



BESSERMATIC

MODEL MS-10

W/LSC-40 SIDE SHIFTER



OPERATION/MAINTENANCE MANUAL
466366F9901US

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BESSER

COMPANY NAME:

SERIAL NUMBER:

ASSEMBLY NUMBER:

WIRING DIAGRAM NUMBER:

INSTALLATION DRAWING NUMBER:

MS-10 /W SIDE SHIFTER

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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	Electric Motor	1
2	All Machines.....	1
	All Panels	1
3	Mixer	4
4	Block Machine.....	1
	SF-7 Cuber	8
	BTO-6.....	2
	Overhead Block Transfer	3
	Depalleter	2
	AF-7 Block Pusher	2
5	Concrete Products Machine.....	1
6	Concrete Products Machine.....	1
7	Concrete Products Machine.....	2
8	Besser-Matic	4
9	Besser-Matic	4
10	Pallet Transport System	4
11	LSC-40A.....	4
	Overhead Block Transfer	4
12	Conveyors	6
13	SF-7 Cuber	8
14	AF-7 Block Pusher	2
	Pallet Transport System	4
15	All Machines.....	1
	All Panels	1
16	SF-7 Cuber	3
	AF-7 Block Pusher	2
	Slat Conveyors	2

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

**1****Large 113236F0409***High Voltage**Width 4 1/2 inch**Height 9 5/8 inch***Small 113236F0204***High Voltage**Width 2 inch**Height 4 1/8 inch***2****113237F0410***Mixer Blade Hazard**Width 4 1/2 inch**Height 1/4 inch***3****113240F0307***Crush Hazard**Width 3 1/2 inch**Height 7 1/2 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
114691F1006
 Shear and Fall Hazards
 Width 5 3/4 inch
 Height 9 3/4 inch



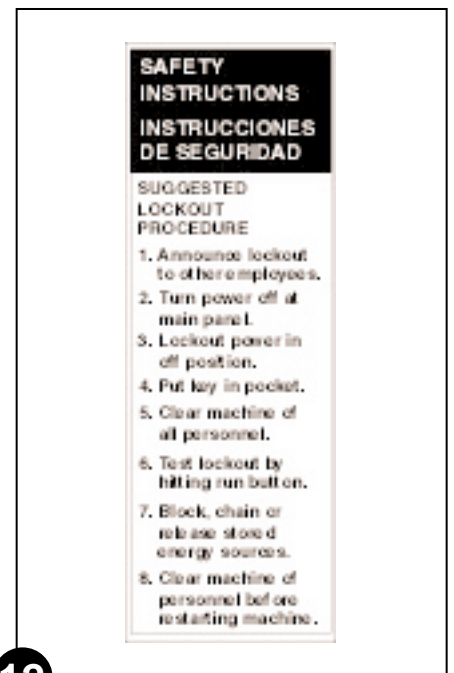
9
113242F0409
 Crush Hazard
 Width 4 1/2 inch
 Height 9 5/8 inch



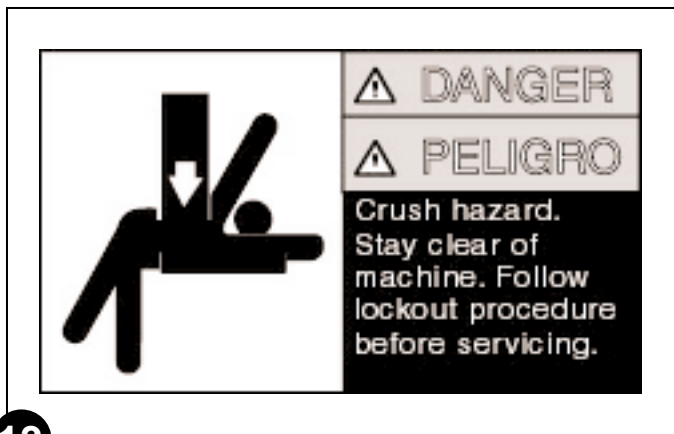
10
113243F0410
 Falling Objects
 Width 4 1/2 inch
 Height 10 inch



11
Vertical: 113245F0704
Horizontal: 113245F1005
 Crush Hazard
 Vertical: Width 4 1/8 inch
 Vertical: Height 7 inch
 Horizontal: Width 10 inch
 Horizontal: Height 5 3/4 inch



12
113249F0410
 Safety instructions decal-
 Suggested Lock-out procedure
 Width 4 inch
 Height 10 inch



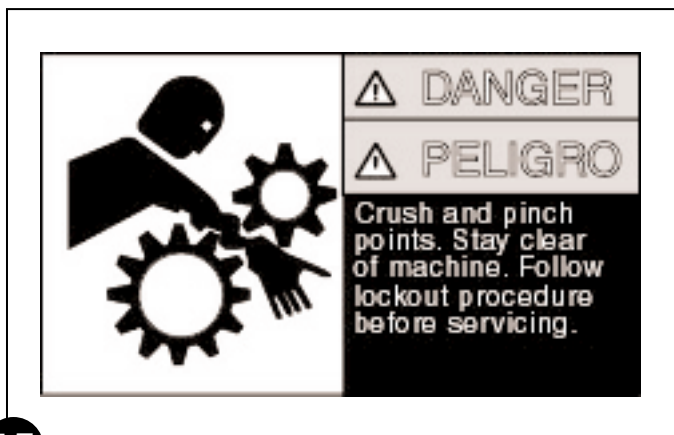
13

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



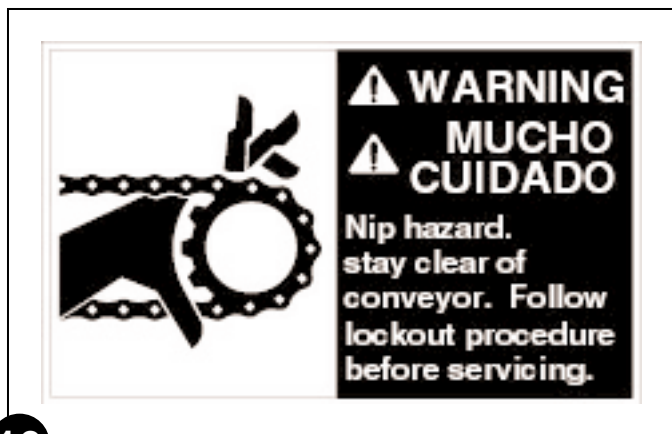
14

113239F0604
Crush Hazard
Width 6 5/8 inch
Height 4 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 Points Hazard
Width 10 inch
Height 6 inch

ELECTRICAL DATA

Plant Power Supply	380 volt, 3 phase, 50 hz
Total Horsepower	23
Total Kilowatts	17.5
Control Panel Transformer	1500 volt-amps
Total Amp Load	35.62
Recommended Branch Circuit Distribution Switch	100 amp
Recommended Branch Circuit Fuse (FRS-R)	50 amp
Recommended Branch Feeder (THHN)	6 AWG (13.3mm ²)
Recommended Branch Circuit Feeder Conduit	0.75 inch [20 mm]
Short Circuit Interrupting Capacity	200,000 AIC

NOTE: Electrical may change from machine to machine. Please consult Installation drawings supplied by Besser.

Electrical Data Notes:

For safety purposes, Besser Company requires that this equipment be connected to a lockable electrical disconnect.



CAUTION:

To comply with Articles 110-9 and 110-10 of the National Electrical Code:

- The customer shall supply a branch circuit protective device to feed this control panel.
- The protective device shall have a short circuit interrupting rating of no less than the available short circuit current. (Besser Company recommends the use of protective devices with interrupting ratings of no less than 200,000 amps rms symmetrical.)
- See table above for the recommended protection.

Failure to comply with these guidelines may result in a rupture of the protective device while attempting to clear a fault.

MS-10 W/SIDE SHIFTER SPECIFICATIONS

TOTAL WEIGHT: 26,840 Lbs [12200 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]
Front delivery conveyors (2)	1250 Lbs [568 Kg]
Loaders / Unloaders (2)	3000 Lbs [1364 Kg] each
Pallet return conveyors (2)	500 Lbs [227 Kg] each
Rackveyor total	5050 Lbs [2295 Kg]
Rackveyor front section:	2250 Lbs [1021 Kg]
Rackveyor center section:	1000 Lbs [455 Kg]
Rackveyor tail section:	1800 Lbs [818 Kg]
Panel assembly:	1400 Lbs [818 Kg]
Graphic control station:	325 Lbs [148 Kg]
Hydraulic power unit:	300 Lbs [136 Kg]
Valve stand assembly:	765 Lbs [347 Kg]
Items shipped loose:	3000 Lbs [1364 Kg]

MINIMUM HYDRAULIC PRESSURE: 850 psi [58 bar]

MACHINE SPEED: Up to 10 cycles per minute

PRODUCTION CAPACITY: Up to 9 pallets high with 26" X 18 1/2" [660mm X 470mm] pallets.

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.

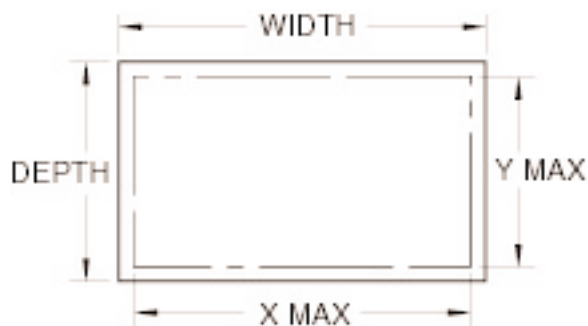
OPERATING RANGES:

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]	18.5" [470mm]	.313" [8mm]	25.0" [635mm]	17.5" [445mm]	470750F0001
26.0" [660mm]	20.5" [521mm]	.313" [8mm]	25.0" [635mm]	19.5" [495mm]	470750F0002
26.0" [660mm]	26.0" [660mm]	.313" [8mm]	25.0" [635mm]	25.0" [635mm]	470750F0003
29.0" [737mm]	18.5" [470mm]	.313" [8mm]	28.0" [711mm]	17.5" [445mm]	470750F0004
29.0" [737mm]	20.5" [521mm]	.313" [8mm]	28.0" [711mm]	19.5" [495mm]	470750F0005

Table A STEEL PALLET SPECIFICATIONS

Overall Dimensions

OVERALL DIMENSIONS (ref. installation print #5):

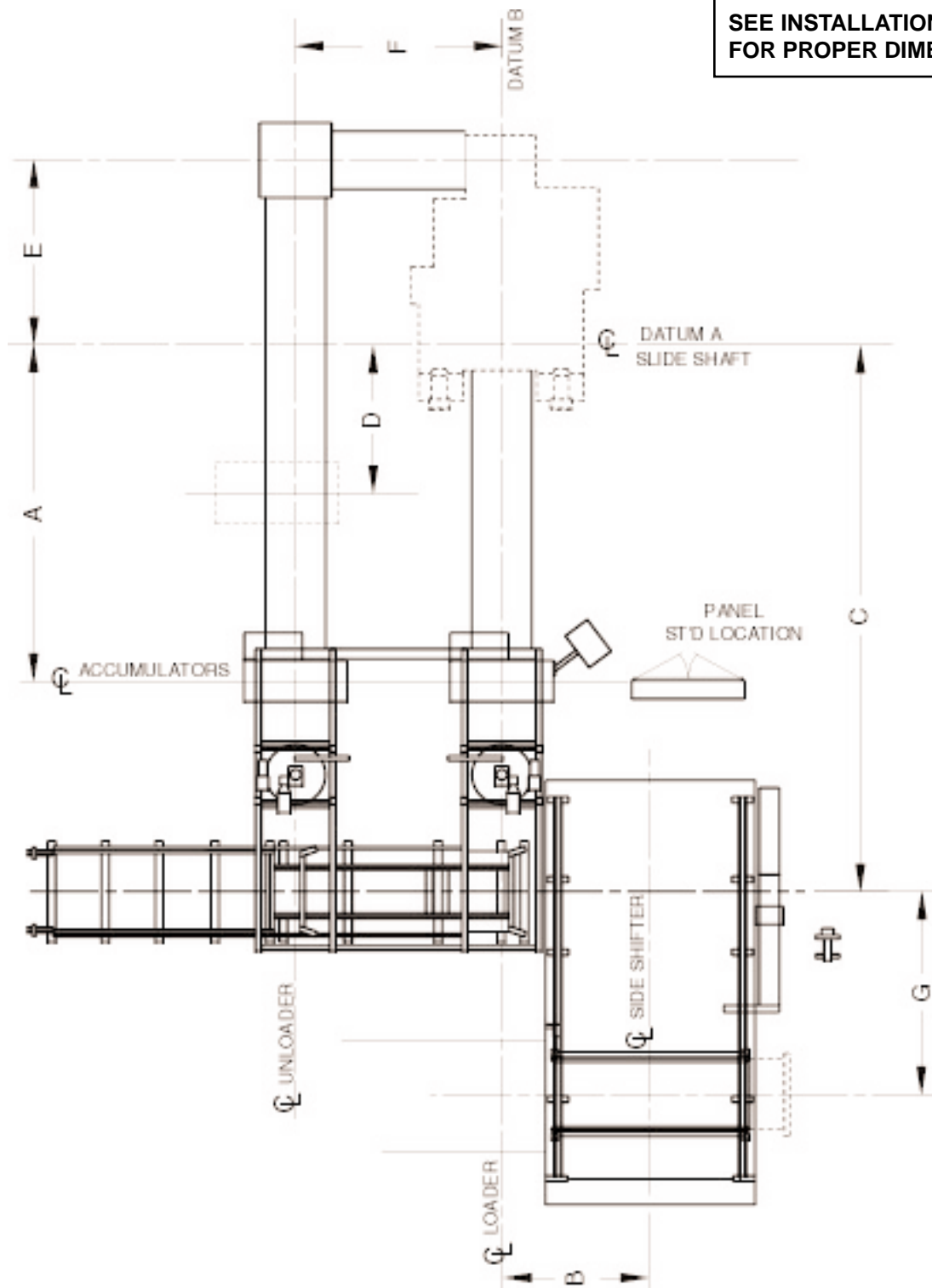


Figure A MS-10 Dimensions

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.

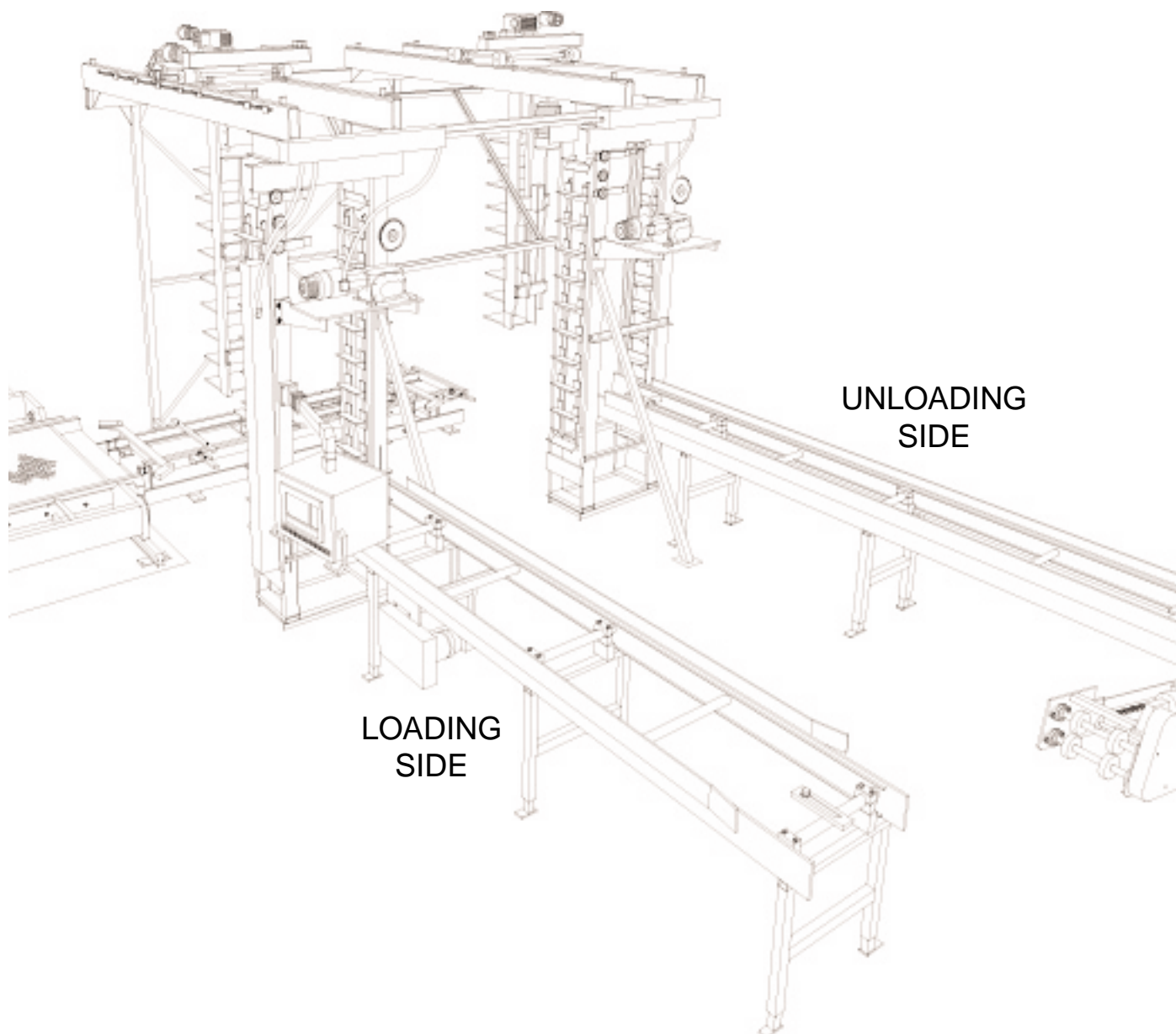


Figure B Operator orientation

SECTION 1

MACHINE DESCRIPTION

1.1 HOW A BESSER-MATIC MS-10 WORKS.

The Besser-Matic MS-10 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 MS-10 gently loads and unloads concrete products onto and off of racks, automatically. The Multi-Spade 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 MS-10 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 MS-10 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)

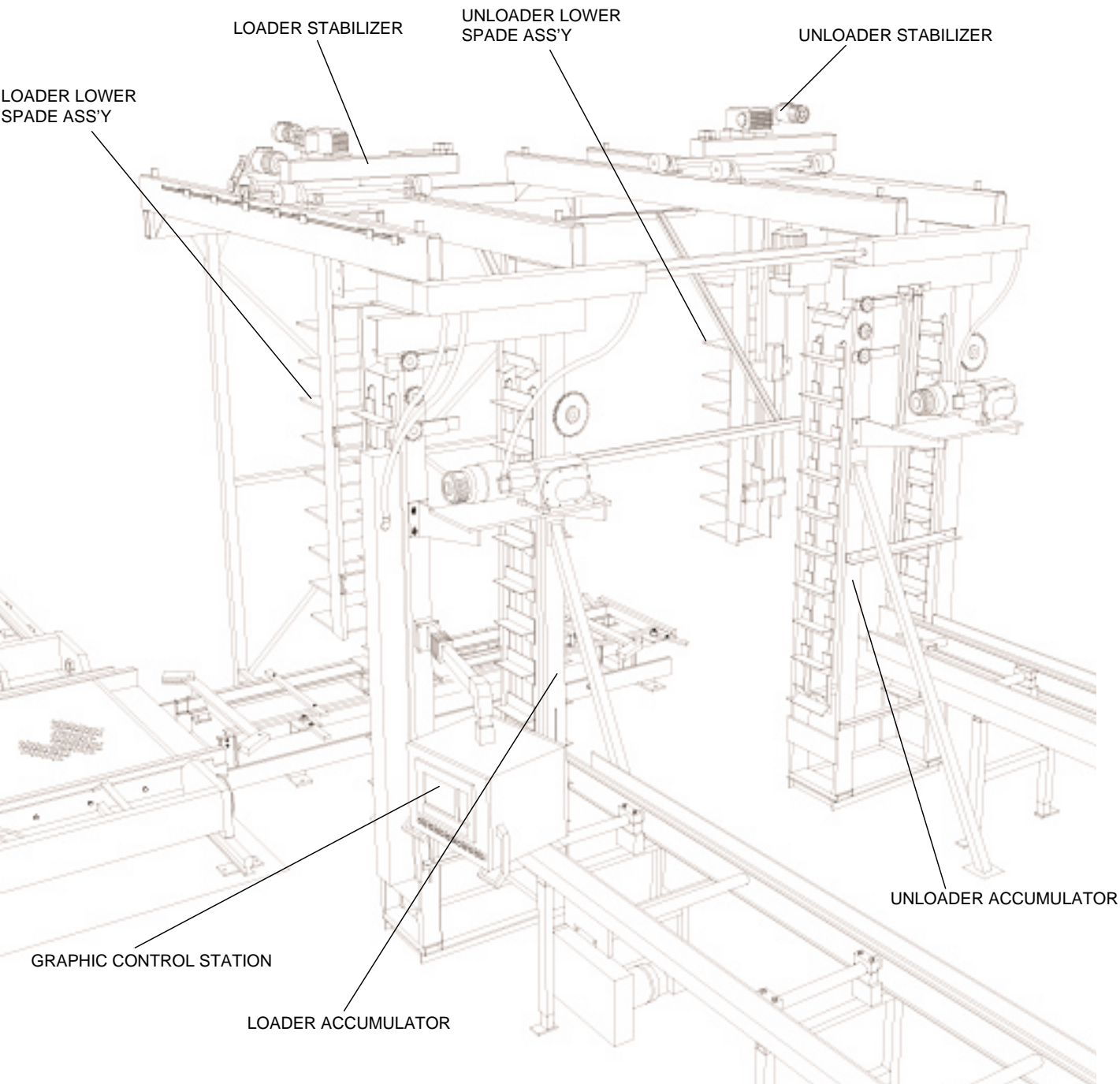
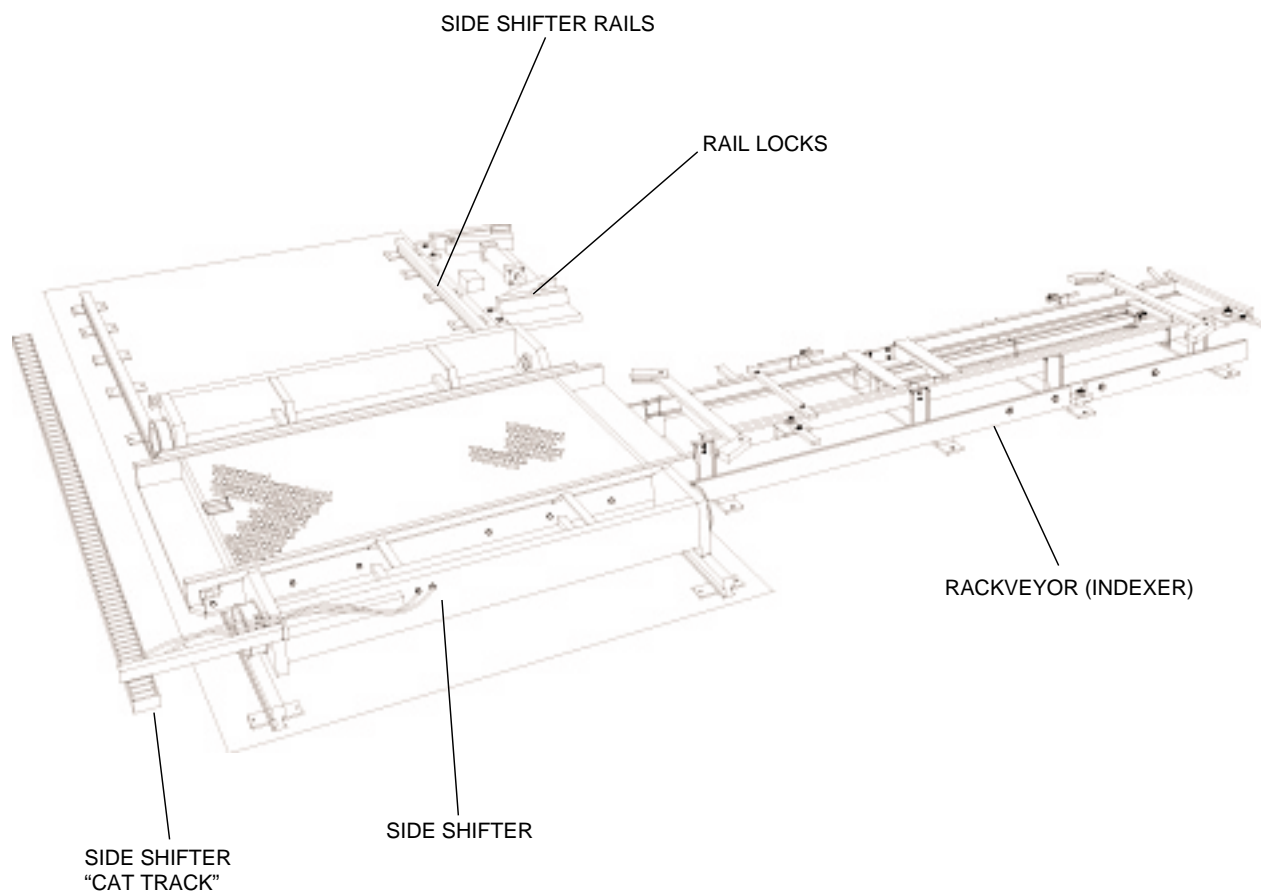


Figure 1.1 Multiple-Spade Assembly

1.3 SIDE SHIFTER AND RACKVEYOR (RIGHT HAND SYSTEM SHOWN)**Figure 1.2** Side Shifter and Rackveyor

1.4 CONVEYORS (RIGHT HAND SYSTEM SHOWN)

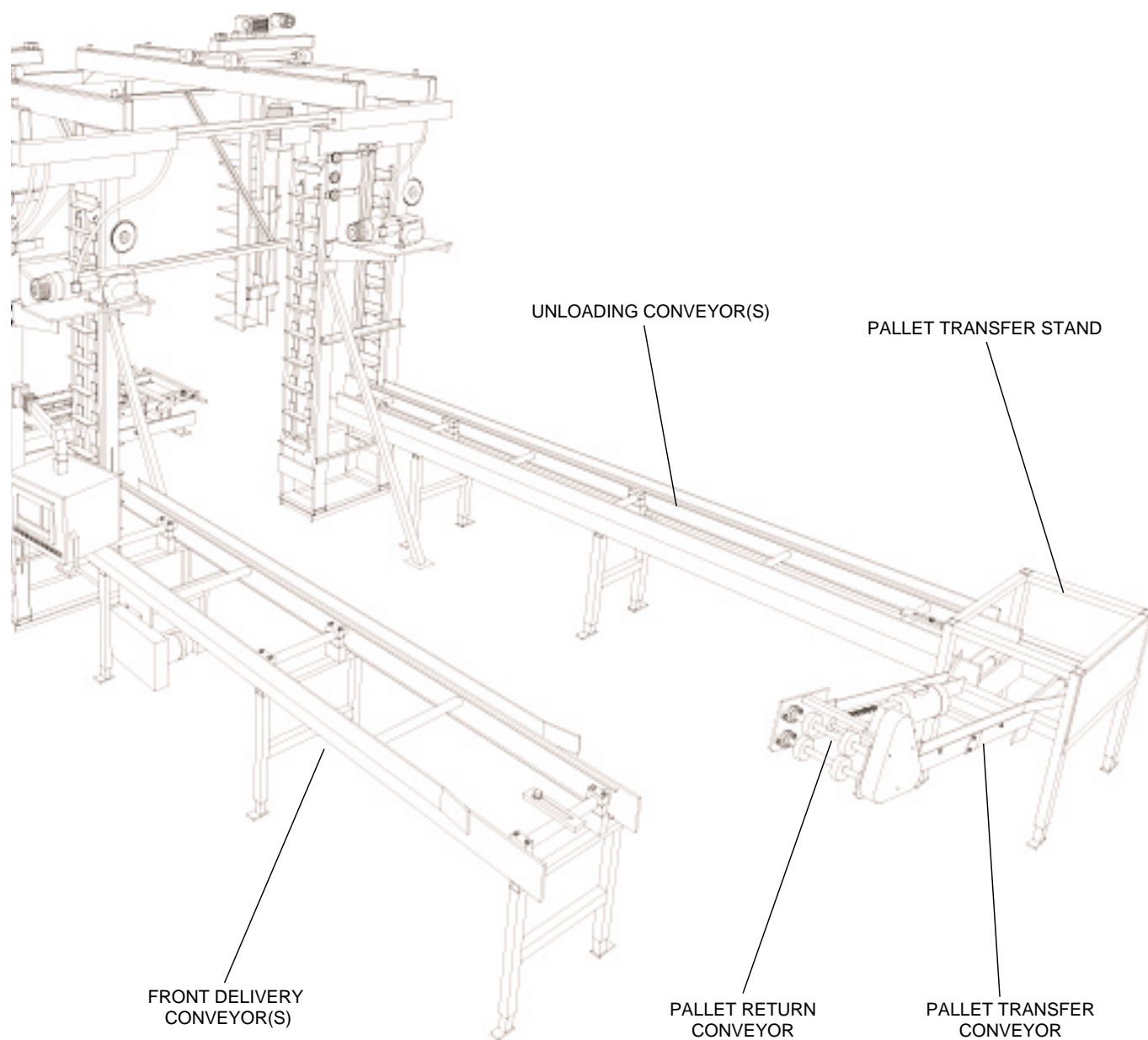


Figure 1.3 Conveyors

SECTION 2

MACHINE INITIAL SET-UP

THE PRESENT SECTION EXPLAINS HOW TO SET UP THE BESSER-MATIC MULTI-SPADE MS-10. 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-40A, YOU SHOULD FOLLOW INSTRUCTIONS FOR BOTH THESE SYSTEMS SIMULTANEOUSLY. INSTRUCTIONS ON THE RACK TRANSPORTER SYSTEM ARE FOUND IN A MANUAL. MAKE SURE THE MACHINE HAS BEEN INSTALLED PROPERLY AS SHOWN IN THE INSTALLATION MANUAL.

2.1 LOADER SIDE INSTRUCTIONS

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)

2.1.1.1 Set delivery height of the front delivery conveyor (refer to paragraph 3.6.1.2 of the Installation manual or sheet 6 of the Installation drawing).

2.1.1.2 Proximity switch (PRS-2A) should be adjusted 1/4" [6.3mm] below the bottom of pallet sitting on chain.

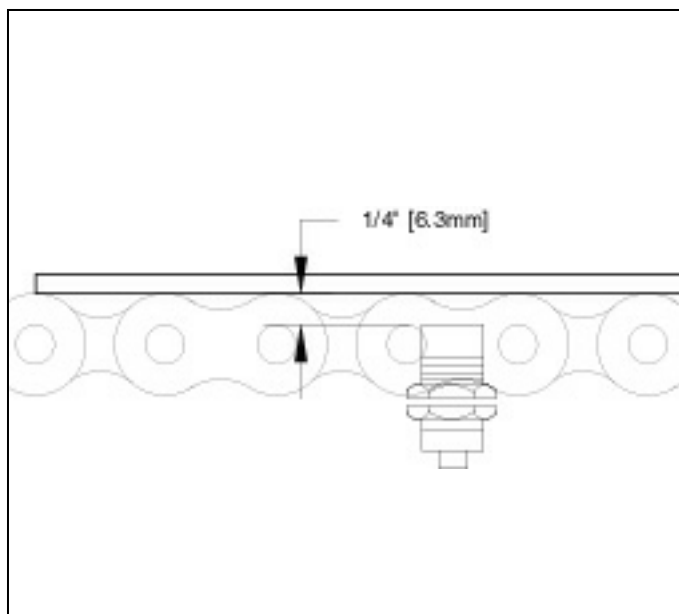


Figure 2.1 PROXIMITY SWITCH PRS-2A.

2.1.2 Front Delivery Conveyor Set-Up (Accumulator End)

2.1.2.1 Switch (PRS-28) should be adjusted 1/4" [6.3mm] below the bottom of pallet. (figure 2.2)

2.1.2.2 Switch must be adjusted so pallet is in pick-up position when switch is released.

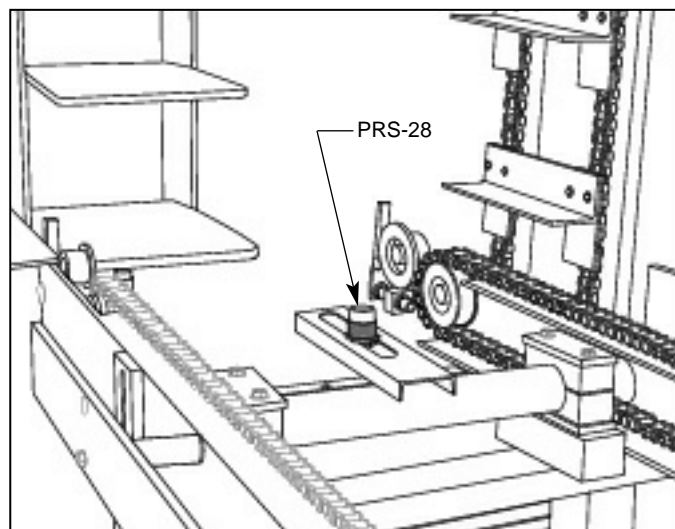


Figure 2.2 PROXIMITY SWITCH PRS-28.

2.1.3 Position for shelf angle home switch on the accumulator

2.1.3.1 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. 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.

2.1.3.2 Run to next shelf angle to verify the position of the switch.

2.1.4 Position for full load switch on accumulator

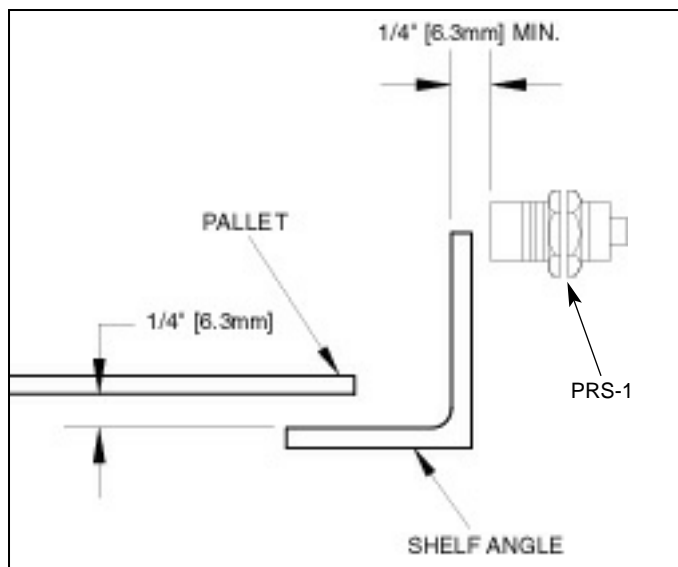


Figure 2.3 PROXIMITY SWITCH PRS-1.

2.1.4.1 PRS-3 (pancake switch) is located on the top of the Accumulator and is the full load indicator. It senses the pallet on the top shelf. It is adjusted according to the number of shelves you run. Adjust switch so that there is 1/2" [12.7mm] between pallet and face of pancake switch.

2.1.4.2 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.

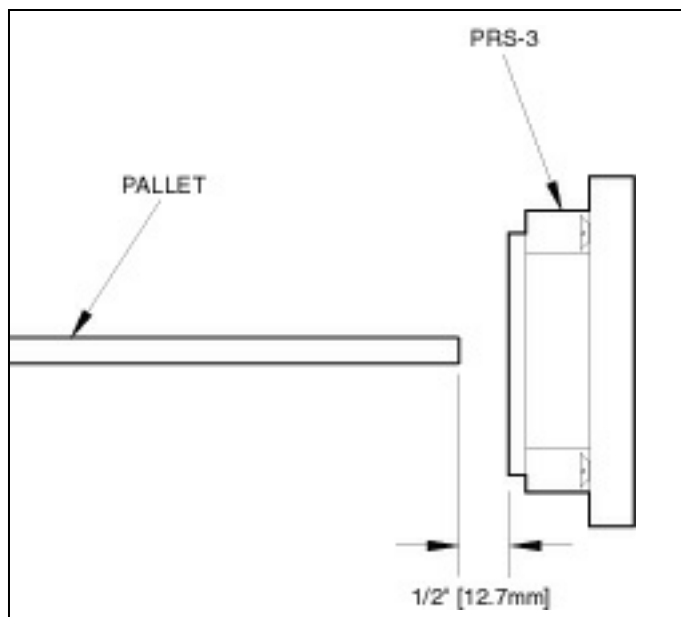


Figure 2.4 PROXIMITY SWITCH PRS-3.

2.1.5 Location of frame actuators

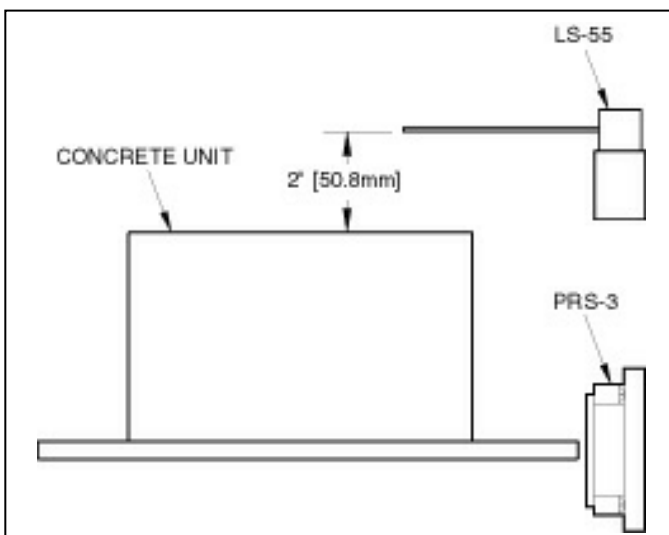


Figure 2.5 LIMIT SWITCH LS-55 AND PROXIMITY SWITCH PRS-3.

Actuators on MS-10 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. Use frame assembly drawing along with the written instructions below to adjust frame actuators:

2.1.5.1 Locate actuator for center-in/center-out.

2.1.5.2 Locate actuator to position pallet in rack (depends on how deep system is).

2.1.5.3 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).

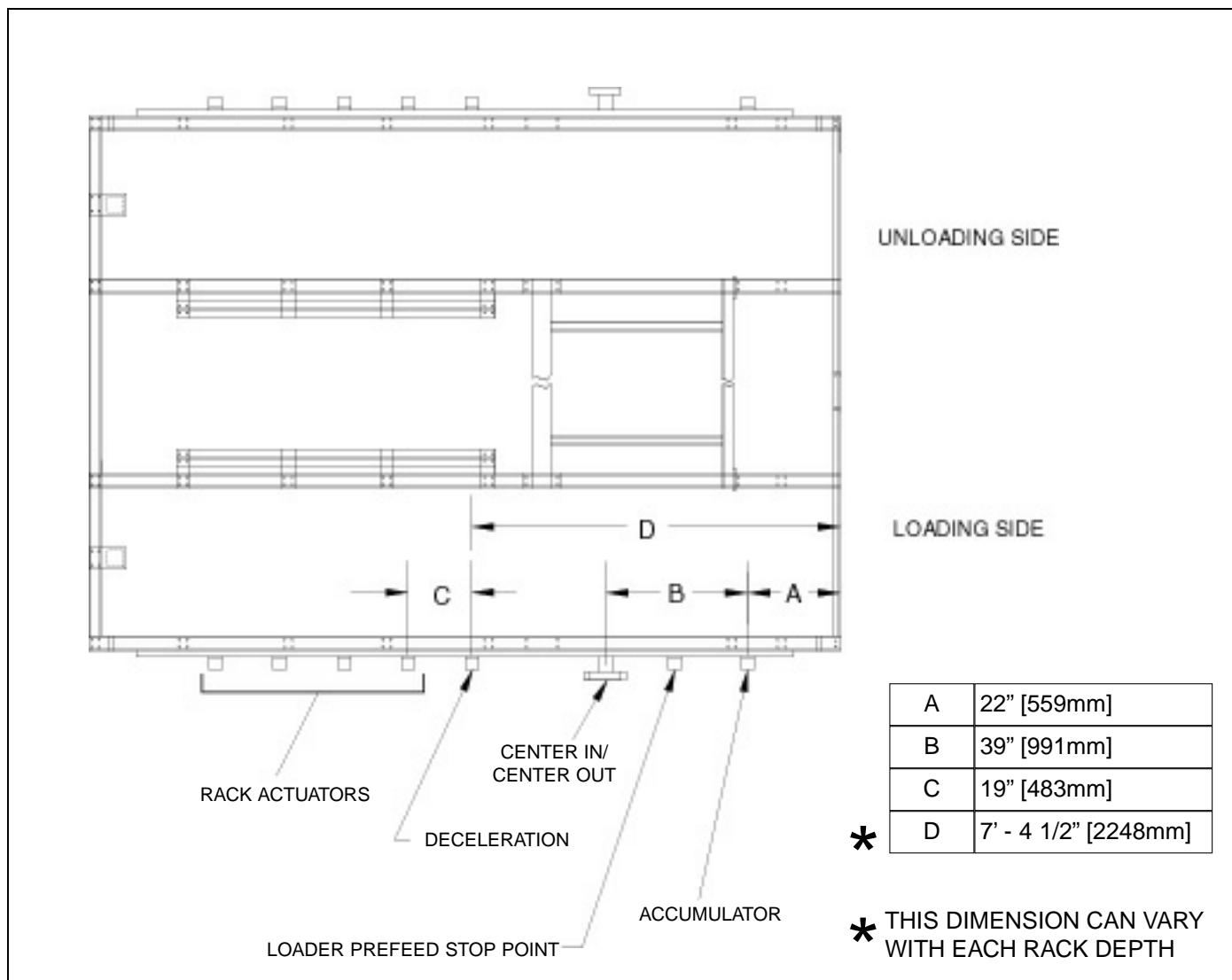


Figure 2.6 FRAME ACTUATORS ON LOADING SIDE (VIEWED FROM ABOVE).

2.1.6 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 2.7 below and need to be adjusted as follows:

2.1.6.1 Adjust switch LS-19 to make sure it trips on frame center in/out actuator.

2.1.6.2 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.

2.1.6.3 Adjust safety switches PRS-51 and PRS-51A 1/4" [6.3mm] above frame track.

4.1.6.4 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 (A)(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.

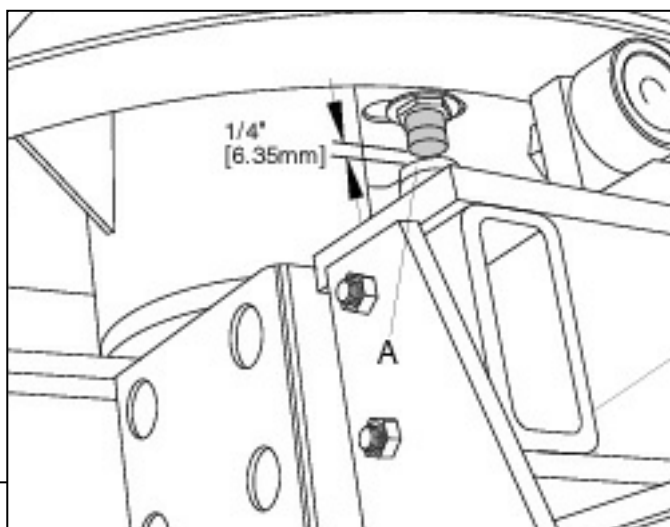


Figure 2.8
TURN SWITCHES.

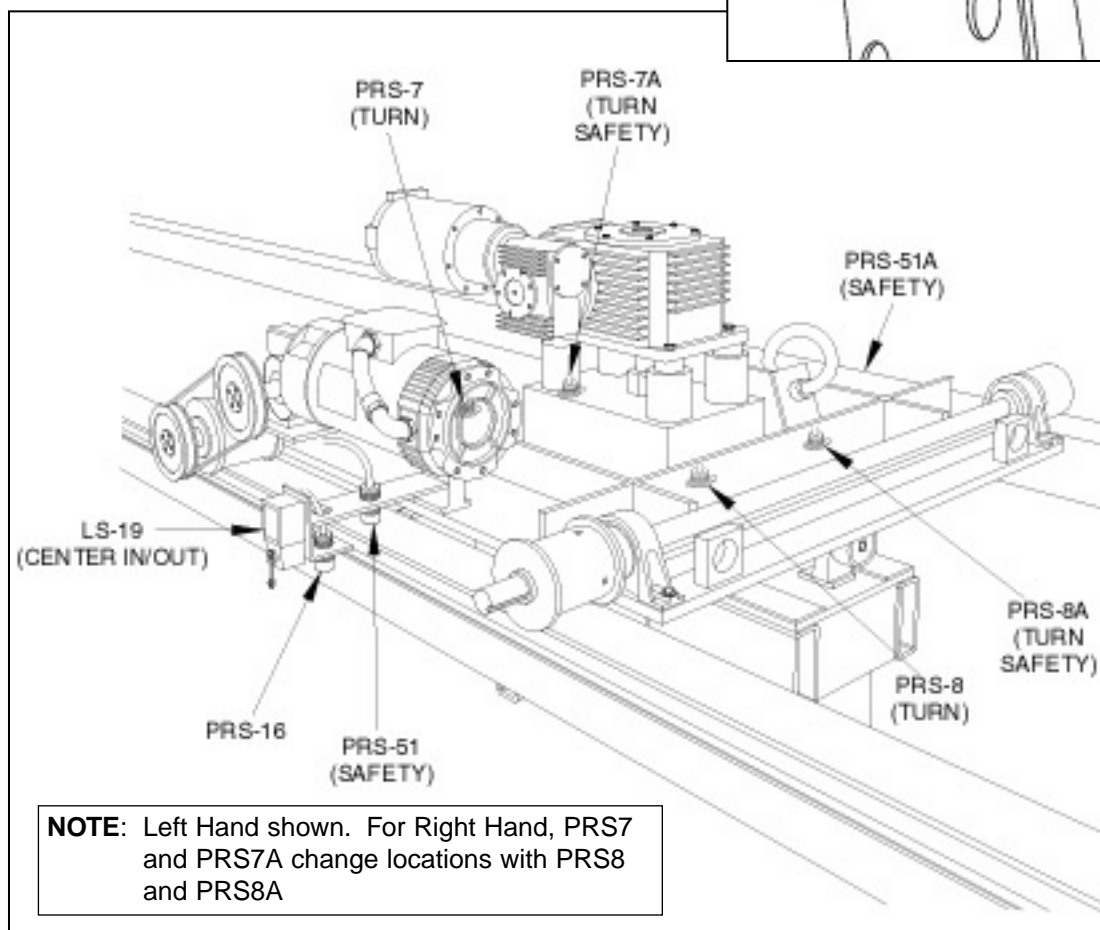


Figure 2.7 STABILIZER SWITCHES.

2.1.7 Adjust Multiple Limit Switches (MLS)

A MLS (figure 2.9) 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 2.10 below identifies all 5 switches in the switch box.

2.1.7.1 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.

2.1.7.2 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.

2.1.7.3 Refer to figure 2.10 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.

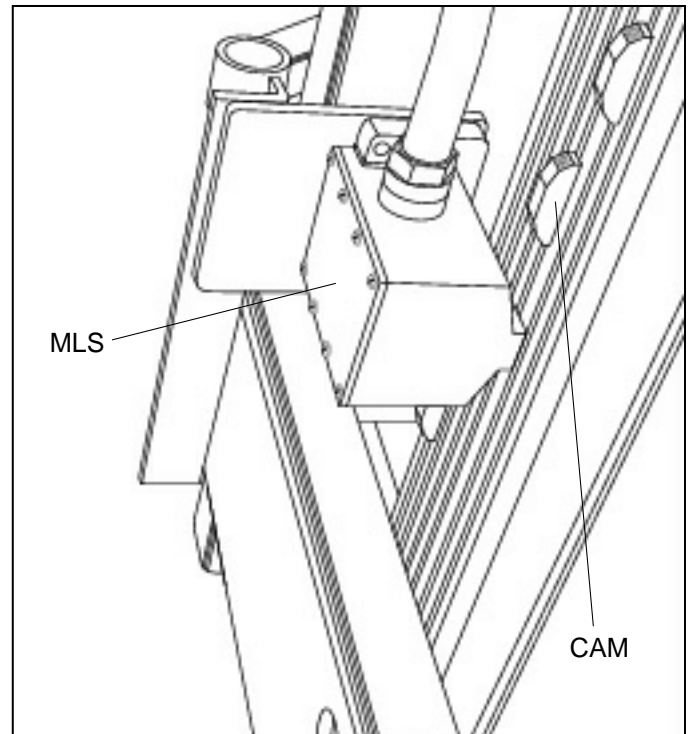


Figure 2.9 MULTIPLE LIMIT SWITCH (MLS).

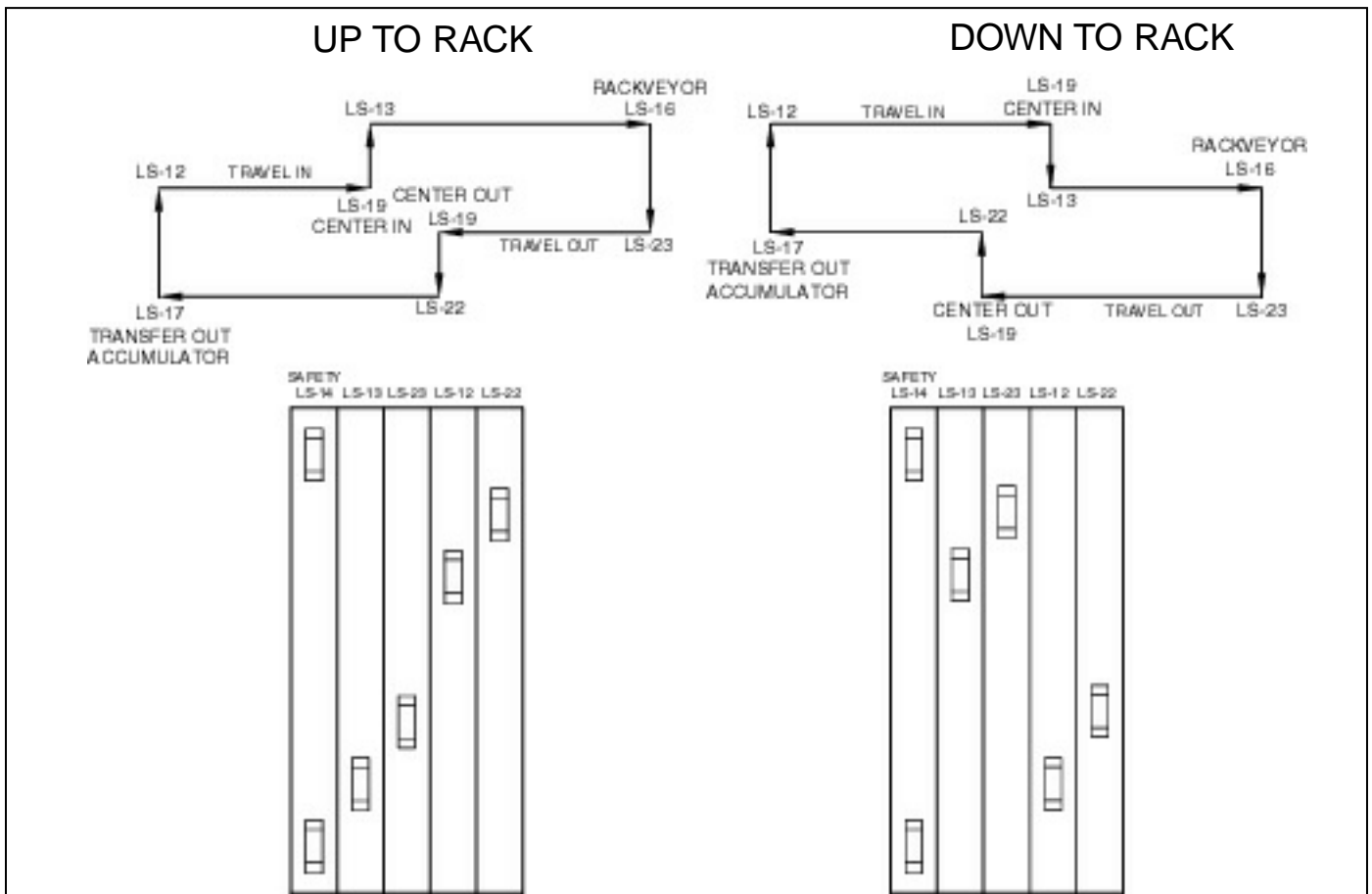


Figure 2.10 CAM CONFIGURATION (APPROXIMATE).

2.1.7.4 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 2.11. Then, move cam until switch LS-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.

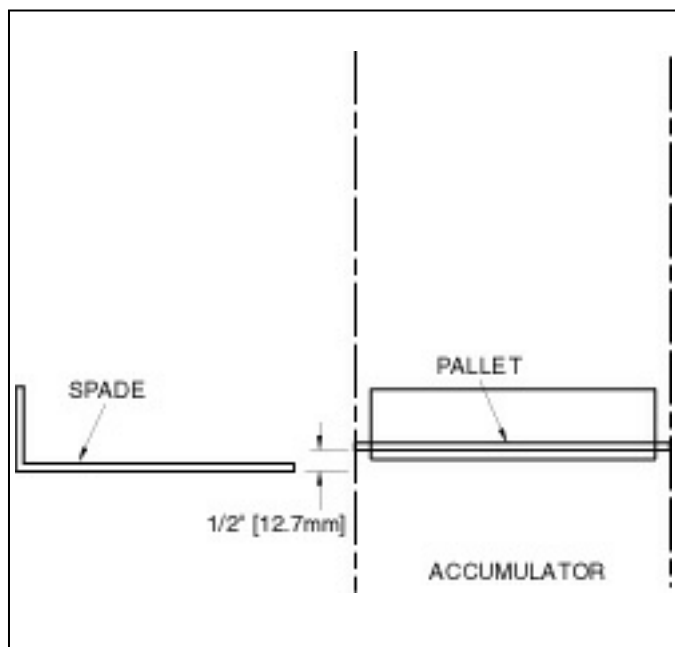


Figure 2.11 SWITCH LS-22 ADJUSTMENT.

2.1.7.5 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 2.12). Then, move cam until switch LS-12 is actuated (screen will indicate that switch has been tripped).

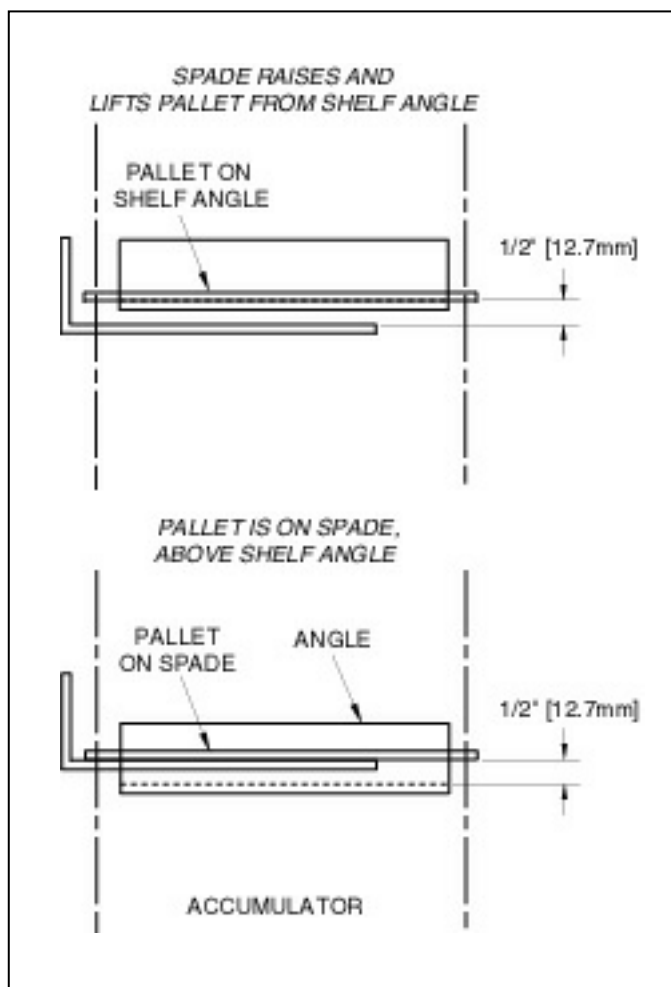


Figure 2.12 SWITCH LS-12 ADJUSTMENT.

2.1.7.6 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 2.13). Then move cam until switch LS-13 is actuated (screen will indicate that switch has been tripped).

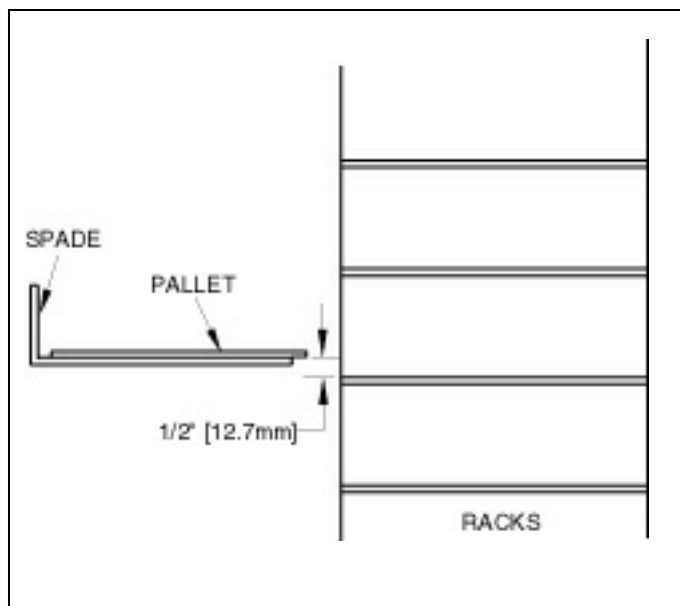


Figure 2.13 SWITCH LS-13 ADJUSTMENT.

2.1.7.7 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 2.14). Then move cam until switch LS-23 is actuated (screen will indicate that switch has been tripped)

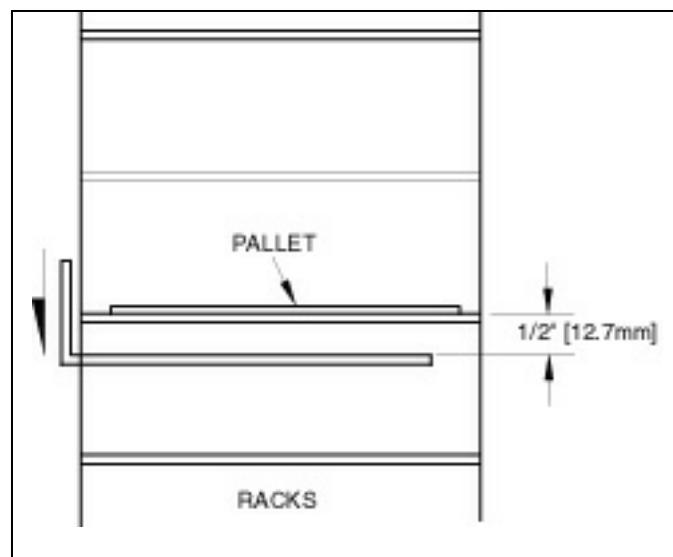


Figure 2.14 SWITCH LS-23 ADJUSTMENT.

2.1.7.8 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 INSTRUCTIONS

2.2.1 Accumulator switches

2.2.1.1 PRS-41 indicates that pallet is completely inside Accumulator. Adjust so that, when bar is pushed all the way in, switch PRS-41 is actuated. See figure 2.15.

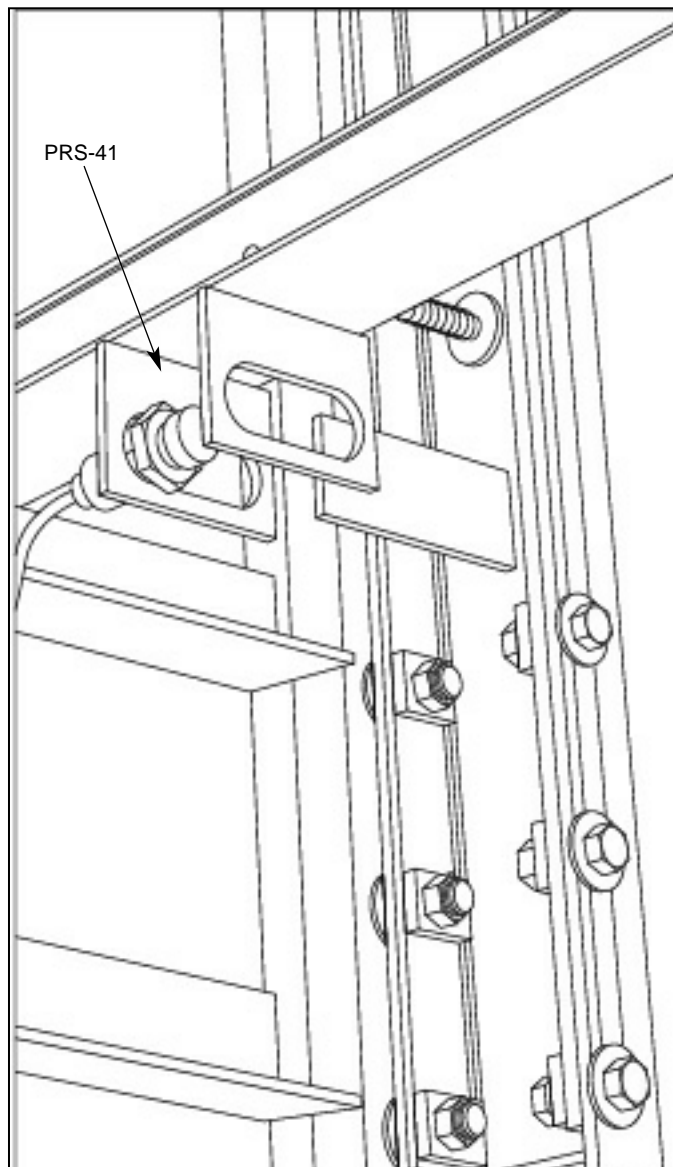


Figure 2.15 PRS-41.

2.2.1.2 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. See figure 2.16.

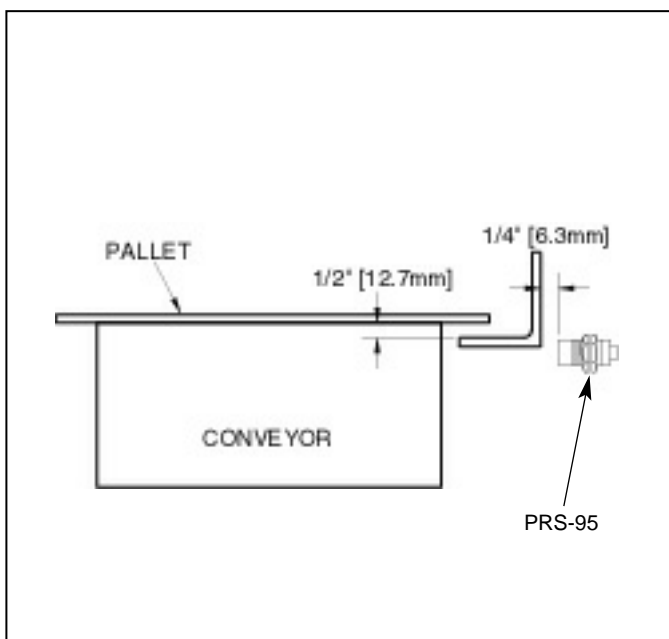


Figure 2.16 PRS-95.

2.2.2 Unloading conveyor switches

2.2.2.1 All switches on unloading conveyor should be adjusted 1/4" [6.35mm] below the bottom of the pallet sitting on chain.

2.2.2.2 Adjust PRS-42 (figure 2.17) so that pallet is clear of Accumulator conveyor when switch is tripped and released, if PRS-43 is not covered.

2.2.2.3 Adjust PRS-43 (figure 2.17) 1/4" [6.3mm] below pallet sitting on chain. PRS-43 is a safety switch. If PRS-43 is tripped, Accumulator will not move.

2.2.2.4 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.

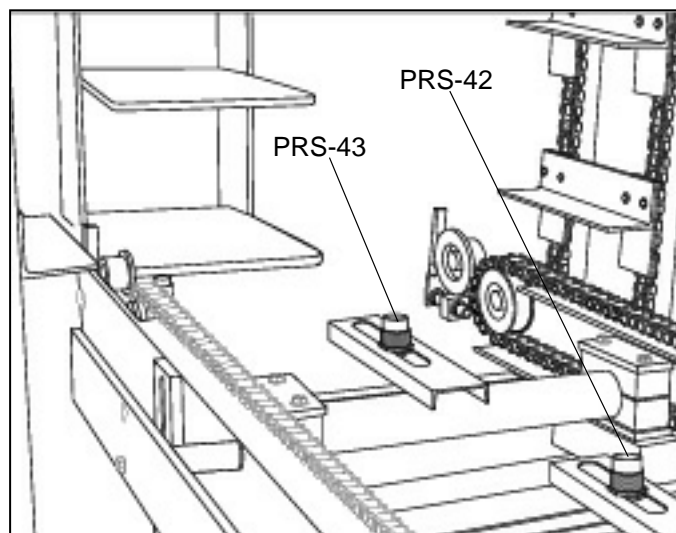


Figure 2.17 PRS-42 AND PRS-43.

2.2.3 Location of frame actuators

Actuators on MS-10 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:

2.2.3.1 Locate actuator for center-in / center-out (shown below).

2.2.3.2 Locate actuator to position pallet in rack (depends on how deep system is).

2.2.3.3 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).

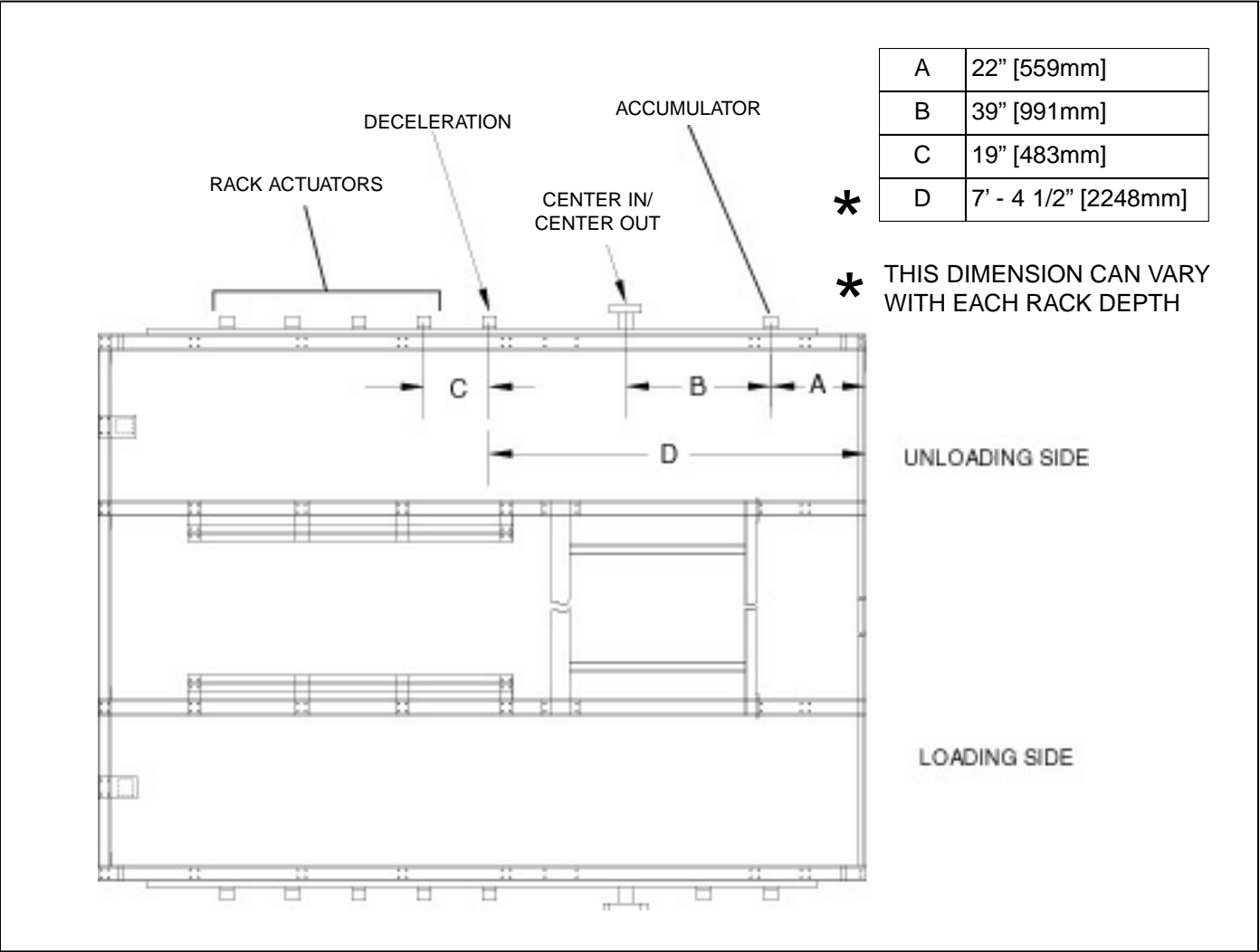


Figure 2.18 FRAME ACTUATORS ON UNLOADING SIDE (VIEWED FROM ABOVE).

2.2.4 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 2.19 below and need to be adjusted as follows:

2.2.4.1 Adjust switch LS-26 to make sure it trips on frame center in/out actuator.

2.2.4.2 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.

2.2.4.3 Adjust safety switches PRS-52 and PRS-52A 1/4" [6.3mm] above frame track.

2.2.4.4 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 (A) (figure 2.20 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.

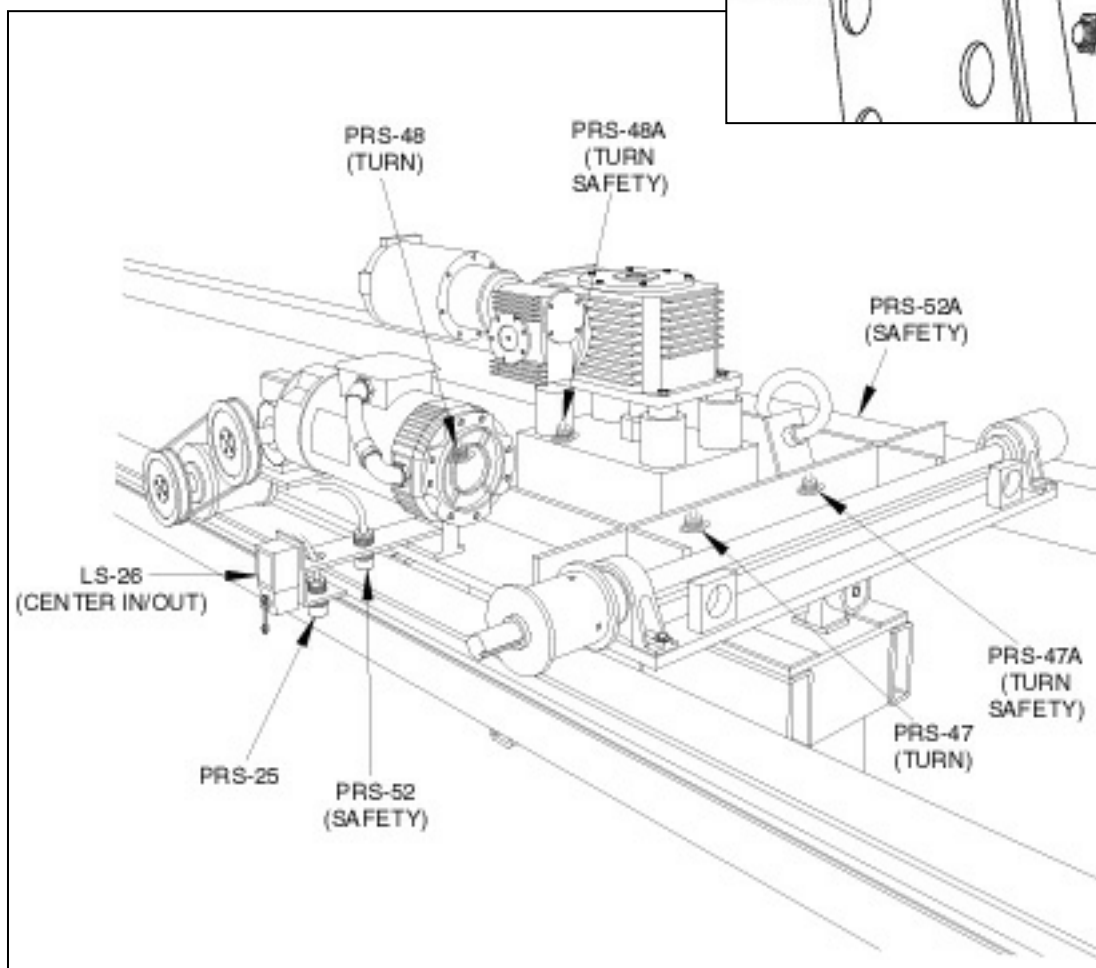
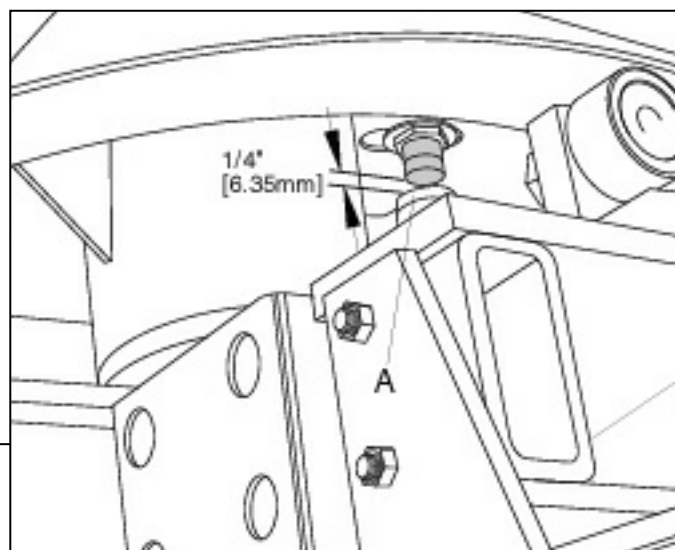


Figure 2.20
TURN SWITCHES.

Figure 2.19 STABILIZER SWITCHES.

2.2.5 Adjust Multiple Limit Switches (MLS)

A MLS (figure 2.21) 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 2.22 below identifies all 5 switches in the switch box.

2.2.5.1 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.

2.2.5.2 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.

2.2.5.3 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.

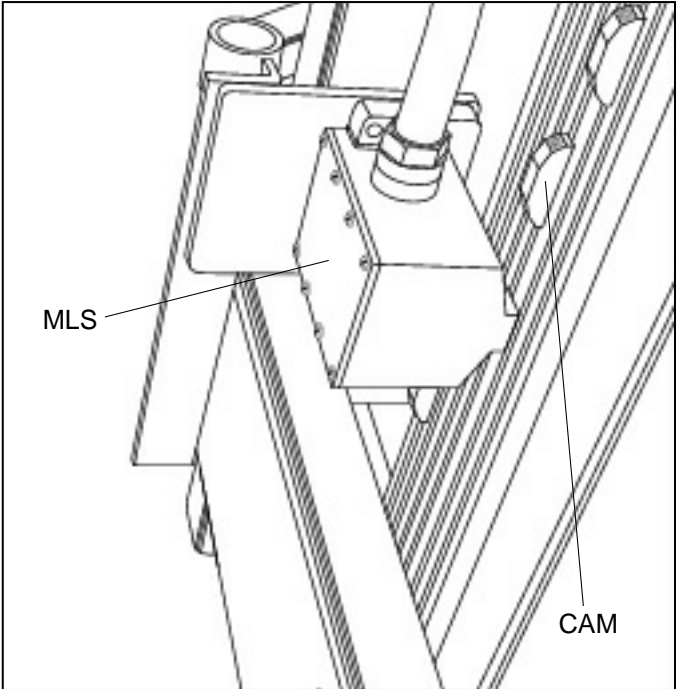


Figure 2.21 MULTIPLE LIMIT SWITCH (MLS).

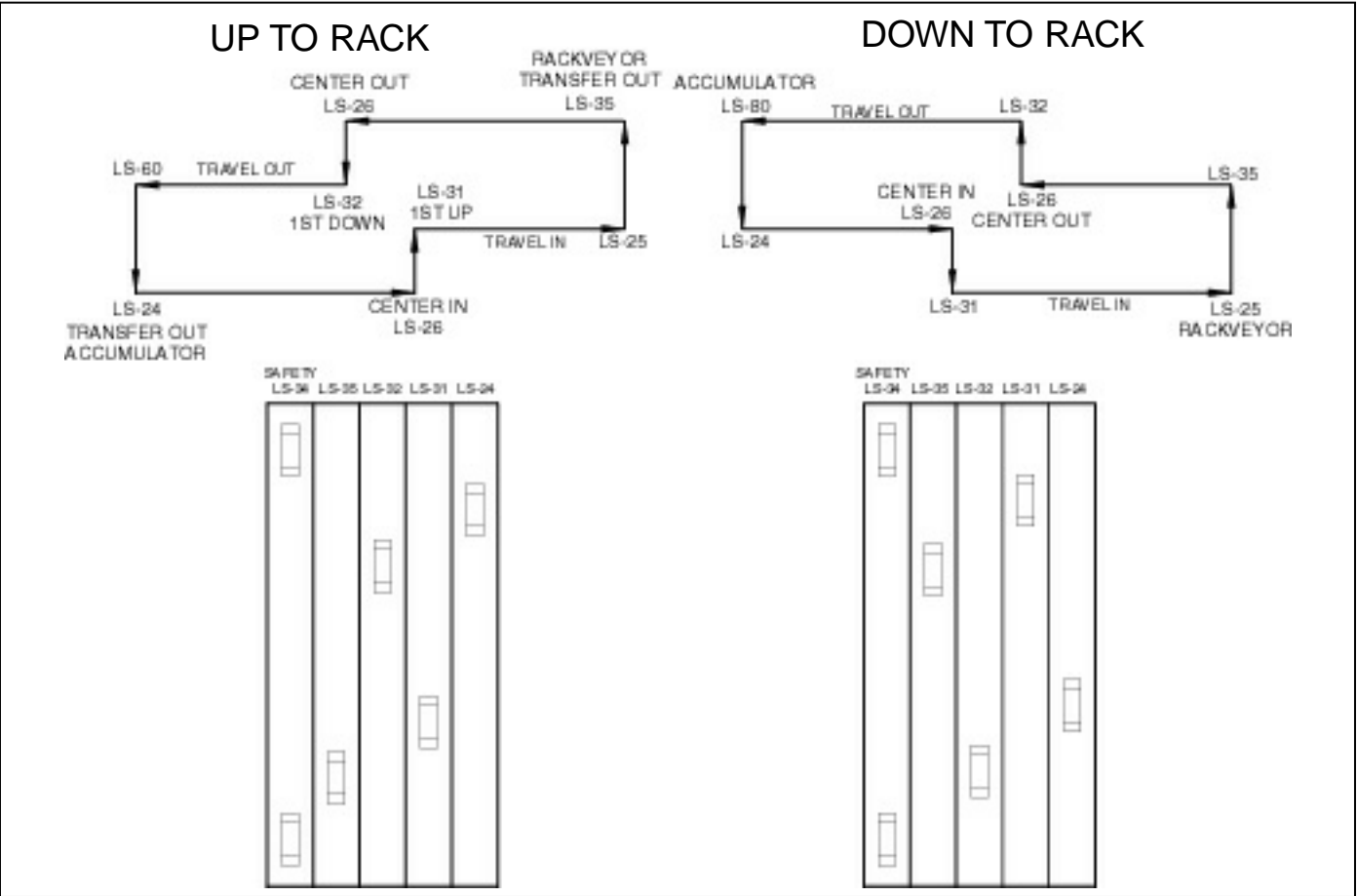


Figure 2.22 CAM BOX CONFIGURATION (APPROXIMATE).

2.2.5.4 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 LS-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.

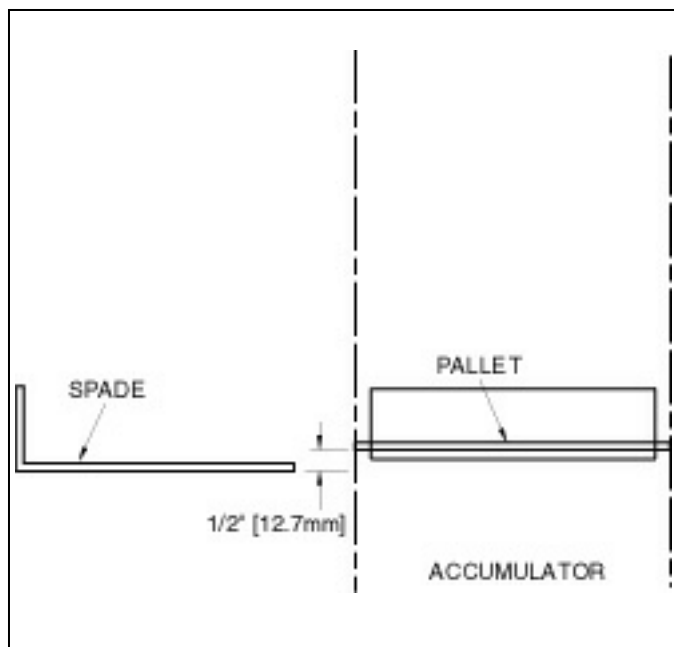


Figure 2.23 SWITCH LS-24 ADJUSTMENT.

2.2.5.5 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 LS-31 is actuated (screen will indicate that switch has been tripped).

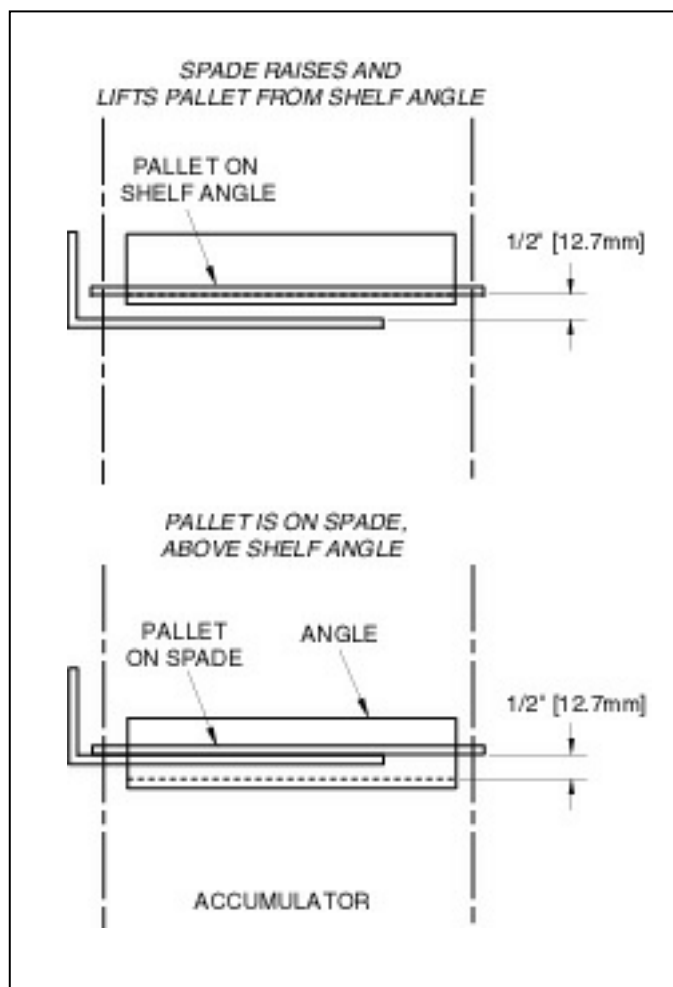


Figure 2.24 SWITCH LS-31 ADJUSTMENT.

- 2.2.5.6** Manually move the spade (see section 6.2) 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 LS-35 is actuated (screen will indicate that switch has been tripped).

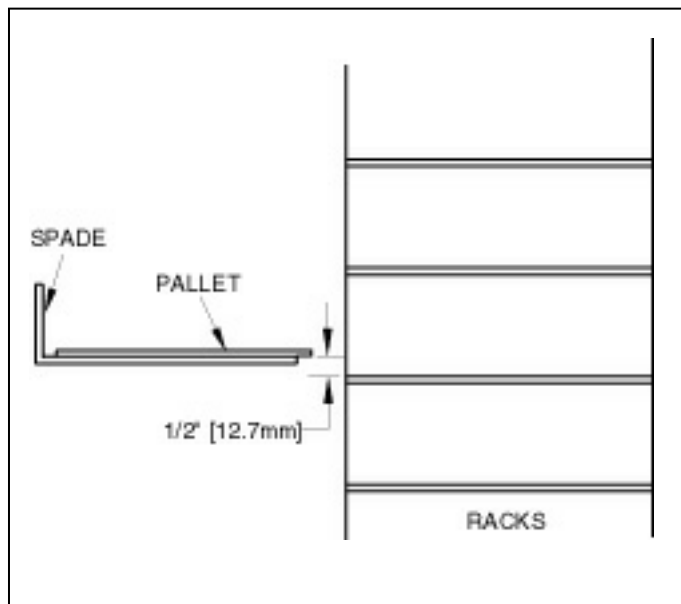


Figure 2.25 SWITCH LS-35 ADJUSTMENT.

- 2.2.5.7** Manually move the spade (see section 6.2) 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 LS-32 is actuated (screen will indicate that switch has been tripped)

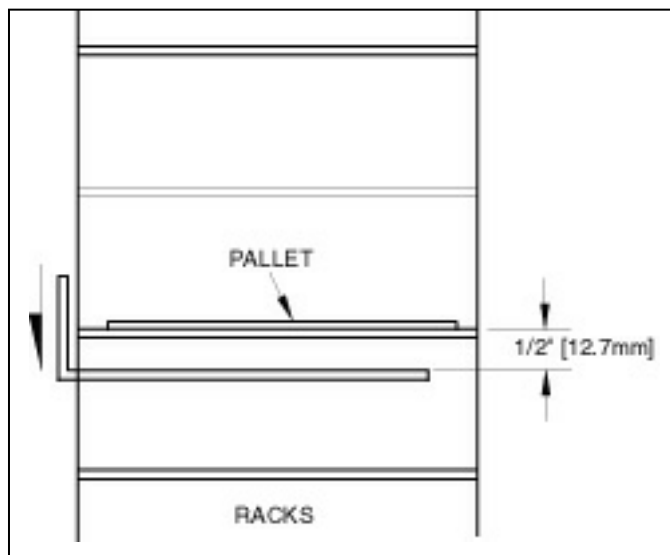


Figure 2.26 SWITCH LS-32 ADJUSTMENT.

- 2.2.6.8** Adjust safety switch LS-34 (with red dot) 1" [25.4mm] above top of highest stroke. (1" [25.4mm] above extreme position) and .1" [2.54mm] below lowest stroke (down extreme).

2.2.6 Conveyor switches

2.2.6.1 The PRS-630 (figure 2.27) 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).

2.2.6.2 Pallet Transfer conveyor PRS-69 switch (figure 2.27) indicates pallet is on transfer conveyor and starts Pallet Transfer motor. Should be adjusted 1/4" [6.3mm] below pallet.

2.2.6.3 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. See figure 2.28.

2.2.6.4 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 2.29

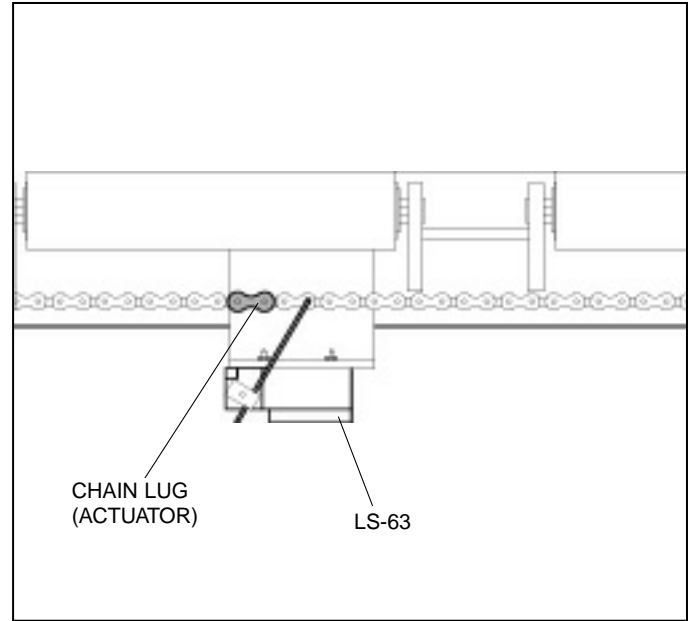


Figure 2.28 SWITCH LS-63 ON PALLET TRANSFER.

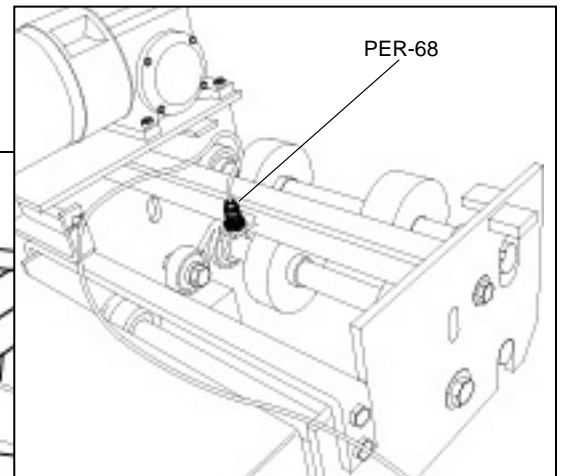
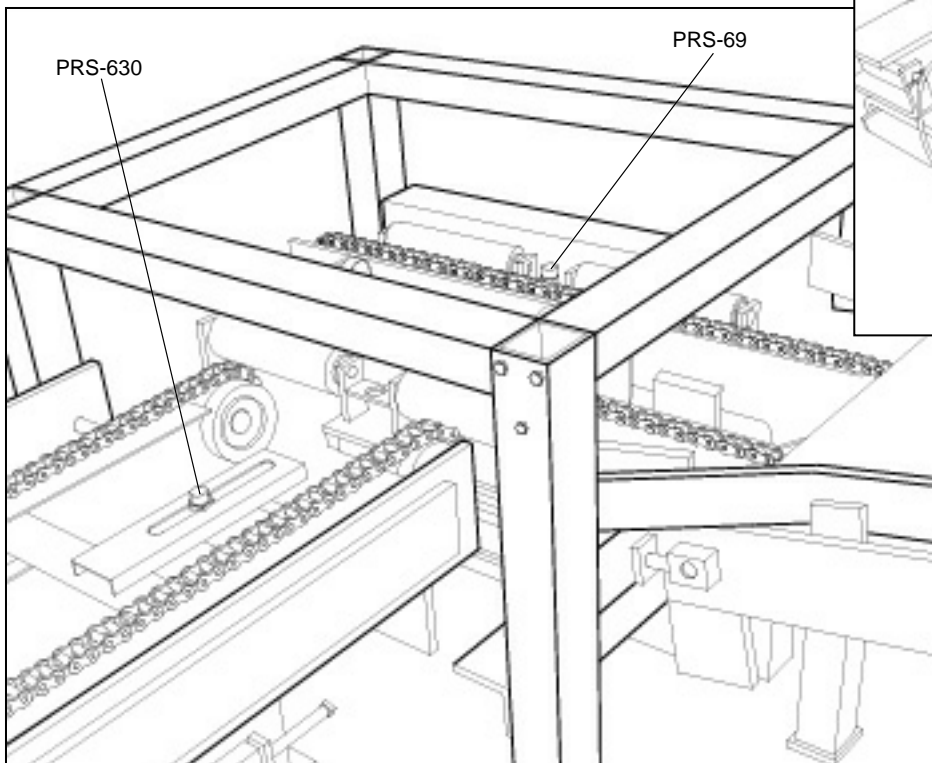


Figure 2.29 SWITCH PER-68.

Figure 2.27 SWITCHES PRS-630 AND PRS-69.

2.2.7 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.

2.2.8 Pallet roller guides

Adjust roller guides to center pallets in unloader Accumulator.

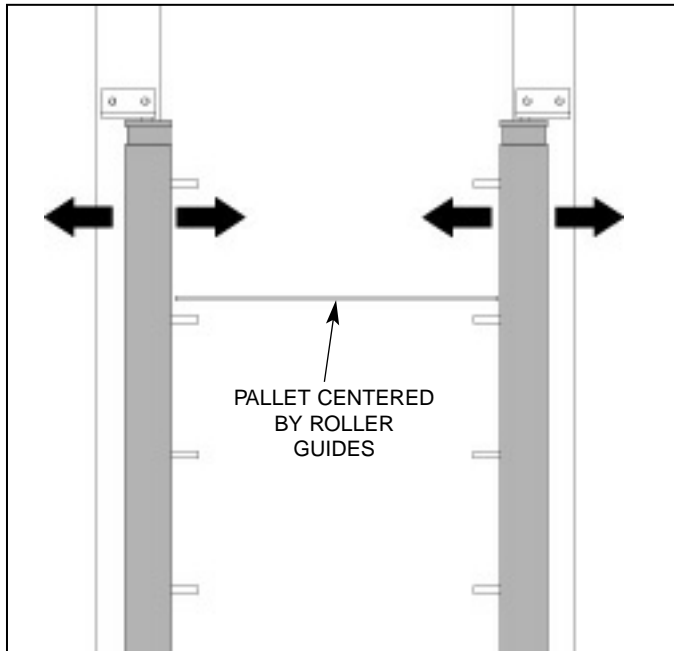


Figure 2.30 ROLLER GUIDES.

2.3 INSTRUCTIONS ON SETTING-UP THE RACKVEYOR AND SIDE SHIFTER (LOADER SIDE SHIFTER).

2.3.1 Set two racks on Rackveyor indexer.

2.3.2 Adjust threaded rod on cap end of cylinder (figure 2.32, item A) so loader pushers center rack bay with loader center line.

2.3.3 Adjust tie-plate (figure 2.32, item B) that links the two carriages together so unloader pushers center rack bay with unloader center line while the loader rackbay is centered.

2.3.4 PRS-105 (figure 2.31 and 2.32) switch indicates the "forward" position where racks are centered with loader center line and unloader center line. Adjust PRS-105 to tie-plate actuator.

2.3.5 PRS-104 (figure 2.31) 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-104 to tie-plate actuator.

2.3.6 PRS-104A (figure 2.31) 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.

2.3.7 Switches PRS-104, 104A and 105 need to be adjusted 1/4" [6.3mm] from tie plate actuator.

2.3.8 LS-110 limit switch (figures 2.31 and 2.32) indicates rack in position for loader. Should be adjusted to actuate off rack legs.

2.3.9 LS-111 limit switch (figure 2.31) indicates rack in position for unloader. Should be adjusted to actuate off rack legs.

2.3.10 When PRS-132 and PRS-133 (figure 2.31) 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.

2.3.11 When PRS-132 is covered and PRS-133 is not, racks will index to PRS-104 for next bay.

2.3.12 When PRS-132 and PRS-133 are not covered by a rack, EMITTER-100 will be turned on to signal crawler to bring in a new rack.

2.3.13 PRS-129 (figure 2.31), when covered then uncovered, 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).

2.3.14 PRS-127 indicates Side Shifter is in position at Rackveyor. Adjust switch (lateral adjustment) to allow Side Shifter to line up with Rackveyor.

2.3.15 PRS-126 indicates Side Shifter is in position at the Crawler rails. Adjust switch to allow Side Shifter to line up with Crawler rails.

2.3.16 LS-123 (figure 2.31) is located on the rail locks. It should be adjusted to actuate off cylinder to indicate locks are unlocked.

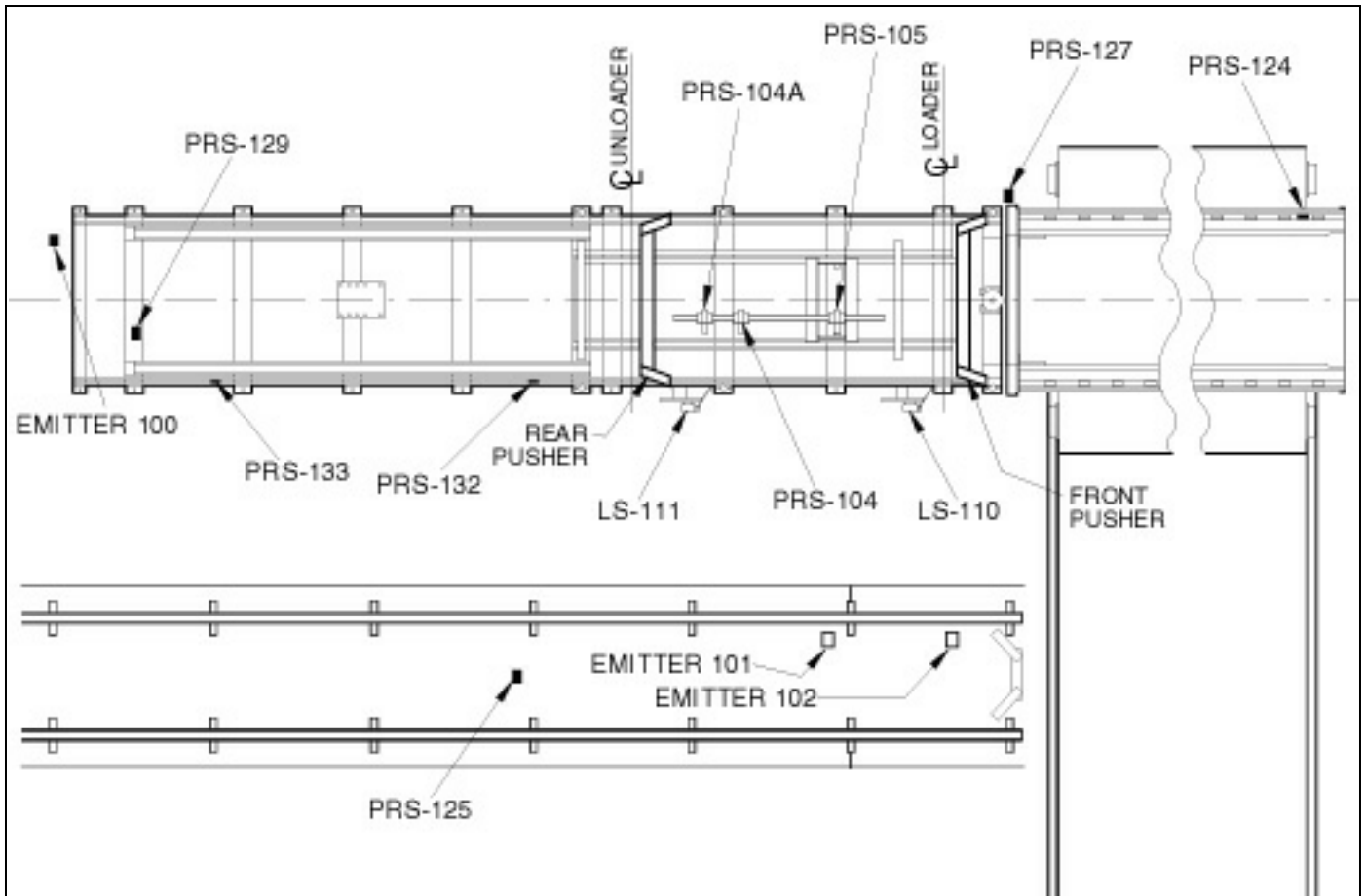


Figure 2.31 RACKVEYOR AND SIDE SHIFTER SWITCHES (LOADER SIDE SHIFTER).

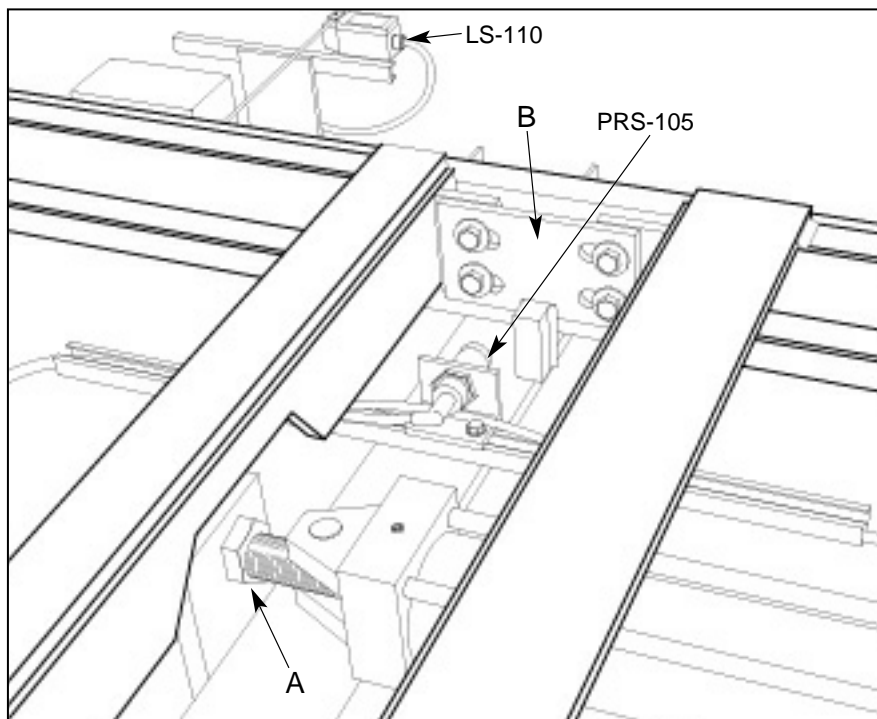


Figure 2.32 RACKVEYOR.

2.3.17 PRS-121 (figure 2.31) will indicate the left lock on the Side Shifter is locked up.

2.3.18 PRS-122 (figure 2.31) will indicate the right lock on the Side Shifter is locked up.

2.3.19 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).

2.3.20 PRS-125 (figure 2.31) when covered then uncovered indicates that Crawler is clear of the Side Shifter.

2.3.21 EMITTERS-101 and 102 come 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 INSTRUCTIONS ON SETTING-UP THE RACKVEYOR AND SIDE SHIFTER (UNLOADER SIDE SHIFTER).

2.4.1 Set two racks on Rackveyor indexer.

2.4.2 Adjust threaded rod on cap end of cylinder (figure 2.32, item A) so loader pushers center rack bay with loader center line.

2.4.3 Adjust tie-plate (figure 2.32, item B) that links the two carriages together so unloader pushers center rack bay with unloader center line while the loader rackbay is centered.

2.4.4 PRS-105 (figure 2.31 and 2.32) switch indicates the "forward" position where racks are centered with loader center line and unloader center line. Adjust PRS-105 to tie-plate actuator.

2.3.5 PRS-104 (figure 2.31) 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-104 to tie-plate actuator.

2.4.6 Switches PRS-104 and 105 need to be adjusted 1/4" [6.3mm] from tie plate actuator.

2.4.7 LS-110 limit switch (figures 2.31 and 2.32) indicates rack in position for loader. Should be adjusted to actuate off rack legs.

2.4.8 LS-111 limit switch (figure 2.31) indicates rack in

position for unloader. Should be adjusted to actuate off rack legs.

2.4.9 When PRS-132 and PRS-133 (figure 2.31) 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.

2.4.10 PRS-129 (figure 2.31), when covered then uncovered, 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).

2.4.11 PRS-127 indicates Side Shifter is in position at Rackveyor. Adjust switch (lateral adjustment) to allow Side Shifter to line up with Rackveyor.

2.4.12 PRS-126 indicates Side Shifter is in position at the Crawler rails. Adjust switch to allow Side Shifter to line up with Crawler rails.

2.4.13 LS-123 (figure 2.31) is located on the rail locks. It should be adjusted to actuate off cylinder to indicate locks are unlocked.

2.4.14 PRS-121 (figure 2.31) will indicate the left lock on the Side Shifter is locked up.

2.4.15 PRS-122 (figure 2.31) will indicate the right lock on the Side Shifter is locked up.

2.4.16 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).

2.4.17 PRS-125 (figure 2.31) when covered then uncovered indicates that Crawler is clear of the Side Shifter.

2.4.18 EMITTERS-101 and 102 come on when Side Shifter is locked up at Crawler rails with no rack on the Side Shifter (PRS-124 and PRS-128 released). These emitters allow the Crawler to enter the Side Shifter.

2.4.19 PRS-128 indicates (when released) that the rack has been removed from the Side Shifter, and starts the Side Shifter reverse towards the Crawler rails.

2.4.20 When the rack is indexed out to PRS-120, Emitter 100 is turned on This tells the Crawler to elevate the rack.

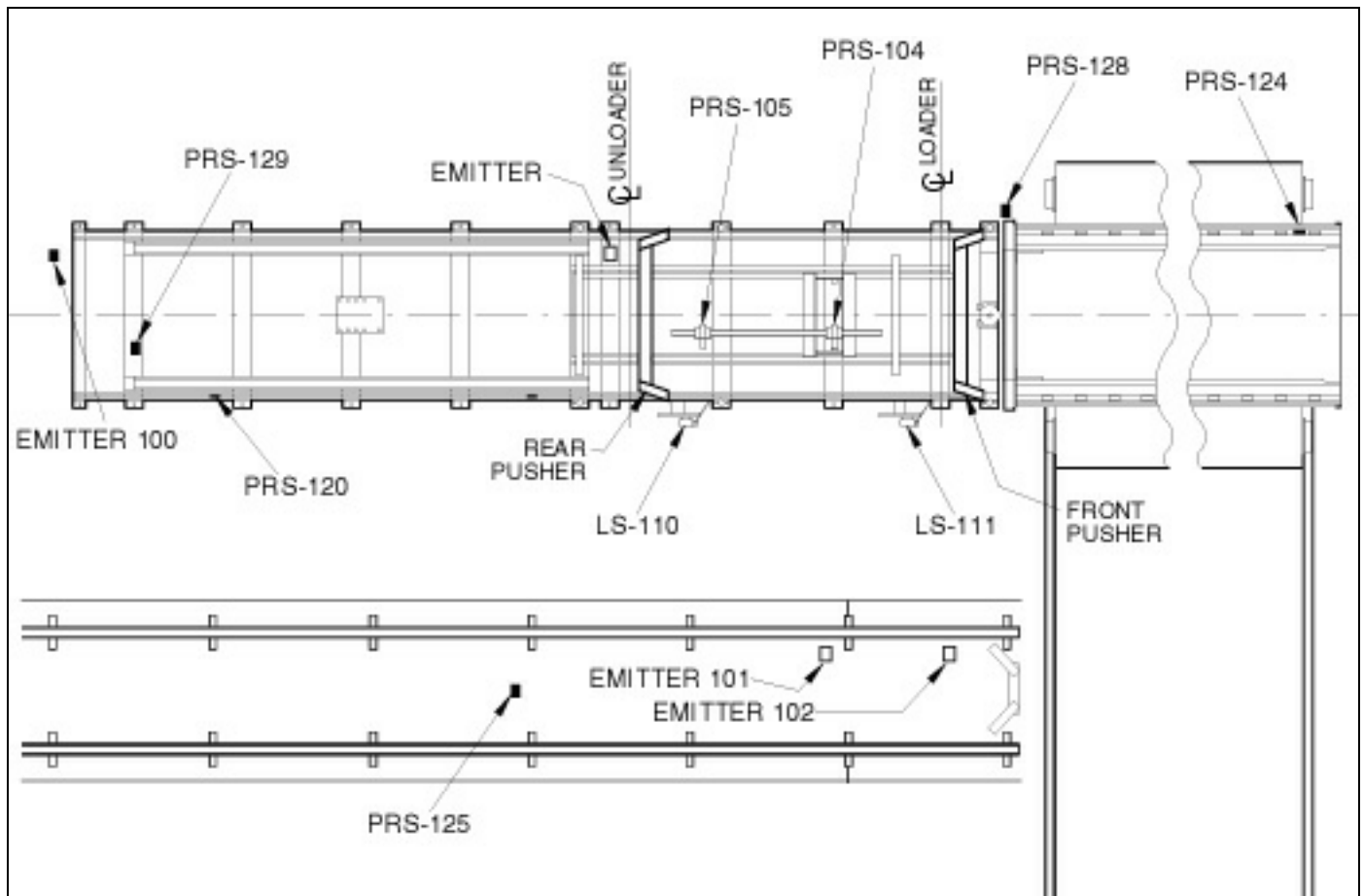
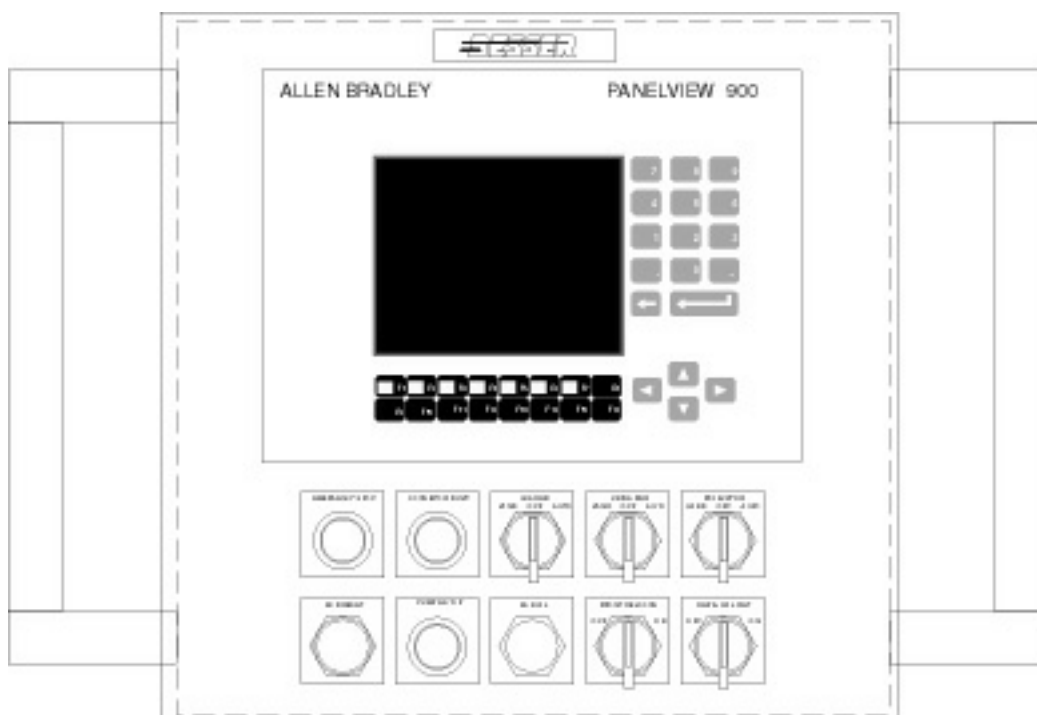


Figure 2.33 RACKVEYOR AND SIDE SHIFTER SWITCHES (UNLOADER SIDE SHIFTER).

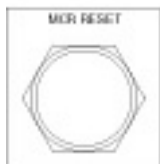
SECTION 3

GRAPHIC CONTROL STATION

3.0 MANUAL CONTROLS



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



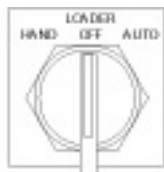
Master Control Relay reset.
Enables the machine to function (emergency button has to be pull out first).



Starts the hydraulic power unit pump.
Pull button to start pump. Push button to stop pump.



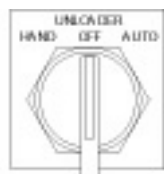
Spade manual control joystick. Operator must set Loader or Unloader to HAND before using. Operates the loader and unloader spades, UP - DOWN - IN -OUT.



Loader controls.

To use spade manually, set to HAND then use joystick to move.

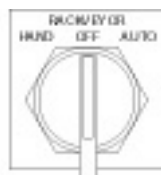
To use accumulator manually, set to HAND then use F6 and F7 keys to move up and down.



Unloader controls.

To use spade manually, set to HAND then use joystick to move.

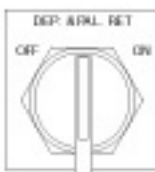
To use accumulator manually, set to HAND then use F6 and F7 keys to move up and down.



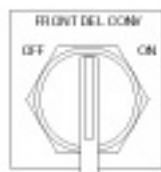
Rackveyor controls.

To use manually, set to HAND then use "F" keys as required or use manual control.

Also operator must place remote control station into the HAND position.

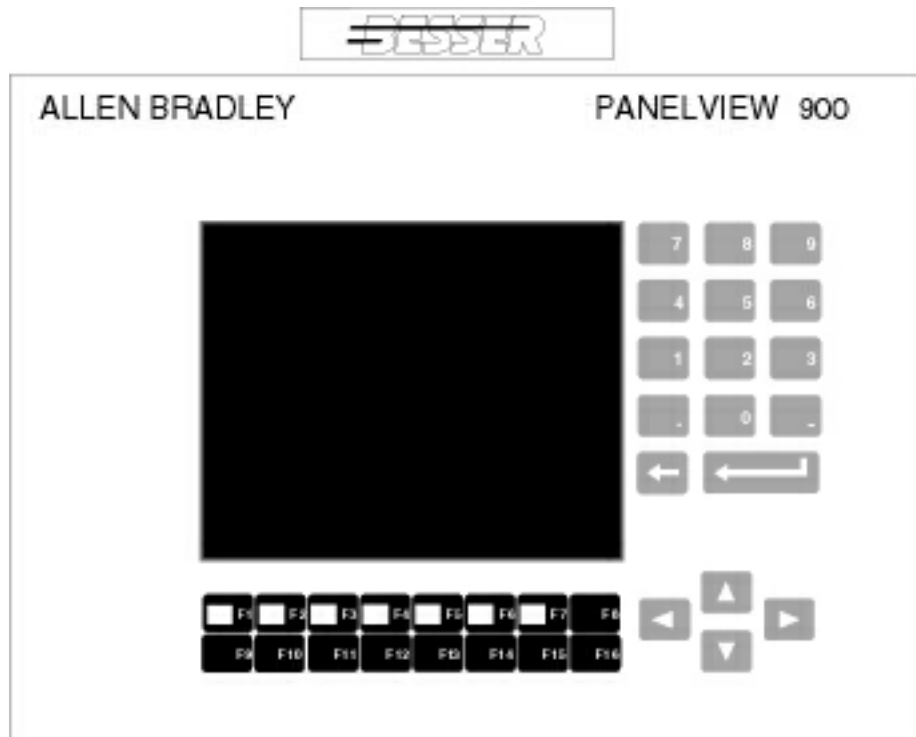


Depalletter and Pallet Return ON and OFF switch.



Front Delivery Conveyor ON and OFF switch.

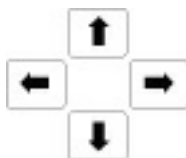
3.1 PROGRAMMING KEYS



F1 To F10 Use these keys to select a menu.

A & B These keys are used to enter starting parameters.

. 0 To 9 These keys are used to enter a parameter.



These keys are used to move cursor up and down and left to right.

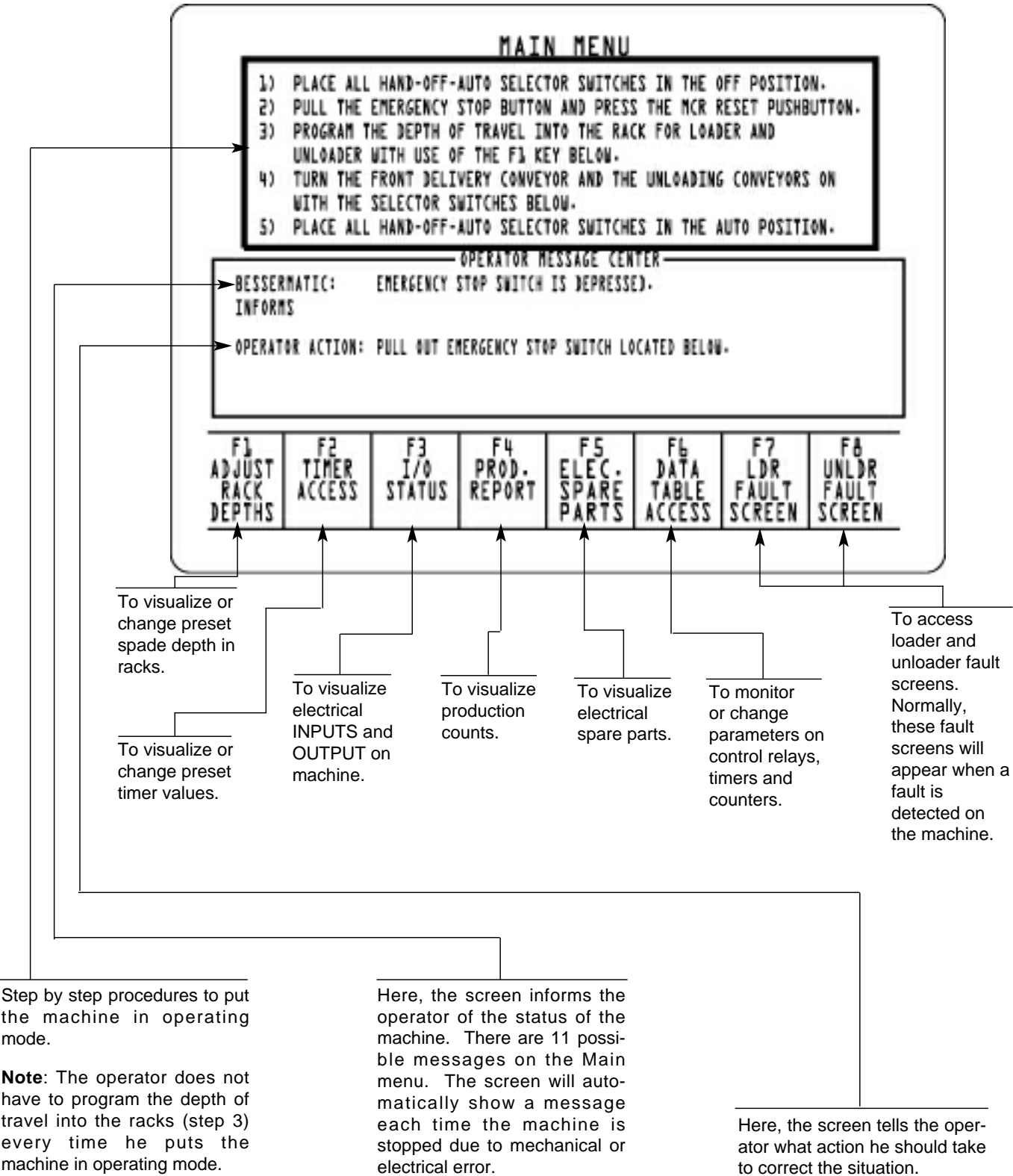


This key allows the operator to erase a parameter.



This key is used to accept a parameter after it has been typed in.

3.2 MAIN MENU



3.2.1 LIST OF POSSIBLE MESSAGES ON OPERATOR MESSAGE CENTER.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: INFORMS	PRS-51 OR PRS-51A OR PRS-52 OR PRS-52A IS NOT MADE. THESE SWITCHES ARE LOCATED ON THE LDR AND UNL SPADES.
OPERATOR ACTION:	CHECK FOR PROPER SWITCH ADJUSTMENT. CHECK LDR-CR1 AND UNL-CR1 RELAYS FOR FUNCTION. REFER TO SHEET 1 OF THE ELEMENTARY WIRING DIAGRAM.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: INFORMS	PRS-7A, PRS-8A OR LS-14 IS TRIPPED. THESE SWITCHES ARE LOCATED ON THE LOADER SPADE.
OPERATOR ACTION:	CHECK FOR PROPER SWITCH ADJUSTMENT. CHECK LDR-CR1 AND UNL-CR1 RELAYS FOR FUNCTION. REFER TO SHEET 1 OF THE ELEMENTARY WIRING DIAGRAM.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: INFORMS	PRS-47A, PRS-48A OR LS-34 IS TRIPPED. THESE SWITCHES ARE LOCATED ON THE UNLOADER SPADE.
OPERATOR ACTION:	MANUALLY MOVE THE SPADE TURN OR ELEVATOR TO RELEASE THE SWITCHES. IF ALL SWITCHES ARE CLEAR, CHECK UNL-CR2 CIRCUIT. REFER TO SHEET 1 OF THE ELEMENTARY WIRING DIAGRAM.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: INFORMS	AN OVERLOAD HAS TRIPPED ON THE LOADER ELEVATOR, TRANSFER, TURN OR STACKER MOTOR STARTER.
OPERATOR ACTION:	LOCATE THESE MOTOR STARTERS IN THE ELECTRICAL PANEL AND RESET THE TRIPPED OVERLOAD. REFER TO SHEET 2 OF THE ELEMENTARY WIRING DIAGRAM.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: INFORMS	A LOADER OR UNLOADER SAFETY GATE IS IN THE UP POSITION.
OPERATOR ACTION:	PLACE BOTH SAFETY GATES IN THE DOWN POSITION.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: THE MASTER CONTROL RELAY IS NOT ENERGIZED.
INFORMS PRESS THE MCR PUSHBUTTON LOCATED BELOW.

OPERATOR ACTION: IF THE MCR DOES NOT LATCH, HOLD THE MCR PUSHBUTTON
TO CONTINUE THE DIAGNOSTIC CHECK. REFER TO SHEET 1 OF
THE ELEMENTARY WIRING DIAGRAM.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: AN OVERLOAD HAS TRIPPED ON THE UNLOADER ELEVATOR, TRANSFER,
INFORMS TURN OR STACKER MOTOR STARTER.

OPERATOR ACTION: LOCATE THESE MOTOR STARTERS IN THE ELECTRICAL PANEL AND
RESET THE TRIPPED OVERLOAD.
REFER TO SHEET 2 OF THE ELEMENTARY WIRING DIAGRAM.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: AN OVERLOAD HAS TRIPPED ON THE UNLOADING CONVEYOR MOTOR
INFORMS STARTER.

OPERATOR ACTION: LOCATE THESE MOTOR STARTERS IN THE ELECTRICAL PANEL AND
RESET THE TRIPPED OVERLOAD(S).
REFER TO SHEET 2 OF THE ELEMENTARY WIRING DIAGRAM.

————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: AN OVERLOAD HAS TRIPPED ON THE RACKVEYOR MOTOR STARTER.
INFORMS

OPERATOR ACTION: LOCATE THIS MOTOR STARTER IN THE ELECTRICAL PANEL AND
RESET THE TRIPPED OVERLOAD.
REFER TO SHEET 2 OF THE ELEMENTARY WIRING DIAGRAM.

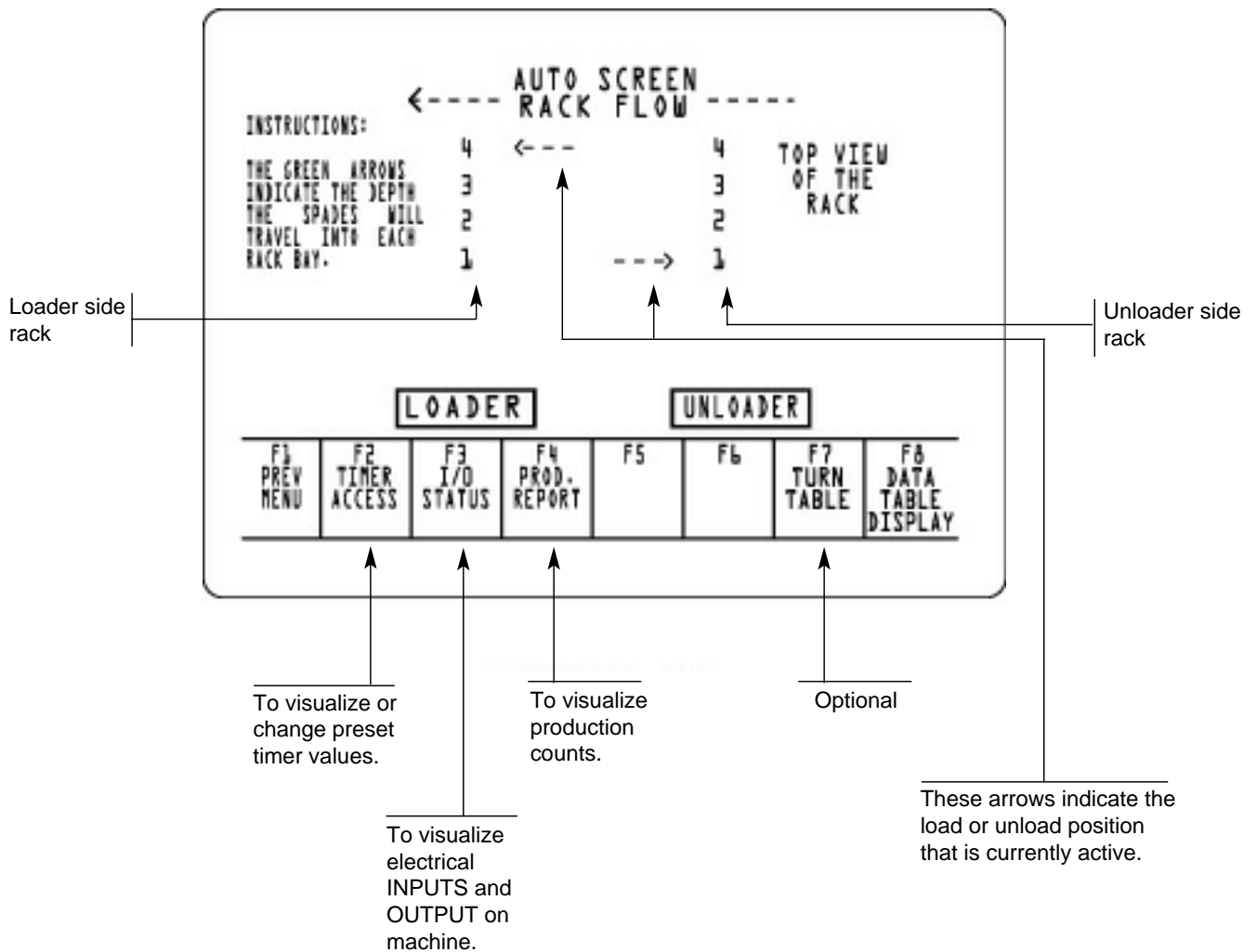
————— OPERATOR MESSAGE CENTER —————

BESSERMATIC: AN OVERLOAD HAS TRIPPED ON THE FRONT DELIVERY CONVEYOR
INFORMS MOTOR STARTER.

OPERATOR ACTION: LOCATE THIS MOTOR STARTER IN THE ELECTRICAL PANEL AND
RESET THE TRIPPED OVERLOAD.
REFER TO SHEET 2 OF THE ELEMENTARY WIRING DIAGRAM.

3.3 AUTOMATIC SCREEN

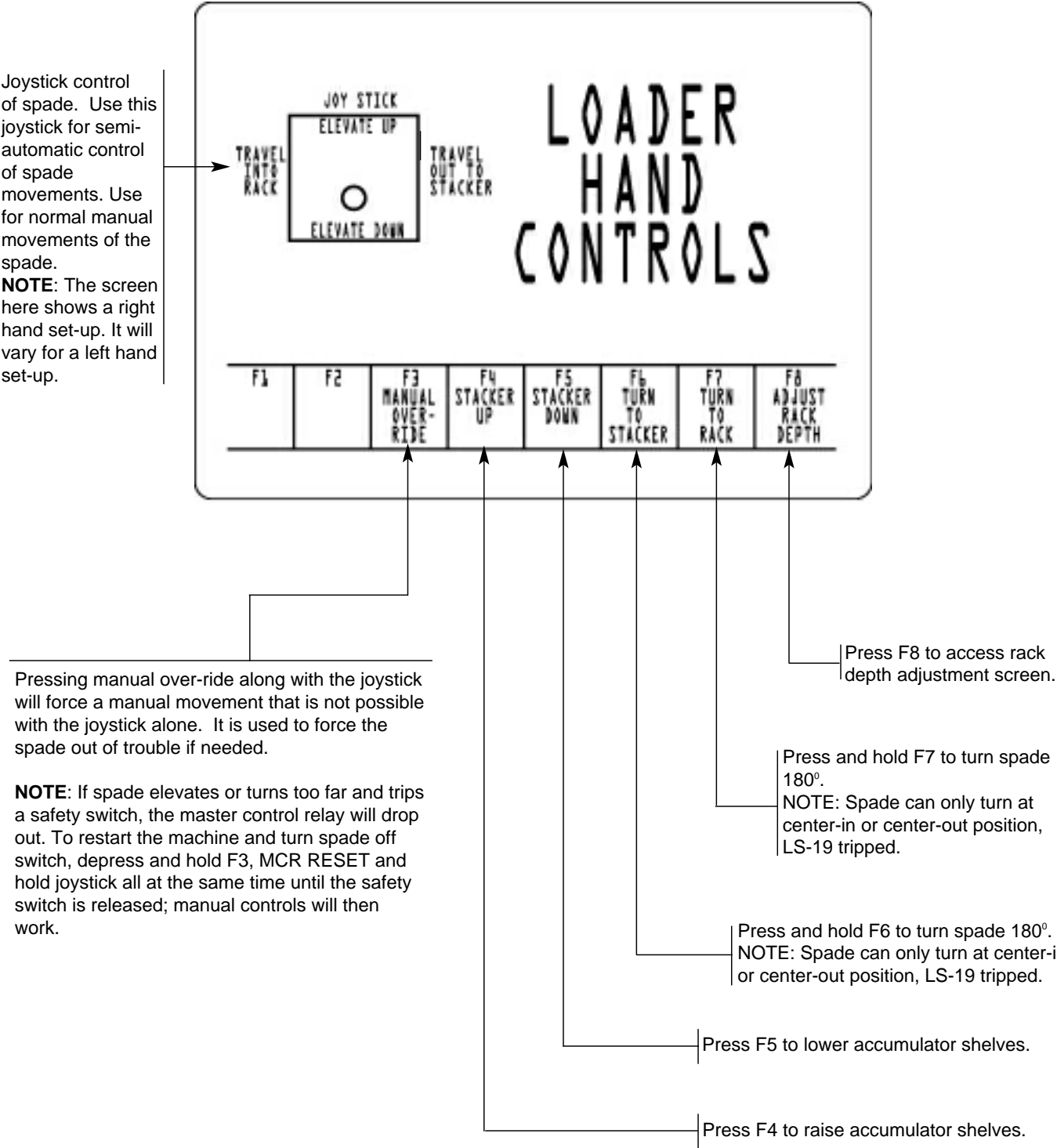
This screen is displayed during normal automatic operation, with the loader, unloader and rackveyor selector switches set to AUTO.



3.4 MANUAL CONTROL SCREENS

3.4.1 LOADER HAND CONTROL SCREEN

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

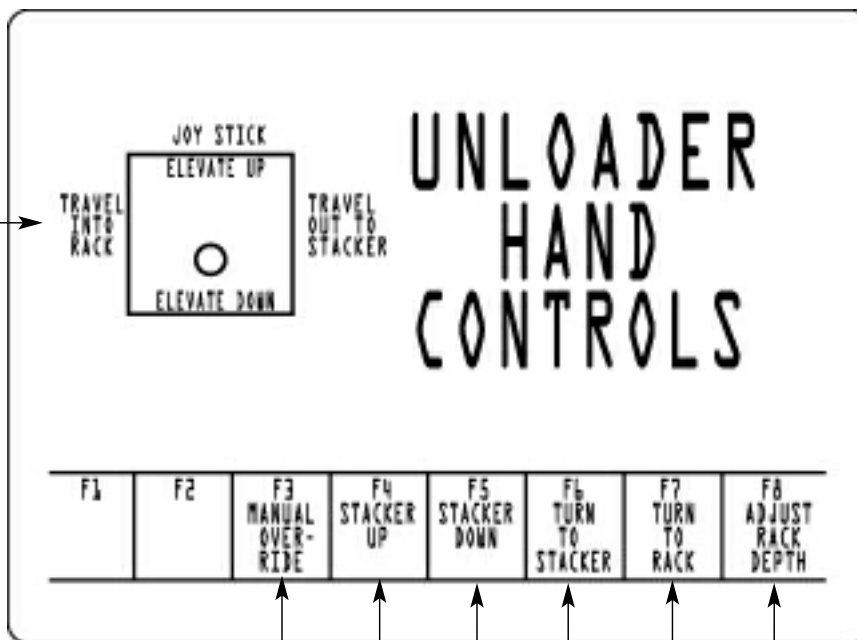


3.4.2 UNLOADER HAND CONTROL SCREEN

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

Joystick control of spade. Use this joystick for semi-automatic control of spade movements. Use for normal manual movements of the spade.

NOTE: The screen here shows a right hand set-up. It will vary for a left hand set-up.



Pressing manual over-ride along with the joystick will force a manual movement that is not possible with the joystick alone. It is used to force the spade out of trouble if needed.

NOTE: If spade elevates or turns too far and trips a safety switch, the master control relay will drop out. To restart the machine and turn spade off switch, depress and hold F3, MCR RESET and hold joystick all at the same time until the safety switch is released; manual controls will then work.

Press F8 to access rack depth adjustment screen.

Press and hold F7 to turn spade 180°.

NOTE: Spade can only turn at center-in or center-out position, LS-26 tripped.

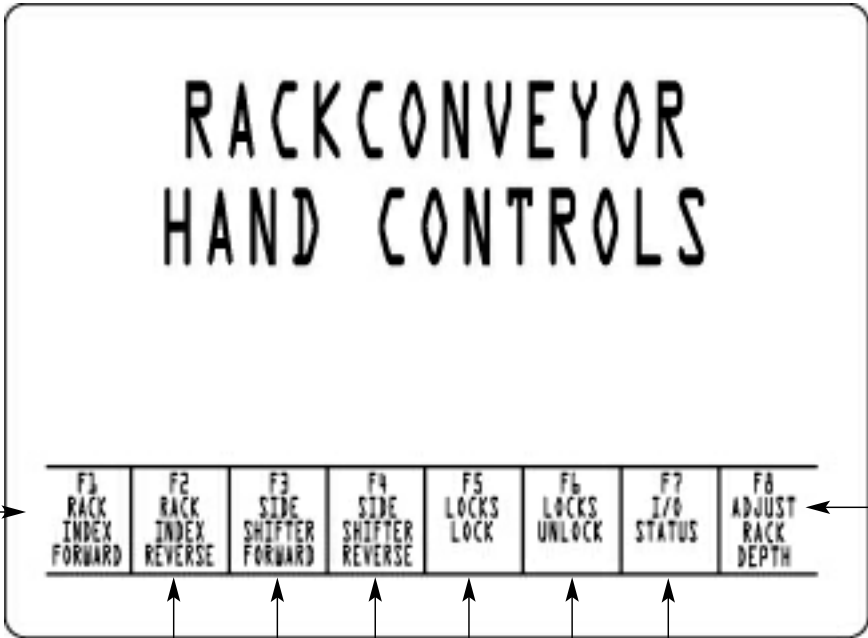
Press and hold F6 to turn spade 180°.
NOTE: Spade can only turn at center-in or center-out position, LS-26 tripped.

Press F5 to lower accumulator shelves.

Press F4 to raise accumulator shelves.

3.4.3 RACKVEYOR HAND CONTROL SCREEN

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



Press F1 to move rack indexer forward.

Press F2 to move rack indexer back (reverse).

Press F3 to move the loader rotator out away from the rackveyor.

Press F4 to move the loader rotator in towards the rackveyor.

To visualize electrical INPUTS and OUTPUT on machine.

To visualize or change preset spade depth in racks.

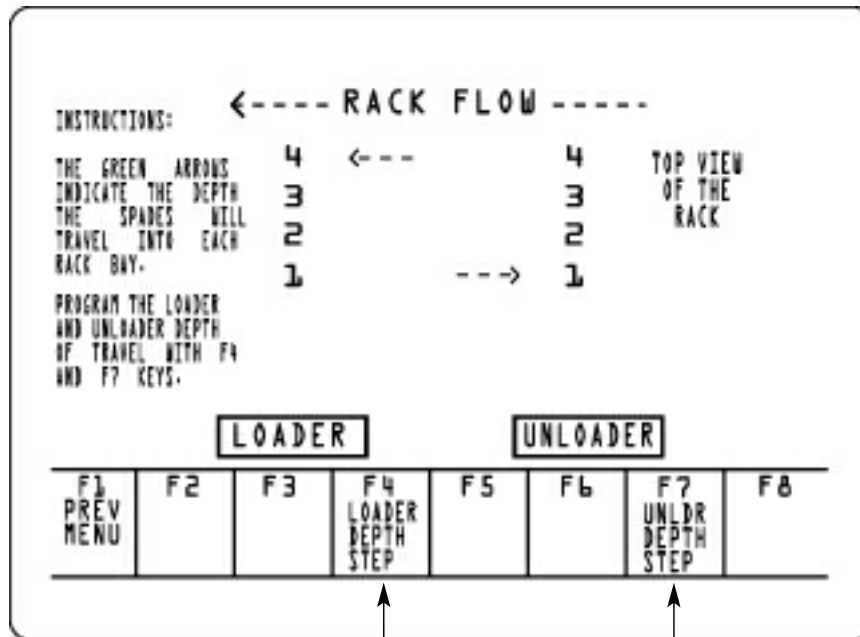
Press F6 to move the unloader rotator out away from the rackveyor,

Press F5 to move the unloader rotator in towards the rackveyor.

3.5 RACK DEPTH ADJUSTMENT F1

This function is to adjust depth of the spade going into the racks. You must adjust the depth on both the loader and unloader side. To access this screen from the **MAIN MENU**, press **F1** or from any hand control screen, press **F10**. The screen will display a top view of the loader and unloader.

NOTE: Depths can only be adjusted if loader & unloader HAND-OFF-AUTO switches are set to HAND.

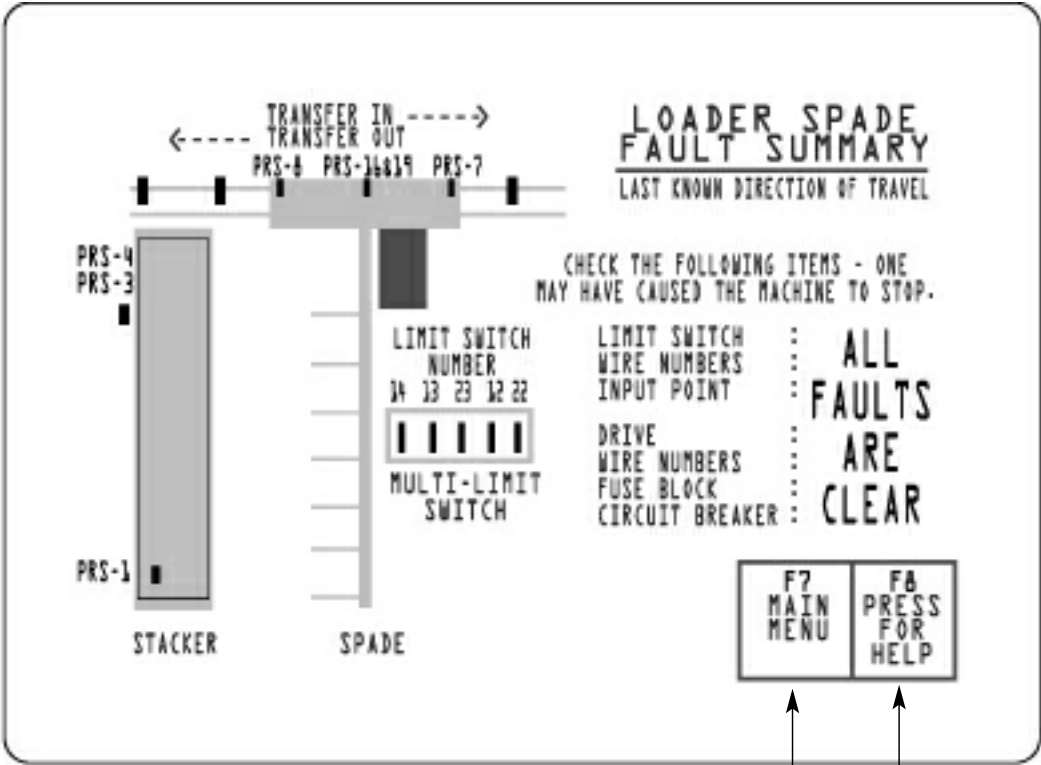


Use F4 key to select depth on loader side. The depth will change each time the F4 key is pressed. Press until proper depth is obtained. Green arrow on screen will indicate present depth setting.

Use F7 key to select depth on unloader side. The depth will change each time the F7 key is pressed. Press until proper depth is obtained. Green arrow on screen will indicate present depth setting.

3.6 LOADER SPADE FAULT SCREEN F7

This screen will be displayed each time a fault occurs on the loader spade. Refer to section 6 “Troubleshooting” for description of all fault screens. To access the screen from the main menu, press the F7 key. The screen below is the no fault screen. It is displayed when all faults have been cleared.



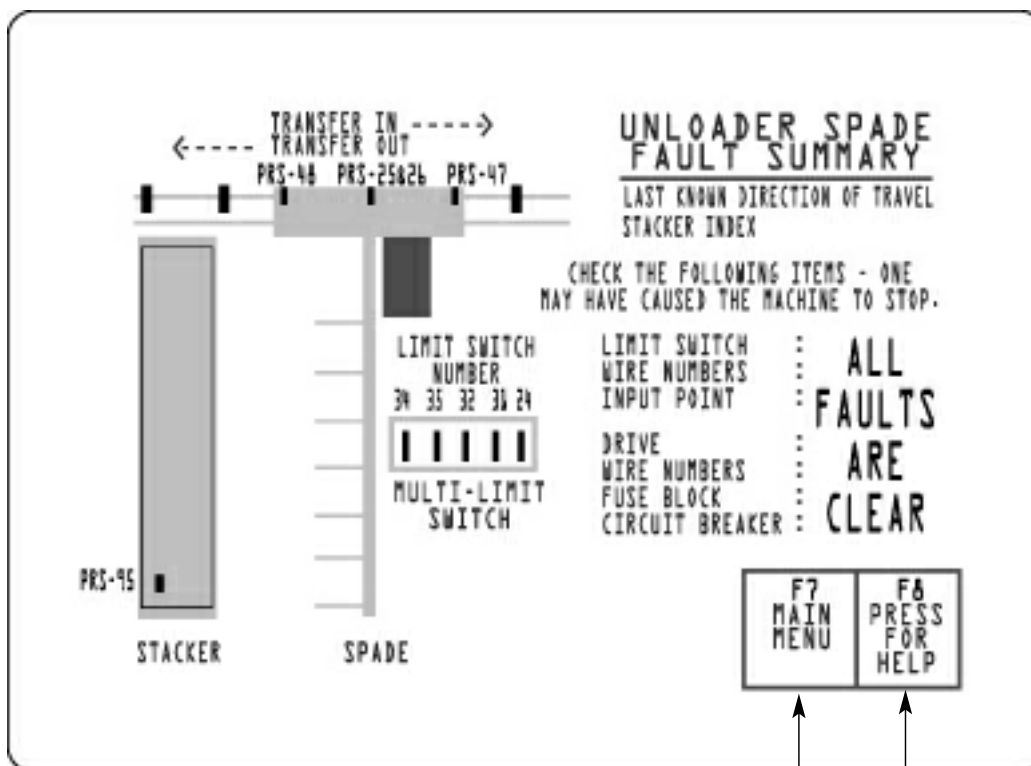
No fault screen

Press F8 for help and instructions.

Press F7 to return to the main menu.

3.7 UNLOADER SPADE FAULT SCREEN F8

This screen will be displayed each time a fault occurs on the unloader spade. Refer to section 6 "Troubleshooting" for description of all fault screens. To access the screen from the main menu, press the F8 key. The screen below is the no fault screen. It is displayed when all faults have been cleared.



No fault screen

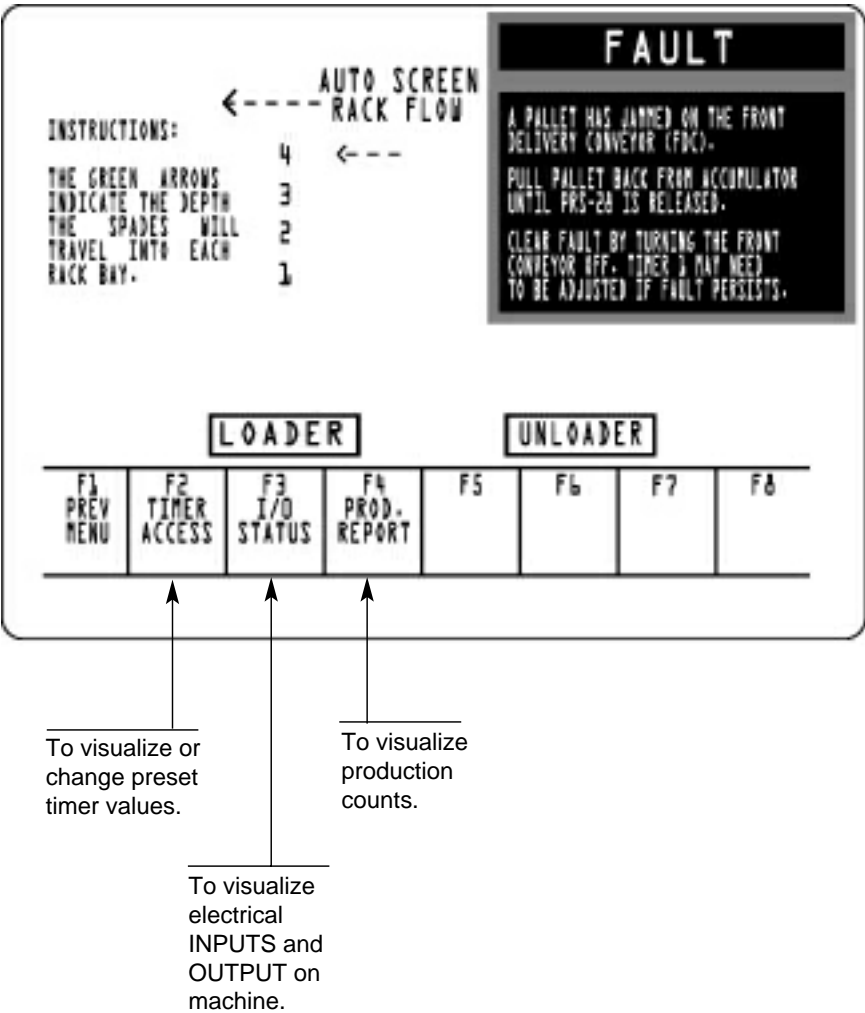
Press F8 for help and
instructions.

Press F7 to return to
the main menu.



3.8 FRONT DELIVERY CONVEYOR FAULT

This screen will be displayed if a front conveyor fault occurs. PRS-28 was tripped too long. A pallet jammed going into the loader accumulator or timer #1 preset value is too low. To reset fault, clear PRS-28 then cycle the front delivery conveyor ON/OFF switch. To adjust timer #1 preset value, refer to section 3.10.



3.9 INPUT/OUTPUT STATUS F3

These screens represent the status of all electrical components on the Besser-Matic. They can be used to isolate one component on the machine or to locate an electrical fault on one of the components.

To access this screen from the **MAIN MENU** or **AUTO MENU**, press **F3**. To access it from the **DIAGNOSTIC HELP SCREEN**, press **F2**.

INPUT/OUTPUT STATUS PAGE 1

ADDRESS	STATUS	DESCRIPTION	ADDRESS	STATUS	DESCRIPTION
I:1/00	OFF	BESSERMATIC ON	I:2/00	OFF	LOADER IN AUTO
I:1/01	OFF	LOADER/UNLOADER GATES	I:2/01	OFF	LOADER IN HAND
I:1/02	OFF	STABILIZERS ON TRACKS	I:2/02	OFF	LS-32 EL UP IN STKR.
I:1/03	OFF	LDR END OF TRAVEL SWS	I:2/03	OFF	LS-22 EL AT CENT OUT
I:1/04	OFF	UNL END OF TRAVEL SWS	I:2/04	OFF	LS-33 EL AT CENT IN
I:1/05	OFF	FDC MOTOR OVERLOAD(S)	I:2/05	OFF	LS-23 EL DWN IN RACK
I:1/06	OFF	LDR MOTOR OVERLOADS	I:2/06	OFF	PRS-7 TURNED TO RACK
I:1/07	OFF	UNL MOTOR OVERLOADS	I:2/07	OFF	PRS-8 TURNED TO STKR
I:1/08	OFF	UNL CONV. OVERLOADS	I:2/08	OFF	PRS-1 LDR STKR. SHELF
I:1/09	OFF	RACKVEYR OVERLOAD	I:2/09	OFF	PRS-29 PALLET AT STKR
I:1/10	OFF	E*STOP SWITCH	I:2/10	OFF	PRS-36 COUNT/POSITION
I:1/11	OFF	ELEVATOR UP MANUAL	I:2/11	OFF	LS-39 CENTER IN
I:1/12	OFF	ELEVATOR DOWN MANUAL	I:2/12	OFF	LS-39 CENTER OUT
I:1/13	OFF	TRANSFER IN MANUAL	I:2/13	OFF	PRS-3 STACKER FULL
I:1/14	OFF	TRANSFER OUT MANUAL	I:2/14	OFF	OPTIONAL PRD. COUNTER
I:1/15	OFF	FRONT DELIVERY CONV.	I:2/15	OFF	LS-55 STACKER FULL

F1 PREV MENU F2 F3 F4 F5 F6 F7 PREV PAGE F8 NEXT PAGE

Press F1 to get out of the I/O status menu. →

← Press F8 to view page 2.

Press F7 to view page 9.

INPUT/OUTPUT STATUS PAGE 2

ADDRESS	STATUS	DESCRIPTION	ADDRESS	STATUS	DESCRIPTION
I:3/00	OFF	UNLOADER IN AUTO	O:4/00	OFF	FRONT DEL CONVEYOR #1
I:3/01	OFF	UNLOADER IN HAND	O:4/01	OFF	LOADER STACKER UP
I:3/02	OFF	LS-32 EL AT CENT OUT	O:4/02	OFF	LOADER STACKER DOWN
I:3/03	OFF	LS-35 EL UP IN RACK	O:4/03	OFF	LOADER TRANSFER
I:3/04	OFF	LS-24 EL DWN IN STKR	O:4/04	OFF	LOADER TURN
I:3/05	OFF	LS-33 EL AT CENT IN	O:4/05	OFF	LOADER ELEV. UP
I:3/06	OFF	PRS-47 TURNED TO RACK	O:4/06	OFF	LOADER ELEV. DOWN
I:3/07	OFF	PRS-48 TURNED TO STKR	O:4/07	OFF	OPTIONAL IFDC #2)
I:3/08	OFF	PRS-45 UNL STKR SHELF			
I:3/09	OFF	PRS-42 PALLET ON UC-5			
I:3/10	OFF	PRS-25 COUNT/POSITION			
I:3/11	OFF	LS-26 CENTER IN			
I:3/12	OFF	LS-26 CENTER OUT			
I:3/13	OFF	PRS-43 PALLETS IN STKR			
I:3/14	OFF	PRS-43 PAL ON CONV			
I:3/15	OFF	OPTIONAL (PRS-36)			

F1 PREV MENU F2 F3 F4 F5 F6 F7 PREV PAGE F8 NEXT PAGE

Press F1 to get out of the I/O status menu. →

← Press F8 to view page 3.

Press F7 to view page 1.

INPUT/OUTPUT STATUS

PAGE 3

ADDRESS	STATUS	DESCRIPTION	ADDRESS	STATUS	DESCRIPTION
I15/00	OFF	PALLET RETURN CONVEYOR	I16/00	OFF	LDR FREE DRIVE START
I15/01	OFF	UNLOADER STACKER UP	I16/01	OFF	LDR FREE DRIVE REV.
I15/02	OFF	UNLOADER STACKER DOWN	I16/02	OFF	SPEED SELECT #1
I15/03	OFF	UNLOADER TRANSFER	I16/03	OFF	SPEED SELECT #2
I15/04	OFF	UNLOADER TURN	I16/04	OFF	DRIVE ENABLE
I15/05	OFF	UNLOADER ELEV. UP	I16/05	OFF	STOP
I15/06	OFF	UNLOADER ELEV. DOWN	I16/06	OFF	OPTIONAL
I15/07	OFF	OPTIONAL	I16/07	OFF	OPTIONAL
			I16/08	OFF	UNL FREE DRIVE START
			I16/09	OFF	UNL FREE DRIVE REV.
			I16/10	OFF	SPEED SELECT #1
			I16/11	OFF	SPEED SELECT #2
			I16/12	OFF	AUXILIARY INTERLOCK
			I16/13	OFF	STOP
			I16/14	OFF	OPTIONAL
			I16/15	OFF	OPTIONAL

F1
PREV
MENU

F2

F3

F4

F5

F6

F7
PREV
PAGE

F8
NEXT
PAGE

Press F1 to get out of the I/O status menu.

Press F8 to view page 4.

Press F7 to view page 2.

INPUT/OUTPUT STATUS

PAGE 4

ADDRESS	STATUS	DESCRIPTION	ADDRESS	STATUS	DESCRIPTION
I18/00	OFF	DEPALLETTER RN	I18/00	OFF	RACKCONV. IN AUTO
I18/01	OFF	TURNMGR INTERLOCK	I18/01	OFF	RACKCONV. IN HAND
I18/02	OFF	PRS-10 DEPALETTER HOME	I18/02	OFF	NOT USED
I18/03	OFF	PRS-12 DEPALETTER FOR	I18/03	OFF	NOT USED
I18/04	OFF	LS-57 PUSHER UP	I18/04	OFF	PRS-100 RACK ON UNL
I18/05	OFF	LS-57 PUSHER DOWN	I18/05	OFF	NOT USED
I18/06	OFF	PRS-14 RST DEPAL CONV.	I18/06	OFF	NOT USED
I18/07	OFF	PRS-16 PAL HIGH LIM	I18/07	OFF	PRS-103 CRAWL ON UNL
I18/08	OFF	PRS-9 PAL IN DEPAL	I18/08	OFF	NOT USED
I18/09	OFF	PRS-37 TURNTABLE HOME	I18/09	OFF	NOT USED
I18/10	OFF	PRS-30 PAL FRT DEPAL	I18/10	OFF	PRS-107 RACK ON LDR
I18/11	OFF	PRS-202 BLK RN PAL DEP	I18/11	OFF	LS-5 AND LS-5A
I18/12	OFF	LS-63 TRANS CONV HOME	I18/12	OFF	LS-5 AND LS-5A
I18/13	OFF	PRS-69 PAL IN PAL RET	I18/13	OFF	NOT USED
I18/14	OFF	PRS-630 PAL/PR/PAL RET	I18/14	OFF	PRS-109 CRAWL ON LDR
I18/15	OFF	PER-68 PAL ROLL CLR	I18/15	OFF	PRS-109A CRAWL ON LDR

F1
PREV
MENU

F2

F3

F4

F5

F6

F7
PREV
PAGE

F8
NEXT
PAGE

Press F1 to get out of the I/O status menu.

Press F8 to view page 5.

Press F7 to view page 3.

INPUT/OUTPUT STATUS PAGE 5

ADDRESS	STATUS	DESCRIPTION	ADDRESS	STATUS	DESCRIPTION
0:12/00	OFF	DEPALLETTER DRIVE	0:12/00	OFF	RACK INDEX FWD
0:12/01	OFF	PUSHER UP	0:12/01	OFF	RACK INDEX REV
0:12/02	OFF	PUSHER DOWN	0:12/02	OFF	SIDE SHIFTER FWD
0:12/03	OFF	TURNTABLE	0:12/03	OFF	SIDE SHIFTER REVERSE
0:12/04	OFF	PAL TRANS FORWARD	0:12/04	OFF	RAILLOCKS - UNLOCK
0:12/05	OFF	UNLOADING CONVEYOR #1	0:12/05	OFF	RAILLOCKS - LOCK
0:12/06	OFF	UNLOADING CONVEYOR #2	0:12/06	OFF	EMITTER # 100
0:12/07	OFF	UNLOADING CONVEYOR #3	0:12/07	OFF	EMITTER # 101 AND #102

Press F1 to get out of the I/O status menu.

F1 PREV MENU **F2** **F3** **F4** **F5** **F6** **F7 PREV PAGE** **F8 NEXT PAGE**

Press F8 to view page 6.

Press F7 to view page 4.

INPUT/OUTPUT STATUS PAGE 6

ADDRESS	STATUS	DESCRIPTION	ADDRESS	STATUS	DESCRIPTION
1:13/00	OFF	PRS-123 UNLOCKED	1:13/00	OFF	REMOVAL READY
1:13/01	OFF	PRS-124 RACK IN SS	1:13/01	OFF	PLACEMENT READY
1:13/02	OFF	PRS-125 CRML CLEAR	1:13/02	OFF	NOT USED
1:13/03	OFF	PRS-126 SS HOME	1:13/03	OFF	NOT USED
1:13/04	OFF	PRS-127 SS AT RCVR	1:13/04	OFF	NOT USED
1:13/05	OFF	PRS-128 RAC CL OF SS	1:13/05	OFF	NOT USED

Press F1 to get out of the I/O status menu.

F1 PREV MENU **F2** **F3** **F4** **F5** **F6** **F7 PREV PAGE** **F8 NEXT PAGE**

Press F8 to view page 7.

Press F7 to view page 5.



INPUT/OUTPUT STATUS						PAGE 7	
ADDRESS	STATUS	DESCRIPTION	ADDRESS	STATUS	DESCRIPTION		
I:7/00	OFF	NOT USED	I:7/00	OFF	NOT USED		
I:7/01	OFF	NOT USED	I:7/01	OFF	NOT USED		
I:7/02	OFF	NOT USED	I:7/02	OFF	NOT USED		
I:7/03	OFF	NOT USED	I:7/03	OFF	NOT USED		
I:7/04	OFF	NOT USED	I:7/04	OFF	NOT USED		
I:7/05	OFF	NOT USED	I:7/05	OFF	NOT USED		
F1 PREV MENU	F2	F3	F4	F5	F6	F7 PREV PAGE	F8 NEXT PAGE

Press F1 to get out of
the I/O status menu.

Press F8 to view
page 8.

Press F7 to view
page 6.

3.10 TIMER ADJUSTMENT F2

These four screens allow the operator to visualize and change preset timer values. There are 40 timers which are accessible through these screens. Additional timers are accessible through the DATA TABLE DISPLAY (F6 then F4). See page 3-23 for all timer addresses and descriptions. Each timer has a specific function related to the machine's overall performance. To access this screen from the **MAIN MENU**, press **F2**.







TIMER ACCESS PAGE 1

TIMER	PRESET	CURRENT	DESCRIPTION
1	SEL → 05:00	00:00	PALLET JAM TIMER
2	02:50	00:00	START RAMP DOWN AT LOADER STACKER ENTRANCE
3	00:50	00:00	START RAMP DOWN BEFORE INSIDE LOADER STACKER
4	00:50	00:00	DELAY LOADER FREQ DRIVE START AFTER A TRANSFER
5	03:50	00:00	LOADER TURN RAMP DOWN - TURN TO STACKER
6	03:50	00:00	LOADER TURN RAMP DOWN - TURN TO RACK
7	00:50	00:00	DELAY LOADER FREQ DRIVE START AFTER A TURN
8	03:50	00:00	LOADER TRANSFER RAMP DOWN BEFORE CENTER IN
9	00:15	00:15	DELAY LOADER CONTACTOR DROP-OUT
10	00:15	00:15	DELAY LOADER TURN CONTACTOR DROP-OUT
11	00:50	00:00	DELAY LOADER ELEVATE DOWN IN RACK
12	04:00	00:00	START RAMP DOWN BEFORE INSIDE UNL STACKER
13	00:00	00:00	DELAY UNL FREQ DRIVE START AFTER A TRANSFER
14	00:00	00:00	UNL TURN RAMP DOWN - TURN TO RACK
15	00:00	00:00	UNL TURN RAMP DOWN - TURN TO STACKER
16	00:00	00:00	DELAY UNL FREQ DRIVE START AFTER A TURN

Navigation buttons at the bottom: F3 PREV MENU, F4 CHANGE PRESET, F5, F6, F7 PREV PAGE, F8 NEXT PAGE.

Annotations:
 Press **F1** to go to previous screen menu. (points to F3)
 Press **F4** to change preset value. (points to F4)
 Press **F8** to go to timer page 2. (points to F8)

3.10.1 TO MODIFY A TIMER VALUE

1. Use F10 key to select page where desired timer is located.
2. Once in proper page, use arrows   to select timer to be adjusted.
3. Press F6 key; the preset value changes to 0.00.
4. Use the  to  and the  keys to enter new preset value.
5. Press  to load the new preset value.
6. Repeat steps 1 to 5 if an error occurs.

Press **F1** to go
to previous
screen menu.

TIMER ACCESS				PAGE 2			
TIMER	PRESET	CURRENT	DESCRIPTION				
17	SEL --> 00:00	00:00	UML TRANSFER RAMP DOWN BEFORE CENTER IN				
18	00:00	00:00	DELAY UML TRANSFER CONTACTOR DROP OUT				
19	00:00	00:00	DELAY UML TURN CONTACTOR DROP OUT				
20	00:00	00:00	RESET MANUAL OVER-RIDE **DO NOT ADJUST**				
21	00:00	00:00	TIME TO TRANSFER IN TO CENTER IN				
22	00:00	00:00	TIME TO TURN TO RACK				
23	00:00	00:00	TIME TO ELEVATE AT CENTER IN				
24	00:00	00:00	TIME TO TRANSFER IN FROM CENTER IN				
25	00:00	00:00	TIME TO ELEVATE UP IN RACK				
26	00:00	00:00	TIME TO TRANSFER OUT OF RACK				
27	00:00	00:00	TIME TO RUN TO STACKER AT CENTER OUT				
28	00:00	00:00	TIME TO ELEVATE AT CENTER OUT				
29	00:00	00:00	TIME TO TRANSFER OUT TO STACKER ENTRANCE				
30	00:00	00:00	TIME TO TRANSFER OUT INTO STACKER				
31	00:00	00:00	TIME TO ELEVATE UP IN STACKER				
32	00:00	00:00	TIME TO INDEX THE LOADER STACKER				
F1 PREV MENU			F4 CHANGE PRESET	F5	F6	F7 PREV PAGE	F8 NEXT PAGE

Press **F4** to change
preset value.

Press **F8** to go to timer
page 3.

Press **F1** to go
to previous
screen menu.

TIMER ACCESS				PAGE 3			
TIMER	PRESET	CURRENT	DESCRIPTION				
33	00:00	00:00	TIME TO TRANSFER IN TO CENTER IN				
34	00:00	00:00	TIME TO TURN TO RACK				
35	00:00	00:00	TIME TO ELEVATE AT CENTER IN				
36	00:00	00:00	TIME TO TRANSFER INTO RACK FROM CENTER IN				
37	00:00	00:00	TIME TO ELEVATE UP IN RACK				
38	00:00	00:00	TIME TO TRANSFER OUT OF RACK TO CENTER OUT				
39	00:00	00:00	TIME TO TURN TO STACKER AT CENTER OUT				
40	00:00	00:00	TIME TO ELEVATE AT CENTER OUT				
41	00:00	00:00	TIME TO TRANSFER OUT TO STACKER				
42	00:00	00:00	TIME TO ELEVATE DOWN IN STACKER				
43	00:00	00:00	TIME TO INDEX THE UNLOADER STACKER				
44	00:00	00:00	DELAY FORWARD STOP				
45	00:00	00:00	DELAY PALLET HIGH LIMIT LOCKOUT				
46	00:00	00:00	DELAY RESTART OF DEP. AFTER HIGH LIMIT				
47	00:00	00:00	PALLET JAM IN PALLET ROLLERS				
48	00:00	00:00	TIME ROLLER PAST ITS HOME SWITCH				
F1 PREV MENU			F4 CHANGE PRESET	F6	F7 PREV PAGE	F8 NEXT PAGE	

Press **F6** to change
preset value.

Press **F8** to go to timer
page 4.

TIMER	FUNCTION	PRESET VALUE
1.	Pallet jam on the loader side. Switch is located on pallet delivery conveyor in front of loader stacker. If pallet trips PRS-28 longer than set time (delay), a fault will come up and front conveyor will stop.	5 sec.
2.	Controls the beginning of the slowdown of spade from center to outside of stacker entrance stop point.	2.5 sec.
3.	Controls the beginning of slowdown of spade from outside of stacker entrance point to inside stacker stop point.	.5 sec.
4.	Delay start of a turn after transfer stops. Do not adjust this timer.	.5 sec.
5.	Begins slowdown of the turn when turning towards stacker.	3.5 sec.
6.	Begins slowdown of the turn when turning towards rack.	3.5 sec.
7.	Delay start of a transfer after a turn is complete.	0.51 sec.
8.	Begins slowdown of spade before reaching center in when traveling from loader stacker.	3.5 sec.
9.	Do not adjust.	.15 sec.
10.	Do not adjust.	.15 sec.
11.	Delays the start of the lowering of pallets inside the rack.	.5 sec.
12.	Controls the beginning of slowdown of unloader spade from center out to inside of unloader stacker.	4 sec.
13.	Delay start of a turn after transfer stops on unloader side . Do not adjust this timer.	.5 sec.
14.	Begins slowdown of the turn when turning towards rack on unloader side.	3.5 sec.
15.	Begins slowdown of the turn when turning towards stacker on unloader side.	3.5 sec.
16.	Delay start of a transfer after a turn is complete, on unloader side.	.5 sec.
17.	Begins slowdown of spade before reaching center in when traveling from unloader stacker.	4 sec.
18.	Do not adjust.	.15 sec.
19.	Do not adjust.	.15 sec.
20.	Do not adjust.	.5 sec.
21.	Do not adjust.	14 sec.
22.	Do not adjust.	14 sec.
23.	Do not adjust.	6 sec.
24.	Do not adjust.	30 sec.
25 thru 43	Diagnostic timers - Do not adjust..	

TIMER	FUNCTION	PRESET VALUE
44	Stops the depalleter in forward position if pusher does not raise in time.	.10 sec.
45.	Amount of time we allow PRS-18 in block machine pallet magazine to be tripped before the depalleter is shut off.	1 sec.
46.	Amount of time PRS-18 is not tripped before depalleter restarts.	5 sec.
47.	Amount of time we allow PRS-68 to be blocked by pallet before the Pallet Return Conveyor (PRC) shuts down.	3 sec.
48.	Not in use.	0 sec.
49.	This timer has to time out before any other function can occur after initial power up.	.75 sec.
50.	Rack conveyor with rack shuttle. - Delay rack index forward.	0.20 sec.
51.	Rack conveyor with rack shuttle. - Delay crawler is clear signal at removal.	3 sec.
52.	Rack conveyor with rack shuttle. - Delay crawler is clear signal at placement.	3 sec.
53.	Rack conveyor with rack shuttle. - Time PER-109 is allowed to be blocked by the crawler at removal before a fault occurs.	50 sec.
54.	Rack conveyor with rack shuttle. - Time PER-109 is allowed to be blocked by the loader shuttle before a fault occurs.	5 sec.
55.	Rack conveyor with rack shuttle.- Time PER-103 is allowed to be blocked by the crawler at placement before a fault occurs.	50 sec.
56.	Rack conveyor with rack shuttle. - Time PER-103 is allowed to be blocked by the unloader shuttle before a fault occurs.	5 sec.
57.	On standard rack conveyor. Timer to allow gap (between rack) to be ignored by LS-5 - LS-5A.	.3 sec.
58.	Not in use.	0 sec.
59.	Not in use.	0 sec.
60.	Not in use.	0 sec.
61.	Not in use.	.20 sec.
62.	Not in use.	0 sec.

3.11 PRODUCT REPORT F4

This menu informs the operator on the production count. The operator may also reset the production count in this menu. To access this screen from the **MAIN MENU**, press **F4**.

The diagram shows a rectangular screen with a title bar at the top. Below the title bar, there are four lines of text showing counts. At the bottom of the screen is a row of eight function keys. Arrows point from the keys to explanatory text blocks.

PRODUCTION REPORT

DAILY PALLET COUNT -- 00,000,000
DAILY RACK COUNT -- 00,000,000
TOTAL PALLET COUNT -- 00,000,000
TOTAL RACK COUNT -- 00,000,000

DAILY PALLET AND RACK COUNTERS ARE RESETTABLE WITH THE USE OF THE F4 AND F7

F1 PREV MENU	F2	F3	F4 RESET PALLET COUNT	F5	F6	F7 RESET RACK COUNT	F8
--------------------	----	----	--------------------------------	----	----	------------------------------	----

Press F1 to get out of the Product report menu.

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

Press the F4 key to reset the daily pallet count.

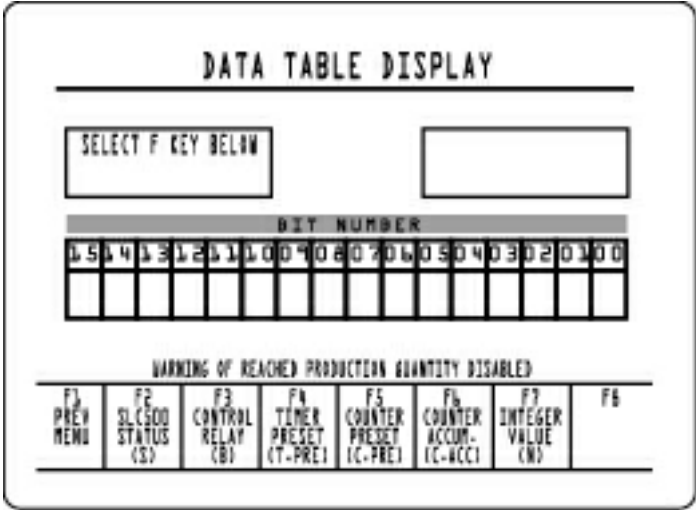
Press the F7 key to reset the daily rack count.



3.12 DATA TABLE ACCESS F6

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

To access the Data table from the **MAIN MENU**, press the **F6** key.



From this screen, the operator has access to 6 different menus. See next pages for description of these menus.

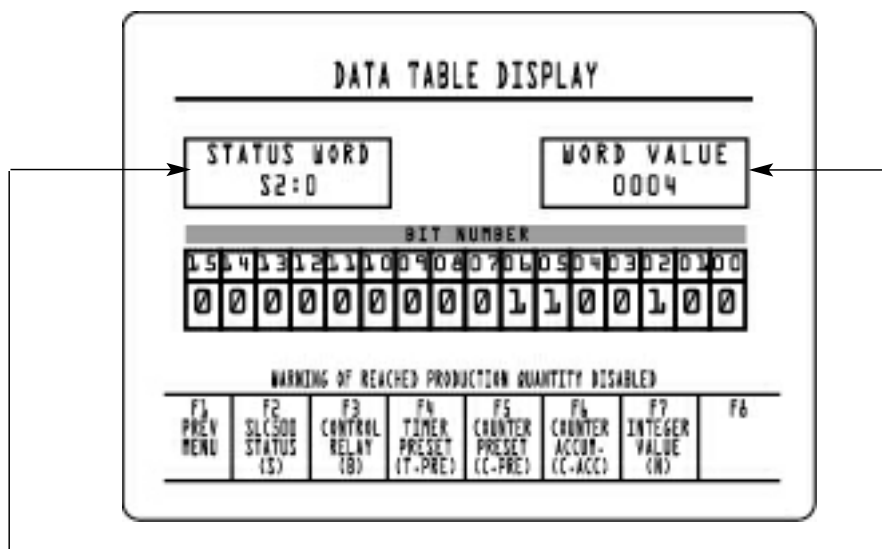
To change or monitor any of the parameters, press any of the keys between **F2** and **F7**.

3.12.1 TO MONITOR A SLC500 STATUS (F2):

From the DATA TABLE DISPLAY SCREEN,

1. Press the **F2** key.

The display will read:



2. Enter a status *word* here then press ENTER. A *word* is an address to a memory location for a timer, a counter, an integer value or a control relay. Refer to appendix A for address location.

The screen here shows the word preset value that is stored in the programmable logic controller.

To change a preset value:

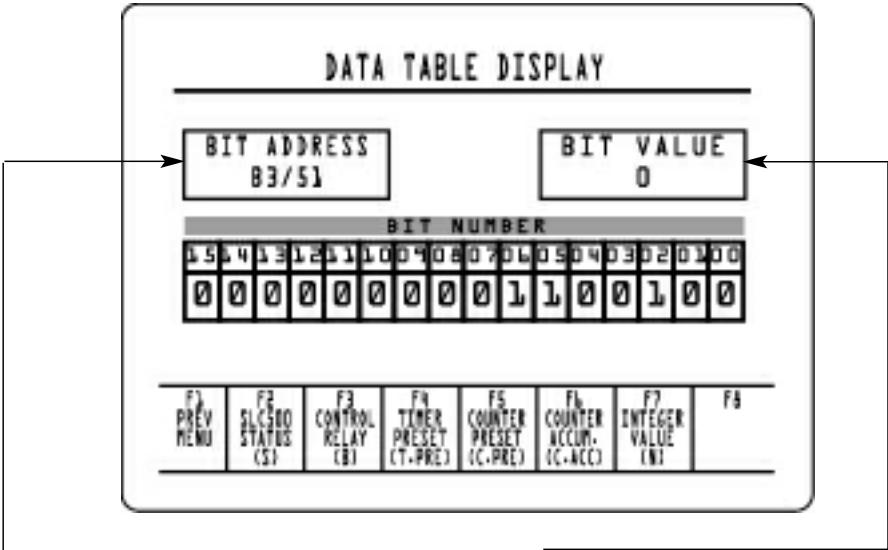
3. Press the A and then the B key.
4. Enter new value.
5. Press ENTER.

3.12.2 TO MONITOR A CONTROL RELAY (F3):

From the DATA TABLE DISPLAY SCREEN,

- 1. Press the **F3** key.

The display will read:



- 2. Enter a *control relay* bit address here then press ENTER. Refer to the logic diagram in appendix A for proper address location.

The screen here shows the bit value for this logic address.

0 = OFF
1 = ON

To change a preset value:

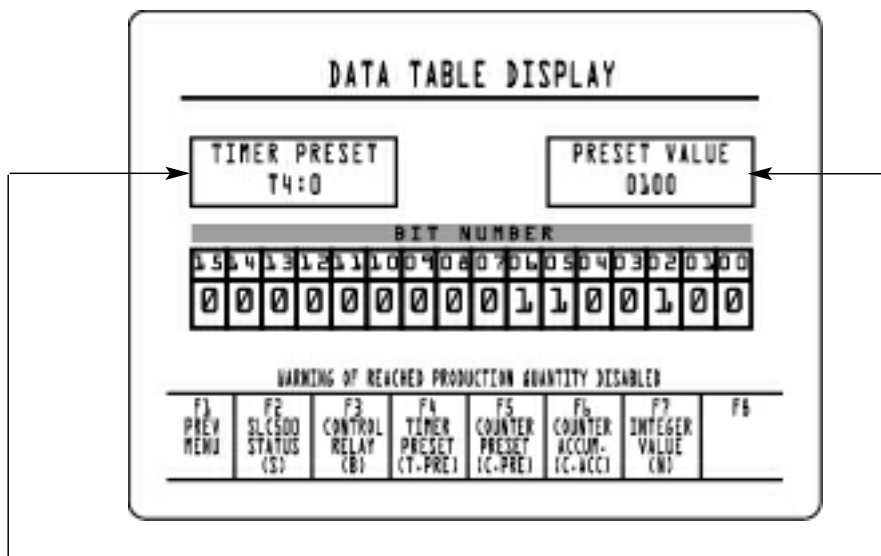
- 3. Press the A and then the B key.
- 4. Enter new value.
- 5. Press ENTER.

3.12.3 TO MONITOR OR CHANGE A TIMER PRESET (F4):

From the DATA TABLE DISPLAY SCREEN,

1. Press the **F4** key.

The display will read:



2. Enter a *Timer* address here then press ENTER.
(Example here is 0) Refer to appendix A for proper address location and description.

The screen here shows the preset value for this timer. NOTE: A time base should be taken into account when establishing true time value.

To change a preset value:

3. Press the A and then the B key.
4. Enter new value.
5. Press ENTER.

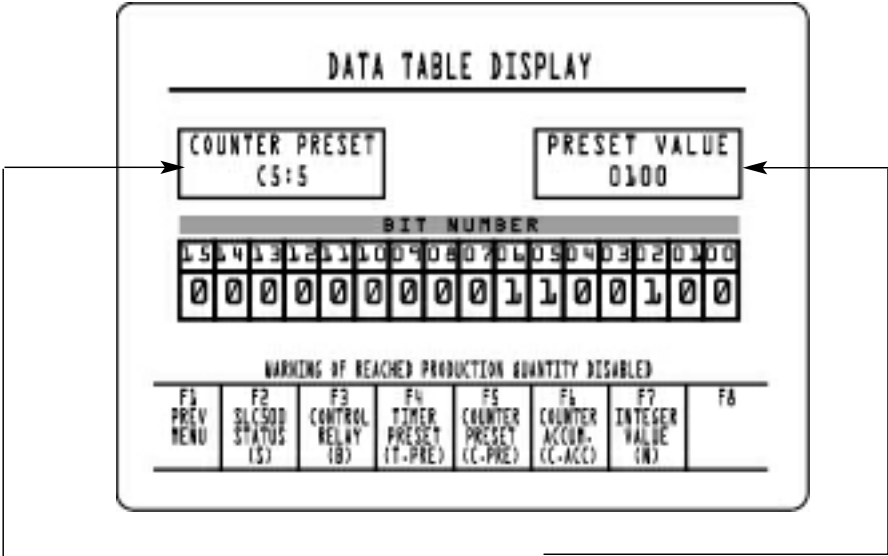


3.12.4 TO MONITOR OR CHANGE A COUNTER PRESET (F5):

From the DATA TABLE DISPLAY SCREEN,

- 1. Press the **F5** key.

The display will read:



- 2. Enter a *Counter* address here then press ENTER.
(example here is 5) Refer to appendix A for proper
address location and description.

The screen here shows the preset value for this
counter.

To change a preset value:

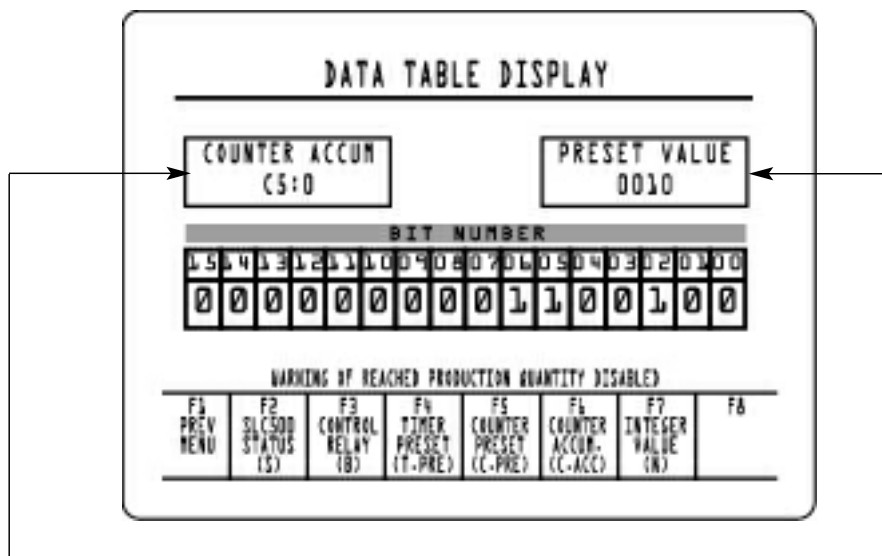
- 3. Press the A and then the B key.
- 4. Enter new value.
- 5. Press ENTER.

3.12.5 TO CHANGE THE ACCUMULATED VALUE OF A COUNTER (F6):

From the DATA TABLE DISPLAY SCREEN,

1. Press the **F6** key.

The display will read:



To change the accumulated value of a counter:

2. Press the A and then the B key.
3. Enter new value.
4. Press ENTER.

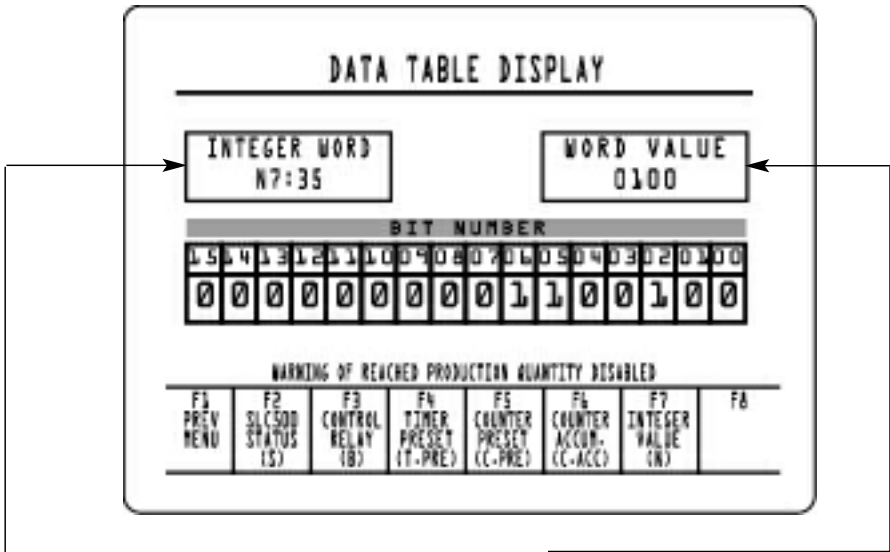
The screen here shows the preset value for this counter.

3.12.6 TO MONITOR OR CHANGE AN INTEGER WORD VALUE (F7):

From the DATA TABLE DISPLAY SCREEN,

- 1. Press the **F7** key.

The display will read:



- 2. Enter an *Integer word* address here then press ENTER.(example here is 7)
- 3. Enter a *word* value then press ENTER (example here is 35)

The screen here shows the *word* value for this *Integer*.

Refer to the logic diagram in appendix A for proper address location and description.

To change a preset value:

- 4. Press the A and then the B key.
- 5. Enter new value.
- 6. Press ENTER.

3.13 ELECTRICAL PART NUMBERS F5

This screen offers the operator and the service crew a partial list of electrical spare parts available for the BESSER-MATIC at BESSER. Use the phone and/or fax number on the screen to order parts.

ELECTRICAL PART NUMBERS							
PART #	DESCRIPTION						
114763	COLOR GRAPHICS DISPLAY						
114779	FLASHRAM FOR DISPLAY						
113773F0001	SLC 5/EN PROCESSOR						
113772F00P2	POWER SUPPLY						
113772F1A16	16 POINT INPUT MODULE (120VAC)						
113772F0W16	16 POINT OUTPUT MODULE (RELAY)						
113772F00A8	8 POINT OUTPUT MODULE (120VAC)						
113773F1012	6 POINT IN AND OUT MODULE (120VAC)						
113773F0M11	EEPROM MODULE 16K						
113772F008A	LITHIUM BATTERY						
113772F0A13	13 SLOT I/O CHASSIS						
111647	3 AMP FUSE - POWER SUPPLY						

ORDER SPARE PARTS
BY CALLING --

CENTRAL ORDER DEPT.
BESSER COMPANY
PHONE: (517) 354-4500
FAX: (517) 354-1432

THANK YOU

F1 PREV MENU	F2	F3	F4	F5	F6	F7	F8
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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.

4.1.1 Pull out the EMERGENCY STOP button.

4.1.2 Press the MCR button.

4.1.3 Adjust rack depth if necessary. To do so, follow instructions given in section 3.5 of this manual.

4.1.4 Set the Unloader, Loader and Rackveyor switches to AUTO. Refer to section 3.0 for switch locations.

4.1.5 Set the Front Delivery conveyor, Depalletter & pallet return conveyor switches to AUTO.

4.1.6 Press the PUMP button to start pump.

4.1.7 Set the Side Shifter switch to AUTO. This switch is located at the Side Shifter Control Station (shown in figure 4.1).

4.1.8 Press the Side Shifter AUTO START button.

4.1.9 Make sure the EMERGENCY STOP button is pulled.

4.1.10 Monitor the automatic screen that is displayed during normal automatic operation. It will indicate rack flow (refer to section 3.3 of this manual).

4.2 OPERATING IN MANUAL MODE.

4.2.1 Operating the loader in semi-auto mode (also refer to section 3.4.1)

4.2.1.1 Set Loader switch to HAND.

4.2.1.2 Use the joystick on Graphic Control Station to operate the spade. Note that the spade will still automatically turn at center-in/center-out.

4.2.1.3 Press F5 to lower Accumulator shelves.

4.2.1.4 Press F4 to raise Accumulator shelves.

4.2.2 Operating the unloader in semi-auto mode (also refer to section 3.4.2)

4.2.2.1 Set Unloader switch to HAND.

4.2.2.2 Use the joystick on Graphic Control Station to operate the spade. Note that the spade will still automatically turn at center-in/center-out.

4.2.2.3 Press F5 to lower Accumulator shelves.

4.2.2.4 Press F4 to raise Accumulator shelves.

4.2.3 Operating the spades in manual mode

The manual mode is only used in troubleshooting situation.

4.2.3.1 Set the Loader or Unloader switch to HAND, which ever you wish to operate manually.

4.2.3.2 Press and hold F7 to turn spade 180° to rack
NOTE: Spade can only turn at center-in or center-out position,LS-19 or LS-26 tripped.

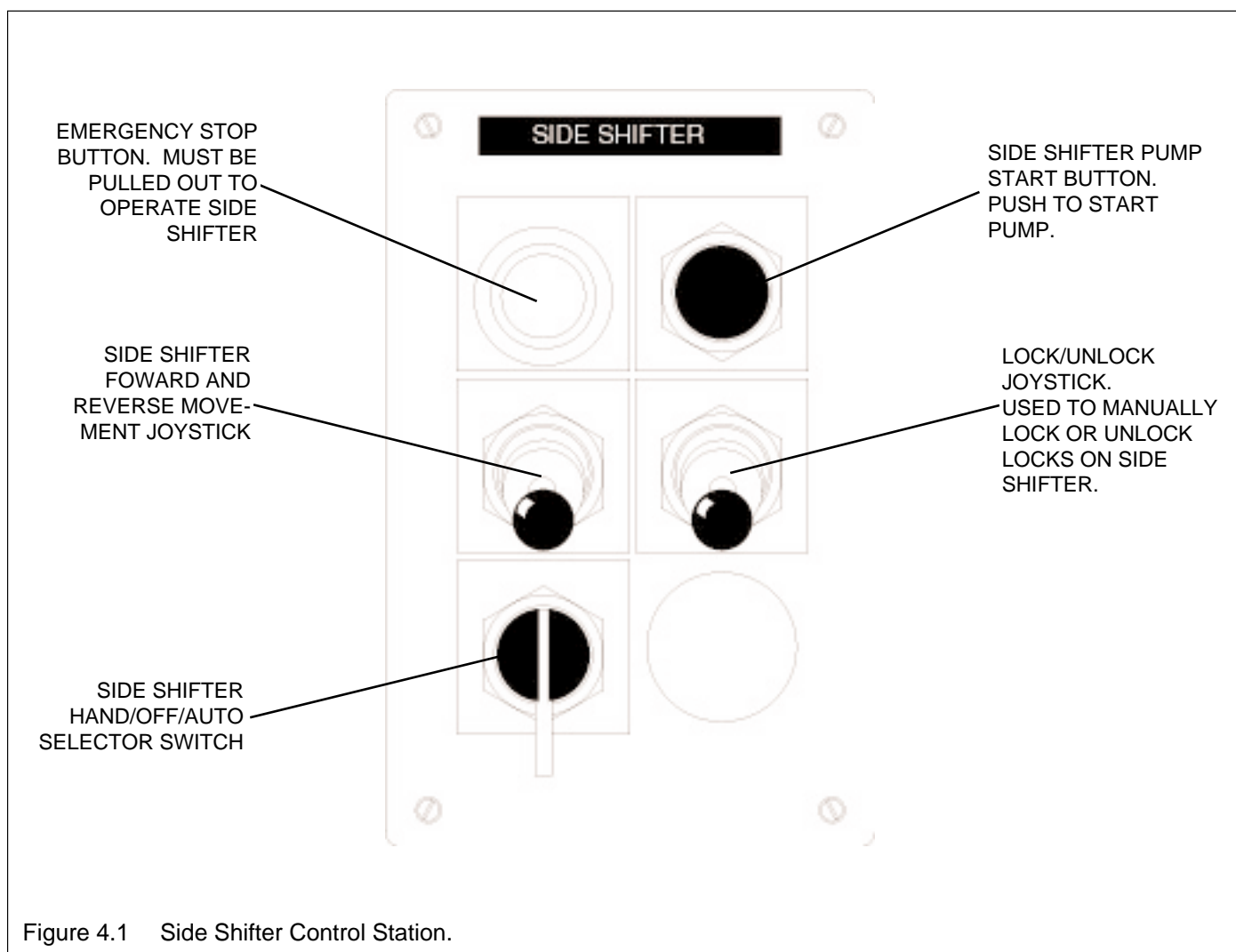
4.2.3.3 Press and hold F6 to turn spade 180° to Accumulator.
NOTE: Spade can only turn at center-in or center-out position,LS-19 or LS-26 tripped.

4.2.4 Operating the Rackveyor and the Side Shifter in manual mode (also refer to section 3.4.3)

- 4.2.4.1 Set Rackveyor switch to HAND.
- 4.2.4.2 Press F1 to move rack Indexer forward.
- 4.2.4.3 Press F2 to move rack Indexer back (reverse).
- 4.2.4.4 Press F3 to move the Side Shifter forward, towards the Rackveyor.
- 4.2.4.5 Press F4 to move the Side Shifter to the Crawler rails.
- 4.2.4.6 Press F6 to [retract] unlock the Side Shifter locks
- 4.2.4.7 Press F5 to [extend] lock the Side Shifter locks.

4.2.5 Operating the Side Shifter in manual mode. Using Side Shifter Control Station (see figure 4.1 below)

- 4.2.5.1 Set Side Shifter switch to HAND.
- 4.2.5.2 Press the AUTO START button to start pump.
- 4.2.5.3 Use Side Shifter joystick to move Forward and Reverse.
- 4.2.5.4 Use the Locks joystick to lock and unlock rail locks.



4.2.6 Rackveyor/Side Shifter speed adjustment

Speed of the Side Shifter, rail locks and Rack Indexer is controlled through valves located on the valve stand shown below.

Speed of each of these components is controlled by two flow controls, one in the front of the manifold block, the other on the back, as shown in figure 4.2 below. 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.

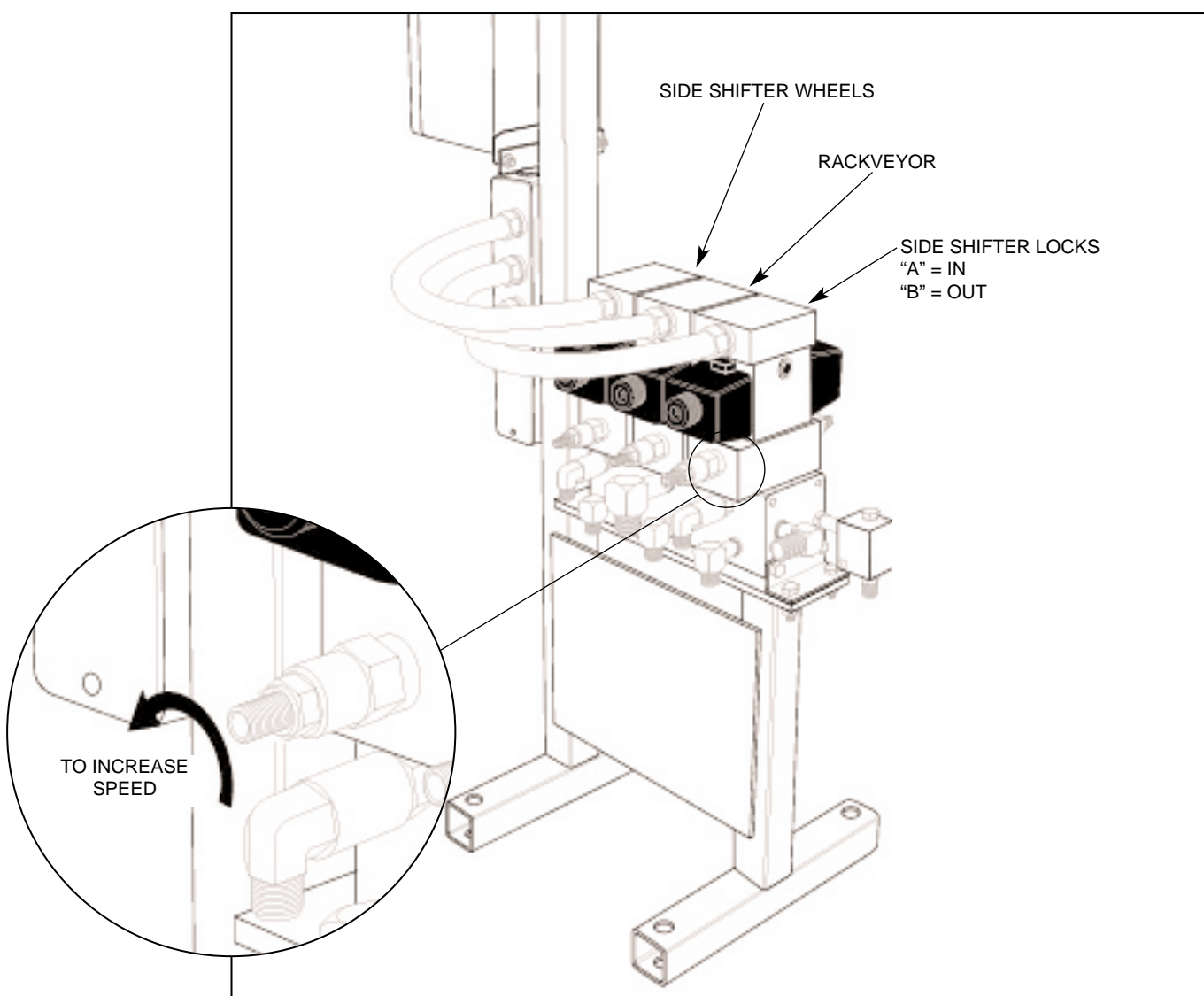


Figure 4.2 The Valve Stand.

SECTION 5

MAINTENANCE

Correct maintenance is largely a matter of good judgment on the part of the operator in charge. The BESSER-MATIC, like any other machine, will do the work required just as long as it is properly maintained. 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 SCREW MAINTENANCE.

5.1.1 GENERAL INSTRUCTIONS

Ball screws tend to have a shroud of mystique about them. In simple terms, they are no more than a lead-screw and nut that have recirculating ball bearings. This greatly reduces the friction between the two, which results in lower drive torque requirements, less heat generated, and more predictable longevity. They should be treated with all the care and respect that you would give a ball bearing in terms of handling and maintenance.

With this in mind, you can expect to see some signs of wear show up with the ballscrew in the same way as with the ball bearing. This includes loss of repeatability, increased lash in the system, and increased tool chatter (all symptoms of loss of preload due to wearing of the balls). In a medium duty machine tool, signs of wear will start to surface normally in 3 to 5 years and should be considered the most advantageous time to think about ballscrew repair - before it starts to wear the ball nut and/or the screw. The repair, at this time, may only involve reballing the assembly to return it to its proper preload and possibly replacing the return guides which may have worn pick-up fingers.

More advanced damage or wear may include brinelling (both false and actual), spalling, chipped lands, or worn ball grooves. These types of repair will involve regrinding either the ballscrew or ballnut, providing that the damage has not broken through the heat treatment. In either case, this (sad to say) will cost more and takes longer to do. Some obvious but often overlooked points:

1. Lubrication - Keep them lubricated just as you would a bearing. This does not have to be rocket science material. Oil is great, grease is wonderful, and even strained bacon drippings will do in a pinch. Stay away from moly grease or graphite products - they tend to clog the return circuitry. Linear lube - BESSER #090121 is recommended.

2. Dirt/Chips - Ballscrews don't like either of them. Wipers are the norm in precision screws; be sure they are in good condition. In extreme environments, use protective shields or bellows.
3. The dreaded "crash" - Disliked by all and hated by machine components. You have two choices: one, accept the fact that they are going to happen and plan for them by using torque limiting, machine saving clutches, or two, hope they don't happen. When they do, examine the ballscrew and support bearings and witness classic brinelling and then hope it can be repaired.

5.1.2 INSTRUCTIONS FOR INSPECTING BALL BEARING SCREW

COMPONENT INSPECTION

Ball bearings - If there is more than one circuit in the ball nut, count the bearing balls (C) in each of the separate containers to be sure each has the same number (within a variation of three balls.)

Check random samples (about 1/4 of the balls for a circuit) for the following:

1. True roundness .0001 maximum variation.
2. Signs of scuffing or fish scaling.
3. More than 0.0001 inch diameter variation between balls of the same circuit.

Where the random sampling shows balls out of round, signs of scuffing or variations of diameter in excess of 0.0001 inch, or short count in any circuit, all balls in the unit must be replaced with a complete set of new bearing balls. (Ball Kits are available from Besser Company)

5.1.3 INSTRUCTIONS FOR INSPECTING BALL BEARING SCREW FOR WEAR

CAUTION:

In order to insure proper operation and long life of the serviced assembly, it is imperative that the diameters of all the replacement balls do not vary in excess of .005" [.125mm]. If Besser Ball Kits are not used for service, make certain that balls used meet the above specifications. (Note: use only chrome alloy steel balls - carbonized balls or carbon steel balls will not provide adequate life.)

Pick-up fingers and deflectors. Ball bearing screws use two methods of directing the bearing balls into return circuit ball guides: -deflectors which are yoke shaped units located within the ball nut and pick-up fingers integral with the ball guides.

5.1.3.1 Deflector yokes (see figure 6.1)

Ball nut assemblies using deflector yokes (G) are characterized by what appears to be threaded studs extending out of the ball nut in the area of the return circuits. Lock nuts are used as clamp fasteners (F) and hold the ball guide clamp (E) securely in place.

To remove yoke deflectors (G) from the ball nut, it is necessary to remove the ball nut (A) completely from the screw shaft (1). This permits the deflector to be removed from the ball nut.

Note: Mark the two deflectors removed from the opposite ends of the ball nut so you can use them as reference. Examine the ends of the deflection yokes for wear or brinelling. Wear can be determined by comparison with the unused ends of the two outside yokes. Since these ends have not been subjected to wear from balls, they are in a like-new condition. Where wear or brinelling are evident, it is best to replace the deflector yokes with new ones.

Note: If the assemblies have had extended use, it is wise to replace all low cost items with new parts (i.e. bearing balls, ball guides, deflector yokes).

5.1.3.2 Pick-up fingers (See figure 6.1)

Inspect the pick-up fingers which consist of short extensions at the end of the ball return guides (D).

Replace with new guides, if a ball brinell impression appears on the tip.

Remove any burrs on the fingers.

Note: If the ball guides were distorted during removal, replace with new guides.

5.1.3.3 Ball nut (A)

Inspect the internal threads of the ball nut for signs of excessive wear, pitting, gouges, corrosion, spalling or brinelling in the ball groove area. On large ball nuts, running the tip of your finger along the groove which is accessible will enable you to detect a secondary ridge in the ball groove when wear is excessive or brinelling has occurred. (The extended lead of a mechanical pencil can also be used as a groove probe). If inspection indicates any of these flaws, all components of the ball nut assembly should be replaced.

When ball nut is usable proceed with reassembly.

Note: Clean all components with a commercial solvent and dry thoroughly before reassembling.

5.1.4 INSTRUCTIONS FOR DISASSEMBLY OF BALL BEARING SCREW.

CAUTION:

Ball Bearing Screw disassembly should be attempted only after being positive that the ball screw assembly is at fault. Disassembly should be done only by personnel familiar with ball bearing screw principles.

5.1.4.1 General inspection Screw Shaft

Inspect the shaft ball grooves (2) for signs of excessive wear, pitting, gouges, corrosion, spalling or brinelling. Normally, where any of the above conditions exist, it is less expensive to replace with a new screw shaft than to rework the old. If, in your opinion, the screw can be reworked, return to your supplier for final evaluation.

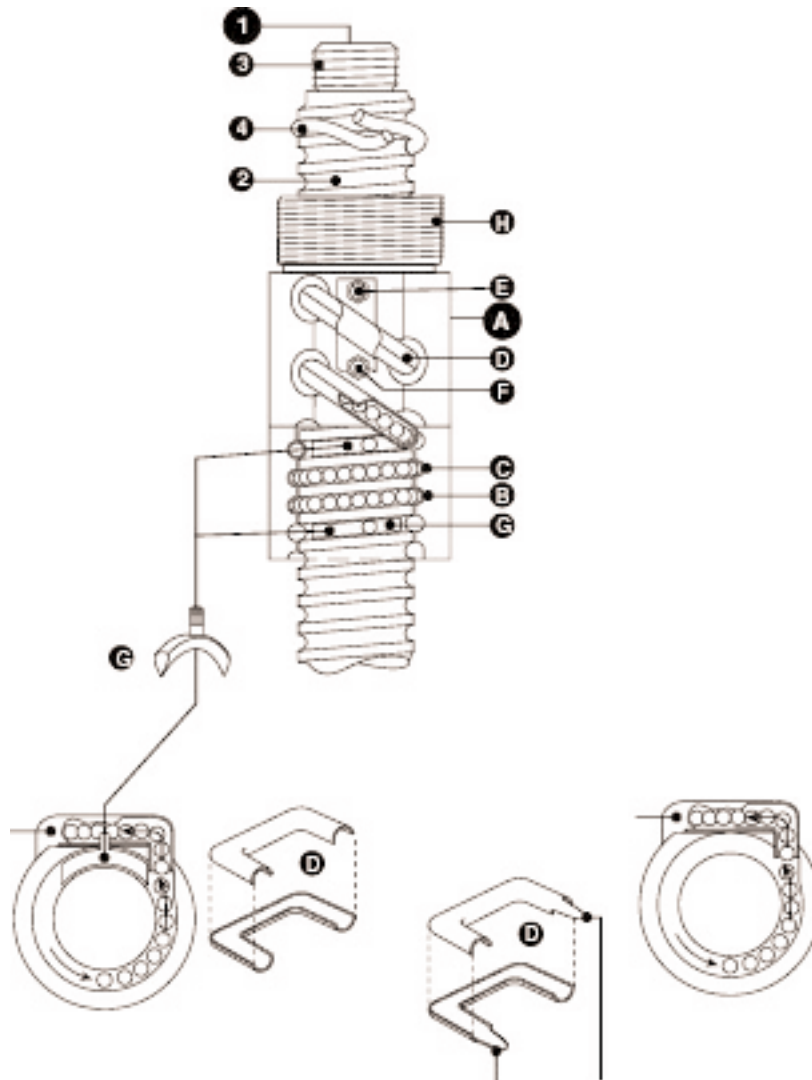


Figure 5.1 Ballscrew.

5.1.5 INSTRUCTIONS FOR DISASSEMBLY OF BALL BEARING SCREW

Backlash:

If the screw appears to be still usable, then inspect assembly for looseness as follows:

Secure the screw shaft (1) (rigidly) in a table clamp or similar fixture.

Make sure that the screw shaft cannot rotate.

Push firmly on the ball nut assembly (A) first in one direction and then in the opposite direction. The axial movement of the ball nut is the backlash (this reading can be taken with a dial indicator)

Note: Make sure that neither member rotates while the readings are taken.

Note: Measure backlash at points of maximum usage or wear.

5.1.5.1 Disassembly

At this point, if the screw appears usable, and the backlash is excessive, the unit should be disassembled for further inspection.

There are two basic types of recirculation systems in the standard b/b screw. The disassembly and inspection for each is noted.

Note: Have a clean container handy (tote tray, cardboard box, etc.) for each ball return circuit of the nut.

A piece of clean cloth approximately a yard square should be placed on the work table and gathered around the edge to form a pocket to retain the balls.

Place the b/b screw assembly over cloth and remove ball guide clamp (E).

Note: Where more than one return circuit ball guide is held in place by a single clamp (E), secure each remaining ball guide (D) with a strip of tape around the diameter of the nut (A)

CAUTION: to prevent accidental ball guide removal before you are ready for that circuit.

Remove both halves of the ball return guide (D), simultaneously to prevent distortion to either half. Catch all the bearing balls (C) from this circuit on the cloth by rotating the screw or ball nut slowly.

Place the removed components into a container.

Identify the container, the ball guide, and the circuit of the ball nut so the components can be reassembled in the same circuit from which they were removed.

Repeat for each circuit. (On unit having yoke deflectors (G), ball nut must be rotated to remove from screw since deflectors engage loosely in screw grooves and act as a thread.)

5.1.6 INSTRUCTIONS FOR RE-ASSEMBLING BALL BEARING SCREW

5.1.6.1 Reassembly

Where the ball nut is equipped with deflector yokes (G), install these and secure temporarily by running the lock nut down the studs and tightening slightly.

Position the ball nut on the screw shaft (Ball nuts with deflector yokes will have to be screwed on. Other ball nuts should slide up the screw shaft without trouble.)

Using dowels with an O.D. approximately equal to the diameter of the bearing balls, center the ball nut grooves (B) with the shaft ball grooves (2) by inserting dowels into each of the ball nut return circuit holes.

Remove the second dowel from one end.

With the ball return holes up, fill the circuit with bearing balls from the container corresponding to that circuit.

Note: Turning the screw in the ball nut will help to feed the balls into the groove.

When the circuit is full, the balls will begin to lift the end dowel from its position. To be sure there are no voids and lightly tap the top bearing ball and see if the end dowel moves.

The remaining balls in the container should fit into one of the halves of the return guide with space for about two to four balls left.

Note: There must be some free space in the ball circuit so the balls will roll and not skid. Do not try to add extra balls into circuit.

Place a dab of bearing grease at each end of the half return guide to hold the balls in place.

Take the other half of the return guide and place over the ball nut circuit you have filled with bearing balls and insert the two ends of the ball guide into the respective holes in the ball nut.

Seat by tapping gently with a rawhide or plastic mallet.

Note: Where more than one ball circuit must be filled in , tape the ball return circuit guide to the ball nut to prevent accidental removal.

Repeat the filling procedure for the remaining ball circuits.

With all ball circuits filled and all return guides in place, secure the return guides with the retaining clamp.

CAUTION:

Care should be taken to insure that balls are not accidentally trapped between circuits in units having pick-up fingers. (In deflector type design - the deflectors fill this void space.)

Note: Be sure screw and ball nut are properly lubricated. (see Lubrication Drawing No. 252782)

7.1.6.2 Assembly inspection

Wrap tape around the ball grooves at the ends of the screw shaft to prevent the ball nut from accidentally rolling off.

Inspect the assembly for free movement of the ball nut along the entire stroke. There should be no binding, squeal, or roughness at any point.

5.1.6.3 Checking play or backlash

Backlash from 0.001" - 0.006" is acceptable.

5.1.6.4 Reducing backlash

Backlash can be reduced by replacing all the bearing balls with a larger size. If the diameters of the bearing balls are increased by 0.001 inch, backlash is decreased by 0.003".

5.2 DODGE/MASTER GEAR BOXES.

Lubrication is extremely important for satisfactory operation. The proper oil level must be maintained in the gearcase at all times. The correct level is indicated by the red head pipe plug. Frequent inspections with the unit not running (preferably when warm), should be made by removing the plug to see that the level is being maintained. If low, (without replacing oil level plug), add lubricant through one of the proper holes until it comes out the oil level hole. Replace the oil level plug securely.

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. When first put into operation, the lubricant in new gearcases becomes contaminated with grit and metal particles from the run-in period.

Lubricant should be drained, the gearcase flushed with mineral spirits and refilled after the first 250 hours of operation; then every 1500 hours or six months thereafter, whichever occurs first. (Normal operation is running 16 hours per day in 80°F. [27°C] ambient). More frequent oil changes may be necessary when running continuously at high temperatures. Use only recommended lubricants as listed in the manufacturer's manual and refer to section 5.10, Lubricant Specifications.

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

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

5.3.1 MAINTENANCE

5.3.1.1 The reducer oil level should be checked weekly and the recommended oil added as required to maintain the proper oil level.

5.3.1.2 The oil should be changed as outlined in the lubrication section.

5.3.1.3 All grease fittings should be lubricated with the recommended grease once per month.

5.3.1.4 The reducer, particularly finned areas and fan covers, should be kept clean to allow maximum heat dissipation.

5.3.1.5 All reducer and foundation bolts should be checked for tightness after three (3) months of service and annually thereafter.

5.3.1.6 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.

5.3.1.7 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.

5.3.2.1 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).

5.3.2.2. 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.

5.3.2.3 Sludge

It is necessary that the oil be 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.

5.3.2.4 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.

5.3.2.5 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.

5.3.2.6 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

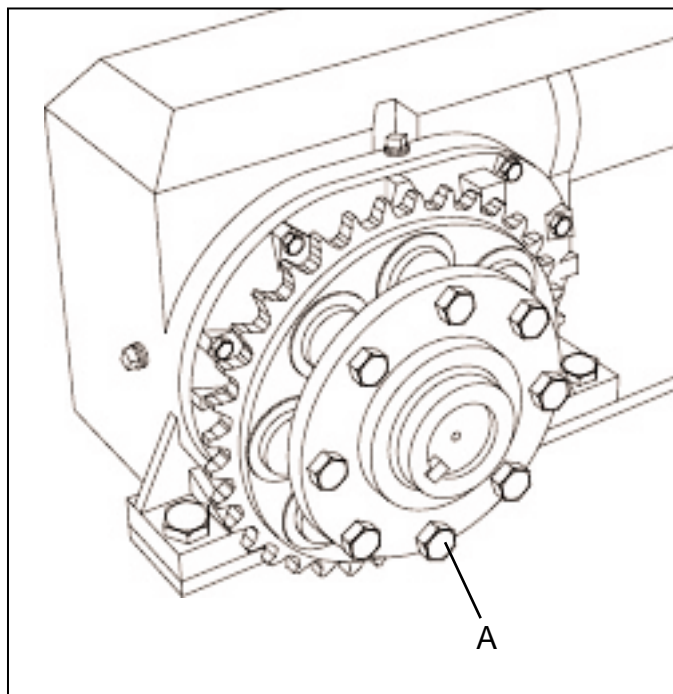


Figure 5.2 Torque Limiter.

5.4.1 TORQUE ADJUSTMENT

- 5.4.1.1** 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).
- 5.4.1.2** 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.
- 5.4.1.3** When making trial run to test the torque limiter, use fully loaded accumulators.
- 5.4.1.4** After the final adjustment, lace the adjusting bolts together with the soft steel wire which is supplied with the torque limiter.
- 5.4.1.5 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).

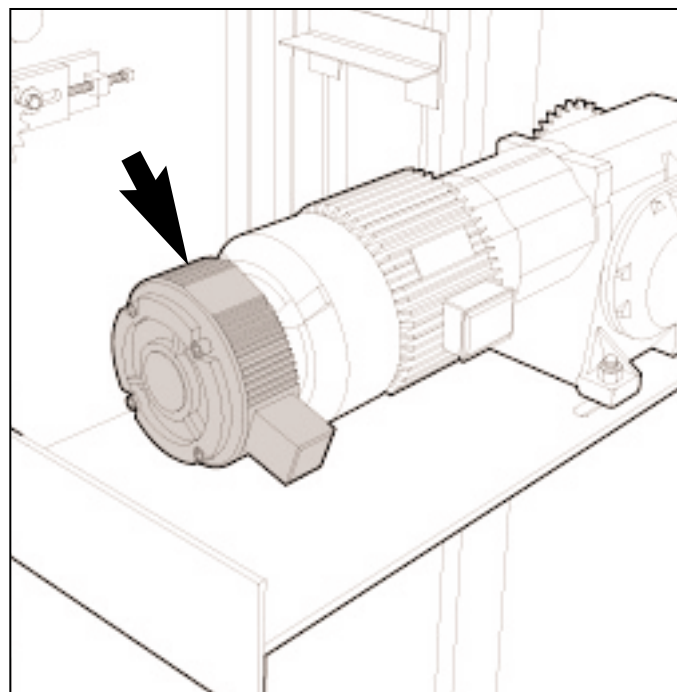


Figure 5.3 Warner Brake.

5.5 WARNER BRAKES

Warner brakes are used on the Accumulator gear motors, spade gear motors and pallet transfer gear motor and are mainly used to stop the motor when a precise stop is necessary. These brakes are adjustable. The Warner brakes on the turn and transfer gear motors are adjustable in the panel (see panel in appendix B) at 90 V. To adjust, first locate the controls in the panel; the Transfer brake control and the Turn brake control. Then adjust voltage by turning voltage button on each control until desired voltage is obtained. The remaining Warner brakes on the Accumulator motors are adjustable through a multi-voltage power supply at motor also at 90 V.(figure 5.3 above shows one of the Accumulator motors with adjustable multi-voltage power supply). To adjust, open cover (shown by arrow) and use screwdriver to adjust to 90V. 90V DC is nominal. $\pm 10\%$ may be used if brake is dragging.



CAUTION: This is an initial set-up!
 Do not use this adjustment if brakes begin to wear.



5.6 DAILY SERVICE SCHEDULE

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

5.7 WEEKLY SERVICE SCHEDULE

5.7.1 CHECKS ON UNLOADER SPADE

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

5.7.2 CHECKS ON LOADER SPADE

COMPONENT	REF.	CHECK FOR	ACTION
Ball screw	5-1	Dirt or wear	Clear or replace
Turn gear box	4-4	Oil	Add
Turn brake	4-4	Wear	Replace
Taperlock bushing on turn link	4-4	Tension	Tighten
Transfer gear box	4-4	Oil	Add
Transfer brake	4-4	Wear	Replace
Transfer V-belts	4-4	Tension or wear	Tighten or replace
Transfer guide rollers		Adjustment	Adjust
Elevator gear box		Oil	Add
Elevator brake		Wear	Replace
Elevator V-belts		Tension and 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	All purpose grease
Conveyor chains	Dry lubricant
Accumulators, transfer spades and conveyor gear boxes,	Shell Omala 320 ISO 320 (8 motors X 1.5 gal. each)
Bearings	
Spade turn motor gear boxes	Mobil SHC 634 (2 motors X 1.5 gal. each)
Hydraulic power unit	Hydraulic oil Shell Tellus 46 ISO 3448