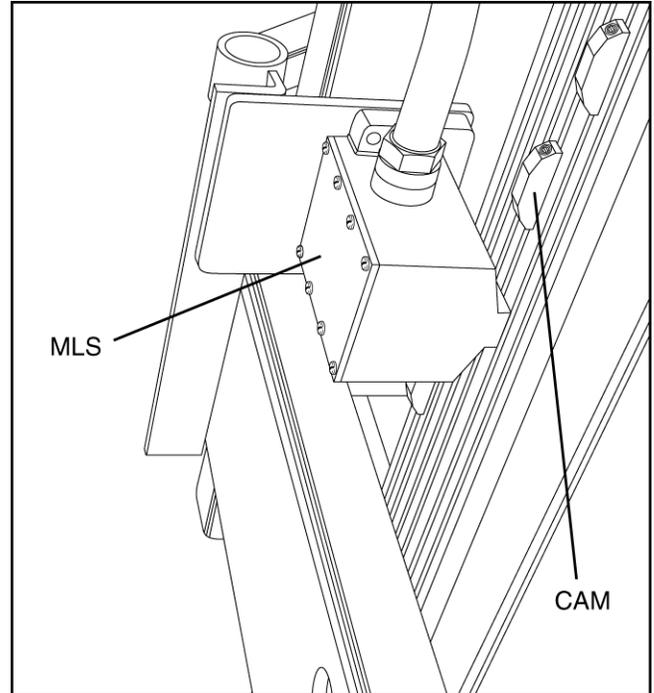


Figure 2.21 MULTIPLE LIMIT SWITCH (MLS)

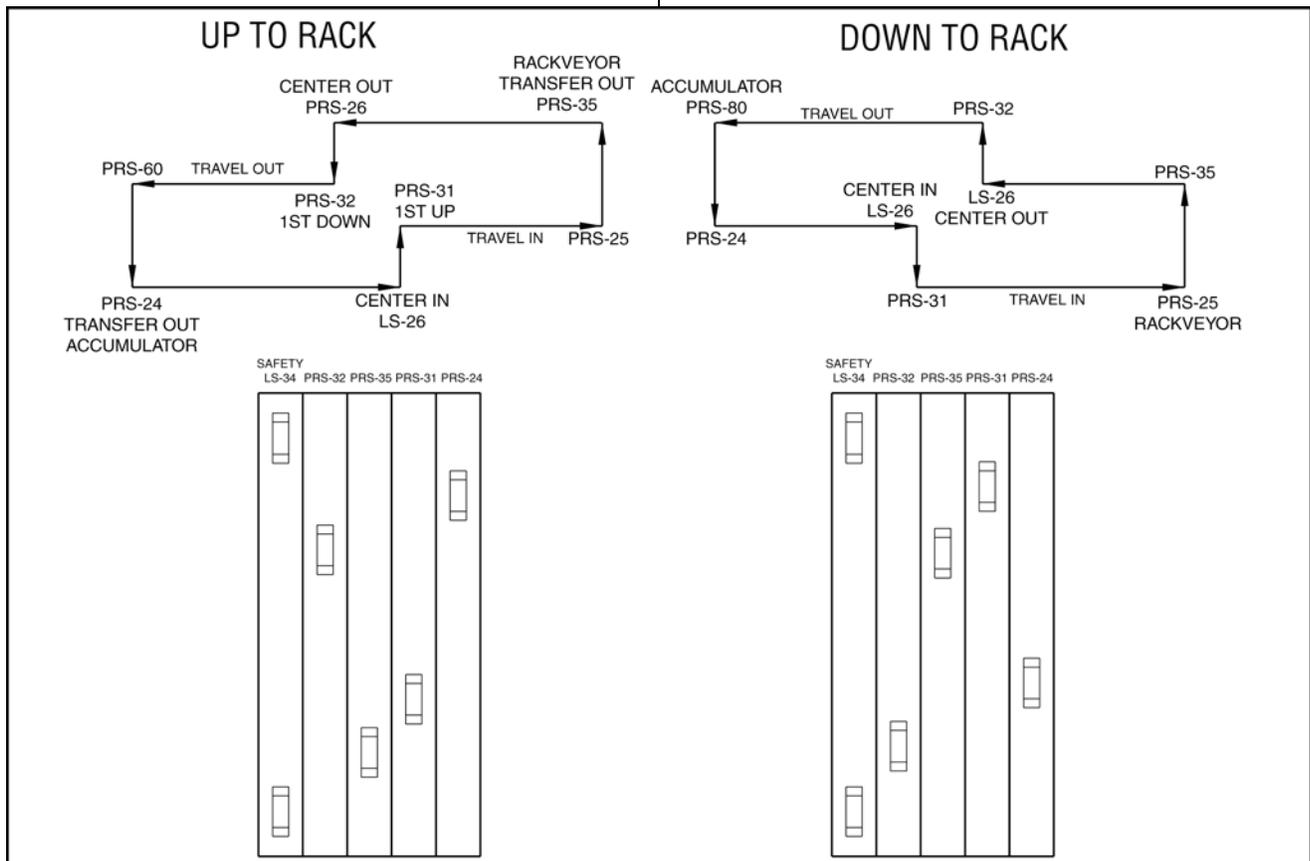


Figure 2.22 CAM BOX CONFIGURATION (APPROXIMATE)



4. With empty pallets set on the unloading spade, manually move the spade (see section 4.2) until it reaches the Accumulator but does not enter. Then move spade up and down until the bottom of pallet is 1/2" [12.7mm] above shelf angle as presented in Figure 2.23. Then move cam until switch PRS -24 is actuated (screen will indicate that switch has been tripped).

NOTE: After moving cam to desired position, carefully tighten cam so it does not move.

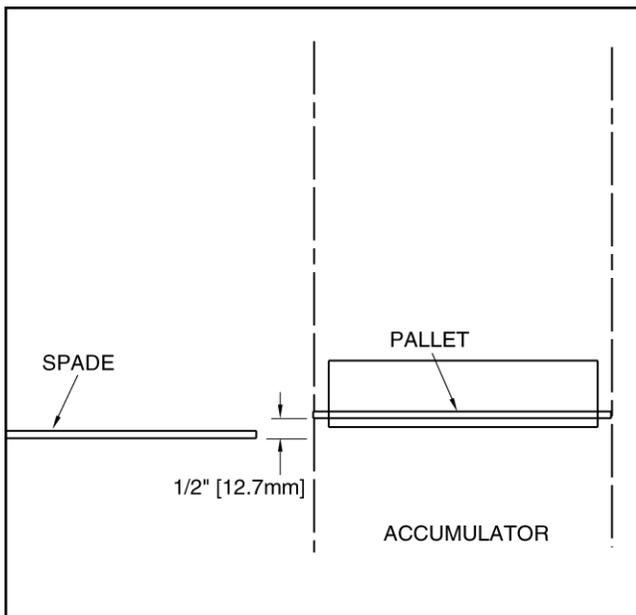


Figure 2.23 SWITCH PRS -24 ADJUSTMENT

5. Manually move the spade (see section 4.2) inside the Accumulator. Then move spade up and down until bottom of pallet is 1/2" [6.3mm] below shelf angle (see Figure 2.24). Then move cam until switch PRS -31 is actuated (screen will indicate that switch has been tripped).

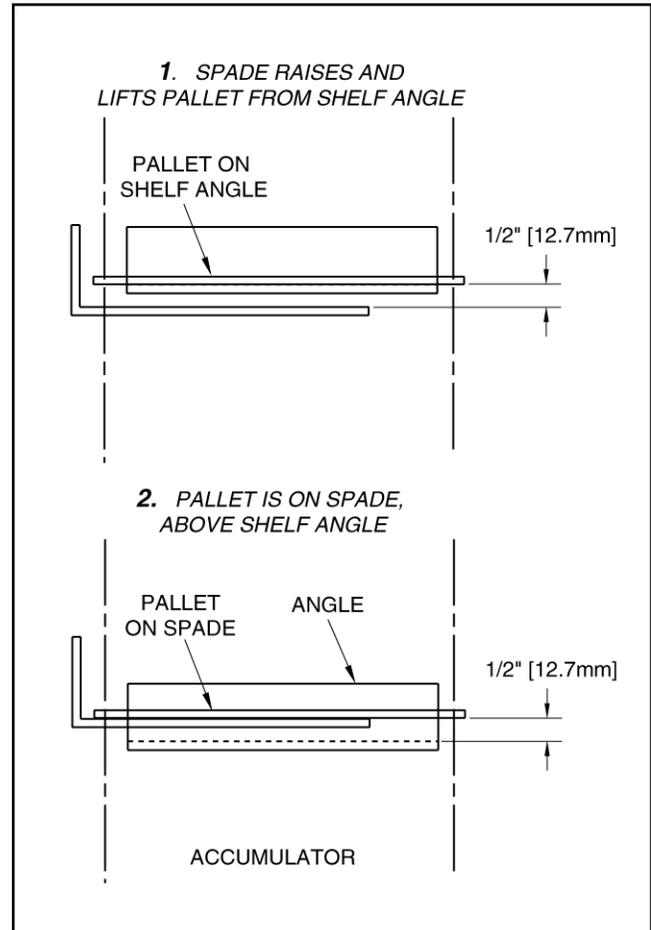


Figure 2.24 SWITCH PRS -31 ADJUSTMENT

6. Manually move the spade (see section 4.2) until it reaches the rack but does not enter. Then move spade up and down until top of spade is 1/2" [12.7mm] below bottom of pallet (see Figure 2.25). Then move cam until switch PRS -35 is actuated (screen will indicate that switch has been tripped).

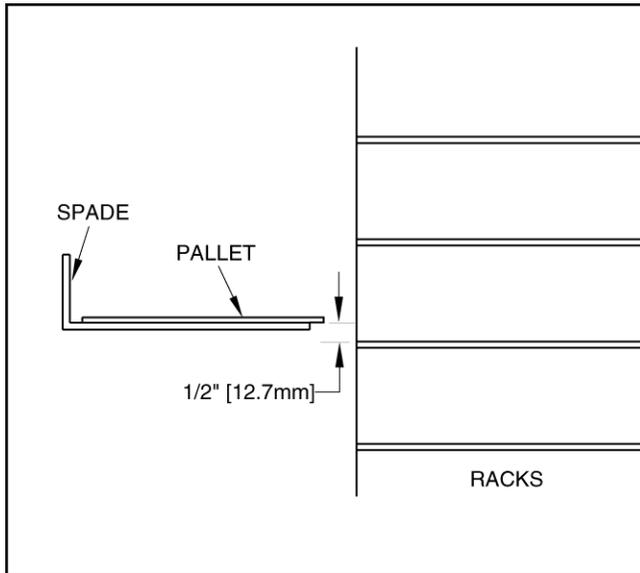


Figure 2.25 SWITCH PRS -35 ADJUSTMENT

7. Manually move the spade (see section 4.2) inside the rack bay. Then move spade up and down until bottom of pallet is 1/2" [12.7mm] above rack shelf (see Figure 2.26). Then move cam until switch PRS -32 is actuated (screen will indicate that switch has been tripped).

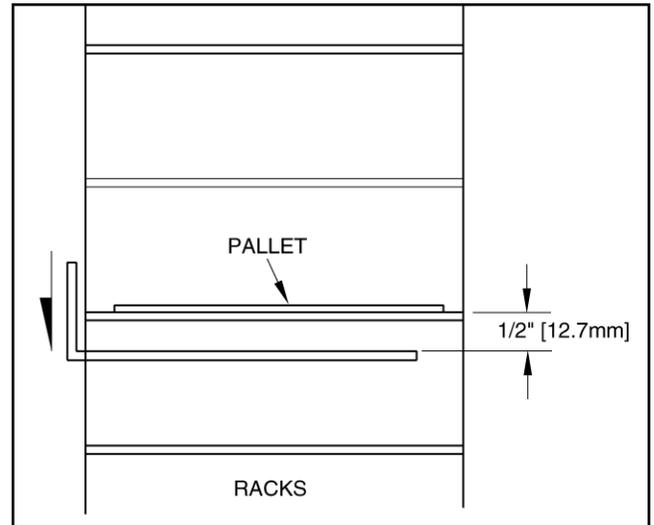


Figure 2.26 SWITCH PRS -32 ADJUSTMENT

8. Adjust safety switch LS-34 (with red dot) 1" [25.4mm] above top of highest stroke. (1" [25.4mm] above extreme position) and 1" [25.4mm] below lowest stroke (down extreme).

2.2.7 Conveyor Switches

1. The PRS-630 switch is located on the unloading conveyor (just before the Pallet Transfer conveyor). It is used to stop the unloading conveyor when Pallet Transfer is in motion (not in home position).
2. LS-63 switch stops the Pallet Transfer conveyor at home position when lug is

approximately 2" to 3" [51 to 76mm] behind pallet, ready to push next pallet.

3. PER-68 is a photoelectric switch located on the Pallet Return conveyor. It is used to detect a pallet jammed between rollers. A timer will shut off machine after a preset timer has timed out. See Figure 2.27.

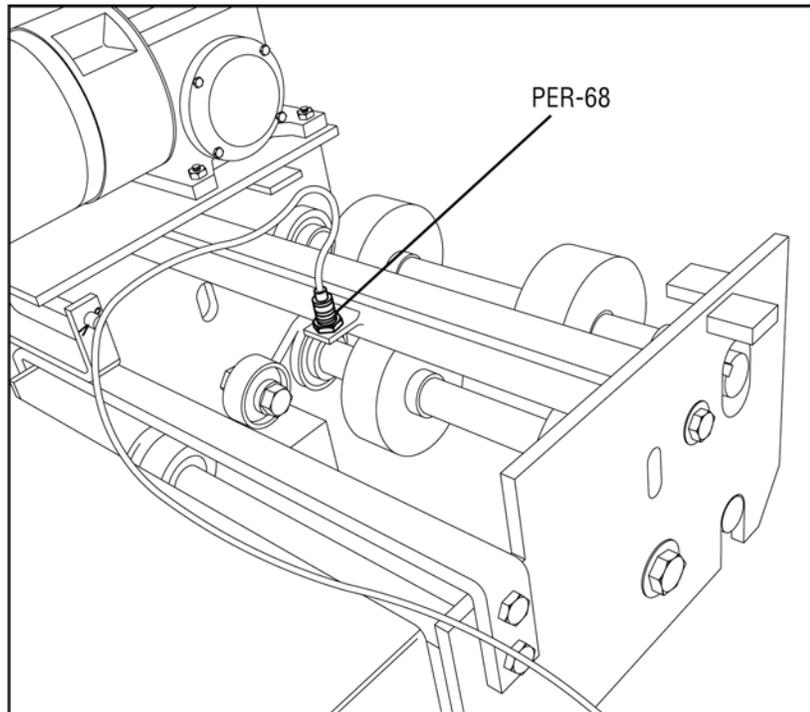


Figure 2.27 SWITCH PER-68

2.2.8 Concrete Product Machine Pallet Magazine

The Pallet Return conveyor will be shut off by two proximity switches located in the Concrete Product Machine. These indicate either a pallet low or pallet high condition. Verify these switches; they should be wired and should work properly.

2.2.9 Pallet Roller Guides

Adjust roller guides to center pallets in unloader Accumulator.

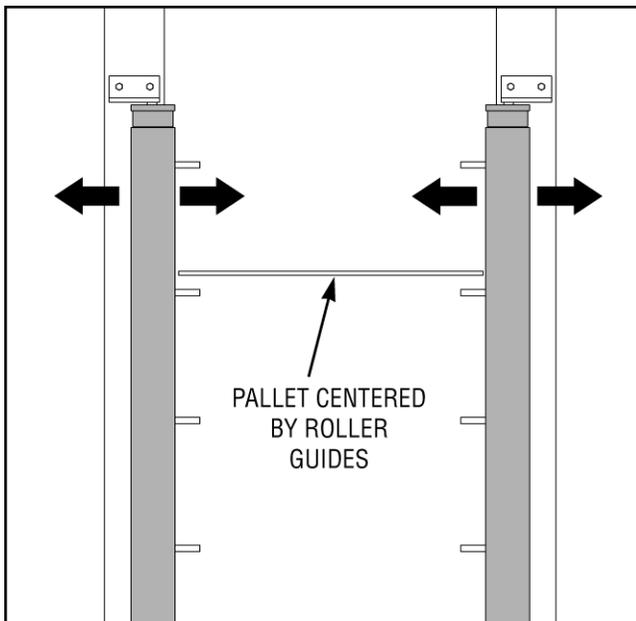


Figure 2.28 ROLLER GUIDES

2.3 RACKVEYOR AND SIDE SHIFTER (LOADER SIDE)

1. Set Two Racks on Rackveyor Indexer.
2. Adjust threaded rod on cap end of cylinder (Figure 2.30, item A) so loader pushers center rack bay with loader center line.
3. Adjust unloader hook plate (Figure 2.30, item B) so unloader pushers center rack bay with unloader center line while the loader rackbay is centered.
4. PRS-105 (Figure 2.29 and Figure 2.30) switch indicates the "forward" position where racks are centered with loader center line and unloader center line. Adjust PRS-105 to tie-plate actuator.
5. PRS-104 (Figure 2.29) switch indicates the "reverse" position to index to next bay. PRS-104 should be adjusted so that carriage hooks

the next leg of the rack. Adjust PRS-104A to tie-plate actuator.

6. PRS-104A (Figure 2.29) switch indicates carriage is reversing to pick up a new rack when bay is full (only on loader-side shifter). It should be adjusted to go past the first up rack to pick-up a fresh rack (full rack). Adjust PRS-104A to tie-plate actuator.
7. Switches PRS-104, 104A and 105 need to be adjusted 1/4" [6.3mm] from tie plate actuator.
8. LS-110 limit switch (Figure 2.29 and Figure 2.30) indicates rack in position for loader. Should be adjusted to actuate off rack legs.
9. LS-111 limit switch (Figure 2.29) indicates rack in position for unloader. Should be adjusted to actuate off rack legs.
10. When PRS-132 and PRS-133 (Figure 2.29) are both covered by a rack, the indexer strokes to PRS-104A to get new rack. Adjust switches to within 1/4" [6.3mm] from bottom of rack.
11. When PRS-132 is covered and PRS-133 is not, racks will index to PRS-104 for next bay.
12. When neither PRS-132 and PRS-133 are covered by rack, Emitter-100 will be turned on to signal crawler to bring in new rack.
13. PRS-129 (Figure 2.29) indicates that crawler is clear and rack index can take place. This switch should be adjusted to actuate off bottom of crawler (1/4" [6.3mm] below bottom).
14. PRS-127 indicates Side Shifter is in position at Rackveyor. Adjust switch (lateral adjustment) to allow Side Shifter to line up with Rackveyor.
15. LS-123 (Figure 2.31) is located on the Side Shifter. It should be adjusted to actuate off cylinder to indicate locks are unlocked.
16. PRS-121 (Figure 2.31) will indicate the left lock on the Side Shifter is locked up.
17. PRS-122 (Figure 2.31) will indicate the right lock on the Side Shifter is locked up.

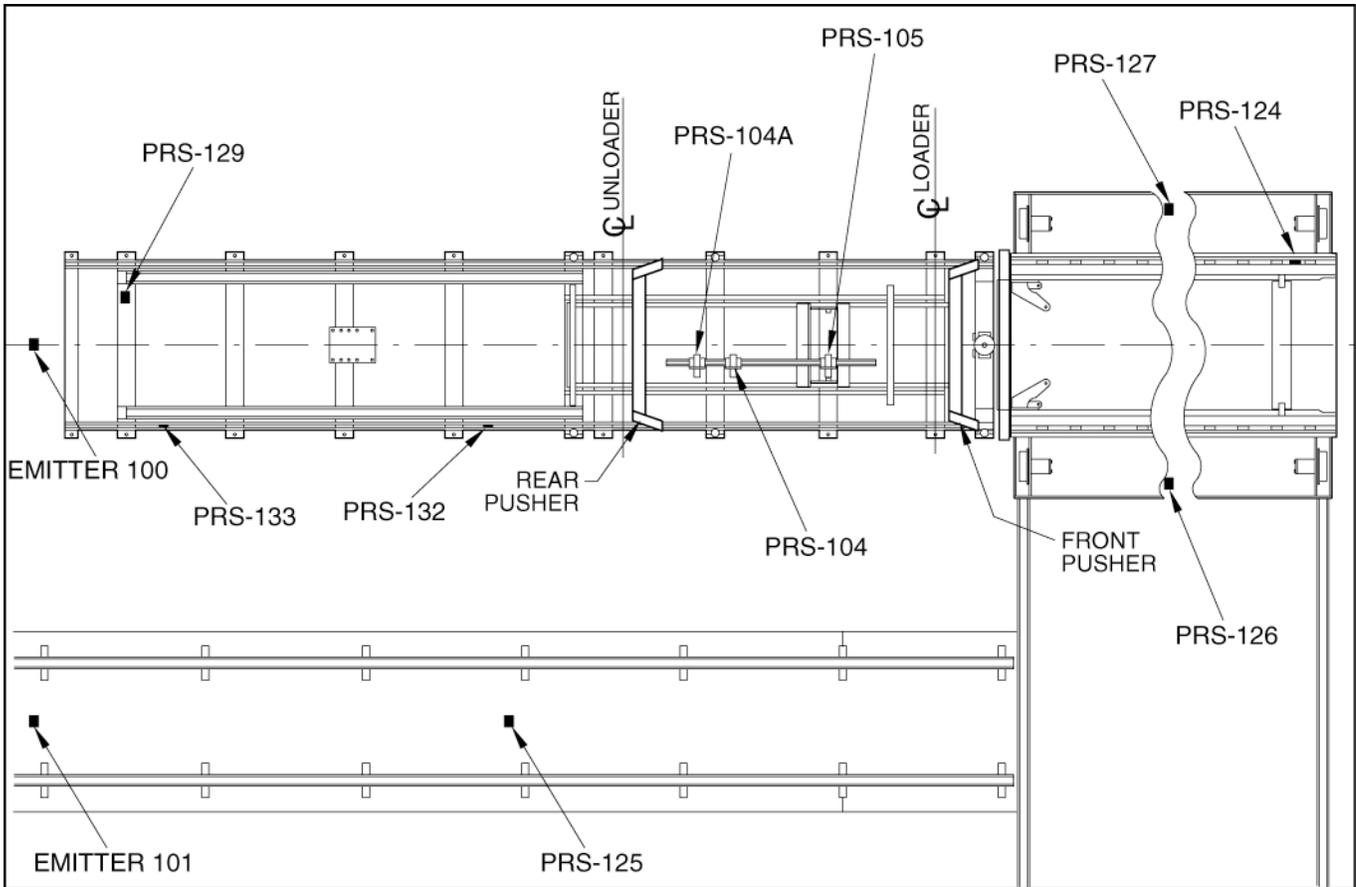


Figure 2.29 RACKVEYOR AND SIDE SHIFTER SWITCHES

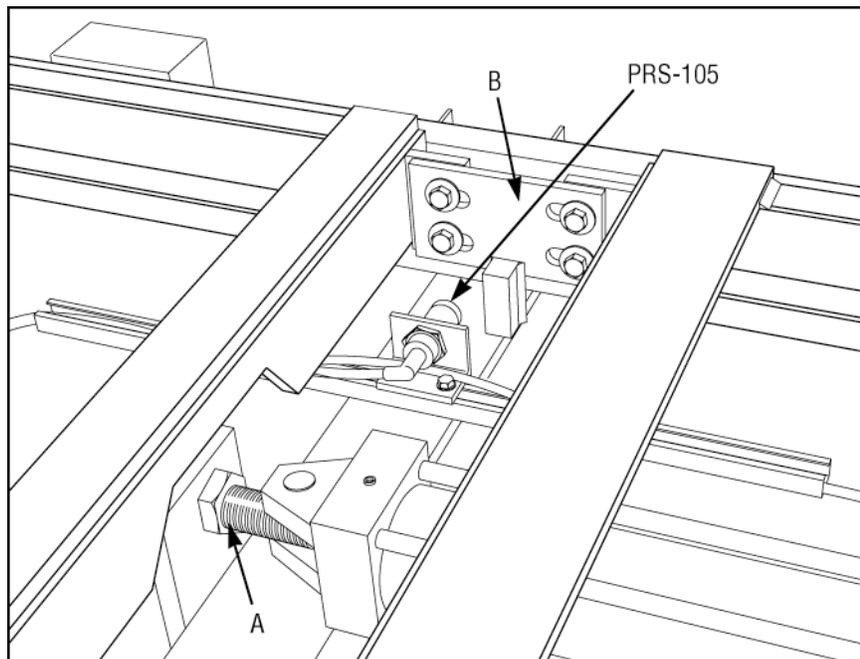


Figure 2.30 RACKVEYOR

18. PRS-124 (Figure 2.31) indicates that a rack is on the Side Shifter. It should actuate off bottom of rack (1/4" [6.3mm] below).
19. PRS-125 (Figure 2.31) indicates that Crawler is clear of the Side Shifter. Emitter-101 comes on when Side Shifter is locked up at rails and there is a rack on the Side Shifter (PRS-126 and PRS-124 actuated).

2.4 RACKVEYOR AND SIDE SHIFTER (UNLOADER SIDE)

1. Set two racks on Rackveyor indexer.
2. Adjust threaded rod on cap end of cylinder (Figure 2.30, item A) so loader pushers center rack bay with loader center line.
3. Adjust unloader hook plate (Figure 2.30, item B) so unloader pushers center rack bay with unloader center line while the loader rackbay is centered.
4. PRS-105 (Figure 2.29 and Figure 2.30) switch indicates the "forward" position where racks are centered with loader center line and unloader center line. Adjust PRS-105 to tie-plate actuator.
5. PRS-104 (Figure 2.29) switch indicates the "reverse" position to index to next bay. PRS-104 should be adjusted so that carriage hooks the next leg of the rack. Adjust PRS-104A to tie-plate actuator.
6. Switches PRS-104, 104A and 105 need to be adjusted 1/4" [6.3mm] from tie plate actuator.
7. When PRS-132 and PRS-133 (Figure 2.29) are both covered by a rack, the indexer strokes to PRS-104A to get new rack. Adjust switches to within 1/4" [6.3mm] from bottom of rack.
8. PRS-129 (Figure 2.29) indicates that crawler is clear and rack index can take place. This switch should be adjusted to actuate off bottom of crawler (1/4" [6.3mm] below bottom).

9. PRS-127 indicates Side Shifter is in position at Rackveyor. Adjust switch (lateral adjustment) to allow Side Shifter to line up with Rackveyor.
10. PRS-126 indicates Side Shifter is in position at the Crawler rails. Adjust switch (lateral adjustment) to allow Side Shifter to line up with Rackveyor.
11. LS-123 (Figure 2.31) is located on the Side Shifter. It should be adjusted to actuate off cylinder to indicate locks are unlocked.
12. PRS-121 (Figure 2.31) will indicate the left lock on the Side Shifter is locked up.
13. PRS-122 (Figure 2.31) will indicate the right lock on the Side Shifter is locked up.
14. PRS-124 (Figure 2.29) indicates that a rack is on the Side Shifter. It should actuate off bottom of rack (1/4" [6.3mm] below).
15. PRS-125 (Figure 2.29) indicates that Crawler is clear of the Side Shifter. Emitter-101 comes on when Side Shifter is locked up at rails and there is a rack on the Side Shifter (PRS-126 and PRS-124 actuated).

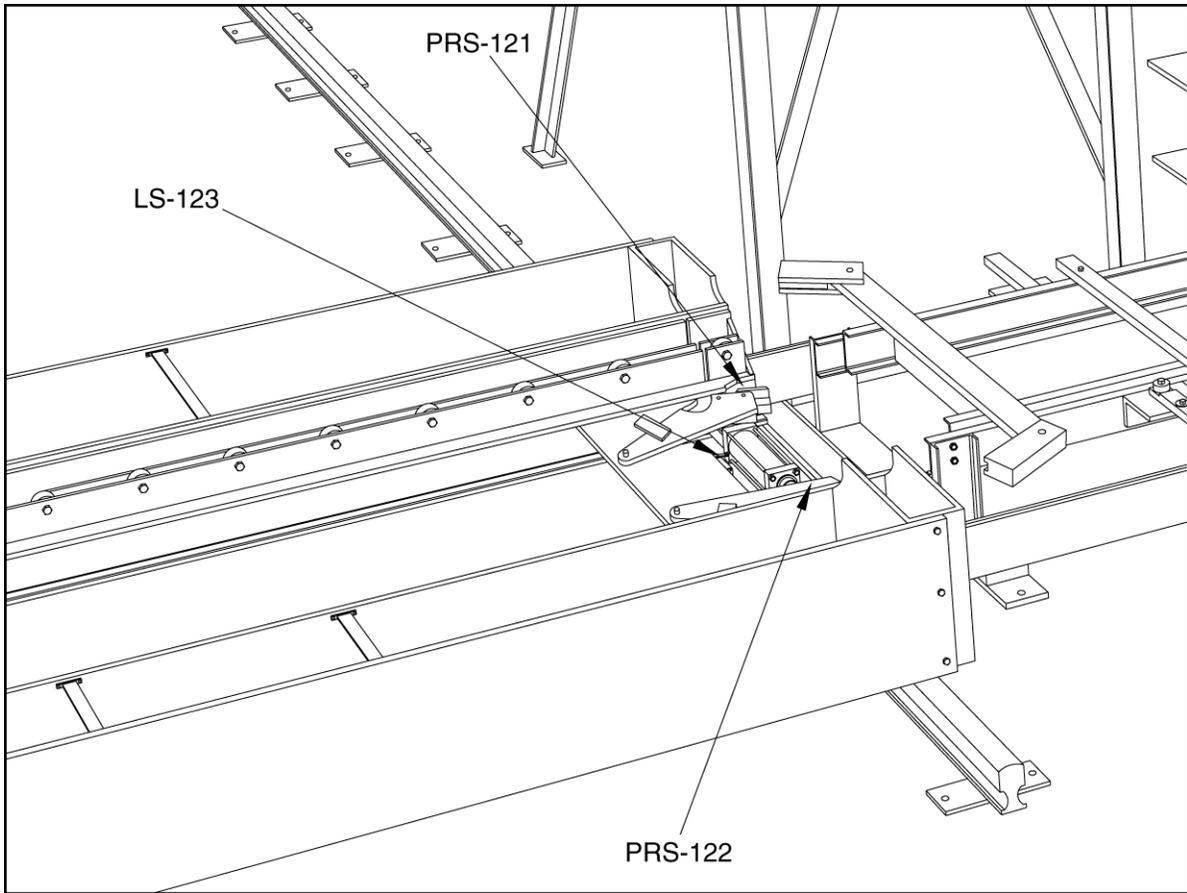
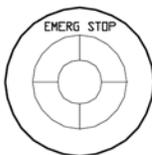
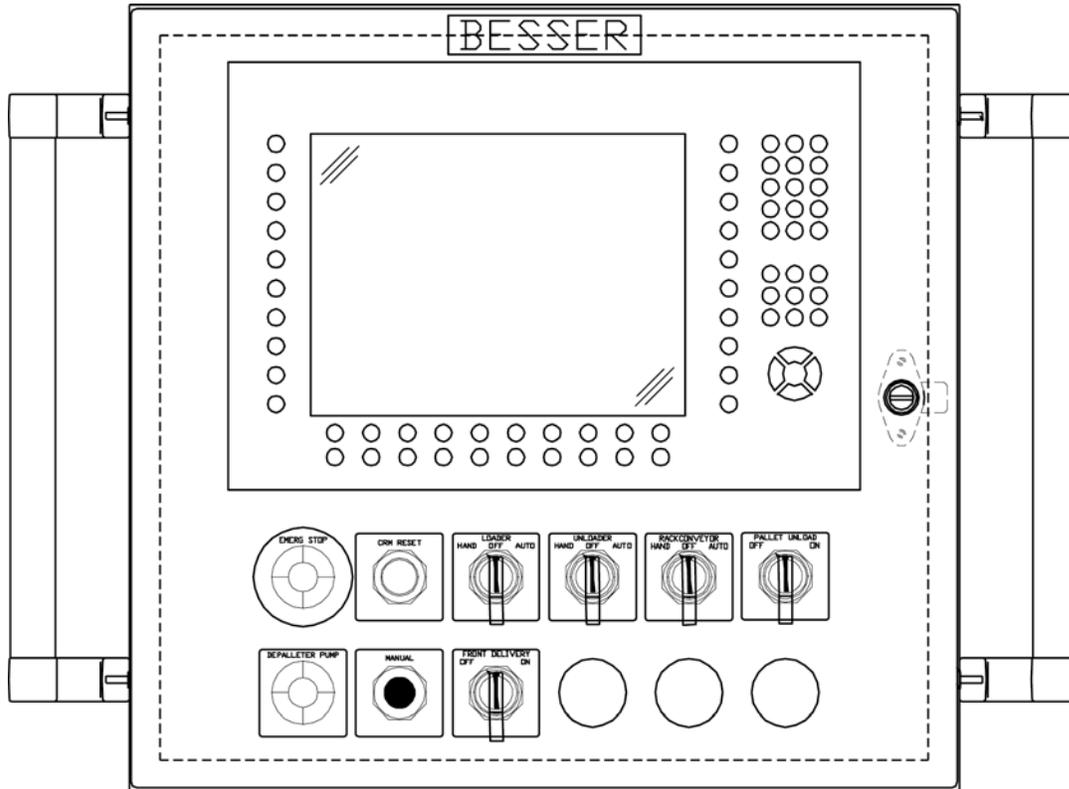


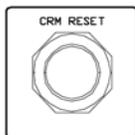
Figure 2.31 SIDE SHIFTER

SECTION 3 GRAPHIC CONTROL STATION

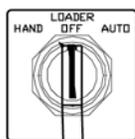
3.1 MANUAL CONTROLS



Emergency Stop, complete shut off of machine.
Needs to be pulled out to start the machine.



Control Relay Master reset.
Enables the machine to function (emergency button has to be pulled out first).



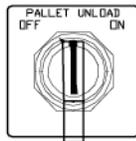
Loader controls.
To use spade manually, set to HAND then use joystick to move.
To use accumulator manually, set to HAND then use F10 and F11 keys to move up and down.



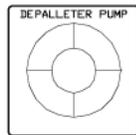
Unloader controls.
To use spade manually, set to HAND then use joystick to move.
To use accumulator manually, set to HAND then use F10 and F11 keys to move up and down.



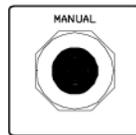
Rackveyor controls.
To use manually, set to HAND then use "F" keys as required.



Pallet Unload ON and OFF switch.
Applies power to unloading conveyors and depalleters.



Depalletor Pump ON and OFF switch (if used).

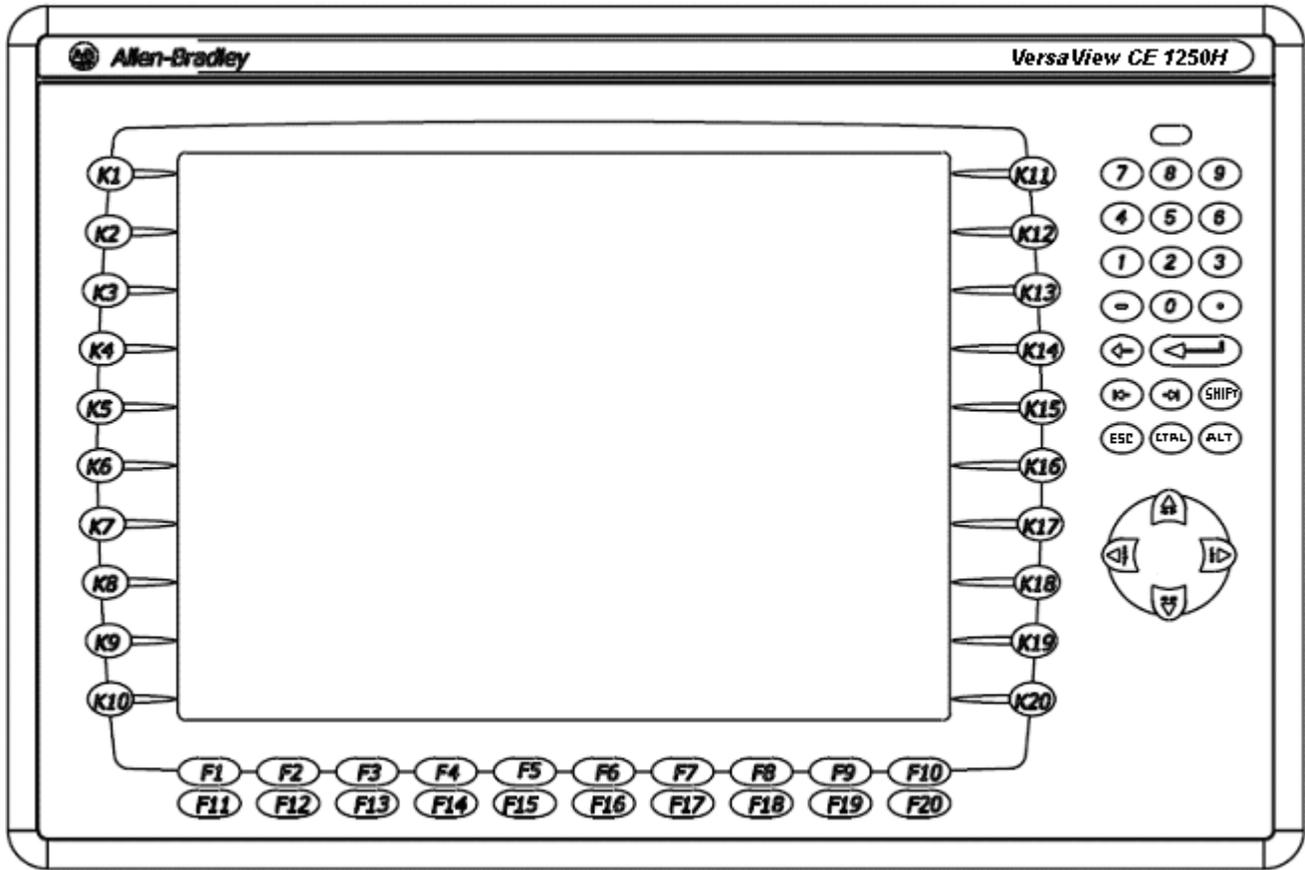


Spade manual control joystick. Operator must set Loader or Unloader to HAND before using.
Operates the loader and unloader spades, UP - DOWN - IN -OUT.



Front Delivery Conveyor ON and OFF switch.

3.2 PROGRAMMING KEYS



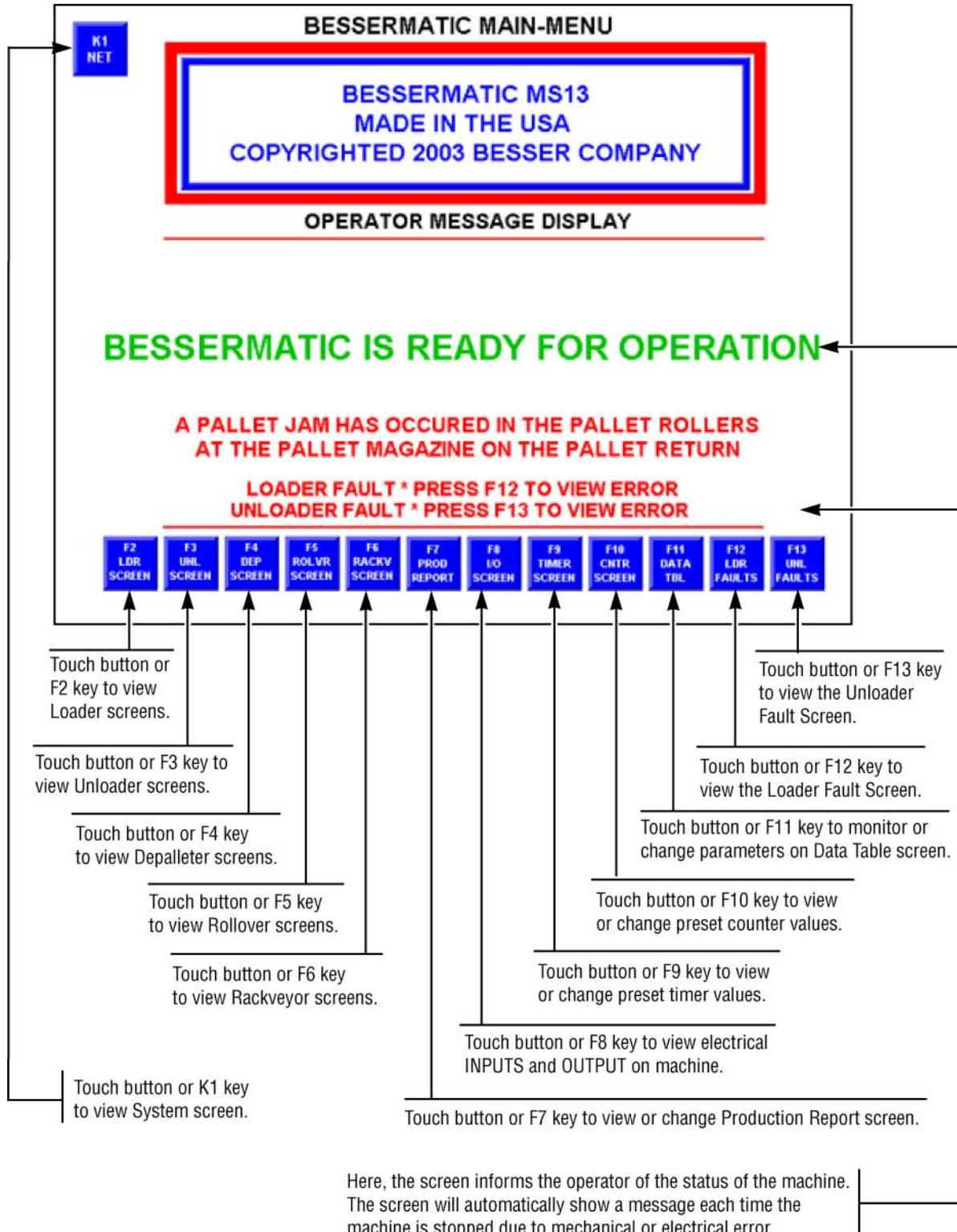
- | | | |
|---|----------------------------|---|
| Kxx and Fxx | Function Keys | Use these keys to select a menu. |
| 0 thru 9, -, . | Numeric Key Pad | Use these keys to enter numeric values. |
|  | Backspace Key | Use this key to erase a parameter. |
|  | Enter Key | Use this key to accept a parameter. |
|  | Navigation Keys | Use these keys to move cursor up and down and left to right. |
|  | Tab, Shift Keys | |
|  | Esc, Ctrl, Alt Keys | Alt+arrow keys activates home, end, page up, page down function keys. |



3.3 MAIN MENU

The screens shown in this section are typical screens. Your screens may vary.

NOTE: These man-machine interfaces are dual capable with touch screen and keypad functionality.

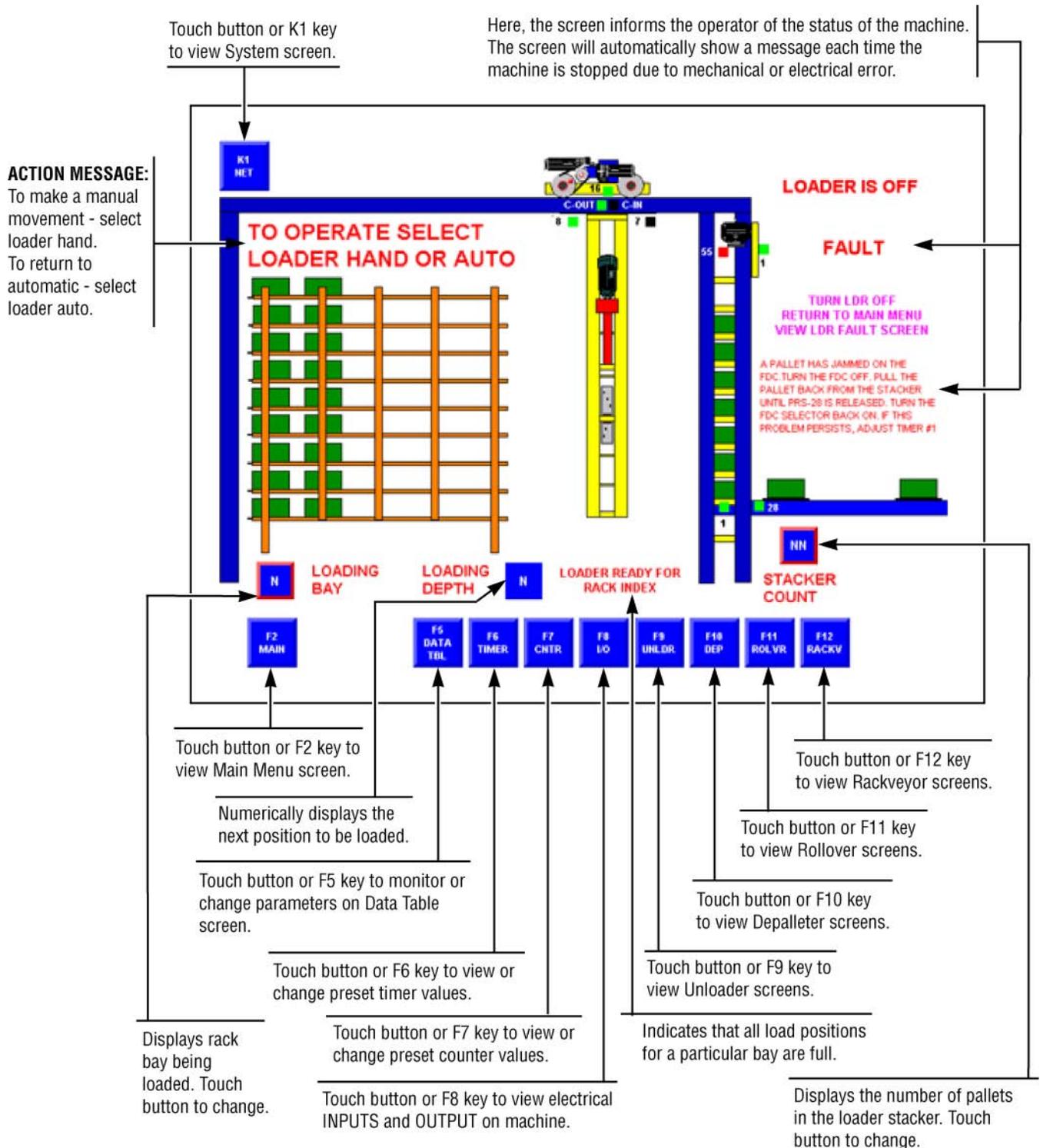


3.4 SELECTION SCREEN

3.4.1 Loader Off Screen

This screen is displayed when the loader HAND-OFF-AUTO selector switch is set to OFF.

NOTE: All sensors change color from black to green and blink when actuated.

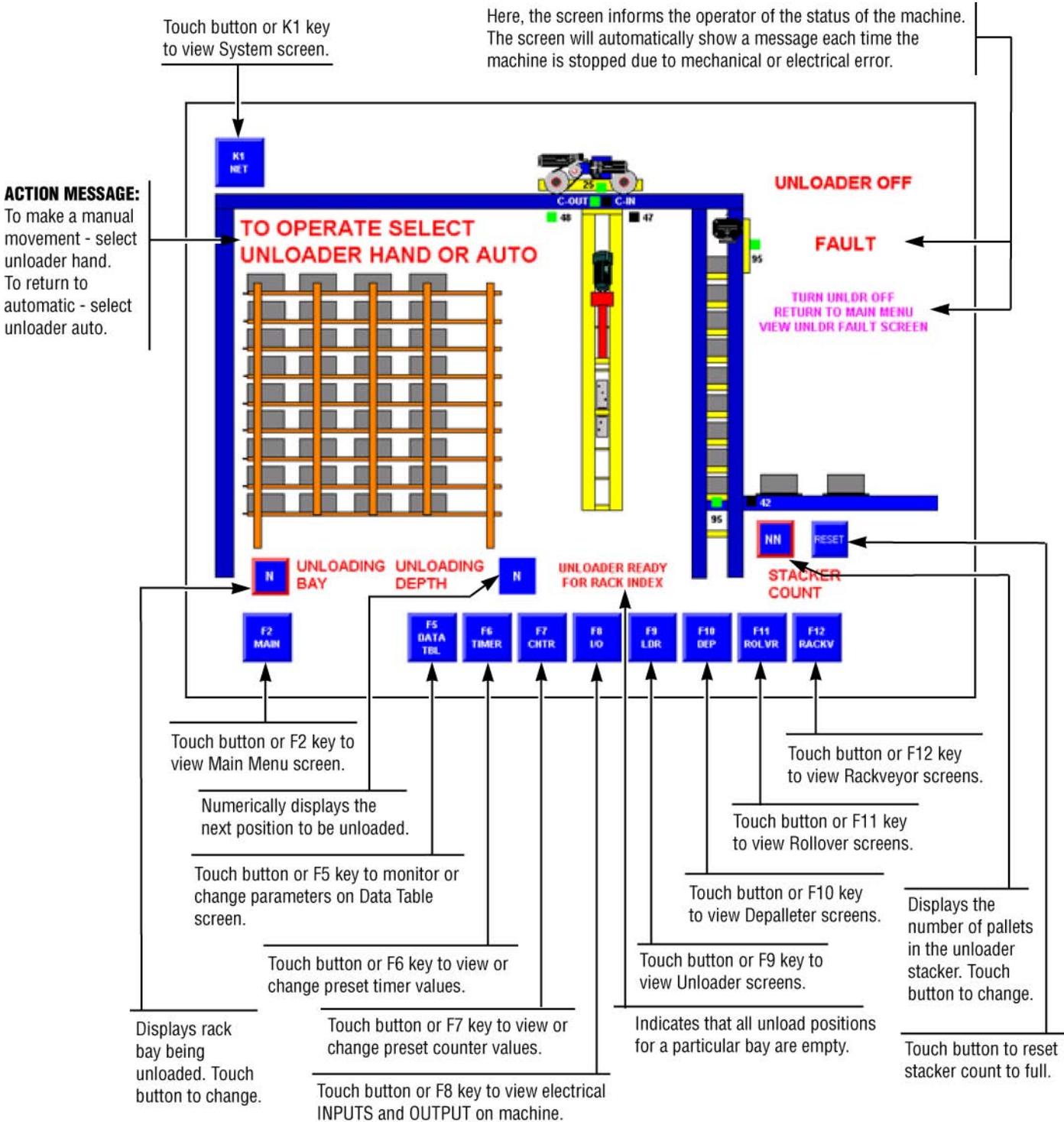




3.4.2 Unloader Off Screen

This screen is displayed when the loader HAND-OFF-AUTO selector switch is set to OFF.

NOTE: All sensors change color from black to green and blink when actuated.

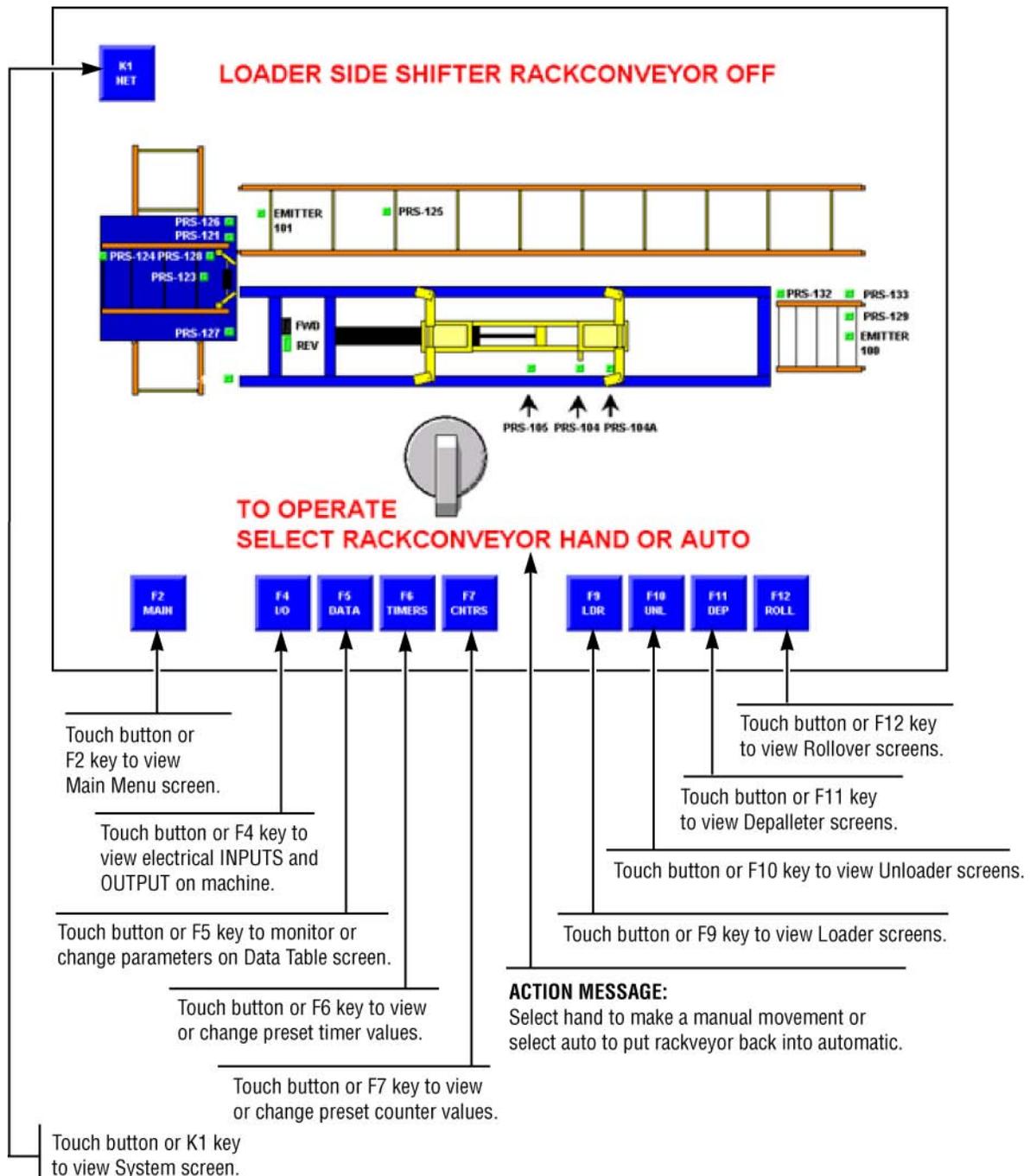


3.4.3 Rackconveyor* Off Screen

This screen is displayed when the rackconveyor HAND-OFF-AUTO selector switch is set to OFF.

* Rackconveyor and rackveyor are terms that refer to the same equipment.

NOTE: All sensors change color from black to green and blink when actuated.



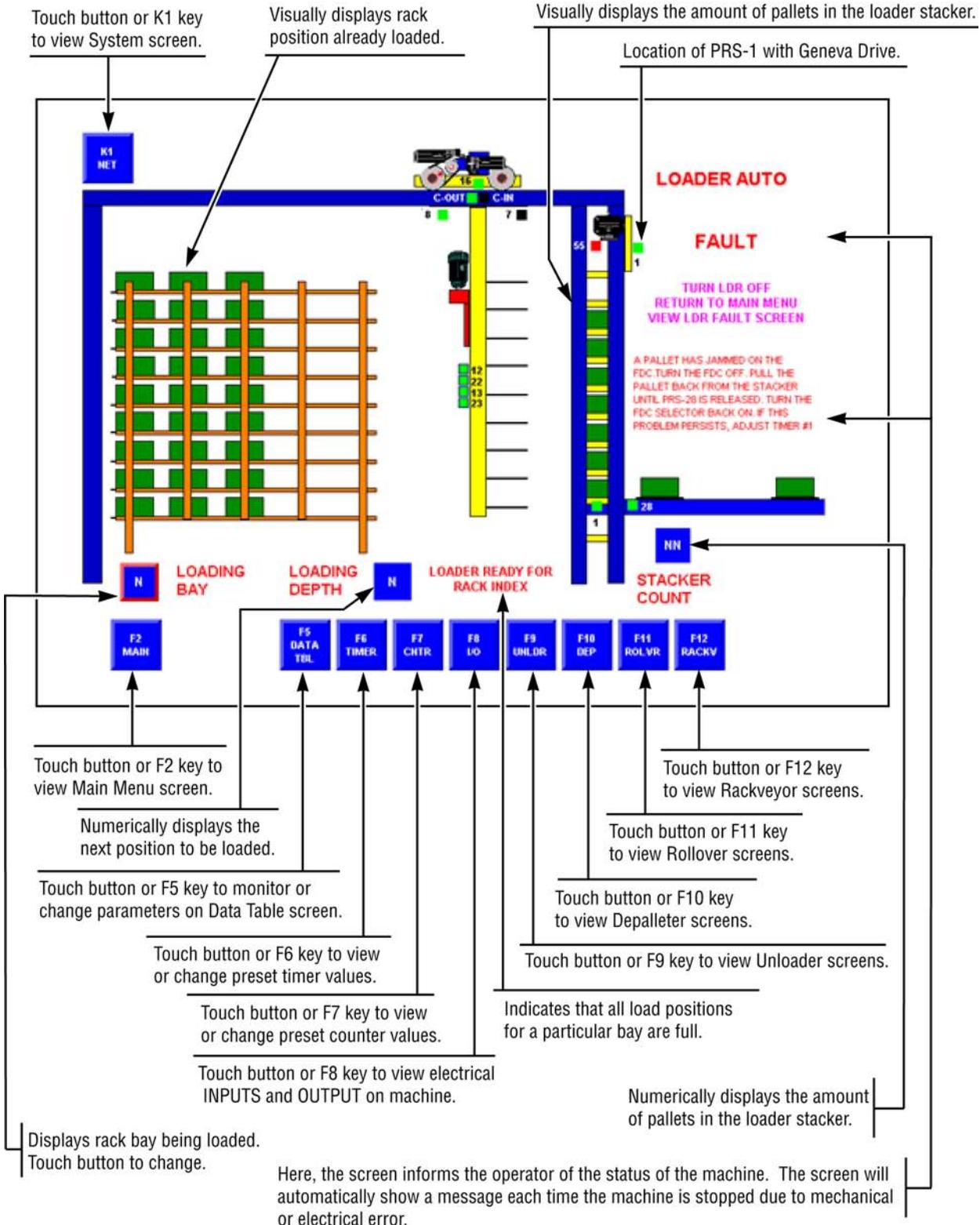


3.5 AUTOMATIC SCREEN

3.5.1 Loader Auto Control Screen

This screen is displayed only when the loader HAND-OFF-AUTO selector switch is set to AUTO.

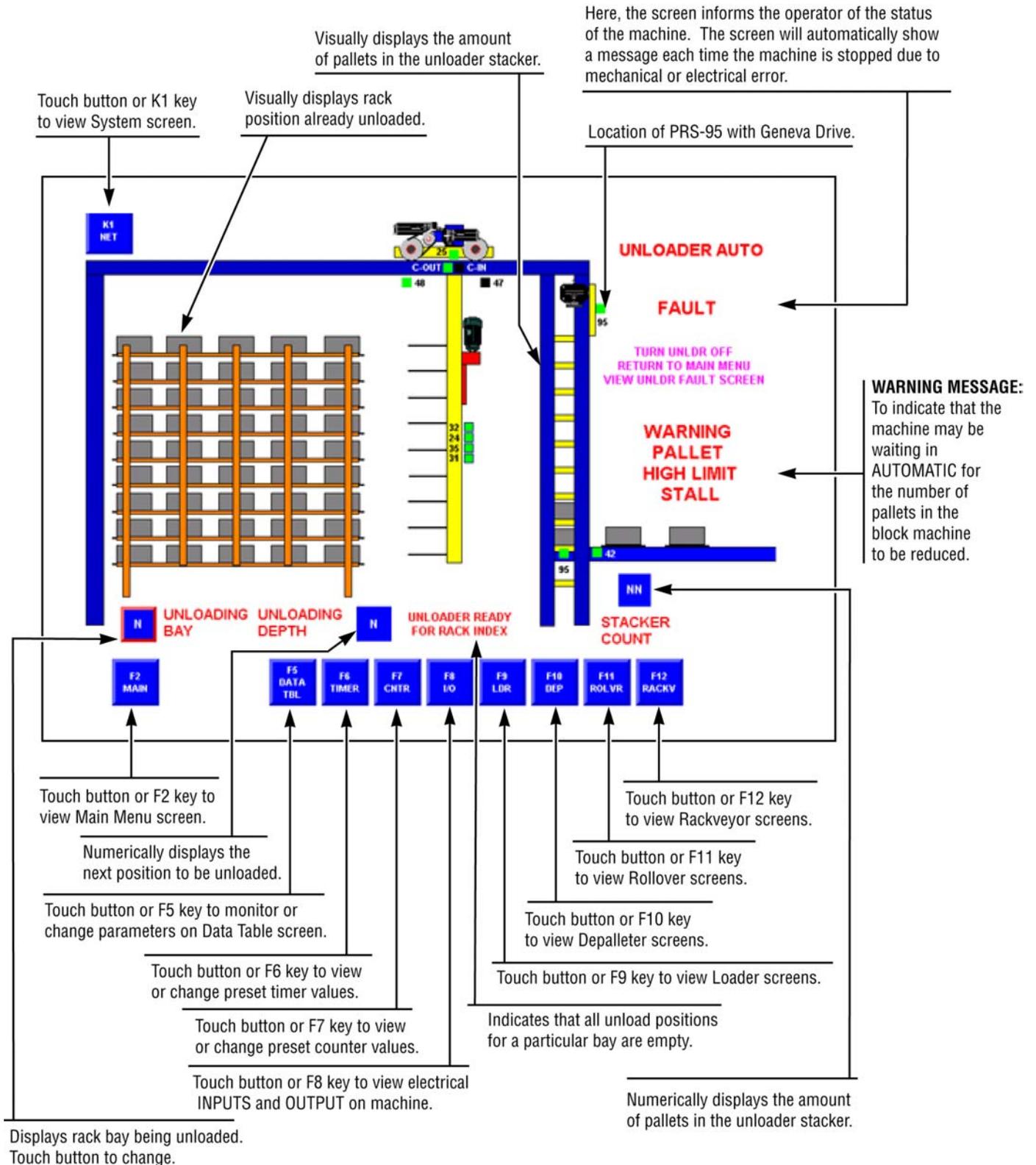
NOTE: All sensors change color from black to green and blink when actuated.



3.5.2 Unloader Auto Control Screen

This screen is displayed only when the unloader HAND-OFF-AUTO selector switch is set to AUTO.

NOTE: All sensors change color from black to green and blink when actuated.



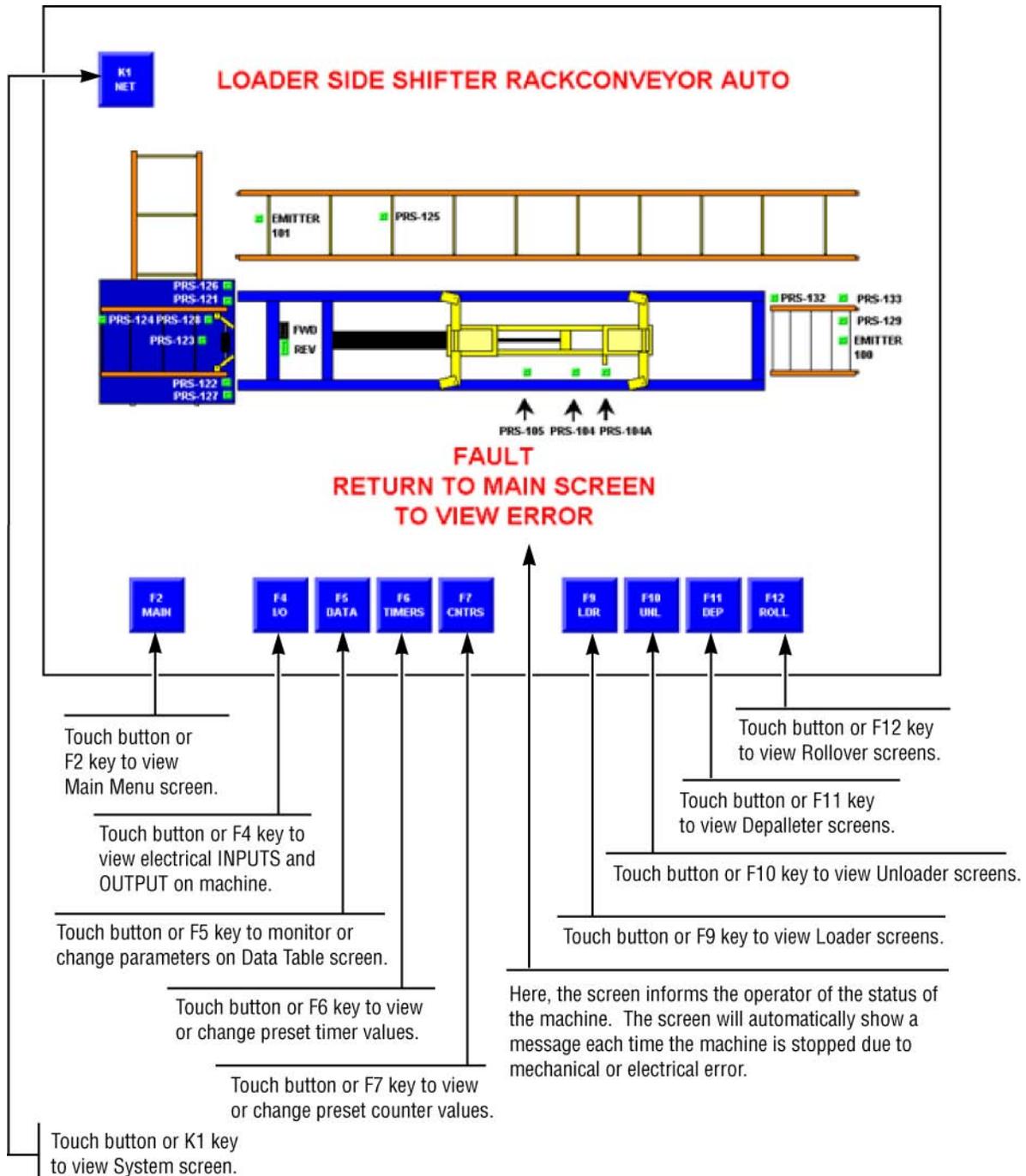
3.5.3 Rackconveyor* Auto Control Screen

This screen is displayed only when the rackveyor HAND-OFF-AUTO selector switch is set to AUTO.

NOTE: If you have an unloader side shifter, you will not use PRS-132 and PRS-133. This screen will appear differently.

* Rackconveyor and rackveyor are terms that refer to the same equipment.

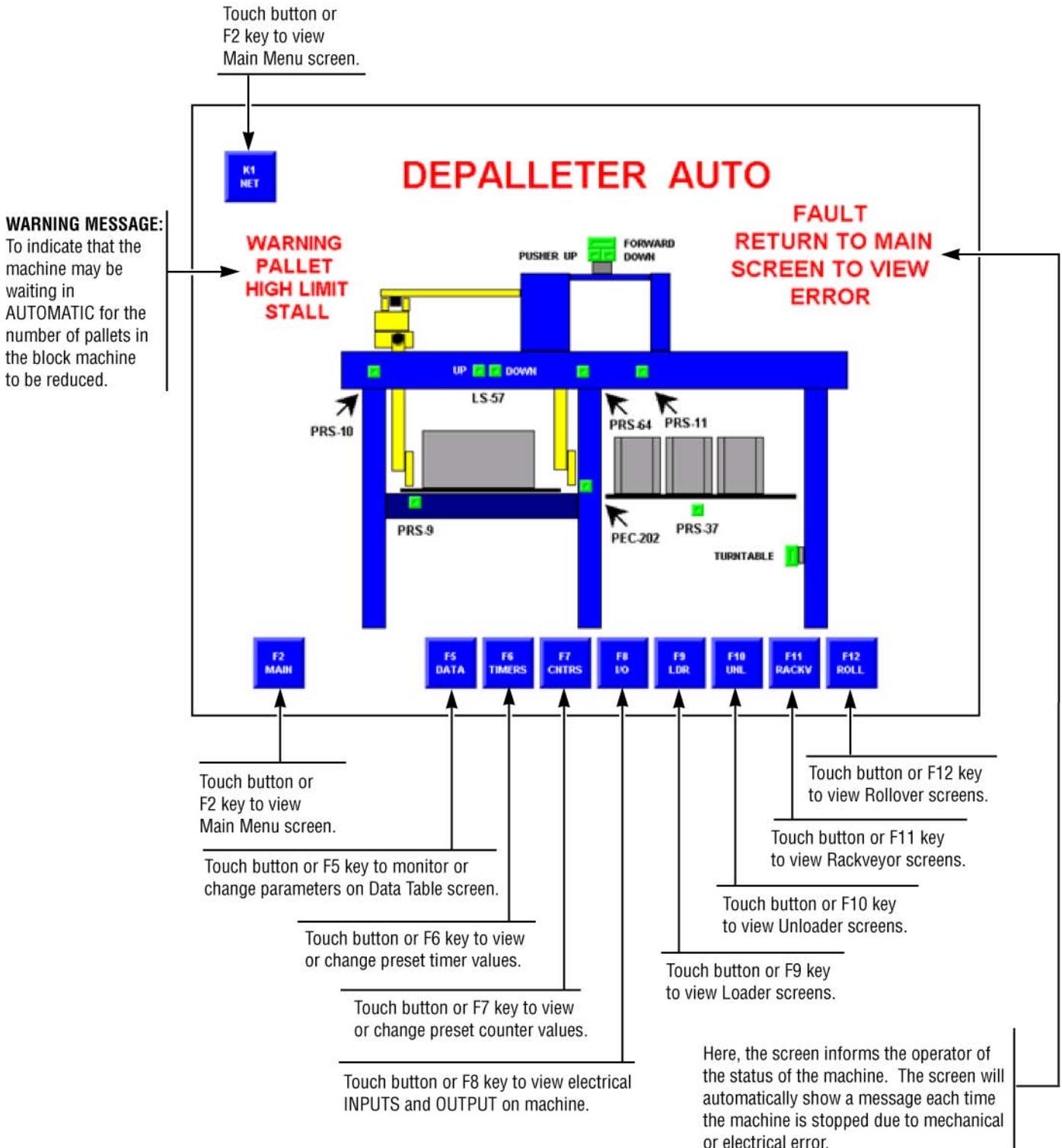
NOTE: All sensors change color from black to green and blink when actuated.



3.5.4 Depalleter Auto Control Screen

These screens are displayed only when the depalleter HAND-OFF-AUTO selector switch is set to AUTO.

NOTE: All sensors change color from black to green and blink when actuated.

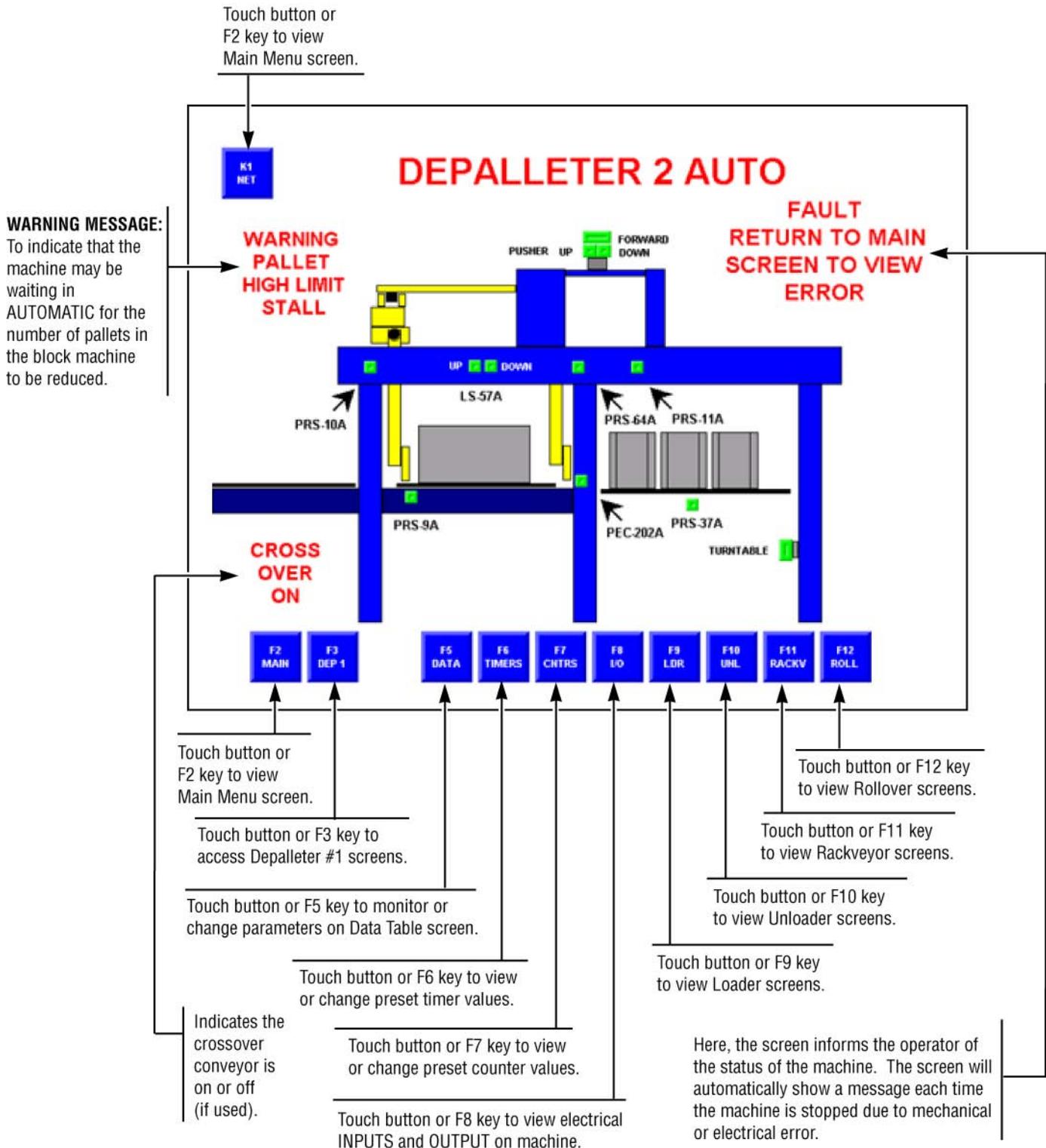




3.5.5 Depalleter #2 Auto Screen

This screen is active only with a 2 depalleter system. This screen is displayed only when depalleter #2 HAND-OFF-AUTO selector switch is set to AUTO.

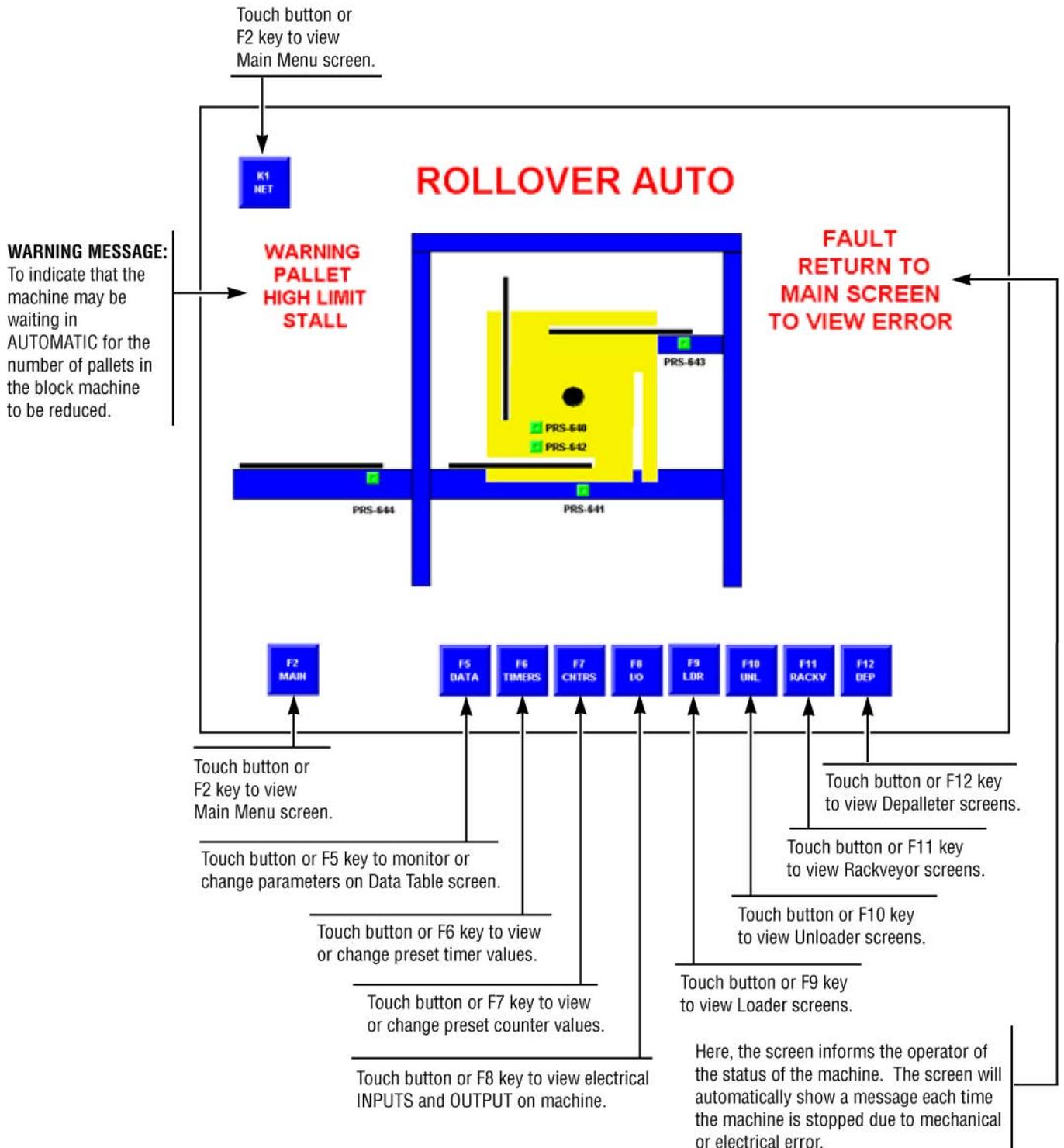
NOTE: All sensors change color from black to green and blink when actuated.



3.5.6 Rollover Auto Control Screen

This screen is displayed only when the rollover HAND-OFF-AUTO selector switch is set to AUTO. This screen is active only when a rollover is in the system.

NOTE: All sensors change color from black to green and blink when actuated.



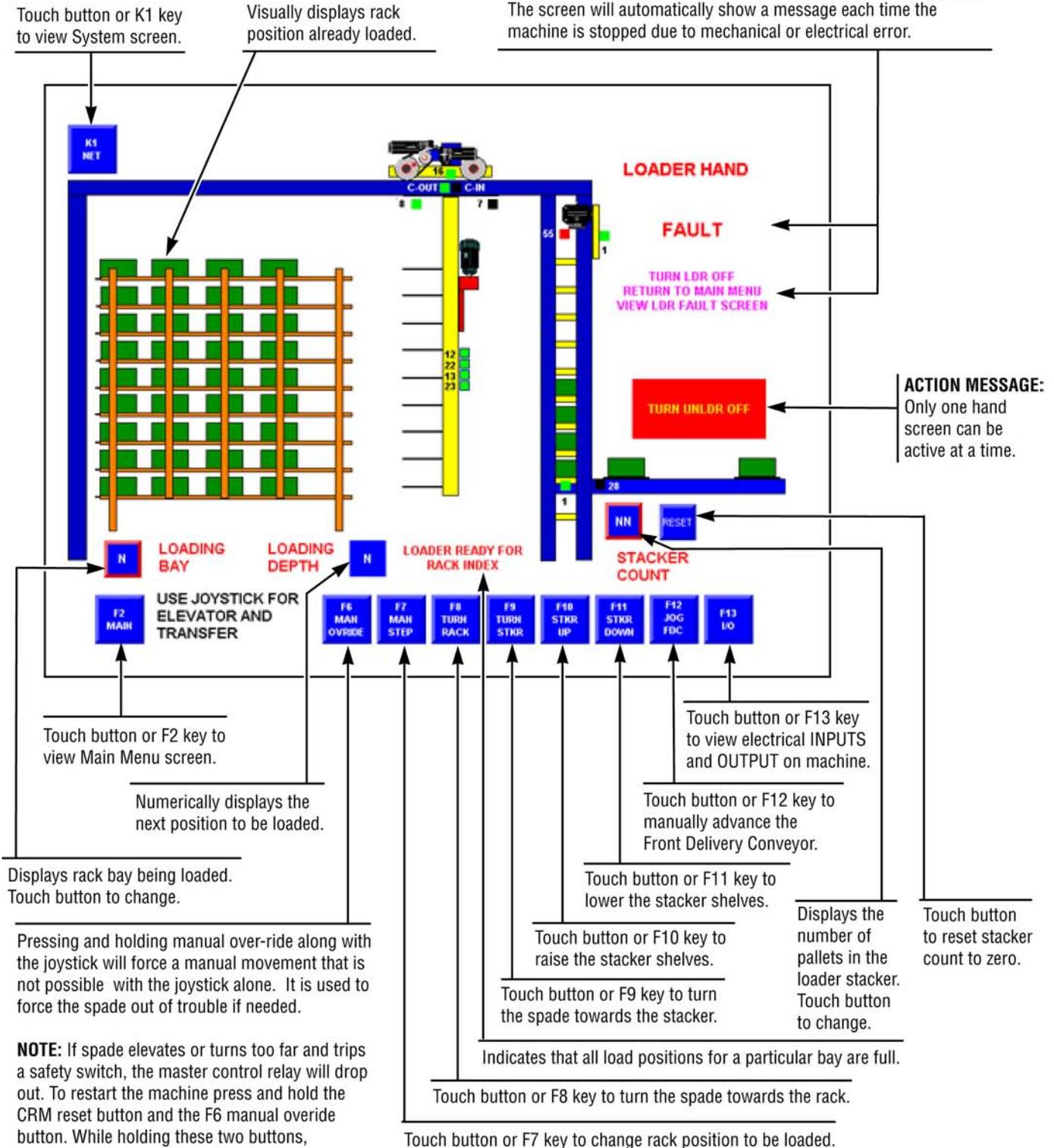


3.6 MANUAL CONTROL SCREENS

3.6.1 Loader Hand Control Screen

This screen is displayed only when the loader HAND-OFF-AUTO selector switch is set to HAND.

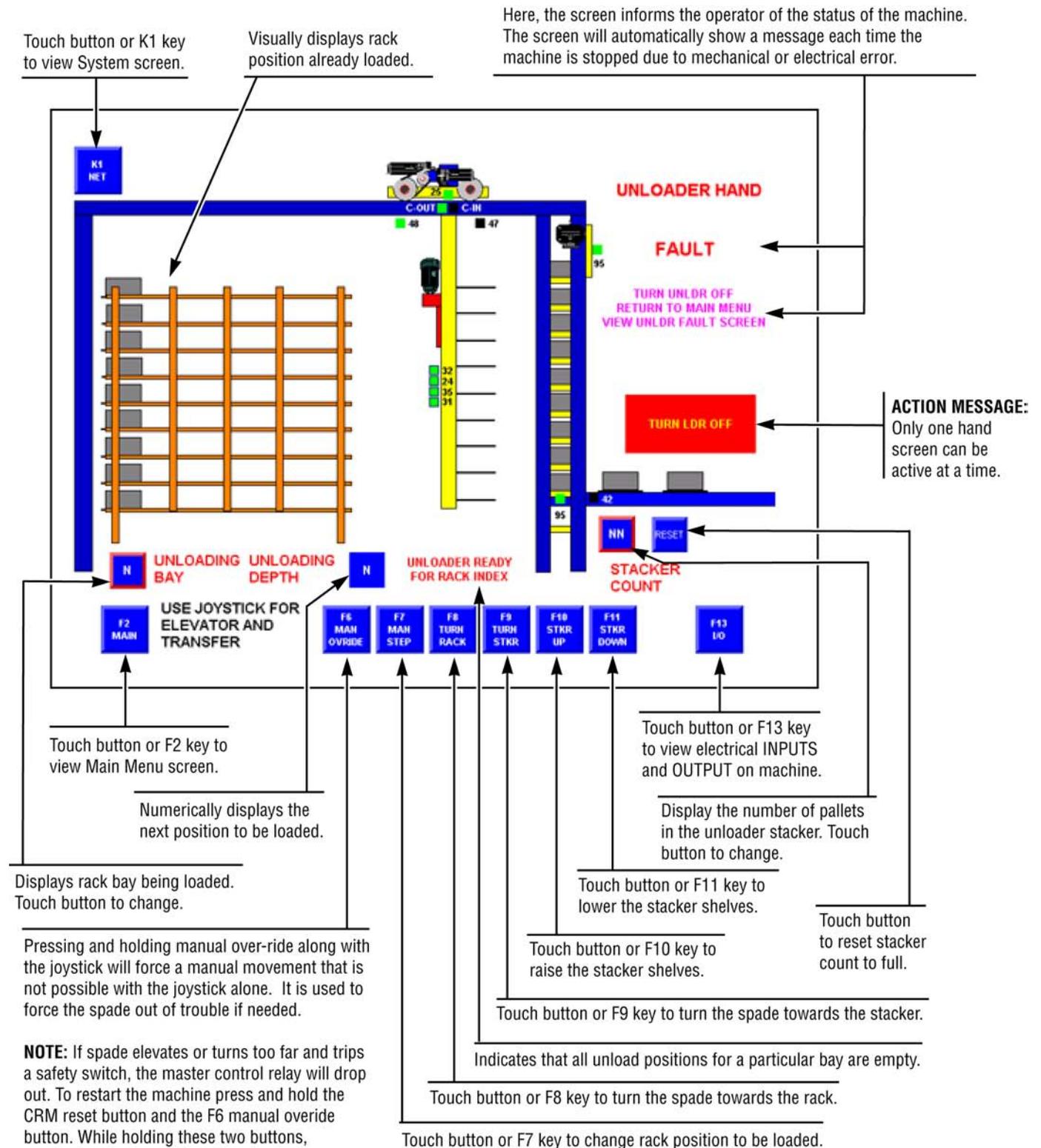
Here, the screen informs the operator of the status of the machine. The screen will automatically show a message each time the machine is stopped due to mechanical or electrical error.



3.6.2 Unloader Hand Control Screen

This screen is displayed only when the unloader HAND-OFF-AUTO selector switch is set to HAND.

NOTE: All sensors change color from black to green and blink when actuated.

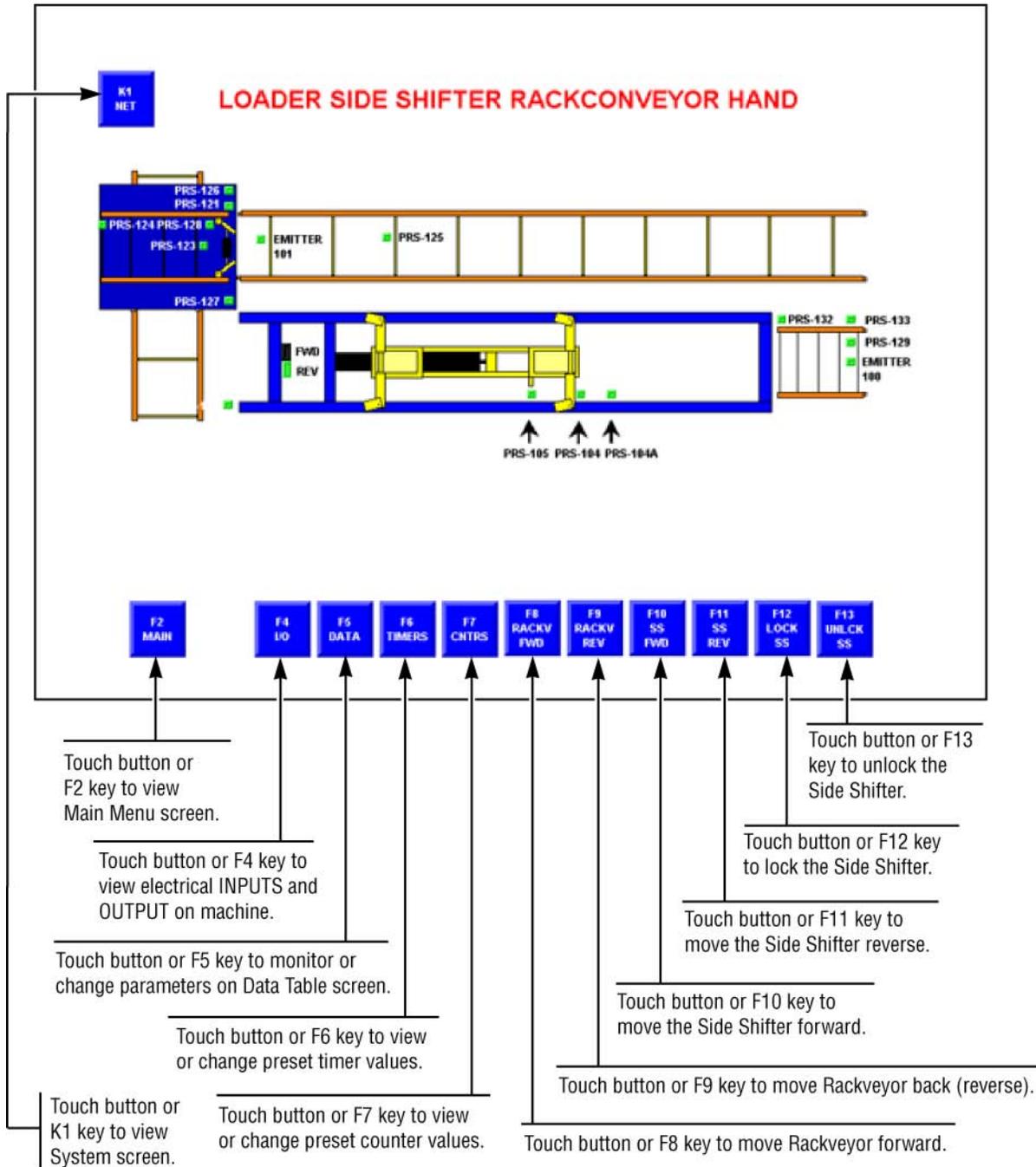


3.6.3 Rackconveyor* Hand Control Screen

This screen is displayed only when the rackveyor HAND-OFF-AUTO selector switch is set to HAND.

* Rackveyor and rackconveyor are terms that refer to the same equipment.

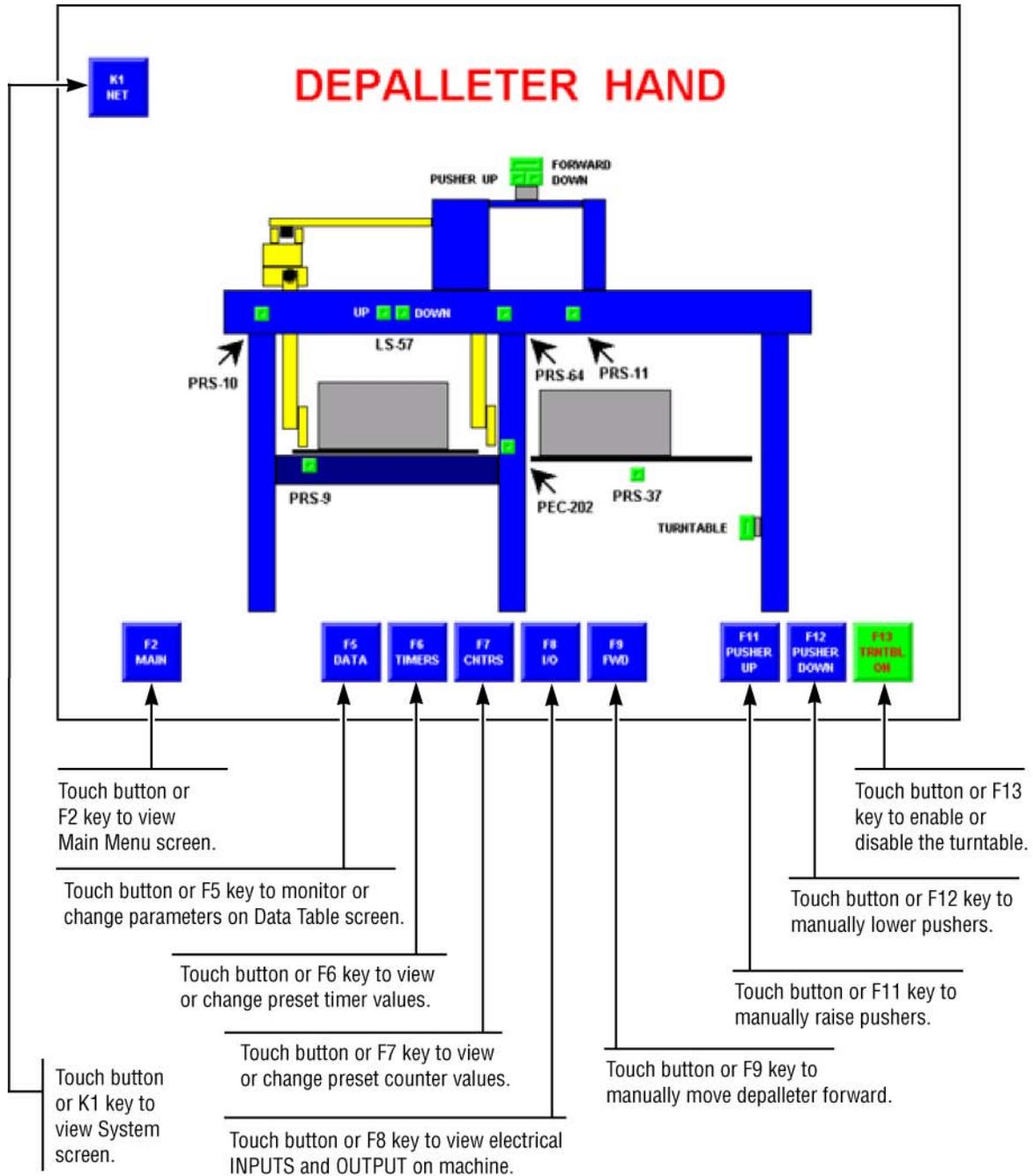
NOTE: All sensors change color from black to green and blink when actuated.



3.6.4 Depalleter Hand Control Screen

These screens are displayed only when the depalleter HAND-OFF-AUTO selector switch is set to HAND.

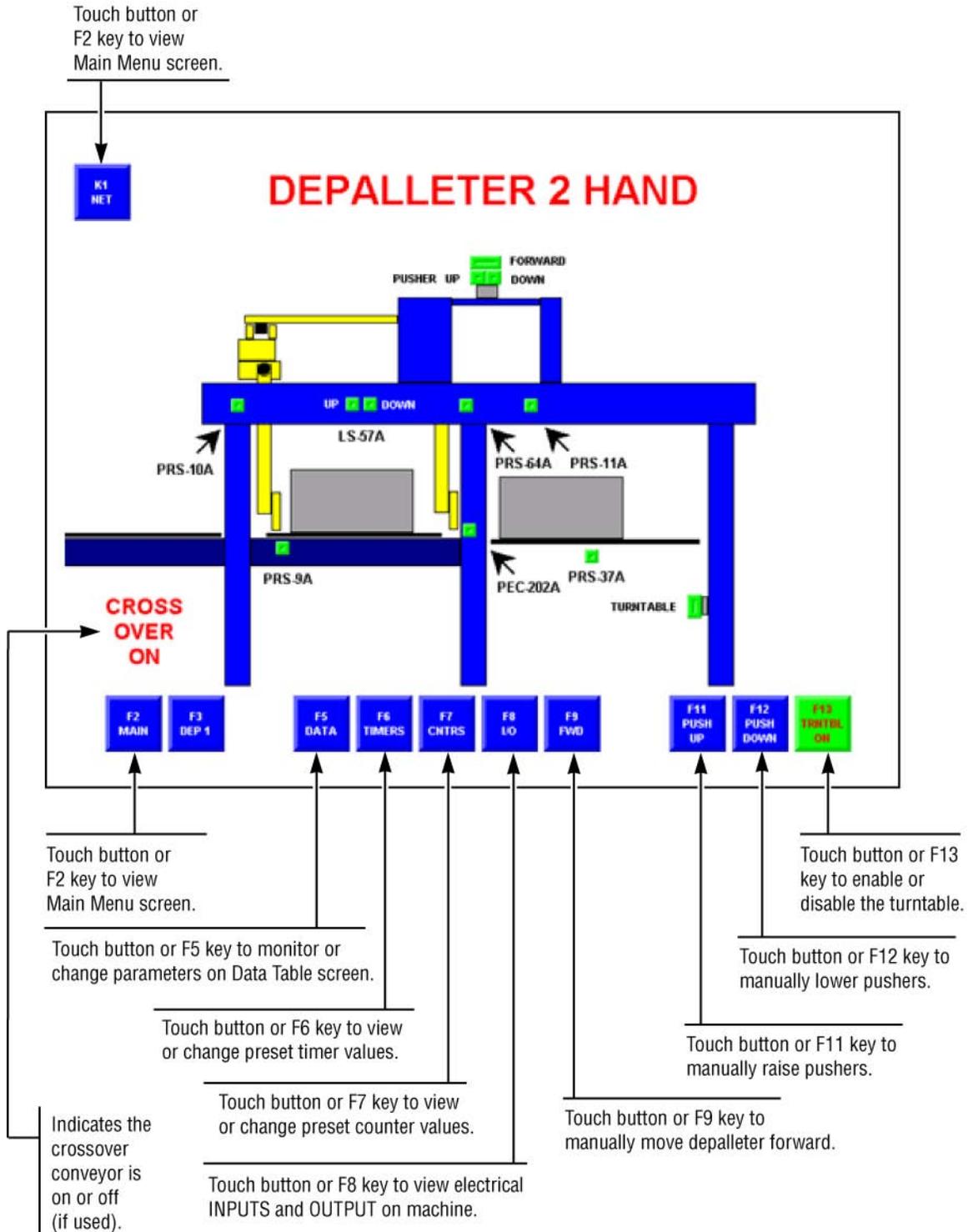
NOTE: All sensors change color from black to green and blink when actuated.



3.6.5 Depalletter #2 Hand Screen

This screen is active only with a 2 depalletter system. This screen is displayed only when depalletter #2 HAND-OFF-AUTO selector switch is set to HAND.

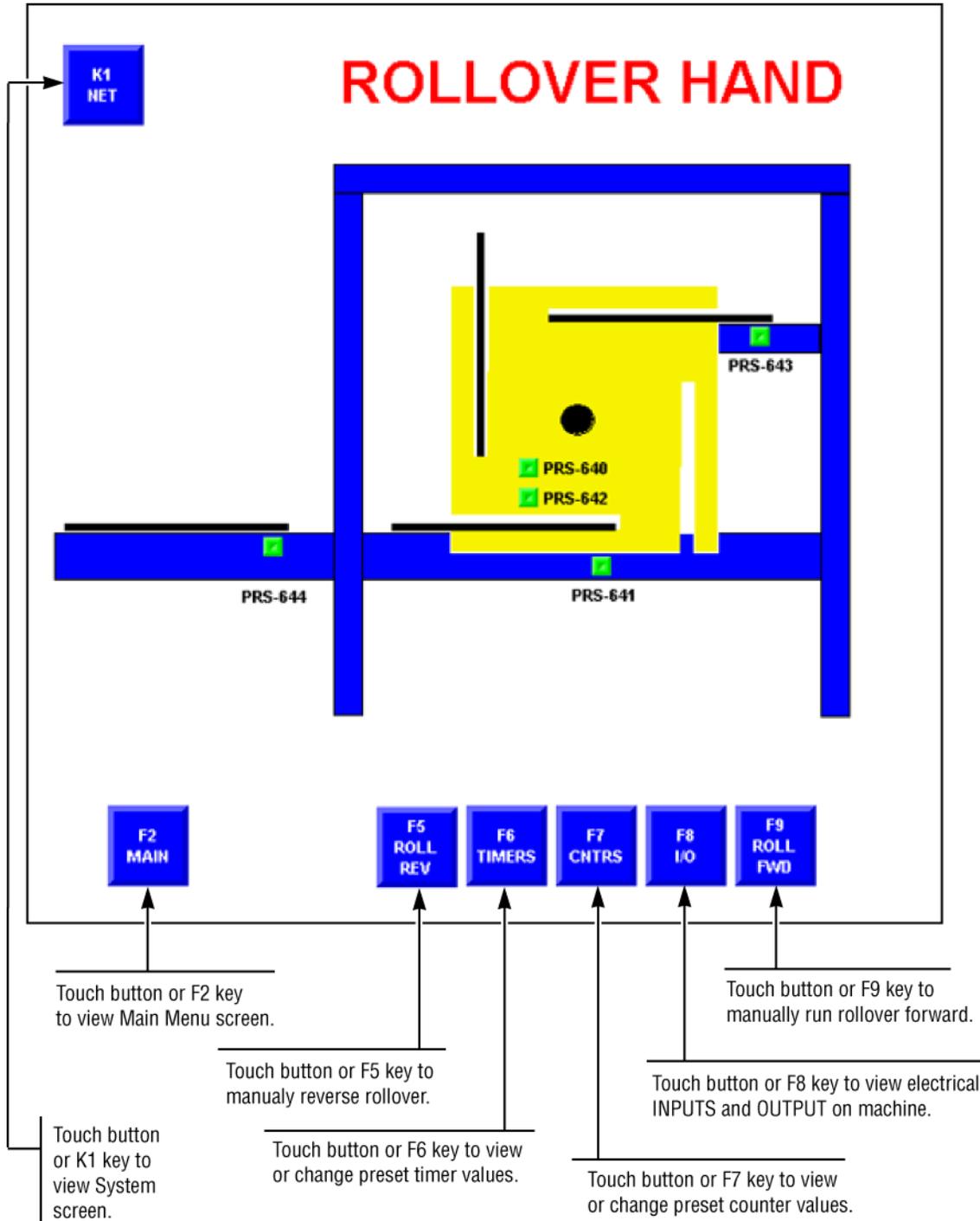
NOTE: All sensors change color from black to green and blink when actuated.



3.6.6 Rollover Hand Control Screen

This screen is displayed only when the rollover HAND-OFF-AUTO selector switch is set to HAND. This screen is active only when a rollover is in the system.

NOTE: All sensors change color from black to green and blink when actuated.



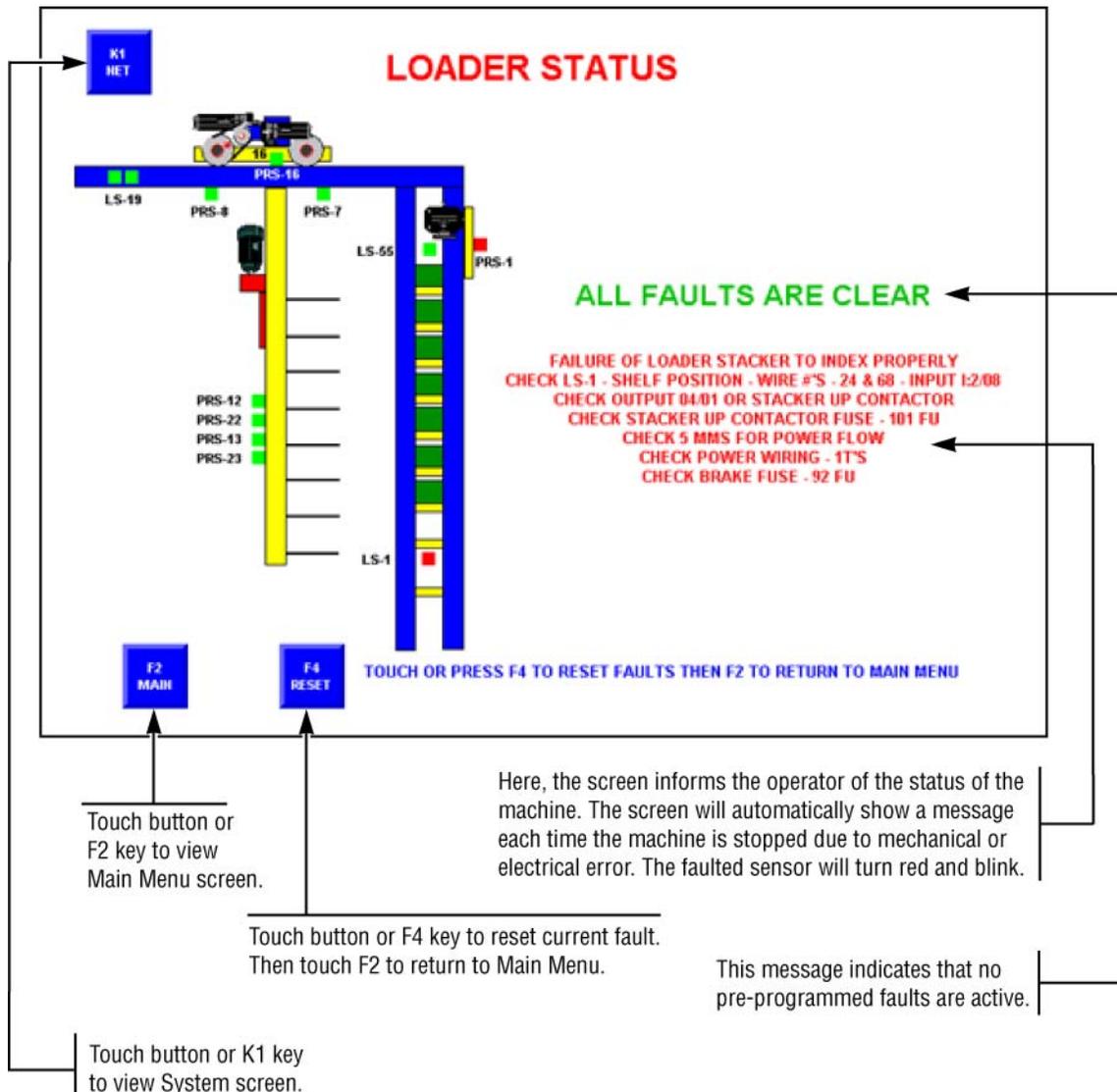


3.7 FAULT SCREENS

3.7.1 Loader Spade Fault Screen

This screen will be updated each time a fault occurs on the loader spade.

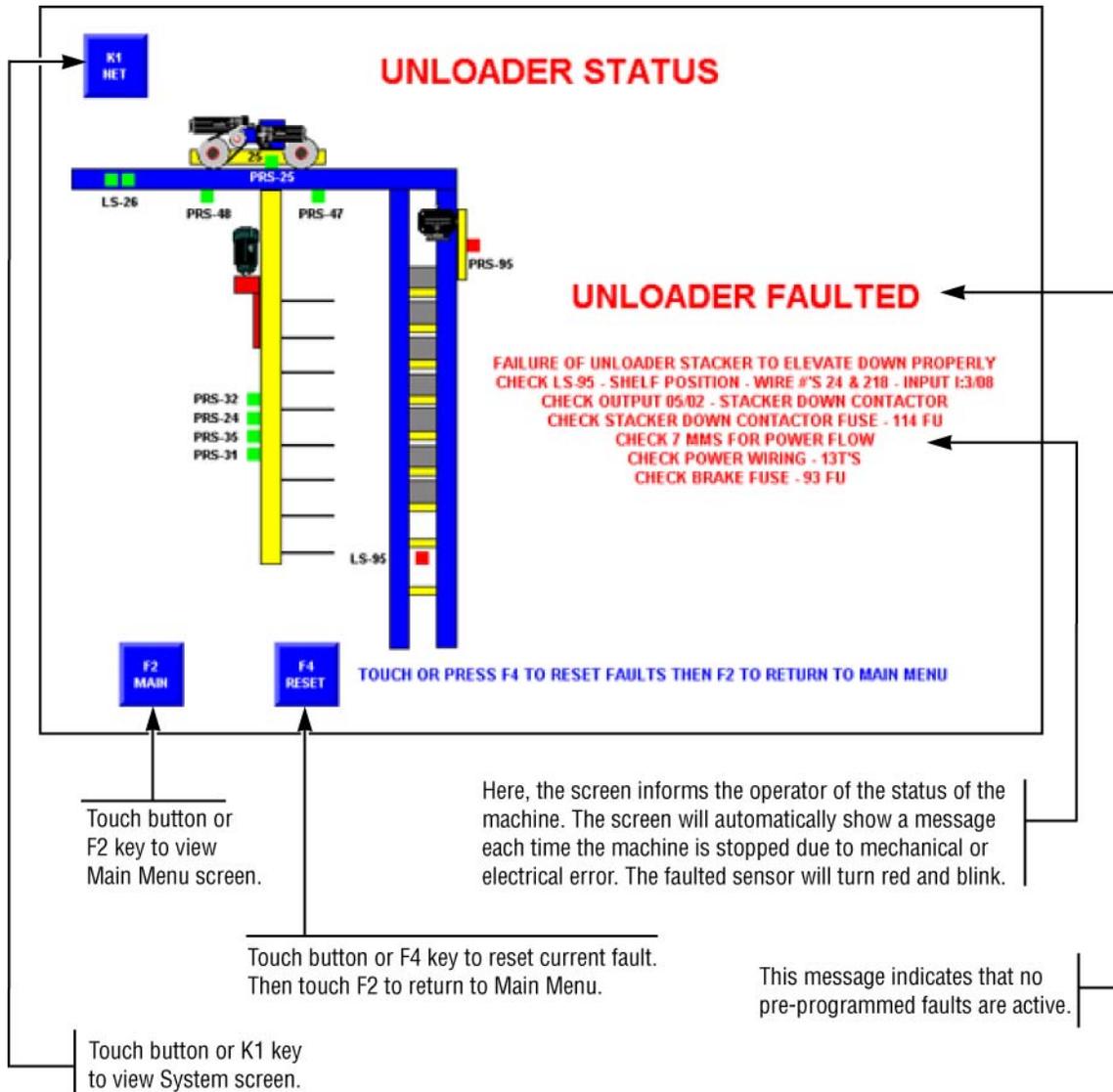
NOTE: All sensors change color from black to green and blink when actuated.



3.7.2 Unloader Spade Fault Screen

This screen will be updated each time a fault occurs on the unloader spade. Refer to Section 6 “Troubleshooting” for description of all fault screens.

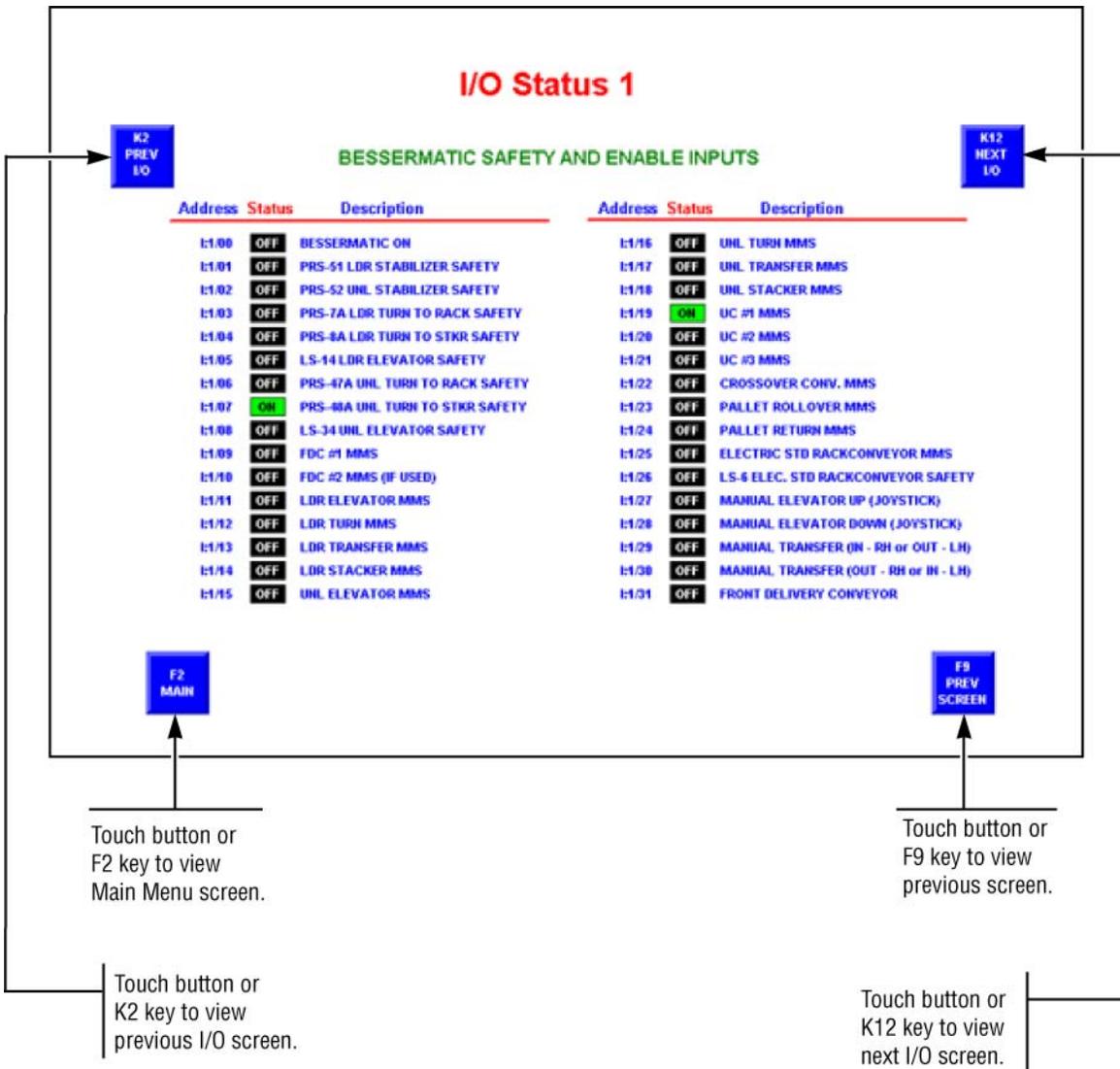
NOTE: All sensors change color from black to green and blink when actuated.





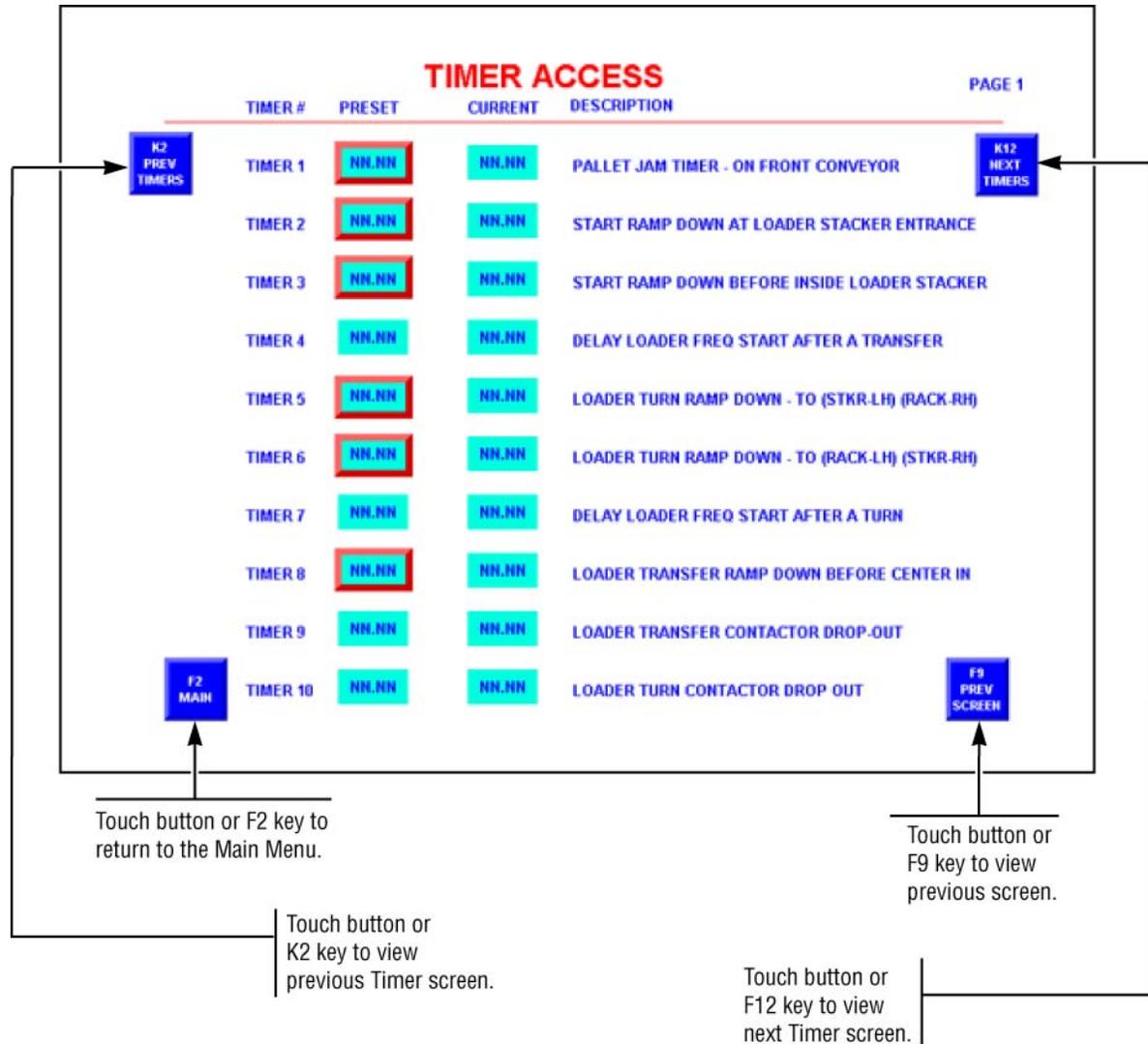
3.8 INPUT/OUTPUT STATUS

This typical I/O screen indicates the on or off status of the inputs and outputs being displayed.



3.9 TIMER ADJUSTMENT

This typical timer screen indicates the preset (programmed) value and current (accumulated) value of the timers being displayed. Values highlighted with red boxes can be modified. Touch the red box to change value.



1.4.2 To Modify a Timer Value

Use K2 or K12 key to select page where desired timer is located.

Once in proper page, touch red box of timer you wish to modify.

Use the **0** to **9** keys of the pop-up keypad to enter new preset value.

Press to load the new preset value.

Repeat steps if an error occurs.

Press to delete left most number.

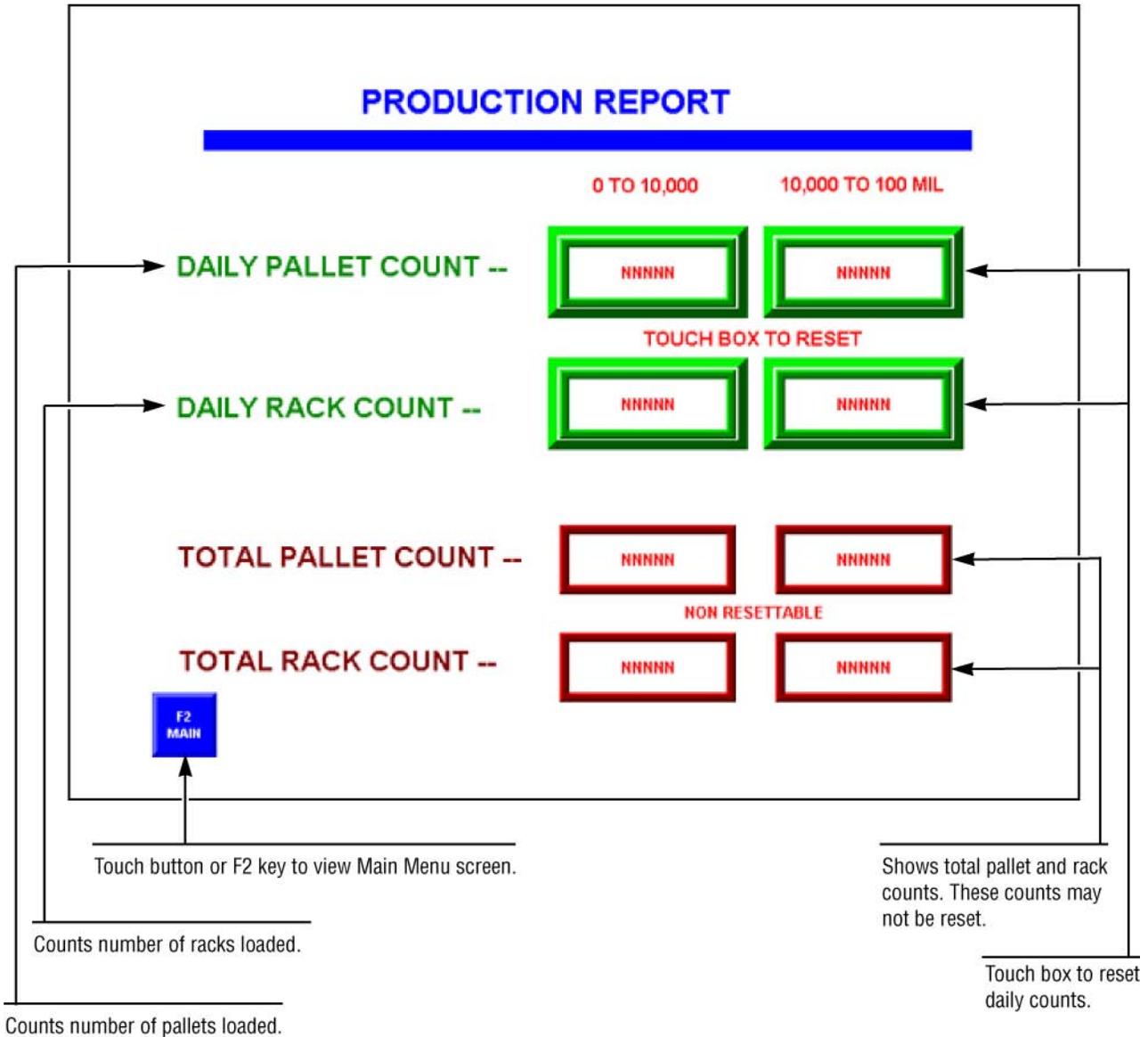
Press to close pop-up keypad.



3.10 PRODUCTION REPORT

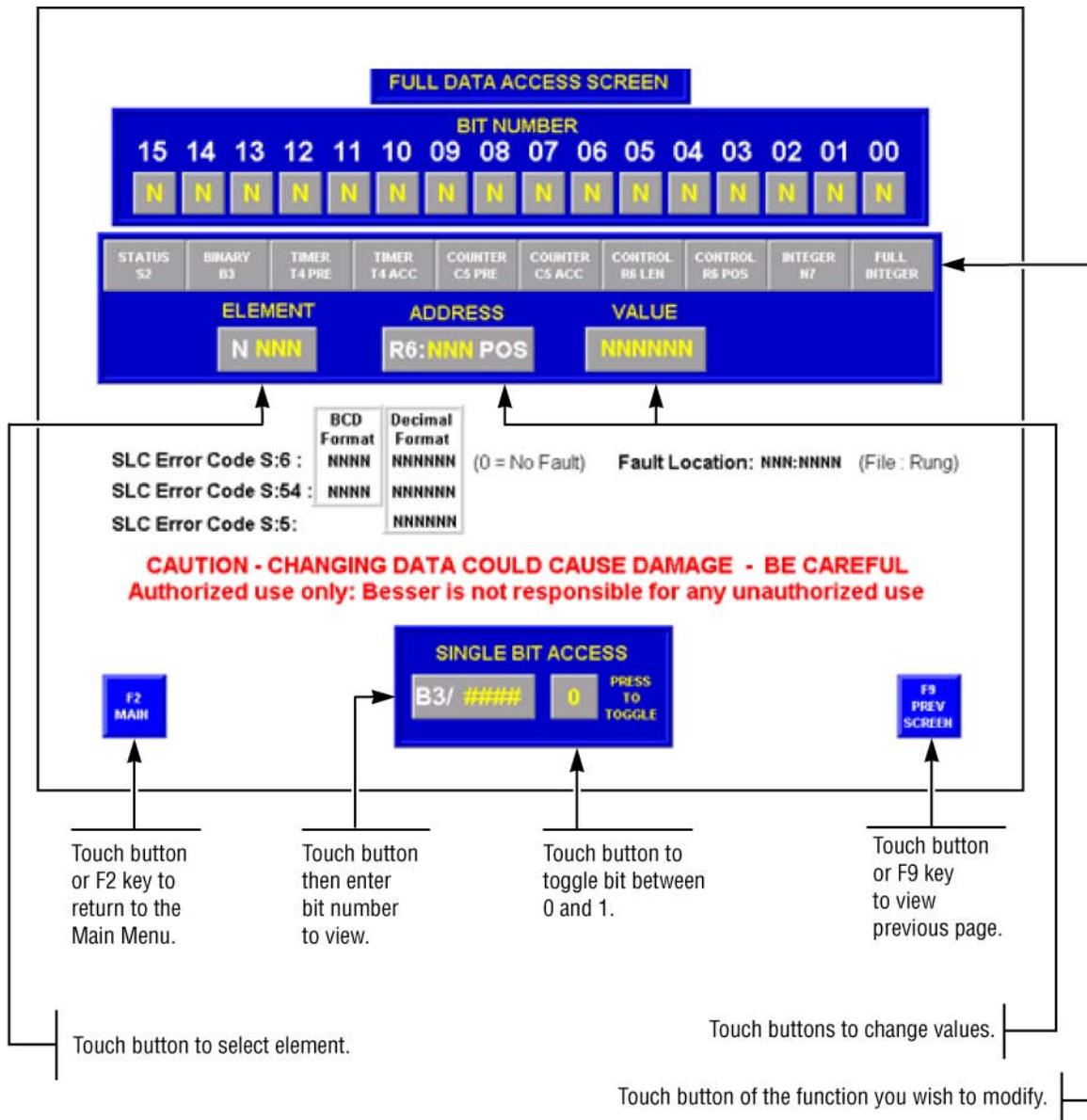
This menu informs the operator on the production count. The operator may also reset the production count in this menu.

NOTE: It is not possible to reset the total pallet and total rack count.



3.11 DATA TABLE ACCESS

The Data table enables the operator to monitor or change parameters concerning: Control relays, Timer and Counter presets as well as Integer value.



CAUTION: CHANGING DATA COULD CAUSE DAMAGE - BE CAREFUL
Authorized use only: Besser is not responsible for any unauthorized use.



To change or monitor any of the parameters, press any of the touch screen keys between STATUS S2 and FULL INTEGER.

3.11.1 To Monitor SLC500 Status (STATUS S2):

From the FULL DATA ACCESS SCREEN,

1. Press the touch screen key, STATUS S2.

The display will read:

FULL DATA ACCESS SCREEN

BIT NUMBER															
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

STATUS S2	BINARY B3	TIMER T4 PRE	TIMER T4 ACC	COUNTER C5 PRE	COUNTER C5 ACC	CONTROL R6 LEN	CONTROL R6 POS	INTEGER I7	FULL INTEGER
-----------	-----------	--------------	--------------	----------------	----------------	----------------	----------------	------------	--------------

ADDRESS	VALUE
S2:6	0

BCD Format	Decimal Format
0	0
852	2130
16640	16640

(0 = No Fault)

Fault Location: 2:308 (File : Rung)

Authorized use only: Besser is not responsible for any unauthorized use

F1 RUN SCREEN

Touch Screen Button - To change value, touch screen here, enter a Status word, then press ENTER (example here is 6). A word is an address to a memory location for a timer, a counter, an integer value or a control relay.

Touch Screen Button - The SLC shows here the word preset value. To change, touch screen here, enter a word value, then press ENTER.

3.11.2 To Monitor Control Relay (BINARY B3):

From the FULL DATA ACCESS SCREEN,

1. Press the touch screen key, BINARY B3.

The display will read:

FULL DATA ACCESS SCREEN

BIT NUMBER															
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

STATUS S2	BINARY B3	TIMER T4 PRE	TIMER T4 ACC	COUNTER C5 PRE	COUNTER C5 ACC	CONTROL R6 LEN	CONTROL R6 POS	INTEGER I7	FULL INTEGER
-----------	------------------	--------------	--------------	----------------	----------------	----------------	----------------	------------	--------------

ADDRESS	VALUE
B3:10	2048

	BCD Format	Decimal Format	
SLC Error Code S:6 :	0	0	(0 = No Fault)
Last SLC Error Code S:54 :	852	2130	
SLC Error Code S:5:		16640	

Fault Location: 2:308 (File : Rung)

Authorized use only: Besser is not responsible for any unauthorized use

F1 RUN SCREEN

Touch Screen Button - To change, touch screen here, enter a Control Relay word address, then press ENTER (example here is 10). Refer to the logic diagram for proper address location.

Touch Screen Button - The SLC shows here the Bit value. To change, touch screen here to toggle bit. 0 = OFF and 1 = ON.



3.11.3 To Monitor or Change a Timer Preset (TIMER T4 PRE):

From the FULL DATA ACCESS SCREEN,

1. Press the **touch screen** key, TIMER T4 RE.

The display will read:

FULL DATA ACCESS SCREEN

BIT NUMBER

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0

STATUS S2	BINARY B3	TIMER T4 PRE	TIMER T4 ACC	COUNTER C5 PRE	COUNTER C5 ACC	CONTROL R6 LEN	CONTROL R6 POS	INTEGER I7	FULL INTEGER
--------------	--------------	-----------------	-----------------	-------------------	-------------------	-------------------	-------------------	---------------	-----------------

ADDRESS **VALUE**

T4:81 PRE 360

	BCD Format	Decimal Format	
SLC Error Code S:6 :	0	0	(0 = No Fault)
Last SLC Error Code S:54 :	852	2130	
SLC Error Code S:5:		16640	

Fault Location: 2:308 (File : Rung)

Authorized use only: Besser is not responsible for any unauthorized use

**F1
RUN
SCREEN**

Touch Screen Button - To change value, touch screen here, enter a Timer address, then press ENTER (example here is 81). Refer to logic diagram for address location and description.

Touch Screen Button - The SLC shows here the Timer preset value. To change, touch screen here, enter a value, then press ENTER.

3.11.4 To Change or Monitor the Accumulated Value of a Timer (TIMER T4 ACC):

From the FULL DATA ACCESS SCREEN,

1. Press the **touch screen** key, TIMER T4 ACC.

The display will read:

The screenshot shows the 'FULL DATA ACCESS SCREEN' with a 'BIT NUMBER' row (15-00) and a row of '0's. Below are data fields: STATUS S2, BINARY B3, TIMER T4 PRE, **TIMER T4 ACC**, COUNTER C5 PRE, COUNTER C5 ACC, CONTROL R6 LEN, CONTROL R6 POS, INTEGER I7, and FULL INTEGER. The 'ADDRESS' field shows 'T4:81 ACC' and the 'VALUE' field shows '0'. Below the screen, a table shows SLC Error Codes in BCD and Decimal formats, and a 'Fault Location' of 2:308 (File: Rung). A red warning message states: 'Authorized use only: Besser is not responsible for any unauthorized use'. A blue button labeled 'F1 RUN SCREEN' is in the bottom left.

	BCD Format	Decimal Format	
SLC Error Code S:6 :	0	0	(0 = No Fault)
Last SLC Error Code S:54 :	852	2130	
SLC Error Code S:5:		16640	

Fault Location: 2:308 (File: Rung)

Authorized use only: Besser is not responsible for any unauthorized use

F1 RUN SCREEN

Touch Screen Button - To change value, touch screen here, enter a Timer address, then press ENTER (example here is 81). Refer to logic diagram for address location and description.

Touch Screen Button - The SLC shows here the Timer accumulator value. To change, touch screen here, enter a value, then press ENTER.

NOTE: A time base should be taken into account when establishing true time value.

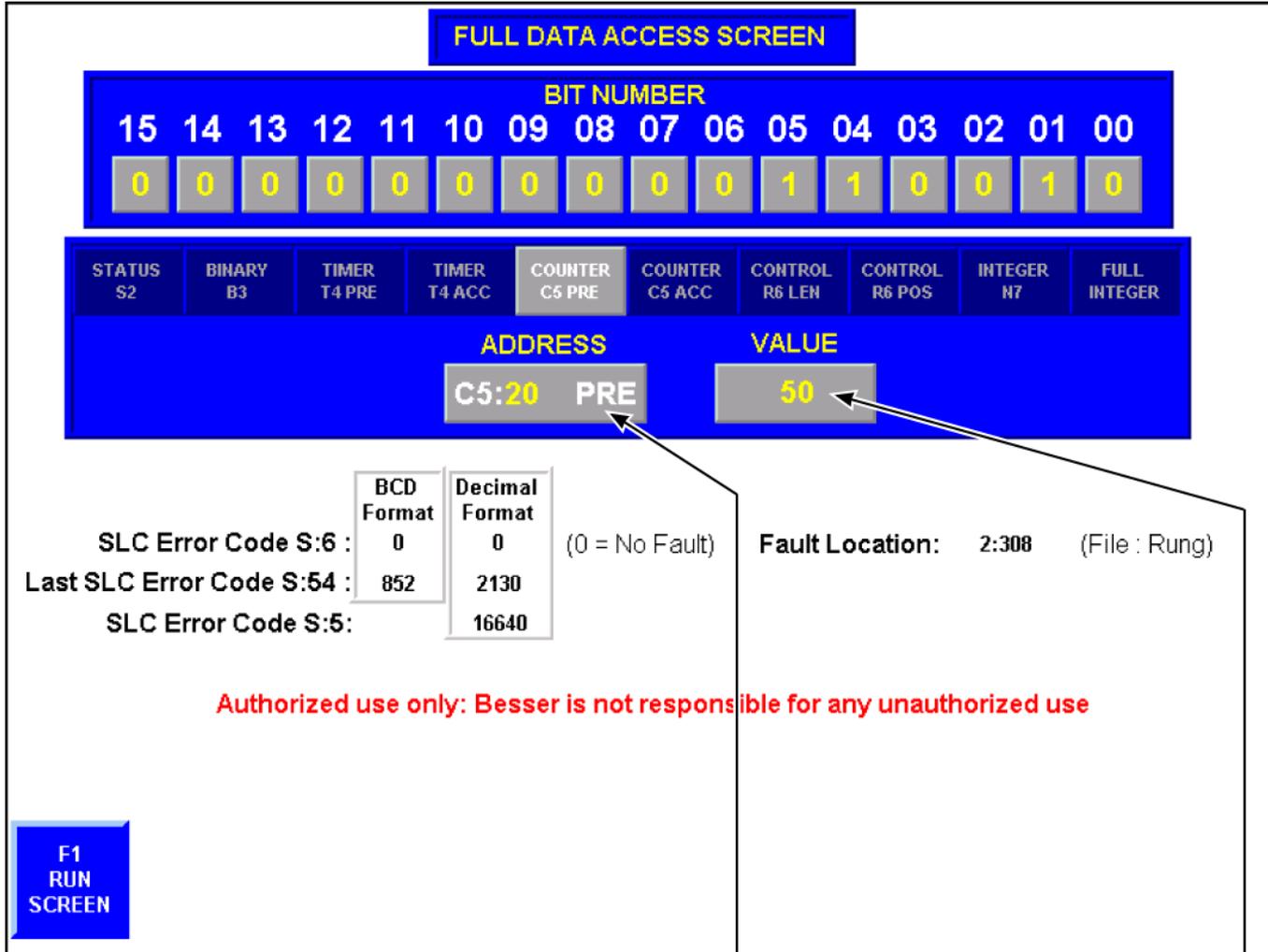


3.11.5 To Monitor or Change Counter Preset (COUNTER C5 PRE):

From the FULL DATA ACCESS SCREEN,

1. Press the touch screen key, COUNTER C5 PRE.

The display will read:



Touch Screen Button - To change value, touch screen here, enter a Counter word address, then press ENTER (example here is 20). Refer to logic diagram for address location and description.

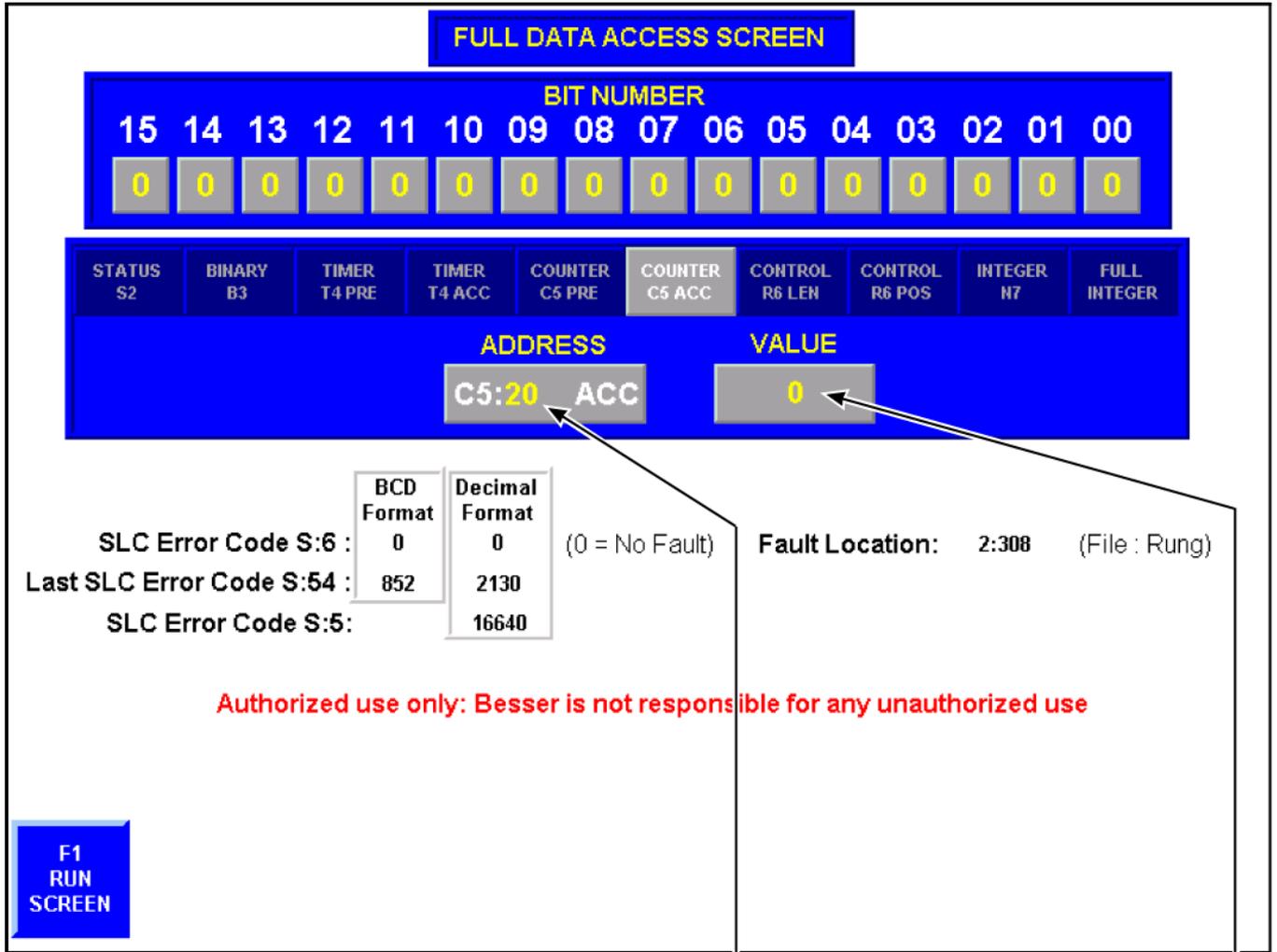
Touch Screen Button - The SLC shows here the Counter preset value. To change, touch screen here, enter a value, then press ENTER.

3.11.6 To Monitor or Change the Accumulated Value of a Counter (COUNTER C5 ACC):

From the FULL DATA ACCESS SCREEN,

1. Press the **touch screen** key, COUNTER C5 ACC.

The display will read:



Touch Screen Button - To change value, touch screen here, enter a Counter address, then press ENTER (example here is 20). Refer to logic diagram for address location and description.

Touch Screen Button - The SLC shows here the Counter Accumulated value. To change, touch screen here, enter a value, then press ENTER.



3.11.7 To Monitor or Change a Integer Word Value (INTEGER N7):

From the FULL DATA ACCESS SCREEN,

1. Press the touch screen key, INTEGER N7.

The display will read:

The screenshot shows the 'FULL DATA ACCESS SCREEN' with a bit number row (15-00) and a row of buttons for various data types. The 'INTEGER N7' button is highlighted. Below it, the 'ADDRESS' field shows 'N7:4' and the 'VALUE' field shows '75'. A table of SLC error codes and a fault location are also visible.

	BCD Format	Decimal Format	
SLC Error Code S:6 :	0	0	(0 = No Fault)
Last SLC Error Code S:54 :	852	2130	
SLC Error Code S:5:		16640	

Fault Location: 2:308 (File : Rung)

Authorized use only: Besser is not responsible for any unauthorized use

F1 RUN SCREEN

Touch Screen Button - To change value, touch screen here, enter an Integer word address, then press ENTER (example here is 4). Refer to logic diagram for address location and description.

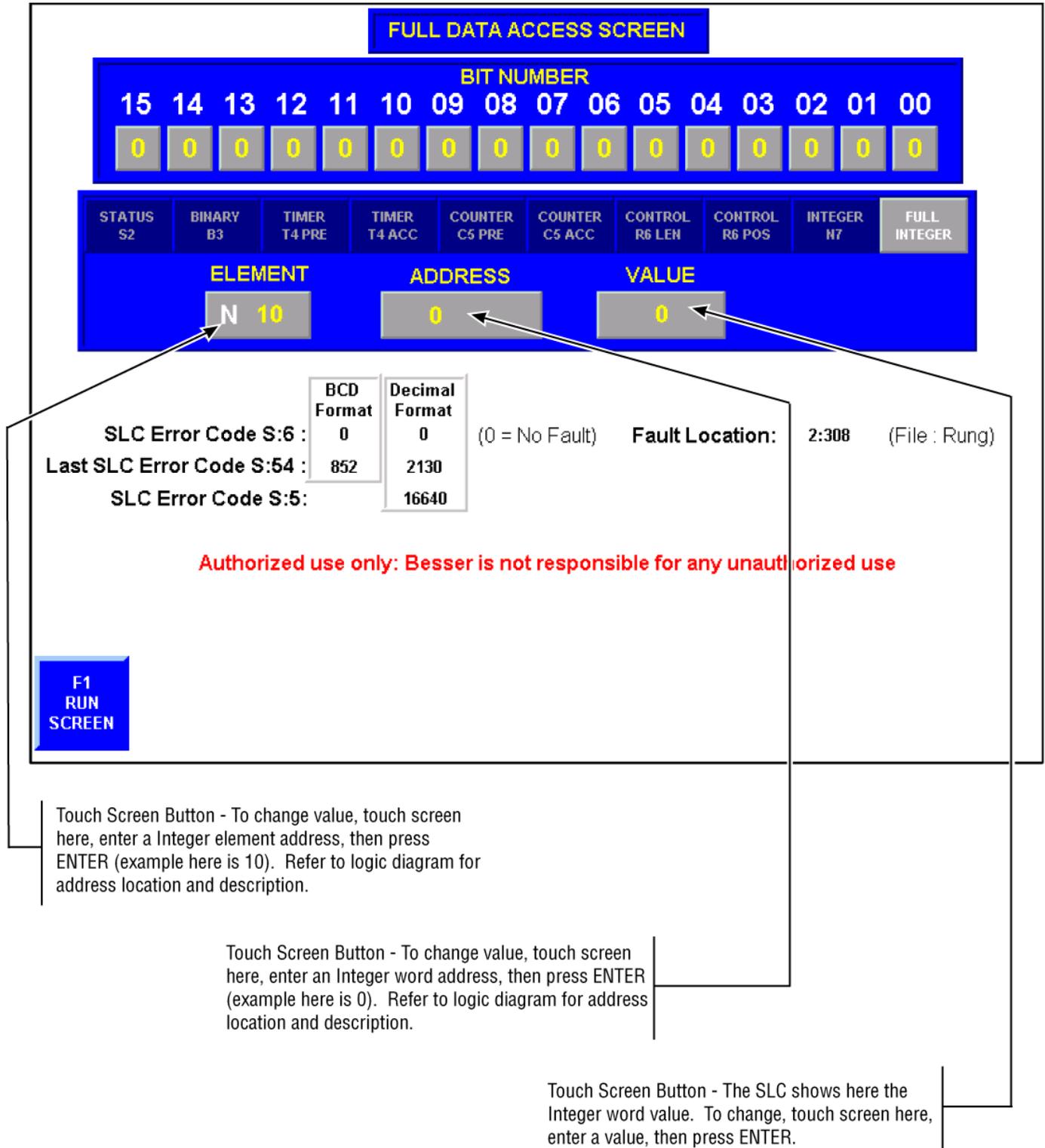
Touch Screen Button - The SLC shows here the Integer word value. To change, touch screen here, enter a value, then press ENTER.

3.11.8 To Monitor or Change a Integer Word Value (FULL INTEGER):

From the FULL DATA ACCESS SCREEN,

1. Press the touch screen key, FULL INTEGER.

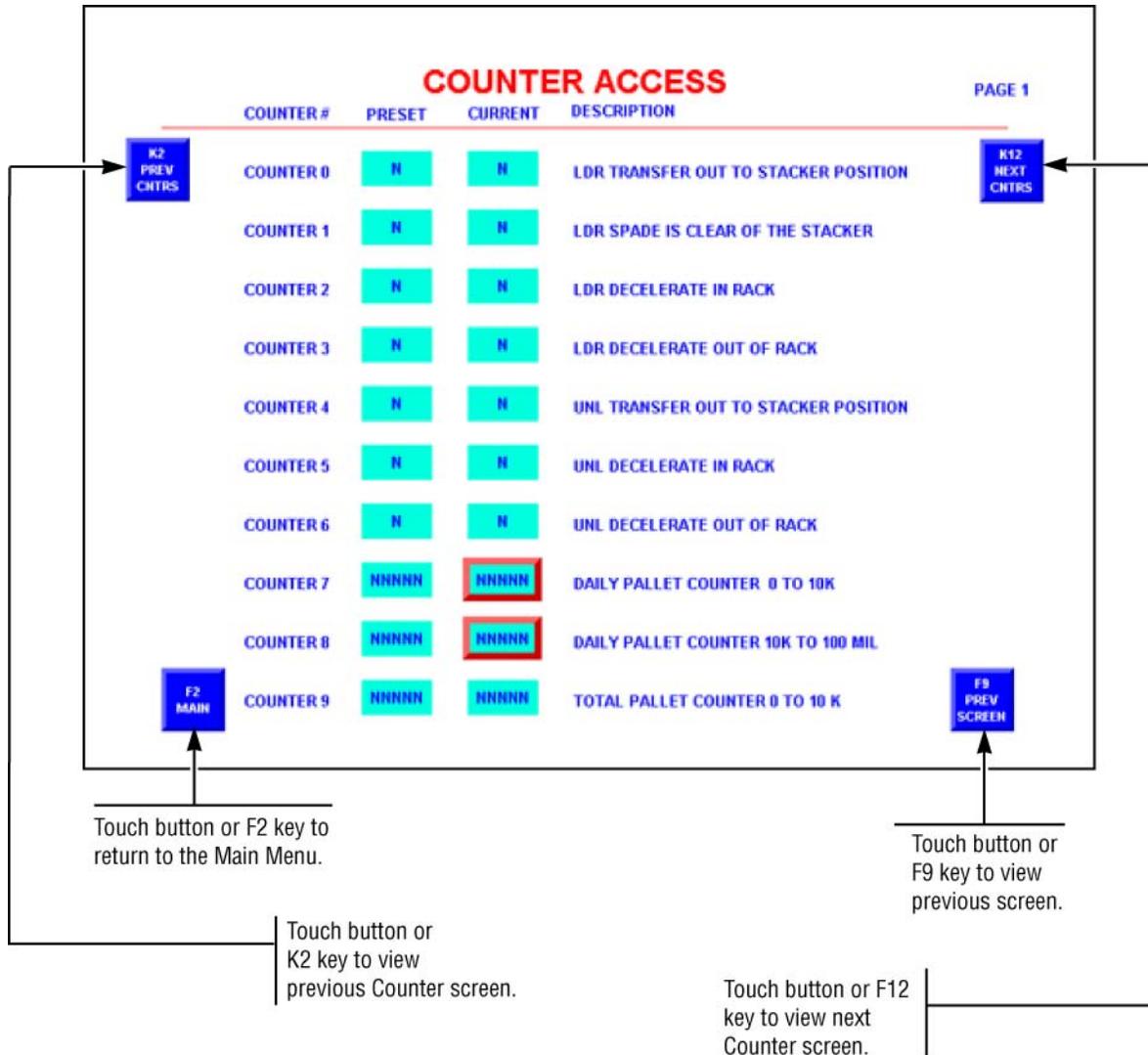
The display will read:





3.12 COUNTER ACCESS

This typical counter screen indicates the preset (programmed) value and current (accumulated) value of the counters being displayed. Values highlighted with red boxes can be modified. Touch the red box to change the value.



3.12.1 To Modify a Counter Access

Use K2 or K12 key to select page where desired counter is located.

Once in proper page, touch red box of counter you wish to modify.

Use the **0** to **9** keys of the pop-up keypad to enter new preset value.

Press to load the new preset value.

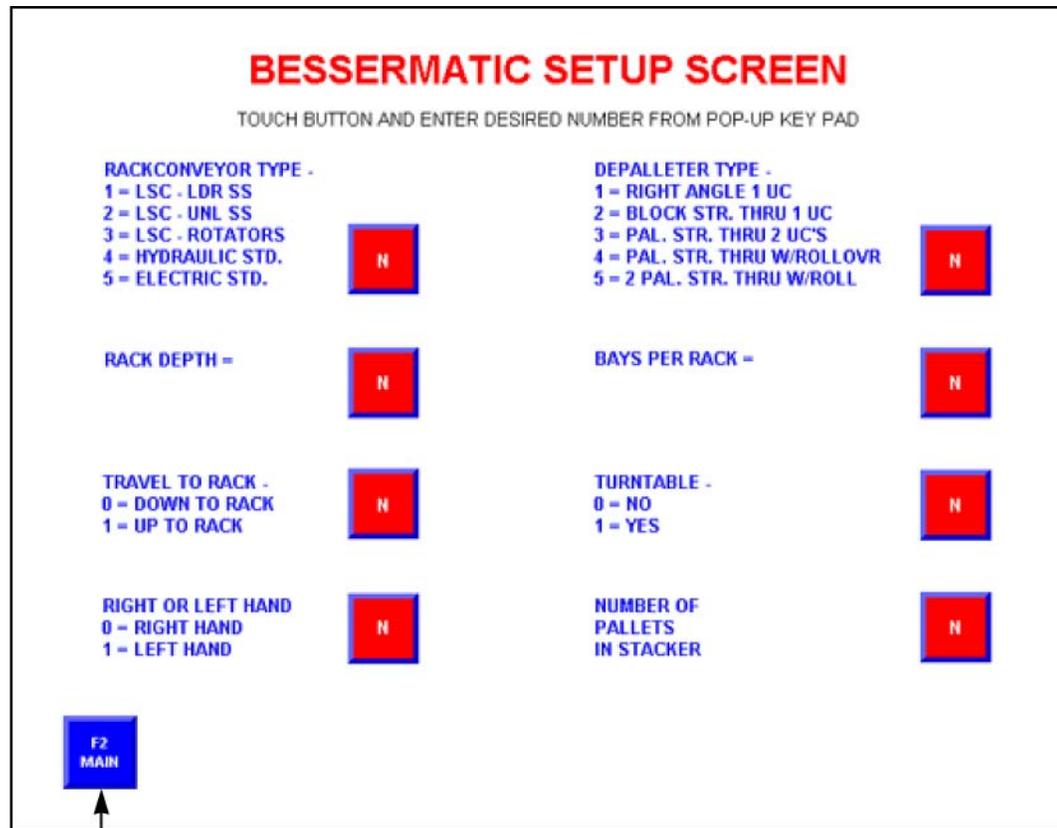
Repeat steps if an error occurs.

Press to delete left most number.

Press **ESC** to close pop-up keypad.

3.13 BESSER-MATIC SETUP SCREEN

To access the Setup screen, display the Main Menu screen and press the F20 key.



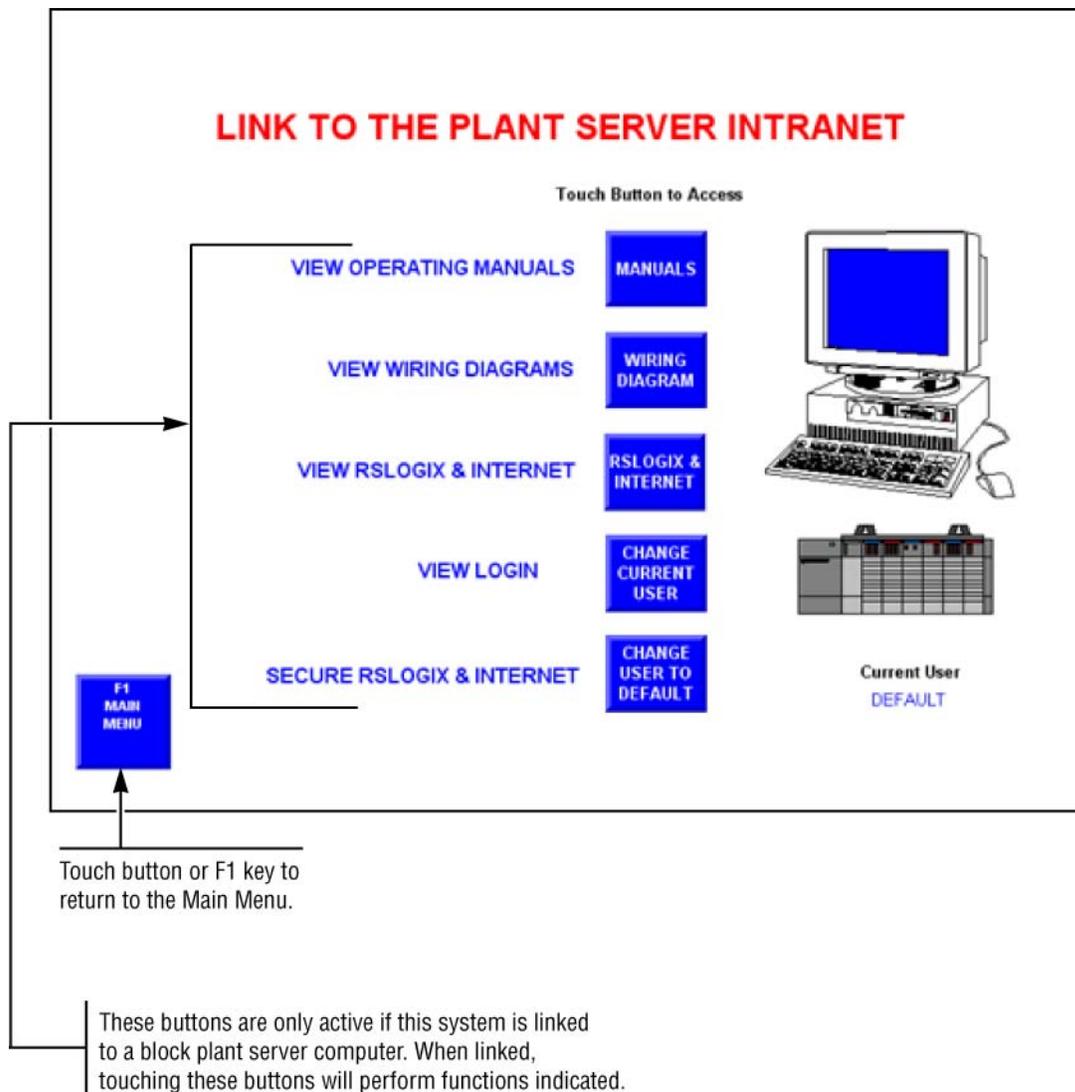
Touch button or F2 key to return to the Main Menu.

NOTE: This is an initial setup screen. It should be accessed only when the equipment is modified.

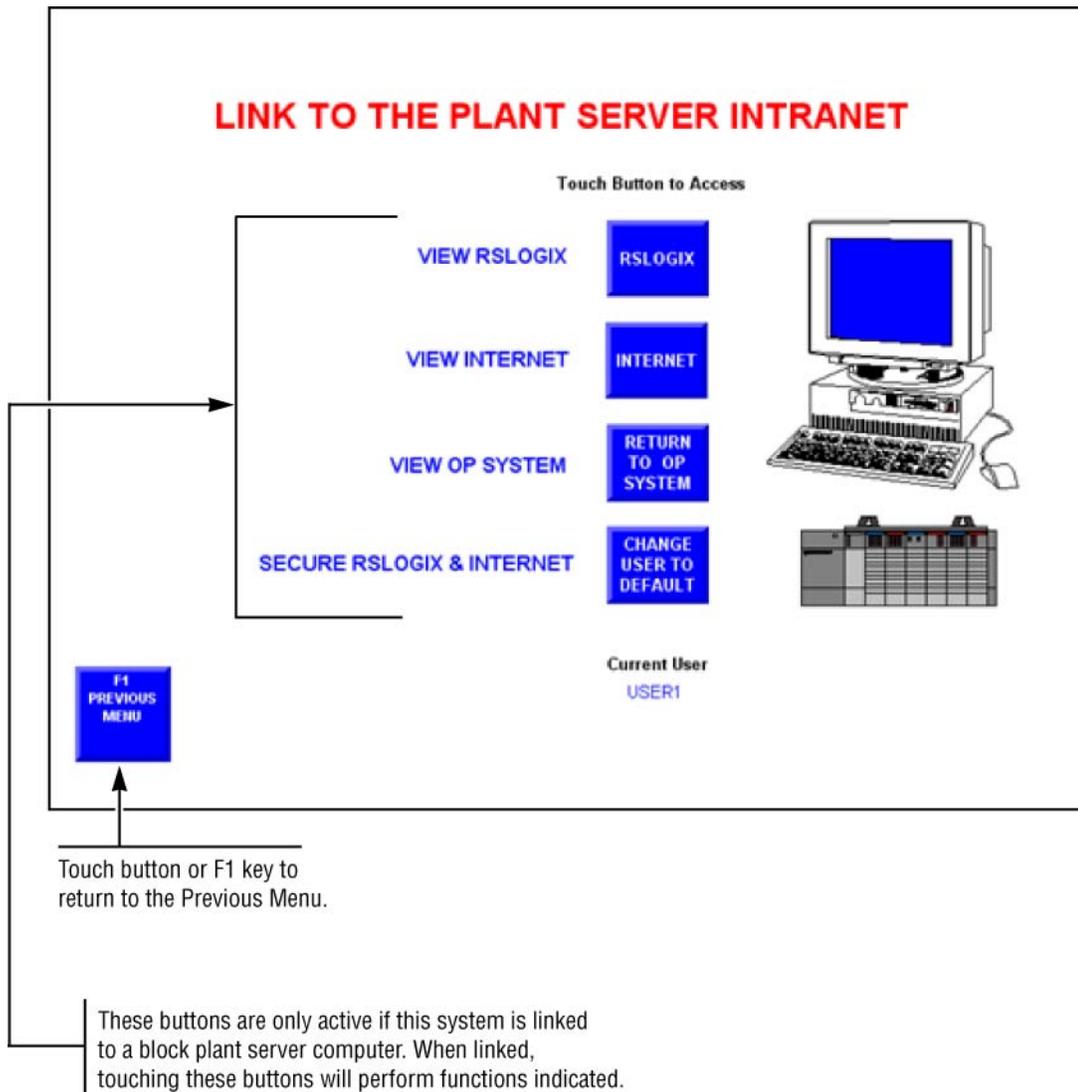


3.14 INTRANET LINK

This screen shows the typical link selections to the intranet.



The following screen appears when the RSLOGIX & INTERNET button is touched on the previous screen.





SECTION 4 OPERATING THE MACHINE

4.1 OPERATING IN AUTOMATIC MODE

If operating the machine for the first time, make sure you have set-up the machine as shown in SECTION 2.

Pull out the EMERGENCY STOP button.

Press the CRM button.

Adjust rack depth and stacker count if necessary. To do so, select Loader and Unloader hand screens (refer to section 3.6).

Set the Unloader, Loader and Rackveyor switches to AUTO. Refer to Section 3 for switch locations.

Set the Front Delivery conveyor, Depalleter & pallet return conveyor and rollover selector switches to AUTO.

Pull out the Pump button to start pump.

Monitor the Loader or Unloader automatic screen during normal automatic operation. They will indicate rack flow (refer to section 3.5).

4.2 OPERATING IN MANUAL MODE

4.2.1 Operating the Loader in Semi-Auto Mode (also refer to section 3.6.1)

1. Set Loader switch to HAND.
2. Use the joystick on Graphic Control Station to operate the spade. Note that the spade will still automatically turn at center-in/center-out.
3. Touch or press F11 to lower Accumulator shelves.
4. Touch or press F10 to raise Accumulator shelves.

4.2.2 Operating the Unloader in Semi-Auto Mode (also refer to section 3.6.2)

1. Set Unloader switch to HAND.
2. Use the joystick on Graphic Control Station to operate the spade. Note that the spade will still automatically turn at center-in/center-out.
3. Touch or press F11 to lower Accumulator shelves.
4. Touch or press F10 to raise Accumulator shelves.

4.2.3 Operating the Spades in Manual Mode

The manual mode is only used in troubleshooting situation.

For example:

1. Set the Loader or Unloader switch to HAND, which ever you wish to operate manually.
2. Touch or press and hold F8 to turn spade 180° to rack.

WARNING: Spade must only turn at center-in or center-out position, LS-19 or LS-26 tripped.

3. Press and hold F9 to turn spade 180° to Accumulator.

WARNING: Spade must only turn at center-in or center-out position, LS-19 or LS-26 tripped.

NOTE: Touch or press and hold F6 Manual Override button along with the joystick if desired motion does not happen.

4.2.4 Operating the Rackveyor and the Side Shifter in Manual Mode (also refer to section 3.6.3)

Select the rackveyor screen by touching or pressing the associated (rackv) F key.

1. Set Rackveyor switch to HAND.
2. Touch or press F8 to move rack Indexer forward.
3. Touch or press F9 to move rack Indexer back (reverse).
4. Touch or press F10 to move the Side Shifter forward, towards the Rackveyor.
5. Touch or press F11 to move the Side Shifter to the Crawler rails.
6. Touch or press F13 to [retract] unlock the Side Shifter locks.
7. Touch or press F12 to [extend] lock the Side Shifter locks.

4.2.5 Operating the Depalleter in Manual Mode. (also refer to section 3.6.4)

Select the depalleter screens by touching or pressing the associated (dep) F key.

1. On the depalleter control station, set the depalleter switch to HAND.
2. Touch or press F9 to move the depalleter forward.
3. Touch or press F11 to raise the pusher.
4. Touch or press F12 to lower the pusher.
5. Touch or press F13 to enable or disable the turntable.
6. You can also use the manual joystick on the depalleter control station.

4.2.6 Operating the Rollover in Manual Mode. (also refer to section 3.6.6)

Select the depalleter screens by touching or pressing the associated (roll) F key.

1. On the rollover control station, set the rollover switch to HAND.
2. Touch or press F9 to move the rollover forward.
3. Touch or press F5 to move the rollover reverse.
4. You can also use the manual joystick on the rollover control station.

4.2.7 Rackveyor/Side Shifter Speed Adjustment

Speed of the Side Shifter, rail locks and Rack Indexer is controlled through valves located on the equipment.

Speed of each of these components is controlled by two flow controls. One controls the forward movement; the other controls the reverse motion. Turning the flow control counter clockwise will increase speed; turning flow control clockwise will decrease speed.

SECTION 5 MAINTENANCE

Correct maintenance is largely a matter of good judgment on the part of the operator in charge. The Besser-Matic will do the work required with proper maintenance. A good preventive maintenance program based on the recommendations below will extend the machine's life at a high level of performance.

5.1 BALL JAC MAINTENANCE

5.1.1 General

Ball Screw Jacs with translating screws are fitted with a retainer for one direction of travel only. Its purpose is to avoid inadvertently running the lifting screw out of the jac and losing the balls from the ball nut.

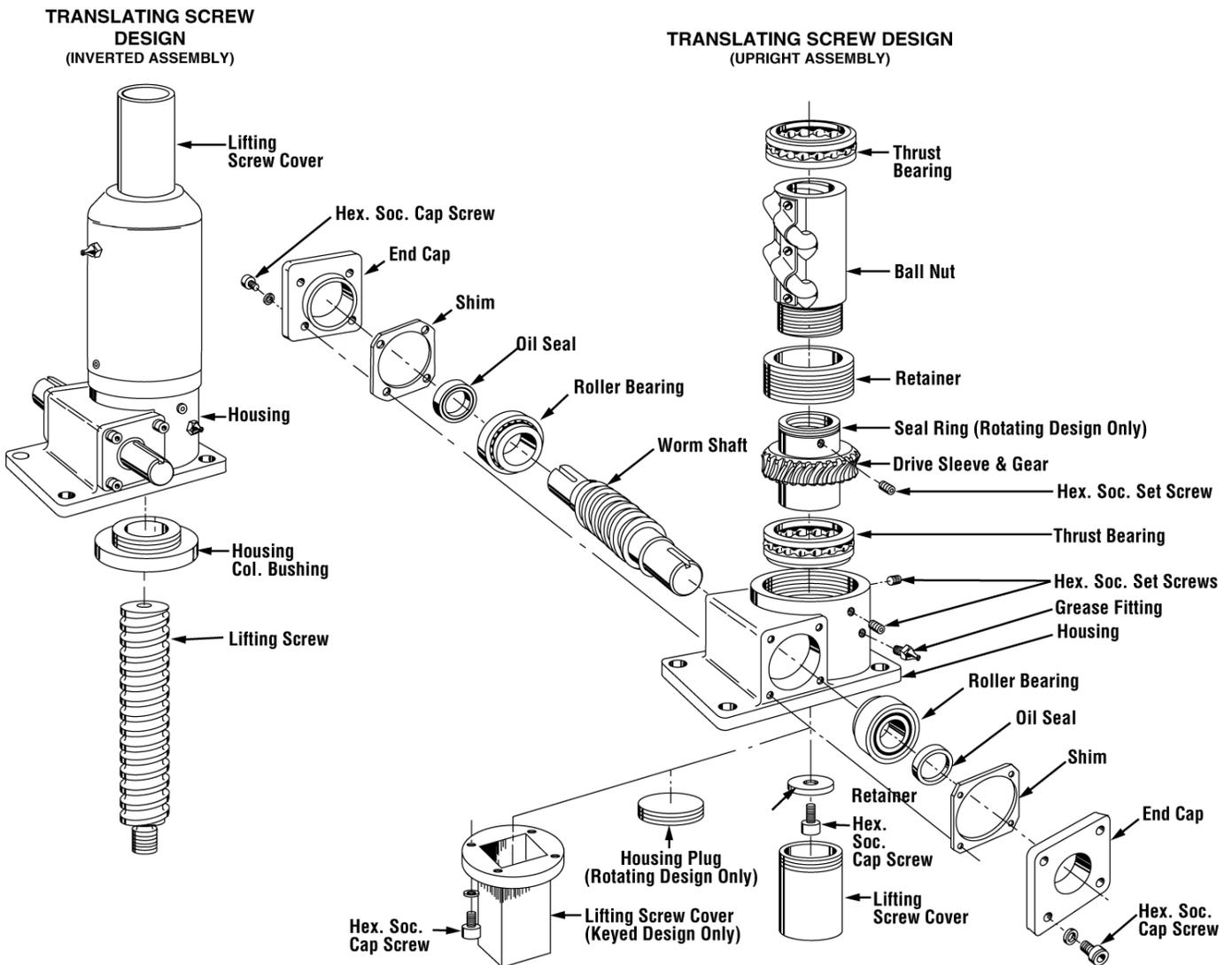


Figure 5.1 EXPLODED VIEW OF A TYPICAL ASSEMBLY (VIEWS ARE ILLUSTRATIVE ONLY)



5.1.2 Lubrication for Gear Box Enclosure

Ball Screw Jacs are shipped with grease in the unit. However, before operating any unit remove the housing plug and check the condition of the lubricant. Lubrication inspection is recommended at regular intervals. Usually one month intervals are satisfactory unless experience indicates that regreasing should occur at shorter or longer intervals.

Each jac unit is furnished with a grease fitting and a pipe plug on opposite sides of the housing.

To lubricate the gear box:

1. Remove the pipe plug.
2. Fill unit with grease until lubricant seeps from the pipe plug opening.
3. Replace pipe plug.

NOTE: Severe operating conditions will shorten the lubrication inspection interval.

Lubricate upper bearing through grease fitting as shown in Figure 5.1.

The lubricant should not be corrosive to gears, ball or roller bearings and must be neutral in reaction. The lubricant must not contain any grit or dirt, abrasives or fillers. It should not precipitate sediment, nor separate at temperatures up to 300°F. The lubricant must also have resistance to oxidation and must be non-channeling. We recommend the following extreme pressure greases or equivalents. For operating conditions outside these limits, consult Besser.

COMPANY	TRADE NAME	TEMPERATURE RANGE
Mobil	Mobilux EP#2	-20 to 225°F

Table 5.1 BALL JAC LUBRICANTS

5.1.3 Lubrication for Ball Screw Assembly

In the normal operating range (32°F to 160°F), oil or a good grade of light bearing grease may be used. Grease containing graphite or moly-disulfide should not be used. Use only enough lubricant to maintain a thin, continuous film.

All units are suitable for intermittent operation in ambient temperatures up to 200°F with proper grease. If protective boots are used, the material must be able to withstand the environment.



5.1.4 Troubleshooting Tips

Your Ball Jac will perform satisfactorily if suggestions described in this booklet are carefully followed. It is estimated that approximately 98 percent of Ball Jac failures can be attributed to improper lubrication, misapplication, and misalignment.

TROUBLE	WHAT TO INSPECT	ACTION
Housing Failure	1. Unit Overload	Reduce load or replace with unit of sufficient capacity.
	2. Improper Support	Unit should be supported over entire base area, not just at bolt hole locations.
	3. High Shock	Select different material.
	4. Uneven Bolting Torque	Take up evenly on mounting bolts.
Worm Shaft Failure	1. Type of Coupling	Rigid Couplings can cause shaft failure. Replace with coupling which will provide adequate flexibility and lateral float.
	2. Coupling Alignment	Realign as required.
	3. Presence of Excessive Overhung Load	Check Jac for allowable loads.
	4. Unit Overload	See Housing Failure No. 1.
	5. Shock Loading	Apply coupling capable of absorbing shock and, if necessary, replace with unit of sufficient capacity. Shock loads can significantly increase apparent dead weight loads.
	6. "Ganging" Units	If several units are "in-line", the worm shaft of the first unit can assume 300% of the rated input torque. If this value is exceeded, you must replace with a larger unit.
Bearing Failure	1. Unit Overload	See Housing Failure No.1.
	2. Excessive Overhung Load	See Worm Shaft Failure No. 3.
	3. Coupling Alignment	See Worm Shaft Failure No. 2.
	4. Coupling Lateral Alignment	Adjust spacing between connecting shafts to relieve end pressure.
	5. Bearing Adjustment	Bearings must not be pinched. Adjustable tapered bearings must be set at proper lateral clearance. All shafts should turn freely when disconnected from the load.
	6. Bearing Lubrication	Add lubricant if necessary.
	7. Shock Loading	See Worm Shaft Failure No. 5.



TROUBLE	WHAT TO INSPECT	ACTION
Drive Sleeve & Worm Gear Wear	1. Unit Overload	See Housing Failure No. 1.
	2. Bearing Adjustment	See Bearing Failure No. 6.
	3. Lubrication	Proper levels and grade must be maintained. See lubrication page.
Ball Nut Failure	1. Unit Overload	See Housing Failure No. 1.
	2. Alignment	Lifting shafts must be perfectly plumb.
	3. Lubrication	See Gear Wear No. 3.
	4. Improper Selection	Refer to load/life predictability chart in Product Catalog.
Lifting Screw Failure	1. Unit Overload	See Housing Failure No. 1.
	2. Alignment	See Ball Nut Failure No. 2.
	3. Side Load	Check with Nook Industries Engineering Department for allowable side load.
	4. Improper Selection	See Ball Nut Failure No. 4.

Table 5.2 BALL JAC TROUBLESHOOTING CHART

5.2 DODGE GEAR BOXES

Besser-Matic uses Dodge Gear Boxes:

- Tigear
- Quantis

Lubrication is extremely important for satisfactory operation. The proper oil level must be maintained in the gearcase at all times.

The satisfactory performance of gears and bearings in gear-motors and reducers depends on clean lubricant, free from dust, grit, sludge, and moisture. Depending on operating conditions, the lubricant will eventually become contaminated and should be replaced periodically.

Please read the manufacturer's manual for more important maintenance tips.

5.2.1 Tigear C-Face Reducer

The Dodge Tigear speed reducer is a compact wormgear reducer. No vent plug is required.

The C-Face Reducer is the hollow input or "quill mount" type. This reducer is for normal duty applications with input speeds of 2500 rpm and less.

1. Lubrication – The unit is lubricated for life.

Change oil only when performing maintenance that requires gearbox disassembly. If oil must be replaced, use only Mobil SHC-634.

NOTE: Do not confuse Mobil SHC634 with Mobilgear 634. Mobilgear 634 is an EP type gear oil NOT suitable for use in the Relialube system.

Fill the gearcase with the proper amount of lubricant as shown in Table 5.3.

Gearcase Size	Amount Required (Fluid Ounces)
133	8
150	11
175	16
200	21
262	38
350	75

Table 5.3 TIGEAR LUBRICATION AMOUNTS

5.2.2 Quantis

1. Lubrication – Fill with synthetic oil for 20,000 hours of operation.

Lubricants shown in Table 5.4 are alternates to the standard factory filled lubricant, mineral oil ISO 220. This is not an exclusive recommendation and equivalent lubricants of other manufacturers can be used.

Do not mix oil of different manufacturers. If a change to another type of oil is made, the lubricant should be drained and the gearcase flushed with clean mineral spirits to avoid any possible compatibility problems.

Ambient Temperature	Oil Type	ISO Viscosity Grade	Examples of Lubricants
			Mobil
10°F to 104°F (-12° to 40°C)	Mineral Oil	220	Mobilgear 630 (standard fill)
0°F to 70°F (-18° to 21°C)	Mineral Oil	100	Mobilgear 627
-35°F to 125°F (-37° to 53°C)	Synthetic Oil	220	Mobil SHC 630
	Mineral Grease (for Ball and Roller Bearings)		Mobilith AW2, AW3

Table 5.4 QUANTIS LUBRICANT RECOMMENDATIONS



5.3 CONE DRIVE GEAR BOXES (2 TURN GEAR MOTORS ON SPADE)

5.3.1 Maintenance

1. The reducer oil level should be checked weekly and the recommended oil added as required to maintain the proper oil level.
2. The oil should be changed as outlined in the lubrication section.
3. All grease fittings should be lubricated with the recommended grease once per month.
4. The reducer, particularly finned areas and fan covers, should be kept clean to allow maximum heat dissipation.
5. All reducer and foundation bolts should be checked for tightness after three (3) months of service and annually thereafter.
6. If a reducer has to be repaired, contact Besser Company for detailed instructions, blueprints, parts lists, etc. If it is necessary, field service is available.
7. If a reducer is to be returned, contact Besser Company for instructions.

5.3.2 Lubrication Data

Lubrication is very important for successful operation of these drives and reducers. Inadequate lubrication can result in increased power consumption, added maintenance and gearset failure. Please review the following recommendations and the manufacturer's manual. Besser recommends only those lubricants listed in the manufacturer's manual.

1. TYPE OF OIL

Lubricating oils for use in gear units should be high quality, well-refined, steam cylinder petroleum oils. They must not be corrosive to gears, to ball, roller or sleeve bearings; they must be neutral in reaction; free from grit or abrasive; and have good defoaming properties. As they may be subject to high operating temperatures, they must have good resistance to oxidation.

For worm-gears, additions of 3 percent to 10 percent of acidless tallow or similar animal fats are desirable.

NOTE: If Mobil SHC-634 is used as recommended in the Lubricant chart (section 710) for normal operation (viscosity group 318.62), the time for changing the lubricant may be extended. Drain, flush, and refill after the first 1500 hours of operation; then every 5000 hours thereafter. (SHC is a registered trademark of the Mobil Corporation).

2. AMBIENT TEMPERATURE

The oils shown on the list of approved lubricants shipped with all Cone Drive gearsets and speed reducers are for use in an ambient temperature range of approximately 15° to 100°F [-9° to 38°C] with the low end of the range depending on the pour point of the specific oil used. If the ambient temperature will be below or above this range please contact Besser Company for specific recommendations on proper lubricant as well as proper oil seal and shim materials.

3. SLUDGE

It is necessary that the oil is clean and free from sludge at all times to obtain long life from gear unit.

Sludge in gear units may be caused by excessive heat, from dust and dirt and other contaminants and by the presence of moisture or chemical fumes. Therefore, every precaution should be taken to prevent water and foreign particles from entering the gear case.

4. OIL CHANGE

Oil change should be carried out after 5000 hours of operation or once per year, whichever occurs first. These change intervals are recommended for units operating under favorable conditions. Where operating conditions are severe, such as a rapid rise and fall in temperature of the gear case with accompanied sweating of the inside walls and resulting formation of sludge, or where operation is in moist or dusty atmospheres, or in the presence of chemical fumes or extended running at sump temperatures in excess of 180°F [82°C], it may be necessary to change the oil at intervals of one to three months. It is recommended that a sampling program be established with your lubricant manufacturer or with Besser Company where reducers are exposed to the severe operating conditions, mentioned above.

5. OIL LEVEL

These drive reducers are furnished with a bronze colored hex head pipe plug to indicate oil level. An oil level tag is affixed to the unit near the oil level indicator. Oil level should always be checked with the unit stopped. Estimated oil capacities for standard reducers are listed on the following page.

6. GREASE PACKED BEARINGS

Bearings that are at least partially submerged in oil or oiled by internal oil scoops do not require special maintenance. However, bearings that are not lubricated as above require grease lubrication. Grease fittings and internal retainers are furnished when required. They should be greased with a high quality lithium base NLGI #2 or NLGI #3 bearing grease at normal maintenance intervals.

5.4 TORQUE LIMITER

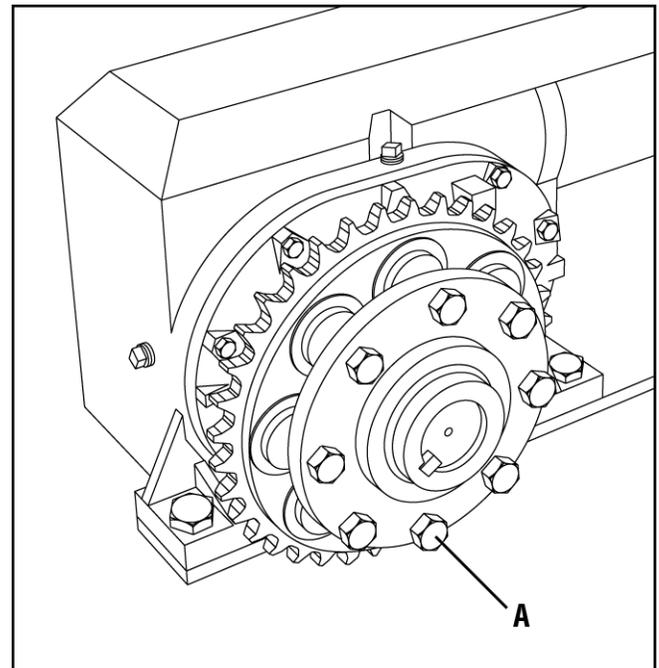


Figure 5.2 TORQUE LIMITER
(NOT USED ON ALL SYSTEMS)

5.4.2 Torque Adjustment

1. Torque should be adjusted when the accumulator chain starts to slip and the shelves angles do not stop at a precise location as desired. (see Section 4 Initial set-up).
2. To add torque, tighten adjusting bolts (item A in Figure 5.2) equally around load plate until torque limiter holds load and accumulator chain stops perfectly. Tighten bolts equally in small increments. Do not completely flatten the disk springs.
3. When making trial run to test the torque limiter, use fully loaded accumulators.
4. After the final adjustment, lace the adjusting bolts together with the soft steel wire which is supplied with the torque limiter.
5. Maintenance

At periodic intervals, or if desired torque is not maintained, inspect Torque Limiter for presence of oil, grease, moisture, or corrosion on the driving surfaces and for proper setting of spring load. Clean and adjust as required (friction facings and bushings are replaceable parts. Contact Besser Company for part orders).



5.5 BESCOSHEAR BRAKES

BescoShear brakes are electrically operated with hydraulic friction plates.

5.5.1 Checking the Oil Level

When the brake is installed and weekly thereafter, or until experience dictates otherwise, check the oil level. Always check the oil level with the brake at room temperature and while it is not running.

The BescoShear Motor Brake has an Oil Sight Gauge (#46) to visually check the fluid level. See Figure 5.3 for the location of this sight gauge.

It is located on the side of the End Housing (#9) for horizontal brakes and on the side of the Main Housing (#8) for vertical brakes.

The oil level is to be at the center of this sight gauge (#46) for all models **with the drive motor turned off**.

5.5.2 Operating Temperatures

1. Ambient Temperature

The standard oil used in the BescoShear Motor Brake was designed to operate in ambient temperatures up to 125°F. If the ambient temperature will fall outside of this range please contact Besser or the manufacturer, Force Control Industries, Inc. for specific recommendations on proper lubricant and oil seals.

2. Oil Sump Temperature

The maximum recommended oil sump temperature is 200°F.

5.5.3 Changing the Oil (See Figure 5.3)

IMPORTANT: Always open the disconnects to the drive motor and lock them out before changing the oil.

Every three months completely drain the oil from the brake by removing the drain plug (#64) or the pipe cap (#67). The sight gauge (#46) and air breather (#45) should also be removed and cleaned at this time.

The oil should be changed more frequently when used in harsh environments or high cyclic applications.

A. Horizontal and Vertical-Brake Down

1. Remove pipe plug (#64) and drain out all of the oil into a suitable container. Save or discard as condition warrants. Replace the drain pipe plug when finished.
2. Remove the pipe plug (#62) and fill with fresh oil to the center of the sight gauge (#46). Replace the fill pipe plug when finished.

B. Vertical-Brake Up

1. Remove pipe cap (#67) and drain out all of the oil into a suitable container. Save or discard as condition warrants. Replace the pipe cap when finished.
2. Remove the pipe plug (#62) and fill with fresh oil to the center of the sight gauge (#46). Replace the fill pipe plug when finished.

	CAUTION: Do not overfill the brake unit. Excess oil will cause the brake to over heat.
--	---

5.5.4 Type of Oil

Use only Mobil Automatic Transmission Fluid ATF-210 (Type "F") or Mobil Multi-Purpose Automatic Transmission Fluid for most drives.

Other fluids may be specified for special applications.

Always use the type of oil specified on the name plate.

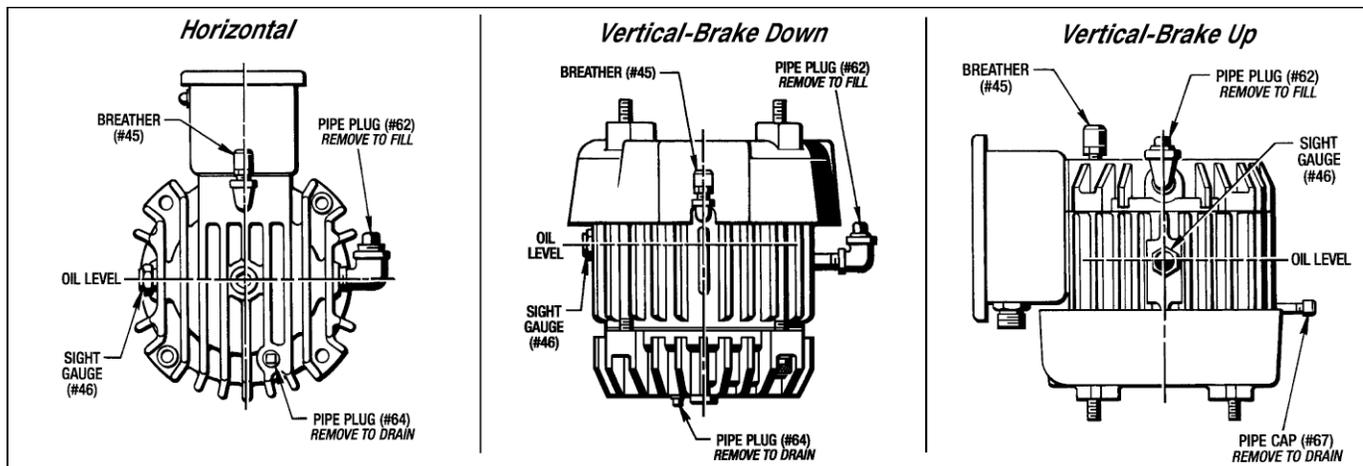


Figure 5.3 LUBRICATION

5.5.5 Operational Checks

Make these Operational Checks with the BescoShear Motor Brake shut down and completely assembled with the drive motor attached.

Provisions for manual operation checks must be made if the drive unit has been removed for service and repair. 120 VAC, 60 Hz. electrical service is required to energize the coils. (See Figure 5.4 for the Test Set-Up)

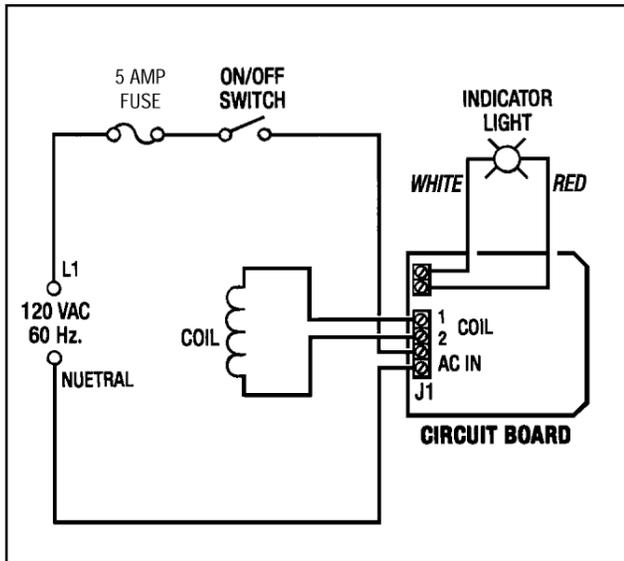


Figure 5.4 TEST SET-UP ELECTRICAL SCHEMATIC

Electrical power is not required to energize the coil. The BescoShear Motor Brake has a normally spring loaded brake when the coil is de-energized.

To check the brake operation:

2. Disconnect the load to the motor.
3. Install a torque wrench on the motor shaft and apply torque. The brake should slip at approximately the static torque of the brake.

To check the brake coil operation:

1. Remove the cover from the Conduit Box.
2. Disconnect the black and white power leads from the Brad-Harrison Cable Connector to "AC In" on Terminal Strip J1 located on the Circuit Board.
3. Connect the test power leads to "AC In" on J1. Turn the On/Off Switch to ON. The Power Indicator Light should come on.
4. Manually turn the Drive Motor Output Shaft. If the shaft turns, then the Brake Coil and Control Circuit are operating properly.

If the shaft does not turn, the brake coil or circuit board is not functioning properly. (See section 5.5.6- Troubleshooting.)

	<p>CAUTION: . Physical damage or malfunction in the motor or brake stack can also prohibit shaft rotation.</p>
--	---



5.5.6 Troubleshooting

Problem	Possible Cause	Remedy
1. Brake fails to engage properly.	Electrical control circuit.	Check control circuit.
	Faulty BescoShear circuit board.	Replace circuit board.
	Worn friction surfaces.	Check disc stack for wear and replace if necessary.
2. Brake fails to release properly.	Electrical control circuit.	Check control circuit.
	Faulty BescoShear circuit board.	Replace circuit board.
	Faulty coil.	Replace coil.
	Low voltage at coil.	Check wire size and voltage.
3. Brake torque too high.	Excessive spring force.	Contact Besser or the manufacturer, Force Control.
	Low oil level.	Check oil level and add oil.
4. Brake torque too low.	Inadequate spring force.	Contact Besser or the manufacturer, Force Control.
5. Noise and vibration.	Motor mounted on poor foundation.	Improve installation. Tighten mounting bolts.
6. Drive overheats (200° F max.)	Brake fails to engage or disengage properly.	See #1 and #2 above.
	Improper oil level.	Check oil level. Add/Drain as req'd.
7. Oil leakage.	Bad oil seal	Disassemble and replace.
	Gaskets.	Tighten all external screws.
	Poor ventilation.	Remove breather and clean.
8. Brake does not repeat.	Electrical control circuit.	Check control circuit.
	Faulty BescoShear circuit board.	Replace circuit board.
	* Oil temperature change.	Check temperature.
	Machine resistance changed.	Lubricate bearings.
* For installations requiring precise starting and stopping, operating temperatures are important. Operating temperatures between 115°F and 165°F are recommended.		

Table 5.5 BESCOSHEAR BRAKES TROUBLESHOOTING CHART



5.6 DAILY SERVICE SCHEDULE

COMPONENT	REF.	CHECK FOR	ACTION
Spades, Accumulators, Rackveyor, Side Shifter, Conveyors		Guards in place	Install or replace
		Sensors working	Adjust or replace
		Safety signs	Clean or replace
		E-Stops	Repair or replace



5.7 WEEKLY SERVICE SCHEDULE

5.7.1 Checks on Unloader Spade

COMPONENT	REF.	CHECK FOR	ACTION
Ball Jac	5-1	Dirt or wear	Clean or replace
Turn gear box	2-4	Oil	Add
Turn brake	2-4	Wear	Replace
Taperlock bushing on turn link	2-4	Tension	Tighten
Transfer gear box	2-4	Oil	Add
Transfer brake	2-4	Wear	Replace
Transfer V-belts	2-4	Tension or wear	Tighten or replace

5.7.2 Checks on Loader Spade

COMPONENT	REF.	CHECK FOR	ACTION
Ball Jac	5-1	Dirt or wear	Clean or replace
Turn gear box	2-4	Oil	Add
Turn brake	2-4	Wear	Replace
Taperlock bushing on turn link	2-4	Tension	Tighten
Transfer gear box	2-4	Oil	Add
Transfer brake	2-4	Wear	Replace
Transfer V-belts	2-4	Tension or wear	Tighten or replace
Transfer guide rollers		Adjustment	Adjust
Elevator gear box		Oil	Add
Elevator brake		Wear	Replace
Elevator V-belts		Tension or wear	Tighten or replace

5.7.3 Checks on Loader Accumulator

COMPONENT	REF.	CHECK FOR	ACTION
Drive chain		Tension	Adjust
Gear box	5-8	Oil	Add
Elevator brake	5-8	Wear	Replace
Elevator chain		Tension	Tighten
Taperlocks		Tension	Tighten

5.7.4 Checks on Unloader Accumulator

COMPONENT	REF.	CHECK FOR	ACTION
Drive chain		Spring tension	Adjust
Gear box	5-8	Oil	Add
Elevator brake	5-8	Wear	Replace
Elevator chain		Tension	Tighten
Taperlocks		Tension	Tighten



5.7.5 Checks on Front Delivery Conveyor

COMPONENT	REF.	CHECK FOR	ACTION
Drive chain		Tension	Adjust
Gear box		Oil	Add
Conveyor chain		Tension	Adjust

5.7.6 Checks on Unloading Conveyor

COMPONENT	REF.	CHECK FOR	ACTION
Drive chain		Spring tension	Adjust
Gear box		Oil	Add
Conveyor chain		Tension	Adjust
Brake		Adjustment	Adjust
Chain rails			

5.7.7 Checks on Rackveyor

COMPONENT	REF.	CHECK FOR	ACTION
Guide rollers		Lubrication	Lubricate
Cam followers		Lubrication	Lubricate
Pusher springs		Tension	Adjust

5.7.8 Checks on Side Shifter

COMPONENT	REF.	CHECK FOR	ACTION
Hydraulics		Leaks	Tighten and replace

5.7.9 Checks on Pallet Transfer Conveyor

COMPONENT	REF.	CHECK FOR	ACTION
Drive chain		Tension	Adjust
Gear box		Oil	Add
Transfer chain		Tension	Adjust
Brake		Wear	Replace
Clutch roller		Should roll in 1 direction	Adjust



5.8 MONTHLY SERVICE SCHEDULE

5.8.1 Checks on Unloader Spade

COMPONENT	REF.	CHECK FOR	ACTION
Turn chain		Condition	Replace
Bearings in turn links		Wear	Replace
Elevator ball screw		Wear	
Ball screw support bearing		Wear	
Relays and timers		Working condition	Replace

5.8.2 Checks on Loader Spade

COMPONENT	REF.	CHECK FOR	ACTION
Turn chain		Condition	Replace
Bearings in turn links		Wear	Replace
Elevator ball screw		Wear	
Ball screw support bearing		Wear	
Relays and timers		Working condition	Replace

5.8.3 Checks on Loader Accumulator

COMPONENT	REF.	CHECK FOR	ACTION
Torque limiter		Slipping	Adjust
Shaft bearing		Wear	Replace
Elevator chains		Lubrication	Grease
Shelf angles		Bent, wear	Replace
Relays and timers		Working condition	Replace

5.8.4 Checks on Unloader Accumulator

COMPONENT	REF.	CHECK FOR	ACTION
Torque limiter		Slipping	Adjust
Shaft bearing		Wear	Replace
Elevator chains		Lubrication	Grease
Shelf angles		Bent, wear	Replace
Relays and timers		Working condition	Replace



5.9 QUARTERLY SERVICE SCHEDULE

5.9.1 Checks on Unloader Spade

COMPONENT	REF.	CHECK FOR	ACTION
Transfer tracks		Alignment or wear	Align or replace
Elevator tracks		Alignment or wear	Align or replace

5.9.2 Checks on Loader Spade

COMPONENT	REF.	CHECK FOR	ACTION
Transfer tracks		Alignment or wear	Align or replace
Elevator tracks		Alignment or wear	Align or replace

5.10 LUBRICANT SPECIFICATIONS

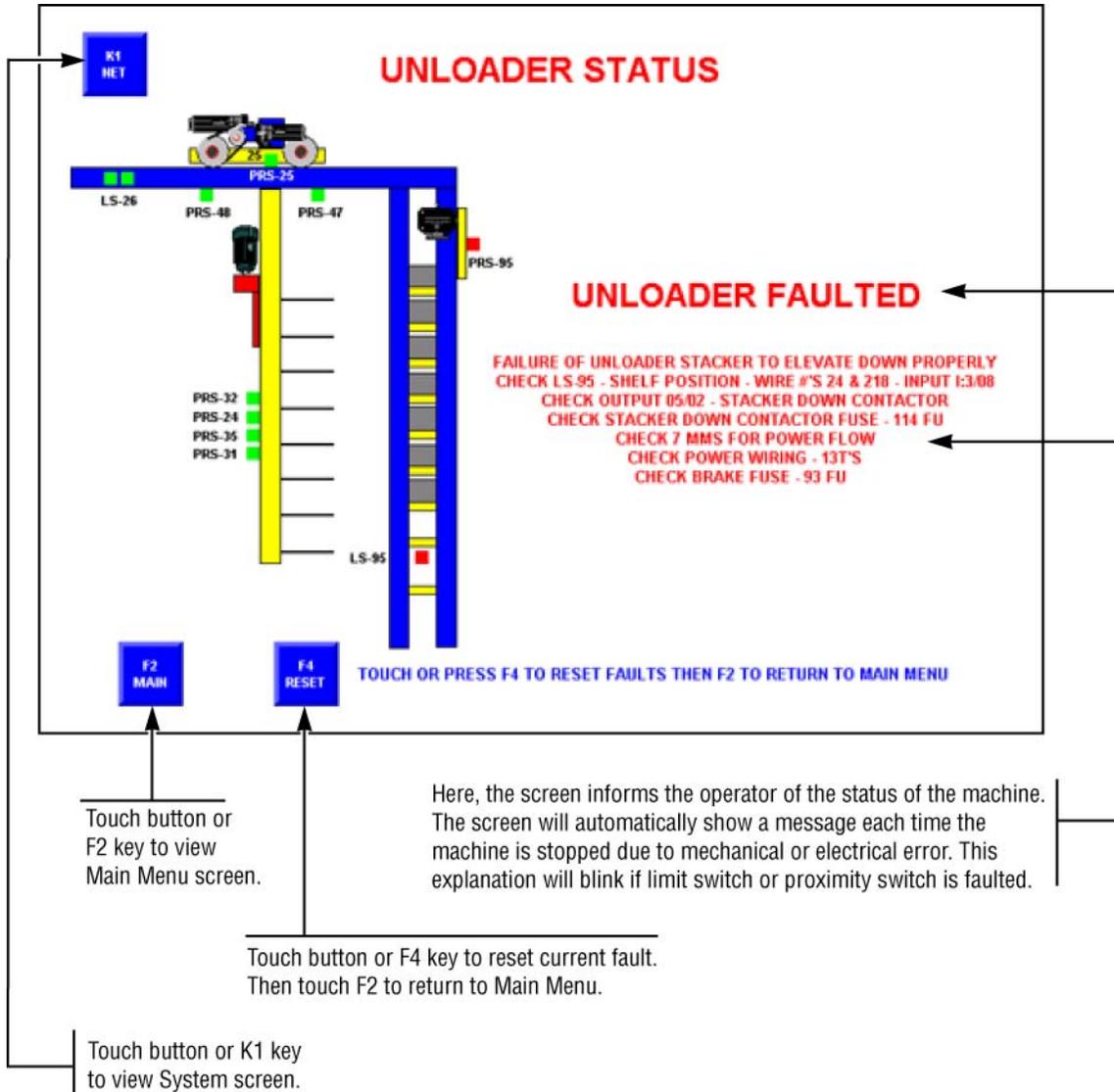
COMPONENT	RECOMMENDED LUBRICANT
Drive chains	Mobil Grease XHP222
Conveyor chains	Dry lubricant
Accumulators, transfer spades and conveyor gear boxes	Mobil SHC 634 (2 motors X 1.5 gal. each)
Bearings	Mobil Grease XHP222
Spade turn motor gear boxes	Mobil SHC 634 (2 motors X 1.5 gal. each)
Hydraulic power unit	Hydraulic oil Mobil DTE 24 ISO 32
Ball Jac	Mobilux EP#2



SECTION 6 TROUBLESHOOTING

6.1 LOADER/UNLOADER SPADE FAULT SCREEN

The Main Menu displays every time a fault occurs on the loader/unloader spade. To view the fault, follow the instruction on the screen. The fault screen displays a series of items to check for troubleshooting. A typical screen is shown here.





6.2 POSSIBLE MECHANICAL FAULT

Here is a list of possible mechanical problems related to the MS-13/14/16.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Lower spade does not move up and down.	Roll guides on lower spades are worn out and spade does not slide up and down.	Replace roll guides.
Spade does not reach racks; it keeps goes back and forth without reaching racks.	Center limit switch is getting second input because it is loose and switch arm swings back.	Adjust switch arm.
Lower spade has lost its setting.	Loosen cam box.	Tighten cam box correctly.
	Rocks or dirt on cam box.	Clean cam box.
	Worn switch actuator on cam box.	Replace switch actuator.
A shelf is missing a pallet.	Prox-switch can't read shelf.	Replace prox-switch.
	Accumulator chain too loose.	Tighten chain.
	Torque limiter too loose.	Adjust torque limiter.
	Brake not adjusted correctly.	Adjust brake.

APPENDIX A ELECTRICAL

A.1 DIAGRAMS

Because of different voltages, models and customer's control preferences, we have not included the electrical wiring diagrams, list of materials and electrical information in this manual. The electrical wiring diagrams of your machine and other electrical information (logic) are supplied with your equipment.

