



INDUSTRIAL TRUCK DIVISION



OPERATORS MANUAL

NARROW AISLE TRUCKS
Models 15 / 20 / 25 / 30 / 40

Resistor Control
Solid State Control

NS-1-2061 thru 2180
NSP -1 -2062 thru 2181

Book No. 0-291-1

CLARK EQUIPMENT COMPANY

PUBLISHED BY

TECHNICAL SERVICE DEPARTMENT,
BATTLE CREEK, MICHIGAN, U.S.A.

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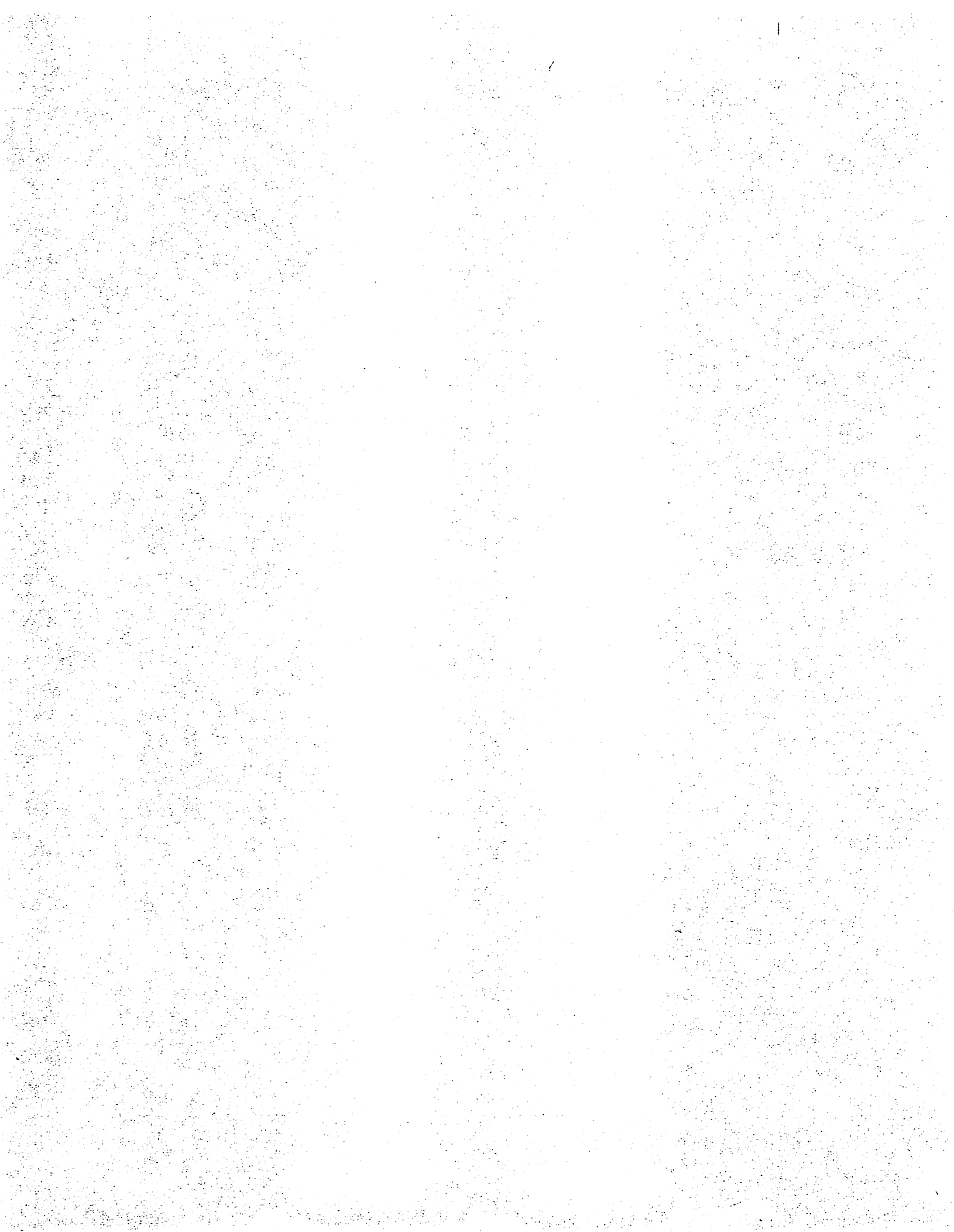
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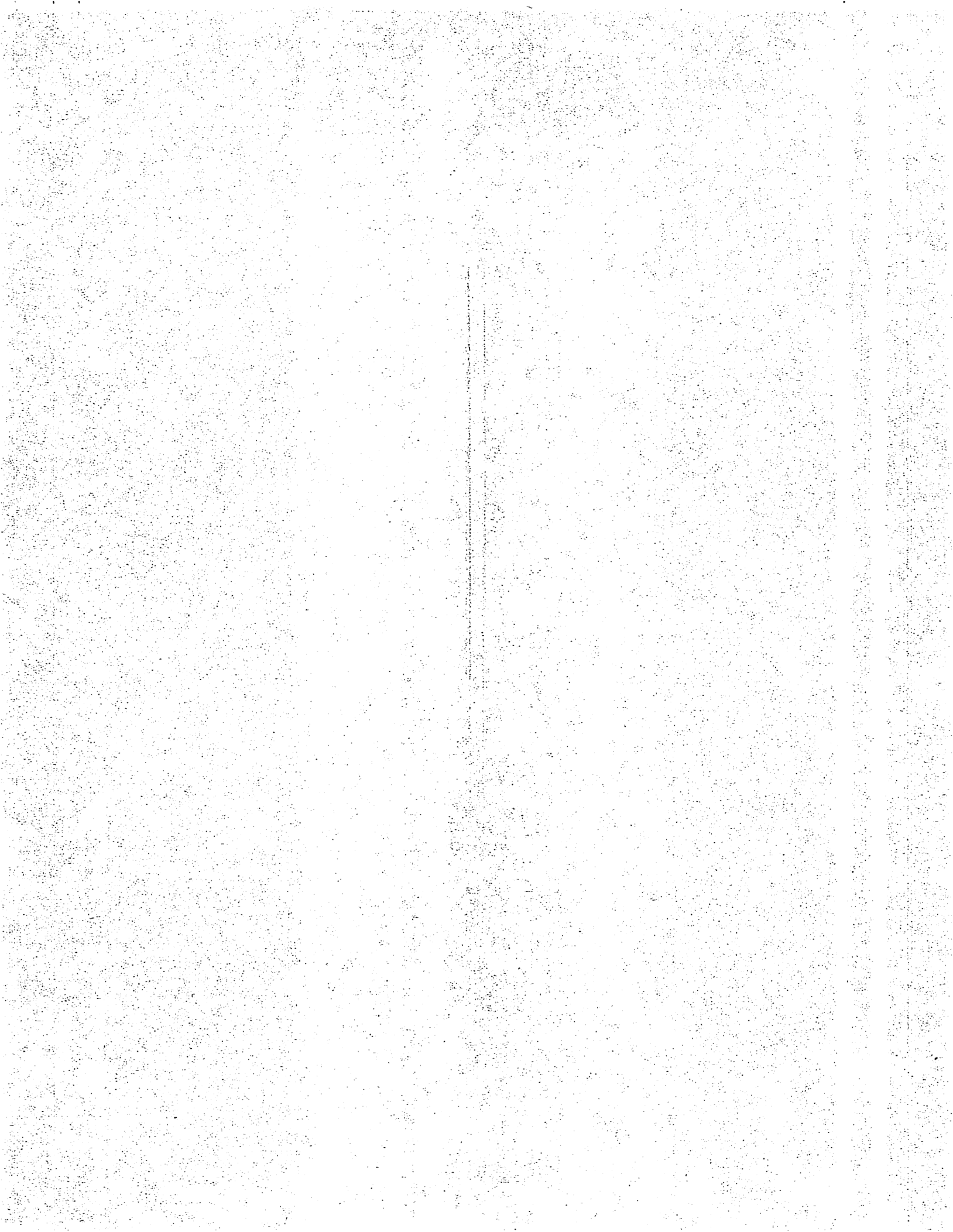
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SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

Powered industrial trucks may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, personnel and procedures should be provided.

Maintenance and inspection of all powered industrial trucks should be performed in conformance with the recommendation in this manual and the following practices.

1. A scheduled preventive maintenance, lubrication, and inspection system should be followed.
2. Only qualified and authorized personnel should be permitted to maintain, repair, adjust, and inspect industrial trucks.
3. Before Leaving The Truck:

- A. Stop truck.
- B. Fully lower the load engaging means.
- C. Place directional controls in neutral.
- D. Apply the parking brake.
- E. Stop the engine or turn off power.
- F. Lock the control or ignition circuit.
- G. Block the wheels if truck is on a ramp, or being worked on.

4. Before Working On Truck:

- A. Raise wheels free of floor or disconnect power source.
- B. Use chocks or other positive truck positioning devices.
- C. Block load engaging means, innermast(s), or chassis before working under them.

Before working on engine fuel system of gasoline powered trucks with gravity feed fuel systems, be sure fuel shutoff valve is closed.

Before working on engine fuel system of LP gas powered trucks, close LP gas cylinder valve and run engine until fuel in system is depleted and engine stops running.

Operation to check performance of the truck or attachments should be conducted in an authorized, safe clearance area.

5. Before Starting To Operate The Truck:

- A. Be in operating position.
- B. Depress clutch (or brake pedal on automatic transmission and electric trucks).
- C. Place directional controls in neutral.
- D. Start engine or turn on power.
- E. Before operating truck, check functioning of lift and tilt systems, directional and speed controls, steering, warning devices, brakes, and any attachment. (If used)
- F. Release parking brake.

- continued -

SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

6. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level, or for leakage, of fuel, electrolyte or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.
7. Properly ventilate work area, vent exhaust fumes and keep shop clean and floor dry.
8. Handle LP gas cylinders with care. Do not drop, dent, or damage in any way.
9. Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, guards and safety devices should be inspected regularly and maintained in a safe operating condition.
10. All parts of lift and tilt mechanisms and frame members should be carefully and regularly inspected and maintained in a safe operating condition.
11. Special trucks or devices designed and approved for hazardous area operation should receive special attention to ensure that maintenance preserves the original, approved safe operating features.
12. Fuel systems should be checked for leaks and condition of parts. Extra special consideration should be given in the case of a leak in the fuel system. Action should be taken to prevent the use of the truck until the leak has been corrected.
13. All hydraulic systems should be regularly inspected and maintained in conformance with good practice. Tilt cylinders, valves, and other similar parts should be checked to assure that "drift" has not developed to the extent that it would create a hazard.
14. Capacity, operation and maintenance instructions plates, tags, or decals should be maintained in legible condition.
15. Batteries, motors, controllers, limit switches, protective devices, electrical conductors and connections should be inspected and maintained in conformance with good practice. Special attention should be paid to the condition of electrical insulation.
16. Industrial trucks should be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.
17. Modifications and additions which affect capacity and safe truck operation should not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance instruction plates, tags or decals should be changed accordingly.
18. Care should be taken to assure that all replacement parts are interchangeable with the original parts and of a quality equal to that provided in the original equipment.

PLEASE NOTE

INSTRUCTIONS ON USE OF MANUAL

This Operator's Manual is published as a service reference guide and includes Specifications, Operating Instructions, Lubrication and Preventive Maintenance Instructions, and Trouble Shooting Guide.

The TABLE OF CONTENTS for this manual is printed on green paper and is placed at the front for easy reference. A separate INDEX (also printed on green paper) is placed in front of the Lubrication and Preventive Maintenance Section.

Lubrication and Preventive Maintenance Instructions are listed under the TIME INTERVALS that they should be performed.

The TIME INTERVAL is part of the page number and code number.

Example: 8H 002-0; 8H is the TIME INTERVAL (8 operating hours),

002 is the PAGE NUMBER and -0 is a CODE NUMBER that you as

a customer should disregard. The dash number or code number is

for the benefit of the publisher only.

The INDEX is set up under the TIME INTERVALS that the Lubrication and Preventive Maintenance should be performed.

Example:	(8 Hours)	Time Interval (H=Hours)	&	Page Number (000-)
Hydraulic Sump Tank, level check...	8H			503
Brake Pedal Free Travel, check.....	8H			373

The above states to check the sump tank fluid level every 8 operating hours and refer to page 503 for fluid recommendations etc. Also, to check brake pedal free travel at this interval and turn to page 373 for instructions.

Turn to the eight (8) hour section (8H) and then to the page listed — 503 or 373 etc. The instructions covered therein will pertain only to the checks or adjustments that should be performed at this TIME INTERVAL.

If, for instance, the Brake Pedal Free Travel is incorrect, you would then refer to the INDEX for "Brake Pedal Free Travel, adjust" which would be listed in the TIME INTERVALS following the 8 hour section.

<u>Example:</u>	(100 Hours)	Time Interval (H=Hours)	&	Page Number (000-)
Brake Pedal Free Travel, adjust....	100H			302

Turn to the one hundred hour section (100H) and then to



INDUSTRIAL TRUCK DIVISION



(continued)

I N S T R U C T I O N S O N U S E O F M A N U A L

page 302. Complete instructions as to the importance of pedal free travel, the method to check and adjust for correct free travel with illustrations are included therein.

N O T E

YOU WILL NOTE THAT AT THE BEGINNING OF EVERY SECTION A LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION IS SHOWN GIVING THE LOCATION OF THE COMPONENTS TO BE SERVICED.

It is impossible to cover all types of machine operations in one manual. Operating conditions should determine the lubrication and maintenance intervals. Common sense and a close observance can best determine the frequency with which you should service your machine.

The care you give your machine will greatly determine the satisfaction and service life that you will obtain from it. A definite maintenance program should be set up and followed. Haphazard maintenance will only lead to faulty performance and short life.



INDUSTRIAL TRUCK DIVISION



TABLE OF CONTENTS

PAGE	DESCRIPTION	PAGE	DESCRIPTION
A001	Instructions on use of manual	C070	Overall controls
A002	Instructions on use of manual	C071	Battery connector
A073	Table of contents		Power key switch, controls
A074	Table of contents	C073	Battery charge indicator,
B071	Illustration of truck(s)		Hour meter
B073	Specifications	C173	Brake and Parking brake
B074	Specifications	C303	To pick-up a load
B075	"		To move a load
B076	"		To deposit a load
B077	"		Safety and Operating
B078	"		Suggestions

LUBRICATION AND PREVENTIVE MAINTENANCE

Time Interval (H-HOURS)	Page Number (000-)	DESCRIPTION

H	071	INDEX
H	072	INDEX PAPER COLOR -- GREEN
		8 HOUR (Every 8 operating hours, or every shift)
8H	000	Battery charge indicator, hour meter
	273	Brake (deadman) switch check
	375	Battery, service checks and maintenance
	473	Battery, service checks and maintenance
	474	Battery, service checks and maintenance
	475	Battery, service checks and maintenance
	476	Battery, service checks and maintenance
	477	Battery, service checks and maintenance
	479	Battery, removal and installation procedure(s)
	503	Hydraulic sump tank level check
		100 HOUR (Every 100 operating hours)
100H	000	100 Hour PM illustration
	185	Drive control adjustment
	186	Drive control adjustment
	187	Drive control adjustment
	188	Drive control adjustment
	302	Brake, check and adjust
	303	Brake, check and adjust
	306	Brake, check and adjust
	307	Brake, check and adjust
	403	Lift cylinder operation check
		Tilt cylinder operation check
		Reach cylinder operation check
		Lift chain(s), check and adjust
		Lubricate truck
		Hydraulic control valve and lines, inspect
		Lift carriage (Pantograph), inspect
		Lift and tilt switches, check
		Hydraulic sump (breather) filter, check
		Contactors, inspect
		Lubrication chart PAPER COLOR -- BLUE
	473	Lubrication chart "
	503	Lubrication -continued- "
	673	Lubrication recommendations "
	772	Lubrication specifications "
867-L thru 881-L		Lubrication chart(s) key "



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Time
Interval
(H-HOURS)

Page
Number
(000-)

DESCRIPTION

500 HOUR (Every 500 Operating hours)

500H 000
173

174
473

500 HOUR PM illustration
Sump tank, drain, flush and refill
Sump tank filter, change
Sump tank breather, check/replace
"
Caster adjustment

1000 HOUR (Every 1000 operating hours)

1000H 000
673
674
773
774
912
913
1507
1573
1940

1000 HOUR PM illustration
Drive motor, inspect
Drive motor brush spring tension, check
Pump motor, inspect
Pump motor brush spring tension, check
Brake, bleeding procedure
Brake, bleeding procedure
Hydraulic system flow and pressure check
Hydraulic system flow and pressure check
Wheels

TROUBLE SHOOTING GUIDE

17.7500

1000H ---
1000H ---

Solid state control

PAPER COLOR -- GREEN

Upright - "B" MODELS

PAPER COLOR -- PINK

UPRIGHT - "C" MODELS

PAPER COLOR -- YELLOW

TSH001

Hydraulic circuit diagram

IN - fold-out

Wiring diagram



INDUSTRIAL TRUCK DIVISION



IMPORTANT

SUBJECT: CAUTIONS CONNECTED WITH
THE OPERATION AND MAINTENANCE OF
SOLID STATE CONTROLLED TRUCKS.

C A U T I O N

WELDING ON SCR TRUCKS:

1. MAKE SURE TRUCK HAS NO GROUNDS.
2. DISCONNECT BATTERY.
3. PROTECT ELECTRICAL WIRING AND COMPONENTS FROM WELD SPLATTER WITH A SHIELD.

IF THE ABOVE IS NOT FOLLOWED.....
DAMAGE CAN RESULT TO WIRING AND
ELECTRICAL COMPONENTS ON A SOLID
STATE CONTROLLED TRUCK.

C A U T I O N

DO NOT STEAM CLEAN A SOLID STATE
CONTROLLED TRUCK AS EXCESSIVE MOIS-
TURE WILL INTERFERE WITH PROPER
OPERATION OF THE SOLID STATE COMPON-
ENTS.

C A U T I O N

BATTERY POLARITY MUST BE CORRECT OR
ELECTRICAL SYSTEM WILL BE DAMAGED.

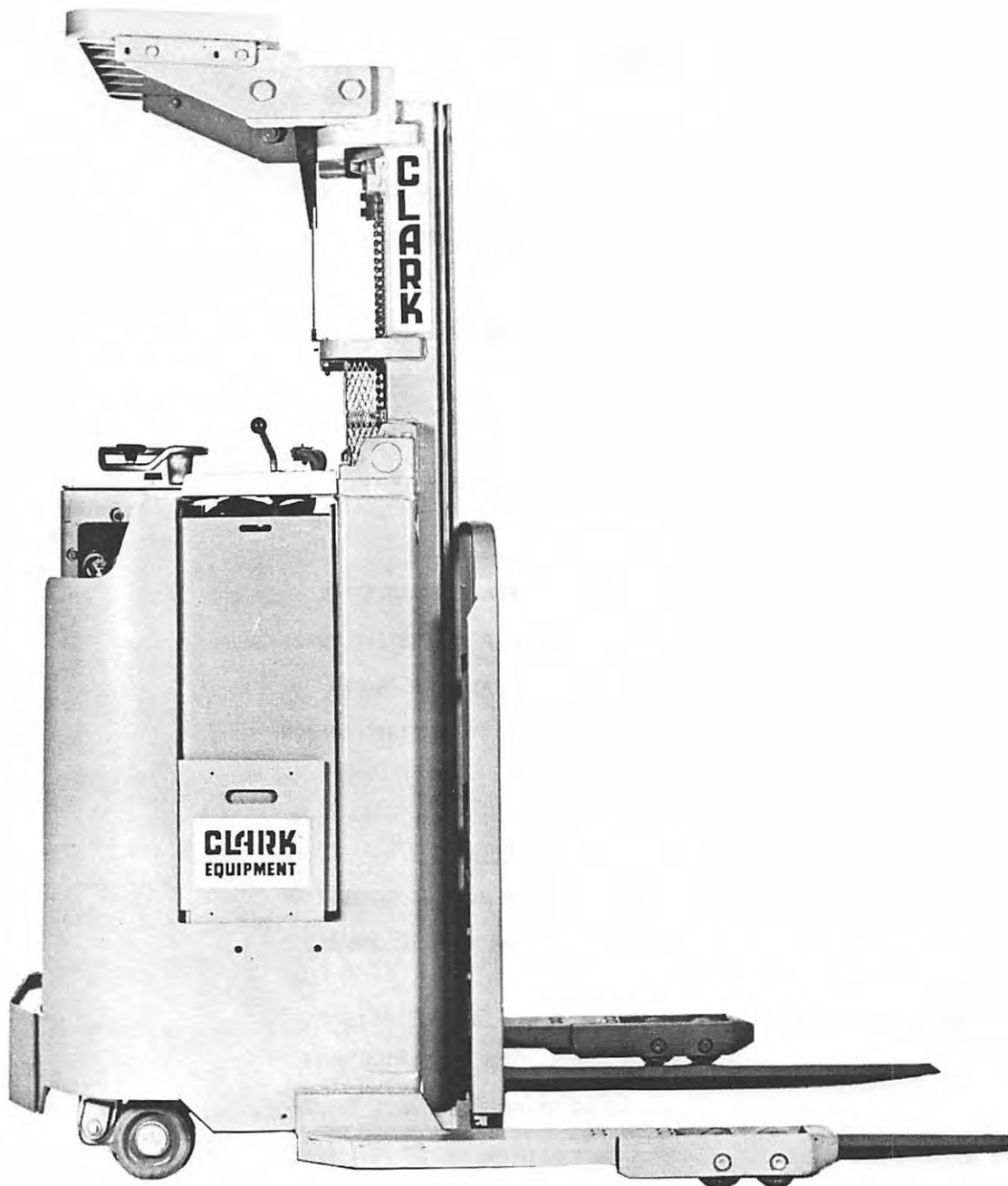
C A U T I O N

DO NOT USE A MOTOR GENERATOR UNIT
SUCH AS READY POWER TO MOVE AND/OR
CHECK THIS MACHINE AS SERIOUS DAM-
AGE MAY OCCUR.

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NARROW AISLE TRUCKS - NS 20 / 30 / 40

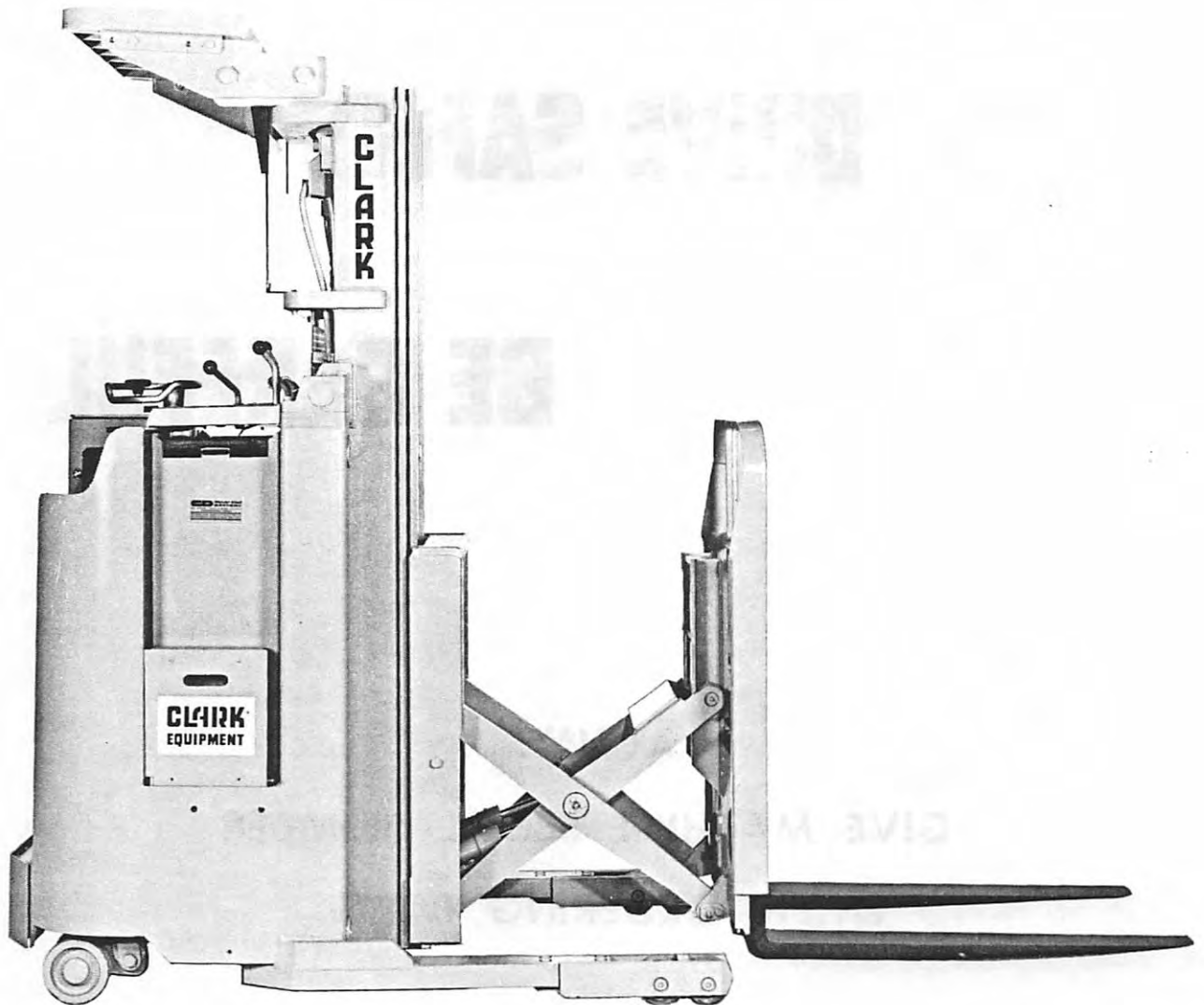
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INDUSTRIAL TRUCK DIVISION

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NARROW AISLE TRUCKS - NSP 20 / 30 / 40

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INDUSTRIAL TRUCK DIVISION



WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS



INDUSTRIAL TRUCK DIVISION



SPECIFICATIONS

TYPE OF VEHICLE.....Electric Narrow Aisle Truck

Weight (in lbs.)	BATTERY COMPARTMENT		NSP20	NSP30
	(12 1/8" x 32 3/4")			
With battery and standard upright			4735	4800
With 128" Std. Upright less battery			3475	3540
<hr/>				
<u>NS20 NS30,40</u>				
With battery (12 1/4" x 32 3/4") and standard upright			3870	4210
With 128" Std. Upright less battery			2610	2950
<hr/>				
<u>NSP40</u>				
With battery (12 1/8" x 36 7/8") and standard upright			5350	
With 128" Std. Upright less battery			4050	

POWER SUPPLY

Type battery	Lead Acid
Voltage	24
Ampere Hour capacity	500
Battery weight	1260 lbs.

CONTACTORS

Replacement: when approximately 1/16" wear is reached.

N.O. contact gap will be 5/16" ± 1/32"
N.C. contact gap will be 1/4" ± 1/32"

Battery Compartment Size
..... 32 3/4 W x 12 1/8 L x 31 1/2 H

Optional Sizes: 37 x 12 1/8 x 31 1/2
32 3/4 x 16 5/8 x 31 1/2
37 x 16 5/8 x 31 1/2

TIRES (in inches)

Front Load (Polyurethane) OPTIONAL (Polyurethane)
(Tandem) 4 Dia. x 2 5/8; (Tandem), 5 x 2 2/8

Front Load OPTIONAL (Rubber)
(Single), 10 x 5

Rear Steer-Drive Rubber
(Single) 10 1/2 x 6 x 5

Caster (Dual) Polyurethane
6 x 2

DIMENSIONS

Without forks 66 3/8'

Width

Height with upright lowered (128" MFH Standard Upright)..... 83

Basic aisle for right angle stacking
..... 71" + 6" operating clearance

Free lift (in inches)

Standard upright 17 1/4
Hilò upright 46 3/4
Triple stage 13

Overall height with 128 MFH Std. upr.
..... 164 1/4 inches

Overall width
..... 34 rear front varies 34 to 58 inches

Ground clearance - under Straddle Arms
..... 2 inches

Grade clearance 15.6%

HYDRAULIC SYSTEM

Suction Filter (cleanable).... 100 mesh screen
Return line filter (replaceable)....10 micron
Sump tank capacity 6.5 gallons

HYDRAULIC VALVE

Pressure relief valve setting.... 1750 P.S.I.

BRAKE SYSTEM

Type Spring applied, Hydraulic release

Service-Parking Brake Effectiveness.....
..... Refer to page 100H 912

SPEEDS AND GRADES

Forward M.P.H.
Loaded 4.9
Empty 5.5

Reverse
Loaded 4.9
Empty 5.5

Gradeability
With Rated Load 10%
Empty 10%

Lifting Speed
Loaded 33 FPM
Empty 50 FPM

Lowering Speed
Loaded 60 FPM
Empty 80 FPM

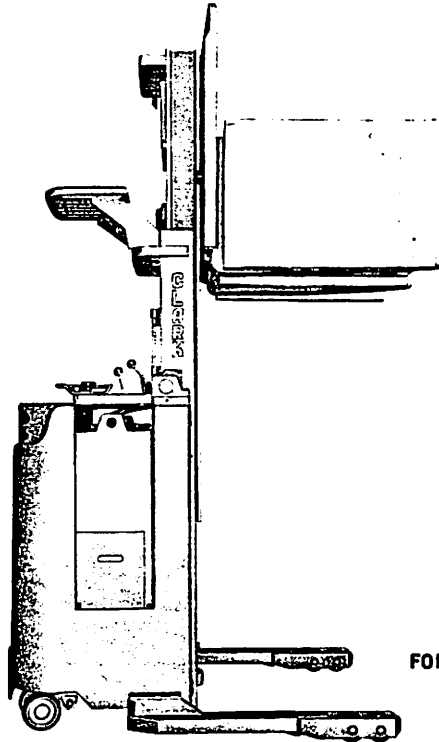


INDUSTRIAL TRUCK DIVISION



S P E C I F I C A T I O N S

BATTERY CONNECTOR.....SB-2
HYDRAULIC PUMPS.....See page 1000H 1573
BRUSH SPRING TENSION.....See page 1000H 774



NS-20

narrow aisle straddle trucks

**2,000 POUNDS CAPACITY
FOR RACK STORAGE OPERATIONS
AND HANDLING OF
UNIFORM SIZE PALLETS**

Clark Narrow Aisle electric trucks transform space-wasting aisles into profitable storage area. Aisle widths can be cut nearly in half, permitting additional storage capacity of up to 30% or more.

The straddle model described in this brochure can be tailored to suit your requirements. Outrigger widths from 27 inches to 50 inches (inside to inside) may be specified to accommodate any size pallet.

Choice of standard, hi-lo, triple-stage, or full free lift triple-stage upright makes this machine a truly versatile performer. Load wheels are available in several sizes, to suit operating conditions.

The exclusive tilting upright offers advantages never before available on narrow aisle trucks. *Back tilt* cradles the load for security. Reduce spilled loads, and you reduce product damage and wasted time. *Forward tilt* permits chiseling under non-palletized loads on the floor. In addition, tilting the upright (rather than just the forks) means shorter head length and increased maneuverability.

Tilt, lift — lower, and travel controls are grouped for one-hand operation . . . driver performs several functions simultaneously.

Four speeds forward and reverse; precise control of all hydraulic operations through full-feathering valves; smooth braking; excellent visibility; unparalleled accessibility — all combine to increase driver efficiency and reduce operating costs.

In every way, Clark Narrow Aisle electric trucks save you money through greater productivity.

MODEL:
NS20 (Narrow Straddle) 2,000 pounds capacity

WEIGHT: With 1,200 lb. battery and
130" upright 3,790 lbs.

TIRES: Drive tire, non-direction
rubber 10½ x 6 x 5
Caster, dual, urethane 6 x 2
Tandem front load tires, urethane 4 x 2½
Optional load tires: 5 x 2½ urethane (tandem)
10 x 5 rubber (single)
10 x 5 urethane (single)

SPEEDS	Empty	2,000 lb. load
Travel Speeds	5.7 MPH (500 FPM)	5.3 MPH (466 FPM)
Lift Speed	86.0 FPM	55.0 FPM
Lowering Speed	80.0 FPM	60.0 FPM

POWER SUPPLY: 24-volt battery with adequate kilowatt-hour capacity. Standard battery compartment size 12½" wide, 31½" high, 32¾" long. For other compartment sizes see dimensional specifications.

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large

contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstand mechanical abuse, are easily cleaned and resist cleaning solvents.

CONTROLS: Two levers, directional in operation, control:
1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 6° back, 0° forward is standard. 4° back and 2° forward, optional. (4° back and 2° forward is standard above 154" MFH.)

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication, through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicator standard equipment.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control—no tilt drift. Both lift and tilt cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump, built into frame of ¼" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a 40-micron replaceable filler cap breather, (2) a 25-micron full flow filter in hydraulic line, (3) a 140-micron suction filter.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 8" to 30". Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; plexiglass finger guard, steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Standard color: yellow.

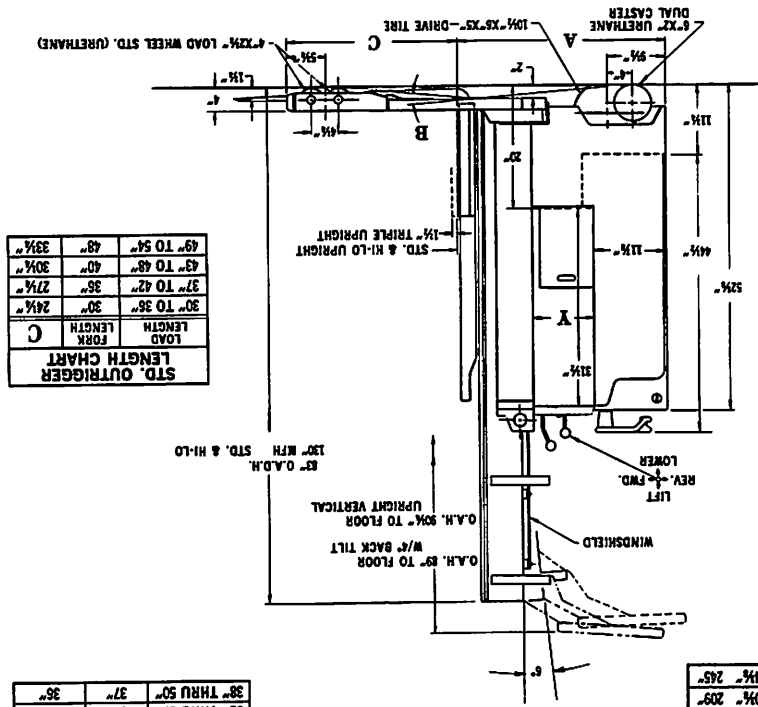
NS-20 Specifications

INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE



NOTE: Clark products and specifications are subject to improvements and changes without notice.
On all CLARK literature, dimensional and performance specifications are checked for accuracy by the engineering department.



NOTE: ... INCREASES IN ... WITH FORWARD TR.

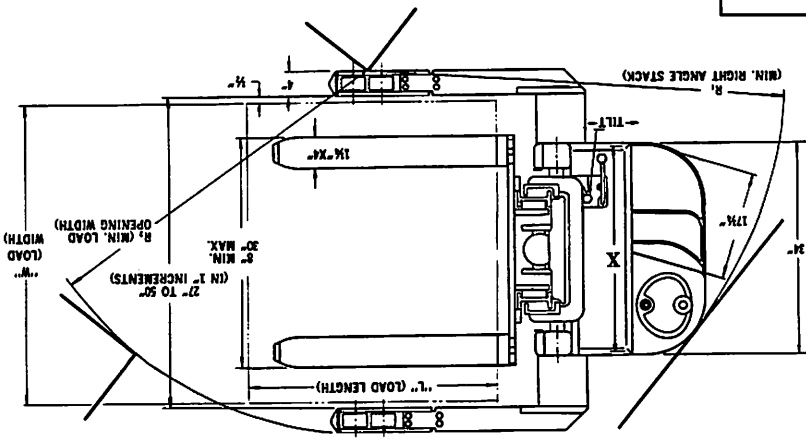
BATTERY COMP.	TRUCK LENGTH	TRUCK WIDTH	TRUCK HEIGHT	TRUCK WEIGHT
Y	32"	30"	30"	30"
X	32"	30"	30"	30"
A	32"	30"	30"	30"
STD. 12 1/2"	32"	30"	30"	30"
OPT. 37"	32"	30"	30"	30"
OPT. 19 1/2"	32"	30"	30"	30"

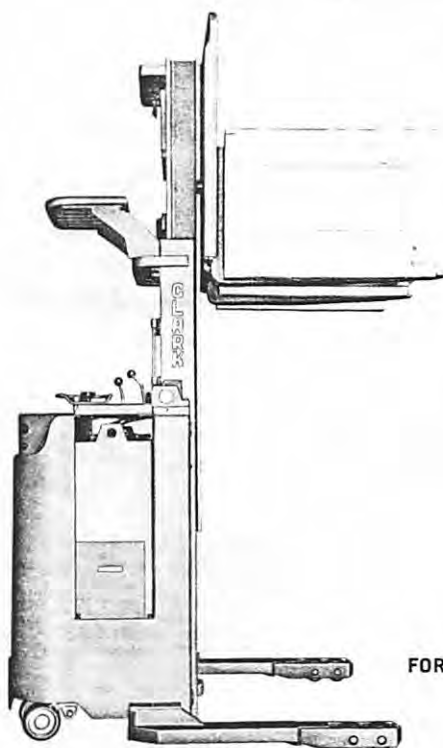
LOAD LENGTH	FORK LENGTH	LOAD LENGTH	FORK LENGTH
49"	TO 54"	48"	39 3/4"
43"	TO 48"	40"	30 3/4"
37"	TO 42"	36"	27 1/4"
30"	TO 36"	30"	24 1/4"

OVERALL HEIGHT	MAXIMUM FORK HEIGHT	FREE LIFT	OVERALL HEIGHT
96"	154"	154"	245"
83"	130"	130"	209"
77"	118"	118"	191"

WIDTH BETWEEN OUTRIGGERS	CARRIAGE MAX. FORK WIDTH	WIDTH
38" THRU 50"	37"	36"
32" THRU 37"	31"	30"
27" THRU 31"	26"	25"

BATTERY COMPARTMENT	LOAD	R1	R2
19 1/2"	48" x 48"	73 1/2"	58 1/2"
19 1/2"	48" x 40"	71 1/2"	51"
19 1/2"	40" x 48"	71"	57 1/2"
19 1/2"	40" x 40"	69 1/2"	49 1/2"
19 1/2"	48" x 48"	69 1/2"	58 1/2"
19 1/2"	48" x 40"	68"	51"
19 1/2"	40" x 48"	67 1/2"	57 1/2"
19 1/2"	40" x 32"	62 1/2"	42"
19 1/2"	32" x 40"	63"	49 1/2"





NS-30

narrow aisle straddle trucks

**3,000 POUNDS CAPACITY
FOR RACK STORAGE OPERATIONS
AND HANDLING OF
UNIFORM SIZE PALLETS**

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MODEL:
NS 30 (Narrow Straddle) 3,000 pounds capacity

WEIGHT: With 1,200 lb. battery and
130" upright 4,380 lbs.

TIRES: Rear drive tire, non-direction
rubber 10½ x 6 x 5
Casters, dual, urethane 6 x 2
Tandem front load tires, urethane 4 x 2½
Optional load tires: 5 x 2½ urethane (tandem)
10 x 5 rubber (single)
10 x 5 urethane (single)

SPEEDS	Empty	3,000 lb. load
Travel Speeds	5.6 MPH (492 FPM)	5.0 MPH (440 FPM)
Lift Speed	52.0 FPM	34.0 FPM
Lowering Speed	80.0 FPM	60.0 FPM

POWER SUPPLY: 24-volt battery with adequate kilowatt-hour capacity. Standard battery compartment size 12¼" wide, 31½" high, 32¾" long. For other compartment sizes see dimensional specifications.

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large

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CONTROLS: Two levers, directional in operation, control:
1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 6° back, 0° forward is standard. 4° back and 2° forward, optional. (4° back and 2° forward is standard above 154" MFH.)

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication, through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

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UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control—no tilt drift. Both lift and tilt cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds; and precise tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump, built into frame of ¼" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a 40-micron replaceable filler cap breather, (2) a 25-micron full flow filter in hydraulic line, (3) a 140-micron suction filter.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 10" to 36". Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; plexiglass finger guard, steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Standard color: yellow.

NS-30 Specifications

NOTE: Clark products and specifications are subject to improvements and changes without notice.
 On all CLARK literature, dimensional and performance specifications are checked for accuracy by the engineering department.



NOTE: % INCREASES & DIMENSIONS IN W/4 BACK & 2° FORWARD TILT.

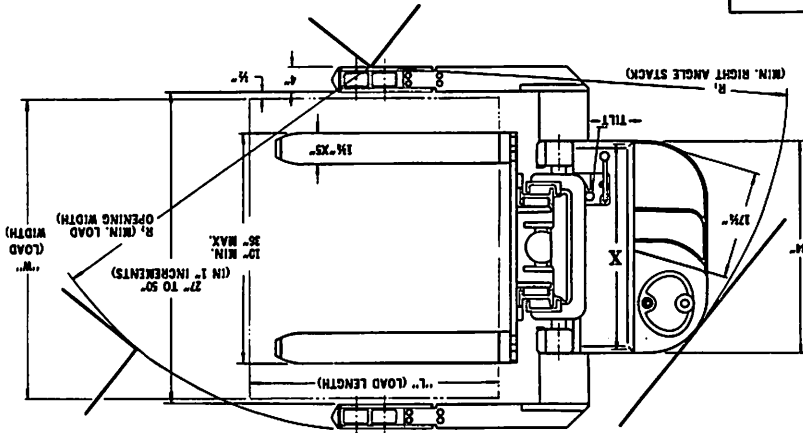
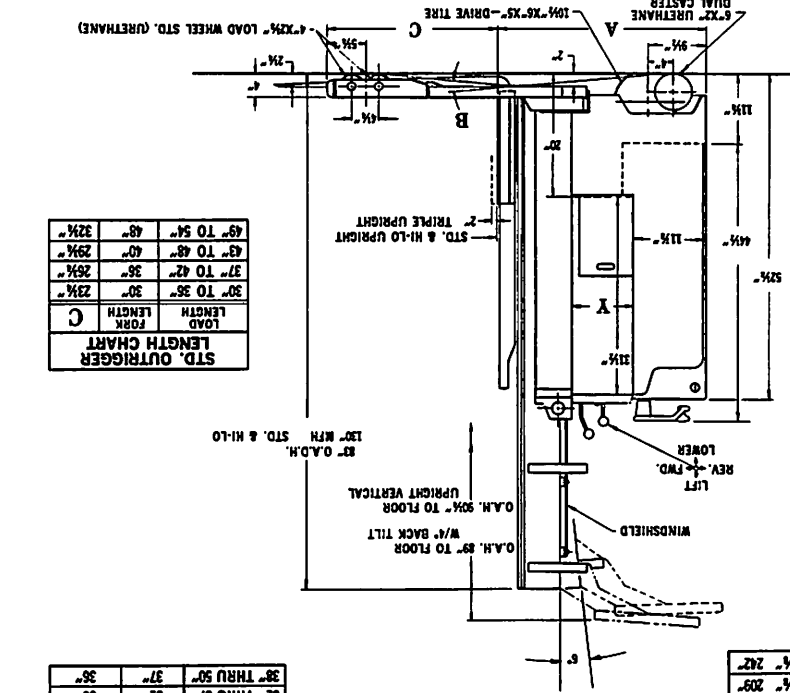
BATTERY COMP.		B % GRADE CLEARANCE		
OUTRIGGER LENGTH	MEAD LENGTH	A	X	Y
C		23"	28"	25"
12 1/2%	32"	18.8	17.1	15.4
16%	48"	16.9	15.5	14.5
	60"	15.5	14.5	

FOR LOAD CAPACITY ABOVE 15% MIN UPRIGHT CONTACT FACTORY
 -SUBTRACT 2M - WHEN LOAD BACK REST IS USED.
 -ADD 2M - WHEN LOAD BACK REST IS USED.

OVERALL HEIGHT	MAXIMUM FORK HEIGHT	FORK HEIGHT W/O INCREASING GAIN	STD. HI-LO TRIPLE			STD. HI-LO TRIPLE			OVERALL HEIGHT
			MIN	MAX	A	X	Y		
77"	118"	118"	17 1/4"	17 1/4"	57 1/4"	13"	138 1/4"	138 1/4"	191"
83"	130"	128"	17 1/4"	18 1/2"	63 1/4"	13"	150 1/4"	150 1/4"	209"
95"	154"	154"	17 1/4"	22 1/2"	75 1/4"	13"	174 1/4"	174 1/4"	242"

STD. OUTRIGGER LENGTH CHART			
OUTRIGGER LENGTH	MEAD LENGTH	LOAD LENGTH	LOAD
30" TO 36"	30"	23 1/4"	25%
37" TO 42"	36"	26 1/4"	26%
43" TO 48"	40"	29 1/4"	29%
49" TO 54"	48"	32 1/4"	32%

STD. CARRIAGE WIDTHS			
OUTRIGGER WIDTH	CARRIAGE WIDTH	MAX. FORK WIDTH BETWEEN CARRIAGE	MIN. WIDTH
27"	31"	26"	25"
32"	37"	31"	30"
38"	50"	37"	36"



BATTERY COMP.	LOAD CAPACITY		R1	R2
	MIN	MAX		
12 1/2%	32" x 40"	64"	49 1/4"	
	40" x 32"	64"	42"	
	40" x 48"	68 1/4"	57 1/4"	
	48" x 40"	68 1/4"	51"	
	48" x 48"	71"	55 1/4"	
	48" x 40"	71"	49 1/4"	
16%	48" x 48"	74 1/4"	58 1/4"	
	48" x 40"	74 1/4"	51"	
	48" x 48"	77"	57 1/4"	
	40" x 32"	68"	42"	
	40" x 40"	67 1/4"	49 1/4"	
	48" x 48"	71"	55 1/4"	

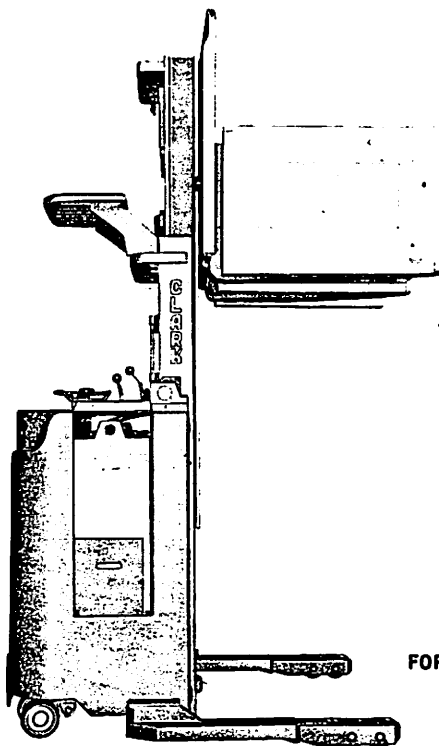
LUBRICATION AND PREVENTIVE MAINTENANCE

INDUSTRIAL TRUCK DIVISION



NS-40

narrow aisle straddle trucks



**4,000 POUNDS CAPACITY
FOR RACK STORAGE OPERATIONS
AND HANDLING OF
UNIFORM SIZE PALLETS**

Clark Narrow Aisle electric trucks transform space-wasting aisles into profitable storage area. Aisle widths can be cut nearly in half, permitting additional storage capacity of up to 30% or more.

The straddle model described in this brochure can be tailored to suit your requirements. Outrigger widths from 27 inches to 50 inches (inside to inside) may be specified to accommodate any size pallet.

Choice of standard, hi-lo, triple-stage, or full free lift triple-stage upright makes this machine a truly versatile performer. Load wheels are available in several sizes, to suit operating conditions.

The exclusive tilting upright offers advantages never before available on narrow aisle trucks. *Back tilt* cradles the load for security. Reduce spilled loads, and you reduce product damage and wasted time. *Forward tilt* permits chiseling under non-palletized loads on the floor. In addition, tilting the upright (rather than just the forks) means shorter head length and increased maneuverability.

Tilt, lift — lower, and travel controls are grouped for one-hand operation . . . driver performs several functions simultaneously.

Four speeds forward and reverse; precise control of all hydraulic operations through full-feathering valves; smooth braking; excellent visibility; unparalleled accessibility — all combine to increase driver efficiency and reduce operating costs.

In every way, Clark Narrow Aisle electric trucks save you money through greater productivity.

MODEL:
NS 40 (Narrow Straddle) 4,000 pounds capacity

WEIGHT: With 1,160 lb. battery and
130" upright 4,380 lbs.

TIRES: Rear drive tire, non-direction
rubber 10½ x 6 x 5
Casters, dust, urethane 6 x 2
Tandem front load tires, urethane 4 x 2½
Optional load tires: 5 x 2½ urethane (tandem)
10 x 5 rubber (single)
10 x 5 urethane (single)

SPEEDS	Empty	4,000 lb. load
Travel Speeds	5.6 MPH (492 FPM)	4.8 MPH (422 FPM)
Lift Speed	52.0 FPM	30.0 FPM
Lowering Speed	80.0 FPM	60.0 FPM

POWER SUPPLY: 24-volt battery with adequate kilowatt-hour capacity. Standard battery compartment size 12½" wide, 31½" high, 32¾" long. For other compartment sizes see dimensional specifications.

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large

contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstand mechanical abuse, are easily cleaned and resist cleaning solvents.

CONTROLS: Two levers, directional in operation, control:
1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright lift; 6° back, 0° forward is standard. 4° back and 2° forward, optional. (4° back and 2° forward is standard above 154" MFH.)

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication, through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicator standard equipment.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. material from wearing packings. Free-floating mounting Tilt lock insures positive control—no tilt drift. Both lift and tilt cylinders have metal rod wipers to keep foreign of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump, built into frame of ¾" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a 40-micron replaceable filler cap breather, (2) a 25-micron full flow filter in hydraulic line, (3) a 140-micron suction filter.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 10" to 36". Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

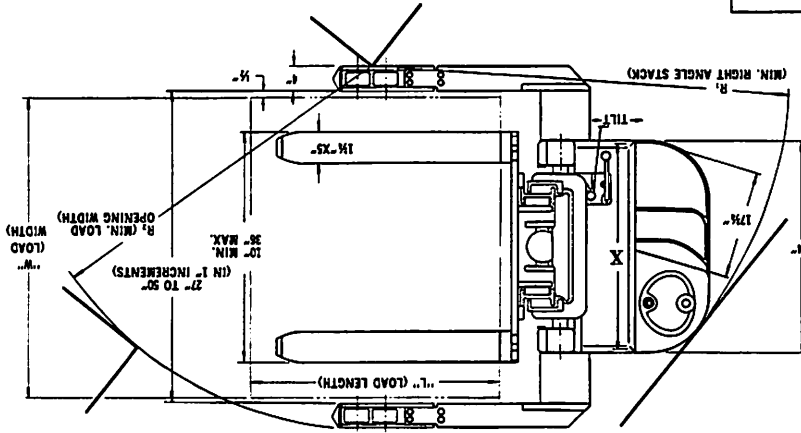
GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; plexiglass finger guard, steering knob, overhead guard and load backrest all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Standard color: yellow.

NS-40 Specifications



INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE



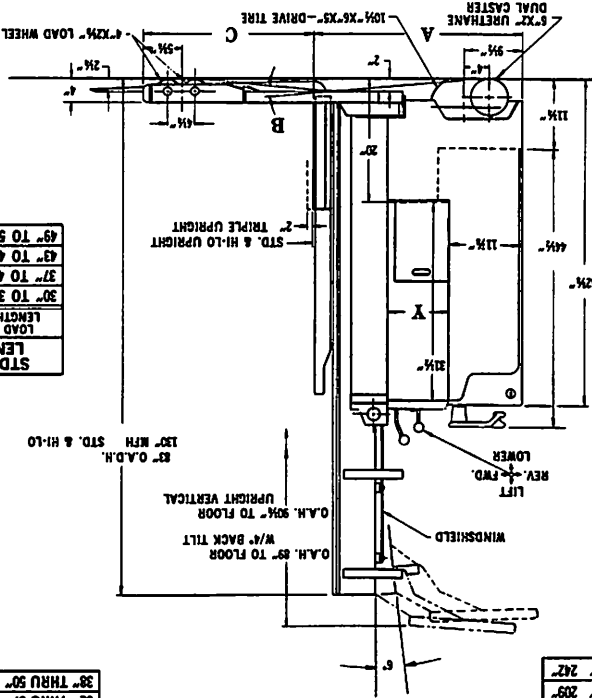
BATTERY COMPARTMENT SIZES (L x W)	LOAD	
	R1	R2
32" x 40"	64"	49 1/2"
40" x 32"	64"	42"
40" x 48"	68 1/2"	57 1/2"
48" x 48"	71"	58 1/2"
32" x 40"	67 1/2"	49 1/2"
40" x 32"	68"	42"
40" x 48"	72"	57 1/2"
48" x 48"	74 1/2"	58 1/2"

OVERALL HEIGHT	MAXIMUM FORK HEIGHT	FORK HEIGHT W/O INCREASING OAH	STD. HI-LO TRIPLE	STD. HI-LO TRIPLE	STD. HI-LO TRIPLE	STD. HI-LO TRIPLE	STD. HI-LO TRIPLE	STD. HI-LO TRIPLE	STD. HI-LO TRIPLE
77"	118"	112"	117"	117 1/4"	57 1/4"	13"	138 1/4"	138 1/4"	191"
83"	130"	130"	130"	130 1/4"	63 1/4"	13"	150 1/4"	150 1/4"	209"
96"	154"	154"	222"	17 1/4"	75 1/4"	13"	174 1/4"	174 1/4"	242"

FOR LOAD CAPACITY ABOVE 1500 LBS. FROM UPRIGHT CONTACT FACTORY.
 *SUBTRACT 2 1/2" WHEN LOAD BACK REST IS USED.
 **ADD 2 1/2" WHEN LOAD BACK REST IS USED.

WIDTH BETWEEN CARRIAGE	MAX. FORK	WIDTH
27" THRU 31"	26"	30"
32" THRU 37"	31"	30"
38" THRU 50"	37"	36"

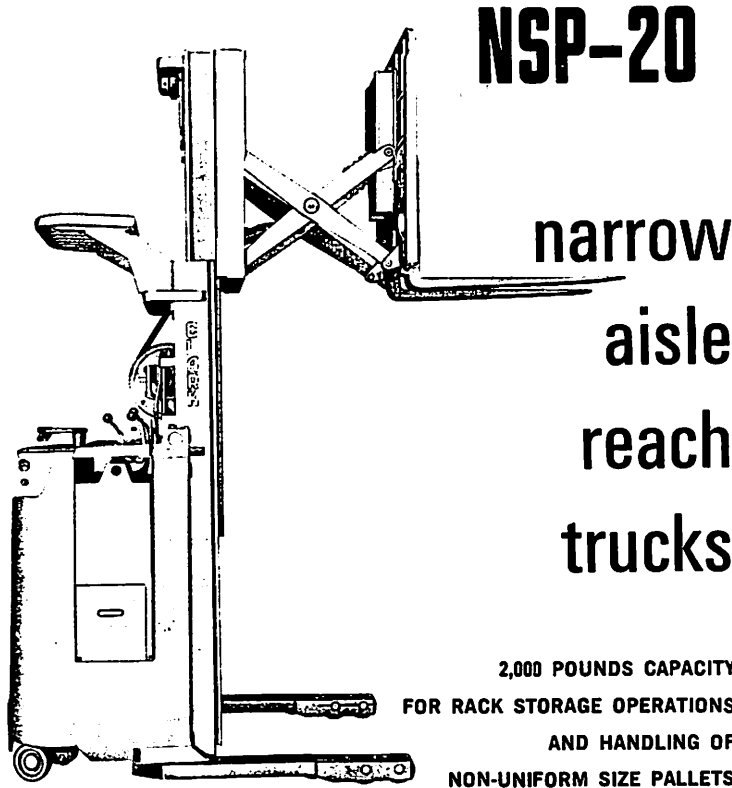
LOAD LENGTH	FORK LENGTH
30"	23 1/2"
30"	23 1/2"
37"	25 1/2"
43"	29 1/2"
49"	32 1/2"



BATTERY COMP. LENGTH	HEAD LENGTH	OUTRIGGER C	X	A	2 1/2"	2 1/2"	2 1/2"	2 1/2"
15.5	15.4	35 1/2"	18.8	17.1	15.4	15.5	16.9	39 1/2"
14.5	14.5	32 1/2"	17.1	15.4	15.5	15.0	16.9	37 1/2"
14.5	14.5	32 1/2"	17.1	15.4	15.5	15.0	16.9	37 1/2"

NOTE: Clark products and specifications are subject to improvements and changes without notice.
 On all CLARK literature, dimensional and performance specifications are checked for accuracy by the engineering department.





NSP-20

**narrow
aisle
reach
trucks**

**2,000 POUNDS CAPACITY
FOR RACK STORAGE OPERATIONS
AND HANDLING OF
NON-UNIFORM SIZE PALLETS**

Clark Narrow Aisle electric trucks transform space-wasting aisles into profitable storage area. Aisle widths can be cut nearly in half, permitting additional storage capacity of up to 30% or more.

The reach model described in the brochure adds versatility to every material handling operation. In racks where pallets are stored two deep, the pantograph reach will often permit "picking" the back pallet after the front pallet has been removed.

Load widths are not restricted by dimension between outriggers. Even wide loads can be picked up at floor level, and pulled back over the outriggers for transport.

The exclusive tilting upright offers advantages never before available on narrow aisle trucks. *Back tilt* cradles the load for security. Reduce spilled loads, and you reduce product damage and wasted time. *Forward tilt* permits chiseling under non-palleted loads on the floor. In addition, tilting the upright (rather than just the forks) means shorter head-length and increased maneuverability.

Reach, tilt, lift-lower, and travel controls are grouped for one-hand operation . . . driver performs several functions simultaneously.

Four speeds forward and reverse; precise control of all hydraulic operations through full-feathering valves; smooth braking; excellent visibility; unparalleled accessibility — all combine to increase driver efficiency and reduce operating costs.

In every way, Clark Narrow Aisle electric trucks save you money through greater productivity.

MODEL:
NSP20 2,000 pounds capacity
(Narrow Straddle Pantograph)

WEIGHT: With 1,200 lb. battery and
128" upright 4,800 lbs.

TIRES: Rear drive tire, non-direction
rubber 10½ x 6 x 5
Casters, dual, urethane 6 x 2
Tandem front load tires, urethane 4 x 2½
Optional load tires: 5 x 2½ urethane (tandem)
10 x 5 rubber (single)
10 x 5 urethane (single)

SPEEDS	Empty	2,000 lb. load
Travel Speeds	5.5 MPH (484 FPM)	5.1 MPH (448 FPM)
Lift Speed	50.0 FPM	36.0 FPM
Lowering Speed	80.0 FPM	60.0 FPM

POWER SUPPLY: 24-volt battery with adequate kilowatt-hour capacity. Standard battery compartment size 12¼" wide, 31½" high, 32¾" long. For other compartment sizes see dimensional specifications.

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large

contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstand mechanical abuse, are easily cleaned and resist cleaning solvents.

CONTROLS: Three levers, directional in operation, control:

1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 6° back, 0° forward is standard. 4° back and 2° forward, optional. (4° back and 2° forward is standard above 154" MFH.)
3. Fork reach and retract.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication, through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicator standard equipment.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control—no tilt drift. Lift, tilt and reach cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise reach and tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump, built into frame of ¾" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a 40-micron replaceable filter cap breather, (2) a 25-micron full flow filter in hydraulic line, (3) a 140-micron suction filter.

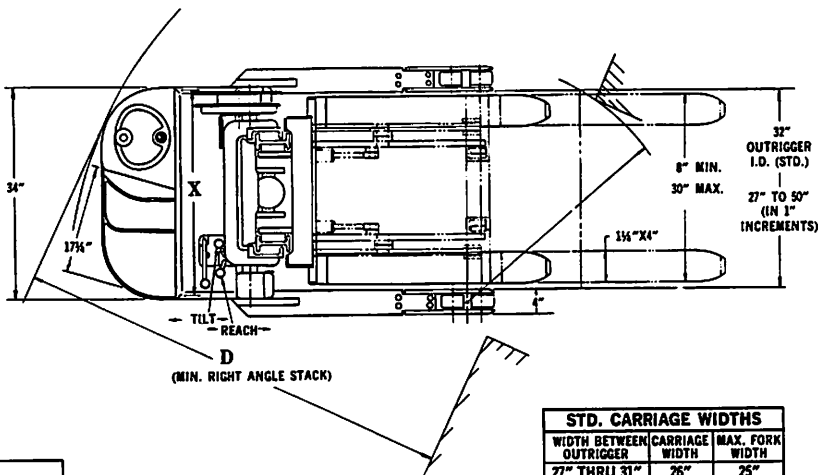
FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 8" to 30". Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; plexiglass finger guard, steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Standard color: yellow.

NSP-20 Specifications

RIGHT ANGLE STACKING AISLE*			
LOAD SIZE L W	CLEARANCE EACH SIDE	BATTERY COMPARTMENT DIM'S.	
		12½"	16½"
48" x 48"	3"	81½"	85½"
48" x 40"	3"	82½"	86½"
40" x 48"	3"	71½"	76½"
40" x 32"	3"	74"	78"
32" x 40"	3"	71"	75"

*ADD 6" FOR OPERATING CLEARANCE



STD. CARRIAGE WIDTHS		
WIDTH BETWEEN OUTRIGGER	CARRIAGE WIDTH	MAX. FORK WIDTH
27" THRU 31"	26"	25"
32" THRU 37"	31"	30"
38" THRU 50"	31" STD. 37" OPT.	30" STD. 36" OPT.

OVERALL HEIGHT LOWERED	UPRIGHT DIMENSION TABLE								
	MAXIMUM FORK HEIGHT*			FREE LIFT FORK HEIGHT W/O INCREASING GADH			OVERALL HEIGHT***		
	STD.	HI-LO	TRIPLE	STD.	HI-LO**	TRIPLE	STD.	HI-LO	TRIPLE
77"	116"	116"	169"	17"	40½"	13"	153½"	152½"	205½"
83"	128"	128"	187"	17"	46½"	13"	165½"	164½"	223½"
95"	152"	152"	220"	17"	58½"	13"	189½"	188½"	256½"

*FOR LOAD CAPACITY ABOVE 154" WITH UPRIGHT CONTACT FACTORY.
**SUBTRACT 11½" WHEN LOAD BACK REST IS USED.
***ADD 11½" WHEN LOAD BACK REST IS USED.

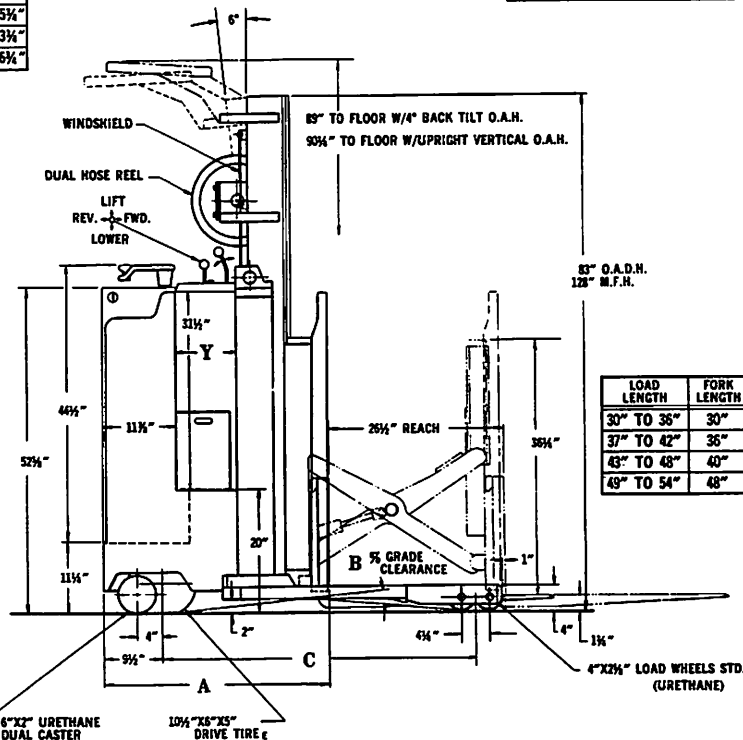
BASIC TRUCK VARIABLES						
BATTERY COMPT.		HEAD LENGTH	% GRADE CLEAR- ANCE	WHEEL BASE	STACK- ING AISLE	
Y	X	A	B	C	D	
STD. 12½"	32½"	38½"	15.6%	50½"	71"	
OPT. 37"	OPT. 37"					
OPT. 16½"	32½"	42½"	14.3%	53½"	75"	
OPT. 37"	OPT. 37"					

NOTE:
"X" INCREASES 1½" WITH 4" BACK & 2" FORWARD TILT.
"A" INCREASES 2" WITH TRIPLE UPRIGHT.

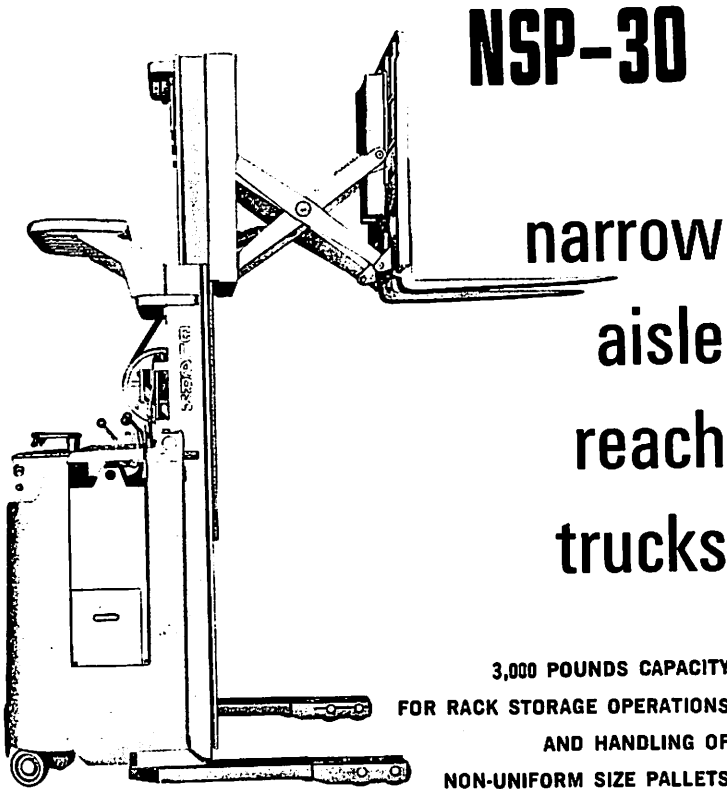


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LOAD LENGTH	FORK LENGTH
30" TO 35"	30"
37" TO 42"	36"
43" TO 48"	40"
49" TO 54"	48"



MODEL:
NSP30.....3,000 pounds capacity
(Narrow Straddle Pantograph)

WEIGHT: With 1,200 lb. battery and
128" upright.....4,840 lbs.

TIRES: Rear drive tire, non-direction
rubber.....10½ x 6 x 5
Casters, dual, urethane.....6 x 2
Tandem front load tires, urethane.....4 x 2½
Optional load tires: 5 x 2½ urethane (tandem)
10 x 5 rubber (single)
10 x 5 urethane (single)

SPEEDS	Empty	3,000 lb. load
Travel Speeds	5.5 MPH (484 FPM)	4.9 MPH (431 FPM)
Lift Speed	50.0 FPM	33.0 FPM
Lowering Speed	80.0 FPM	60.0 FPM

POWER SUPPLY: 24-volt battery with adequate kilowatt-hour capacity. Standard battery compartment size 12½" wide, 31½" high, 32½" long. For other compartment sizes see dimensional specifications.

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large

contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstand mechanical abuse, are easily cleaned and resist cleaning solvents.

CONTROLS: Three levers, directional in operation, control:

1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 6° back, 0° forward is standard. 4° back and 2° forward, optional. (4° back and 2° forward is standard above 154" MFH.)
3. Fork reach and retract.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication, through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicator standard equipment.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

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Load widths are not restricted by dimension between outriggers. Even wide loads can be picked up at floor level, and pulled back over the outriggers for transport.

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Reach, tilt, lift-lower, and travel controls are grouped for one-hand operation . . . driver performs several functions simultaneously.

Four speeds forward and reverse; precise control of all hydraulic operations through full-feathering valves; smooth braking; excellent visibility; unparalleled accessibility — all combine to increase driver efficiency and reduce operating costs.

In every way, Clark Narrow Aisle electric trucks save you money through greater productivity.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control—no tilt drift. Lift, tilt and reach cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise reach and tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump, built into frame of ¾" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a 40-micron replaceable filler cap breather, (2) a 25-micron full flow filter in hydraulic line, (3) a 140-micron suction filter.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 10" to 30". Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; plexiglass finger guard, steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Standard color: yellow.

NSP-30 Specifications



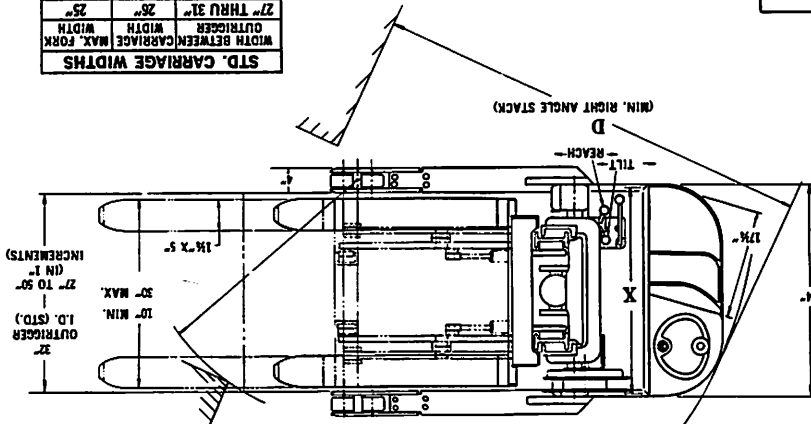
INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE



RIGHT ANGLE STACKING AISLE.

LOAD SIZE	L W	CLEARANCE EACH SIDE	
		BATTERY COMPARTMENT DIMS.	12 1/2"
48" x 48"	82"	3"	86"
48" x 40"	82 1/2"	3"	87"
40" x 48"	72 1/2"	3"	76 1/2"
40" x 32"	74 1/2"	3"	78 1/2"
32" x 40"	71"	3"	75"



STD. CARRIAGE WIDTHS

WIDTH BETWEEN OUTRIGGERS	CARRIAGE WIDTH	MAX. FORK WIDTH
38" THRU 50"	31"	37" OPT.
31" STD.	30"	30" STD.
32" THRU 37"	28"	32" STD.
27" THRU 31"	26"	30" OPT.

UPRIGHT DIMENSION TABLE

OVERALL HEIGHT	MAXIMUM FORK HEIGHT	FREE LIFT FORK HEIGHT W/O INCREASING ODN	STO. HI-LO TRIPLE	STO. HI-LO TRIPLE	STO. HI-LO TRIPLE	STO. HI-LO TRIPLE	STO. HI-LO TRIPLE	STO. HI-LO TRIPLE
95"	152"	152"	220"	17"	58 1/2"	13"	189 1/2"	188 1/2" - 256 1/2"
83"	128"	128"	187"	17"	46 1/2"	13"	165 1/2"	164 1/2" - 223 1/2"
77"	116"	116"	169"	17"	40 1/2"	13"	153 1/2"	152 1/2" - 205 1/2"

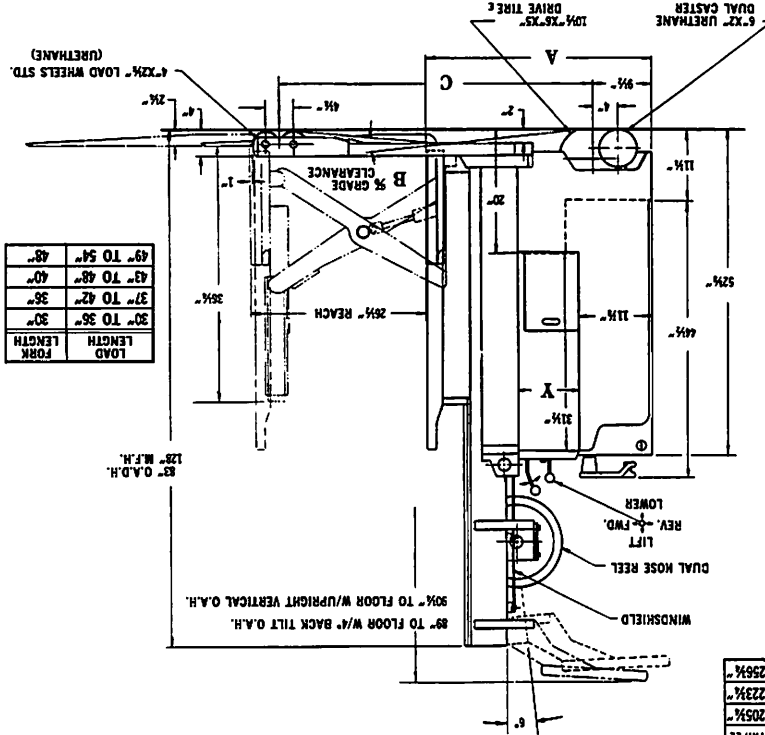
NOTE: LOAD CAPACITY ABOVE 154" MIN UPRIGHT CONTACT FACTORY. SUBTRACT 1 1/2" WHEN LOAD BACK REST IS USED. ADD 1 1/2" WHEN LOAD BACK REST IS USED.

BASIC TRUCK VARIABLES

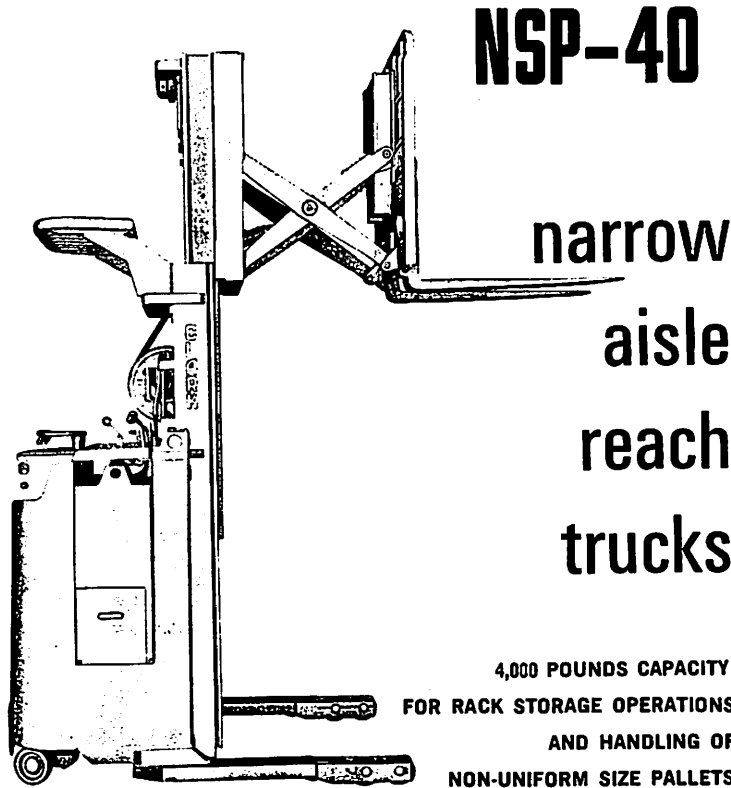
Y	X	A	B	C	D
BATTERY COMPT. LENGTH	32 1/2"	38 1/2"	38 1/2"	32 1/2"	32 1/2"
WHEEL BASE	50 1/2"	50 1/2"	50 1/2"	50 1/2"	50 1/2"
STACK. WHEEL ANGLE	15.6%	15.6%	15.6%	15.6%	15.6%
HEAD WHEEL ANGLE	32%	32%	32%	32%	32%
OPT. 37"	32%	32%	32%	32%	32%
OPT. 16 1/2"	14.3%	14.3%	14.3%	14.3%	14.3%



On all CLARK literature, dimensional and performance specifications are checked for accuracy by the engineering department. NOTE: Clark products and specifications are subject to improvements and changes without notice.



LOAD LENGTH	30" TO 36"	36"	37" TO 42"	40"	43" TO 54"
FORK	48"	48"	48"	48"	48"



NSP-40

**narrow
aisle
reach
trucks**

**4,000 POUNDS CAPACITY
FOR RACK STORAGE OPERATIONS
AND HANDLING OF
NON-UNIFORM SIZE PALLETS**

MODEL:
NSP40.....4,000 pounds capacity
(Narrow Straddle Pantograph)

WEIGHT: With 1,200 lb. battery and
125" upright.....5,400 lbs.

TIRES: Rear drive tire, non-direction
rubber.....10½ x 6 x 5
Casters, dual, urethane.....6 x 2
Single front load tires, urethane.....10 x 5
Optional load tires: 5 x 2½ urethane (tandem)

SPEEDS	Empty	4,000 lb. load
Travel Speeds	4.9 MPH (431 FPM)	4.1 MPH (360 FPM)
Lift Speed	42.0 FPM	24.0 FPM
Lowering Speed	80.0 FPM	60.0 FPM

POWER SUPPLY: 24-volt battery with adequate kilowatt-hour capacity. Standard battery compartment size 12½" wide, 31½" high, 36¾" long. For other compartment sizes see dimensional specifications.

BATTERY CONNECTORS: Anderson type SB, standard. Easily accessible for quick disconnect. Both halves identical and interchangeable — one half mounted on truck, other half attached to flexible battery lead.

MOTORS: Pump and drive motors are fan cooled and ventilated; series-parallel windings in motor fields. Large

contact-area brushes provide good commutation and long service life. Class "F" insulation protects motor windings against temperatures far in excess of those normal to motor, withstand mechanical abuse, are easily cleaned and resist cleaning solvents.

CONTROLS: Three levers, directional in operation, control:

1. Four speeds forward and reverse; also raises and lowers forks.
2. Upright tilt; 6° back, 0° forward is standard. 4° back and 2° forward, optional. (4° back and 2° forward is standard above 154" MFH.)
3. Fork reach and retract.

BRAKES: Five-inch diameter, 1½" wide brake drum mounted on drive motor shaft, with brake multiplication, through drive gear reduction. Radial fins on brake drum serve as fan to cool both brake drum and motor. Bonded linings eliminate rivet scoring.

STEERING: Chain reduction and anti-friction 6" radius hand wheel. Drive wheel position indicator standard equipment.

UPRIGHT: Nested telescopic roller type. "I" beam inner section is nested within outer channel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are laterally adjustable for wear to maintain new truck tolerances. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

Clark Narrow Aisle electric trucks transform space-wasting aisles into profitable storage area. Aisle widths can be cut nearly in half, permitting additional storage capacity of up to 30% or more.

The reach model described in the brochure adds versatility to every material handling operation. In racks where pallets are stored two deep, the pantograph reach will often permit "picking" the back pallet after the front pallet has been removed. Load widths are not restricted by dimension between outriggers. Even wide loads can be picked up at floor level, and pulled back over the outriggers for transport.

The exclusive tilting upright offers advantages never before available on narrow aisle trucks. *Back tilt* cradles the load for security. Reduce spilled loads, and you reduce product damage and wasted time. *Forward tilt* permits chiseling under non-palleted loads on the floor. In addition, tilting the upright (rather than just the forks) means shorter head-length and increased maneuverability.

Reach, tilt, lift-lower, and travel controls are grouped for one-hand operation . . . driver performs several functions simultaneously.

Four speeds forward and reverse; precise control of all hydraulic operations through full-feathering valves; smooth braking; excellent visibility; unparalleled accessibility — all combine to increase driver efficiency and reduce operating costs.

In every way, Clark Narrow Aisle electric trucks save you money through greater productivity.

LIFT AND TILT CYLINDERS: Tilt rod chrome plated. Tilt lock insures positive control—no tilt drift. Lift, tilt and reach cylinders have metal rod wipers to keep foreign material from wearing packings. Free-floating mounting of lift cylinder minimizes side strains. Modulating flow regulator in cylinder base reduces maximum lowering speed as weight of load increases.

HYDRAULIC SYSTEM: Tandem hydraulic pumps permit increased lift speeds and precise reach and tilt control. Full feathering balanced spool type valves for accurate load positioning. Built-in pressure relief valve protects system against overloads. Hydraulic sump, built into frame of ½" thick plate has 6.5 gal. capacity. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a 40-micron replaceable filler cap breather, (2) a 25-micron full flow filter in hydraulic line, (3) a 140-micron suction filter.

FORK CARRIAGE AND FORKS: Steel fork carriage of all-welded construction to withstand impacts. Lateral fork adjustments from 10° to 30°. Convenient snap-action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

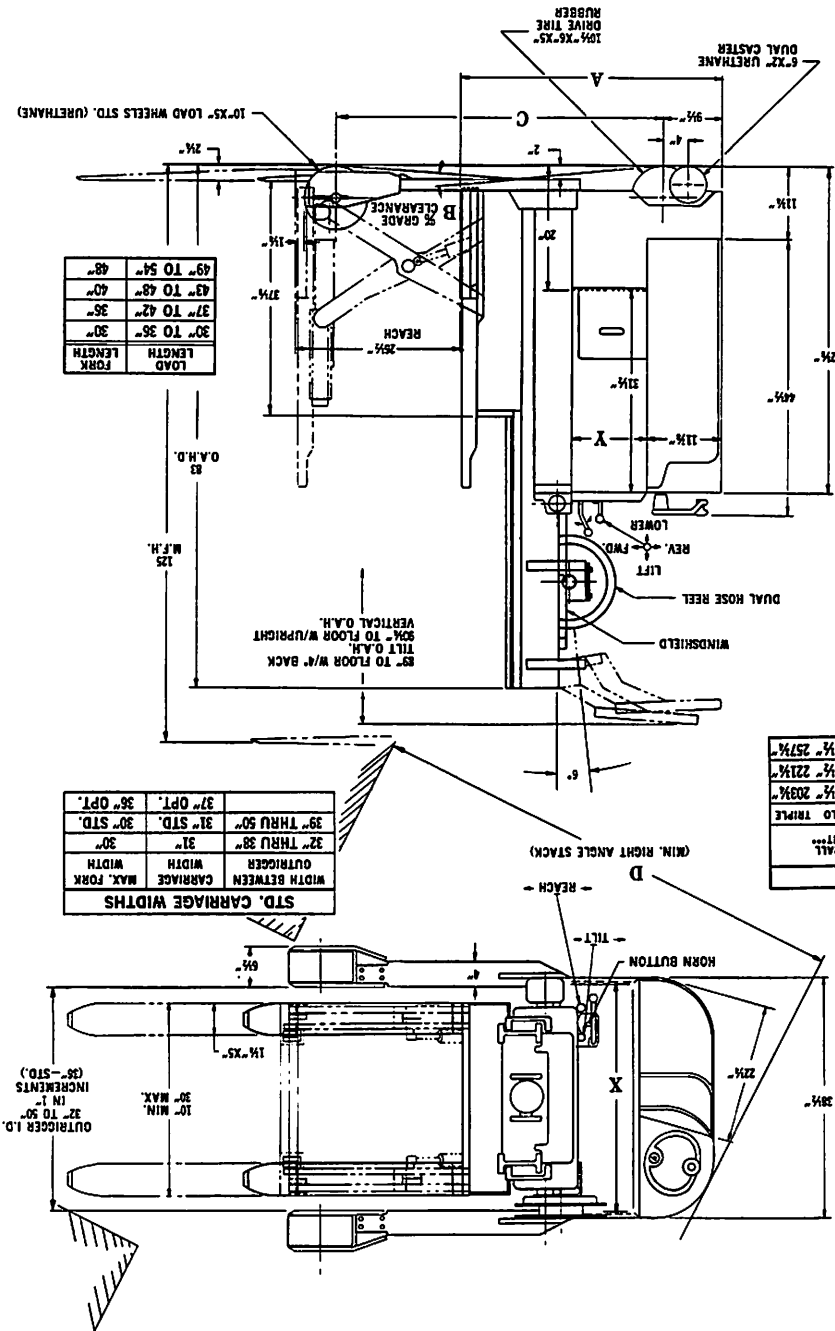
GENERAL: Ignition key lock to prevent unauthorized operation, electric horn, cushion floor mats and cushion compartment body pads; safety glass finger guard, steering knob, all standard equipment. All exposed surfaces shot blasted and prime painted with weather-resistant paint. Standard color: yellow.

NSP-40 Specifications



INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE



NOTE: Clark products and specifications are subject to improvements and changes without notice.
On all CLARK literature, dimensional and performance specifications are checked for accuracy by the engineering department.



NOTE:
-A- INCREASES 1" WITH TRIPLE UPRIGHT.
-B- INCREASES 2" WITH TRIPLE UPRIGHT.

BASIC TRUCK VARIABLES		Y	X	A	B	C	D
STACKING AISLE	WHEEL CLEARANCE	HEAD	WHEEL	BASE	ANGLE	LENGTH	BASE
OPT. 14%	36"	36"	46%	46%	13.1%	55%	79"
OPT. 16%	36"	36"	46%	13%	57%	80%	
STD. 12%	36"	42%	14%	52%	76%		

UPRIGHT DIMENSION TABLE		OVERALL HEIGHT	MAXIMUM FORK HEIGHT	FREE LIFT INCREASING OVER	STO. MI-LO TRIPLE	STO. MI-LO TRIPLE	STO. MI-LO TRIPLE	STO. MI-LO TRIPLE	STO. MI-LO TRIPLE
96"	149"	149"	20%	58"	15"	187"	186%	257%	
83"	125"	125"	20%	46"	15"	163"	162%	221%	
77"	113"	113"	20%	40"	15"	151"	150%	209%	

FOR LOAD CAPACITY ABOVE 1ST* REAR UPRIGHT CONTACT FACTORY.
*SUBTRACT 11" WHEN LOAD BACK REST IS USED.
**ADD 11" WHEN LOAD BACK REST IS USED.

STD. CARRIAGE WIDTHS		MAX. FORK WIDTH	CARRIAGE WIDTH	WIDTH BETWEEN OUTRIGGERS
37"	THRU 50"	31"	32" THRU 38"	31"
31"	OPT.	36"	OPT.	31"

RIGHT ANGLE STACKING AISLE		LOAD SIZE	L	W	CLEARANCE EACH SIDE	BATTERY COMPARTMENT DIM'S
48" X 48"	3"	3"	85"	90%	88%	14"
48" X 48"	3"	3"	81"	91%	89%	
40" X 48"	3"	3"	79%	81"	79"	
40" X 32"	3"	3"	78%	83"	81"	
32" X 40"	3"	3"	76%	80%	79"	

ADD 6" FOR OPERATOR'S REAR ANGLE



INDUSTRIAL TRUCK DIVISION



WORK SAFELY

DRIVE SAFELY

BE CAREFUL

**ALWAYS
GIVE MACHINE SERIAL NUMBER
WHEN ORDERING PARTS**

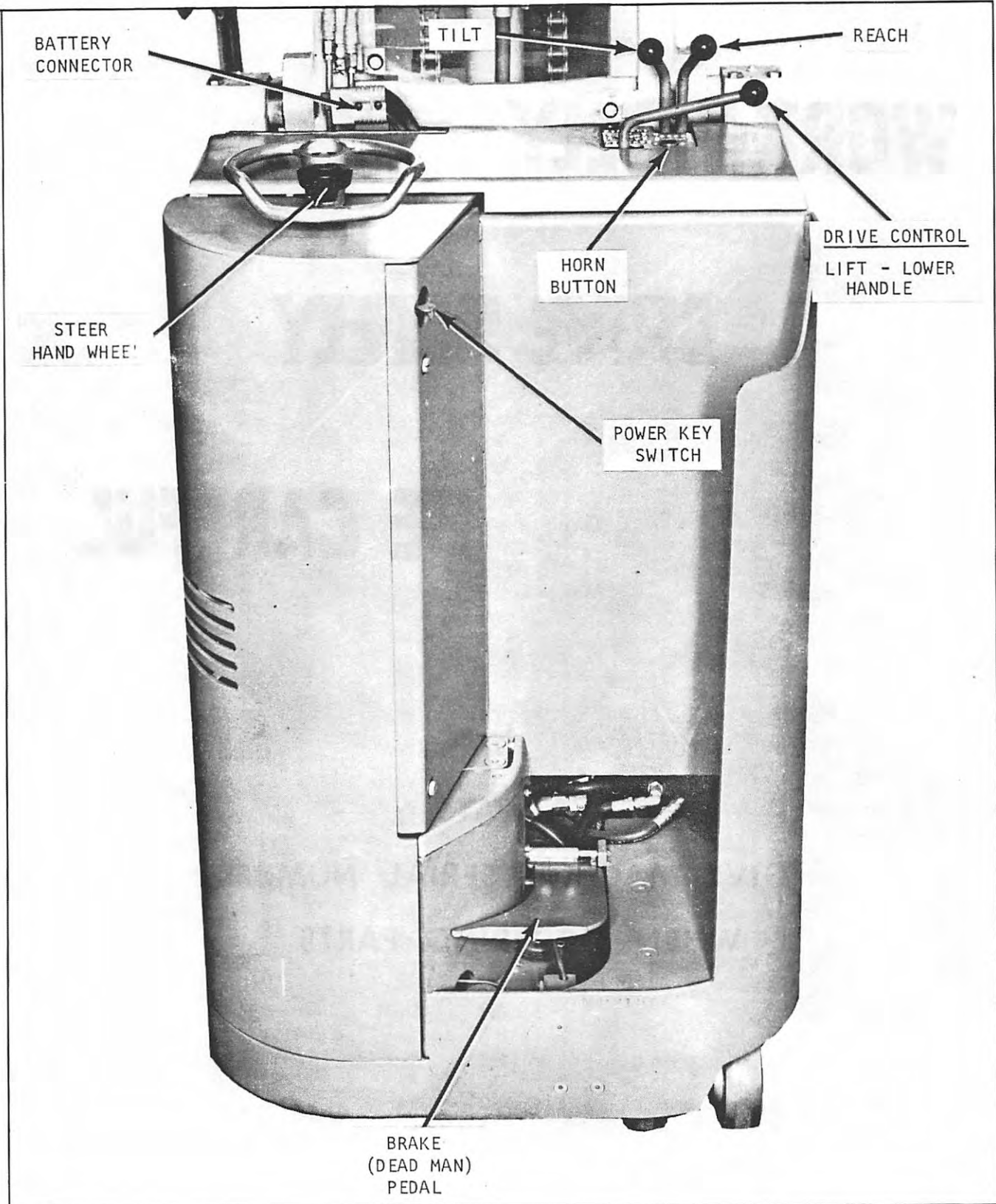


Plate 7510. Overall Controls

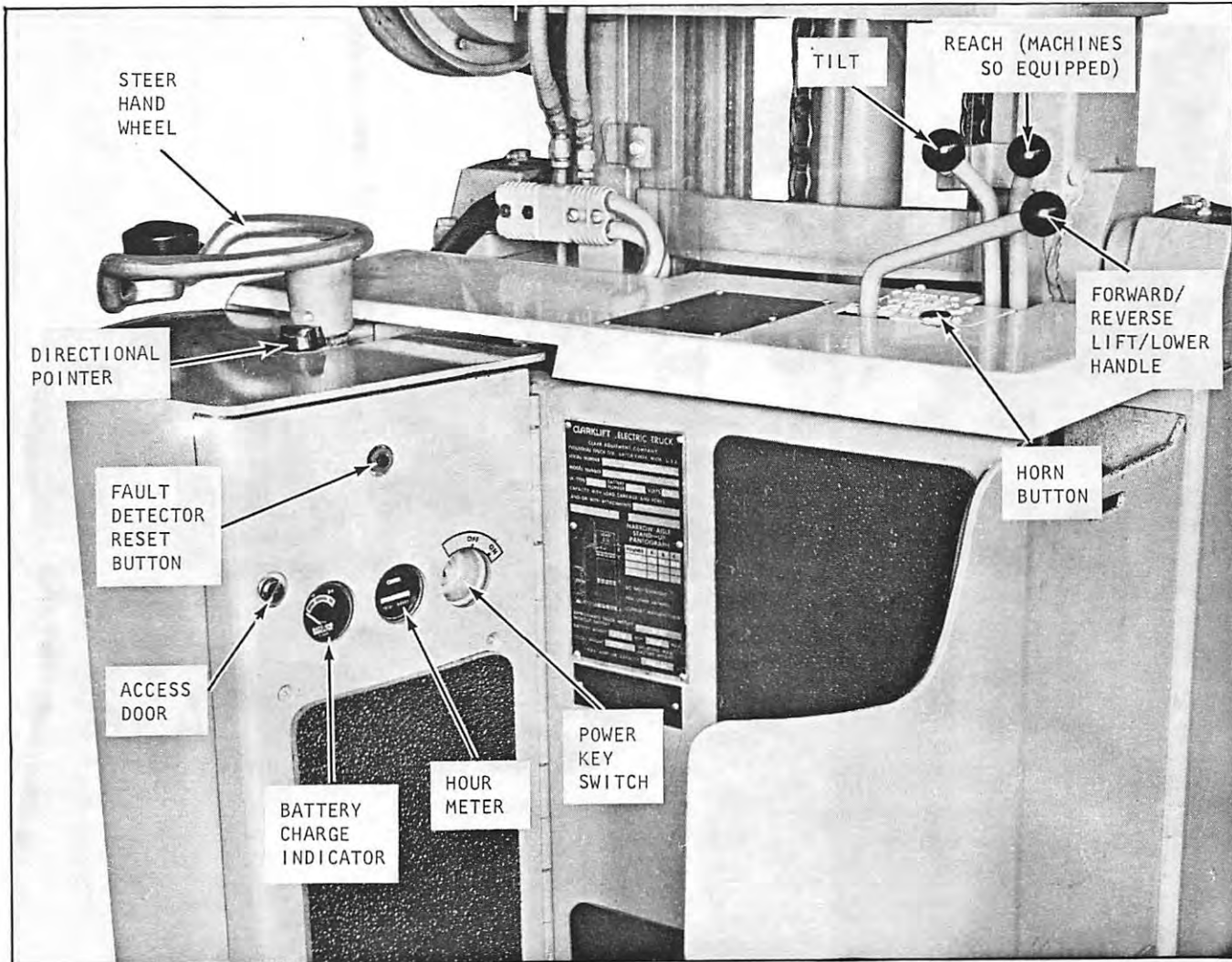


Plate 9460. Typical Overall Controls

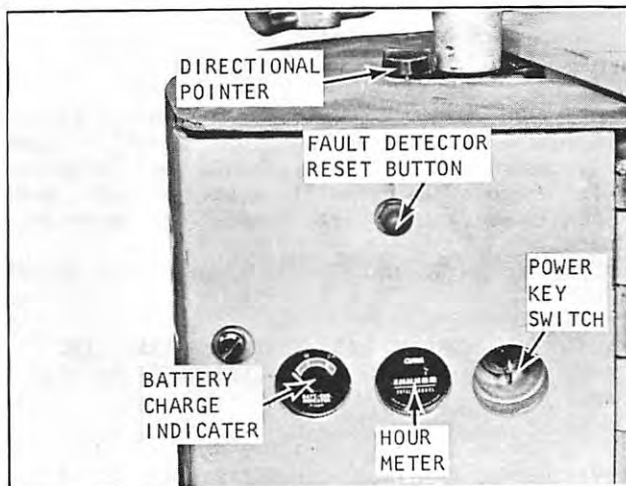
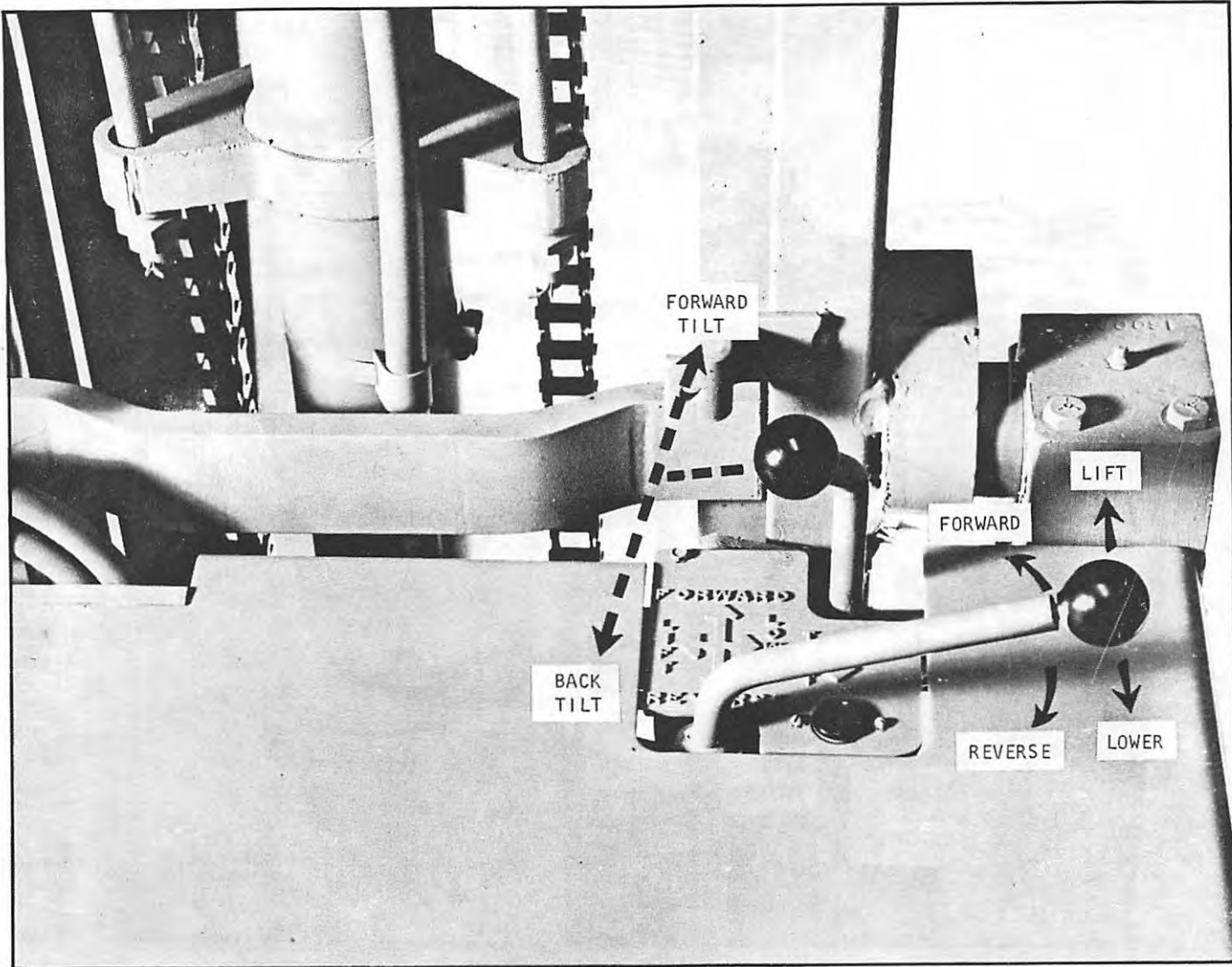


Plate 9461. Typical Instrument Locations

FAULT DETECTOR RESET BUTTON

The fault detector senses current overloads, shorts, etc. in the electrical drive system. When this occurs, the main source of electrical power is shut off by an open circuit. Should the machine stop during some operation, push on the reset button. If this doesn't close the circuit, report to the designated person in authority.



Controls
Plate 7511. Combination Drive and Lift-Lower Control Handle
Tilt Lever

BATTERY CONNECTOR: Connect battery to truck.

POWER SWITCH KEY: Turn key to ON position, and stand on brake (deadman) pedal.

COMBINATION DRIVE AND LIFT-LOWER CONTROL HANDLE: Move control handle forward to go forward and vice versa. The control handle operates an accelerating master control (switch) box that provides the same number of speeds for both forward and reverse. There are four individual speeds with time delay acceleration and plugging control.

The drive control handle also serves to raise and lower the upright lift carriage and load, see Plates 7510 and 7511.

NOTE: Do not hold hydraulic control levers in extreme actuated position after a load has reached its limit. A high oil pressure will result which will heat the oil and cause undesirable high operation temperatures.

CAUTION

AVOID OVERLOADING AS THIS SHORTENS THE LIFE OF THE TRUCK AND INCREASES MAINTENANCE.

WARNING

OVERLOADING A TRUCK COULD RESULT IN PERSONAL INJURY — REFER TO SPECIFICATIONS FOR MAXIMUM LOAD CAPACITIES.



Plate 7515. Battery Charge Indicator

With the key switch in the "on" position, the battery charge indicator will show the available battery voltage. When the indicator needle registers in the red portion of the indicator scale, the battery should be recharged. It is recommended that at this time a specific gravity test be taken with a hydrometer to more accurately determine battery condition.



Plate 7162. Hour Meter

The hour meter accurately records the actual hours of machine operation. This will serve as an aid in determining the time intervals for lubrication and preventive maintenance services.

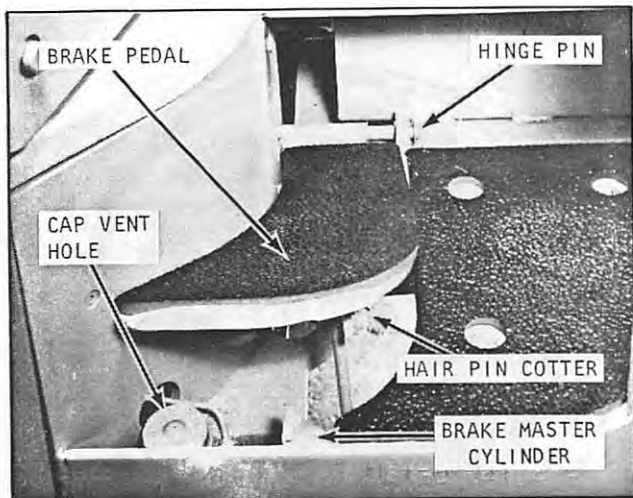


Plate 8264. Brake Pedal

BRAKE AND PARKING BRAKE: The brake pedal is located on the left side of the operator's compartment. The brake is designed to actuate as the brake pedal is released from the down position — driver steps off pedal. Partial brake applications (slowly releasing pedal) allows the driver to brake gradually.

Before the brake is applied, a deadman switch is actuated and all electrical power is shut off to the drive motor. It is impossible to operate the truck with the pedal in the UP position.

Although the brake is released by hydraulic pressure, it is spring-applied and therefore



Plate 7513. Steer Wheel with Directional Pointer

serves as a safe parking brake. **NOTE:** Always turn power key switch to the OFF position when leaving truck.

STEERING: A horizontal steering wheel (shown above) is connected to the steerable drive wheel by roller chains and sprockets thus providing approximately 180° steering.

A "directional pointer" located on the top side of the steer wheel (see above) indicates the direction in which the steer/drive wheel is facing.

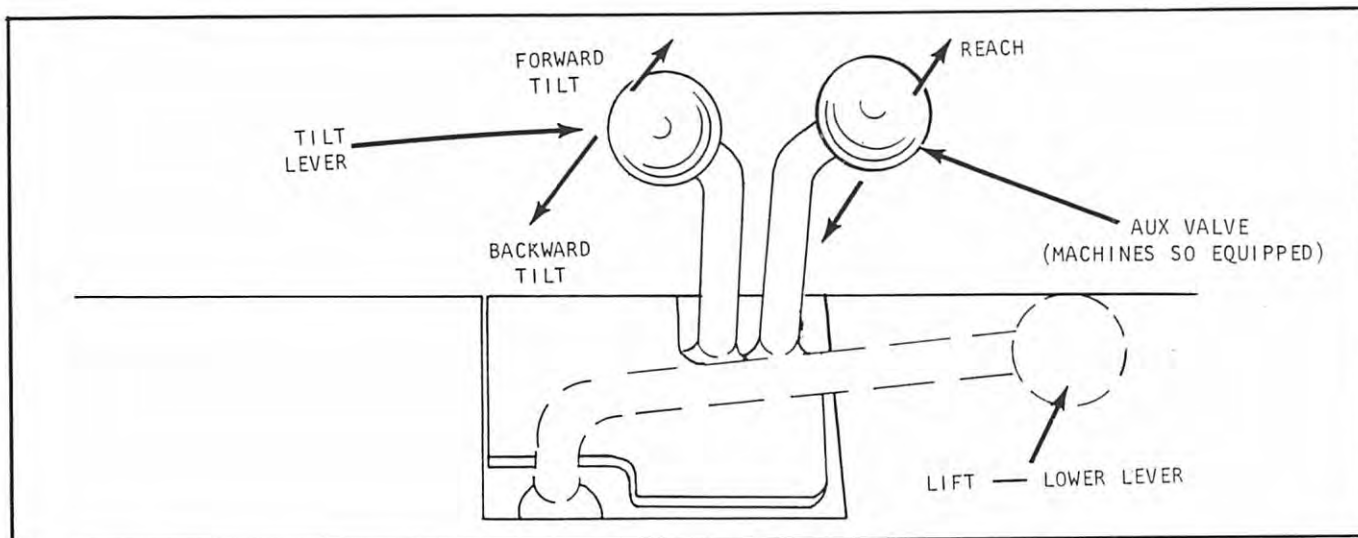


Plate 8280. Hydraulic Control Levers



INDUSTRIAL TRUCK DIVISION



OPERATIONS

To Move A Load.

The forks should be adjusted sidewise on the fork bars to obtain firm support and maximum balance of the load. Raise or lower the forks to the proper level and engage the load by driving forward. Tilt the upright backward sufficiently to adequately cradle the load, and raise load sufficiently to clear obstructions. Back away from stack.

The operator should have clear vision ahead when moving in a forward direction. When this is not possible, the operator should drive in reverse and turn in his seat to obtain clear vision backward.

When the load is to be deposited, enter the area squarely, especially when placing one load on top of another, in order that all piles will be square and secure. Place load directly over desired area and slowly lower into position. Disengage forks from the load by using necessary lift-tilt and then back away.

Loads will vary in size, shape, method of packaging, stacking procedures, etc. The best way to handle a load will depend on these factors. If in doubt, consult with your supervisor.

I M P O R T A N T

EVERY 8 OPERATING HOURS (OR EVERY SHIFT) ELEVATE UPRIGHT TO THE UPPER LIMIT. THIS WILL PROVIDE LUBRICATION TO THE TOP PORTION OF THE LIFT CYLINDER. CHECK FOR NORMAL SEQUENCE OF OPERATION.

OPERATING SAFETY RULES AND PRACTICES.

1. Operators of powered industrial trucks should be physically qualified. An examination should be made on an annual basis and include such things as field of vision, hearing, depth perception and reaction timing.

2. Only trained and authorized operators should be permitted to operate a powered industrial truck. Methods should be devised to train operators in the safe operation of powered industrial trucks. It is recommended that badges or other visual indication of the operator's authorization should be displayed at all times during work period.

GENERAL.

1. Safeguard the pedestrians at all times. Do not drive a truck up to anyone standing in front of a bench or other fixed object.

2. Do not allow anyone to stand or pass under the elevated portion of any truck, whether loaded or empty.

3. Unauthorized personnel should not be permitted to ride on powered industrial trucks. A safe place to ride should be provided where riding of trucks is authorized.

4. Do not put arms or legs between the uprights of the mast or outside the running lines of the truck.

5. When leaving a powered industrial truck unattended, load engaging means should be fully lowered, controls should be neutralized, power shut off, brakes set, key or connector plug removed. Block wheels if truck is parked on an incline.

6. Maintain a safe distance from the edge of ramps or platforms and do not, while on any elevated dock or platform, push freight cars. Do not use trucks for opening or closing freight doors.

7. Have brakes set and wheel blocks in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading. Fixed jacks may be necessary to support a semi-trailer during loading or unloading when the trailer is not coupled to a tractor. Check the flooring of trucks, trailers, and railroad cars for breaks and weakness before driving onto them.

8. Be sure of sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.

9. Use an Overhead Guard and Load Backrest Extension unless conditions prevent their use.

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x x x x x x x x x x x x x x x x x x x x x x x x x
x
x           W A R N I N G           x
x
x AN OVERHEAD GUARD IS INTENDED TO OFFER x
x PROTECTION FROM THE IMPACT OF SMALL x
x PACKAGES, BOXES, BAGGED MATERIAL, ETC., x
x REPRESENTATIVE OF THE JOB APPLICATION, x
x BUT NOT TO WITHSTAND THE IMPACT OF A x
x FALLING CAPACITY LOAD. x
x
x x x x x x x x x x x x x x x x x x x x x x x x x

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10. Use only approved industrial trucks in hazardous locations.



INDUSTRIAL TRUCK DIVISION



OPERATIONS

11. Elevate personnel only on an approved safety platform firmly secured to the lifting carriage and/or forks.

12. Report all accidents involving personnel, building structures, and equipment.

13. Fire aisles, access to stairways, and fire equipment should be kept clear.

TRAVELING.

1. Observe all traffic regulations including authorized plant speed limits. Under normal traffic conditions, keep to the right. Maintain a safe distance, approximately three truck lengths from the truck ahead, and keep the truck under control all times. Use of truck on public roads should conform to local traffic regulations.

2. Yield the right of way to ambulances, fire trucks, or other vehicles in emergency situations.

3. Do not pass another truck traveling in the same direction at intersections, blind spots, or at other dangerous locations.

4. Slow down and sound horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view travel with the load trailing.

5. Cross railroad tracks diagonally wherever possible. Do not park closer than 8 feet from center of railroad tracks.

6. Look in the direction of, and keep a clear view of the path of travel.

7. Ascend or descend grades slowly.

When ascending or descending grades in excess of 10%, loaded trucks should be driven with the load upgrade.

Unloaded trucks should be operated on all grades with the load engaging means downgrade.

On all grades the load and load engaging means should be tilted back if applicable, and raised only as far as necessary to clear the road surface.

8. Under all travel conditions the truck should be operated at a speed that will permit it to be brought to a stop in a safe manner.

9. Travel with load engaging means or load low and, where possible, tilted back. Do not elevate the load except during stacking.

10. Make starts, stops, turns or direction reversals in a smooth manner so as not to shift load and/or overturn the truck.

11. Stunt driving and horseplay should not be permitted.

12. Slow down for wet and slippery floors.

13. Before driving over a dockboard or bridgeplate, be sure that it is properly secured. Drive carefully and slowly across the dockboard or bridgeplate and never exceed its rated capacity.

14. Do not run vehicles onto any elevator unless specifically authorized to do so. Approach elevators slowly, and then enter squarely after the elevator car is properly leveled. Once on the elevator, neutralize the controls, shut off power, and set brakes. It is advisable that all personnel leave the elevator before a truck is allowed to enter or leave.

15. Avoid running over loose objects on the roadway surface.

LOADING.

1. Handle only stable or safely arranged loads. When handling off-center loads which cannot be centered, operate with caution.

2. Handle only loads within the rated capacity of the truck.

3. Adjust for long or high (including multiple tiered) loads which may affect capacity.

4. When attachments are used, particular care should be taken in securing, manipulating, positioning, and transporting the load. Operate trucks equipped with attachments as partially loaded trucks when not handling a load.

5. Place load engaging means under the load as far as possible and carefully tilt the mast backward to stabilize the load. Caution should be used in tilting backward with high or segmented loads.

6. Use extreme care when tilting load forward or backward particularly when high tiering. Do not tilt forward with load engaging means elevated except to pick up a load. Do not tilt an elevated load forward except when the load is in a deposit position over a rack or stack. When stacking or tiering use only enough backward tilt to stabilize the load.

OPERATOR CARE OF THE TRUCK.

1. Give special consideration to the proper functioning of tires, horn, lights, battery, controller, lift system (including load engaging means, chains, cable, and limit switches), brakes and steering mechanism. If at any time

OPERATOR CARE OF THE TRUCK (CONT.).

a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the matter should be reported immediately to the designated authority, and the truck should be taken out of service until it has been restored to safe operating condition.

2. Do not make repairs or adjustments unless specifically authorized to do so.

3. Do not use open flames for checking electrolyte level in storage batteries.

NOTE

The preceding is reproduced from:

American National Standard ... Safety Standard
for Powered Industrial Trucks. B56.1 - 1969



INDUSTRIAL TRUCK DIVISION



OPERATIONS

PREVENTIVE MAINTENANCE:

1. Arrange for systematic inspection and lubrication. See that the truck is properly lubricated and in good repair at all times. Refer to pertinent lubrication chart for lubrication instructions.
2. Avoid overloading the truck, as a safety measure against possible injury to the driver and fellow workmen. Overloading also shortens the life of the truck and increases maintenance. Refer to Name (Serial No.) Plate.
3. Take proper care of the battery. Check height of electrolyte solution daily. Never allow the water level to be below the top of the plates. When replacing evaporation, fill cells to proper level only -- overfilling causes loss of acid and reduces capacity. Use only water approved for battery use. Keep top of battery clean and dry at all times. A light coating of vaseline or a light cup grease on the battery terminals will help prevent corrosion. If terminals become corroded, wash off corrosion with a soda and water solution and rinse thoroughly. See that the battery is properly charged after each day or shift.
4. Wiring should be checked periodically to make certain all connections are tight and intact.
5. The hydraulic system should be checked periodically for worn hoses, loose fillings and/or leaks, and security of mountings.
6. A periodic check of the brake system should be made for lining wear. Proper brake adjustment should be maintained at all times.
7. Charging equipment should be carefully maintained. Maintenance, operation, and service of charging equipment should be carried out in accordance with the battery manufacturers instructions.

CHANGING AND CHARGING STORAGE BATTERIES:**N O T E**

The two types of batteries in common use are (1) lead and (2) nickel-iron. They contain corrosive chemical solutions, either acid or alkali, and therefore present a chemical hazard. On charge, they give off hydrogen and oxygen which, when mixed with air in certain concentrations, may be explosive. They are of relatively small bulk and great weight making handling a special consideration.

1. Battery charging installations should be located in areas designated for that purpose. Facilities should be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

2. When racks are used for support of batteries, they should be made of materials not conducive to spark generation or be coated or covered to achieve this objective.

Handling Batteries:

1. A conveyor, overhead hoist, or equivalent material handling equipment should be provided for handling batteries.

2. Chain hoists should be equipped with load-chain containers. When hand hoist is used, uncovered batteries should be covered with a sheet of plywood or other non-conducting material to prevent the hand chain from shorting on cell connectors or terminals. A properly insulated spreader bar should be used with any overhead hoist.

3. Reinstalled batteries should be properly positioned and secured in the truck.

4. A carboy tilter or siphon should be provided for handling electrolyte. Always pour acid into water; not water into acid. Personnel maintaining batteries should wear protective clothing such as face shield, long sleeves and gauntlet gloves.

5. Electrical installations should conform to the National Electrical Code (NEPA No. 70; USA Standard C1-1965) and any local ordinances.

6. Trained and authorized personnel should change or charge batteries.

7. Trucks should be properly positioned and brake applied before attempting to change or charge batteries.

8. When charging batteries, the vent caps

should be kept in place to avoid electrolyte spray. Care should be taken to assure that vent caps are functioning. The battery (or compartment) cover (s) should be open to dissipate heat.

9. Smoking should be prohibited in the charging area.

10. Precautions should be taken to prevent open flames, sparks, or electric arcs in battery charging areas.

11. Tools and other metallic objects should be kept away from the top of uncovered batteries.



INDUSTRIAL TRUCK DIVISION



DEALER CHECK-OUT SHEET NS/NSP/NST

** General Electric - Solid State Control

Truck Serial No. _____ DATE _____

Power Wiring:

1. Battery voltage: (no load) _____ SP. GR. _____
2. Battery polarity checked? _____
3. Positive lead to 1FU checked? _____
4. Negative lead to PS2 checked? _____
5. Ground tests: (+) to frame _____ (-) to frame _____

Control Wiring: (Battery Disconnected)

6. Term's 2 (+) to 13 (-) (all switches open) _____ (Res.)
7. Term's 2 (+) to 13 (-) (deadman, key, Fwd. closed) _____ (Res.)
Rev. closed) _____ (Res.)

Accelerator Wiring: (Battery Disconnected)

8. Term's 13 to 29 (when fwd. or rev. switch operates) _____ (Res.)
9. Term's 13 to 29 (when "1A" switch operates) _____ (Res.)

Performance: (Battery Connected)

10. Fwd., Rev., 1A Contactors - Contactors and Interlocks checked? _____
11. Inching frequency checked? _____ (FPM)
(or RPM)
12. Maximum speed voltage (Cables (+) to T2 on SCR panel at 60-70 amps) _____ (Volts)
13. Current limit reading _____ (Amps)

Operation:

14. Plugging distance _____ (Feet)

Mechanic _____ Hr. Meter Reading _____

SERVICE RECORDER:

The service recorder records number of productive lifts in addition to busy and idle time of each truck. The records are made on a 6-inch diameter chart, revolving once. This model records the raising or lowering of a predetermined load. The limits generally are between 5% of the truck's capacity and a full load. Minimums may be established, and the chart will show only those lifts of the minimum weight or greater. Selective load records are made by using an adjustable pressure switch. This switch fits into the hydraulic system between the lift control and the cylinder. It is sensitive to system pressure changes but insensitive to surges or vibration. Switch setting can be adjusted externally and then sealed. The load recording stylus is always in contact with the chart. When the predetermined load or more is lifted, an electrical circuit is closed and this stylus is lifted up, making a record. A surge dampener is recommended particularly when lift trucks are in service where rough or uneven floors occur.

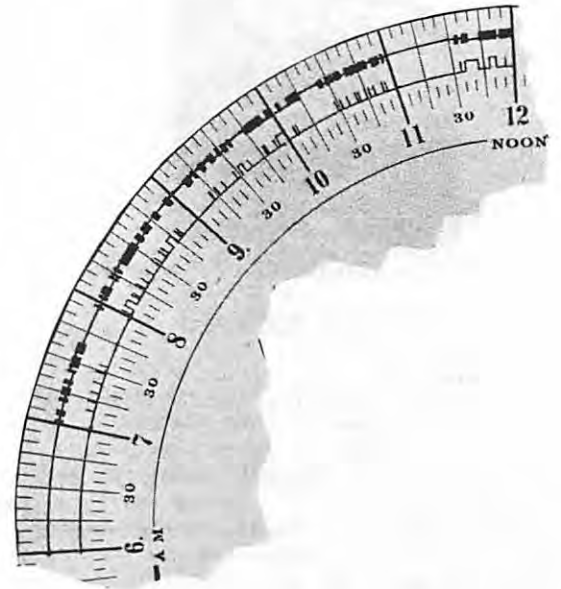


Plate 10161. Service Recorder Chart

HOW TO OPERATE SERVICE RECORDERS

Wind the Clock Movement: No key is needed. Turn the star-shaped winding disc clockwise until the movement is wound fairly tight. Do not overwind. It is a good practice to wind the clock each time a chart is changed even if it is not run down.



Plate 10164

Place Chart in the Recorder: Snap up the two finger-like clamps. Slip the chart down over the now vertical clamps to the face of the winding disc.



Plate 10165

To Set the Chart: Before clamping it down, turn the chart so that the place on it that corresponds to the present time of the day is at the little white spot on rim of Recorder case. If this is not done correctly, the recorder will be "that much off" all day.



Plate 10166

Fasten the Chart in Place By snapping down the two clamping fingers. Now close and lock the Recorder and it is ready to operate for its full cycle, the length of time depending on the model and clock speed.



Plate 10167

HOW TO READ THE CHART:

This section of chart shows a typical record. The wide marks in the outer record band show when the truck was in motion. The fine line shows down time.

Inner record band shows lifts. Load recording stylus normally rests at lower or inner position. When activated by pressure switch, it is moved outward to record each lift.



Plate 10162. Service Recorder Chart

When the key is turned to lock or unlock the Recorder, the stylus makes a round dot at the exact time of locking or unlocking. The mark appears on the face of the chart, and it is also embossed on the back. It is unmistakable.

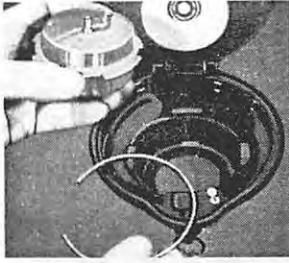


Plate 10163. Clock Exchange

HOW TO EXCHANGE CLOCK MOVEMENTS:

A clock movement is inherently a delicate mechanism that should receive reasonably good care. We have tried to make the clocks in Servis Recorder as rugged as possible to withstand the rough use they sometimes get. If the clock should fail, it can be easily lifted out and mailed in for repair or replacement. Merely unscrew the winding disc by turning it counter-clockwise and pry out wire retaining ring.

To replace the clock movement, first notice that one of the four retaining lugs in the Recorder case is wider than the rest. Match this wide space in movement top and settle movement into place. Then force wire retaining ring into place securely under lugs.

It is a good policy to have a spare clock movement in stock to insure uninterrupted service. Extra clocks are inexpensive.



INDUSTRIAL TRUCK DIVISION



I N D E X

DESCRIPTION	TIME INTERVAL (H-HOURS)	PAGE NUMBER (000-)	
Battery charge indicator	8H	273	8 HOUR
Battery service		473	
Battery, removal/installation		479	
Brake switch check		375	
Hour meter		273	
Hydraulic sump tank level check		503	
Brake check	100H	302	100 HOUR
Brake pedal check		302	
Drive control check		185	
Contactors		673	
Hydraulic control valve and lines		403	
Hydraulic sump tank breather		503	
Hydraulic sump tank filter		503	
Lift and tilt switches		473	
Lift carriage (Pantograph), inspect		403	
Lift chain(s), check and adjust		403	
Lift, reach and tilt cylinders, check		403	
Lubrication chart(s)		772	PAPER COLOR -- BLUE
Lubrication specifications, recommendations, key	867-L thru 881-L		PAPER COLOR -- BLUE
Service/Parking brake, check and adjust		306	



INDUSTRIAL TRUCK DIVISION



Caster adjustment	500H	473	500 HOUR
Sump tank breather, check		174	
Sump tank filter, check		174	
Sump tank, drain and refill		174	
Brake, bleeding procedure	1000H	912	1000 HOUR
Drive motor brush spring tension check		674	
Drive motor, inspect		673	
Hydraulic system flow and pressure checks		1573	
Pump drive motor brush spring tension check		774	
Pump drive motor inspect		773	

TROUBLE SHOOTING

UPRIGHT - "B" MODEL UPRIGHTS	1000H	----	PAPER COLOR -- PINK
UPRIGHT - "C" MODEL UPRIGHTS	1000H	----	YELLOW PAPER
SOLID STATE CONTROL	17.7500	----	GREEN PAPER

HYDRAULIC CIRCUIT DIAGRAM TSH001

ELECTRICAL WIRING DIAGRAM & SCHEMATIC FOLD-OUT PAGE (IN REAR OF MANUAL)

NOTE

WHEN PERFORMING THE 100, 500, or 1000 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE, ALWAYS INCLUDE THE PREVIOUS LUBRICATION AND PREVENTIVE SCHEDULES.



INDUSTRIAL TRUCK DIVISION



WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS

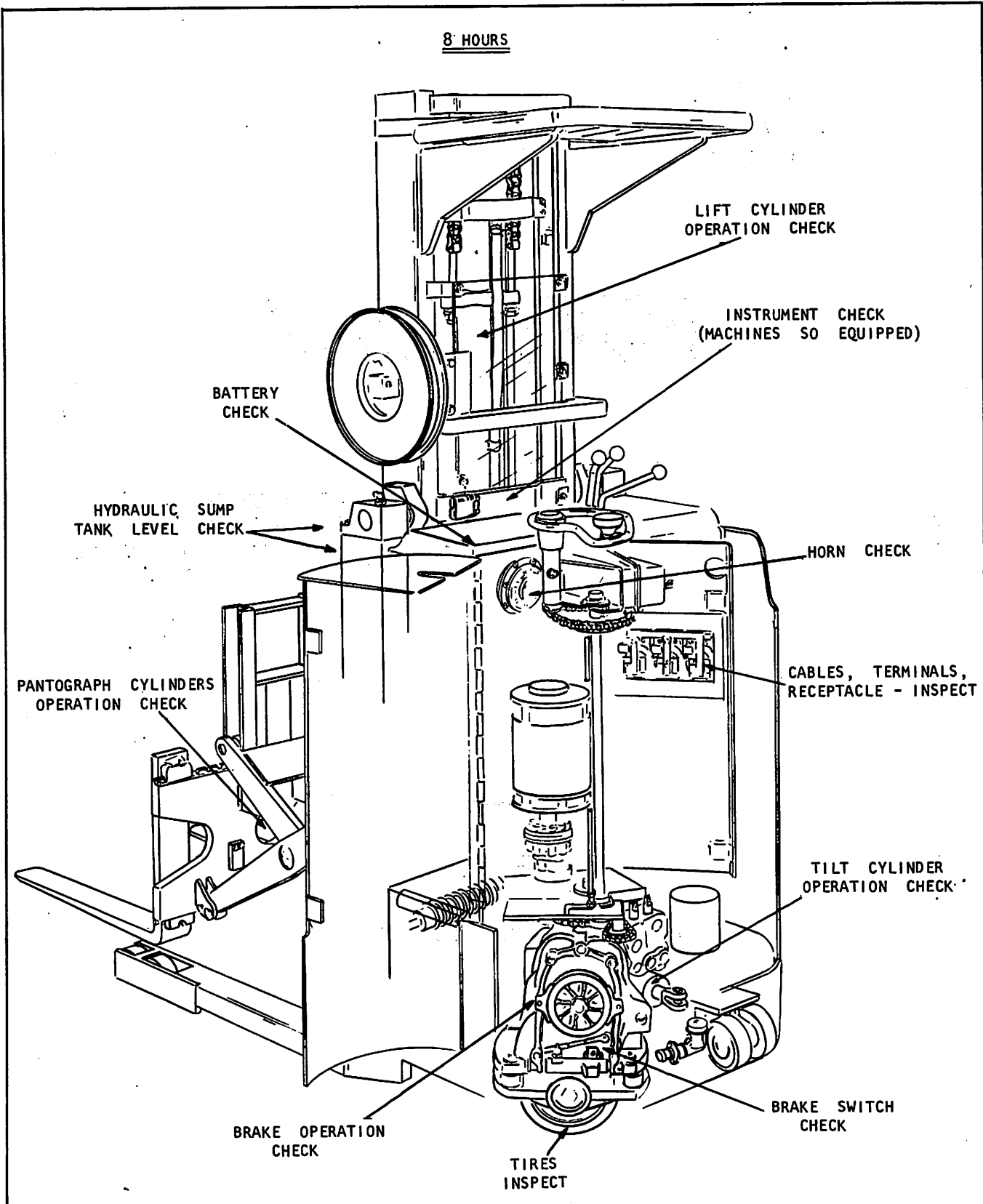


Plate 7521. Lubrication & Preventive Maintenance Illustration



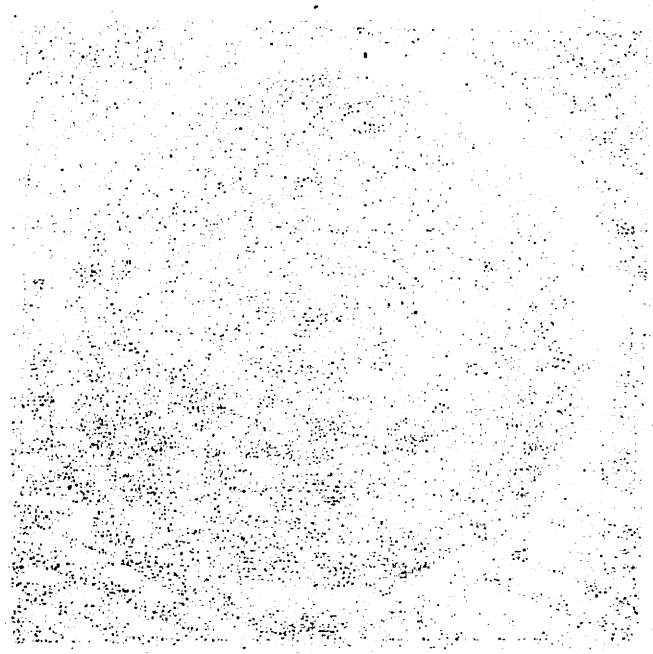
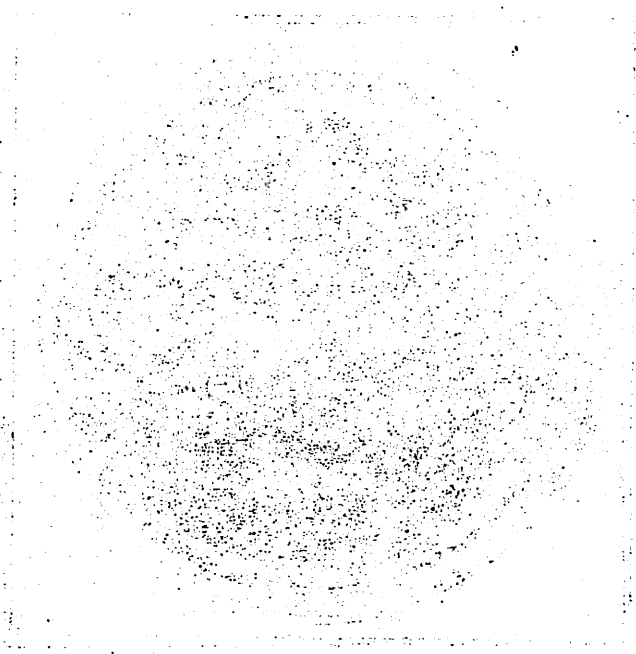
Plate 7515. Battery Charge Indicator

With the key switch in the "on" position, the battery charge indicator will show the available battery voltage. When the indicator needle registers in the red portion of the indicator scale, the battery should be recharged. It is recommended that at this time a specific gravity test be taken with a hydrometer to more accurately determine battery condition.



Plate 7162. Hour Meter

The hour meter accurately records the actual hours of machine operation. This will serve as an aid in determining the time intervals for lubrication and preventive Maintenance services.



1. The first part of the document discusses the importance of maintaining accurate records of all activities. It emphasizes the need for thoroughness and attention to detail in the collection and analysis of information.

2. The second part of the document describes the various methods used to gather intelligence, including human sources, technical surveillance, and open source information. It also discusses the challenges associated with each of these methods and the need for constant vigilance and adaptation to changing circumstances.



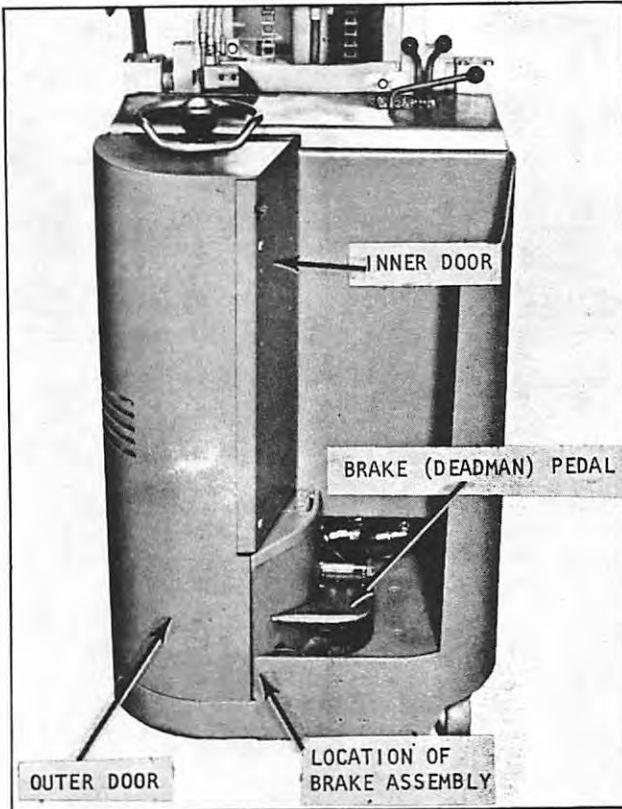


Plate 7535. Location of Brake Assembly

**BRAKE (DEADMAN) SWITCH
ADJUSTMENT CHECKS**

1. Turn key switch off.
2. Open both inner and outer doors.
3. Rotate steer hand wheel so the brake assembly is visible from rear of truck.
4. Depress and then release brake pedal. Brake switch should open (actuate) before R.H. brake shoe contacts brake drum.

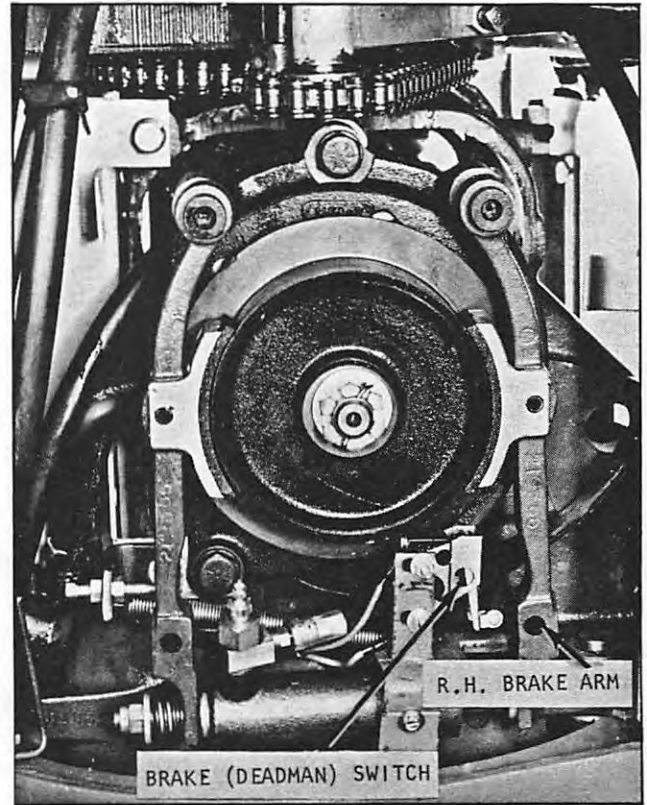


Plate 7536. Brake (Deadman) Switch Adjustment

As the driver releases pedal from the down position, which should contact brake arm and actuate just before the brake shoe (located on the switch side) contacts brake drum. If an adjustment is necessary, refer to page 100H 303.

Brake switch adjustment is important. The switch must actuate, cut electrical current to the drive motor, before the brake shoes touch brake drum. If correct adjustment is not maintained, lining wear will increase, heating of the drive motor will result as the motor is trying to operate against the brake.

THESE ARE THE RESULTS OF THE TESTS
CONDUCTED ON THE SAMPLES OF
MATERIALS SUBMITTED TO THE
LABORATORY FOR ANALYSIS.

THE RESULTS OF THE TESTS
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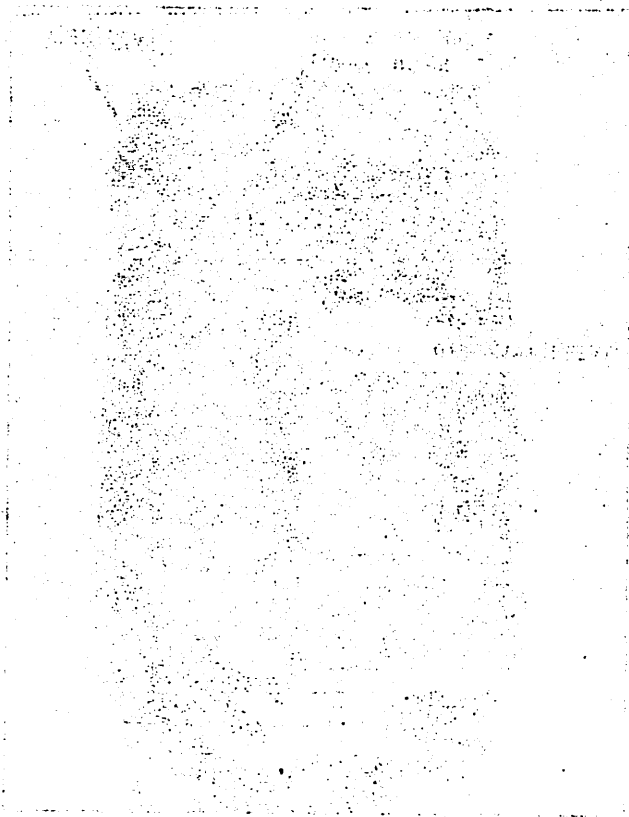
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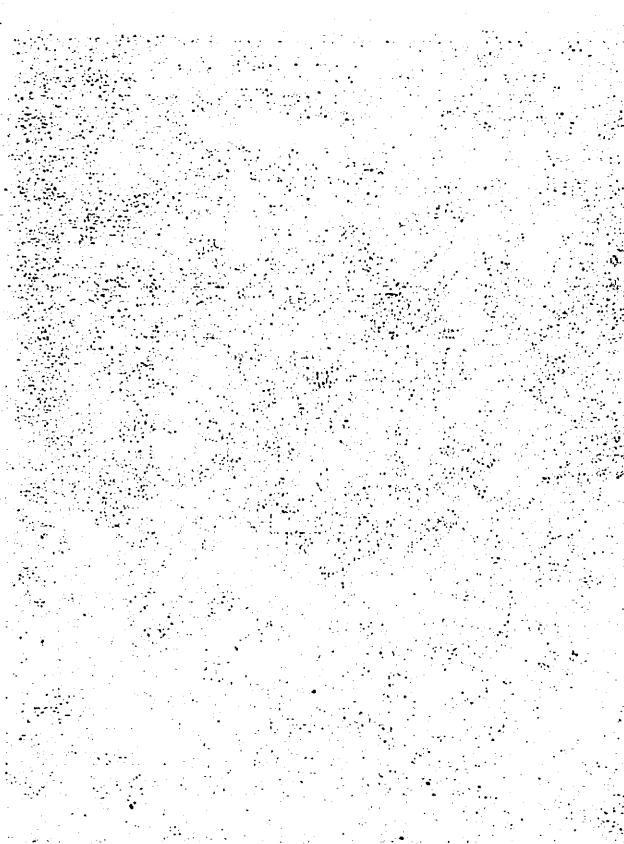
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LABORATORY FOR ANALYSIS.

BATTERIES - LEAD-ACID

The lead-acid battery has a lead peroxide positive plate, a sponge lead negative plate, and the electrolyte is a solution of sulphuric acid.

The battery does not store electricity. When the battery is connected to an electrical circuit, a chemical reaction starts inside the battery. This chemical action produces lead sulphate on both the positive and negative plates, and the chemical actions produces the electric current through the electrical circuit. This action continues only as long as the circuit is complete from negative pole to the positive pole. As the battery plates become coated with lead sulphate the voltage output of the battery decreases. When both the positive and negative plates have become thoroughly coated with lead sulphate, both plates act alike (or like similar metals). This causes the current to stop flowing.

When the point is reached where the battery is discharged, the battery must be charged. Charging is accomplished by connecting the battery to a direct current source in such a manner that the electricity flows through the battery in the opposite direction of the normal battery current.

BATTERY LIFE

Economical and efficient operation of the electric fork lift truck depends, to a great extent, upon the efficiency and life of the battery.

During the operation of the fork lift truck, many things occur which, if not corrected or prevented, can greatly reduce the life of the battery.

The operator should be acquainted with the limits, capacities and capabilities of his truck. He should know the correct point of power to use to move all loads up to the rated capacity of the truck.

Batteries are rated in ampere hours over a set period of time, and should be of a proper size for the particular work intended. Extending the work means over-discharging the battery. This will greatly shorten its life. Overcharging the battery by using too high a rate of charge, will cause it to gas vigorously after it has reached its fully charged state and will also shorten its life.

If service requirements demand only partial discharge of the battery, it is unnecessary to recharge following each partial discharge. When the hydrometer reading indicates the battery is 75% discharged, (approximately 1130 specific gravity) arrangements should be made to recharge.

Controlling the "charge" and "discharge" of the battery is a very important contributing factor in determining battery life.

The discharge of a battery can be controlled in several ways.

Batteries are rated according to the job for which they are being used. A fully charged battery is capable of doing a certain amount of work or lasting a certain length of time in a specific service. With information of this type, a schedule or duty cycle can be worked out and the batteries can be changed or serviced with very few failures.

Experienced operators can tell from the action of the truck, when the battery is reaching the point where it should be charged or changed. Prompt action in seeing that the battery is serviced at this time can result in longer battery life.

Several "meters" or "indicators" are available for use on battery powered trucks. These indicators show the operator the state of charge of the battery, how much useful power is left in the battery, or just simply warns the operator when the battery should be charged.

MAINTENANCE

Keep the "tops" of the battery clean and dry at all times. Normally wiping the top of the battery with a damp cloth is sufficient. If the battery is removed from the truck, it can be hosed off with clean water. If electrolyte is spilled, it will not dry off. Neutralize the acid with a solution of ordinary "bicarbonate of soda" and rinse thoroughly with clean water.

A light coating of vasoline or a light cup grease on the terminals will help prevent corrosion. If the terminals have become corroded, wash off the corrosion with a soda solution and rinse thoroughly.

The vent plugs should be in place at all times when using, cleaning, and charging the battery. They should be cleaned weekly by immersing in a bucket of clean water for one half hour. Check the vent holes in the vent plugs and clean out.

The vent holes must be open to allow gas to escape from the cell.

The batteries should be numbered and assigned to a given truck. A record should be kept of (1) daily hydrometer reading on a pilot cell at the beginning of each charging, (2) a weekly reading of the pilot cell after charge, and (3) a hydrometer reading of all cells and temperature of one cell each "4" months before and after charging. When battery shows nonuniformity of these readings and an inability to work through a shift, it is an indication that replacement is necessary.

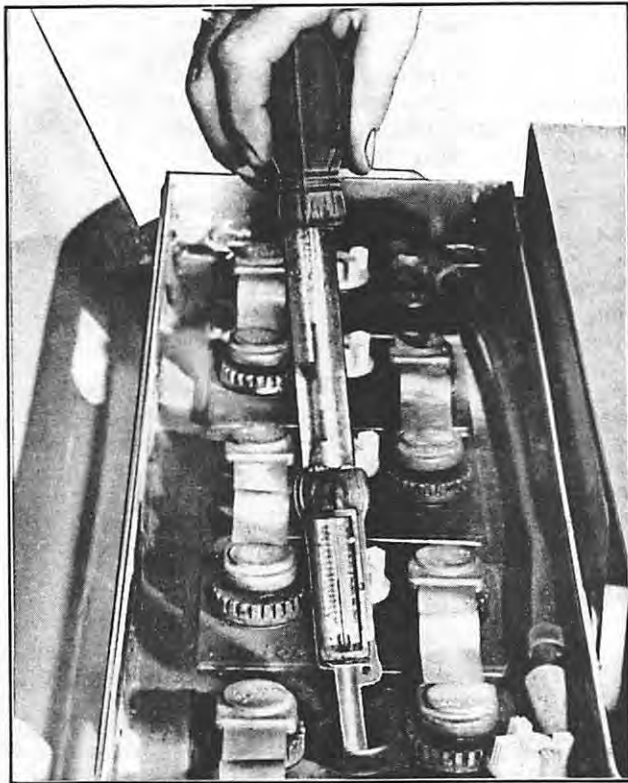


Plate 4018. Hydrometer Check Method

TWO-RATE CHARGING

"Two-Rate" charge, as the name implies, consists of two average rates. A "high" rate is provided at the beginning of the charge, while, toward the end of the charge, this is automatically changed to a "low" rate. (In actual operation, both high and low-rate is obtained in modern charging equipment by the use of a voltage relay in a rate charging circuit). When the battery cell voltage rises to approximately 2.37 volts per cell, at

77° F., the voltage relay automatically lowers the charging rate. The same voltage relay operating with a time switch can also be used to stop the charge automatically.

"Two-Rate" charging is generally used with rectifiers, although it is also used with a generator when the voltage is too high for the taper charge. For dependable, day-in and day-out repeat performance, the quality of the voltage relay and time switch is important.

TAPER-CHARGING

The "Taper" charge (Modified constant potential) is obtained inherently (a natural characteristic) in a circuit design by balancing the charging source against the battery voltage rise during charge. As the battery voltage rises, it approaches the value of the charging source and hence, there is less difference between the charging source and battery voltage. As a consequence, the flow of charging current will taper off in value opposite to the way the battery voltage rises.

"Taper" charge requires a close tolerance (plus or minus 3%) of charging source voltage (2.63 times the number of cells) when more than one charge circuit is on the same machine. A single circuit taper charge does not need this close voltage limit as the inherent taper is obtained as a natural part of the shunt generator load characteristic.

However, taper charge circuits are specifically designed for a definite number of cells, in the battery, to achieve the inherent taper. The only duty performed by a voltage relay time switch control, on the taper circuit, is to stop the charge.

NICKEL-IRON-ALKALINE STORAGE BATTERIES

The alkaline storage battery is known as the "nickel-iron-alkaline type" because nickel oxide is used in the positive elements, and iron in the negative elements; while the electrolyte is an alkaline solution containing potash and lithia.

TYPE AND SERIES

Each cell bears a distinguishing type letter and size number plainly stamped upon the cover. A serial number, just under the type letter and size number combination, denotes date of manufacture. All cells having the same type letter are similar in operating characteristics and



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

are made from the same class of plates and size. Therefore, the capacity of the cell simply varies with the number of plates. The "size number" indicates the number of positive plates. The total number of positive and negative plates is one more than twice the size number.

INSPECTION ON RECEIPT

Alkaline batteries are shipped in either a "charged" or "discharge" condition. The cells shipped charged, are intended for service within a short time without further charging. If the cells are not put into service within a month, it will be found advisable to charge one or two hours before using.

A red label, included with the battery in each shipment, indicates that the cells are charged ready for immediate use on receipt.

A green label, indicates that the cells are in a discharged condition and must be given an extra charging time as specified by the manufacturer.

Upon receipt of the battery, inspect each cell for solution height. Use a glass tube for this purpose. DO NOT use a match or other open flame for inspection.

If electrolyte has been spilled, if plate tops are visible above the surface of the solution, or if the inside of packing case, etc., shows yellowish stains. The loss must be replaced; preferably with Refill Alkaline Storage Battery Solution, or lacking this, with RENEWAL Solution diluted to a specific gravity of 1.215 by the addition of distilled water. The proper height of solution above plate tops is as follows: Cell type is stamped on the cover of each cell.

"A" Type Cells - 1/2"
"C" Type Cells - 1"
"D" Type Cells - 1 1/4"

When the level of solution is only a small amount below the proper height, fill with pure distilled water and in the future, use pure distilled water for replenishing the solution.

CONNECTIONS

The positive pole of an "alkaline cell" is designated by a red bushing around the pole and a plus (+) mark stamped on the cell cover.

The negative pole, is designated by a black bushing around the pole; no designating mark on the cover.

The connections between cells, in a tray, are made of solid wire with lugs on both ends. These are known as "connectors". The flexible, rubber-covered cables used to join trays together are known as "jumpers".

To avoid unnecessary electrical losses, all electrical connections must be tight. (To obtain this, it is necessary to see that all the contact surfaces between the poles and lugs are clean and make good contact.) Remove any Esbaline, grease, or dirt that may stick to the tapered surfaces of the poles or the inside of the lugs before connecting. If necessary, use 00 sandpaper or 00 emery cloth for this purpose. NEVER use a file or anything that will harm the contact surfaces.

A loose or dirty contact on a cell pole will cause excessive heating, and may be detected by touching the connectors after the current has been passing through them for some time.

DISCONNECTING LUG

A "disconnecting jack" or "lug puller" is supplied with each battery. This jack is designed to straddle the connector or jumper lug and, by means of a jack screw, break the lug loose from the cell pole.

CHARGING

Direct current must be used to charge any storage battery. If only alternating current is available, it is necessary to convert to direct current by the use of a motor generator set, mercury arc rectifier, or other suitable form of current rectifier.

An alkaline battery may be charged at either a constant current rate throughout the entire charging period, or at a modified constant potential rate. In either case the average rate should be such that the battery can be brought from a discharged state to full charge within between six and seven hours. In connecting a battery to the charging circuit, always connect the positive terminal to the positive side of the line, and the negative terminal to the negative side of the line.

It is not necessary to take specific gravity reading during charge, as the electrolyte does not change appreciably.

Before starting to charge, see that the solution is at the proper level. If the solution is low, bring it to the proper level by adding pure distilled water as instructed under watering. If the battery is in a compartment, open the cover before starting a charge. DO NOT charge in a hot place or allow the temperature of the solution to exceed 115° Fahrenheit on charge.

CHARGE TEST FORK

The charge test fork was developed to provide an easy means of determining the state of charge of an alkaline battery.



Plate 4008. Charge Test Fork Check

This is done by obtaining a key voltage reading which, on reference to the charts supplied for use with instrument, will indicate the amount of charge necessary to restore the battery to a fully charged condition.

ELECTROLYTE

The specific gravity of the electrolyte in fully charged alkaline cells has a normal operating range of between 1.215 and 1.160, with electrolyte at the proper level and corrected for temperature.

The specific gravity reading of the electrolyte (of an alkaline cell) has no value in determining its state of charge, as the specific gravity does not change during the charging or discharging periods

to any marked extent. It, therefore, is only necessary to take infrequent readings, to determine if the specific gravity has dropped to the point where a change of electrolyte is desirable.

There are two kinds of alkaline potash electrolyte which are normally used when a "change" of solution is found necessary. Renewal solution, which has a specific gravity of approximately 1.250; is normally used to replace old electrolyte, the gravity of which has dropped to the low limit ranging between 1.160 and 1.170. Refill solution has a specific gravity of approximately 1.215 and is used to replace spillage. DO NOT use any potash solution other than alkaline electrolyte, as the presence of impurities or improper compounding of such solution may permanently injure your battery.

WATERING CELLS

Before putting a new electric filler into service; see that the tank is washed thoroughly to remove any foreign matter and then rinse tank, hose and filler thoroughly by running distilled water through them. Then fill the tank with distilled water and mount in a convenient place at least four or five feet above the cells to be watered.

To operate, insert the nozzle into the filler opening in the top of the cell. If the solution is already at the proper height, the bell signal will ring. If bell does not ring, start flow of water by opening valve by pushing down lever on filler handle. When the bell rings, remove the nozzle from the cell, close cell filler cap and proceed to next cell.

LAYING UP BATTERY

If battery is to be laid up for any length of time (in excess of one year) be sure that the plates are covered to the proper height with solution and that the battery is discharged and short circuited. The battery should be stored in a cool dry place.

Alkaline batteries are easy to lay up. Merely discharge to zero voltage and short circuit. They may be left standing idle indefinitely, without injury, if stored in this short circuited condition. The battery may be stored for 6 months to a year without discharging and short circuiting.



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

CAUTIONS

NEVER put lead battery acid into an alkaline battery or use utensils that have been used with acid; you may ruin the battery.

NEVER bring a "lighted match" other "open flame" near a battery.

NEVER lay a "tool" or any piece of "metal" on a battery. Always keep the filler caps closed except when necessary to have them open for filling as provided for in these instructions.

ALWAYS keep batteries clean and dry externally.

ALKALINE ELECTROLYTE is injurious to the skin or clothing and must be handled carefully. Solution spilled on the person should be immediately washed away with plenty of water.

DO NOT use the electric filler, or fill cells while a battery is on charge.

USE ONLY pure distilled water for watering the battery.

WEAR GOGGLES when cleaning or changing solution.

CABLES, TERMINALS AND BATTERY RECEPTACLE.

Check cables, terminals and receptacle for condition and security of mounting. Correct as necessary.

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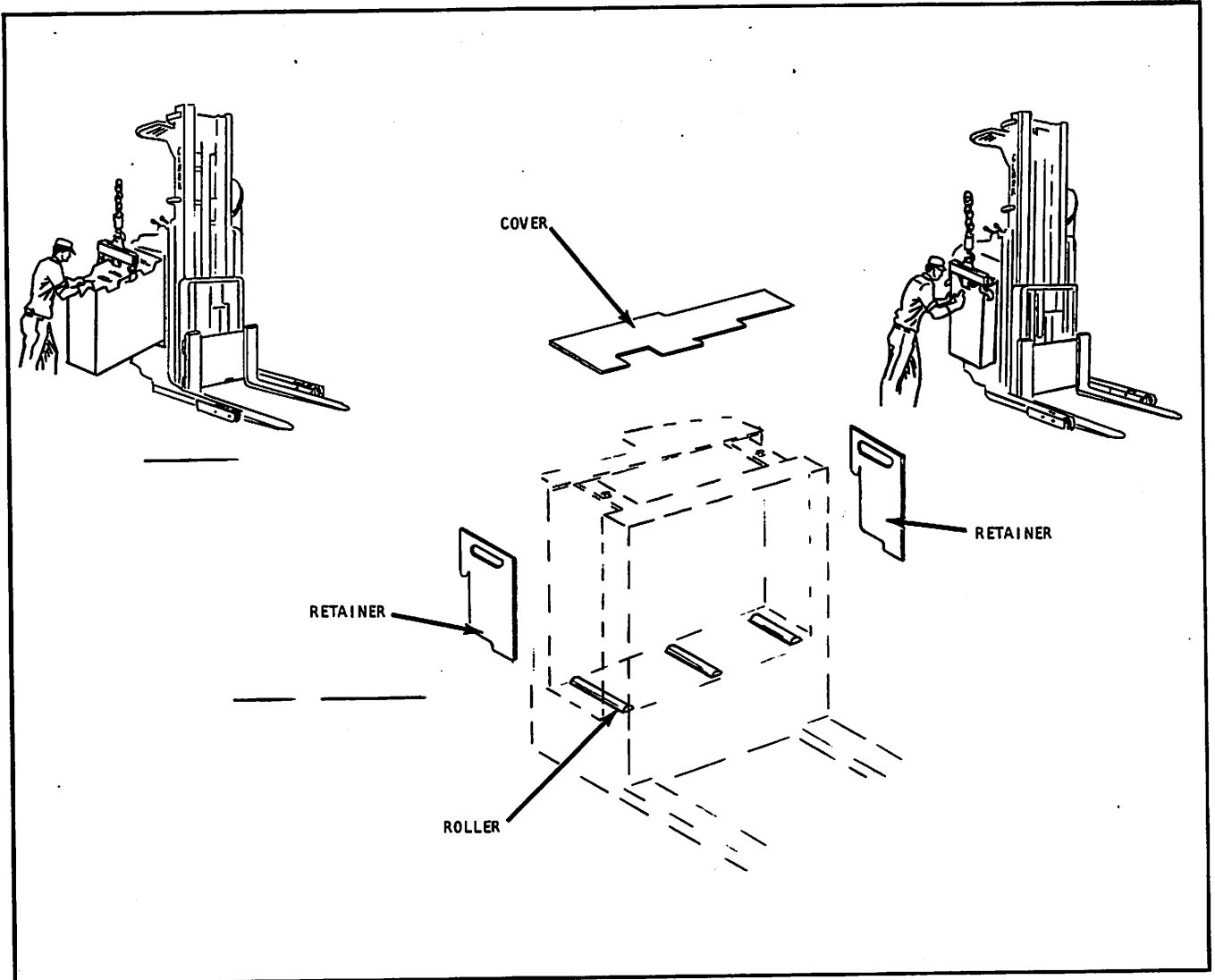


Plate 7520. Battery Installation

BATTERY

The battery is mounted on three (3) rollers and may be removed from either side of the machine. Lifting slots are provided in the battery casing for ease in handling.

NOTE

THE BATTERY MAY BE SERVICED IN THE VEHICLE BY REMOVING THE BATTERY BOX COVER.

BATTERY INSTALLATION

Remove battery box cover and one battery retainer. Place battery carrier in center slots of battery. Use chain hoist to lift battery into position and slide battery into compartment as far as hooks will allow (see above).

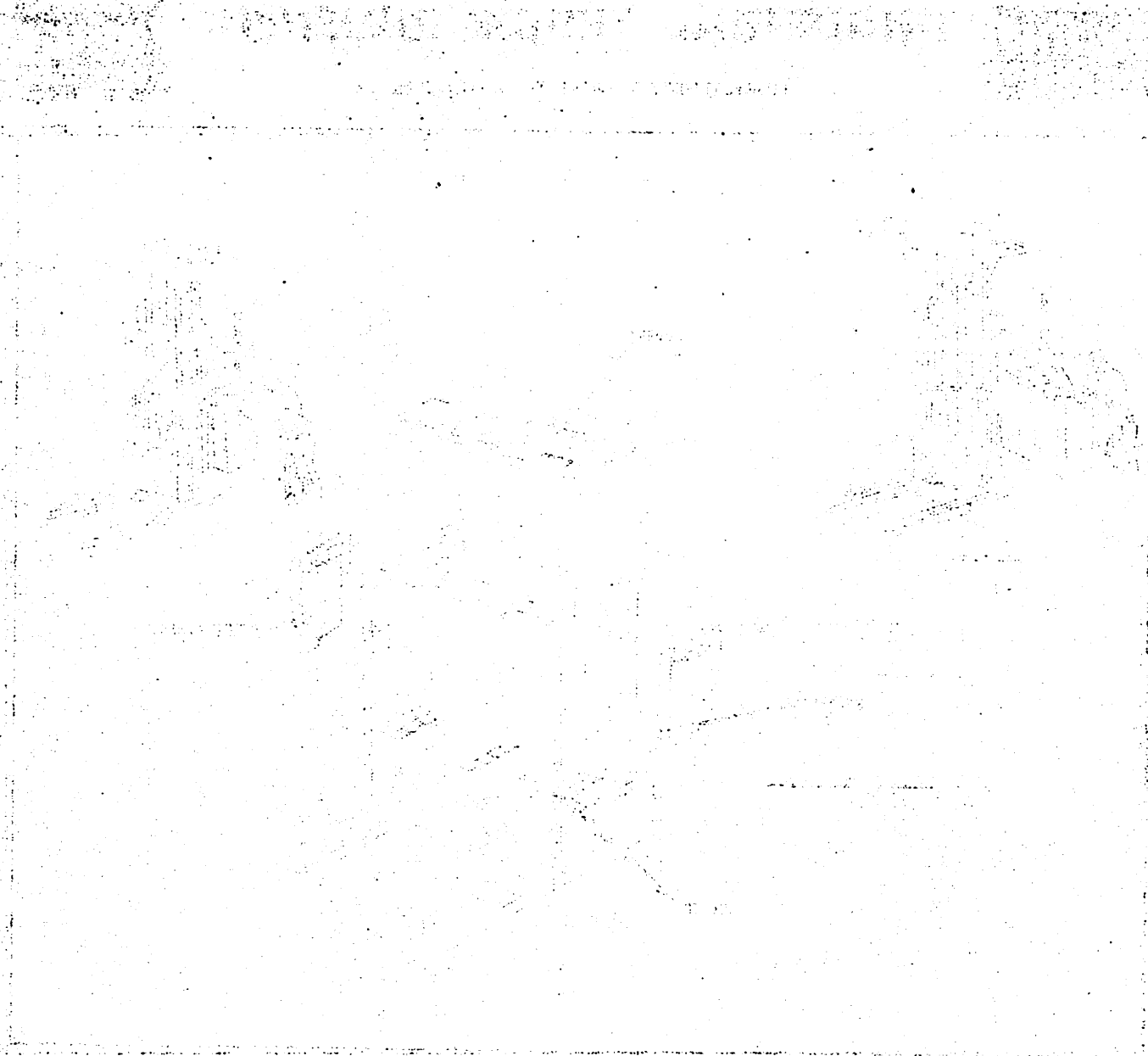
CAUTION

BE SURE BATTERY IS RESTING SECURELY ON TWO ROLLERS SO THAT IT WILL NOT TIP OR FALL WHEN CARRIER IS REMOVED.

Remove carrier from battery and slide battery into position, as shown above, then install battery retainer and cover.

WARNING

DO NOT ALLOW CHAIN HOIST, OR BATTERY CARRIER OR ANY METAL OBJECT TO COME IN CONTACT WITH CELL CONNECTORS, TERMINAL POSTS ETC., THUS CAUSING A DIRECT SHORT RESULTING IN BATTERY DAMAGE, AND POSSIBLE PERSONAL INJURY.



TO THE DIRECTOR, FEDERAL BUREAU OF INVESTIGATION
WASHINGTON, D. C.

FROM: SAC, [illegible]

RE: [illegible]

[illegible]

[illegible]

[illegible]

HYDRAULIC SUMP TANK(S) ... LEVEL CHECK

Check hydraulic sump fluid level in the following manner:

1. Lower upright.
2. Remove oil level plug ... hydraulic fluid should be at level of hole.
3. Remove breather filter plug and inspect. Be sure breather holes are not plugged, replace filter if dirty.

If necessary ... fill sump to proper level using fluid recommended on page 100H 772.

3. Install plugs and operate valve control levers to allow any air in the lines to escape ... then recheck sump fluid level before placing truck in operation.

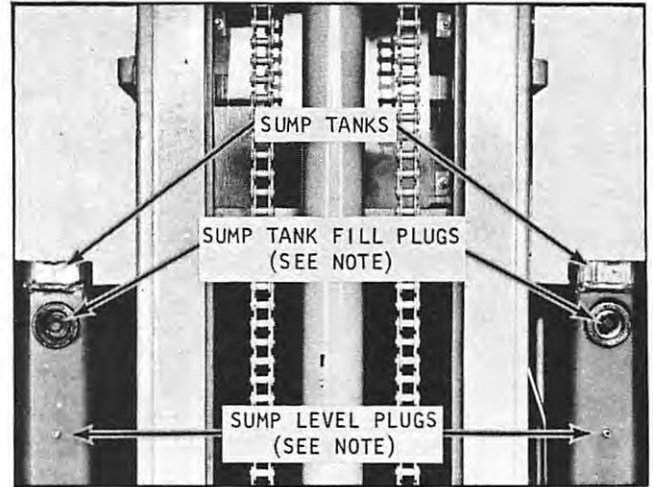


Plate 7528. Hydraulic Sump Tanks

HYDRAULIC CONTROL LEVER

I M P O R T A N T

Every 8 operating hours (or every shift) ... elevate upright to upper limit ... to lubricate the top portion of the lift cylinder.

1. Check lift and tilt operation, and check reach operation (if applicable). The cylinders should actuate when control levers are moved either way from neutral position.
2. When a load is elevated and the control levers are in neutral position ... the load should remain stationary with no noticeable downward, backward, or forward drift. If load drifts excessively ... report condition to the proper authority.

C A U T I O N

NEVER ALLOW THE LIFT CARRIAGE TO REMAIN IN AN ELEVATED POSITION FOR ANY PROLONGED PERIOD. LIFT CARRIAGE SHOULD BE LOWERED WHEN NOT IN USE.

DO NOT HOLD CONTROL LEVERS IN EXTREME POSITIONS AFTER THE UPRIGHT OR LIFT CARRIAGE HAS REACHED ITS LIMIT OF TRAVEL. TO DO SO WILL RESULT IN HIGH HYDRAULIC OIL PRESSURES AND POSSIBLE OVER-HEATING OF THE FLUID.

1. The purpose of this document is to provide a comprehensive overview of the current state of the project and to identify the key areas that require attention. The information presented here is based on the most recent data available and is intended to serve as a guide for decision-making.

2. The following table provides a summary of the key findings from the recent analysis. It highlights the areas where the most significant changes have occurred and the potential impact of these changes on the overall project goals.

3. In conclusion, the project is currently on track, but there are several critical areas that require immediate attention. It is recommended that the following actions be taken to ensure the successful completion of the project:



INDUSTRIAL TRUCK DIVISION



IMPORTANT

SUBJECT: CAUTIONS CONNECTED WITH
THE OPERATION AND MAINTENANCE OF
SOLID STATE CONTROLLED TRUCKS.

CAUTION

WELDING ON SCR TRUCKS:

1. MAKE SURE TRUCK HAS NO GROUNDS.
2. DISCONNECT BATTERY.
3. PROTECT ELECTRICAL WIRING AND COMPONENTS FROM WELD SPLATTER WITH A SHIELD.

IF THE ABOVE IS NOT FOLLOWED.....
DAMAGE CAN RESULT TO WIRING AND
ELECTRICAL COMPONENTS ON A SOLID
STATE CONTROLLED TRUCK.

CAUTION

DO NOT STEAM CLEAN A SOLID STATE
CONTROLLED TRUCK AS EXCESSIVE MOIS-
TURE WILL INTERFERE WITH PROPER
OPERATION OF THE SOLID STATE COMPON-
ENTS.

CAUTION

BATTERY POLARITY MUST BE CORRECT OR
ELECTRICAL SYSTEM WILL BE DAMAGED.

CAUTION

DO NOT USE A MOTOR GENERATOR UNIT
SUCH AS READY POWER TO MOVE AND/OR
CHECK THIS MACHINE AS SERIOUS DAM-
AGE MAY OCCUR.

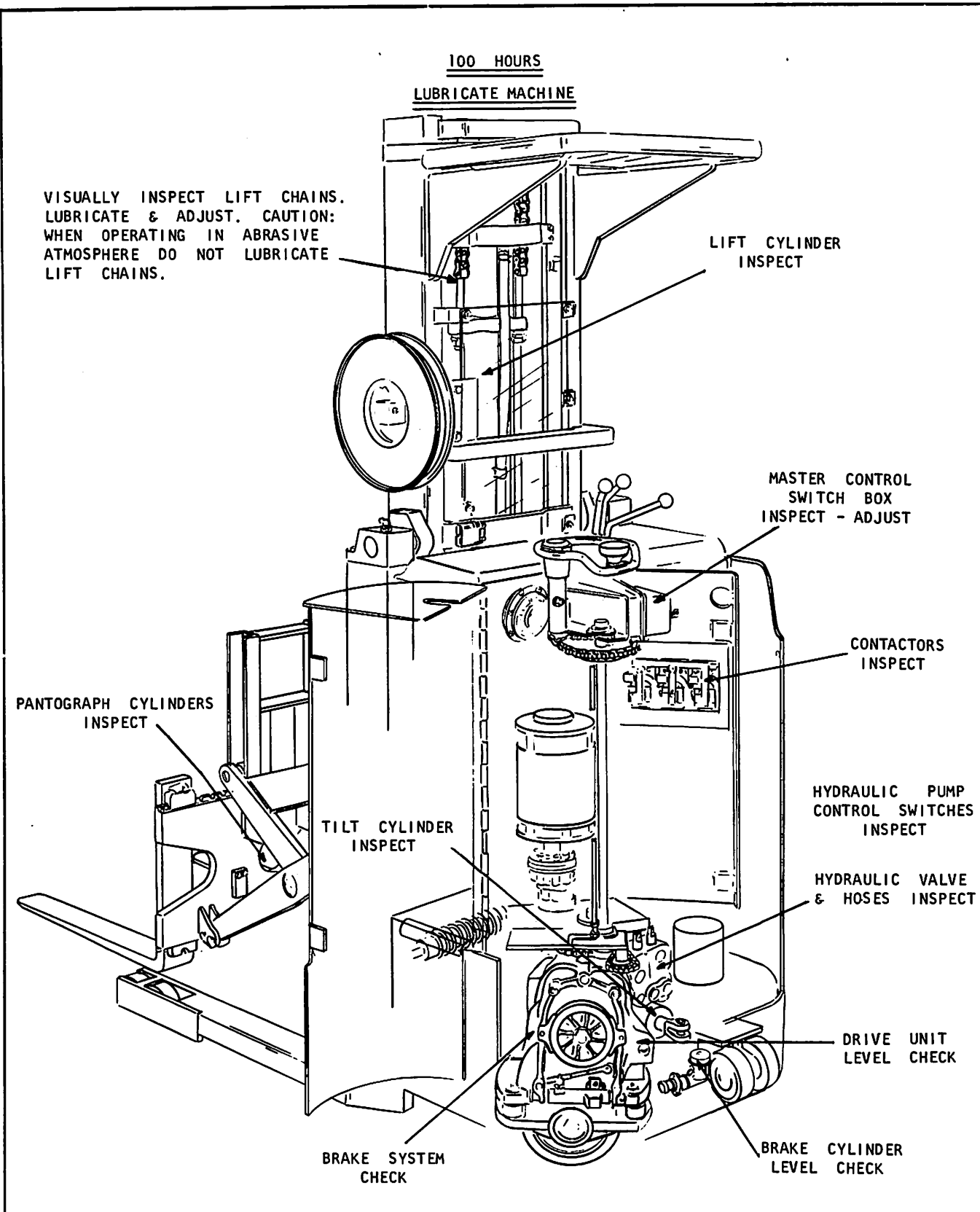


Plate 7522. Lubrication & Preventive Maintenance Illustration

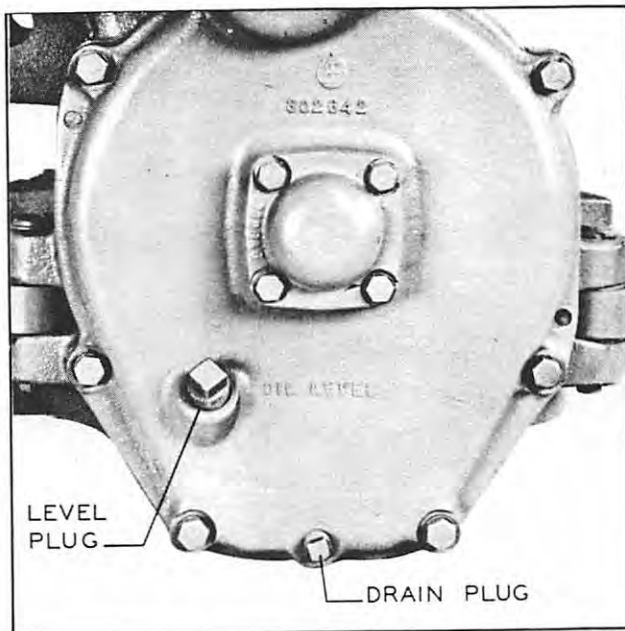


Plate 4274. Drive Unit Assembly

DRIVE UNIT LUBRICANT LEVEL CHECK

Verify lubricant level ... fill if necessary with:

DEXRON AUTOMATIC TRANSMISSION FLUID
(or Type "A", Suffix "A" ATF)
(AQA-Armour Qualified)

Typical Product Recommended by
Major Brand Oil Suppliers

-
- Shell Auto. Trans. Fluid Dena x T-6, Dexron
 - Sunoco Auto. Trans. Fluid, Dexron.
 - ARCO Auto. Trans. Fluid, Dexron.
 - Gulf Auto. Trans. Fluid, Dexron.
 - Mobil Auto. Trans. Fluid 220, Dexron.
 - Texaco 1859 Texamatic Fluid, Dexron.
 - Citgo Auto. Trans. Fluid, Dexron.
 - AMOCO Auto. Trans. Fluid, Dexron.
- ... or the equivalent to the above.

1. Clean dirt from around level plug and remove the plug. Fill until fluid reaches the height of the level plug opening.

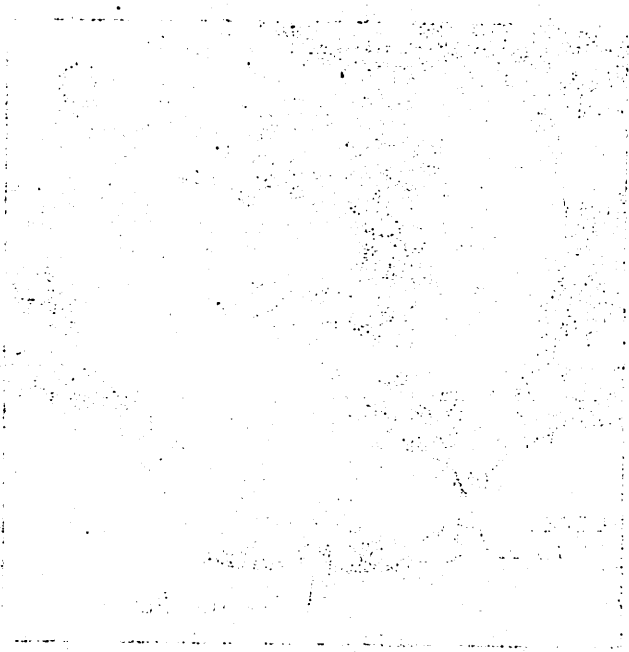
**DO NOT OVERFILL AS THE
EXCESS QUANTITY WILL
SERVE NO USEFUL PURPOSE.**

If the oil level is too high, it will cause excessive oil churning and attendant high oil temperature and possible leakage.

2. After drive unit has been filled to the proper level, replace level plug.

NOTIFICATION

ATTENTION: [Illegible]



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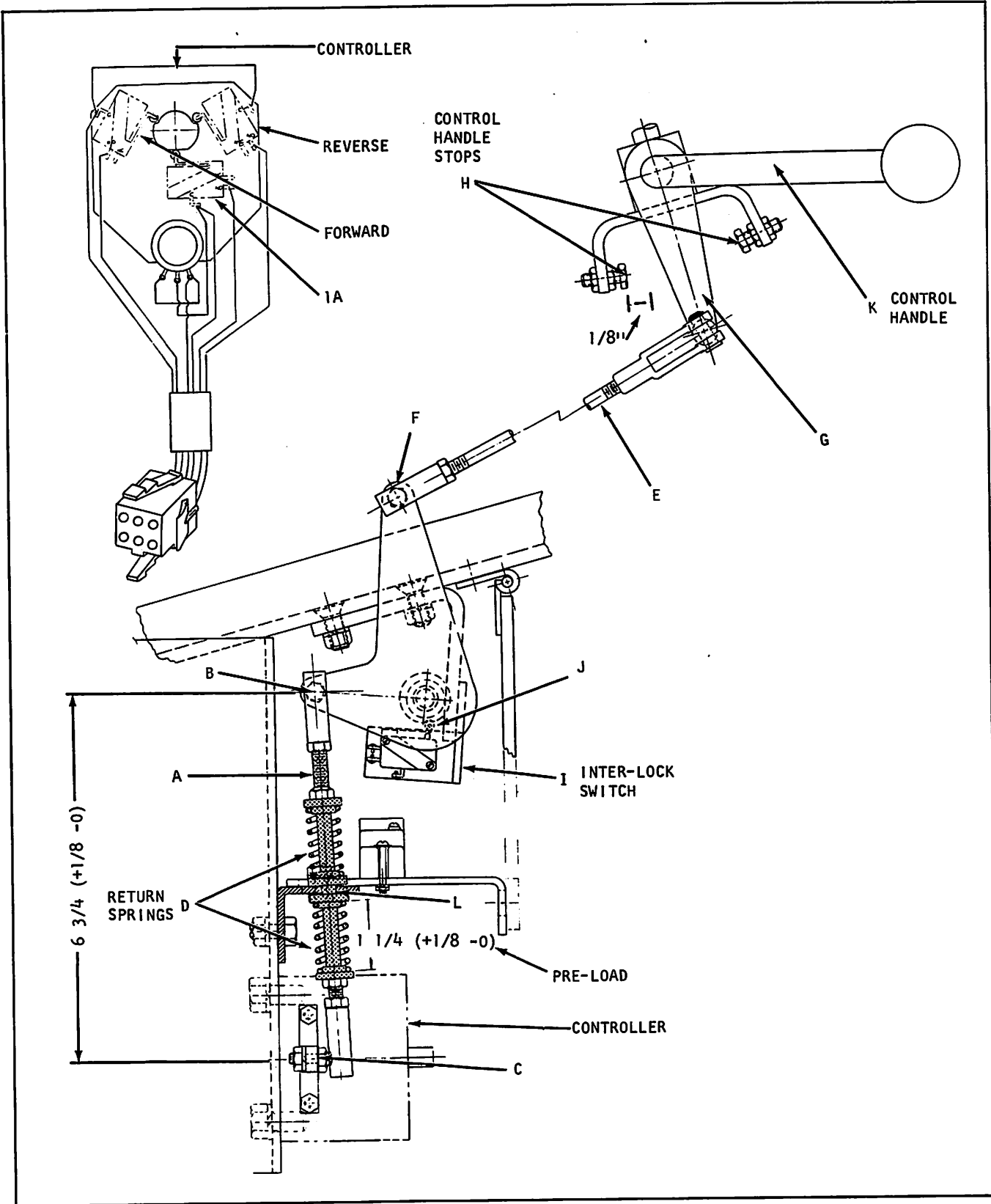


Plate 9447. Typical Upper Drive Controls

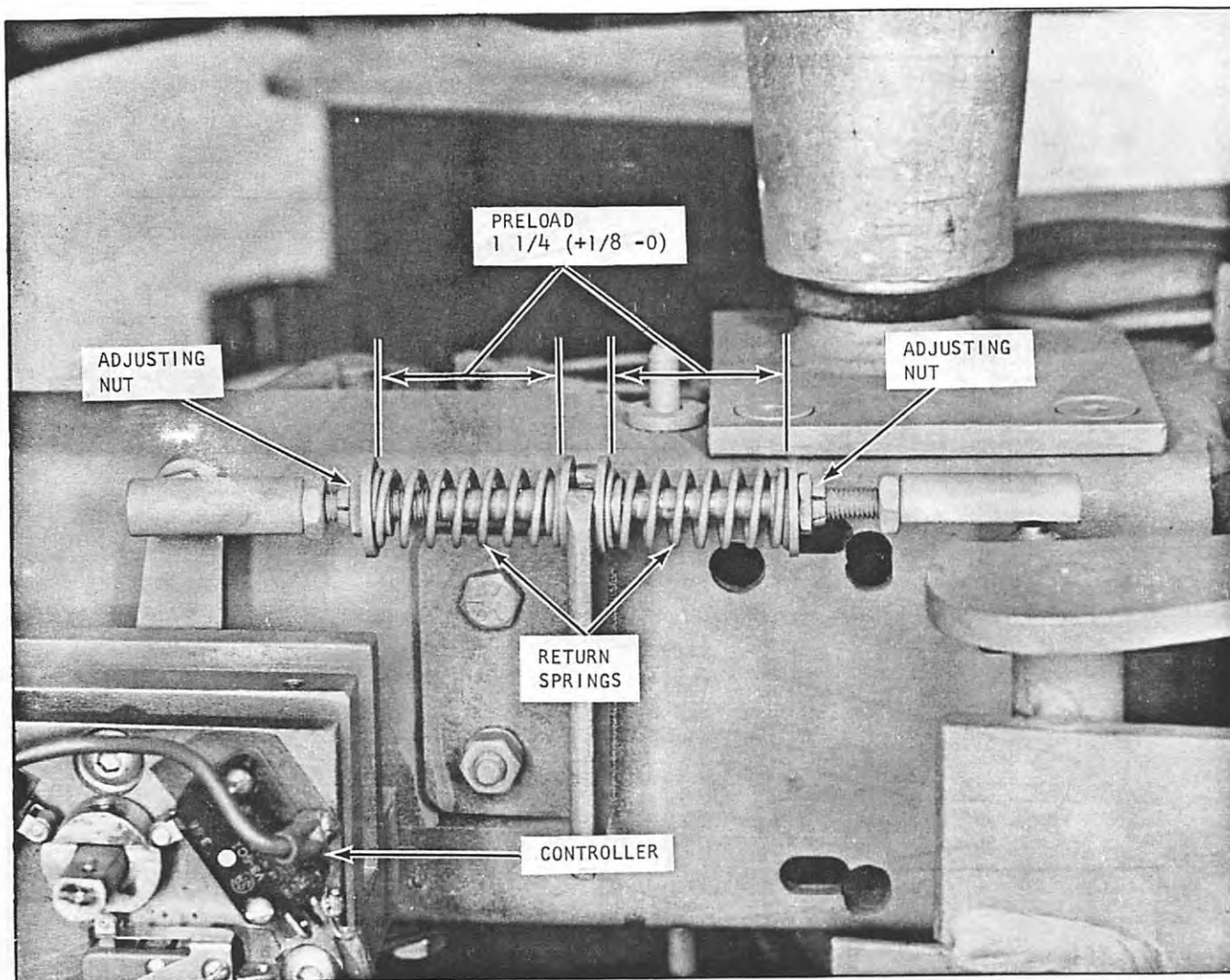


Plate 9448. Typical Return Springs

DRIVE CONTROL LINKAGE ADJUSTMENTS (Plate 9447)

Objective: To adjust drive control linkage to controller in such a manner that: all switches operate in their proper sequence, there is no rubbing of linkage rod against bracket slot, and control handle arm is midway between stop brackets. All dimensions referred to in this write-up are for initial adjustment. Should any of the dimensions here-in give the wrong results on your machine, then the dimension should be changed to suit the particular condition.

1. Disconnect rod "A" from bellcrank at position "B" and rod "E" from bellcrank at position "F".
2. Check controller arm "C" to make sure it is in a vertical position when controller is in neutral.

N O T E

Some controller arms are adjustable by loosening the setscrew. Some are not adjustable due to the detent in the controller shaft. In this latter case, disregard adjusting.

3. Adjust rod "A" to measure $6 \frac{3}{4} (+ \frac{1}{8}-0)$ " and attach to bellcrank "B".
4. Adjust springs "D" to measure $1 \frac{1}{4} (+ \frac{1}{8}-0)$ " each.
5. Rotate bellcrank in both directions, watching to see if there is any rubbing action (at extreme ends of travel) in bracket slot "L". If not, go to step 6. If so, adjust as follows: If the rod rubs slot "L" while being turned clockwise, then the rod must be shortened. If the rod rubs slot "L" while being turned counter-clockwise then rod "A" must be

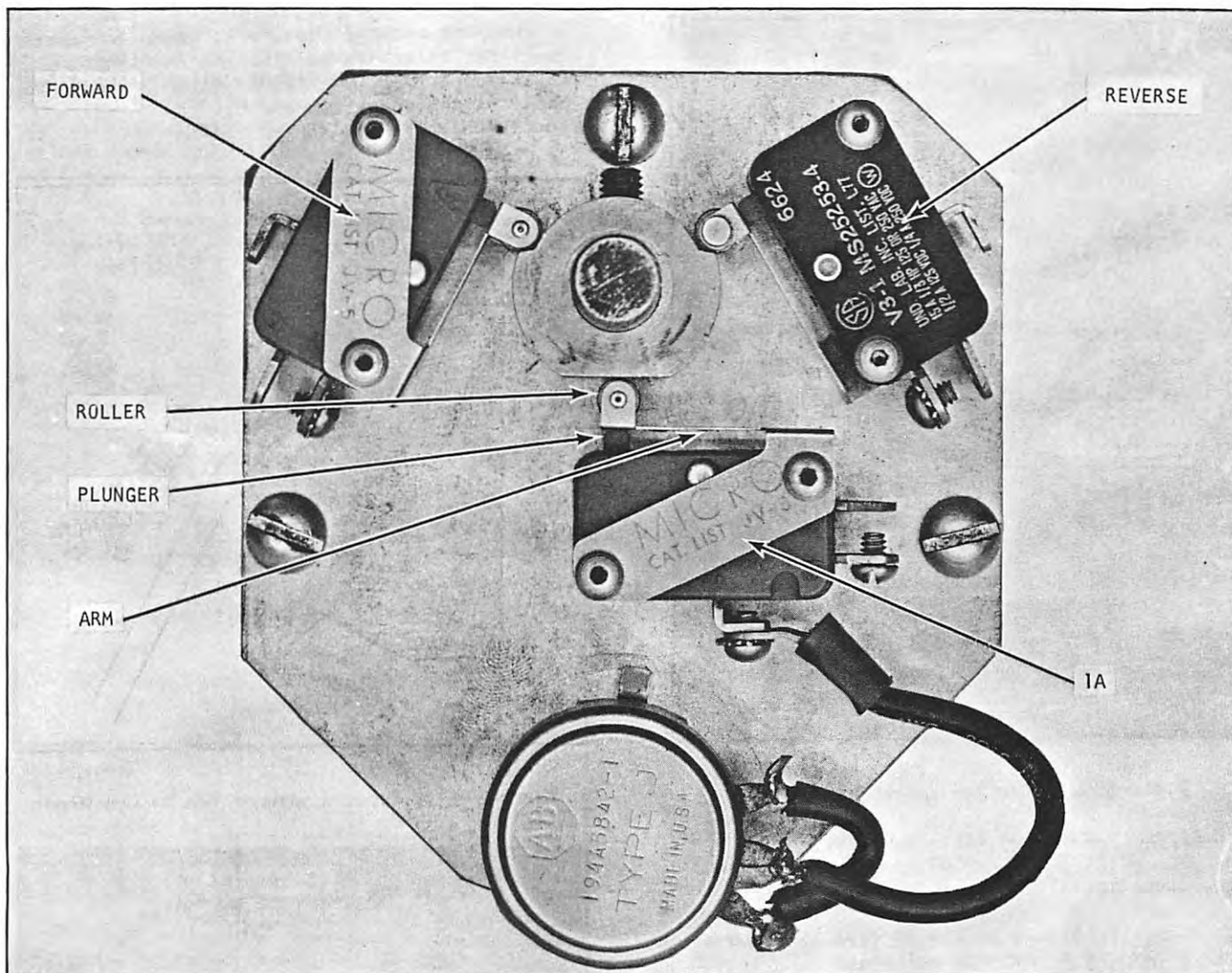


Plate 9492. Typical SCR Controller

lengthened. Continue this procedure until no rubbing action is noted.

6. Now check to see if the bottom (flat) part of the controller cam is horizontal and adjust if necessary.
7. Refer to plate 9492 and determine if switches are adjusted to the cam as shown and here described: The forward and reverse switch rollers must be just setting in their respective detents so that the arm of the switch just touches the switch plunger. Next determine that the 1A switch roller is positioned midway of the bottom surface (machined from the cam) and that the arm is also just touching its plunger.

If the switches are not adjusted properly, then adjust as follows:

NOTE

Switches are mounted to a Tapping plate. Mounting screws pass thru oversized holes in the bracket to a tapping plate. (See plate 9493.)

- (a) Loosen the screws on one of the switches that is out of adjustment just enough so switch is moveable (being careful not to over-loosen because backing plate would then fall off).
- (b) Position switch as described previously and tighten screws while holding switch in this position.
- (c) Follow this same procedure with any other switches not adjusted properly.

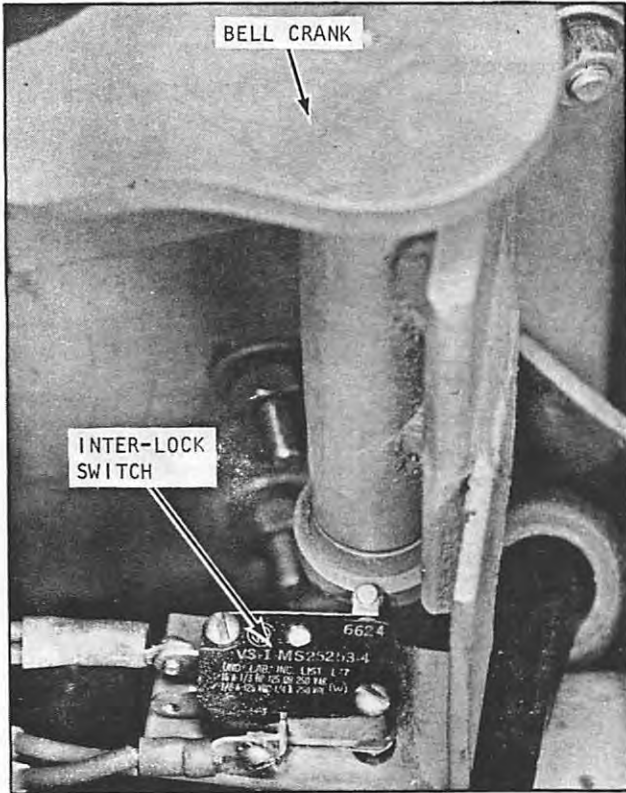


Plate 9449. Typical Interlock Switch

8. Attach rod "E" at bellcrank position "F" and arm "G" so that arm "G" is midway between stop brackets.
9. Adjust interlock switch so that it actuates before forward or reverse switches.
10. Move control handle forward until IA switch actuates, hold, and adjust right hand stop 1/8" from arm "G". Do the reverse of this for the remaining stop.

REVIEW CHECK

If everything is adjusted properly, the following conditions should be present:

1. With control handle in neutral all switch rollers (F, R, IA, interlock) should be in their proper positions (detents).
2. Control handle arm "G" should be midway between its stops "H".
3. When control handle is moved forward the first "click" should be in the interlock switch actuating, the second "click" should be the F switch actuating and the third "click" should be the IA switch actuating.

4. When the control handle is moved in reverse the first "click" should be the interlock switch actuating, the second "click" should be the R switch actuating and the third "click" should be the IA switch actuating.

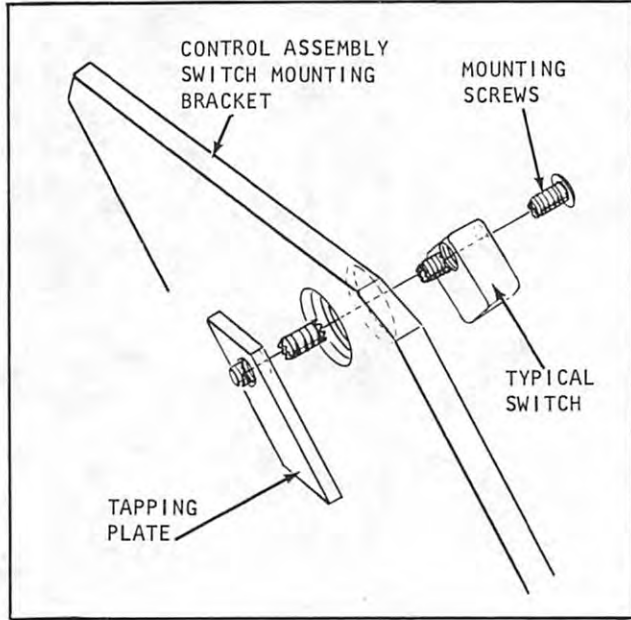


Plate 9493. Typical Controller Switch Mount

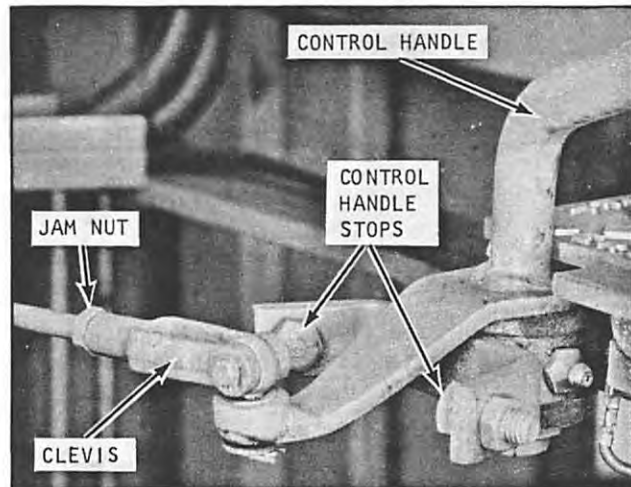


Plate 9450. Typical Control Handle Stops



INDUSTRIAL TRUCK DIVISION



WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS

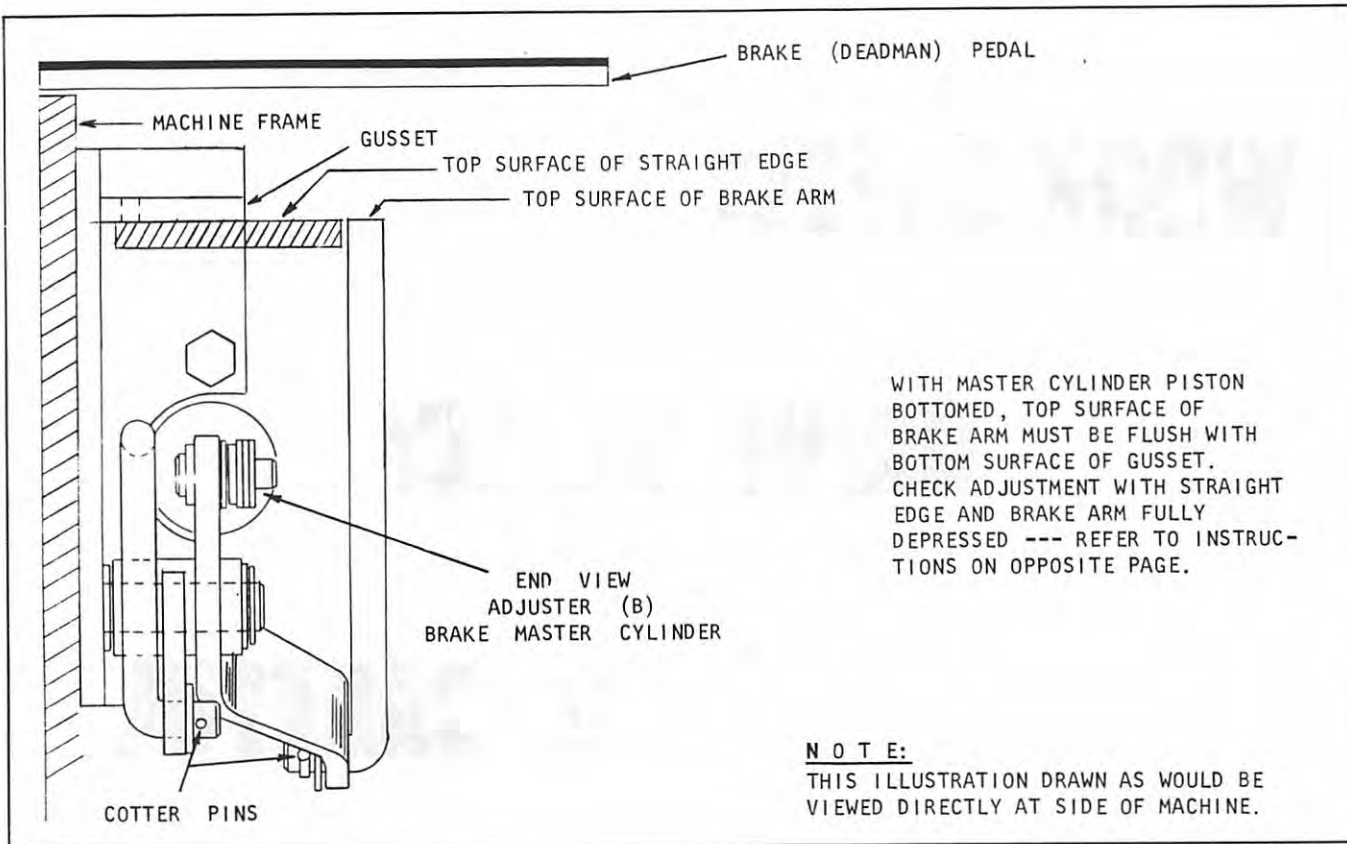


Plate 8267 Brake (Deadman) Pedal Arm (fully depressed)

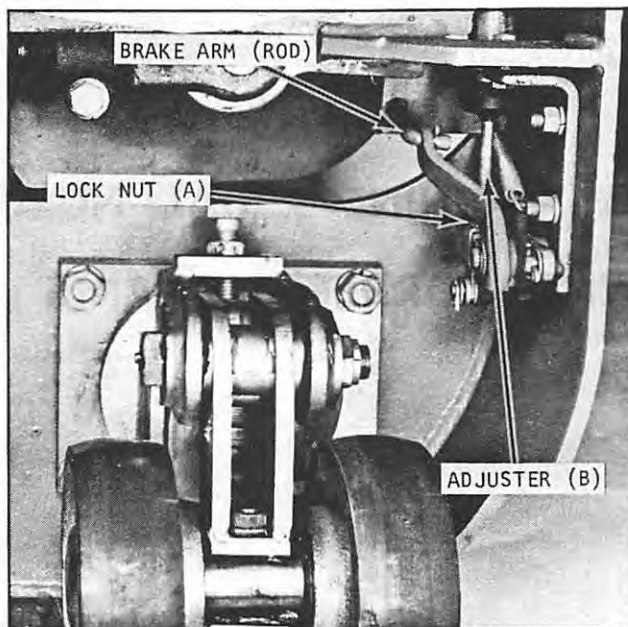


Plate 8268. Brake Cylinder, Pivot Arm and Pedal Rod Adjustment

BRAKE PEDAL LINKAGE ADJUSTMENT

NOTE: The brake pedal (when fully depressed) **MUST** rest on the machine frame and not on the brake linkage. In other words, the brake arm must not support the brake pedal with the pedal in the down position. If such a condition should exist, this means that the master cylinder piston has bottomed and the piston and brake arm are the full support of the machine operator when standing on the brake pedal. Such a condition causes excessive strain on the master cylinder and linkage and could very well cause damage to these components. On the other hand, the linkage must not be adjusted for too short a piston stroke.

1. Remove hair pin cotter connecting brake arm to brake pedal. Remove brake pedal from machine by rotating hinge pin from its self locking down position to the up position. This hinge pin is located at the front or pivot end of the brake pedal. With pin in the up (unlocked) position, move pin to the left — move pedal to the right and remove from machine.

2. Clean dirt from around the filler cap of the master cylinder reservoir and unscrew cap. Brake fluid should be within 1/4 inch of the top — replenish with S.A.E. 70R3 hydraulic brake fluid (Clark Part No. 1800200) and replace cap. **NOTE:** Check cap vent hole for obstruction. Vent hole must be open at all

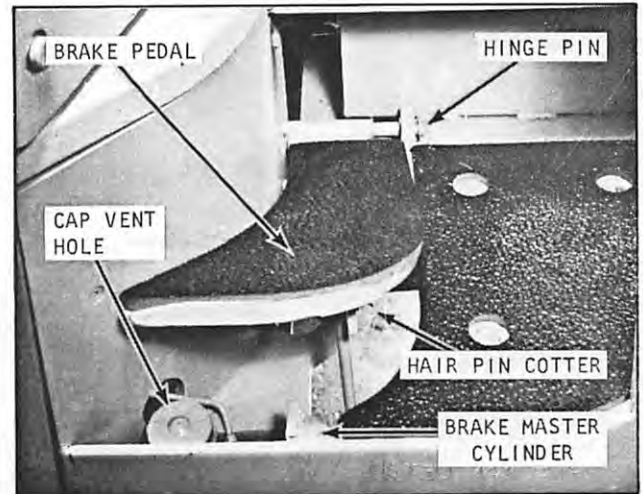


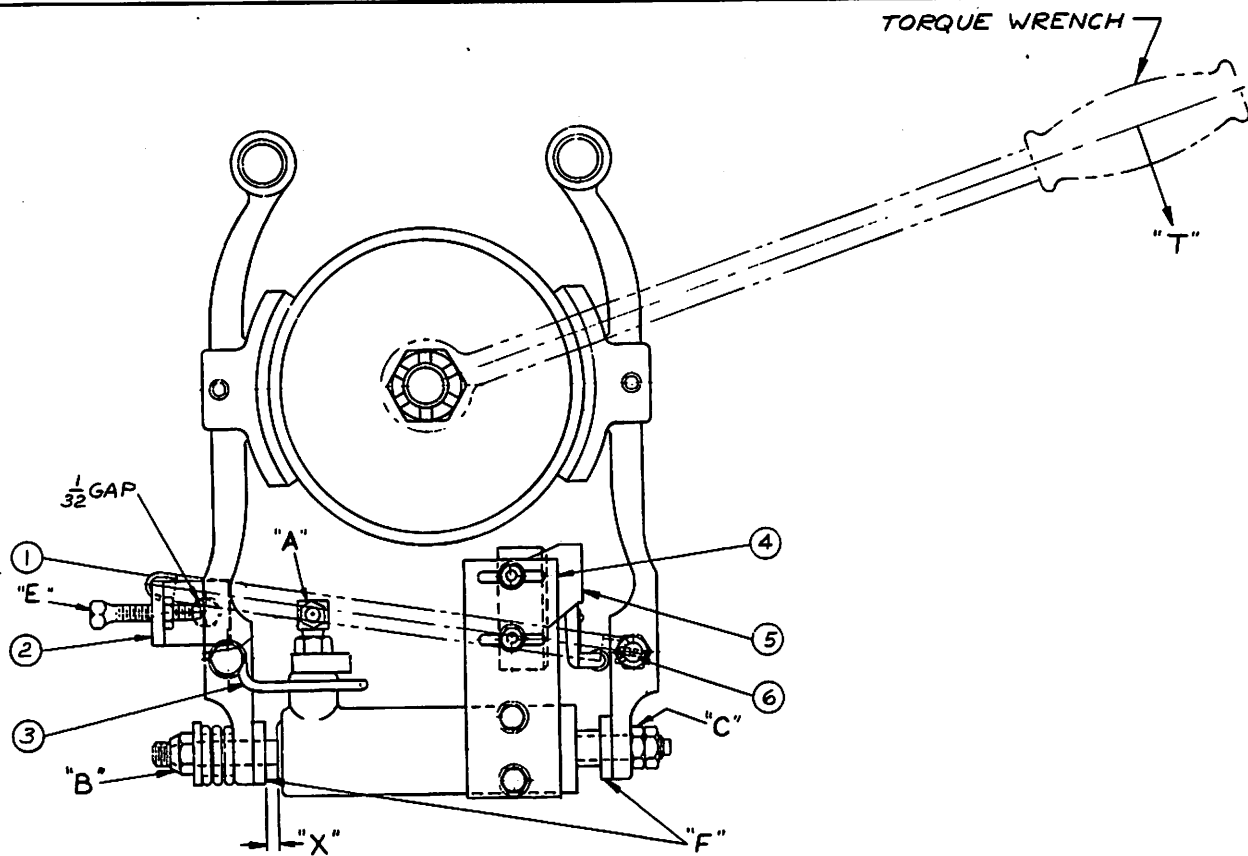
Plate 8264. Brake Pedal

times — clean if needed.

3. Place a straight edge (flat) under gusset (D), see Plate 8267 on preceding page. Depress brake arm downward as far as it will go.

4. Loosen lock nut (A), see Plate 8268 on preceding page. Rotate adjuster (B) until the top surface of the brake arm is flush with the upper surface of the straight edge, see Plate 8267.

5. Tighten lock nut (A) and check adjustment as explained above. Repeat adjustment procedure until correct adjustment is obtained, then replace brake pedal. Connect brake rod to brake pedal with hair pin cotter.



"T" = CALCULATED TORQUES BASED ON MIN. REQUIREMENTS OF HOLDING TRUCK ON 15% GRADE

TABLE "D"

MODEL	WEIGHT LOADED	"T" - POUND - INCHES	
		18.36-1 *	22-1 *
NS 20	5900	225	185
NS 30	7300	275	230
NS 40	8300	325	270
NSP20	6800	250	210
NSP30	7800	300	250
NSP40	9300	375	310

* DRIVE UNIT GEAR RATIOS 18.36-1 STD. ON NS20-30 AND 40 ALSO NSP20 AND 30; 22-1 STD. ON NSP 40 (OTHERS OPT.)

Plate 7460. Service-Parking Brake Assembly



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

SERVICE — PARKING BRAKE

Braking is accomplished with the use of a brake drum directly connected to the drive motor shaft. Two brake shoes with bonded linings are connected to two brake shoe arms. The spring supplies the braking force applied on the brake shoe linings to the brake drum — hence the brake is a spring applied unit which is always set until the driver steps on the brake pedal. Stepping on brake pedal actuates a brake cylinder thru linkage which pushes the brake shoe arms or brake linings away from the brake drum thus releasing brake.

- TO ADJUST BRAKE -

1. Loosen Bleeder Screw (A) and bleed out all air (CAUTION - KEEP BRAKE FLUID OFF DRUM AND SHOES). Refer to page 1000H 912 for brake bleeding procedure.
2. Adjust for gradual brake application by adjusting Gap (X) to 3/16" with Nut (B). (NOTE: - NUT (C) TO BE SUFFICIENTLY TIGHT SO BUSHING INSIDE OF SPRING WILL NOT PULL AWAY FROM BRAKE ARM.)
3. Adjust brake holding torque by raising drive tire from floor and adjusting Nut (C) until torque wrench reads correct rating, refer to Table (D), without drum slipping.

X
 X X W A R N I N G X
 X X AFTER RAISING MACHINE AND BEFORE MAKING X
 X X ANY ADJUSTMENTS, ADJUSTMENT CHECKS OR BE- X
 X X FORE PERFORMING ANY MAINTENANCE, PLACE X
 X X ADEQUATE BLOCKING (SUFFICIENT TO SUPPORT X
 X X THE MACHINE) UNDER THE FRAME TO PREVENT X
 X X ACCIDENTAL LOWERING OR FALLING OF THE X
 X X VEHICLE, THUS PREVENTING PERSONAL IN- X
 X X JURY TO MECHANIC OR BYSTANDERS. X
 X

4. Adjust L.H. Brake Arm Stop (E) for approximately 1/32" gap. Loosen jam nut and rotate screw stop as necessary, tighten jam nut.
5. Adjust brake switch to open before R.H. brake shoe touches drum.

As driver releases brake pedal from the down position, switch should contact brake arm and actuate just before the brake shoe (located on the switch side) contacts the brake drum.

Adjustment is made at the switch mounting bracket. Switch bracket is provided with elongated holes. Loosen nuts and move switch as necessary to obtain correct adjustment. Then tighten nuts securely.

- TO ADJUST FOR LINING WEAR -

6. Repeat Steps 1 thru 5; when wear becomes too great for this adjustment, move Spacers (F) to outside of brake arms — then repeat Steps 1 thru 5.

BRAKE LINING REPLACEMENT

1. Remove spring adjusting nut, washer and spring, freeing brake arm from cylinder.
2. Remove retainer nuts freeing brake arm from cylinder.
3. Remove shoulder bolts allowing brake arms to be removed from brake assembly.
4. Remove roll pins from brake shoes and arms. The roll pins may be tapped free with a suitable punch and mallet.
5. When replacing lining assemblies, purchase brake shoe part number 302658 which will contain the bonded brake lining.

C A U T I O N

IT WILL BE NECESSARY TO ADJUST THE BRAKE AFTER LINING REPLACEMENT.

If the roll pins are not useable after removal, be sure to replace the old pins with new. Pin part number 654619.

After installing components, adjust the brake and check the switch adjustment.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is crucial for the company's financial health and for providing reliable information to stakeholders.

2. The second part of the document outlines the specific procedures for recording transactions. It details the steps from initial entry to final review, ensuring that all necessary information is captured and verified.

3. The third part of the document addresses the role of the accounting department in this process. It highlights the need for clear communication and collaboration between different departments to ensure data accuracy.

4. The fourth part of the document discusses the importance of regular audits and reviews. It explains how these activities help identify errors, prevent fraud, and ensure compliance with relevant regulations.

5. The fifth part of the document provides a summary of the key points discussed. It reiterates the importance of accuracy, transparency, and regular communication in the financial reporting process.

6. The sixth part of the document offers some practical tips for improving the efficiency of the recording process. It suggests using technology, standardizing procedures, and providing training for staff.

7. The seventh part of the document concludes with a final statement on the overall goal of the financial reporting process. It is to provide a clear, accurate, and timely picture of the company's financial performance.

8. The eighth part of the document provides a list of resources and references for further information. It includes links to relevant regulations, industry best practices, and internal company policies.

9. The ninth part of the document is a call to action, encouraging all employees to take responsibility for the accuracy of their financial reporting and to report any discrepancies immediately.

10. The tenth part of the document is a closing statement, thanking the reader for their attention and expressing confidence in the company's financial reporting process.

The document is a comprehensive guide for the accounting department, detailing the procedures and responsibilities involved in financial reporting. It is designed to ensure that all transactions are recorded accurately and that the company's financial statements are reliable.

The document is organized into ten sections, each covering a different aspect of the financial reporting process. It is intended to be a practical resource for all employees involved in financial reporting.

The document is a key component of the company's financial reporting system. It provides the necessary framework and guidance for ensuring the integrity and accuracy of the company's financial data.

The document is a critical tool for the accounting department. It helps to streamline the recording process, reduce errors, and improve the overall efficiency of financial reporting.

The document is a valuable resource for all employees. It provides clear instructions and guidance on how to properly record transactions and maintain accurate records.

The document is a key element of the company's financial reporting strategy. It ensures that all transactions are recorded consistently and that the company's financial statements are reliable.

The document is a comprehensive guide to the financial reporting process. It covers all aspects of the process, from initial entry to final review and audit.

The document is a key component of the company's financial reporting system. It provides the necessary framework and guidance for ensuring the integrity and accuracy of the company's financial data.

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The document is a valuable resource for all employees. It provides clear instructions and guidance on how to properly record transactions and maintain accurate records.

The document is a key element of the company's financial reporting strategy. It ensures that all transactions are recorded consistently and that the company's financial statements are reliable.

LIFT AND TILT CYLINDERS

Check for drift, leakage at packings, damage and security of mountings. (Anchor pivot pins, flanges and mounting rings.)

LIFT CHAINS

The lift chains are mounted to the chain anchors on the lift carriage and at the chain anchor rods near the lift cylinder piston head.

If it becomes necessary to adjust the lift chains, proceed as follows:

X
X
X W A R N I N G X
X
X K E E P C L E A R O F L O A D A N D C A R R I A G E W H E N X
X M A K I N G A D J U S T M E N T S T O A V O I D I N J U R Y I F X
X A N Y M A L F U N C T I O N S H O U L D O C C U R A N D C A U S E X
X L O A D O R C A R R I A G E T O F A L L . X
X X

1. Elevate carriage to about 4 feet.
2. Smear grease on the innerslide channel as shown in Plate 8622.
3. Pick up a capacity load.

N O T E

It is important that the chain adjustment be made with a capacity load. In this manner you will allow for chain stretch.

4. Making sure upright is either vertical or aft of vertical, lower load to the bottom.
5. Remove capacity load.
6. Raise carriage and measure the distance from where the center of the bottom carriage roller stopped, to the bottom edge of the inner slide. Distance must not be less than 1/2".

LUBRICATE MACHINE

Lubricate all miscellaneous linkage with SAE 20 oil and all grease fittings with chassis grease. (Refer to Lubrication Chart.)

C A U T I O N

WHEN LUBRICATING MACHINE INSPECT FOR LEAKING HYDRAULIC LINES, FITTINGS, AND ELECTRICAL WIRING.

HYDRAULIC CONTROL VALVE AND LINES

Inspect for damage, leakage and security of mounting.

LIFT BRACKET

Inspect for damage, bent forks, etc.

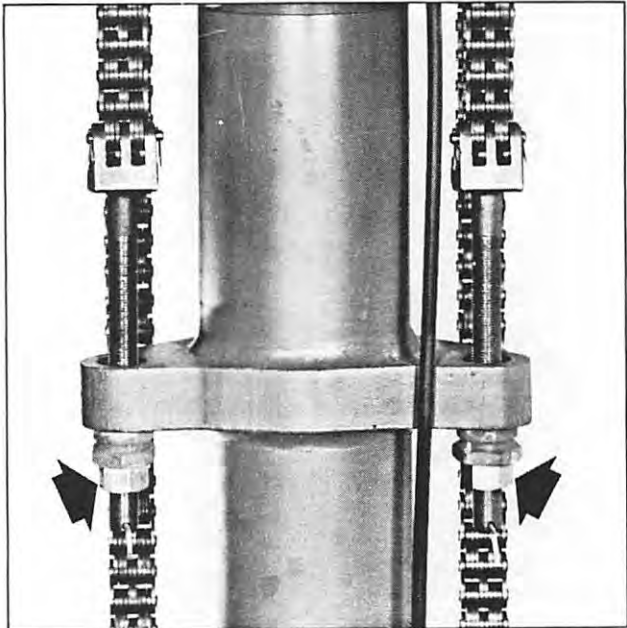


Plate 6634. Lift Chain Adjustment (Chain Anchor Rods)

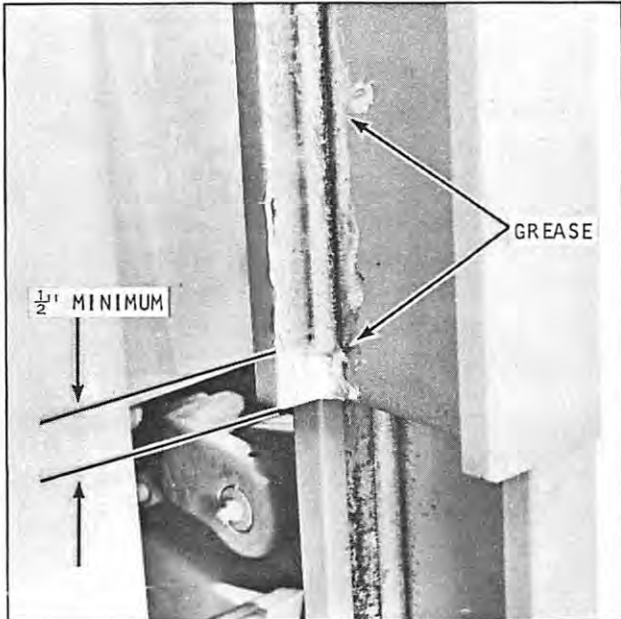


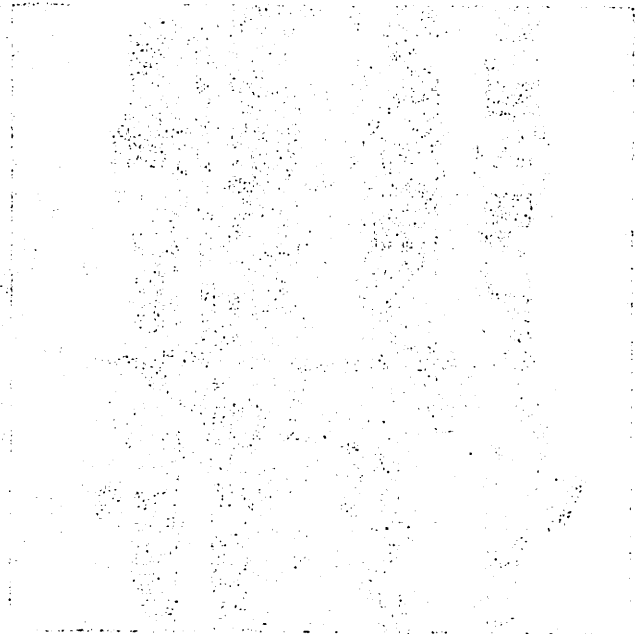
Plate 8622. Lift Chain Adjustment

UNITED STATES DEPARTMENT OF JUSTICE

WASHINGTON, D. C. 20535

TO: SAC, NEW YORK
FROM: SAC, PHOENIX
SUBJECT: [Illegible]

RE: [Illegible]



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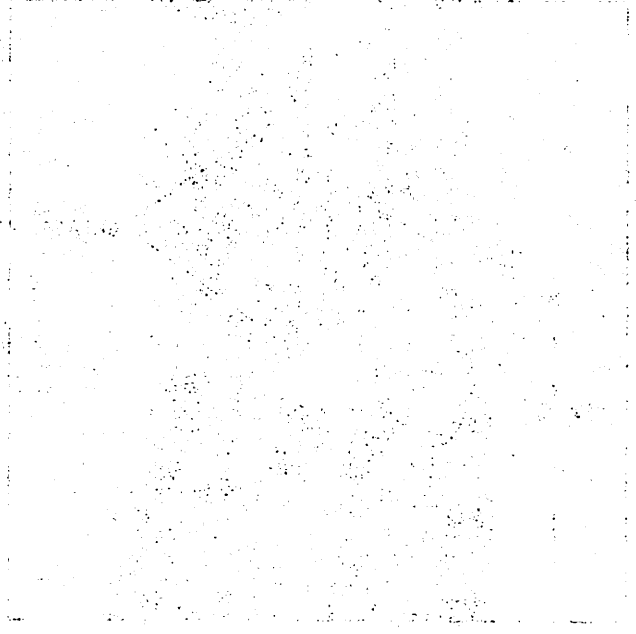
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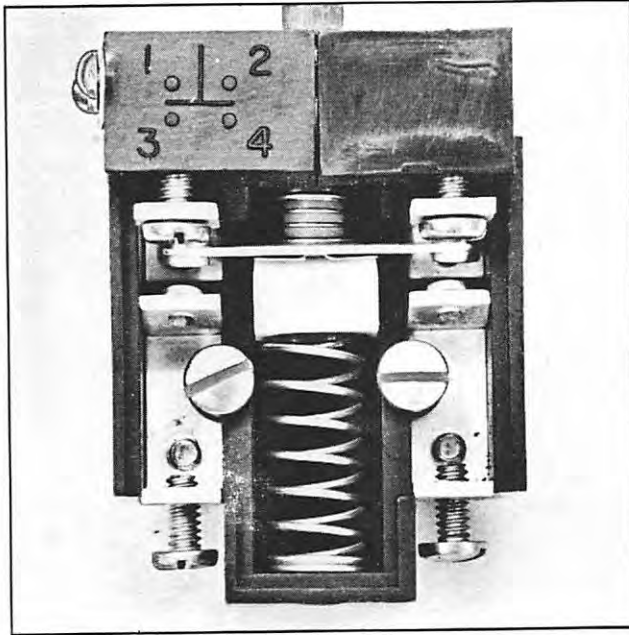


Plate 7443. Typical Pump Control Switch

PUMP CONTROL SWITCHES

The pump control switches are mounted at the valve spool end covers and are activated by movement of the valve spool.

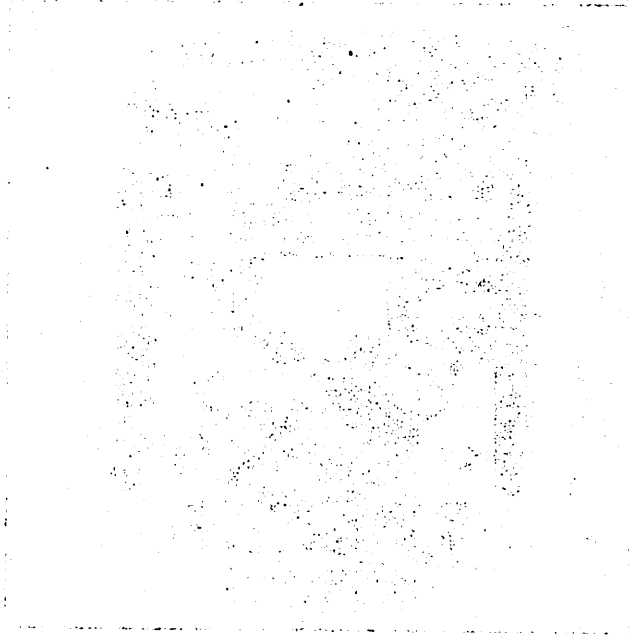
SWITCH ADJUSTMENT

1. Loosen the two screws clamping switch to valve.
2. Position switch on spool end cover so that movable switch contacts are centered between stationary contacts. (Switch contacts are viewed thru clear plastic cover on switch.)

N O T E

ADJUSTMENT OF SWITCHES MUST BE MADE WITH VALVE SPOOL IN NEUTRAL POSITION.

3. After correct adjustment is obtained tighten switch clamping screws.



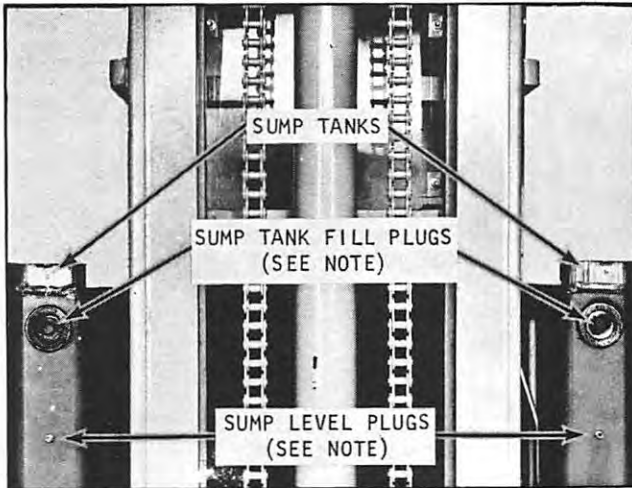


Plate 7528. Location of (Breather) Filter

HYDRAULIC SUMP (BREATHER) FILTER CHECK

1. Remove sump fill plug breather/s located in the upper sump tank/s at the top. See above illustrations.
2. Disassemble breather and inspect. If breather is not fit for further service (dirty or clogged with foreign material), then replacement is necessary.

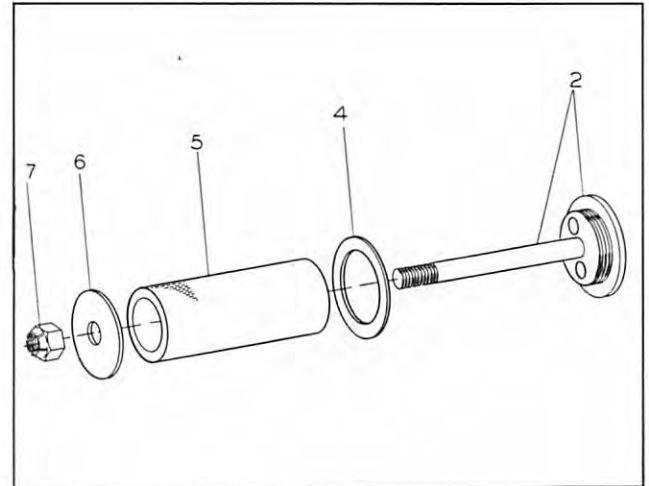
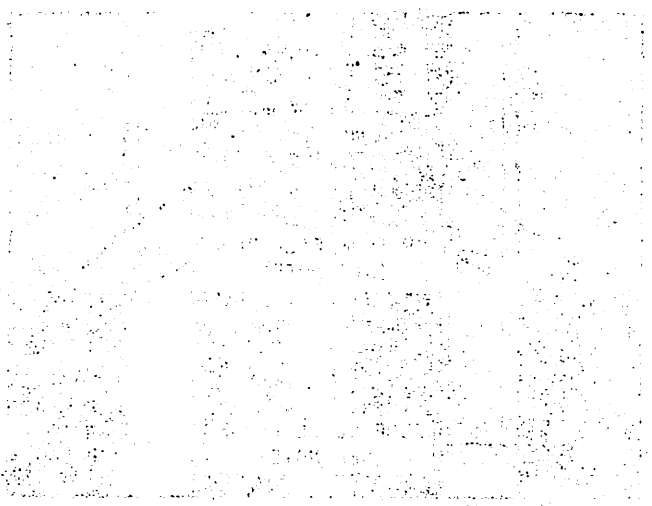
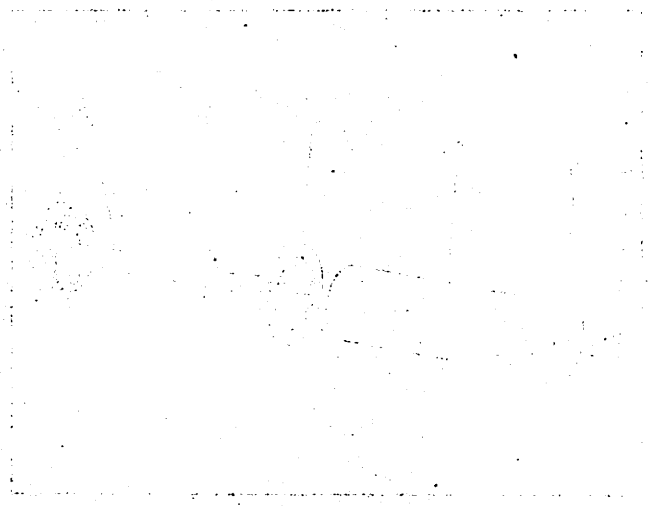


Plate 7527. Hydraulic Sump (Breather) Filter

3. Check both air holes for obstructions. Holes must be open.
4. Check breather gasket for further service and replace if necessary.
5. Reassemble components and install.



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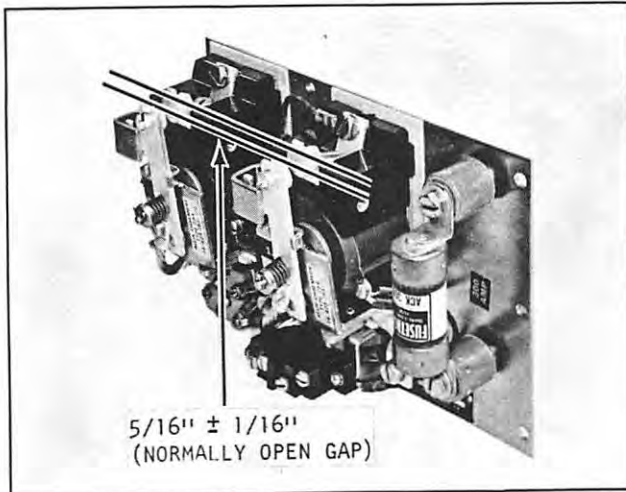


Plate 9455. Typical Frame Mounted Contactor Panel

CONTACTORS

Keep the contactor as free from dust and dirt as possible. This can be accomplished by periodically blowing off with low air pressure or wiping with a clean dry cloth. **DO NOT LUBRICATE.** Contact tips are of silver alloy and require no cleaning. Replace with a new contact tip when maximum contact wear (approximately 3/32") is reached.

N O T E

If contact tip carrier and/or springs are discolored from heat, replace them as well.

Contact Tip Torque

Tighten to nominal value of 19 inch-lbs.

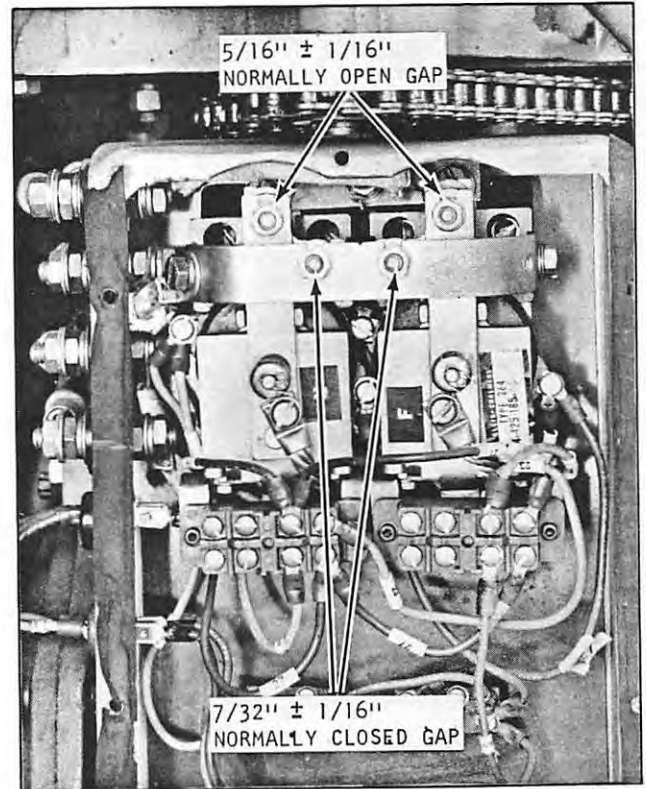


Plate 9456. Typical Contactor Panel Mounted on Drive Unit

ADJUSTMENTS

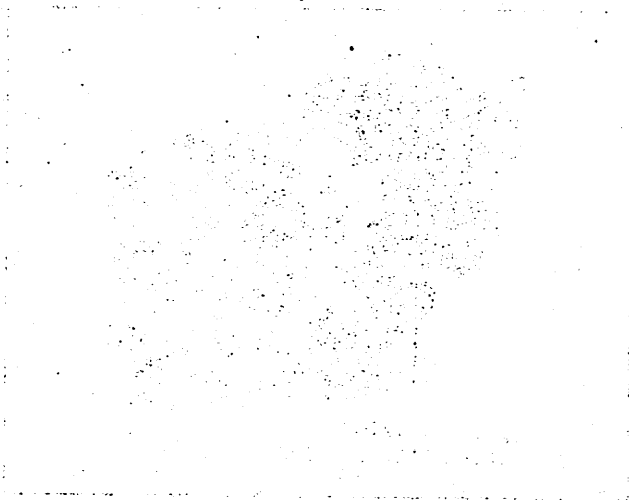
There are no adjustments necessary on these contactors. The normally open contact gap will be 5/16" plus or minus 1/16" and the normally closed gap is 7/32" plus or minus 1/16".

The force required to separate the normally closed tips is 4 oz. (measured at the tips).

The force required to separate the normally open tips is 1-3/4 pounds (measured at tips).

The force required to seat the normally open tips is 4-1/2 pounds (measured at the armature).

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LIFT CHAINS (LUBRICATE EVERY 100 OPERATING HOURS.)

CAUTION
WHEN OPERATING IN AN ABRASIVE ATMOSPHERE, DO NOT LUBRICATE LIFT CHAINS.

SUMP TANK (BREATHER) FILTERS
(CHECK EVERY 500 OPERATING HOURS. SEE PAGE 500H 173.)

NOTE

WIPE ALL GREASE FITTINGS FREE OF DIRT BEFORE LUBRICATING TRUCK.

BRAKE ROD LINKAGE
(LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATES 7538 & 7540. CARBON PILE ONLY.)

DRIVE CONTROL HANDLE
(LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATE 7537.)

STEER SHAFT & UPRIGHT MOUNTING PINS-(LUBRICATE EVERY 100 OPERATING HOURS)

STEER CHAINS (LUBRICATE EVERY 100 OPERATING HOURS.)

HYDRAULIC SUMP TANK
(DRAIN & REFILL EVERY 500 OPERATING HOURS.)

PANTOGRAPH (LIFT CARRIAGE)
(LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATES 7509, 7542, 7539, & PAGE 1000H 1815)

ACCELERATOR CONTROL LINKAGE
(LUBRICATE EVERY 100 OPERATING HOURS)

RADIAL ROLLERS, WHEEL SHAFT ROLLER AND VERTICAL THRUST ROLLER
(LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATE 7538.)

CASTER WHEEL BEARINGS
(REPACK WHEEL BEARINGS EVERY 1000 OPERATING HOURS. REFER TO PAGE 1000H 803.)

DRIVE UNIT (DRAIN & REFILL EVERY 1000 OPERATING HOURS. SEE PAGE 100H 073.)

BRAKE MASTER CYLINDER
CHECK FLUID LEVEL EVERY 100 OPERATING HOURS. SEE PAGE 100H 073.)

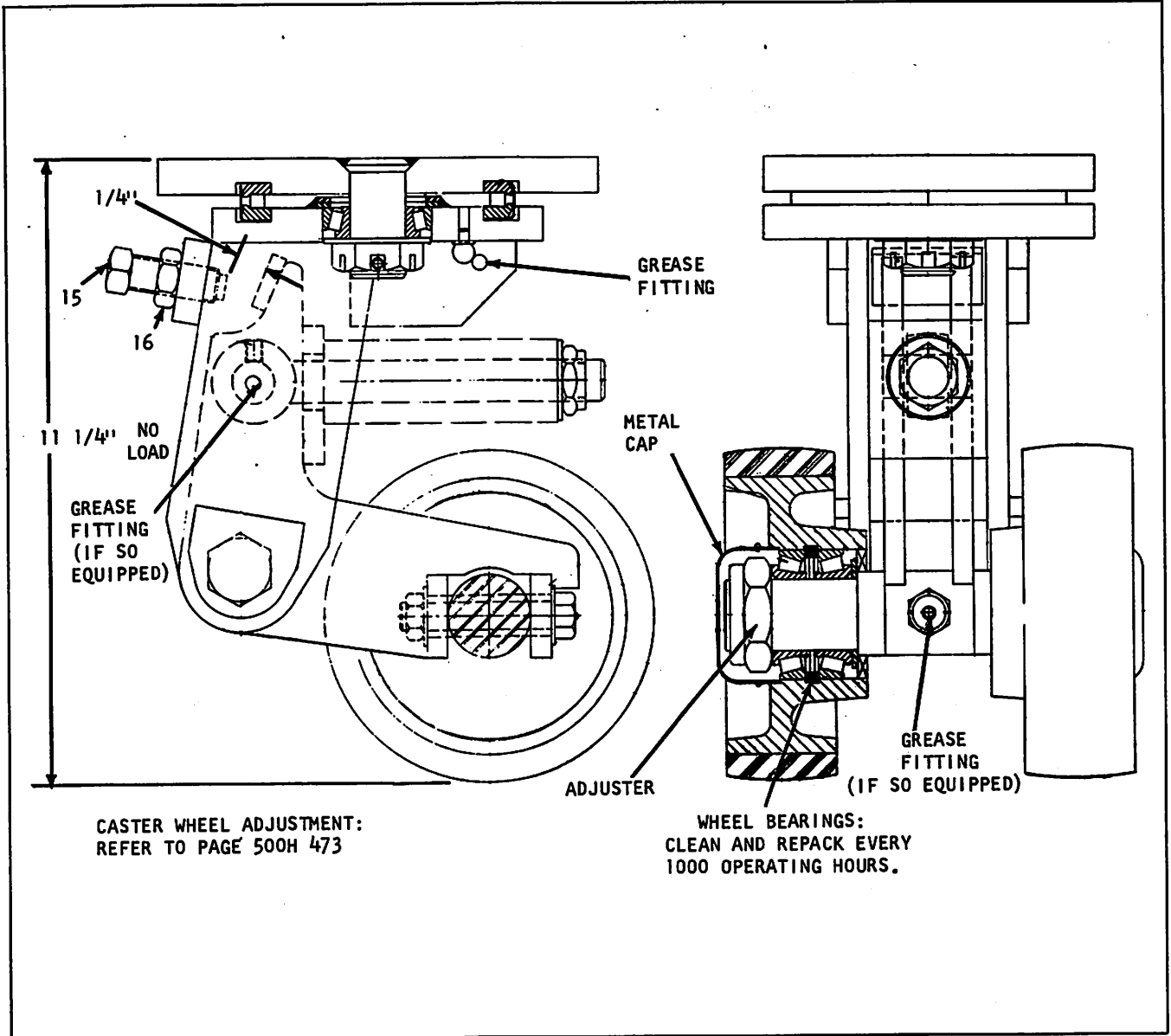
CASTER WHEELS (LUBRICATE EVERY 100 OPERATING HOURS. SEE PLATE 7538.)

HYDRAULIC FLUID FILTER
(CHANGE EVERY 500 OPERATING HOURS.)

Map of the State of California

Scale: 1 inch = 100 miles





CASTER WHEEL ADJUSTMENT:
REFER TO PAGE 500H 473

WHEEL BEARINGS:
CLEAN AND REPACK EVERY
1000 OPERATING HOURS.

Plate 7529. Typical Caster Wheel Assembly

CASTER LUBRICATION

Lubricate casters at grease fitting with NLGI #2 (Amolith grease EP #2 or its equivalent).



Plate 9445. Typical Pantograph Piston Rod Mounting Point Lubrication

LUBRICATION:

Lubricate every 100 operating hours with NLGI #2 (Amolith grease EP #2 or its equivalent).

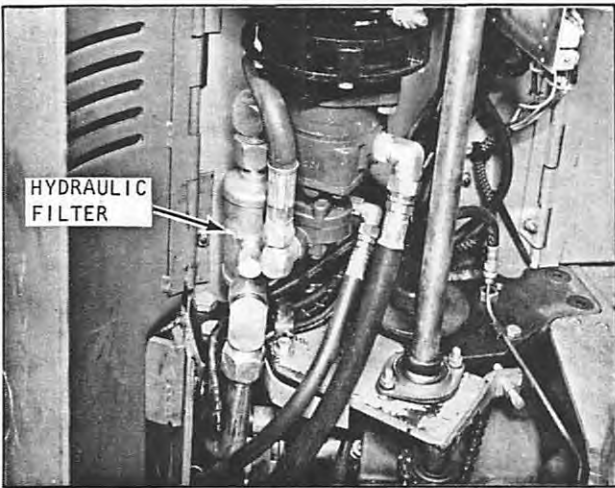


Plate 9491. Typical Hydraulic Filter Filter (Hydraulic) Location

On earlier models the hydraulic filter is located on the underside of the machine.

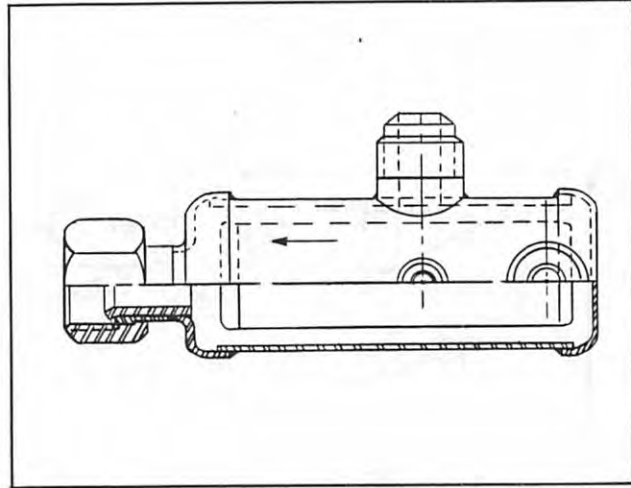


Plate 9446. Typical Hydraulic Fluid Filter

N O T E

Filter to be of 100 mesh screen.

CLEANING

Clean every 100 operating by immersing in solvent and blowing out with air. Blow air in nut end (against direction of arrow).

LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

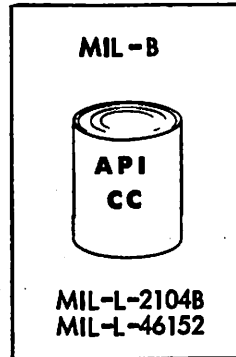
(A) ENGINE CRANKCASE OIL

FOR ... GASOLINE, L.P. GAS
ENGINES AND NATURALLY
ASPIRATED DIESEL ENGINES.

SPECIFICATION TO MEET API Service
Classification "CC" and "SC" per
SAE Report J183 and/or MIL-L-2104B*
Sulfated ash content 1.00% weight
maximum. Zinc content 0.06 to 0.10%
weight maximum.

This specification includes oils
meeting Specification MIL-L-46152
when applicable. Also, API Service
"SC"/"SD" (Formerly "MS") oils may
be preferred under stop-and-go or
light service conditions.

*Although Specification MIL-L-2104B
has recently been superceded, oils
of this quality will continue to be
available.



TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

Chevron RPM DELO Multi-Service Oil
Shell X-100 or Rotella, Rotella T
Sunfleet H.P. Motor Oil
ARCO Fleet X.H.D. Motor Oil
or ARCO Fleet H.D.
Gulflube Motor Oil X.H.D.
Citgo C300 Motor Oil
AMOCO 200 Motor Oil
Texaco Havoline
or URSA Extra Duty Motor Oil
Mobil Delvac 1100B
or 1200 Series Motor Oil
...or the equivalent to the above.

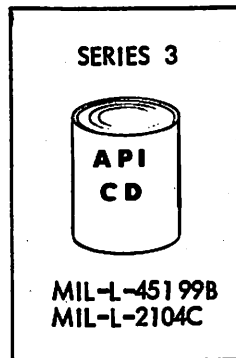
OILS FORMULATED FOR L.P.G. ENGINES

Cito L.P. Gas Engine Oil
Chevron Gas Engine Oil HDAX

(B) ENGINE CRANKCASE OIL (cont.)

FOR ... TURBOCHARGED DIESEL ENGINES
or DIESEL ENGINES USING
HIGH SULFUR CONTENT FUEL
(OVER 0.5% SULFUR).

SPECIFICATION TO MEET API Service
Classification "CD" per SAE Report
J183 and equivalent Series 3 and/or
MIL-L-45199B specifications. Also
MIL-L-2104C when applicable.
Sulfated ash content 1.65% maximum.



Chevron DELO Super 3 Oil
Shell Rimula Motor Oil
Sunfleet S-3 Motor Oil
ARCO Fleet MS-3 Motor Oil
Gulf Super Duty Motor Oil
AMOCO 300 Motor Oil
Citgo C-500 Motor Oil
Texaco URSA LA-3 Motor Oil
Mobil Delvac 1300 Series Motor Oil
...or the equivalent to the above.

FOR ALL OPERATIONS WITHIN NOMINAL TEMPERATURE RANGES, THE USE
OF SINGLE-GRADED OILS IS RECOMMENDED...AS LISTED BELOW.

SAE 10W	...	0 deg -to- 32 deg F.
SAE 20/20W	...	33 deg -to- 75 deg F.
SAE 30	...	above 75 deg F.

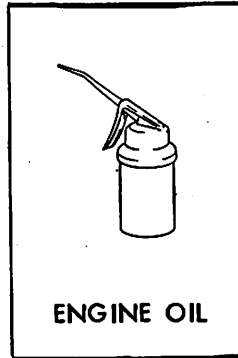
SAE #30 OIL OF MIL-L-2104B PERFORMANCE LEVEL IS RECOMMENDED
FOR YEAR AROUND USE IN DETROIT DIESEL ENGINES...(Limitations -
Zinc . 0.10% maximum, sulfated ash 1.0% maximum.). The use of
Multi-grade oils in Detroit Diesel engines is not recommended.

Oil Change Intervals ... a helpful guide in determining the
intervals is an engine oil analysis made several different
times. Local oil distributors offer this service. And by
using it you can set P.M. intervals with greater certainty.

LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

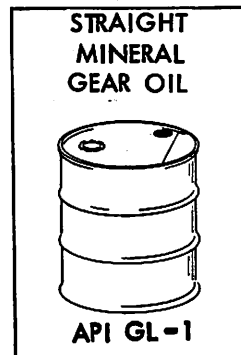
(A/B) ENGINE CRANKCASE OIL
FOR ... MISCELLANEOUS LINKAGE



TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

(C) TRANSMISSION LUBRICANT
FOR ... STANDARD MANUAL SHIFT
(SYNCHROMESH) TRANSMISSIONS
AND GEAR BOXES.

SPECIFICATION Regular type gear
lubricant of straight mineral gear
oil for API GL-1 Service per SAE
Report J308a. ("EP" lubricants
are not approved.)

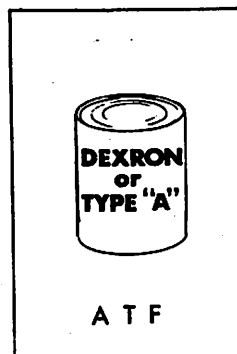


Chevron RPM Gear Oil
Shell Dentax 90 Gear Oil
Sunoco Gear Oil
ARCO Mineral Gear Oil
Gulf Transmission Oil
AMOCO Gear Lubricant
Citgo Regular Gear Oil
Texaco Thuban 90
Mobilube C Gear Oil
Molub-Alloy Trans., Gear Lube
...or the equivalent to the above.

ABOVE 0 deg F. - SAE #90
BELOW 0 deg F. - SAE #80

(D) TRANSMISSION FLUID

FOR ...
...POWRSHIFT FORWARD & REVERSE UNIT
...POWRWORKER HYDRAULIC SYSTEMS
...POWER STEERING RESERVOIRS
...POWRSHIFT TRANSMISSIONS
...HYDRACOO (WET) CLUTCH TRANS.
...HYDRATORC TRANSMISSION
...AUTOMATIC TRANSMISSION
...FLUID COUPLING DRIVES
...TORQUE CONVERTERS
...ELECTRIC TRUCK DRIVE UNITS*
... (WHEN SPECIFIED ON LUBE CHARTS*)
...NARROW AISLE TRUCK HYDRAULIC SYS.



Shell Auto. Trans. Fluid Donax T-6,
Dexron.
Sunoco Auto. Trans. Fluid, Dexron.
ARCO Auto. Trans. Fluid, Dexron.
Gulf Auto. Trans. Fluid, Dexron.
Mobil Auto. Trans. Fluid 220
Dexron.
Texaco 1859 Texamatic Fluid,
Dexron.
Citgo Auto. Trans. Fluid, Dexron.
AMOCO Auto. Trans. Fluid, Dexron.
...or the equivalent to the above.

SPECIFICATION USE DEXRON AUTO-
MATIC TRANSMISSION FLUID or Type
"A", Suffix "A" ATF (AQA-Armour
Qualified) as available.

LUBRICATION SPECIFICATIONS

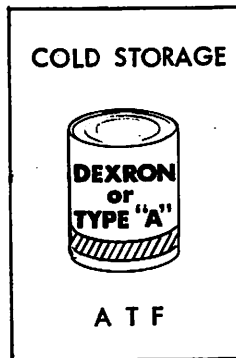
LUBRICATION CHART KEY

(D) TRANS. FLUID - continued -
DRIVE UNIT FLUID

FOR ... -COLD STORAGE OPERATION-

FOR ... DRIVE UNIT(S)
NARROW AISLE TRUCKS
POWRORKERS
ELECTRIC RIDER TRUCKS

SPECIFICATIONS Refer to Specifica-
tions listed under Item "D" on the
previous page.



TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

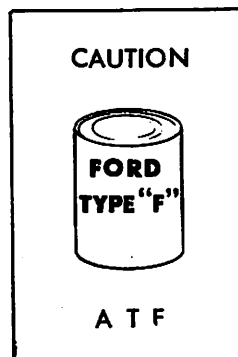
Refer to the previous page
under Item "D".

(E) TRANSMISSION FLUID - FORD

FOR ... ALL FORD AUTOMATIC TRANS-
MISSIONS AND CONVERTERS.

SPECIFICATIONS Automatic Trans.,
Fluid, Type "F", which meets
FORD MOTOR COMPANY Specification:

M2C33E (UNDYED) -or-
M2C33F (RED DYED)



Shell Auto. Trans. Fluid
Donax T-7, Type "F".
Sunoco Auto. Trans. Fluid,
Type "F".
ARCO Auto. Trans. Fluid, Type "F".
Gulf Auto. Trans. Fluid, Type "F".
Citgo Auto. Trans. Fluid, Type "F".
Texaco 1876 Texamatic Fluid,
Type "F".
Mobil Auto. Trans. Fluid 210,
Type "F".
...or the equivalent to the above.

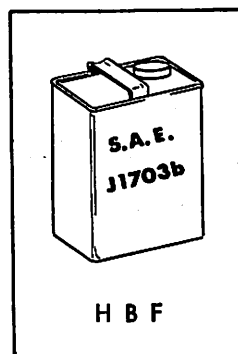
C A U T I O N

DEXRON AND TYPE "A" FLUIDS ARE NOT COMPATIBLE WITH TYPE "F" FLUIDS AND SHOULD NOT BE MIXED. DEXRON FLUID OR TYPE "A" FLUID SHOULD NOT BE USED IN THESE TRANSMISSIONS AND CONVERTERS ... (CTA "E" MODELS) ... TO DO SO WILL RUIN CLUTCH DISC FACINGS.

(F) HYDRAULIC BRAKE FLUID

FOR ... HYDRAULIC BRAKE SYSTEMS
EXCEPT WHEN SPECIFIED
DIFFERENTLY ON THE
LUBRICATION CHART(S)
AND NOT USED FOR COLD
STORAGE.

SPECIFICATION Use only heavy-
duty Hydraulic Brake Fluid which
meets the requirements of SAE J1703b.



Shell Super Safety or Donax "B"
Brake Fluid.
Gulf Super Heavy Duty Hydraulic
Brake Fluid.
Atlas Heavy Duty Hydraulic Brake
Fluid.
Texaco Super Heavy Duty Hydraulic
Brake Fluid.
Mobil Hydraulic Brake Fluid.
ARCO Heavy Duty Brake Fluid.
Wagner 21B Hydraulic Brake Fluid.
Hollingshead 2665 Heavy Duty
Brake Fluid.
...or the equivalent to the above.

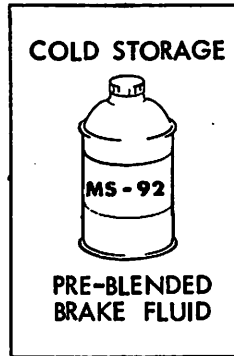
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(F) HYDRAULIC BRAKE FLUID
 FOR ... -COLD STORAGE OPERATION-
 FOR ... ALL HYDRAULIC BRAKE SYSTEMS
 EXCEPT WHEN SPECIFIED
 DIFFERENTLY ON LUBRICATION
 CHART(S).

SPECIFICATION Use Fluid per CLARK
 Specification MS-92:

Recommended fluid: 85% by volume,
 Isopropyl Alcohol: 15% by volume.



TYPICAL PRODUCT RECOMMENDED BY
 MAJOR BRAND OIL SUPPLIERS

Extreme Low Temperature Hydraulic
 Brake Fluid:

Dow Chemical Company
 (Pre-Blended
 Clark Fluid Number 300)

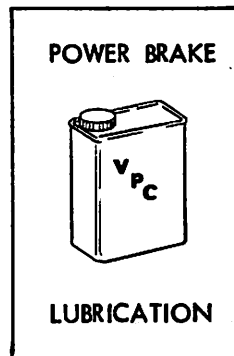
... Dow Chemical Fluid HD35-4
 ... Hollingshead Formula 2665

(G) POWER BRAKE VACUUM CYLINDER
 LUBRICANT

FOR ... BENDIX HYDROVAC UNIT

SPECIFICATION Bendix Vacuum
 Power Cylinder Oil or approved
 equivalent.

Apply after installation
 and periodic maintenance
 per instruction.

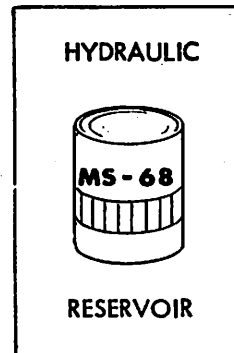


Bendix Vacuum Power Cyl Lubricant
 Part No 377299 (2 oz Tube)
 Part No 377300 (Quart Can)

Texaco Rabtex
 AeroShell Fluid 4
 ...or the equivalent to the above.

(H) HYDRAULIC FLUID
 FOR ... MAIN HYDRAULIC SYSTEMS
 EXCEPT WHEN SPECIFIED
 DIFFERENTLY ON THE LUBRI-
 CATION CHART(S).

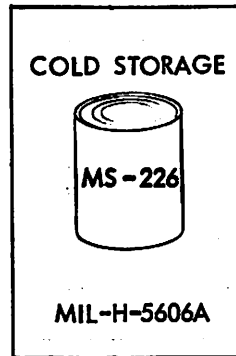
SPECIFICATIONS Use only high
 quality hydraulic fluid with Zinc
 Anti-Wear Additive which meets
 Clark Specification MS-68.



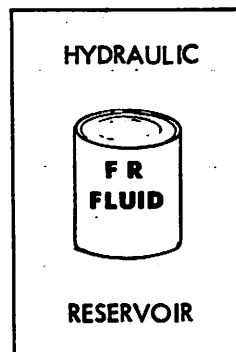
Shell LO Hydrax 127
 Sunvis Industrial Oil #816 WRP
 Gulf Harmony 43 AW
 AMOCO Industrial Oil RL #14A
 Citgo Pacemaker XD-15 MS-68
 Hydraulic Fluid.

Texaco 729 Rando Oil HD-A
 ARCO Duro AW-16 or Duro AWS-150
 Chevron EP Hydraulic Oil 9
 Molub-Alloy Industrial Hydraulic
 Oil #601.
 ...or the equivalent to the above.

(H) -continued-

TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERSHYDRAULIC FLUIDFOR ... -COLD STORAGE OPERATION-FOR ... MAIN HYDRAULIC SYSTEMS
EXCEPT WHEN SPECIFIED
DIFFERENTLY ON THE LUBRI-
CATION CHART(S).SPECIFICATIONS Use Hydraulic
Fluid which meets MIL-H-5606A
per CLARK Specification MS-226.A petroleum base hydraulic fluid
with additives to improve viscosity
index, oxidation resistance, and
anti-wear characteristics blended
to form a stable product under
storage and operational conditions
between -65 and +160 deg. F. meet-
ing MIL-H-5606A* per CLARK
Specifications MS-226.*The restrictive
cleanliness specifica-
tions of later revisions
is not required.Shell Product #60421
AeroShell Hydraulic Fluid 4
...or the equivalent to the above.HYDRAULIC FIRE RESISTANT FLUID

FOR ... SPECIAL APPLICATIONS

FOR ... MAIN HYDRAULIC SYSTEMS
EXCEPT WHEN SPECIFIED
DIFFERENTLY ON THE LUBRI-
CATION CHART(S).SPECIFICATIONS High quality
Water-Glycol Fire Resistant
Hydraulic Fluid composed of
approximately 42% water and
58% glycol with a nominal
viscosity of 200 SUS at 100F.
Pour point -60 deg. F min.
To contain proper additive
balance to impart optimum
stability, lubricity, wear and
corrosion protection. Approved
by Factory Mutual Insurance
Underwriters.Citgo Pacemaker Glycol - FR
Fluid, Grade 20.
Houghto-Safe 620
Texaco Hydraulic Safety Fluid 200
...or the equivalent to the above.

NOTE

For data pertaining
to the "testing" of
Water-Glycol ...
refer to the last
page of this KEY.

NOTES

FUEL SYSTEM	ELECTRICAL SYSTEM	COOLING SYSTEM	BRAKES	CLUTCH	HYD. SYSTEM	STEERING COLUMN & AXLE	WHEELS & TIRES	TRANS. DIFF. DR. AXLE	ENGINE	UPRIGHT ASSY.	CHASSIS

(J) DRIVE AXLE GEAR LUBRICANT:

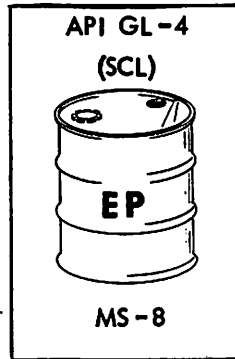
FOR: ... DRIVE AXLES,
HEAVY DUTY DIFFERENTIALS,
PLANETARY WHEEL ENDS.

SPECIFICATIONS: Extreme pressure type gear lubricant with sulfur-chlorine-lead (SCL) 'EP' additive for API GL-4 Service per SAE Report J308a. To meet CLARK Specification MS-8.

Below 0 to -10 de F -- SAE 80
Normal Temperature -- SAE 90
100 deg F and above -- SAE 140

NOTE

SAE 80 and SAE 140 viscosities, when used, should contain like additives as specified by MS-8 (SAE 90). DO NOT ADD (MIX) DIFFERENT TYPES OF LUBRICANT.

**TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS**

Shell HDR Gear Oil 90 EP
Shell HDR Gear Oil 140 EP
Chevron RPM Special Gear Lube SCL
Sunoco XD Gear Lubricant
Gulf Hypoid Gear Lubricant A.P.T.
AMOCO Superla Gear Lubricant
Citgo Gear Oil Lead Base
Texaco Gear Lube HD 90
Molub-Alloy Drive Axle Lube #518
Mobilube 46
ELCO Gear Safety 28
...or the equivalent to the above.

(K) GENERAL PURPOSE GREASE:

FOR: ... CLARK AXLE ENDS
WHEEL BEARINGS
STEERING GEARS
JOINTS, LEVERS & BUSHINGS
POWRORKER and NARROW
AISLE TRUCKS - ALL POINTS

SPECIFICATIONS: NLGI #1 per MS-107B

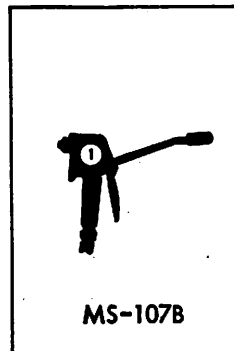
GENERAL PURPOSE GREASE:

FOR: ... STEER AXLE TRUNNION BRGS.
UPRIGHT MAST ROLLERS &
SLIDES,
UNIVERSAL JOINTS,
WATER PUMP BEARINGS,
GENERAL CHASSIS LUBRICATION.

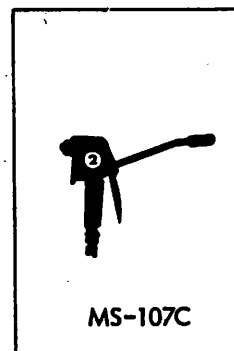
SPECIFICATIONS: NLGI #2 per MS-107C

A multi-purpose grease of refined mineral oil blended with a lithium soap thickener or equal containing anti-wear, anti-rust and anti-oxidants with EP additives.

Clark Specification:
MS-107B - Grade No. 1
MS-107C - Grade No. 2



Shell Alvania EP Grease #1 or #2
Sun Prestige 741 EP #1 or #2
Gulfcrown Grease EP #1 or #2
AMOLITH GREASE EP #1 or #2
Citgo HEP Grease #1 or #2 or
Citgo AP Grease.
Texaco Multifak EP #1
or Marfak ALL Purpose #2.
Molub-Alloy General Purpose
Grease #1 or #2.
ARCO Litholine Ind. Grease #2 EP
or Litholine EP #2 Grease.
Mobilgrease 76 or 77
...or the equivalent to the above.

**REFER TO THE ABOVE FOR
RECOMMENDED SUPPLIERS.****ADDITIONAL RECOMMENDATIONS**

*Chevron BRB-2
*Shell AeroShell Grease 5

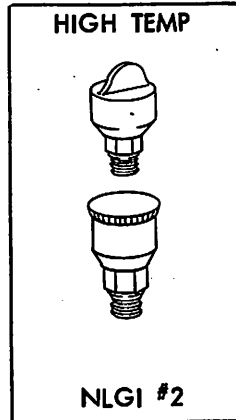
*Recommended for Water Pumps
and Universal Joints.

(L) HIGH TEMPERATURE GREASE

FOR ... CLUTCH THROWOUT BEARINGS
CLUTCH PILOT BEARINGS
DYNATORK PILOT BEARINGS

SPECIFICATIONS A high temperature grease of refined mineral oil base with a lithium soap thickener or equal compounded with additives to give high load-carrying ability and resistance to water and high temperature. To withstand temperatures of -20 deg F (to) +300 deg F. NLGI Grade No. 2.

Reference Specification:
(For typical product.)
MIL-G-3545C



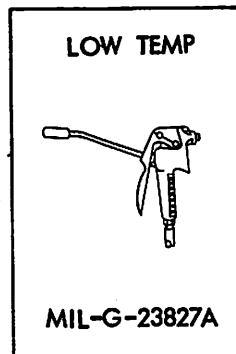
TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

Shell AeroShell Grease #5
Gulfcrow Grease EP #2
AMOLITH Grease EP #2
Citgo HEP Grease #2 or
Citgo AP Grease.
Texaco High Temperature Grease
1999 #2.
Mobilgrease 28
...or the equivalent to the above.

(M) LOW TEMPERATURE GREASE

FOR ... -COLD STORAGE OPERATION-

FOR ... GENERAL CHASSIS GREASE
UPRIGHT MOUNTING
UPRIGHT LIFT CHAINS
ALL MOVABLE PARTS EQUIPPED
WITH GREASE FITTINGS.
BRAKE (AND CLUTCH) PEDAL
LINKAGE.
(Narrow Aisle Trucks and
Powrworkers)
DRIVE UNIT FITTINGS
PANTOGRAPH
CASTER WHEELS
STEER CHAIN
LOAD WHEELS WITH FITTINGS



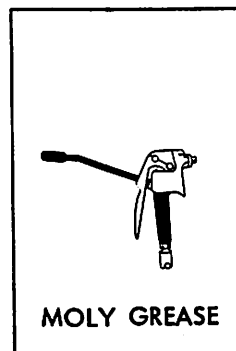
SPECIFICATION An extreme low temperature aircraft quality grease meeting Specification MIL-G-23827A, or equivalent product. Temperature range -100 to +250 deg F.

Texaco #2346 Low Temperature
Grease "EP".
American Oil SUPERMIL
Grease A-72832.
...or the equivalent to the above.

(N) SPECIAL GREASE

FOR ... STRADDLE CARRIERS
EQUALIZING LINKAGE
HOOK & HANGER BUSHINGS
HOIST MECHANISM

SPECIFICATIONS A smooth high quality grease of refined mineral oil base with a lithium soap thickener or equal compounded with corrosion and oxidation inhibitors and containing 1 to 3% moly (molybdenum disulfide).
NLGI #2



American Molyllith Grease #92006
Molub-Alloy General Purpose
Grease #2.
Molytex #2
...or the equivalent to the above.

LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(N) SPECIAL GREASE - continued -

FOR: ... DISTRIBUTOR CAMS

SPECIFICATION: Refer to previous page.



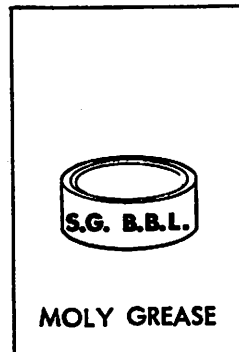
TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

Clark Part Number: 1800636

SPECIAL GREASE - continued -

FOR: ... DELCO STARTER BEARINGS

SPECIFICATION: Refer to previous page.



Clark Part Number: 1800574

(P) SPECIAL GREASE:

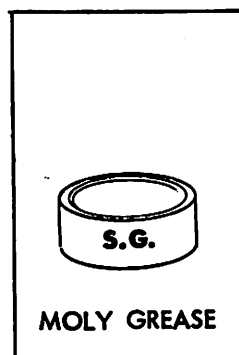
FOR: ... GENERATOR PUMP DRIVE TANG
PUMP & MOTOR SHAFT SPLINES

SPECIFICATIONS: A lithium base or equal multi-purpose grease blended with selected additives to provide high load-carrying capacity with superior protection against corrosion and high-temperature oxidation and containing 3 (to) 5% moly (molybdenum disulfide).

NLGI #2

N O T E

Grease products under this specification are suitable for use on ball and roller bearings operating under extreme loads or in severe environments, and for extended lubrication intervals including chassis, sleeve bearings, cams and sliding mechanisms, etc., under heavy loads, shock and vibration.

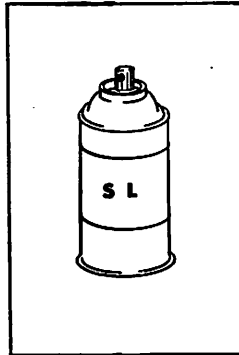


Clark Part Number: 1800531

(R) SPECIAL LUBRICANT

FOR ... CLUTCH THROWOUT BEARING-
CARRIER RAILS

SPECIFICATION Use an approved
Dry Film Type Lubricant or the
equivalent.

**TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS**

Graph-O-Kote #220 (Aerosol-can)
(Joseph Dixon, Crucible Company,
Jersey City, N.J.)

Molub-Alloy #369 Dry Lube.

Dow Corning Molykote 321
Bonded Lubricant

...or the equivalent to the above.

(S) COLD STORAGE OPERATION

FOR ... ELECTRICAL SWITCHES
AND TERMINALS.
- ELECTRIC RIDER TRUCKS -

FOR ... SOLID STATE CONTROL
EQUIPPED TRUCKS.

SPECIFICATION Spray Coating



Krylon, Inc.,
Norristown, Pa. -6412-

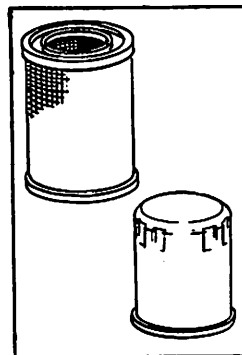
Sprayon 707 PDRP
26300 Fargo Avenue
Bedford, Ohio -44146-

...or the equivalent to the above.

(‡) OIL & FLUID FILTERS

FOR ... TRUCK SYSTEM(S)

SPECIFICATIONS Replacement parts
to be of a quality equal to that
provided in the original equipment.
‡Consult CLARK Service Parts
Publication(s) for recommended
replacement parts.



Oil Filter Cartridge Kit(s)
(Reference: Appropriate
Parts Manual)

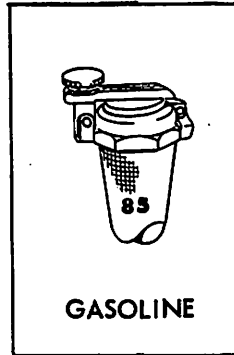
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

(T) ENGINE FUEL - GASOLINE
FOR ... INDUSTRIAL GASOLINE ENGINES

SPECIFICATIONS Fuel to be Auto-
motive Quality Regular Grade
Gasoline containing a corrosion
inhibitor.

Minimum Motor Octane
Number - 85



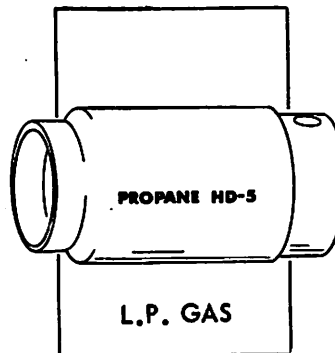
TYPICAL PRODUCT RECOMMENDED BY
MAJOR BRAND OIL SUPPLIERS

Shell Regular Gasoline
Sunoco 200 Gasoline
Good Gulf Gasoline
American Regular Gasoline
Citgo Regular Gasoline
Texaco Firechief Gasoline
ARCO Gasoline Regular
Mobil Gasoline Regular
...or the equivalent to the above.

(U) ENGINE FUEL - L.P.GAS
FOR ... INDUSTRIAL L.P.GAS
POWERED ENGINES

SPECIFICATIONS Use LPG meeting
PROPANE HD-5 (NGPA Specification
2140-62) or ASTM D2154 (Special
Duty Propane) requirements.

Minimum Motor Octane
Number - 95

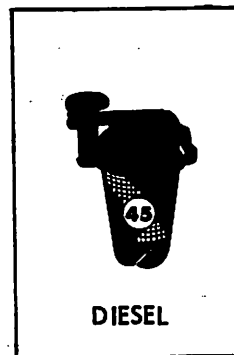


Citgo L.P. Gas (HD-5)
Texaco 436 Propane
...or the equivalent to the above.

(V) ENGINE FUEL - DIESEL
FOR ... INDUSTRIAL DIESEL
POWERED ENGINES

SPECIFICATIONS Fuel to be Auto-
motive Quality Diesel Fuel Oil as
defined by ASTM D975, Grades
No. 1-D and 2-D, and having a
Sulfur Content of less than 0.5%
weight.

Recommended Cetane
Number - 45 Minimum



Shell Premium Dieseline OR45
Sun Diesel Fuel 245-T
ARCO Premium Diesel
ARCO Diesel #1 and #2
Gulf Diesel Fuel #1 or #2
AMOCO Diesel Fuel #1D and American
Premier Diesel Fuel #2D
Citgo Diesel Fuel #1 or #2
Texaco Diesel Chief #1
Mobil Fuel Diesel & Mobil Diesel
Fuel Special
...or the equivalent to the above.

NOTE

AN ASTM NO. 1-D FUEL IS PREFERRED
WHERE MINIMUM SMOKE AND ODOR IS
REQUIRED OR WHERE LIGHT LOAD AND
SPEED WITH CONSIDERABLE IDLING IS
ENCOUNTERED AND FOR COLD-WEATHER
USE GENERALLY.



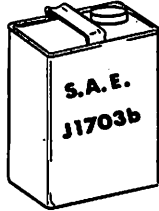
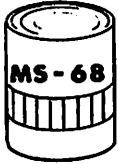

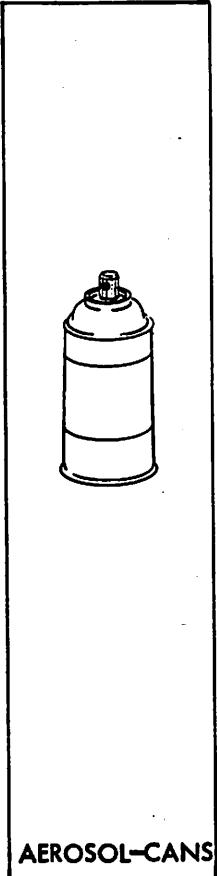
INDUSTRIAL TRUCK DIVISION



LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

LUBRICANTS ETC., BY CLARK PART NUMBER

PART NUMBER			DESCRIPTION
HYDRAULIC BRAKE FLUID	884677 1800200 850487		1 - quart can 1 - case of 16-ounce cans 1 - case of 6 one-gallon cans
HYDRAULIC SYSTEM FLUID	885385 885382		1 - case of 24 one-quart cans 1 - case of 6 one-gallon cans
AUTOMATIC TRANSMISSION FLUID	879803 879804 941615		1 - quart can 1 - case of 24 one-quart cans 1 - case of 6 one-gallon cans
BATTERY CLEANER	886398		1 - case of 12 one-pint cans
LUBRICANT	886396		1 - case of 12 one-pint cans
PENETRATING OIL	886397		1 - case of 12 one-pint cans
BELT DRESSING	1800078		1 - case of 12 one-pint cans
CHAIN LUBE	886399		1 - case of 12 one-pint cans (Roller & Leaf Chain Lube)
SPRAY KOTE	886784		1 - case of 12 16-ounce cans (Transparent Protective Insulating Sealer with Clear Lube.)
SPRAY LUBE	886785		1 - case of 12 16-ounce cans (Black Heavy-Duty "EP" Lubricant.)
DEGREASER	1800330		1 - case of 12 one-pint cans
CONQUER SPRAY	1801145		1 - case of 12 16-ounce cans
DEGREASER	1801146		1 - case of 12 16-ounce cans

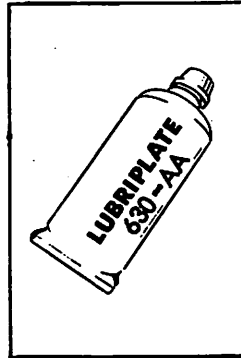
LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

LUBRIPLATE

FOR ... SLIP TUBES, SLEEVES,
SPRING APPLIED SLEEVES,
LINKAGE BALL JOINTS, ETC.

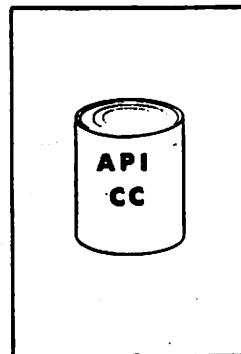
SPECIFICATION Lubriplate 630-AA
or equivalent.



Fiske Brothers Refining Company
...or the equivalent to the above.

CRANKCASE MOTOR OIL

S.A.E. 10W	1800946
S.A.E. 20W	1800990
S.A.E. 30	1800947
S.A.E. 10W - 30	1800948



1 - case of 24 one-quart cans
1 - case of 24 one-quart cans
1 - case of 24 one-quart cans
1 - case of 24 one-quart cans

TECHNICAL SOCIETIES IN REFERENCE (PREVIOUS PAGES)

AGMA	-----	American Gear Manufacturers Association
API	-----	American Petroleum Institute
ASTM	-----	American Society for Testing and Materials
EMA	-----	Engine Manufacturers Association
MIL	-----	Military Specification
NGPA	-----	Natural Gas Processors Association
NLGI	-----	National Lubricating Grease Institute
SAE	-----	Society of Automotive Engineers



INDUSTRIAL TRUCK DIVISION



LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

PRODUCTS IN REFERENCE

**AMERICAN OIL COMPANY
STANDARD OIL DIVISION**

AMOCO
Amolith
Molyolith

SHELL OIL COMPANY

Rotella, Rotella T Motor Oil
Rimula Motor Oil
Dentax Gear Oil
Spirax Gear Lubricant
Alvania Grease
AeroShell

ATLANTIC RICHFIELD COMPANY

ARCO

SUN OIL COMPANY

CHEVRON OIL COMPANY

Chevron Products

Sunfleet Motor Oil
Sunoco Products
Sun Prestige
Sunvis Oil

CITIES SERVICE OIL COMPANY

Citgo Products

THE ELECO CORPORATION

ELCO

GULF OIL CORPORATION

Gulf Products
Gulfcrown

TEXACO, INC

Texaco Havoline or URSA
Thuban
Texamatic
Molytex

IMPERIAL OIL & GREASE COMPANY., INC

Molub-Alloy

MOBIL OIL CORPORATION

Mobilube
Mobilgrease

LOW TEMPERATURE OPERATION (MULTI-VISCOSITY OILS)

MULTI-VISCOSITY OIL SHOULD BE USED ONLY WHERE COLD STARTING CONDITIONS MAKE IT NECESSARY. THE OIL SUPPLIER SHOULD ASSUME FULL RESPONSIBILITY FOR SATISFACTORY PERFORMANCE OF THE MULTI-VISCOSITY OIL AT BOTH LOW AND NORMAL ENGINE OPERATING TEMPERATURES.

SERVICE CONDITIONS

OIL PERFORMANCE WILL REFLECT ENGINE LOAD, TEMPERATURE, FUEL QUALITY, ATMOSPHERIC DIRT, MOISTURE AND MAINTENANCE. WHERE OIL PERFORMANCE PROBLEMS ARISE OR ARE ANTICIPATED, THE OIL SUPPLIER SHOULD BE CONSULTED. WHEN EXTENDED DRAIN PERIODS ARE CONTEMPLATED, HIS ANALYSIS OR THAT OF A REPUTABLE LABORATORY SHOULD DETERMINE THE SUITABILITY OF OIL FOR FURTHER SERVICE.

LUBRICATION SPECIFICATIONS

LUBRICATION CHART KEY

Reference: HYDRAULIC FIRE RESISTANT FLUID (SPECIAL APPLICATIONS)
Ref. Specification(s): 871-L-224-1971 Water-Glycol

THE FOLLOWING "TEST PROCEDURE" WAS DEVELOPED BY CITGO ... BE SURE TO REQUEST "TEST PROCEDURE(S)" FROM THE SUPPLIER OF THE PRODUCT USED IN YOUR EQUIPMENT.

The Cities Service Research and Development Department has developed a simple and rapid method for determining the alkalinity level of CITGO Pacemaker Glycol-FR Fluid. This procedure is based on the use of Quantab 8001, an indicating device calibrated to permit the direct determination of free alkalinity present in the fluid. Quantabs are available from Ames Company, Inc, Elkhart, Indiana.

CITIES SERVICE TEST PROCEDURE --
CONTROL OF FREE ALKALINITY

1. Measure 90 ml. of distilled water into a 100 ml. graduate.
2. Add 10 ml. of the CITGO Pacemaker Glycol-FR Fluid from the system to be tested. This measurement should be accurate in order to assure proper alkalinity readings.
3. Stopper the graduate and shake well for approximately 30 seconds.
4. Place approximately 10 ml. of the diluted fluid into a small (150 ml.) beaker or other suitable receptacle.
5. Remove the end tab from a Quantab 8001 indicator and place the Quantab into the beaker with the 10 ml. sample of diluted fluid.
6. After the fluid has wetted the entire column (about 15 to 20 minutes) read the height of the color alternation on the Quantab as shown by a change from blue to green opposite the Quantab scale.
7. If the Quantab scale reading is 3.2 or above, no alkalinity adjustment is required; if the scale reading is below 3.2, add 1 quart of morpholine for each 50 gallons of fluid in the system.

An alkalinity check should be made twenty-four hours after the water content or alkalinity of the fluid is adjusted. Alkalinity levels should be checked frequently during the first month after a system has been converted to CITGO Pacemaker Glycol-FR Fluid. Thereafter, a regular schedule for checking alkalinity should be set up depending on experience and the needs of the system.

Control of alkalinity by direct measurement of the pH of the system fluid is not recommended. Where laboratory facilities are available the free alkalinity of CITGO Pacemaker Glycol-FR Fluid may be measured by electrometric titration. A sample of fluid from the system is diluted with distilled water and titrated to a pH of 6.3 with standardized 0.1N HCL. If the milliequivalents per liter of HCL is below 60, one quart of morpholine should be added for each 50 gallons of fluid in the system. The control value of "60" in this procedure corresponds to the 3.2 scale reading of the Quantab 8001 indicator in the Cities Service Test Procedure.



INDUSTRIAL TRUCK DIVISION



NOTICE

THE WIRING DIAGRAM IN THIS MANUAL IS FOR A STANDARD TRUCK, WITHOUT SPECIAL CUSTOM FEATURES.

THE PARTS BOOK FOR THIS SERIAL NUMBER INCLUDES WIRING DIAGRAM/S COVERING SPECIAL CUSTOM OPTIONS INCORPORATED AT TIME OF SHIPMENT.

500 HOURS

NUTS, BOLTS & CAPSCREWS.
CHECK SECURITY OF MOUNT-
ING, TIGHTEN AS REQUIRED.

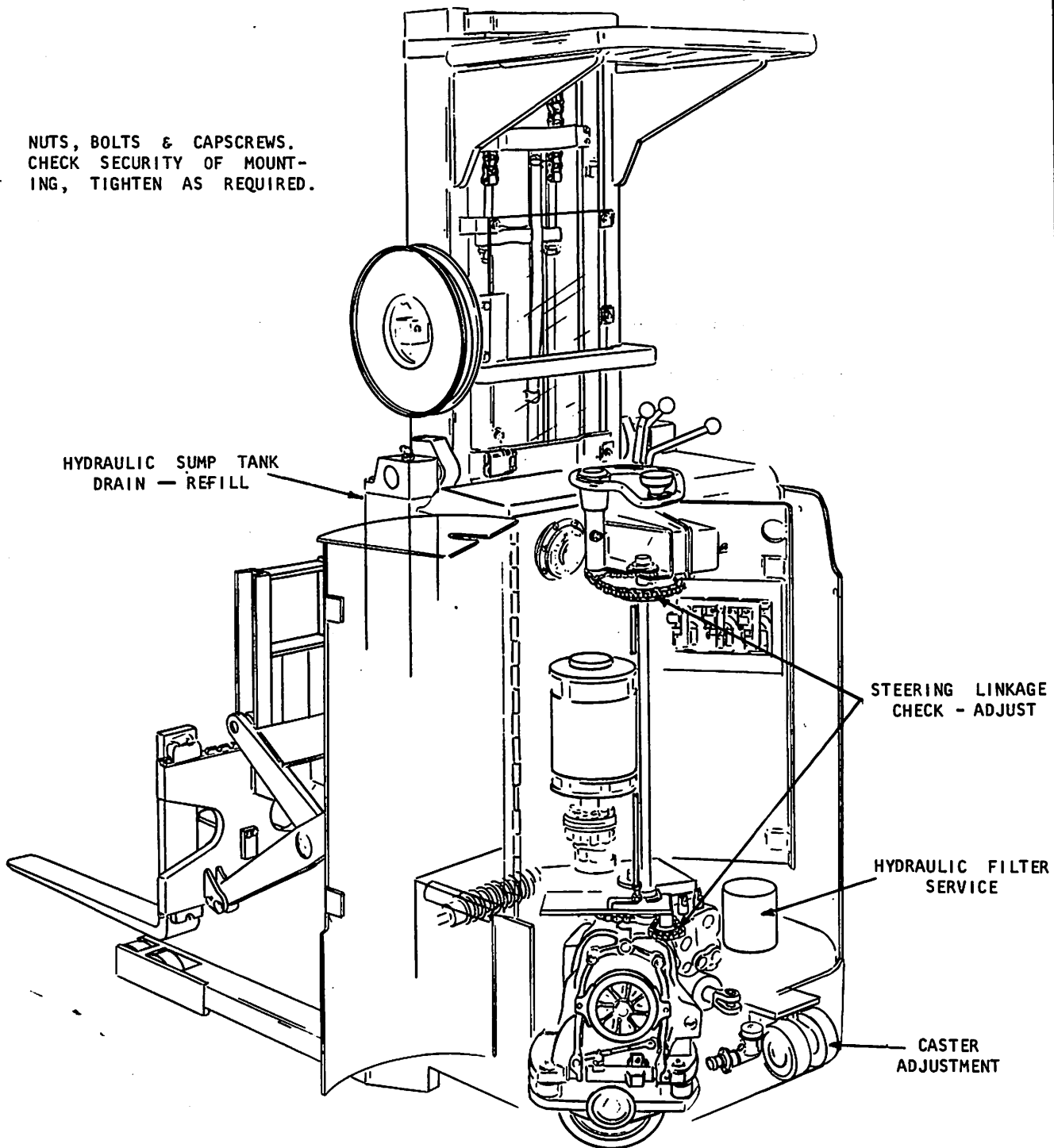


Plate 7523. Lubrication & Preventive Maintenance Illustration

DRAIN HYDRAULIC SUMP TANKS,
CHANGE HYDRAULIC SYSTEM FILTERS,
CHECK HYDRAULIC SYSTEM BREATHER(S)

CAUTION

THE HYDRAULIC SYSTEM MUST BE KEPT CLEAN. IT MAY BE NECESSARY TO DRAIN, CLEAN AND REFILL THE SUMP TANK MORE OFTEN UNDER ADVERSE CONDITIONS. THIS IS BEST DETERMINED BY CHECKING CONDITION OF THE HYDRAULIC FLUID FOR EVIDENCE OF DIRT, SLUDGE OR ANY FOREIGN MATTER AT PERIODIC INTERVALS.

1. Lower forks to the floor.
2. Turn switch key "off".
3. Place a container under each drain plug. See plate 7525.
4. Remove drain plugs and drain fluid.

5. Remove sump breather located in right hand sump tank at the top, see 7258.

If breather is not fit for further service ... replacement is required. Plate 7527.

Check both air holes in the breather cap(s) for obstructions. Holes must be open at all times.

6. After tanks have drained ... remove fill plug on left hand tank, see Plate 7528.

Flush tank ... pour two quarts of new hydraulic fluid thru each fill plug opening.

When tank has completely drained, install drain plugs.

CAUTION

DO NOT START PUMP WHILE SUMP TANK IS EMPTY. DAMAGE TO HYDRAULIC PUMP WILL RESULT WITH NO FLUID IN THE SYSTEM.

WHEN FILLING OR CHECKING SUMP TANK, THE UPRIGHT FORKS MUST BE LOWERED TO THE FLOOR.

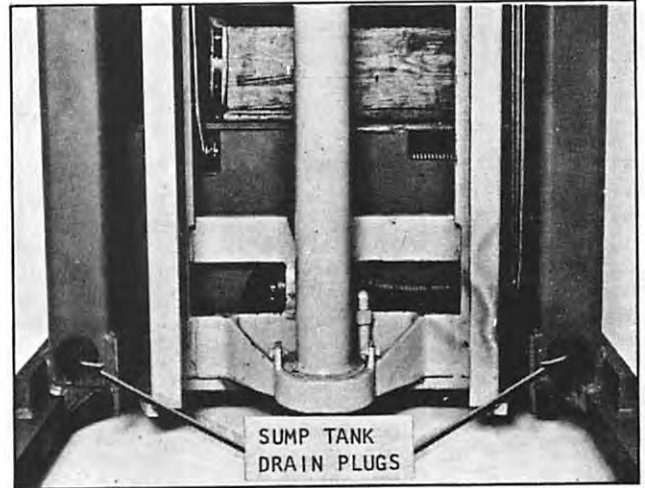


Plate 7525. Drain the Hydraulic Sump Tanks

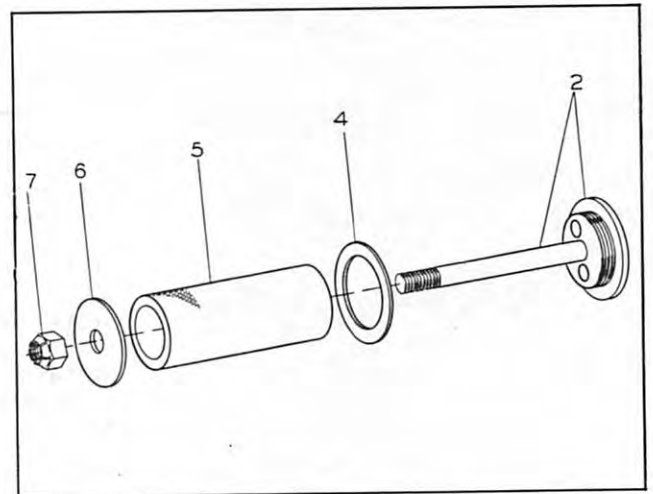


Plate 7527. Hydraulic Sump Tank Breather

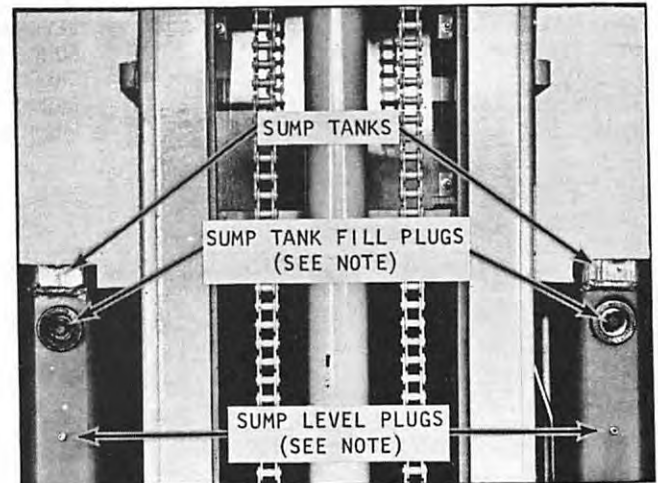


Plate 7528. Hydraulic Sump Tanks

7. Remove old hydraulic filter element and discard. Install new element, see Plate 7526.
8. Fill sump from either side until fluid reaches bottom of level plug openings. Install level plugs finger tight, see Plate 7528....previous page.

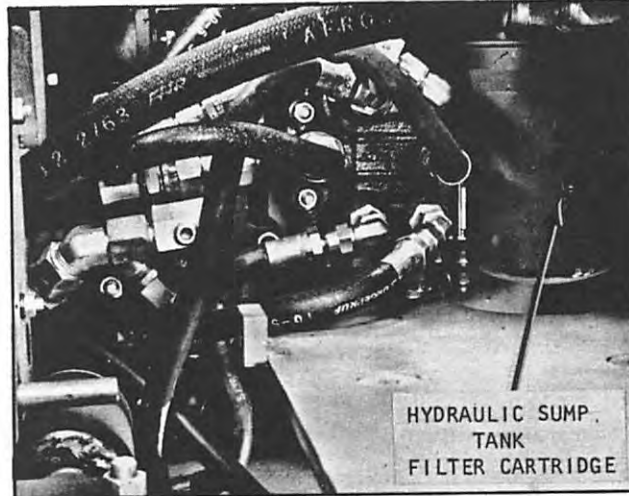


Plate 7526. Location of Hydraulic Filter

9. Turn power key switch on and operate the hydraulic control levers several times to force air ... trapped in the lines ... into the sump where it can escape. Turn key switch off.
10. Check fluid level at level at the level plugs ... add fluid as required. Install and tighten level plugs.

Install sump breather in the right hand sump tank (as viewed from the front of truck).

Install fill plug in the left hand tank.

C A U T I O N

ALWAYS OPERATE HYDRAULIC CONTROL LEVERS SEVERAL TIMES AFTER FILLING SUMP TANK TO PURGE AIR FROM SYSTEM. CHECK FLUIDFILTER FOR LEAKS AND RE-CHECK FLUID LEVEL AFTER PURGING AIR FROM SYSTEM.

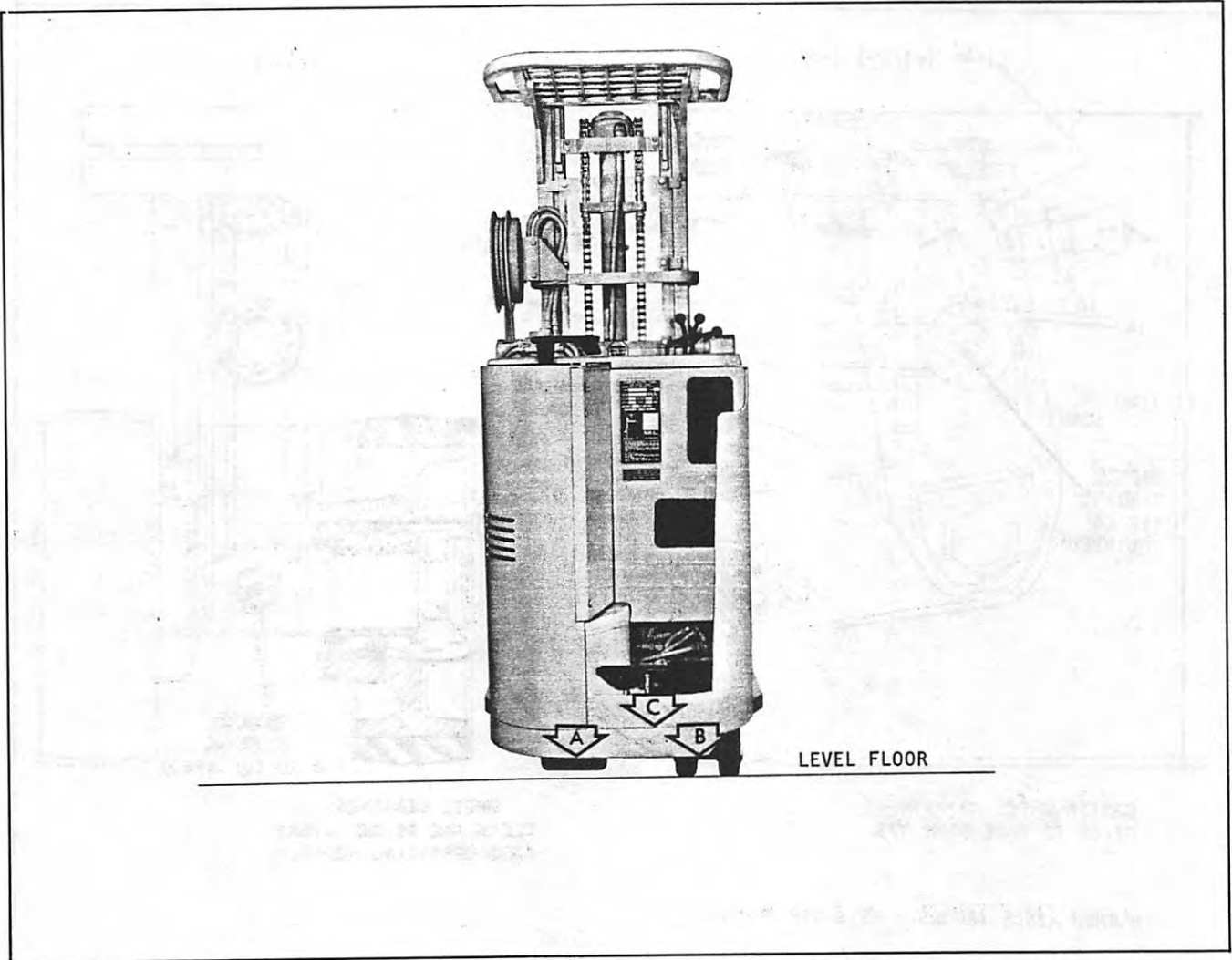


Plate 11497. Caster Adjustment Measurement Checks
Narrow Aisle Truck Series ... NS and NSP

**CASTER ADJUSTMENT CHECK
-and-
ADJUSTMENT PROCEDURES**

IMPORTANT

The truck must be on as level a floor as possible prior to making any checks.

ALL CHECKS AND ADJUSTMENTS MUST BE MADE WITH THE (CORRECT) BATTERY IN THE BATTERY COMPARTMENT.

1. Measure distance from POINT "A" (refer to the illustration above) to floor. Now ... measure distance at POINT "B" to floor.

ALTERNATE

1. Using a 6' level ... first, check floor level, then check the truck by placing the level at skirt (ref. item "C").

- continued -

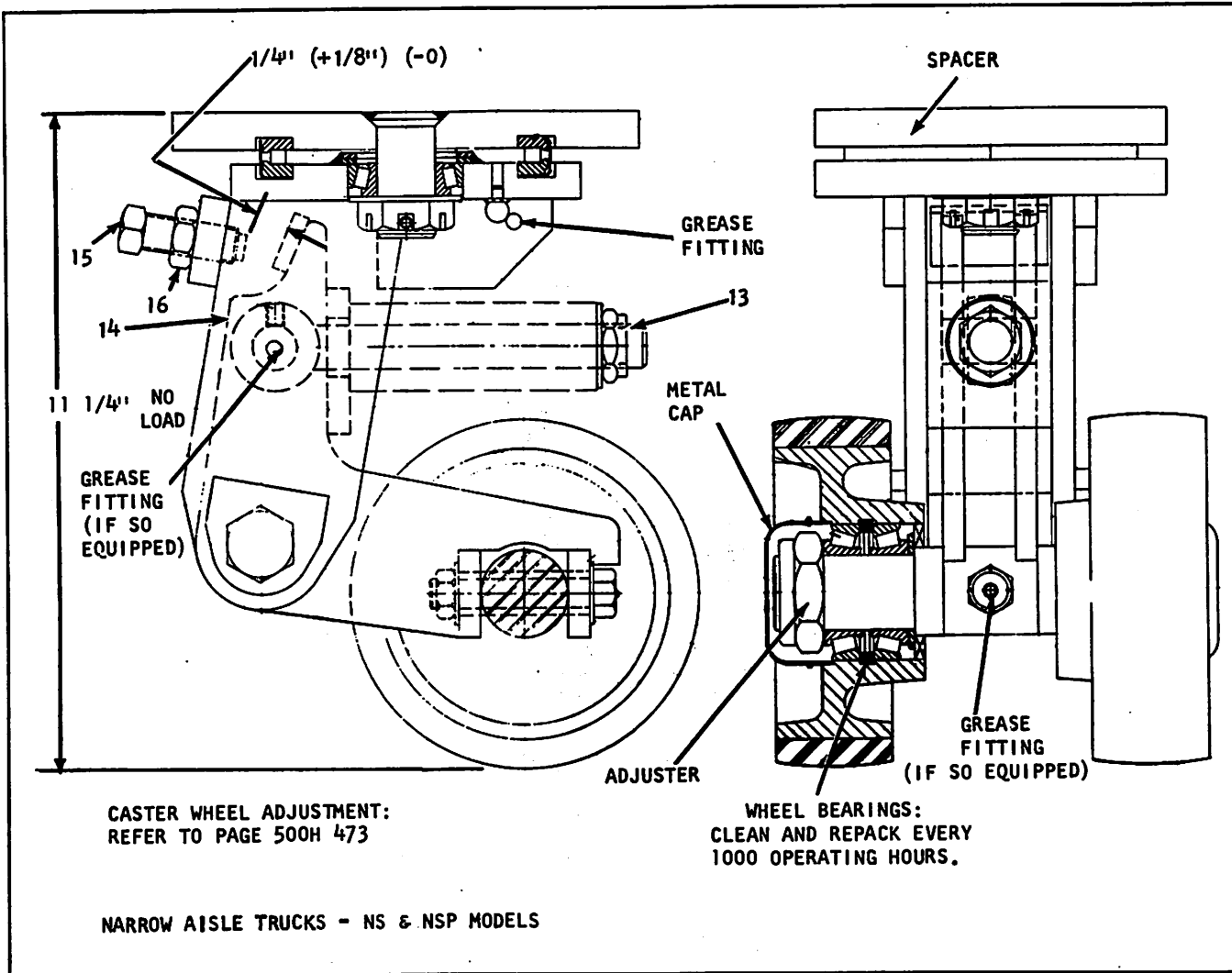


Plate 7529. Caster Adjustments - NS & NSP

2. If the truck is not level ... if dimensions are not the same ... either tighten or loosen the LOCK NUT retaining the Belleville washers, ITEM 13. Refer to illustration above.

NOTE

Make sure stop bolt, ITEM 15, is backed off FOUR turns to keep the "L" bracket, ITEM 14, from bottoming out.

Again, the truck must be on as level a floor as possible when checking these dimensions and ... prior to making any adjustments.

3. Tighten stop bolt, ITEM 15, finger tight ... then ... back off three turns.

This will give you the correct clearance between the stop bolt and "L" bracket.

4. Tighten jam nut, ITEM 16, securely. This completes the adjustment.



INDUSTRIAL TRUCK DIVISION



WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

**GIVE MACHINE SERIAL NUMBER
WHEN ORDERING PARTS**

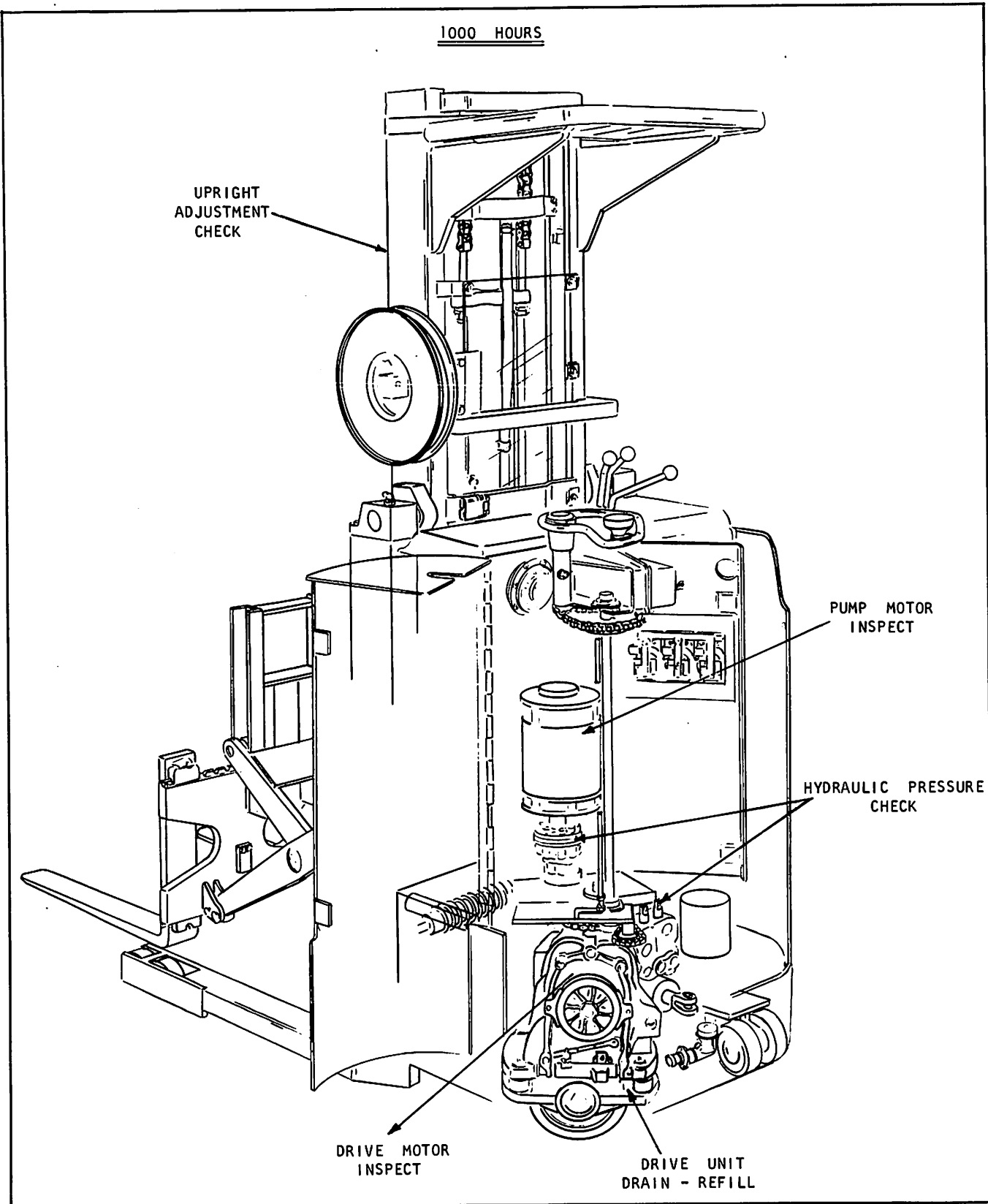


Plate 7524. Lubrication & Preventive Maintenance Illustration

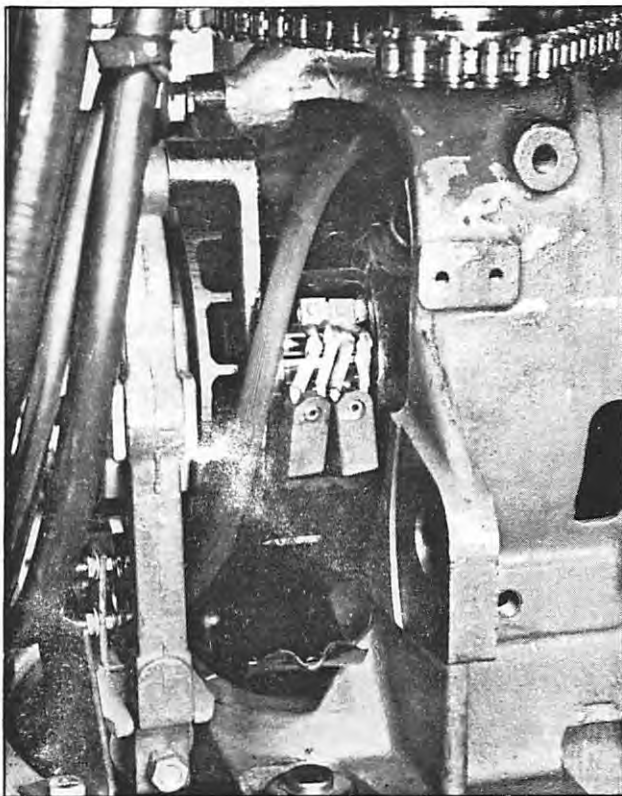


Plate 7518. Typical Drive Motor

DRIVE MOTOR

Wiring: Inspect all connecting wires to be sure they are secure. Insulation should not be worn or damaged.

Commutator: If commutator is glazed or dirty, clean with a strip of No. 00 sandpaper. Blow out all dirt and grit with compressed air.

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

Brushes: The brushes should slide freely in their holders and make full contact on the commutator. Worn brushes

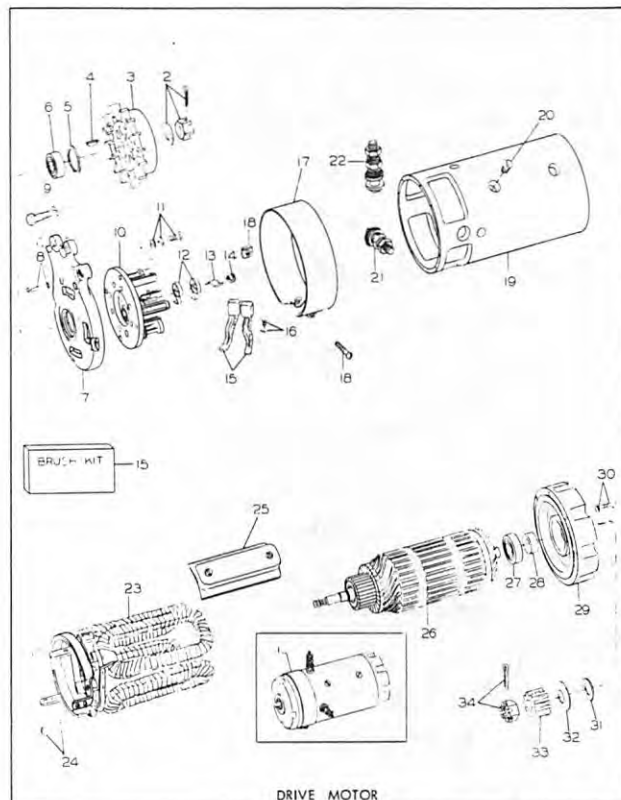


Plate 7519. Typical Drive Motor

(length of worn out brushes 5/16") should be replaced. Badly chipped, broken or oil soaked brushes should also be replaced. Brushes may be wiped with a dry clean cloth to remove loose particles of dirt.

CAUTION

DO NOT CLEAN THE BRUSHES IN ANY KIND OF SOLVENT OR ALLOW THEM TO COME IN CONTACT WITH GREASE OR OIL.

Length of new brush is 1-1/16"

Length of worn out brush 5/16"

Length of usable brush 3/4"



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

Brush Spring Tension: If the tension is too great, the commutator and brushes will wear excessively. Conversely, if the tension is not great enough, arcing will occur causing damage to the commutator. To change brush spring tension, twist the spring at the holder with long nose pliers.

CAUTION

DO NOT ALLOW SPRING TO SNAP DOWN ON BRUSH.

Spring tension should be adjusted so that each brush has the correct tension (see below). Adjust the spring tension to the high limit of the specification. This will allow the spring to maintain adequate pressure for a longer period of time as tension will gradually decrease due to shortening of the brush caused by normal wear. Use a suitable spring scale to measure the pressure of the brush on the commutator. With a thin strip of paper placed between the brush and commutator, pull up on the spring scale and slightly pull on the paper. When the pressure of the brush is reduced enough to allow the paper to be pulled out, read the indication on the scale.

BRUSH SPRING TENSION

Early Models (red springs):

- New 6.5-7 lbs.
- Old 2-2.5 lbs.

Late Models (yellow springs):

- New 35-40 oz.
- Old 14 oz. min.

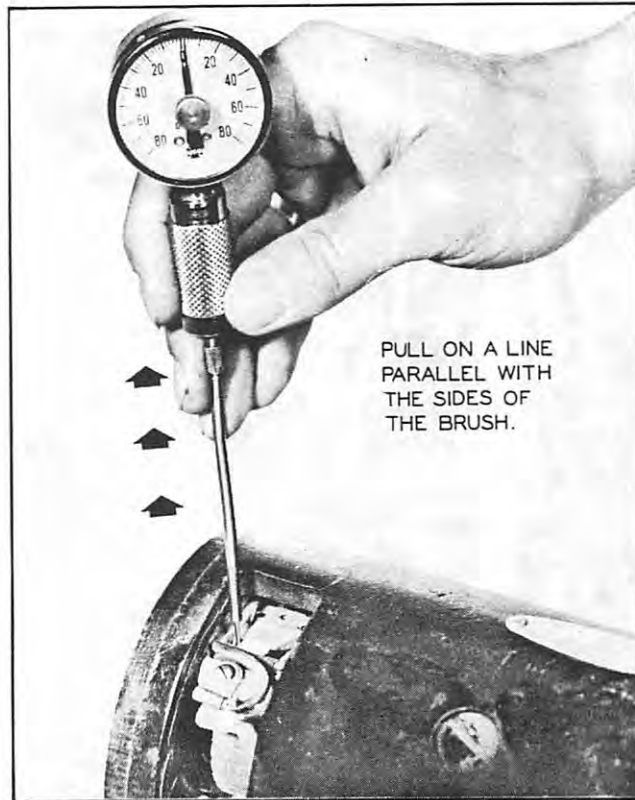


Plate 6450. Checking Brush Spring Tension

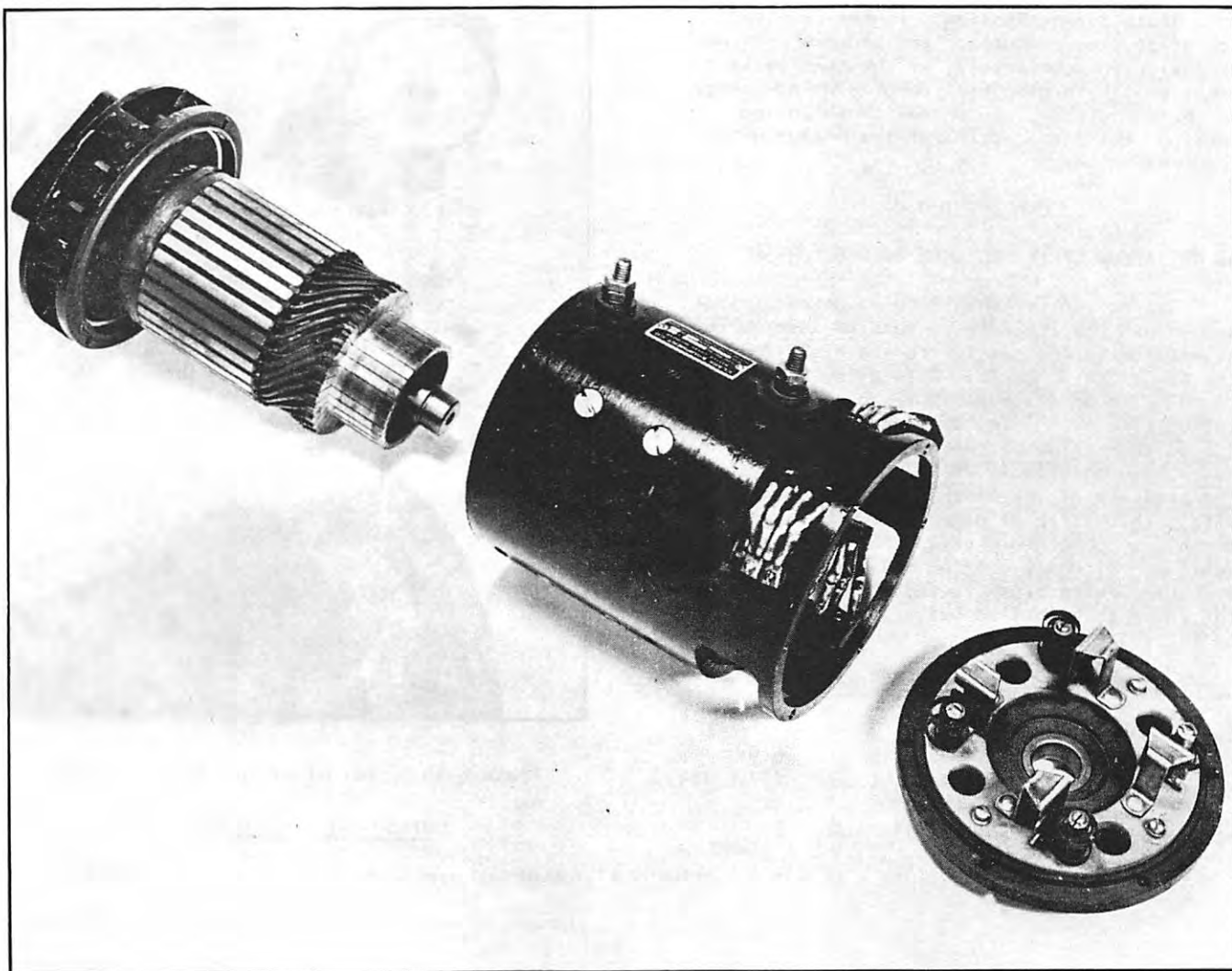


Plate 7530. Typical Pump Drive Motor

PUMP MOTOR

Wiring: Inspect all connecting wires to be sure they are secure. Insulation should not be worn or damaged.

Commutator: If commutator is glazed or dirty, clean with a strip of No. 00 sandpaper. Blow out all dirt and grit with compressed air.

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

Brushes: The brushes should slide freely in their holders and make full

contact on the commutator. Worn brushes (length of worn out brush: 5/16 inch) should be replaced. Badly chipped, broken or oil soaked brushes should also be replaced. Brushes may be wiped with a dry clean cloth to remove loose particles of dirt.

CAUTION

DO NOT CLEAN THE BRUSHES IN ANY KIND OF SOLVENT OR ALLOW THEM TO COME IN CONTACT WITH GREASE OR OIL.

Brush Spring Tension: If the tension is too great, the commutator and brushes will wear excessively. Conversely, if the tension is not great enough, arcing will occur causing damage to the commutator. To change brush spring tension, twist the spring at the holder with long nose pliers.

C A U T I O N

DO NOT ALLOW SPRING TO SNAP DOWN ON BRUSH.

Spring tension should be adjusted so that each brush has the correct tension (see below). Adjust the spring tension to the high limit of the specification. This will allow the spring to maintain adequate pressure for a longer period of time as tension will gradually decrease due to shortening of the brush caused by normal wear. Use a suitable spring scale to measure the pressure of the brush on the commutator. With a thin strip of paper placed between the brush and commutator, pull up on the spring scale and slightly pull on the paper. When the pressure of the brush is reduced enough to allow the paper to be pulled out, read the indication on the scale.

BRUSH SPRING TENSION

Early Models (red springs):	
New	6.5-7 lbs.
Old	2-2.5 lbs.
Late Models (yellow springs):	
New	35-40 oz.
Old	14 oz. min.

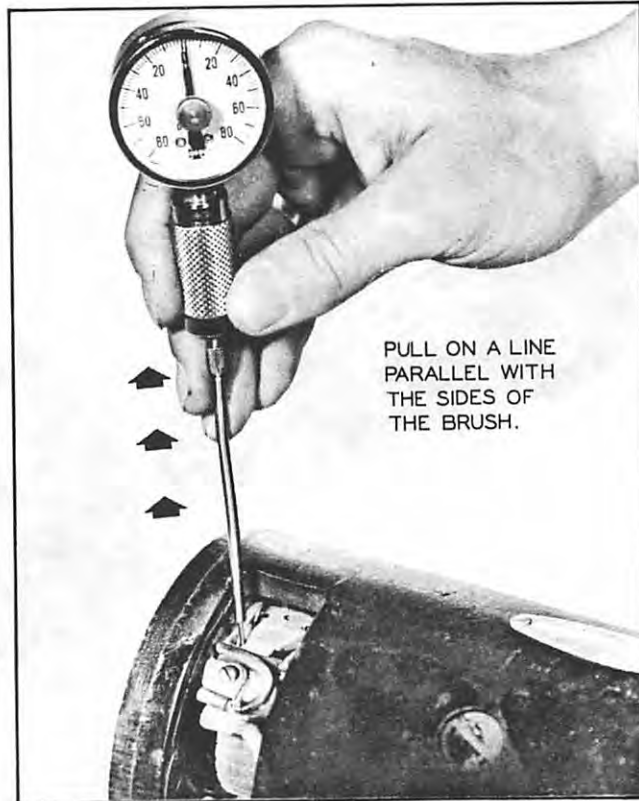


Plate 6450. Checking Brush Spring Tension

BRUSH SPECIFICATIONS

Length of new brush is.....1-1/16 inch
 Length of worn out brush is.....5/16 inch
 Length of useable brush is.....3/4 inch

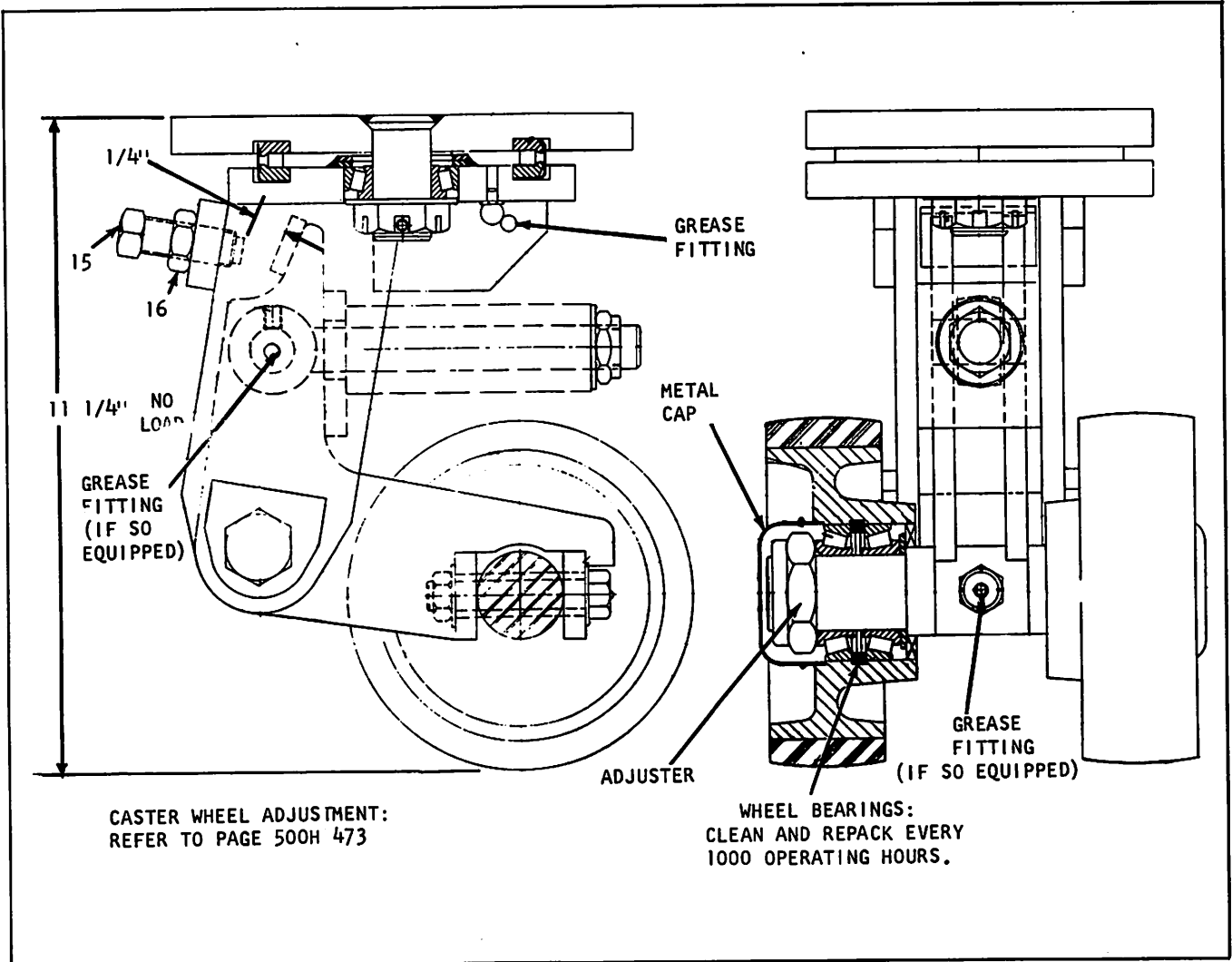


Plate 7529. Typical Caster Wheel Assembly

CASTER WHEEL BEARING LUBRICATION AND ADJUSTMENT

Remove, clean and repack the bearings every 1000 operating hours. Use NLGI #1 (Amolith Grease EP #1 or its equivalent.)

Check grease seals for further serviceability, replace if required.

Adjust bearings after lubrication.

1. Tighten adjuster until wheel is snug then back off 1/8 to 1/4 turn.

2. Tap each side of wheel hub with a mallet to position the bearing cups and free the wheel.

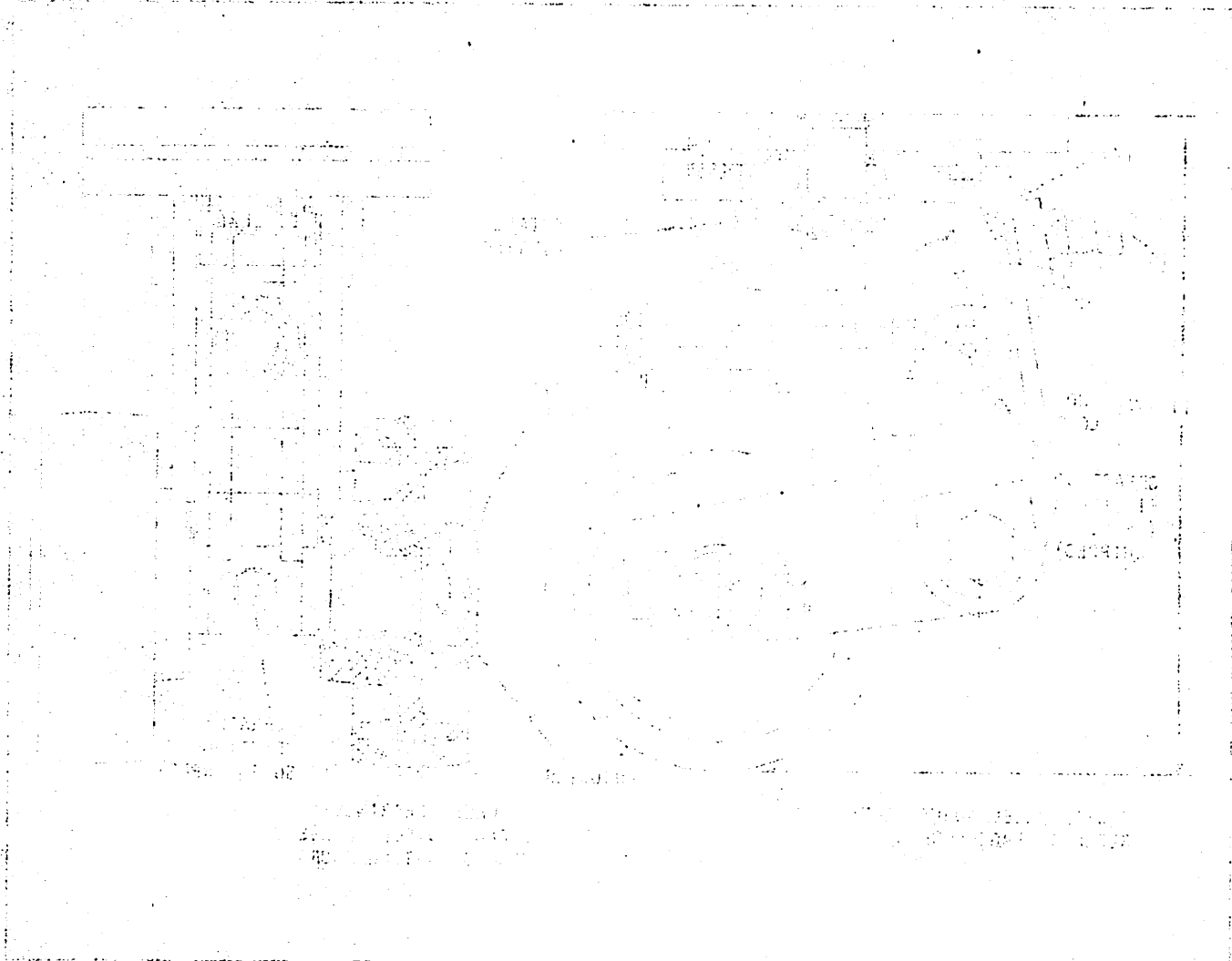


Figure 1. [Illegible text]

1. [Illegible text]

2. [Illegible text]

3. [Illegible text]

4. [Illegible text]

5. [Illegible text]

6. [Illegible text]

7. [Illegible text]

8. [Illegible text]



INDUSTRIAL TRUCK DIVISION



WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS

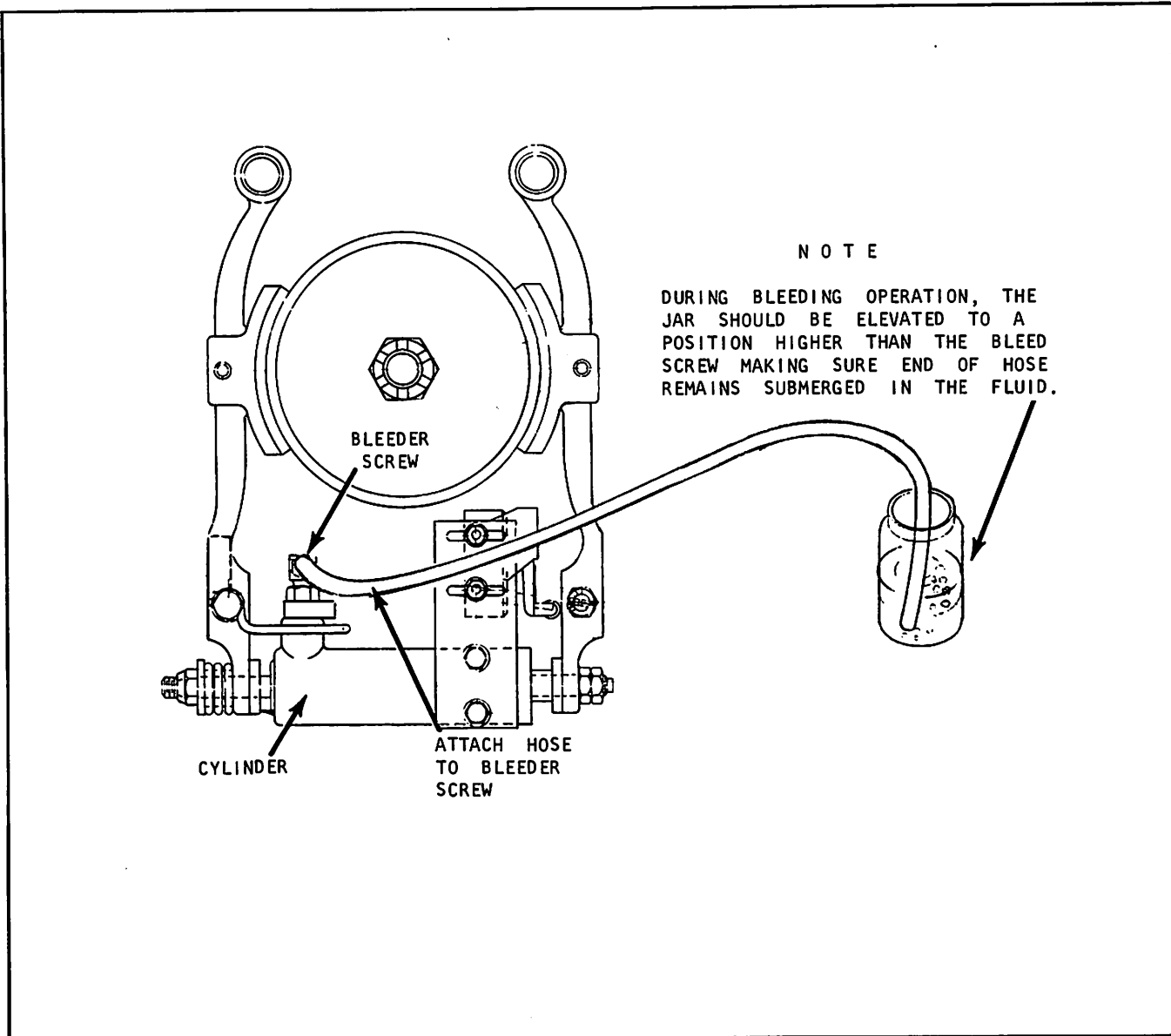


Plate 7531. Service-Parking Brake

BLEEDING PROCEDURE

1. Clean dirt from around filler cap of the master cylinder. Remove cap. Brake fluid should be within 1/4 of an inch from the top.

CAUTION

KEEP BRAKE FLUID OFF DRUM, SHOES AND LININGS.

2. Install a bleeder hose on the cylinder bleeder screw and submerge the unattached end of the hose in a clean transparent jar containing several inches of brake fluid.

NOTE: DURING BLEEDING OPERATION, THE JAR

SHOULD BE ELEVATED TO A POSITION HIGHER THAN THE BLEEDER SCREW MAKING SURE THAT THE END OF THE HOSE REMAINS SUBMERGED IN THE FLUID AT ALL TIMES.

3. Loosen bleeder screw and slowly depress brake pedal to the down position (hold pedal in this position) watch fluid flow from bleeder screw and close connection before flow stops, then release pedal. Repeat this operation until fluid appears clear of air bubbles. Check master cylinder reservoir level periodically during bleeding operation, fill to within 1/4 of an inch of the top with S.A.E. 70R3 heavy duty brake fluid. Clark Part Number 1800200.

LUBRICATION AND PREVENTIVE MAINTENANCE

- TO ADJUST BRAKE -

1. LOOSEN BLEEDER SCREW "A" AND BLEED OUT ALL AIR (CAUTION - KEEP BRAKE FLUID OFF DRUM AND SHOES), REFER TO OPPOSITE PAGE FOR BLEEDING PROCEDURES. AFTER BLEEDING CHECK ADJUSTMENTS AS OUTLINED BELOW.
2. ADJUST FOR GRADUAL BRAKE APPLICATION BY ADJUSTING GAP "X" TO 3/16" WITH NUT "B". (NOTE - NUT "C" TO BE SUFFICIENTLY TIGHT SO BUSHING INSIDE OF SPRING WILL NOT PULL AWAY FROM BRAKE ARM)
3. ADJUST BRAKE HOLDING TORQUE BY RAISING DRIVE TIRE FROM FLOOR AND ADJUSTING NUT "C" UNTIL TORQUE WRENCH READS CORRECT RATING (TABLE "D") WITHOUT DRUM SLIPPING. SAFELY BLOCK MACHINE. REFER TO PAGE 100H 303.
4. ADJUST L.H. BRAKE ARM STOP "E" FOR APPROXIMATELY 1/32 GAP.
5. ADJUST BRAKE SWITCH TO OPEN BEFORE R.H. BRAKE SHOE TOUCHES DRUM.

- TO ADJUST FOR LINING WEAR -

6. REPEAT STEPS 1 THRU 5; WHEN WEAR BECOMES TOO GREAT FOR THIS ADJUSTMENT MOVE SPACERS "F" TO OUTSIDE OF BRAKE ARMS. - THEN REPEAT STEPS 1 THRU 5.

TABLE "D"

MODEL	WEIGHT LOADED	"T" - POUND - INCHES	
		18.36-1 *	22-1 *
NS 20	5900	225	185
NS 30	7300	275	230
NS 40	8300	325	270
NSP20	6800	250	210
NSP30	7800	300	250
NSP40	9300	375	310

* DRIVE UNIT GEAR RATIOS 18.36-1 STD. ON NS20-30 AND 40 ALSO NSP20 AND 30; 22-1 STD. ON NSP 40 (OTHERS OPT.)

ACCOUNTING REPORT

PERIOD: 1968-1969

1. REVENUE
Total Revenue: \$100,000
Less: Expenses: \$20,000
Net Revenue: \$80,000

2. EXPENSES
Total Expenses: \$20,000
Less: Depreciation: \$5,000
Net Expenses: \$15,000

3. NET INCOME
Total Net Income: \$65,000
Less: Retained Earnings: \$10,000
Net Income Available: \$55,000

4. ASSETS
Total Assets: \$100,000
Less: Liabilities: \$35,000
Net Assets: \$65,000

5. LIABILITIES
Total Liabilities: \$35,000
Less: Current Liabilities: \$10,000
Net Liabilities: \$25,000

6. EQUITY
Total Equity: \$65,000
Less: Preferred Stock: \$10,000
Net Equity: \$55,000

Summary Table:

Category	Amount
Revenue	\$100,000
Expenses	\$20,000
Net Income	\$80,000
Assets	\$100,000
Liabilities	\$35,000
Equity	\$65,000

DRIVE UNIT ... DRAIN AND REFILL

Fill with:

DEXRON AUTOMATIC TRANSMISSION FLUID

(or Type "A", Suffix "A" ATF)
(AQA-Armour Qualified)

Typical Product Recommended by
Major Brand Oil Suppliers

Shell Auto. Trans. Fluid Dona x T-6, Dexron
Sunoco Auto. Trans. Fluid, Dexron
ARCO Auto. Trans. Fluid, Dexron
Gulf Auto. Trans. Fluid, Dexron
Mobil Auto. Trans. Fluid 220, Dexron.
Texaco 1859 Texamatic Fluid, Dexron.
Citgo Auto. Trans. Fluid, Dexron.
AMOCO Auto. Trans. Fluid, Dexron.
... or the equivalent to the above.

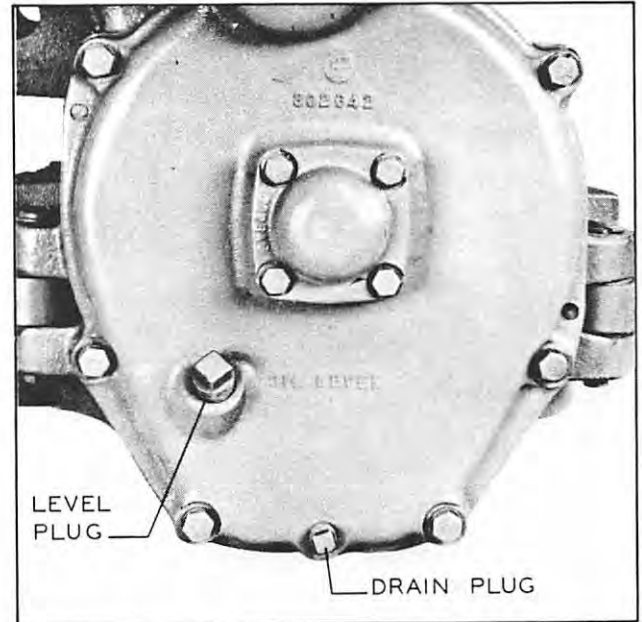


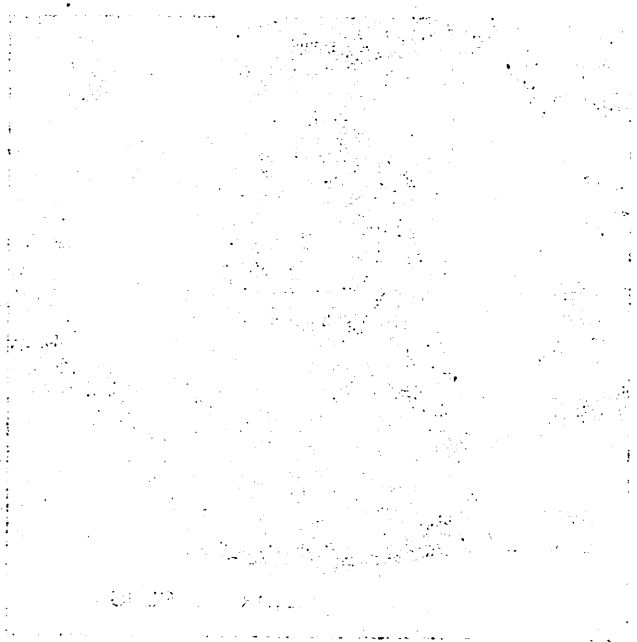
Plate 4274. Drive Unit Assembly

1. Remove drain plug and allow drive unit to completely drain.
2. Replace drain plug.
3. Clean any dirt from around level plug and remove plug.
4. Fill unit until level reaches the height of the level plug.

DO NOT OVERFILL AS THE
EXCESS QUANTITY WILL
SERVE NO USEFUL PURPOSE.

If the oil level is too high, it will cause excessive oil churning and attendant high oil temperature and possible leakage.

5. After drive unit has been filled to the proper level, replace level plug.



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HYDRAULIC SYSTEM PRESSURE CHECKS

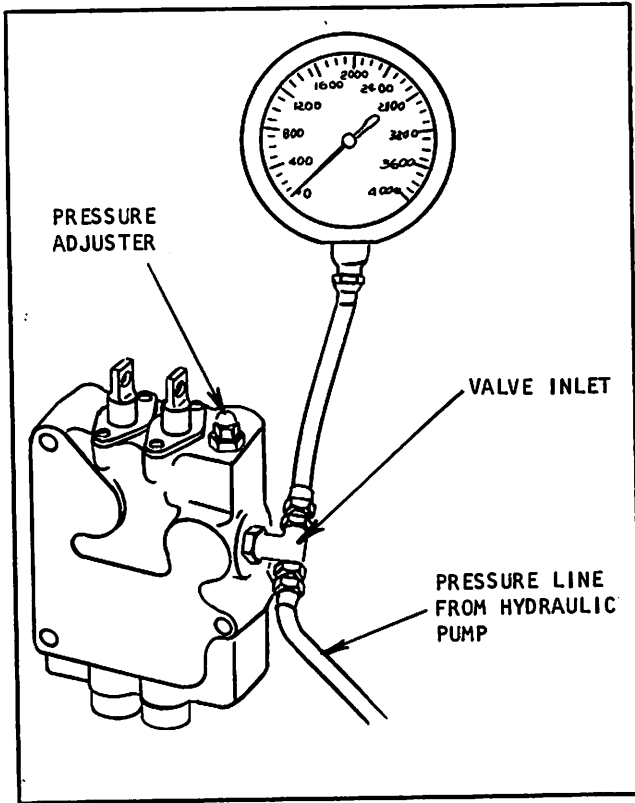


Plate 7333. Typical method for checking Hydraulic System Pressure

1. Remove the pressure check plug (if so equipped) from either valve and install a 0 - 4000 P.S.I. pressure gauge. If valve is not equipped with plug, then provide a suitable means for connecting a gauge at the inlet side of valve. A "tee" at the inlet side may be used.

2. Turn key switch on and operate a hydraulic control lever to extend, lift or reach (depending upon which circuit and valve is to be tested) position. When the hydraulic cylinder or cylinders reach the end of their travel, check gauge reading. Pressure should be within the limits listed in Specifications.

NOTE

DO NOT HOLD A CONTROL LEVER IN AN ACTUATED POSITION FOR ANY PROLONGED PERIOD AFTER THE CYLINDER OR CYLINDERS HAVE REACHED THE END OF THEIR (LIMIT) TRAVEL. THIS WILL CAUSE HEATING OF THE HYDRAULIC FLUID AND SHOULD BE AVOIDED.

If pressure is not as specified, report to designated person in authority.

MEMORANDUM FOR THE DIRECTOR

Reference is made to the report of the Special Agent in Charge, New York, dated 10/15/54, and the report of the Special Agent in Charge, New York, dated 10/22/54, both captioned as above.

The above information was obtained from the New York Office and is being furnished to you for your information.

Very truly yours,

Special Agent in Charge

Special Agent in Charge

Special Agent in Charge

Special Agent in Charge

Special Agent in Charge

Special Agent in Charge

Special Agent in Charge

Special Agent in Charge



Diagram illustrating the layout of the [illegible] system.

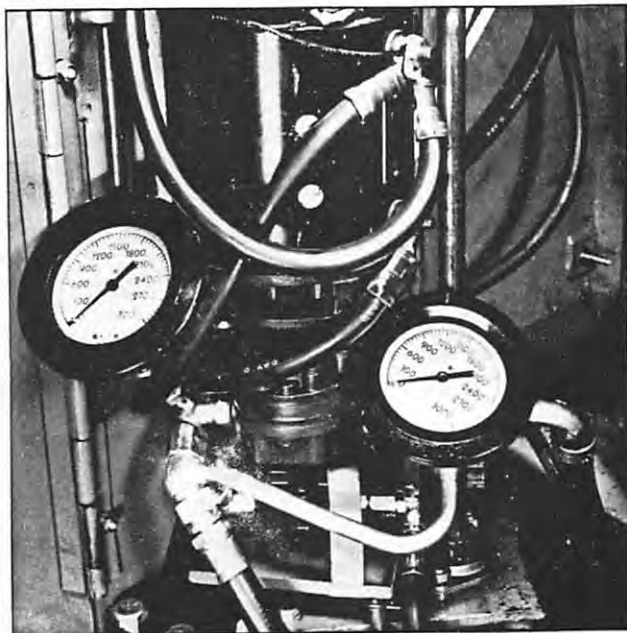


Plate 7534. Typical Hydraulic System Checks
HYDRAULIC SYSTEM CHECKS

Pressure Checks

N O T E

Before checking hydraulic pressure be sure battery is fully charged.

1. Remove the pressure check plug (if so equipped) from either pump and install a 0 -

3000 PSI pressure gauge, as shown at left. If pumps are not provided with plugs, then provide a suitable means for connecting a gauge to the pumps as shown at left. A "tee" may be used.

- 2 Turn key switch on and operate a hydraulic control lever to extend, lift or reach (depending upon which pump is to be tested). When the hydraulic cylinder or cylinders reach the end of their travel, check gauge reading. Pressure should be within the limits listed in the chart below.

N O T E

Do not hold a control lever in an actuated position for any prolonged period after the cylinder or cylinders have reached the end of their (limit) travel. This will cause heating of the hydraulic fluid and should be avoided.

If pressure is not as specified, report to designated person in authority.

Flow Checks

- 3 Remove pressure gauges and install flow gauges in their place.
- 4 Follow Step 2 and check for the specified hydraulic flow listed in the chart below.

If flow is not as specified, report to designated person in authority.

	<u>FLOW IN GPM/PUMP RPM</u>		
	<u>300 PSI</u>	<u>1000 PSI</u>	<u>1500 PSI</u>
<u>NS 20-30-40</u>			
<u>TANDEM PUMP</u>			
<u>LIFT PUMP</u>	10 GPM/2650 RPM	7.3 GPM/2000 RPM	5.8 GPM/1650 RPM
<u>TILT/REACH PUMP</u>	2.3 GPM/3500 RPM	2 GPM/3000 RPM	1.5 GPM/2550 RPM
<u>NSP 20-30</u>			
<u>TANDEM PUMP</u>			
<u>LIFT PUMP</u>	10 GPM/2650 RPM	7.3 GPM/2000 RPM	5.8 GPM/1650 RPM
<u>TILT/REACH PUMP</u>	2.3 GPM/3500 RPM	2 GPM/3000 RPM	1.5 GPM/2550 RPM
<u>NSP 40</u>			
<u>TANDEM PUMP</u>			
<u>LIFT PUMP</u>	8.8 GPM/2850 RPM	6.3 GPM/2200 RPM	5 GPM/1700 RPM
<u>TILT/REACH PUMP</u>	2.3 GPM/3500 RPM	2 GPM/3000 RPM	1.5 GPM/2550 RPM
<u>NSP 40 (optional)</u>			
<u>TANDEM PUMP</u>			
<u>LIFT PUMP</u>	7.1 GPM/270 RPM	5.3 GPM/2100 RPM	4.5 GPM/1850 RPM
<u>TILT/REACH PUMP</u>	2.3 GPM/3500 RPM	2 GPM/3000 RPM	1.5 GPM/2550 RPM

CONFIDENTIAL

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2. The second part of the report...

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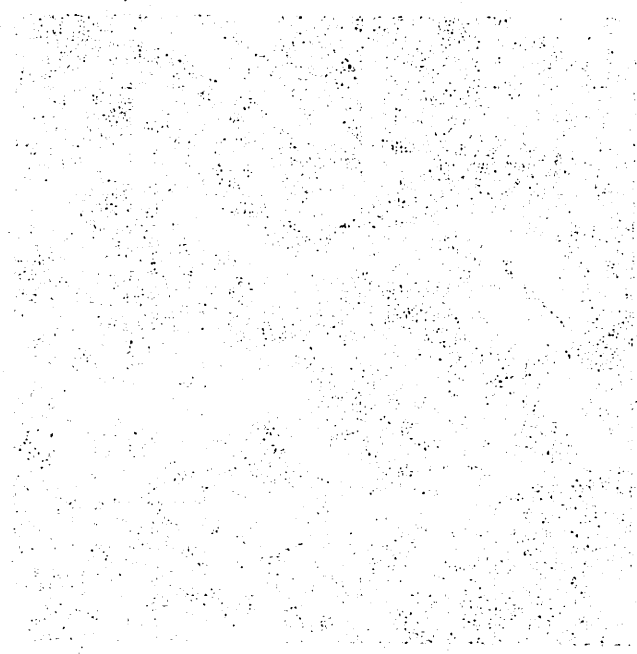
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35. The thirty-fifth part of the report...

HOW TO IDENTIFY THE:

"C" MODEL UPRIGHT

Note the INNER RAIL TIE BAR
is mounted VERTICALLY to the rails.

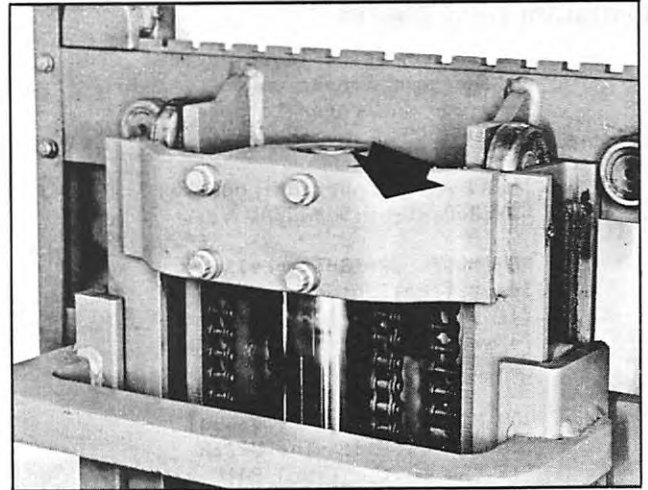


Plate 11847

"B" MODEL UPRIGHT

Note the INNER RAIL TIE BAR
is mounted HORIZONTALLY to the rails.

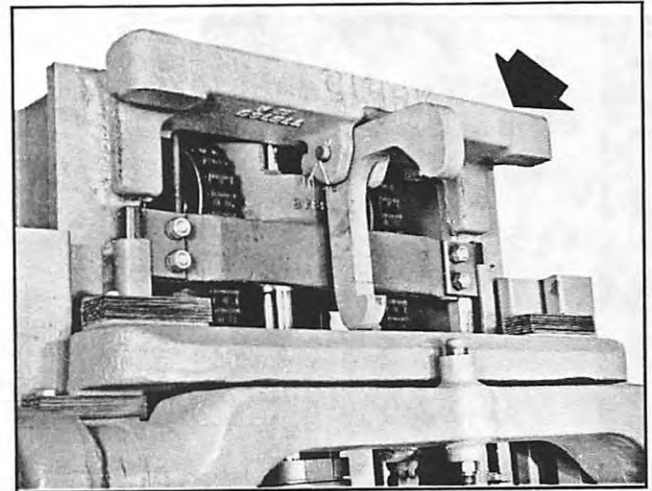


Plate 11848

"B" MODEL UPRIGHT

Note this upright has the TIE BAR
mounted inbetween the rails.

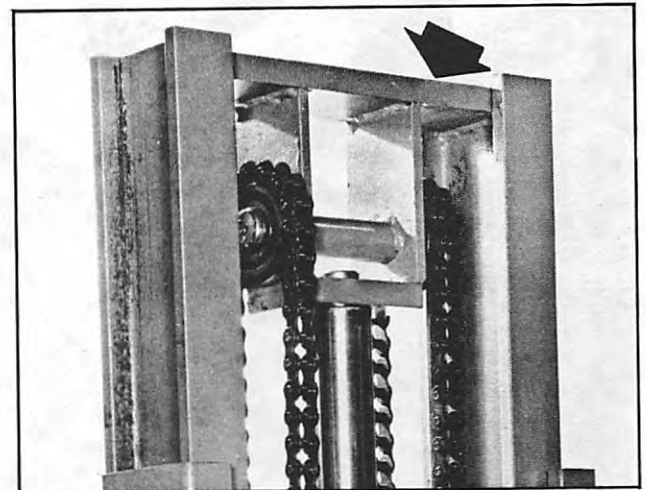


Plate 11849

PANTOGRAPH FRAME ROLLERS

Pantograph frame is adjusted in the same manner as a Standard carriage ... refer to page 1000H 1803.

THERE ARE TWO UPRIGHT MODELS COVERED IN THIS MANUAL ...

"B" MODEL UPRIGHTS - visual identification: The UPPER TIE BAR on the INNER RAIL ASSY., is welded HORIZONTALLY to the rails (narrow side of bar faces out).

"C" MODEL UPRIGHTS - visual identification: The UPPER TIE BAR on the INNER RAIL ASSY., is welded VERTICALLY to the rails (wide side of bar faces out).

Outer Side Thrust Rollers

1. Tighten the outer side thrust rollers to 150 pound feet torque.

The end these (thrust roller) shafts have a machined groove. On later models ... the shaft HAS A NYLON LIP and staking is not required.

2. On a shaft that requires staking ... stake with a punch at each end of groove to secure shaft to pantograph frame.

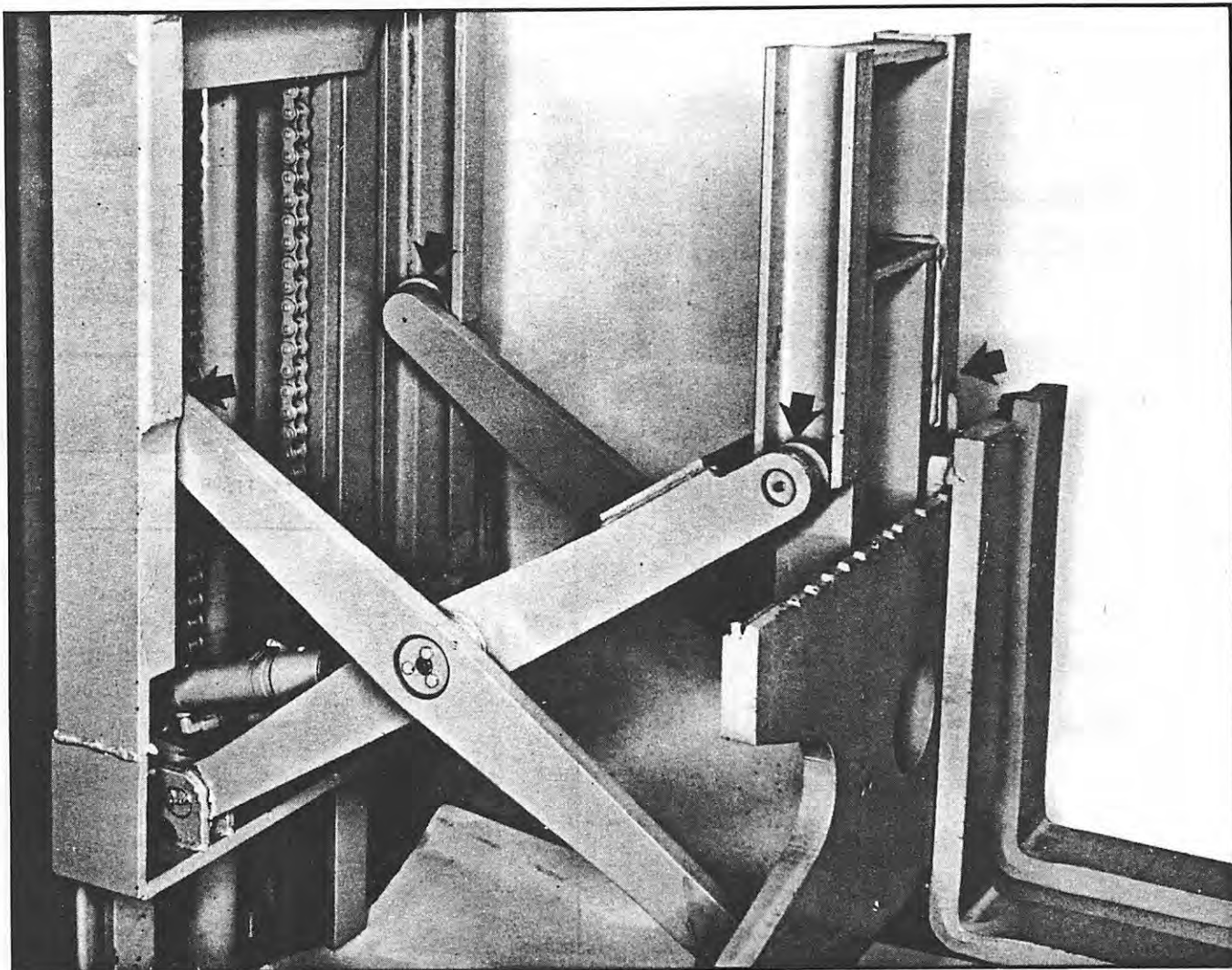


Plate 7509. Typical Pantograph Frame Roller Checks and Adjustments

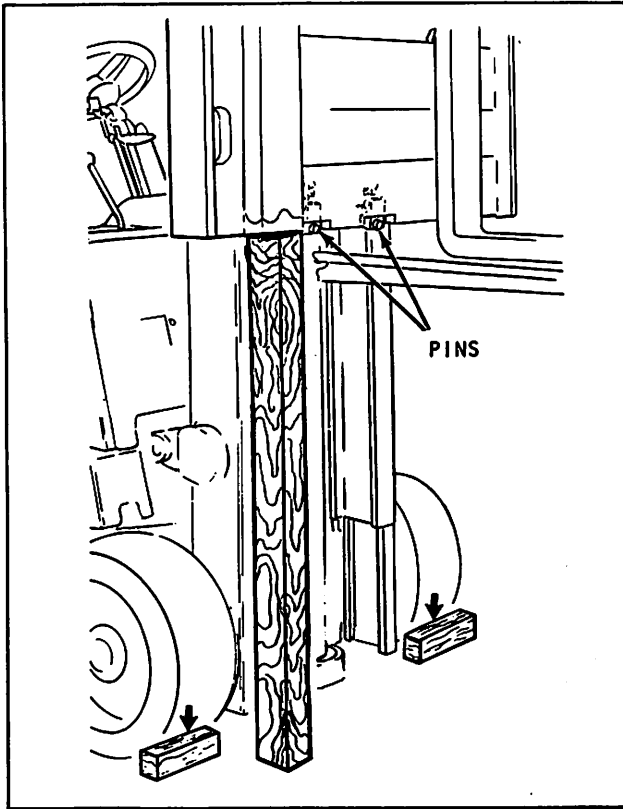


Plate 9593 Carriage Pin Replacement

Step 2. Remove anchor pins and replace with 3/8" x 2" bolts. **FOR SAFETY REASONS, REMOVE ONLY ONE PIN AT A TIME.** This will make pin removal easier when carriage is lowered.

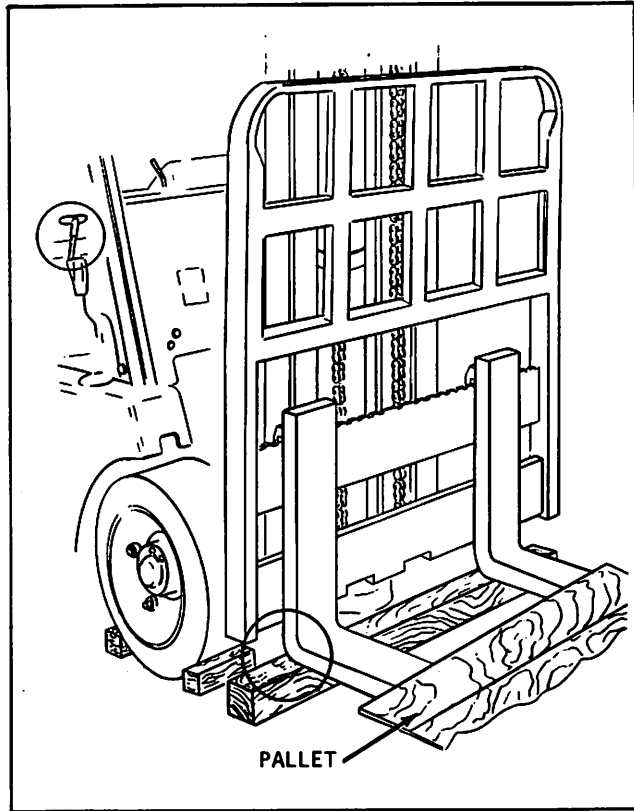


Plate 9560 Fork and Carriage Blocking

Step 3. Raise carriage off beam. Place beam on floor so, when lowered, the heel of the fork will rest on it as shown.

Step 4. Tilt upright full forward.

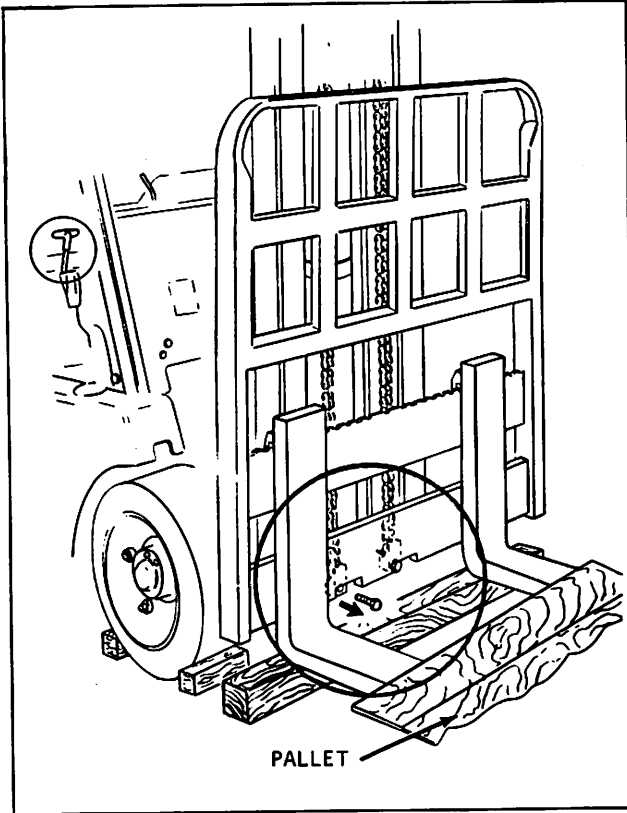


Plate 9561 Removing Bolts

Step 5. Remove 3/8" x 2" bolts. Place pallet on fork ends.

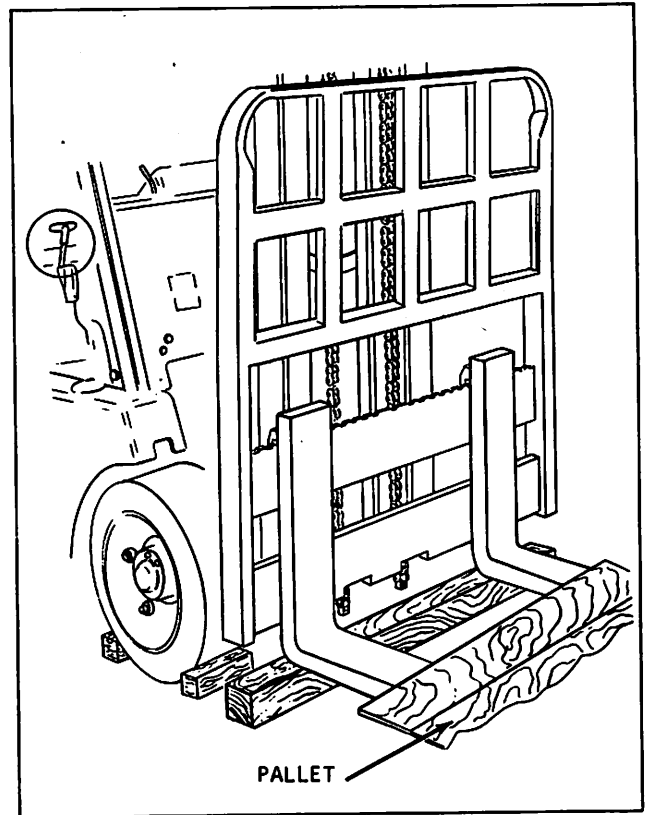


Plate 9562 Removing Chains From Anchors

Step 6. Pull chains out of carriage anchor brackets.

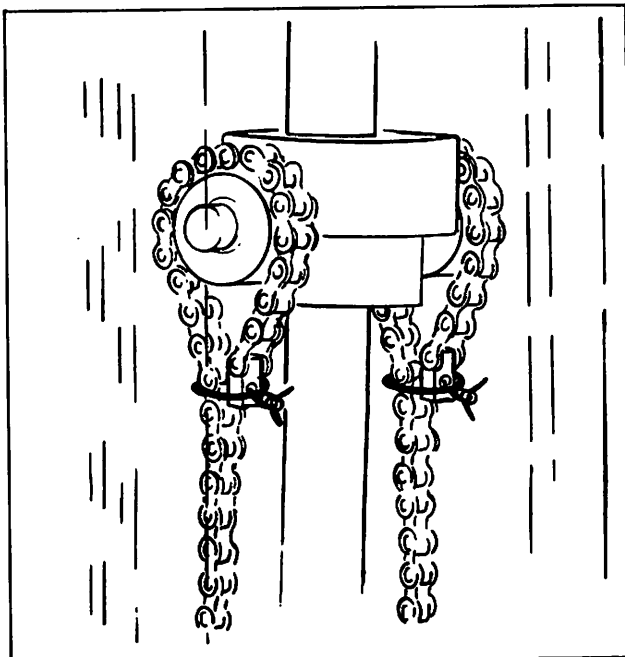


Plate 9563 Securing Chains (Typical)

Step 7. Wire chains around chain sheaves as shown

N O T E

Use the same method on all cylinders.

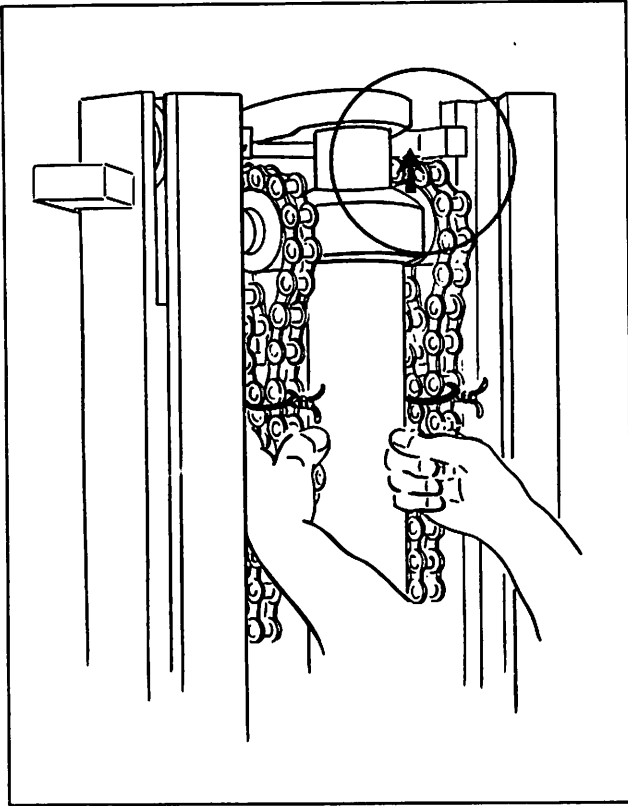


Plate 9564 Guiding Piston Head

Step 8. Guiding piston head with hands on chains raise piston to full up position.

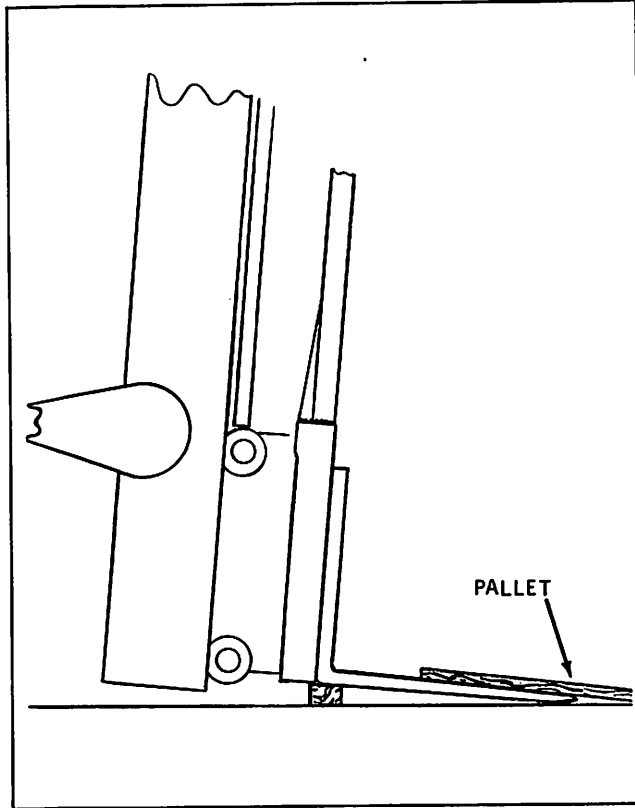


Plate 9565 Inner Rail Clearing Carriage Rollers

Step 9. Raise inner rail so it just clears upper carriage rollers. Leave upright at full forward tilt.

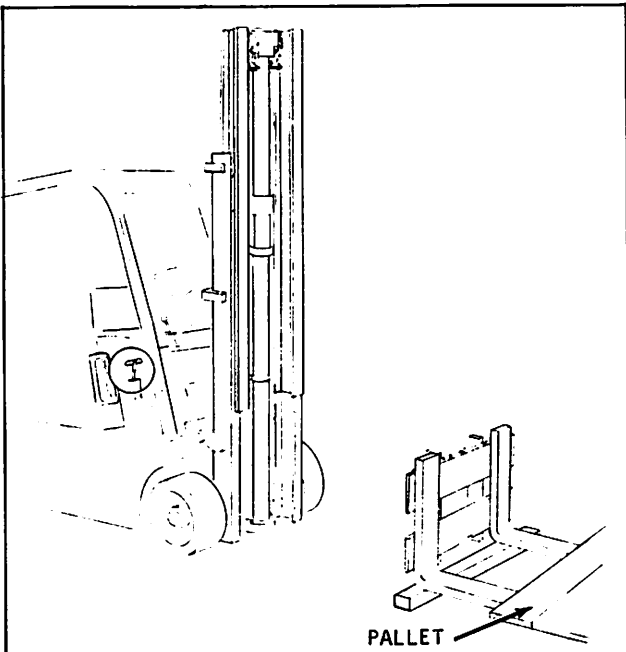


Plate 9566 Backing Machine Away From Carriage

Step 10. Remove blocks and release brake. Back machine away from carriage.

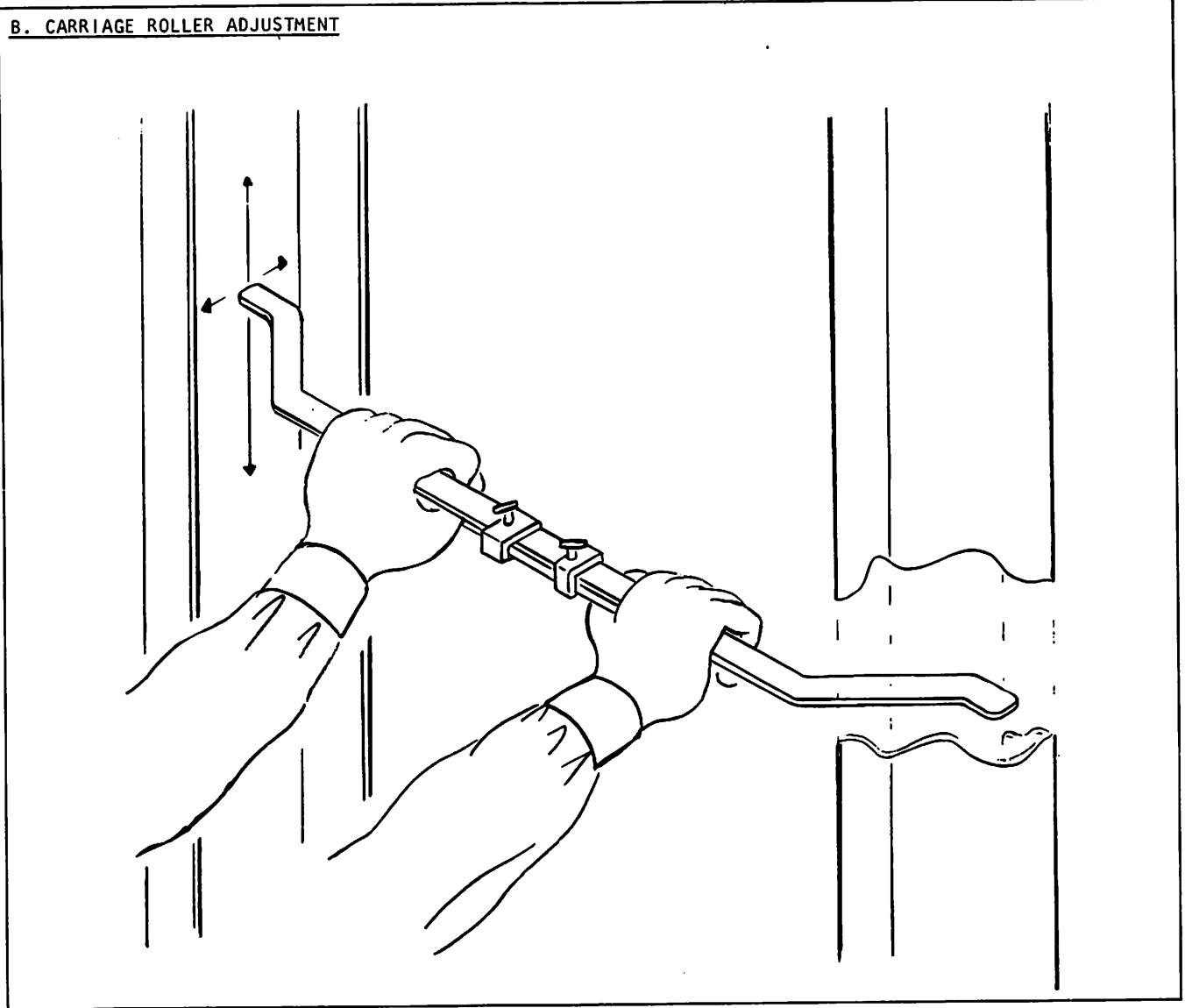
B. CARRIAGE ROLLER ADJUSTMENT

Plate 9567 Spanning Inner Rail

Step 1. Span inner rail with inside spanning tool to find the smallest distance between the rails. Lock tool in position.

N O T E**FOR SIX ROLLER CARRIAGE ONLY**

After finding the smallest distance between rails, place a shim between the spanning tool and the inner rail, then lock spanning tool in position.

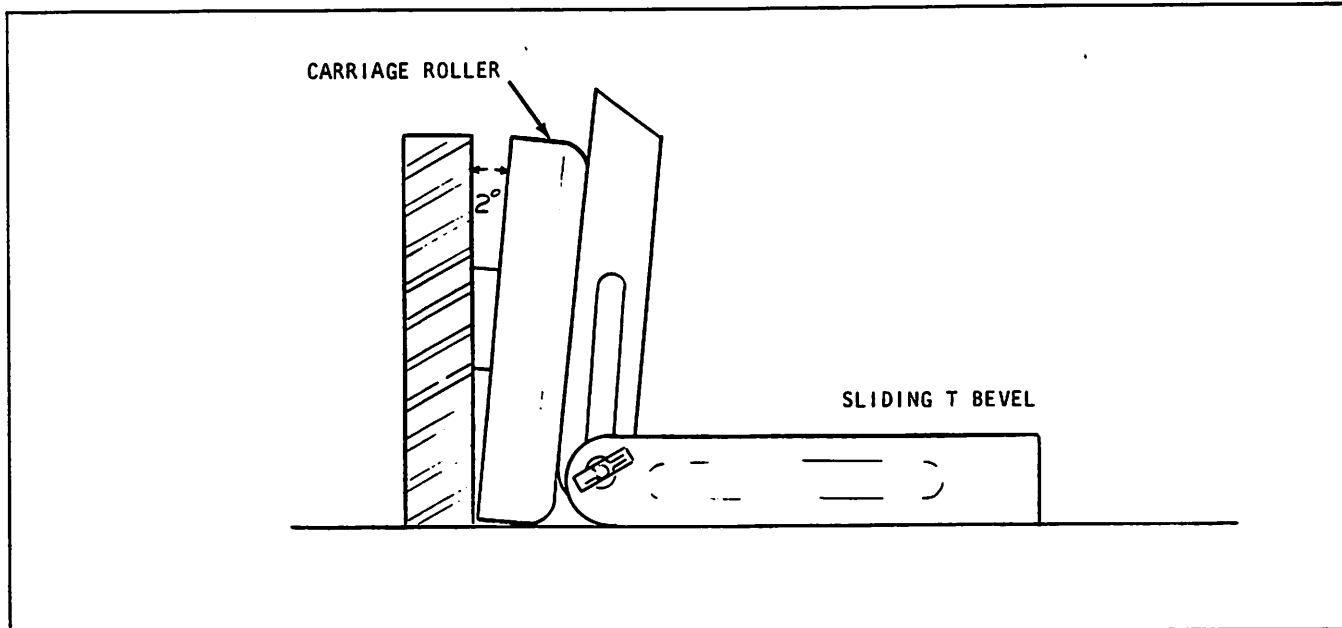


Plate 9589 Setting T Bevel

N O T E

Check angle of carriage rollers. Roller pin bosses are welded at $2^\circ \pm 1/2^\circ$ and if damaged, replace carriage roller pin boss assembly. To obtain this, contact Central Parts.

To check roller angle use a Sliding T Bevel and Protractor. Lay one side against roller surface and lock in place.

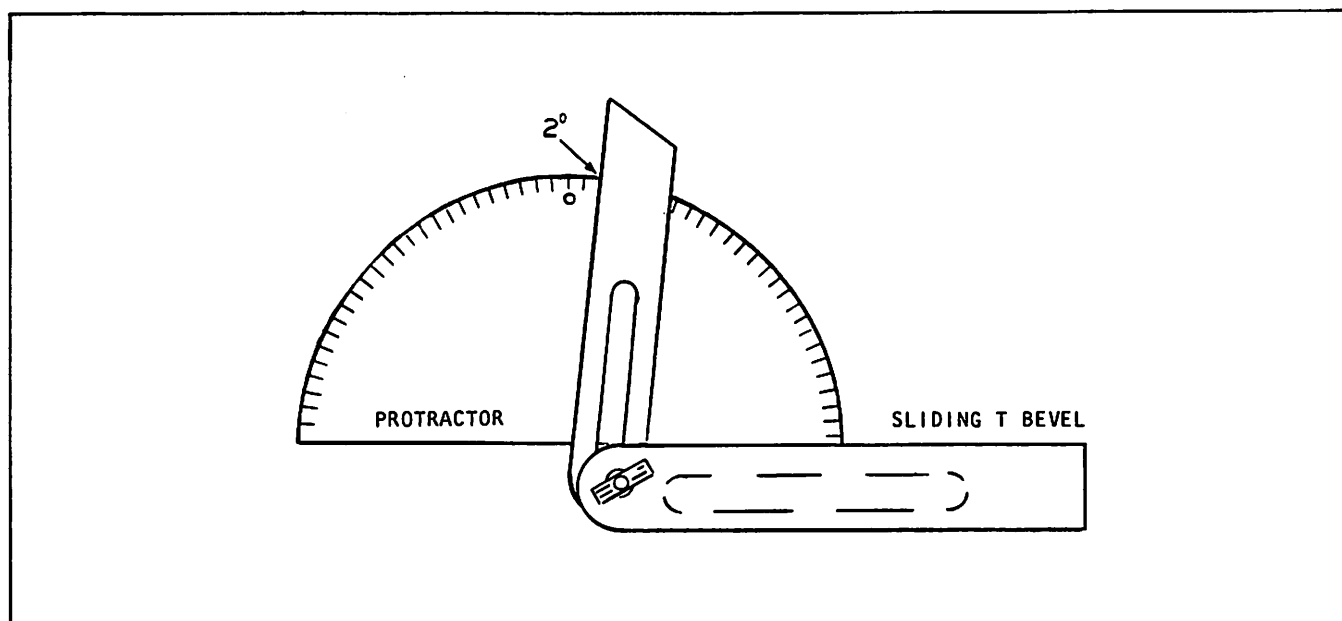


Plate 9590 Checking Roller Angle

Determine degree of angle by placing Protractor on Sliding T Bevel.

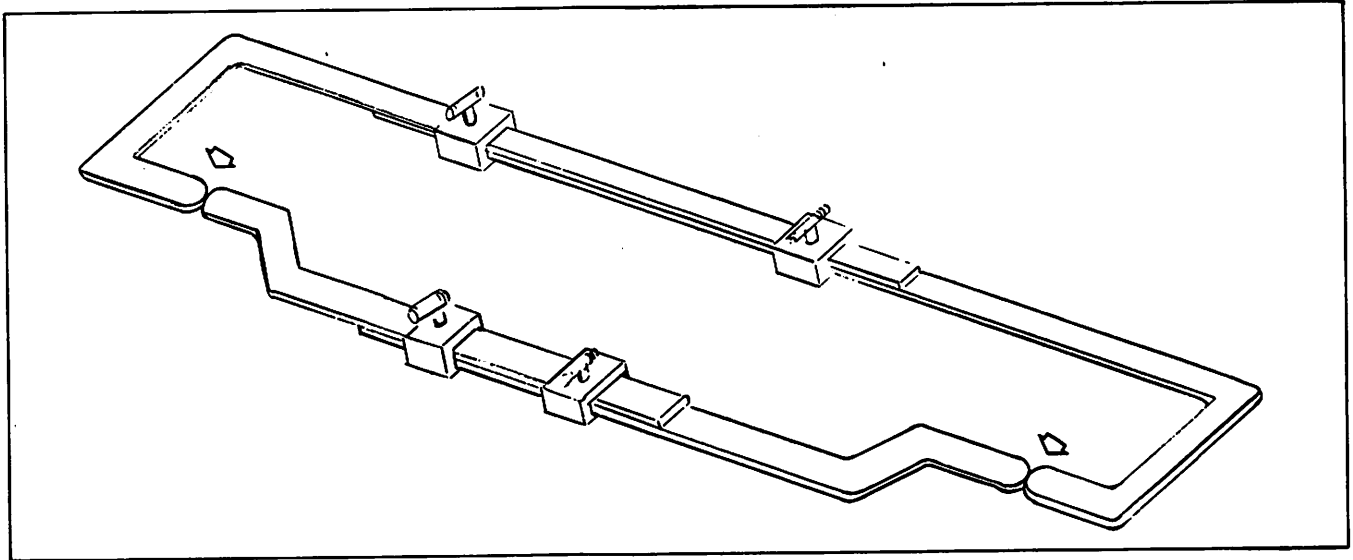


Plate 9568 Setting Outside Spanning Tool

Step 2. Set outside spanning tool to match inside spanning tool. Lock tool in position.

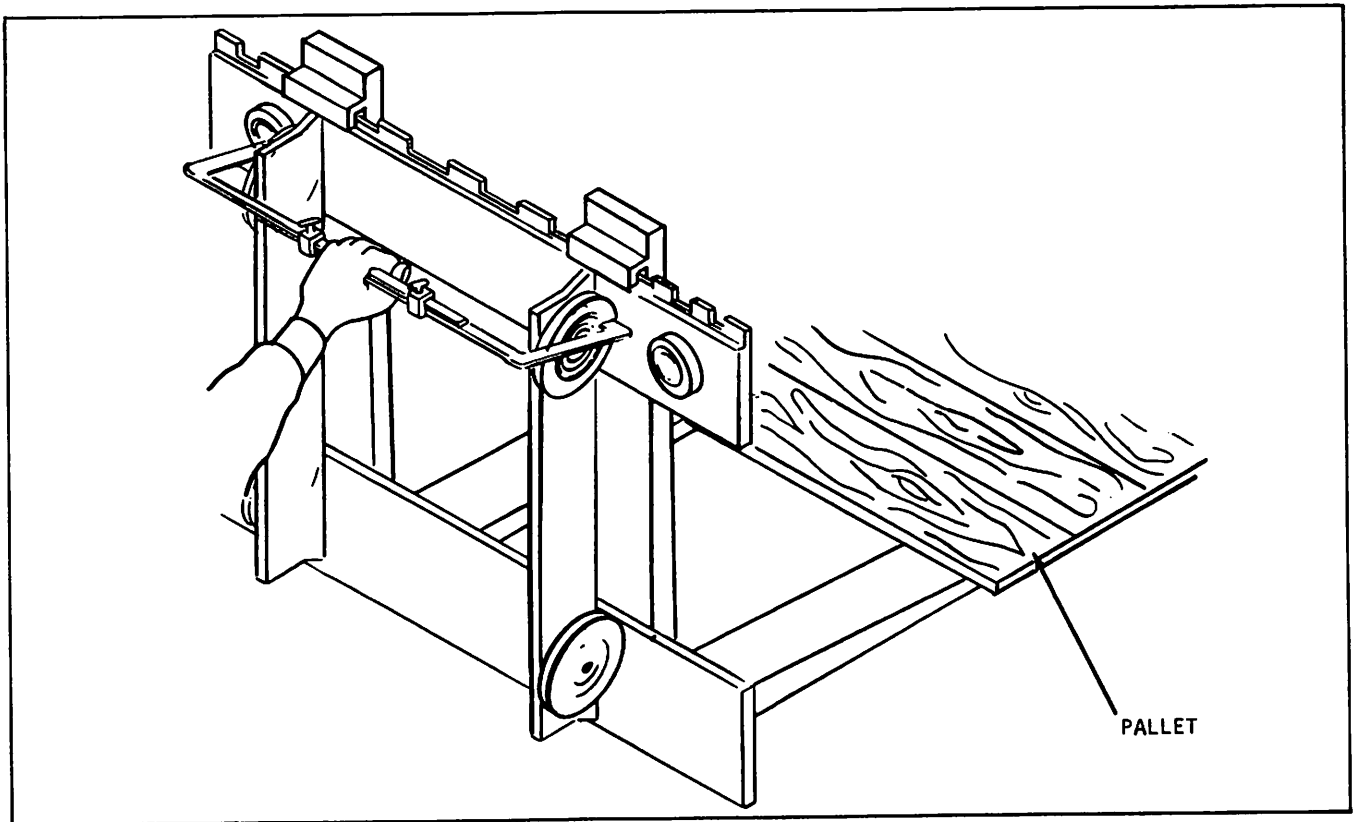


Plate 9569 Spanning Upper Rollers (Four Roller Carriage)

Step 3. Span upper carriage rollers at their outer most camber point. Add or subtract ...

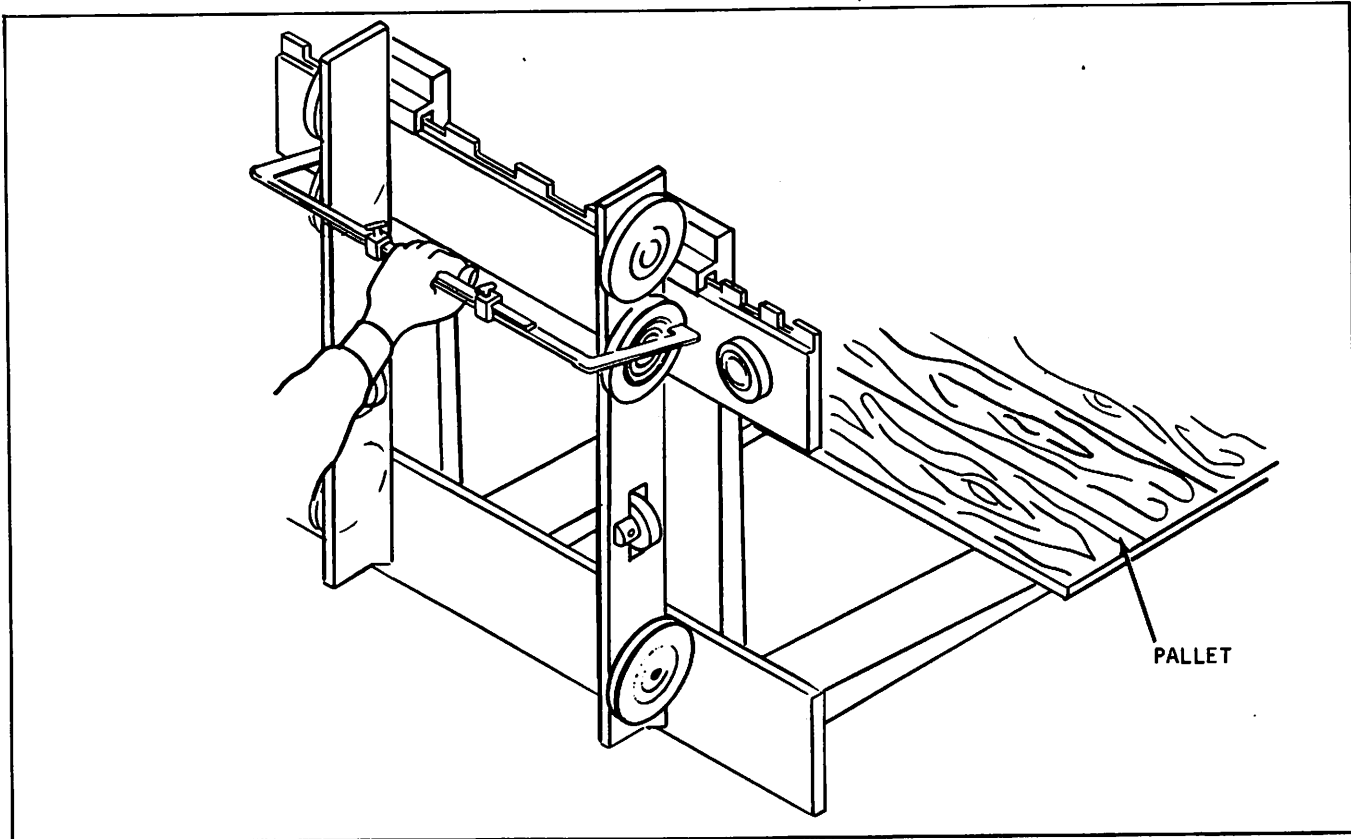


Plate 9570 Spanning Upper Rollers (Six Roller Carriage)

...shims at roller shaft to reach tool size.

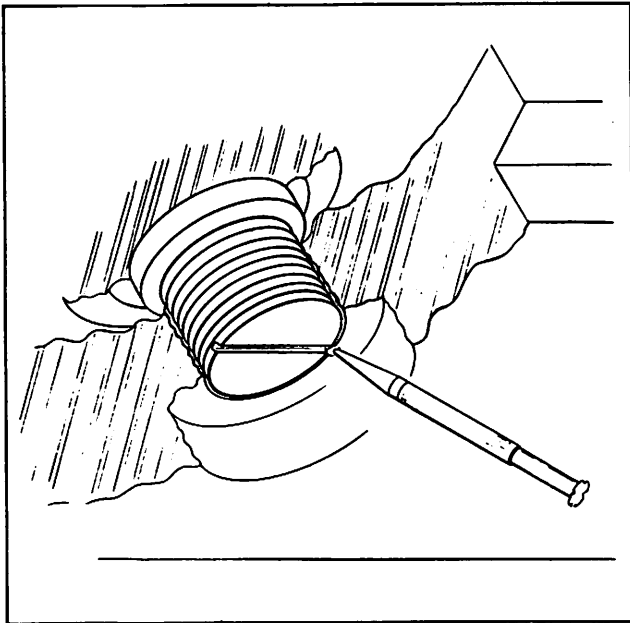


Plate 9571 Securing Outer Thrust Roller

NOTE

Before centering carriage rollers check outer thrust rollers for security and condition of bearings. If loose tighten and stake. If worn replace.

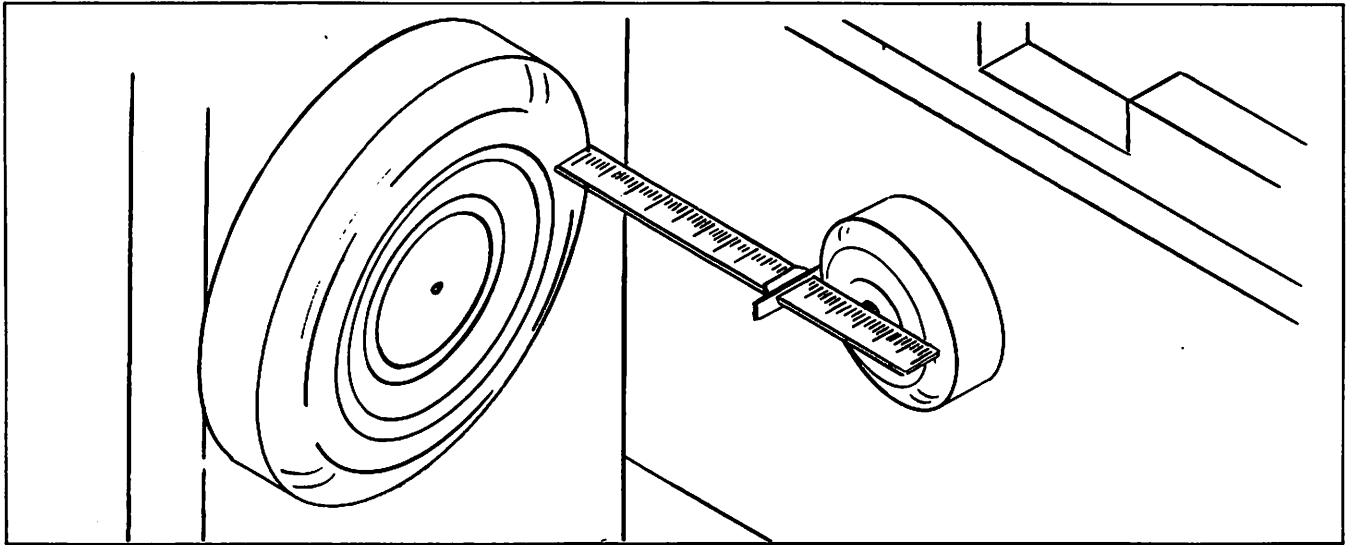


Plate 9572 Centering Carriage Rollers

Step 4. Center carriage rollers within outer thrust rollers by placing 6" scale on the carriage roller surface and measuring the distance to the outer thrust roller face. Add or subtract shims from one roller to the other to make measurement equal.

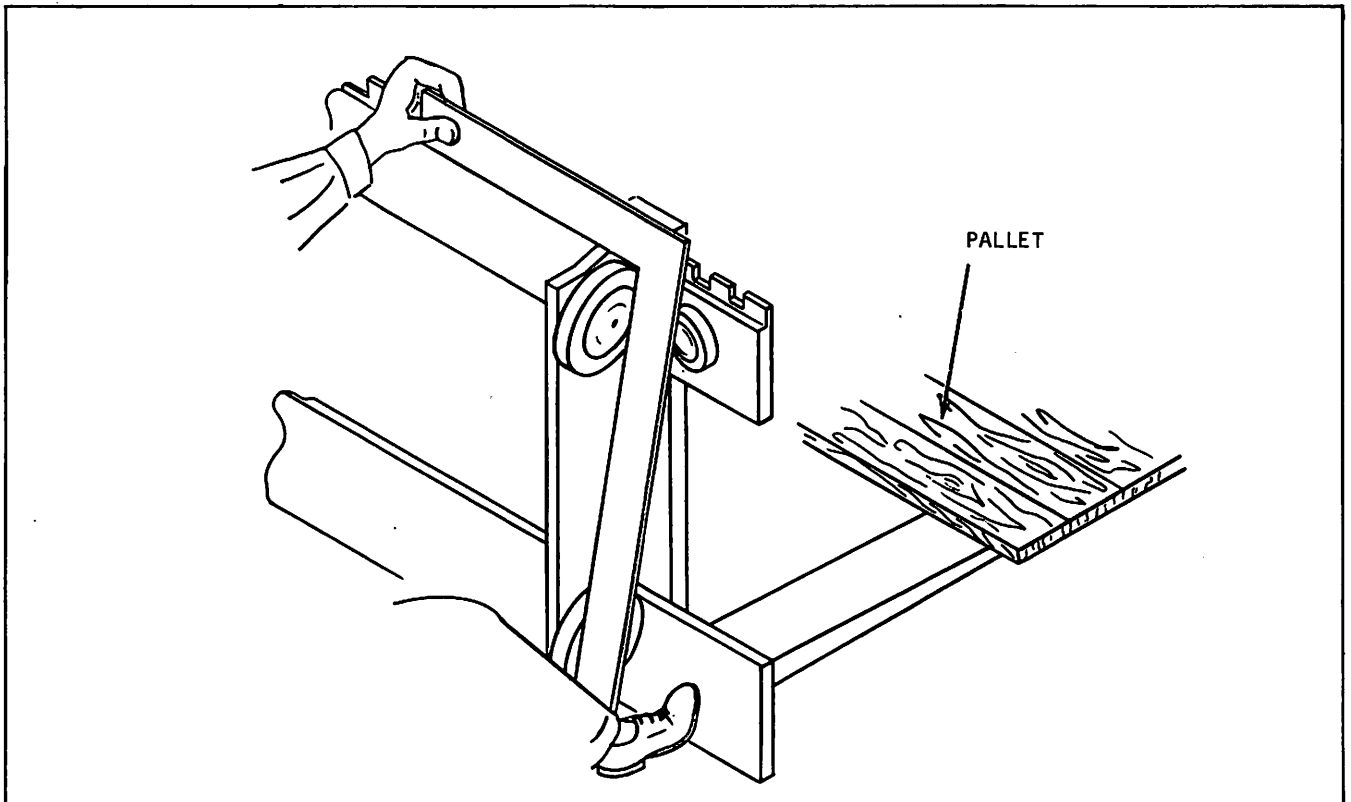


Plate 9573 Squaring Carriage Rollers (Four Roller Carriage)

Step 5. Square carriage rollers by placing carpenter's square at the outer most camber of the ...

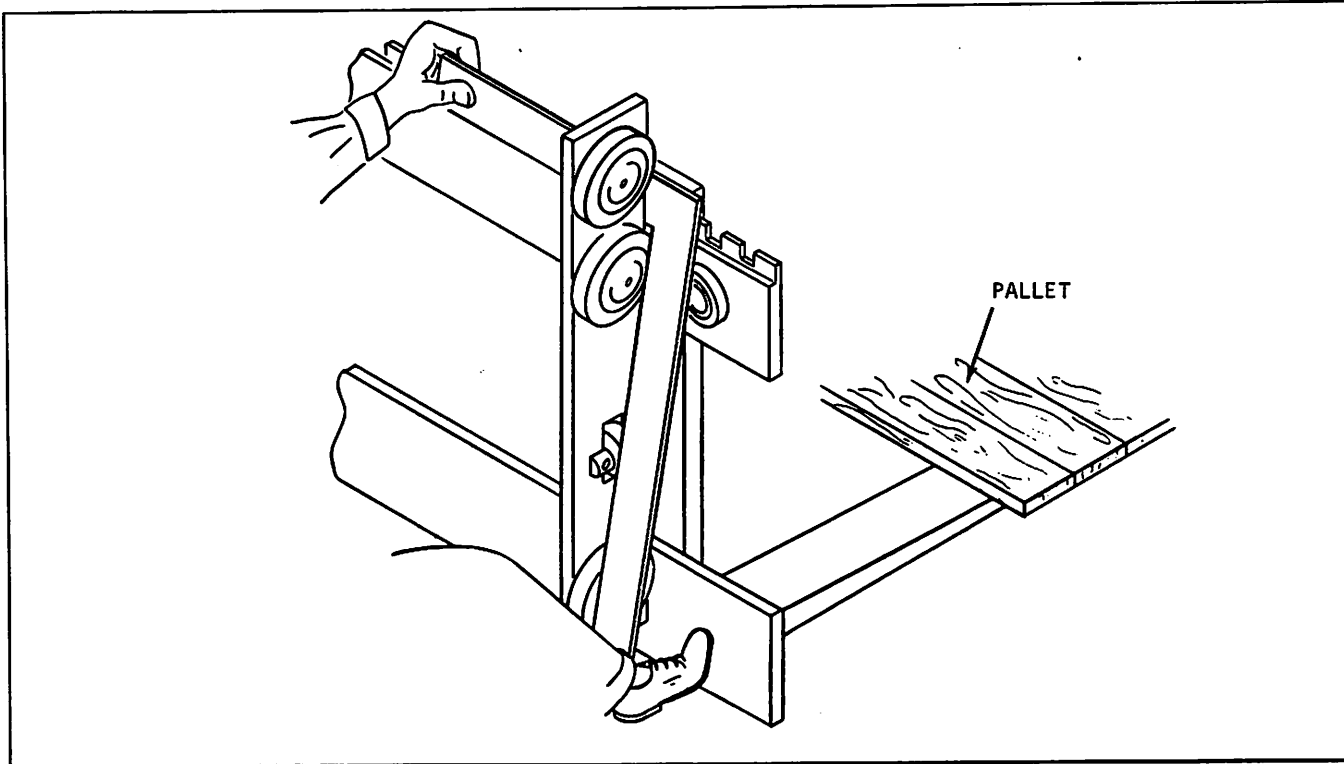
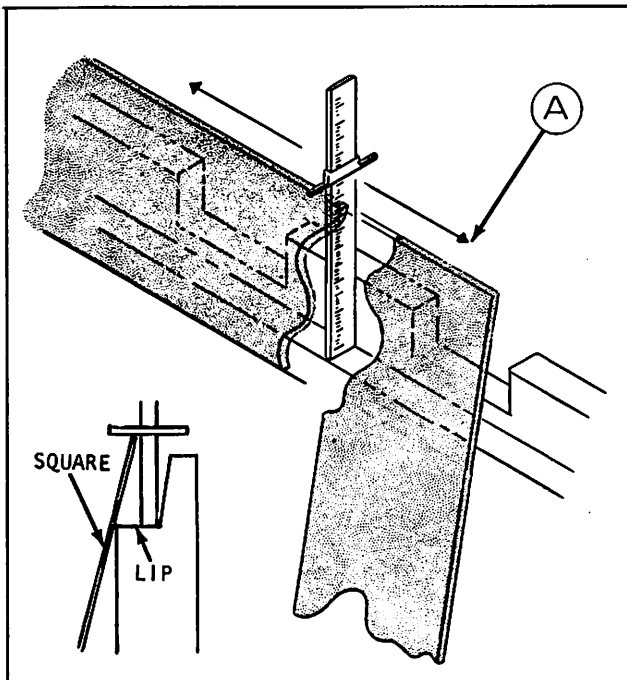


Plate 9574 Squaring Carriage Rollers (Six Roller Carriage)

... upper and lower rollers. Hold square in place with ankle and hand as shown.



Step 6. Hold square and measure the distance between the top face (or lip) of the upper fork bar to the edge of the square at Point A. Now take a measurement at opposite end of square these measurements should be the same. If they are not, add or remove shims on lower roller shaft until distance measured at each end is equal.

Plate 9575 Measuring For Squareness

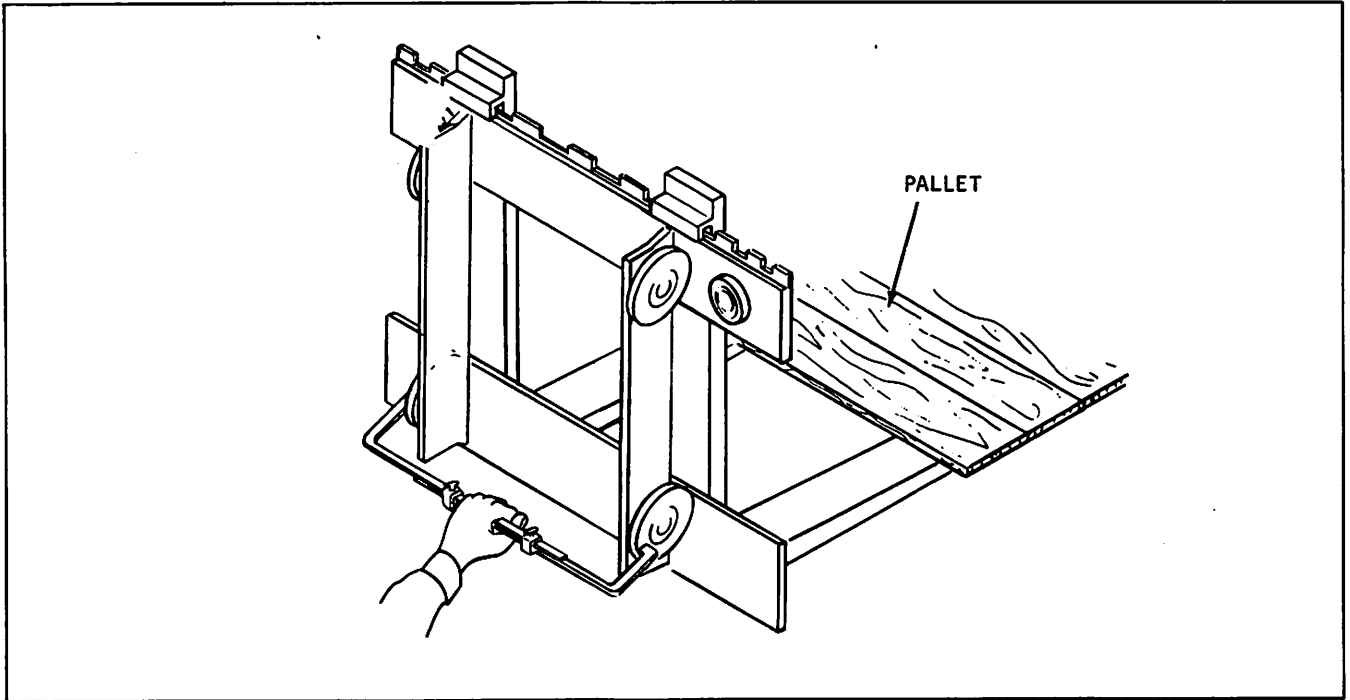


Plate 9576 Spanning Lower Rollers (Four Roller Carriage)

Step 7. Span lower rollers. Add or subtract shims to (the roller that has not been squared) ...

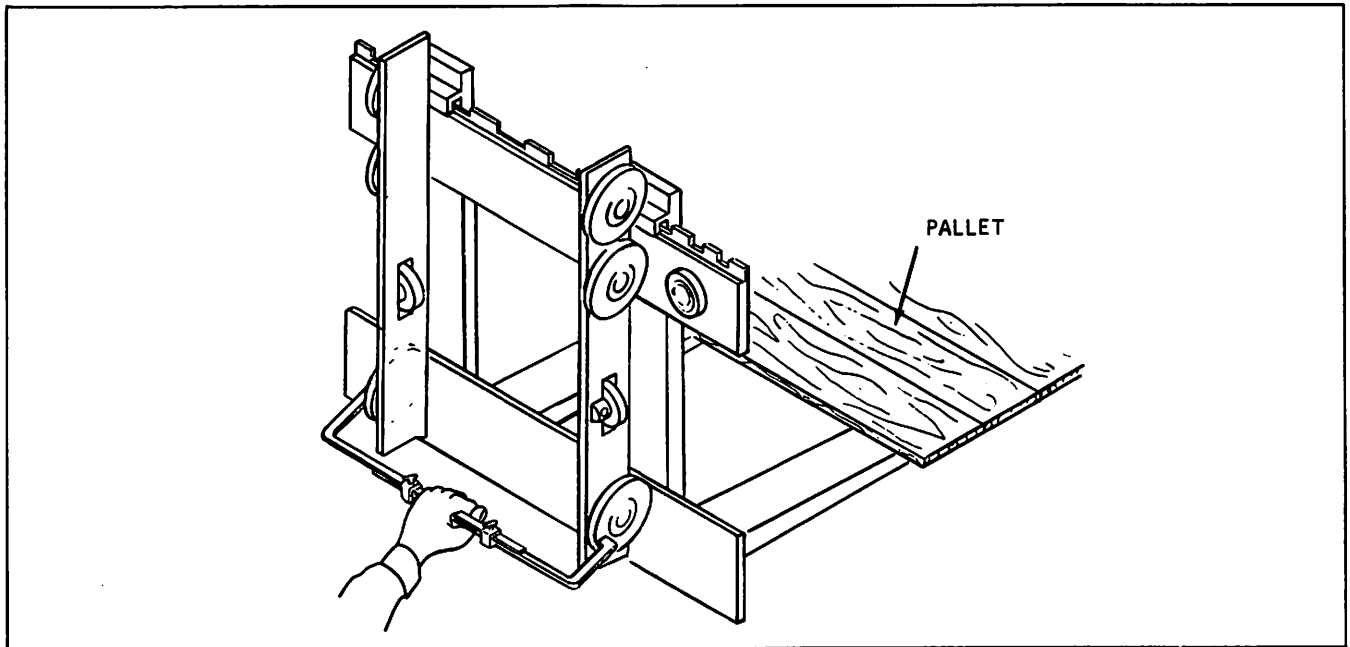


Plate 9577 Spanning Lower Rollers (Six Roller Carriage)

... reach the size of the outside spanning tool.

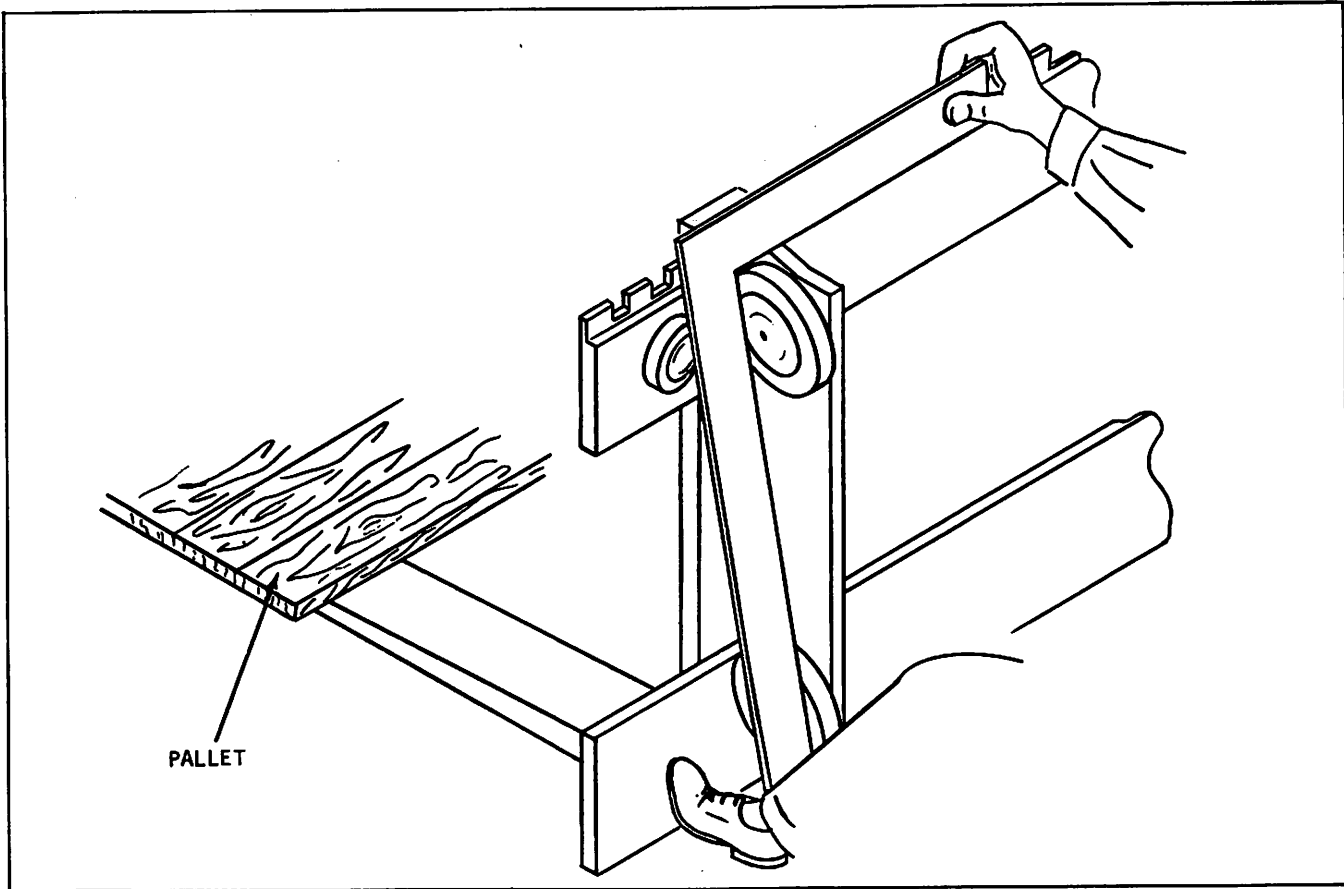


Plate 9578 Checking Squareness (Four Roller Carriage)

Step 8. Check opposite side for squareness (by holding square in the same manner as before and checking ...

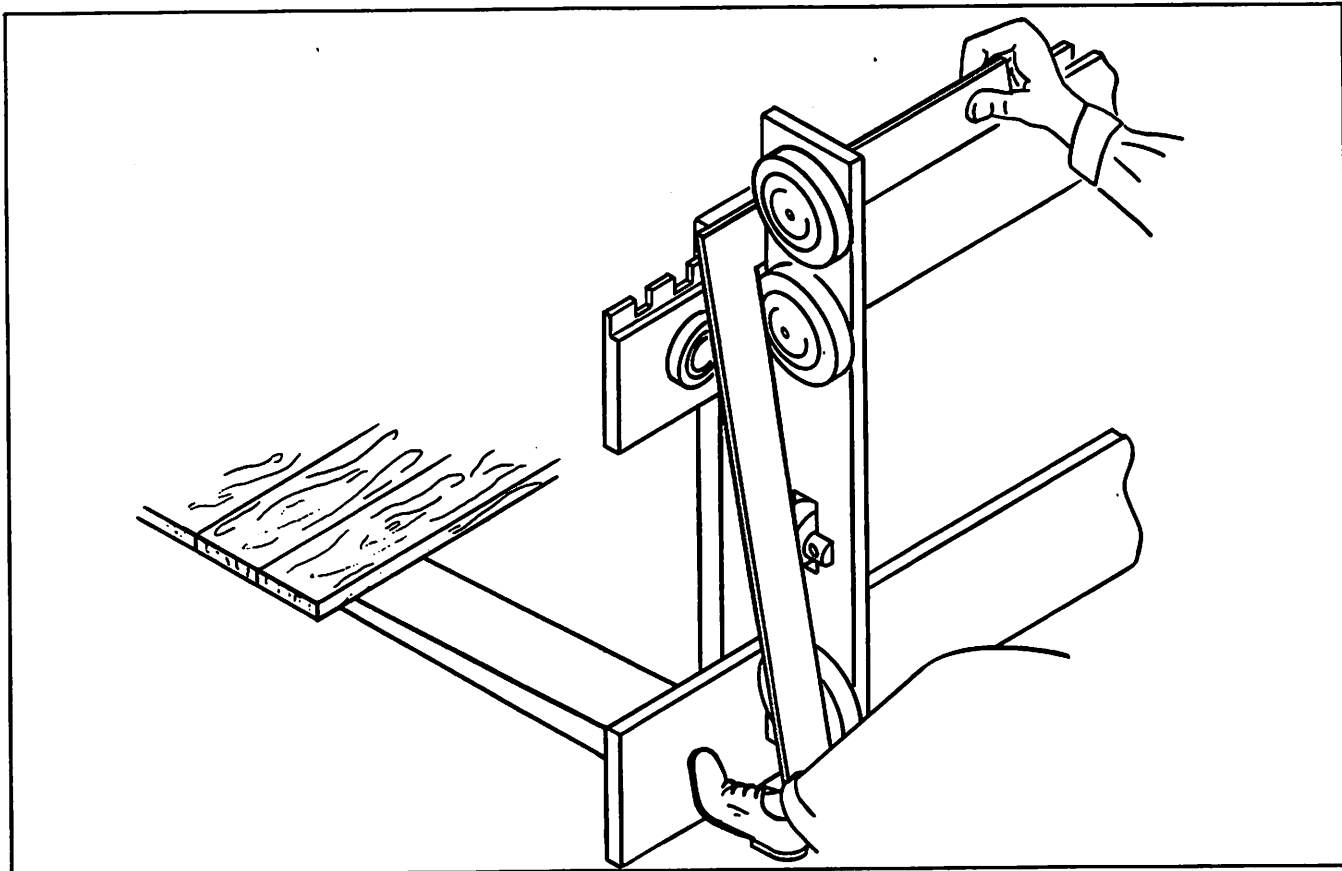


Plate 9579 Checking Squareness (Six Roller Carriage)

... measurement). This side will be square within $1/32''$; if not, return to Step 5. and repeat procedure.

SIX ROLLER CARRIAGE ONLY

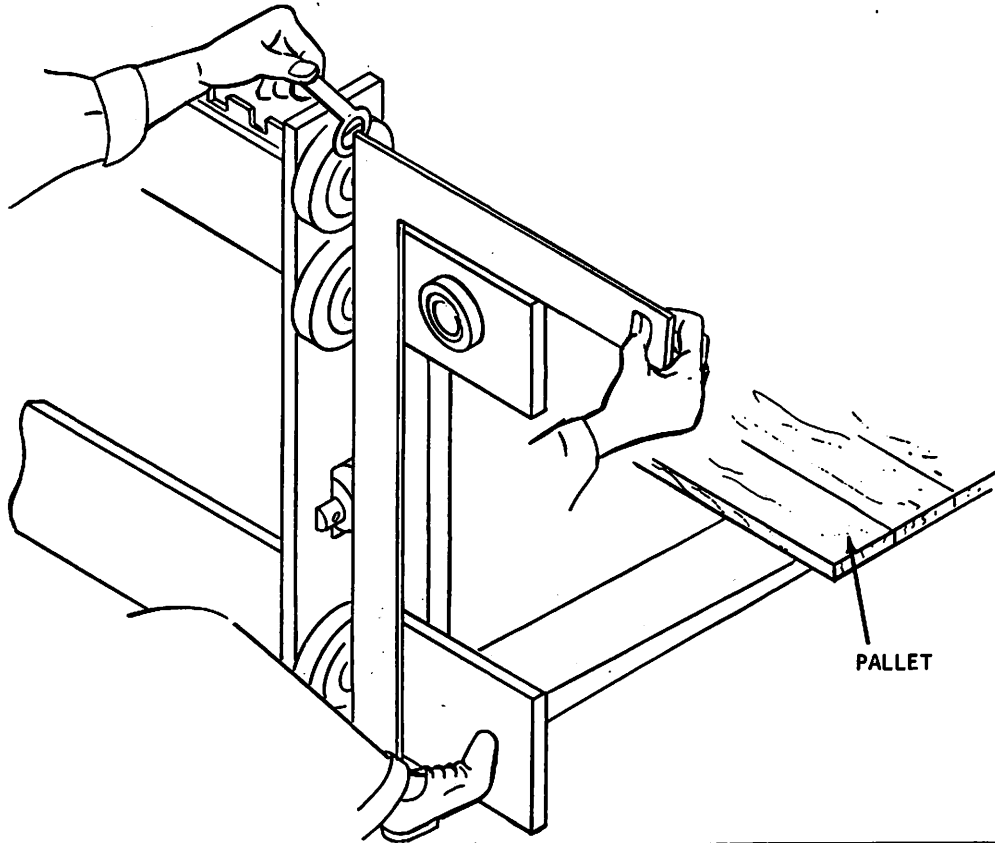
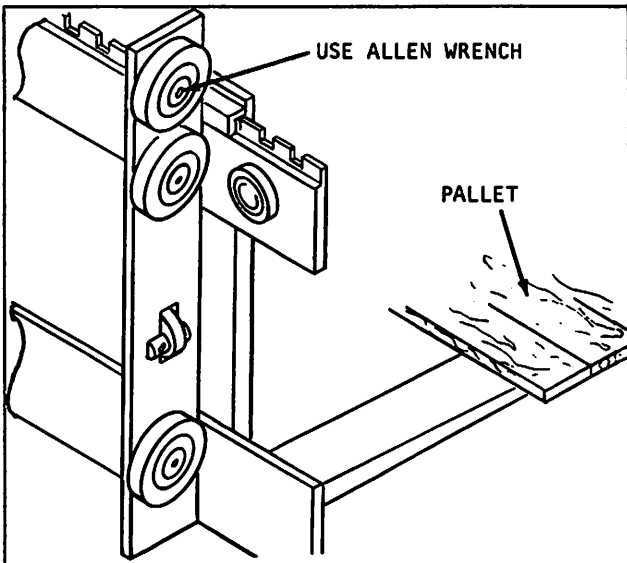


Plate 9580 Top Roller Clearance

Step 1. Place square on the vertical center line of the carriage rollers, as shown above. There must be some clearance between the square and the side surface of the top roller. This clearance should not exceed 1/32" or one shim



Step 2. If adjustment is necessary, remove allen screw, lock washer and flat washer to add or remove shims on shaft. Tighten screw securely after completing adjustment.

Plate 9581 Removing Top Roller

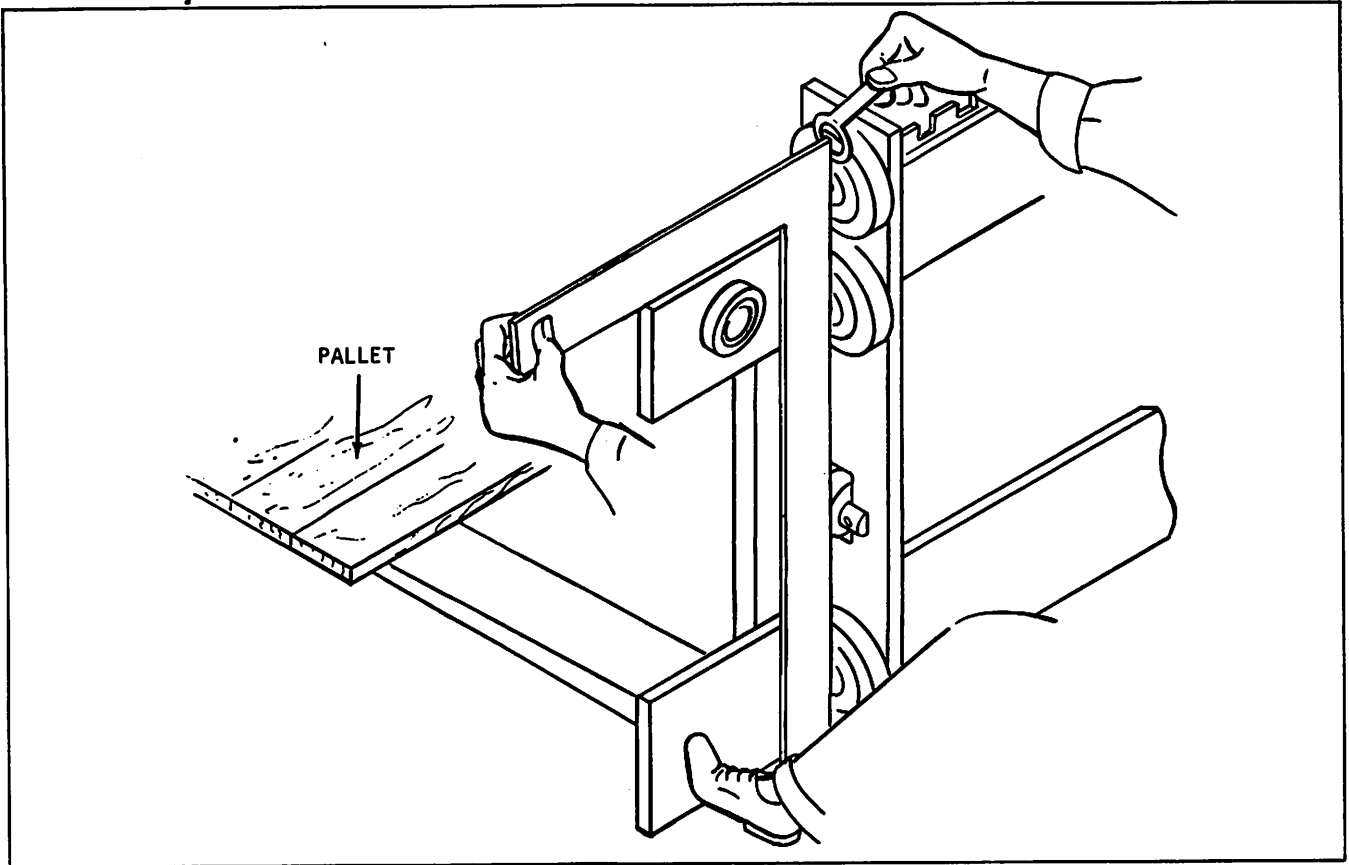


Plate 9582 Top Roller Clearance

Step 3. Check opposite upper roller in the same manner; adjust if necessary.

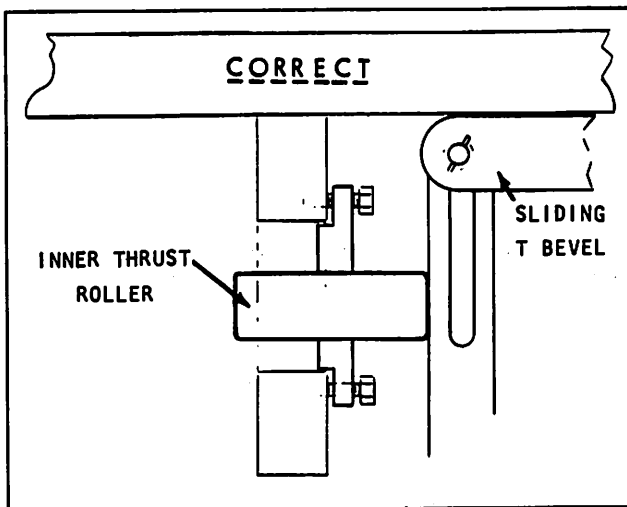


Plate 9583 Checking Squareness ■ CORRECT

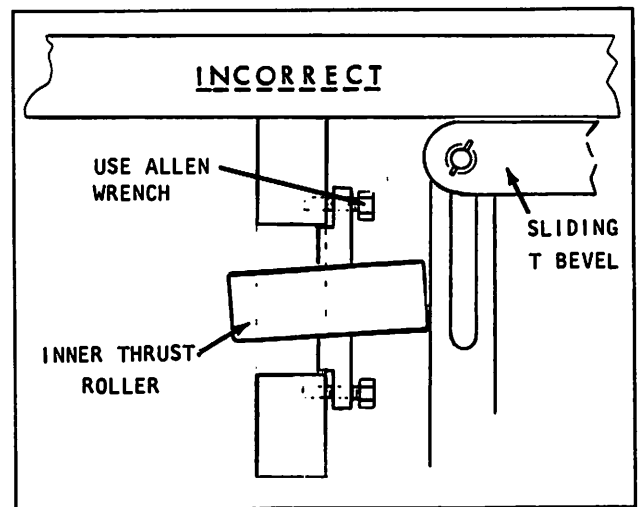


Plate 9584 Checking Squareness ■ INCORRECT

Step 4. Check squareness of inner thrust rollers with Sliding T Bevel. Set Sliding T Bevel to 90° using carpenter's square.

Step 5. Add or subtract shims for adjustment (Use allen wrench see Plate 9584).

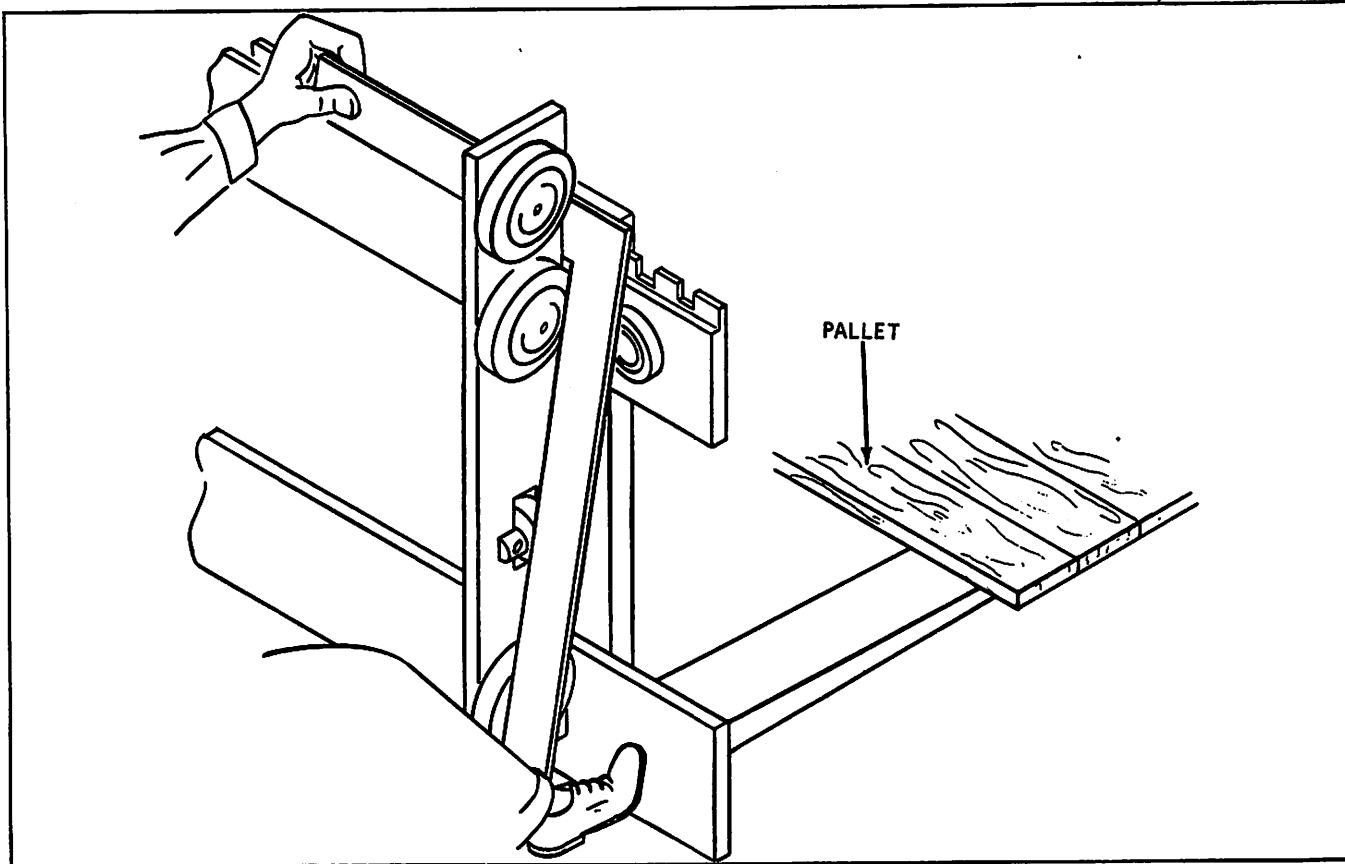


Plate 9574 Square And Side Thrust Roller

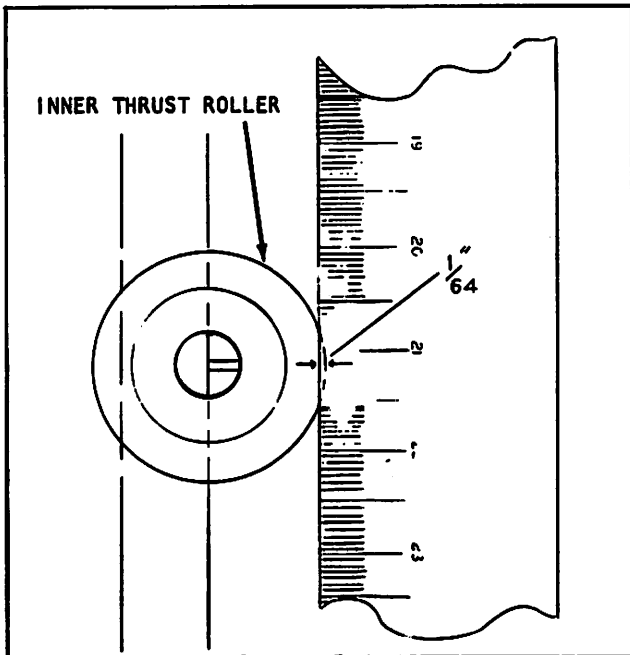


Plate 9585 Reading Roller Projection

Step 6. The inner thrust roller is to project $1/64$ " past line of square. Use one thrust roller shim and eyeball distance as shown (Plate 9573 and Plate 9585).

Step 7. Repeat Step 6. on opposite side.

C. CARRIAGE INSTALLATION

N O T E

Before installing carriage, check upright for proper shimming adjustment.

Step 1. Drive machine up to carriage and position upright to match tilt of carriage.

Step 2. Raise inner rails to just clear upper carriage rollers.

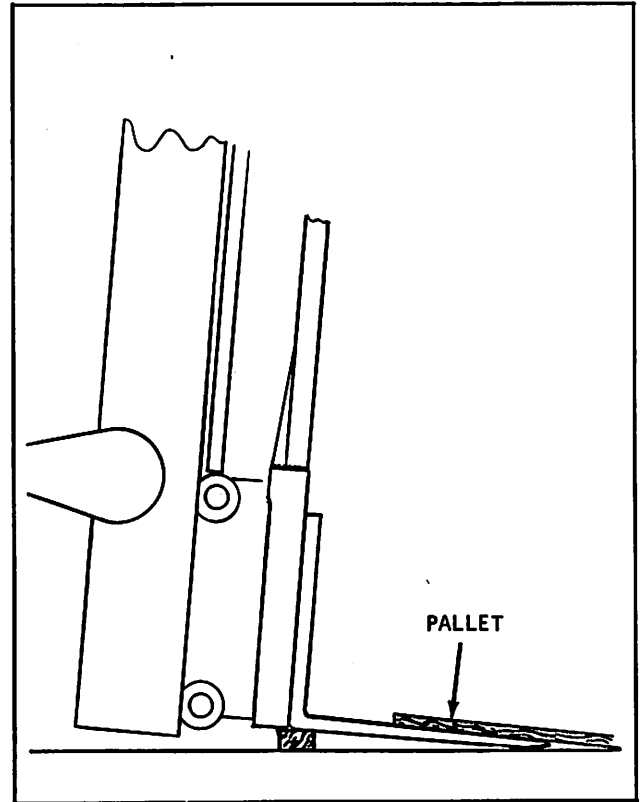


Plate 9565 Inner Rail Clearing Carriage Rollers

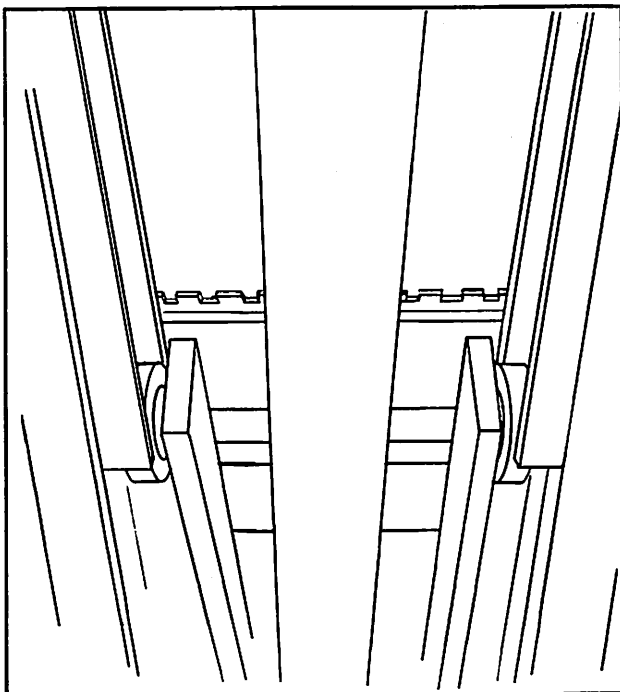


Plate 9591 Rollers Guiding Into Inner Rail

Step 3. Continue to drive machine forward until inner rails line up with upper carriage rollers, then... slowly lower inner rails to full down position.

CAUTION

CHECK TO BE SURE THE TOP CARRIAGE ROLLERS ARE GUIDING INTO INNER RAIL.

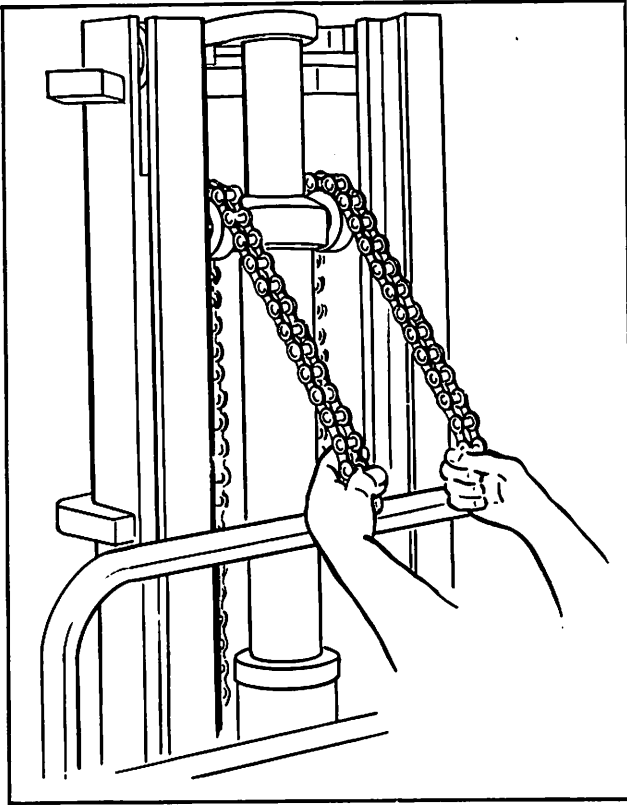


Plate 9586 Pulling Piston Head Down

Step 3(a). Remove wires holding lift chains.

(b). With a chain in each hand and someone holding the lift cylinder lever down, pull the piston to full down position. Place chains behind carriage.

Step 5. Raise carriage about 5' and place a 3' to 4' long 4"x4" wooden beam under it. DO NOT stand directly under forks. Lower carriage onto beam.

Step 6. Replace bolts with anchor pins.

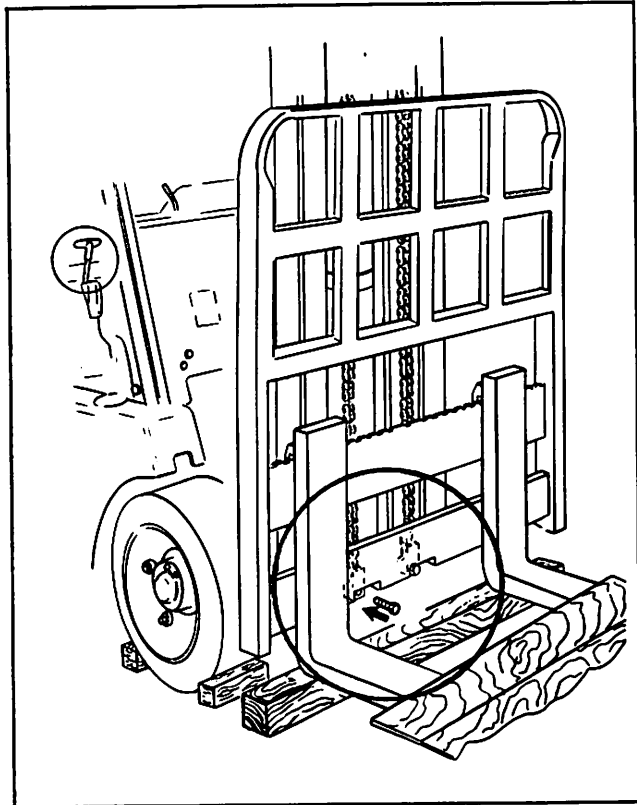


Plate 9587 Installing Bolts

Step 4. Put chain anchors in carriage anchor brackets and install 3/8" x 2" bolts in anchor pin holes.

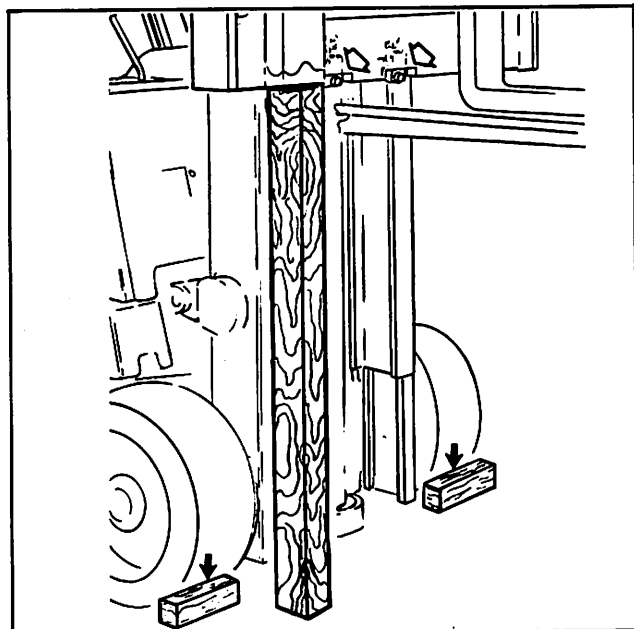


Plate 9593 Carriage Pin Replacement

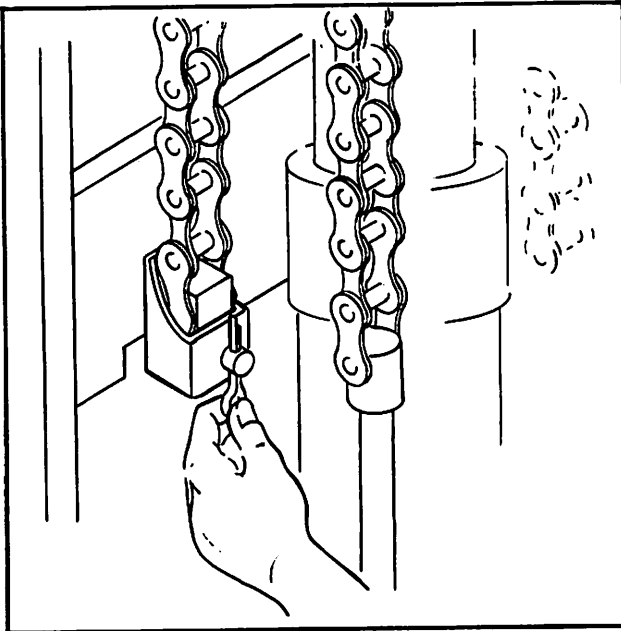


Plate 9588 Installing Cotter Pins

Step 7. Replace cotter pins in anchor pins.

Step 8. Raise and lower carriage to full positions checking all phases of operation.

PANTOGRAPH FRAME ROLLERS

Pantograph frame is adjusted in the same manner as a Standard carriage ... refer to page 1000H 1803.

THERE ARE TWO UPRIGHT MODELS COVERED IN THIS MANUAL ...

"B" MODEL UPRIGHTS - visual identification: The UPPER TIE BAR on the INNER RAIL ASSY., is welded HORIZONTALLY to the rails (narrow side of bar faces out).

"C" MODEL UPRIGHTS - visual identification: The UPPER TIE BAR on the INNER RAIL ASSY., is welded VERTICALLY to the rails (wide side of bar faces out).

Outer Side Thrust Rollers

1. Tighten the outer side thrust rollers to 150 pound feet torque.

The end these (thrust roller) shafts have a machined groove. On later models ... the shaft HAS A NYLON LIP and staking is not required.

2. On a shaft that requires staking ... stake with a punch at each end of groove to secure shaft to pantograph frame.

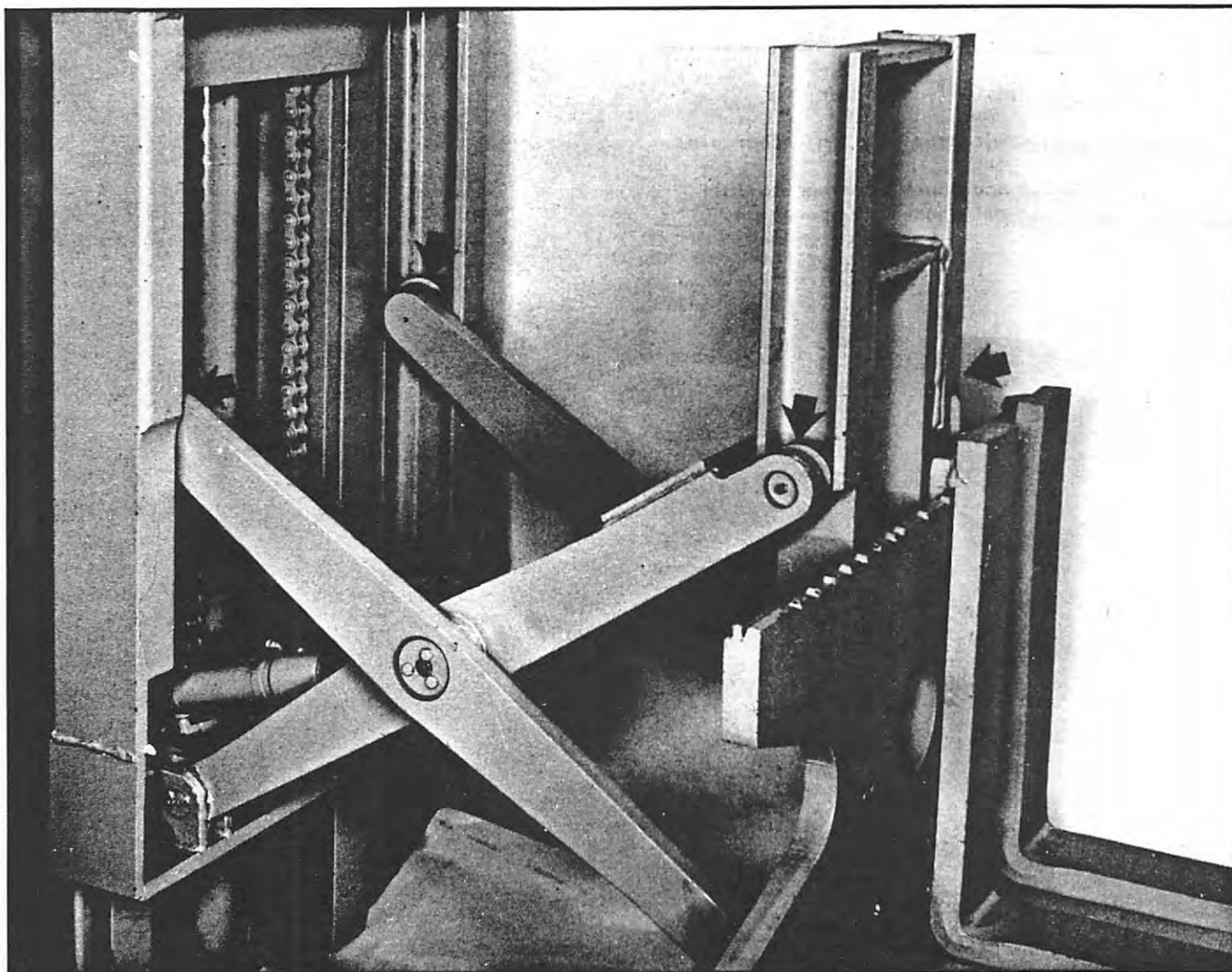
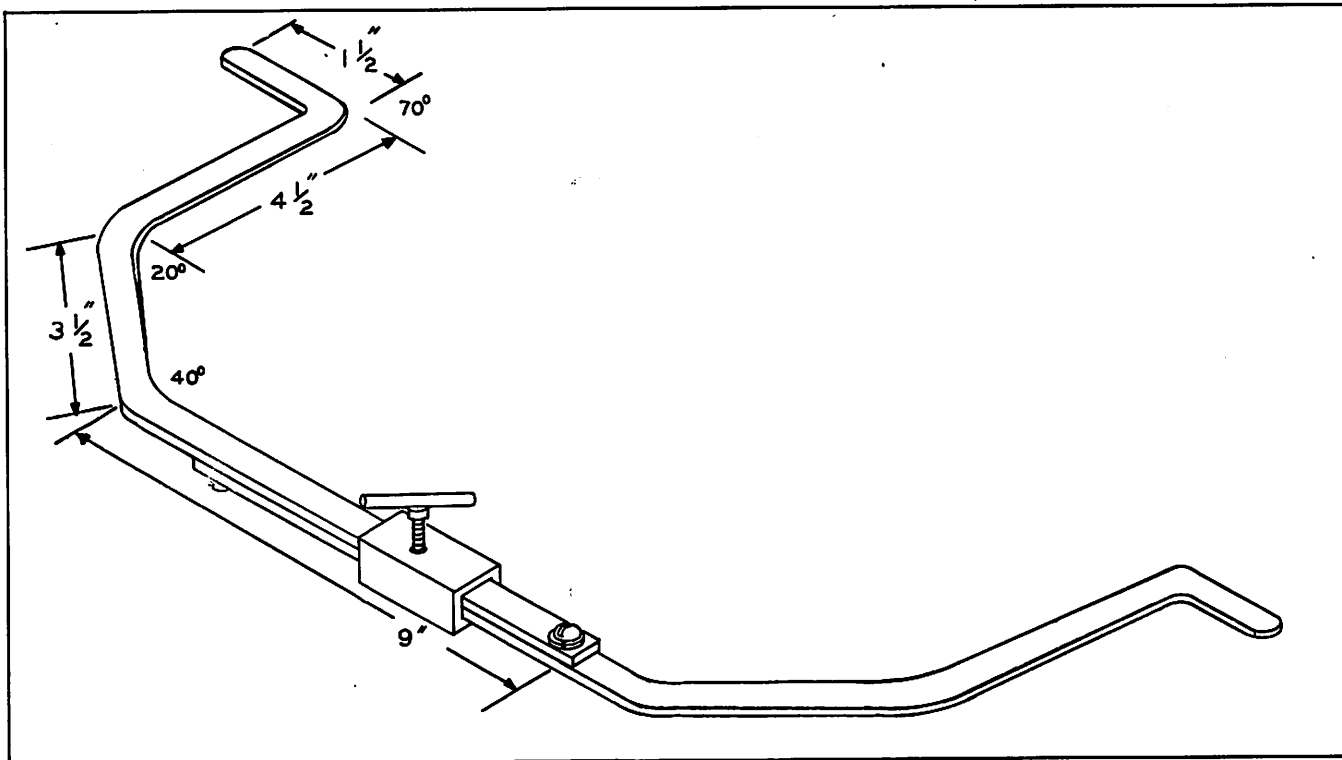
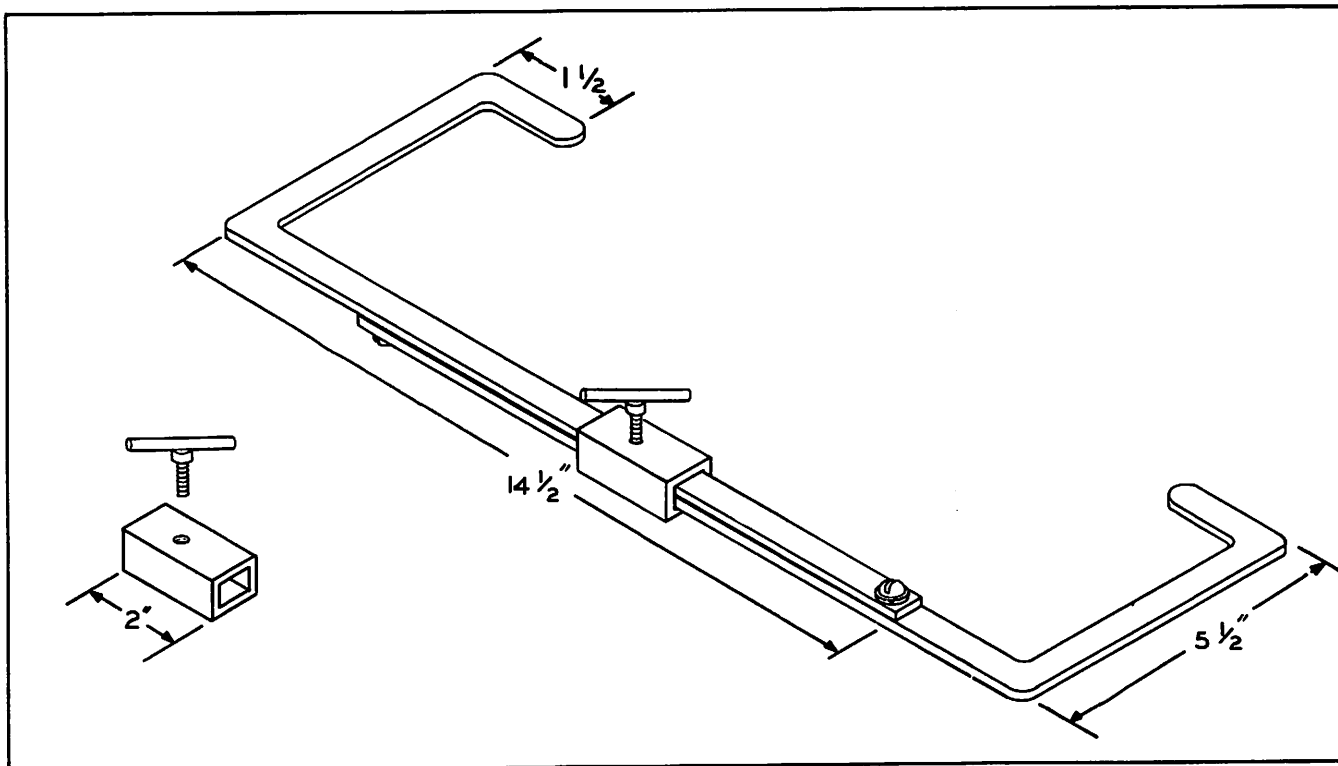


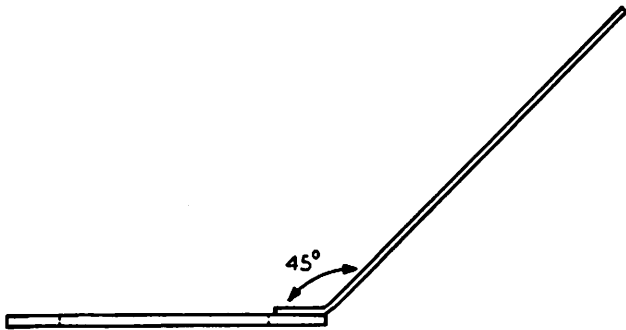
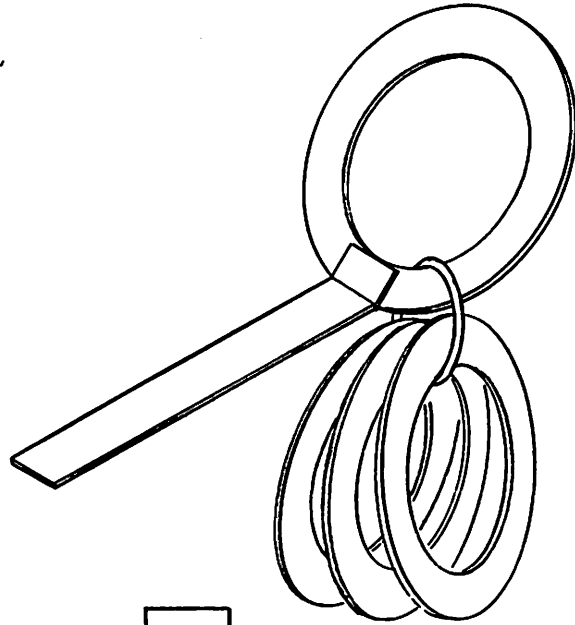
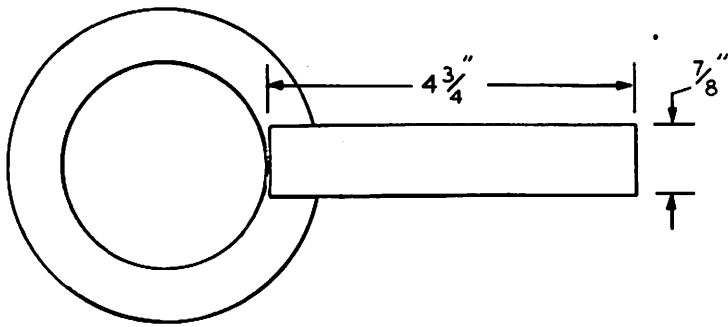
Plate 7509. Typical Pantograph Frame Roller Checks and Adjustments



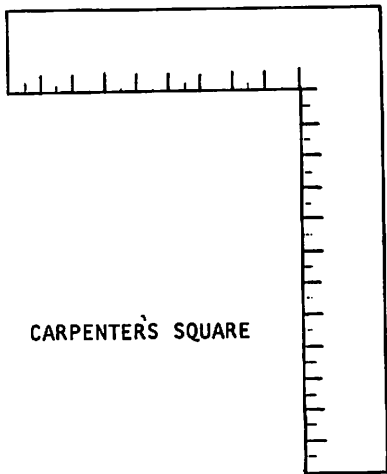
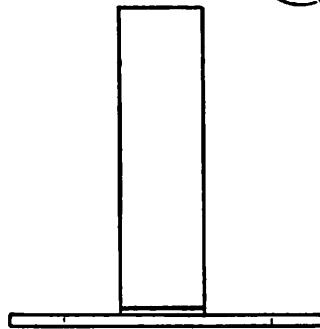
INSIDE SPANNING TOOL



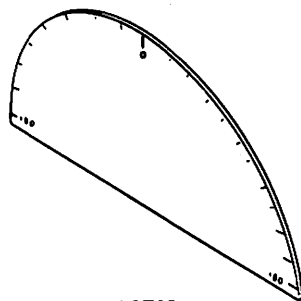
OUTSIDE SPANNING TOOL



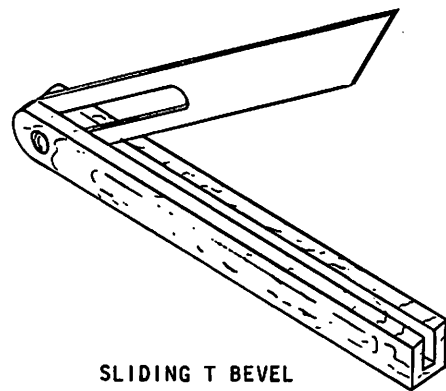
SHIM GAUGE



CARPENTER'S SQUARE

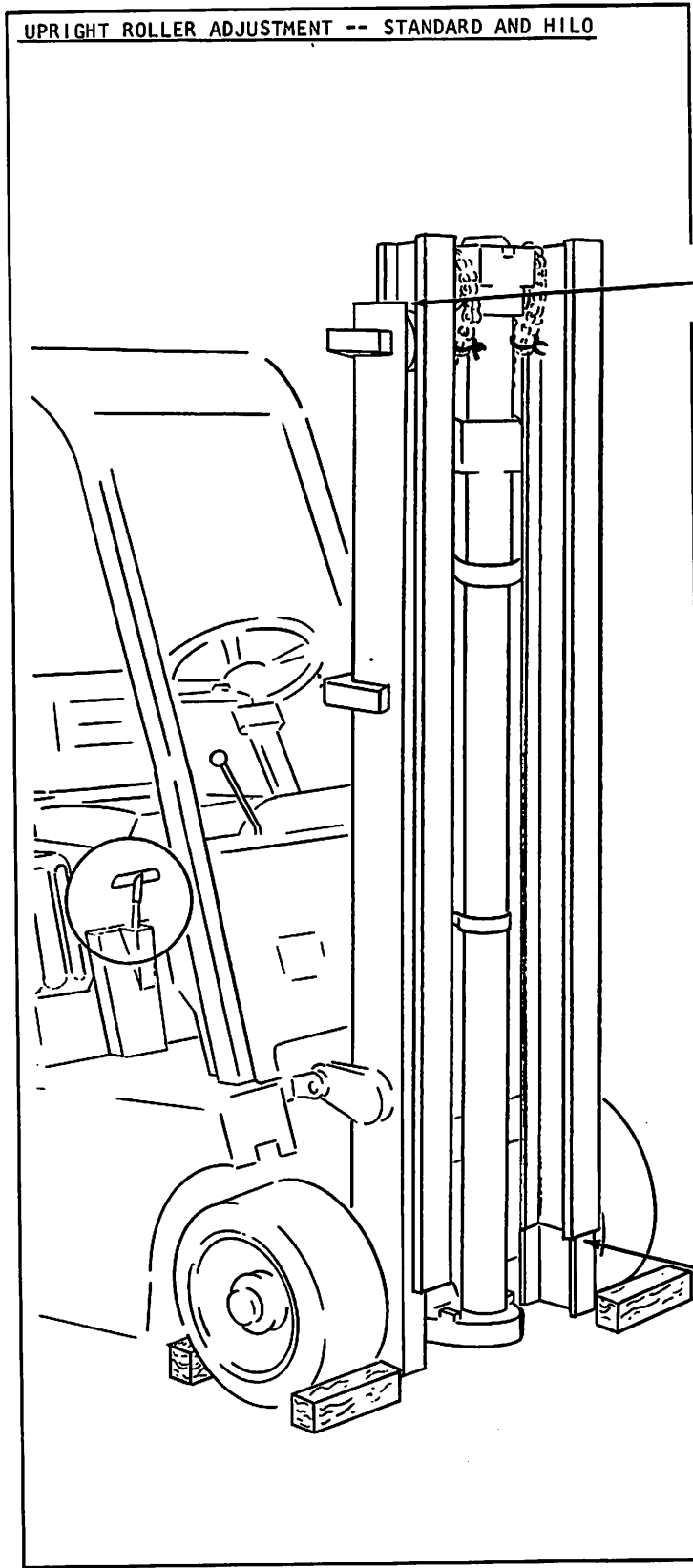


PROTRACTOR



SLIDING T BEVEL

UPRIGHT ROLLER ADJUSTMENT



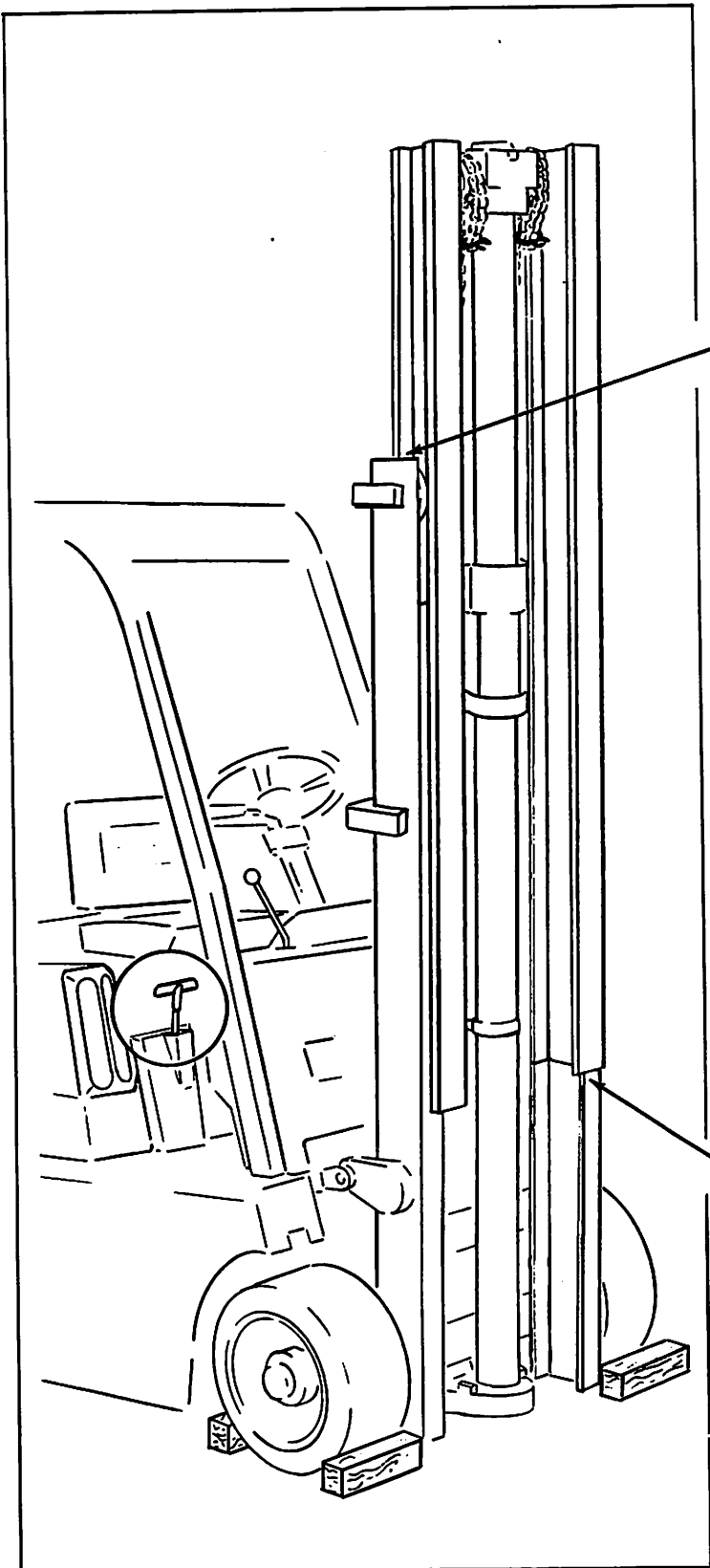
UPRIGHT ROLLER ADJUSTMENT -- STANDARD AND HILO

Step 1(a). Remove carriage. Refer to CARRIAGE REMOVAL.

Before checking roller clearance, position inner rail about 5" above full down position.

Check both sides for roller clearance at (top and bottom) of inner rail. Use tool to determine the number of shims to be added and record this number on the rail. Record number of shims to be used, on outer rail (for top rollers only). Record number of shims to be used on inner rail (for bottom rollers only).

There is to be some clearance but it is not to exceed 1/32".

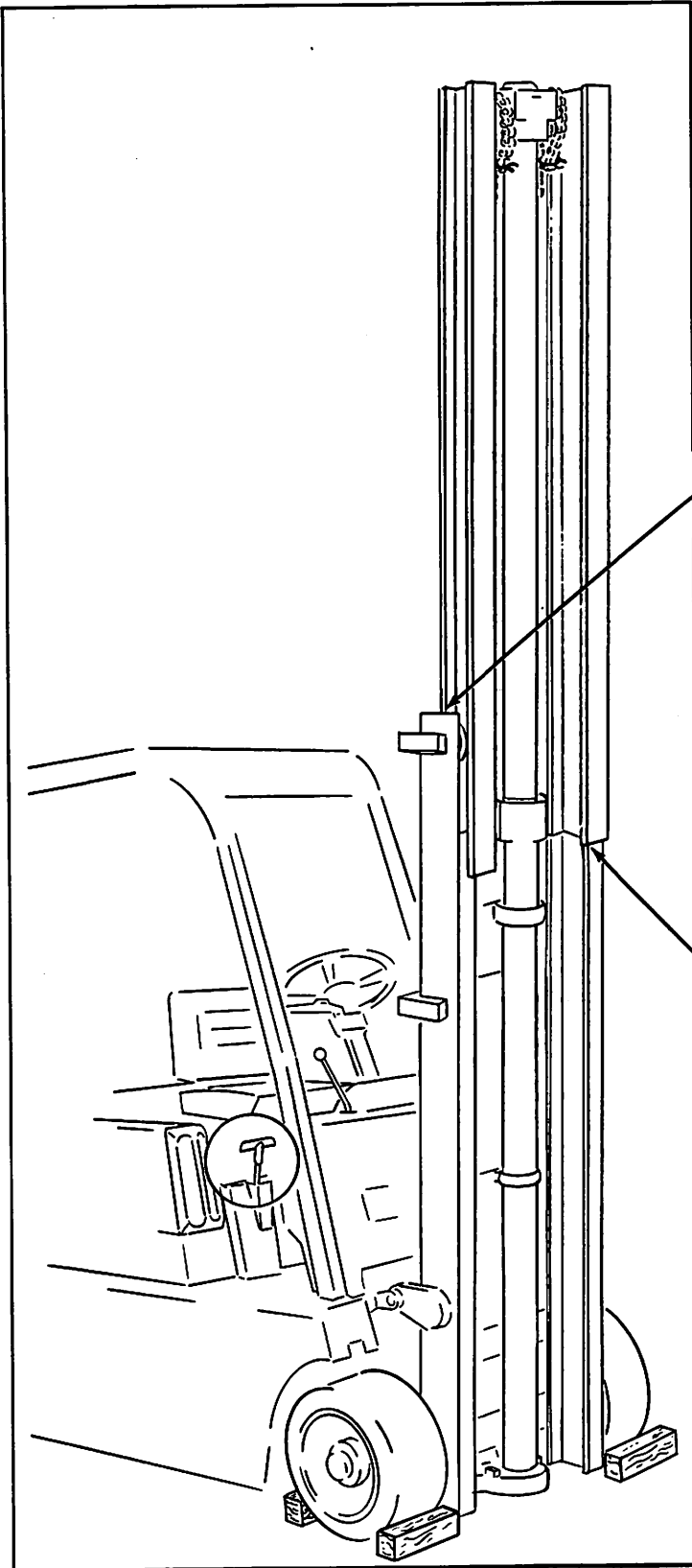


Step 1(b). Raise inner rail to 1/2 of its full up position. With tool and bar, check the roller clearance in the same manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used on inner rail (for bottom rollers only).

Plate 9625



Step 1(c). Raise inner rail to full up position and with tool and bar, check for roller clearance in the manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rollers only).

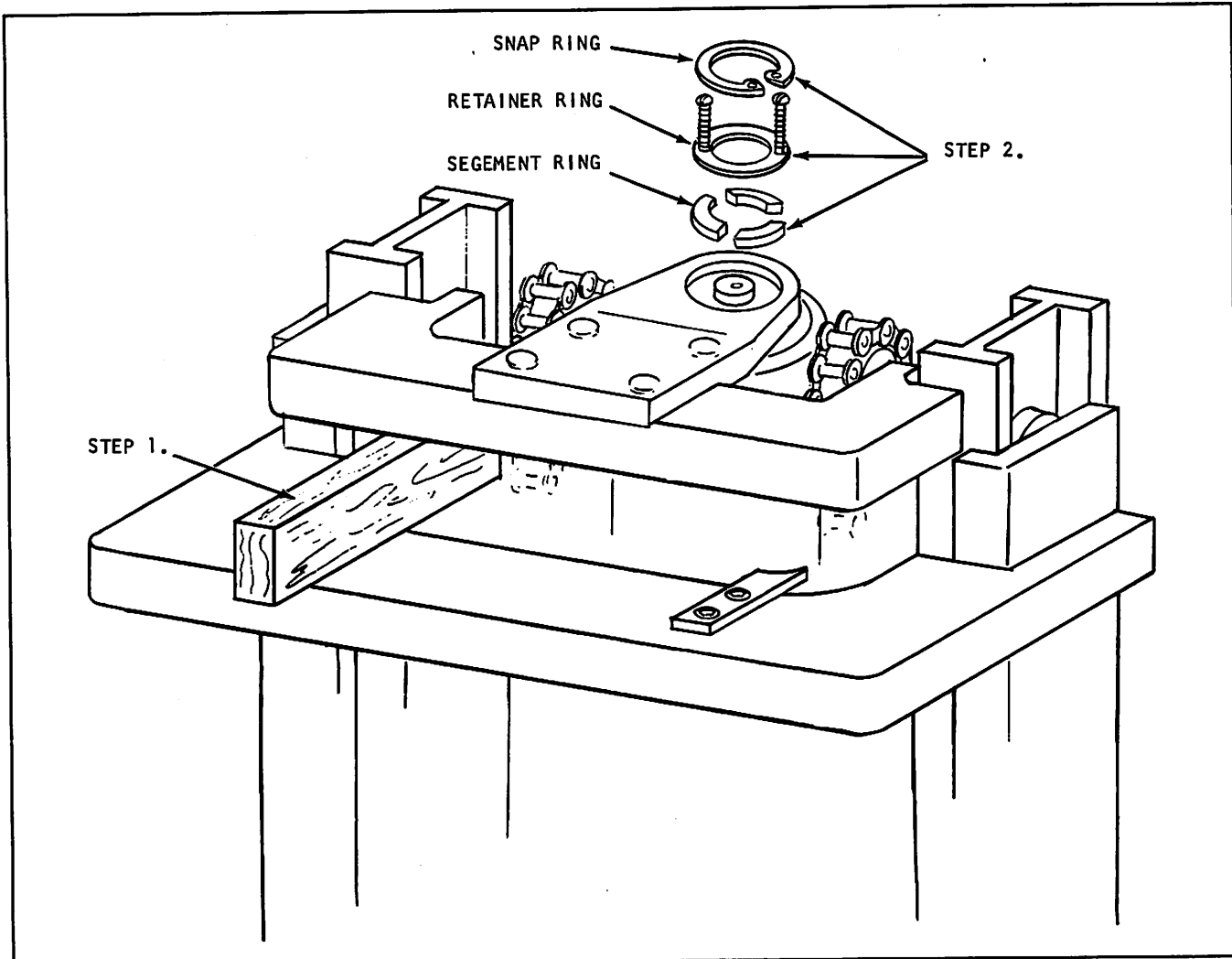


Plate 9627

REMOVAL OF INNER RAIL

Step 1. Raise inner rail about 5 inches and place a 2" x 4" block between upper tie bars. Lower inner rail until block supports it.

The upright you are working with may have a different piston anchor than the one shown above, remove it accordingly.

Step 2(a). Secure piston head with chain hoist.

(b). Remove lift cylinder from upper anchor

1. Remove snap ring

2. Place two (2) #6-32X2" round head slotted machine screws (in holes provided) in retainer ring.

(c). Remove segment ring.

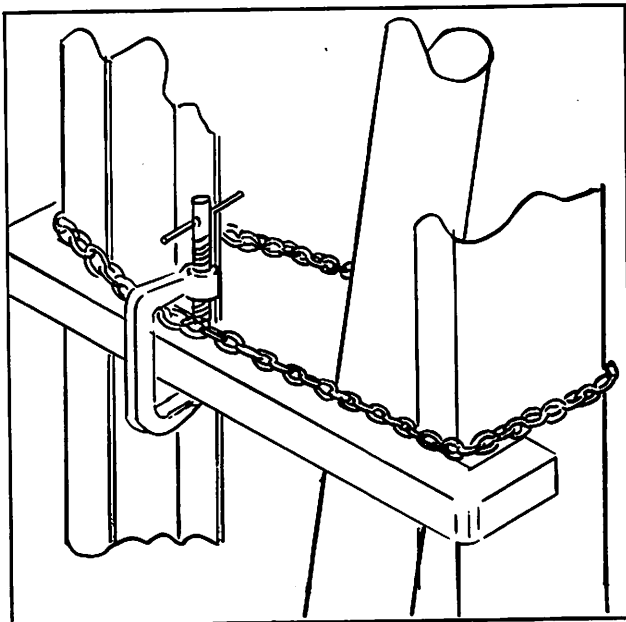


Plate 9628

Step 3. Place a safety strap or chain around outer rail as shown.

Step 4. Lower piston head out of anchor using pry bar. With the upright tilted forward the piston will rest on the strap or chain.

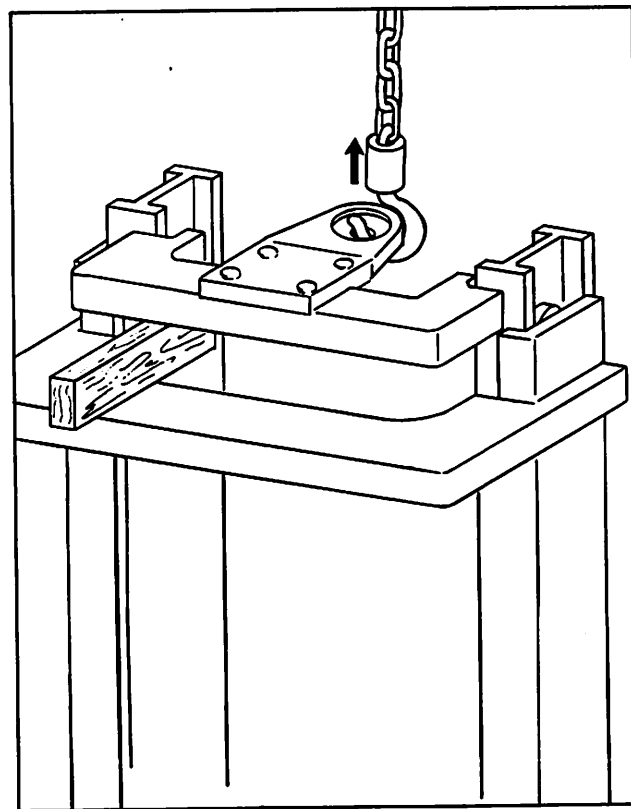


Plate 9630

Step 6. Place lifting device hook in hole of cylinder anchor. Raise about 2" and remove block between tie bars.

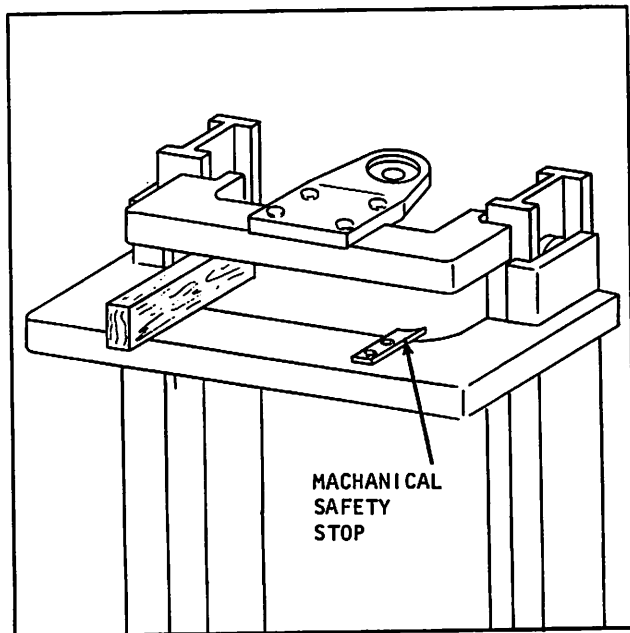
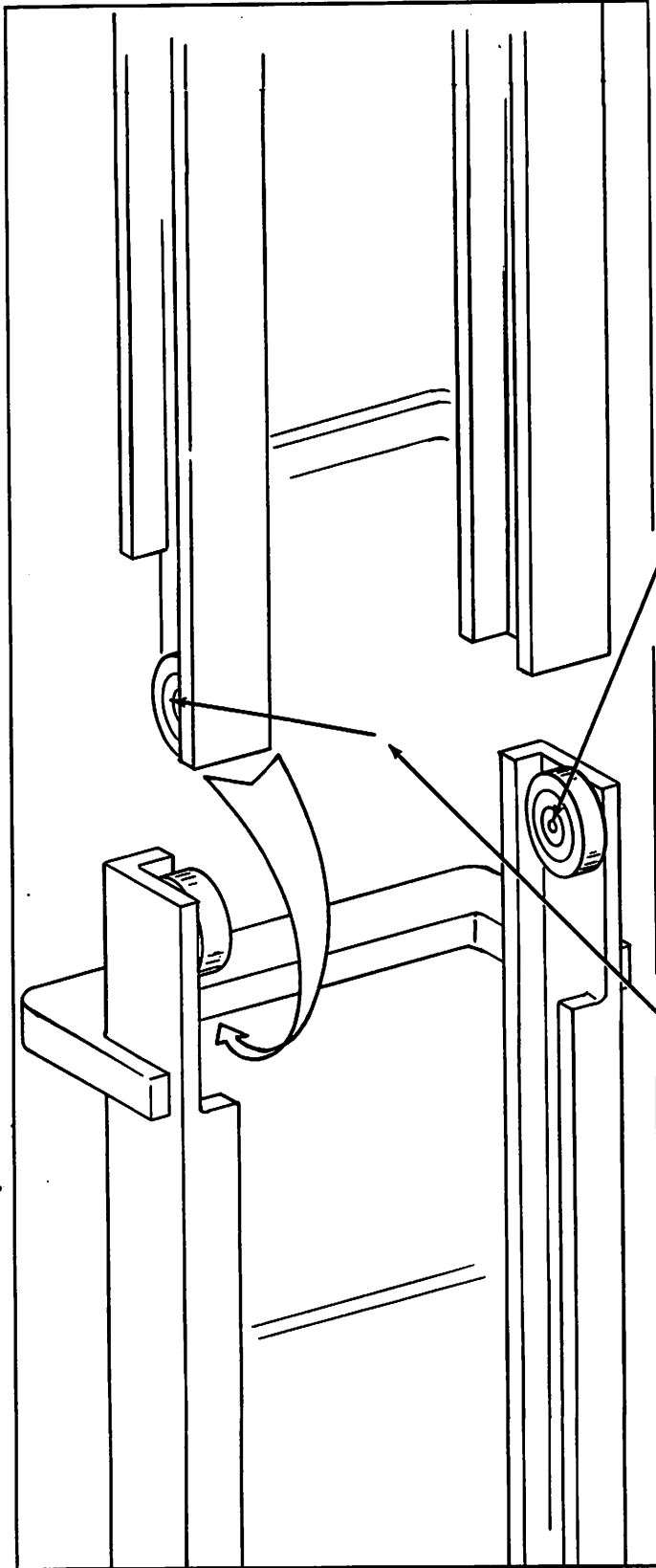


Plate 9629

Step 5. Remove mechanical safety stops with allen wrench.



Step 7. Raise inner rail out of outer rail.

Step 8. Leave inner rail in this position while adjusting rollers.

Step 9. Adjusting upright rollers:

A. Outer rail rollers.

1. Count the number of shims at the right and left hand rollers.

2. Look at the three (3) numbers you recorded on the outer rail in Step 1. The smallest of these numbers is the total number of shims to be added. A '0' means DO NOT add shims.

3. Your target for adjustment is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.

B. Inner rail rollers

1. Count the number of shims at the right and left hand rollers.

2. Look at the three (3) numbers you recorded on the inner rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.

3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace inner rail.

Plate 9631

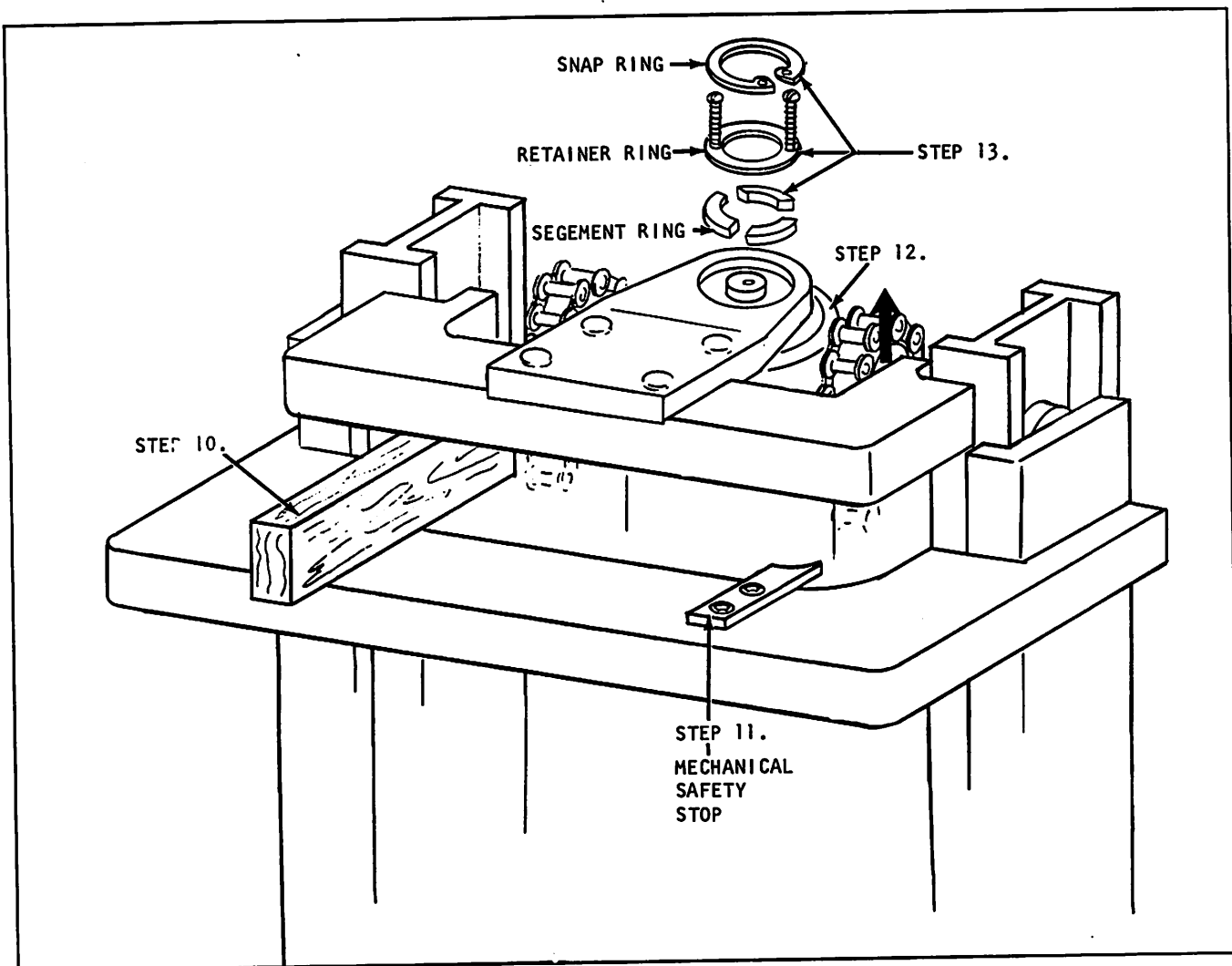


Plate 9632

Step 10(a). Place block between upper tie-bars. Lower inner rail until block supports it.

(b). Unhook lifting device.

Step 11. Install mechanical safety stops. Be sure to install lock washer and screw fasteners.

Step 12. Guide piston into anchor with one hand and move the lift lever with the other.

Step 13. Secure lift cylinder to anchor.

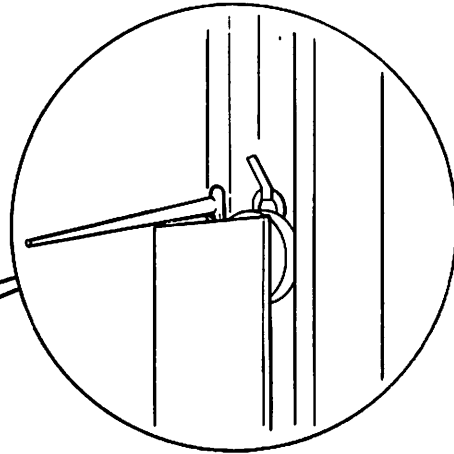
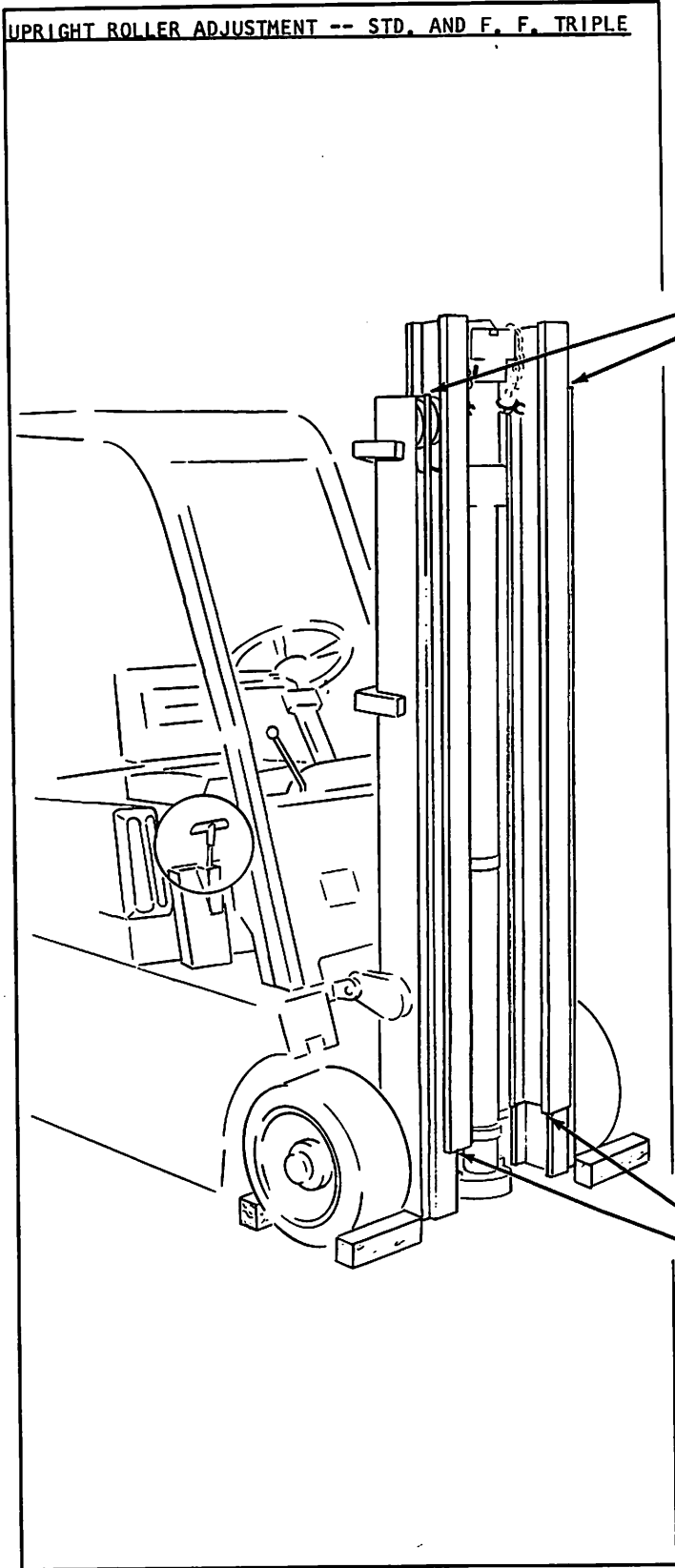
(a). Install segment ring.

(b). Install retainer ring and remove both slotted machine screws.

(c). Install snap ring.

(d). Raise and lower to full positions checking piston and anchor. Remove block between tie bars.

UPRIGHT ROLLER ADJUSTMENT -- STD. AND F. F. TRIPLE



Step 1(a). Remove carriage.

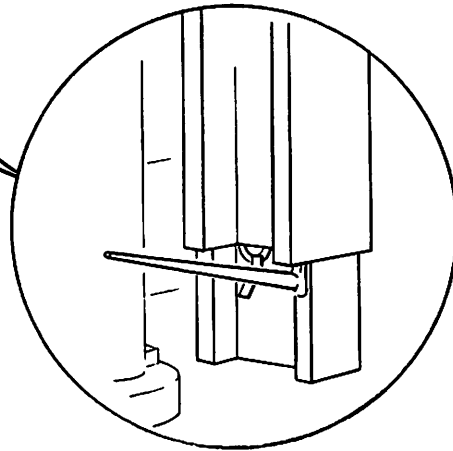
Before checking, position inner rail about 5 inches above full down position.

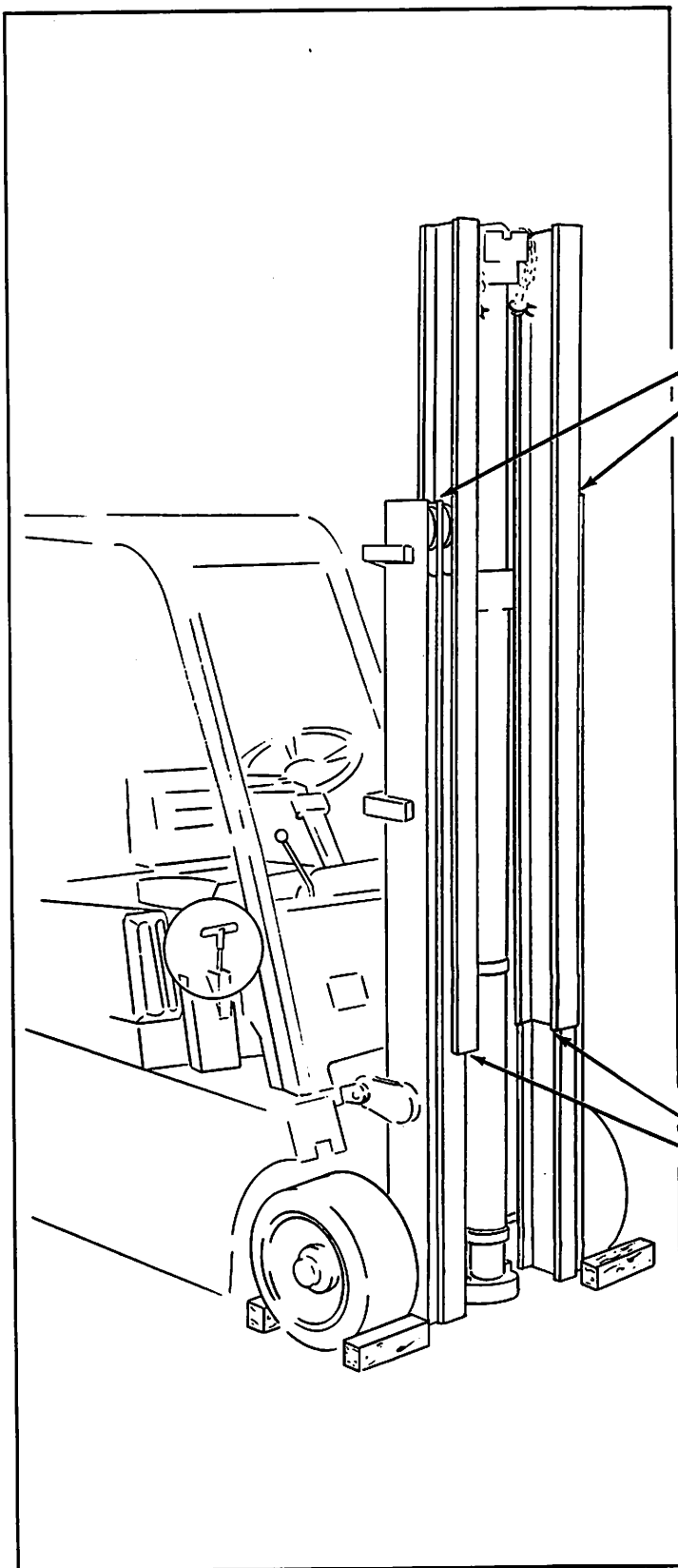
Check both sides for roller clearance at (top and bottom) of inner rail. Use tool to determine the number of shims to be added and record this number on the rail.

Record number of shims to be used, on intermediate rail (for top rollers only).

Record number of shims to be used on inner rail (for bottom rollers only).

There is to be some clearance but it is not to exceed 1/32 inch.

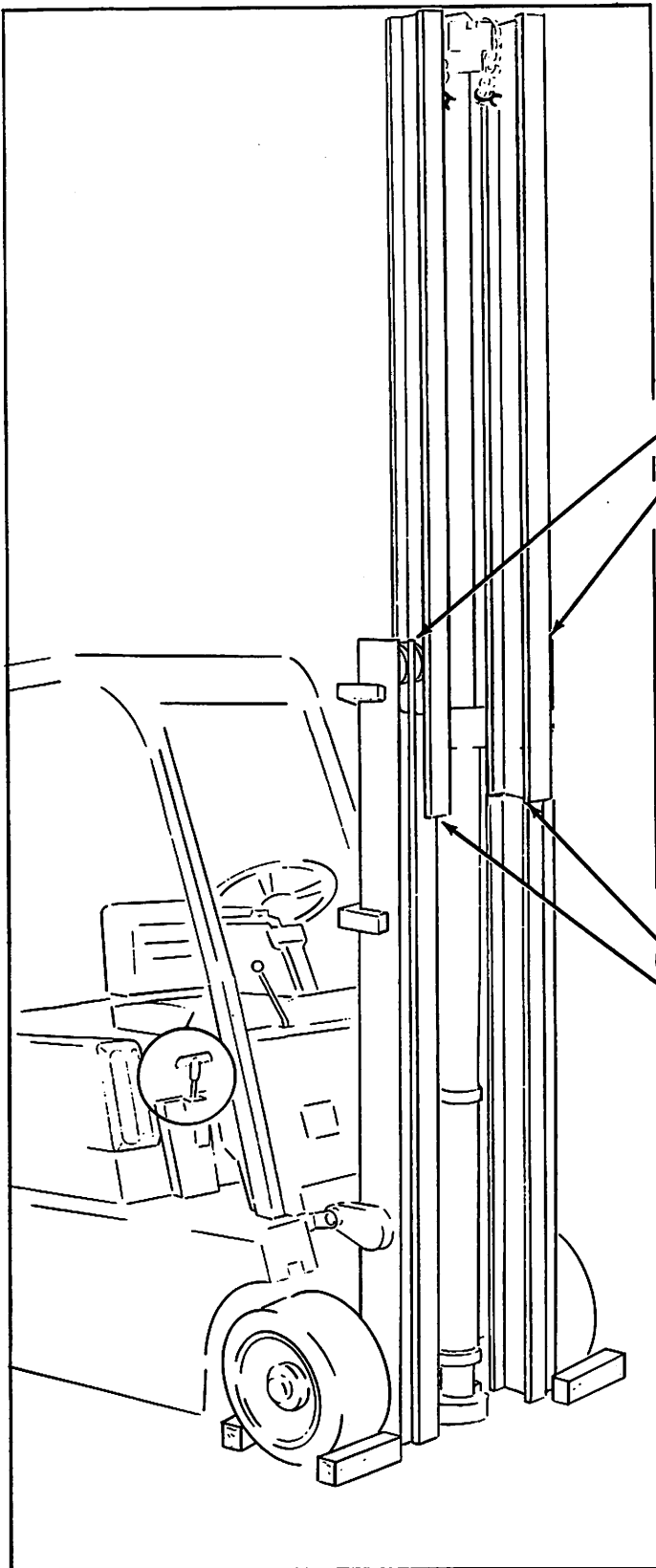




Step 1(b). Raise inner rail to 1/2 of its full up position. Check roller clearance in the same manner as before.

Record number of shims to be used, on intermediate rail (for top roller only).

Record number of shims to be used, on inner rail (for bottom rollers only).

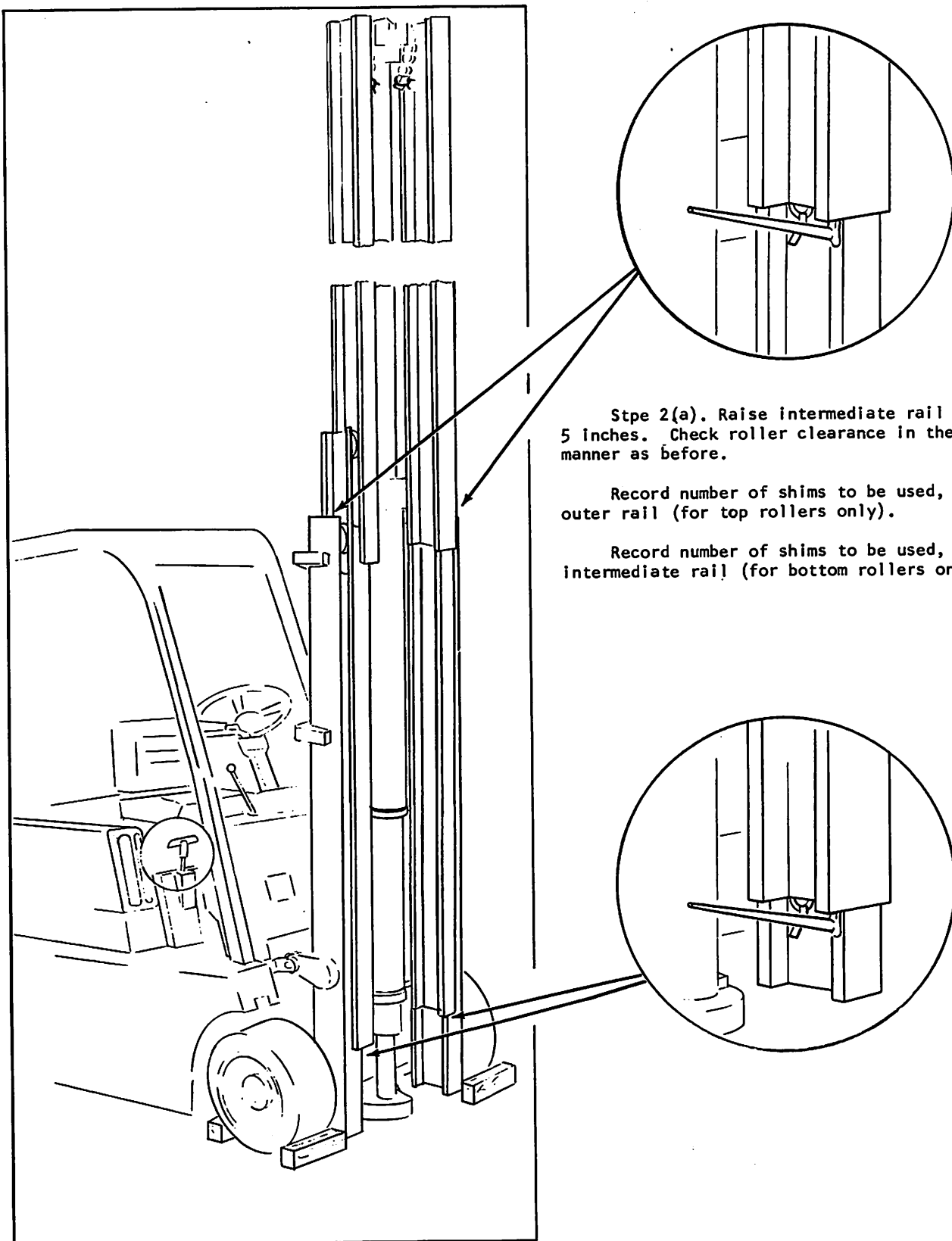


Step 1(c). Raise inner rail to full up position. Check roller clearance in the same manner as before.

Record number of shims to be used, on intermediate rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rails only).

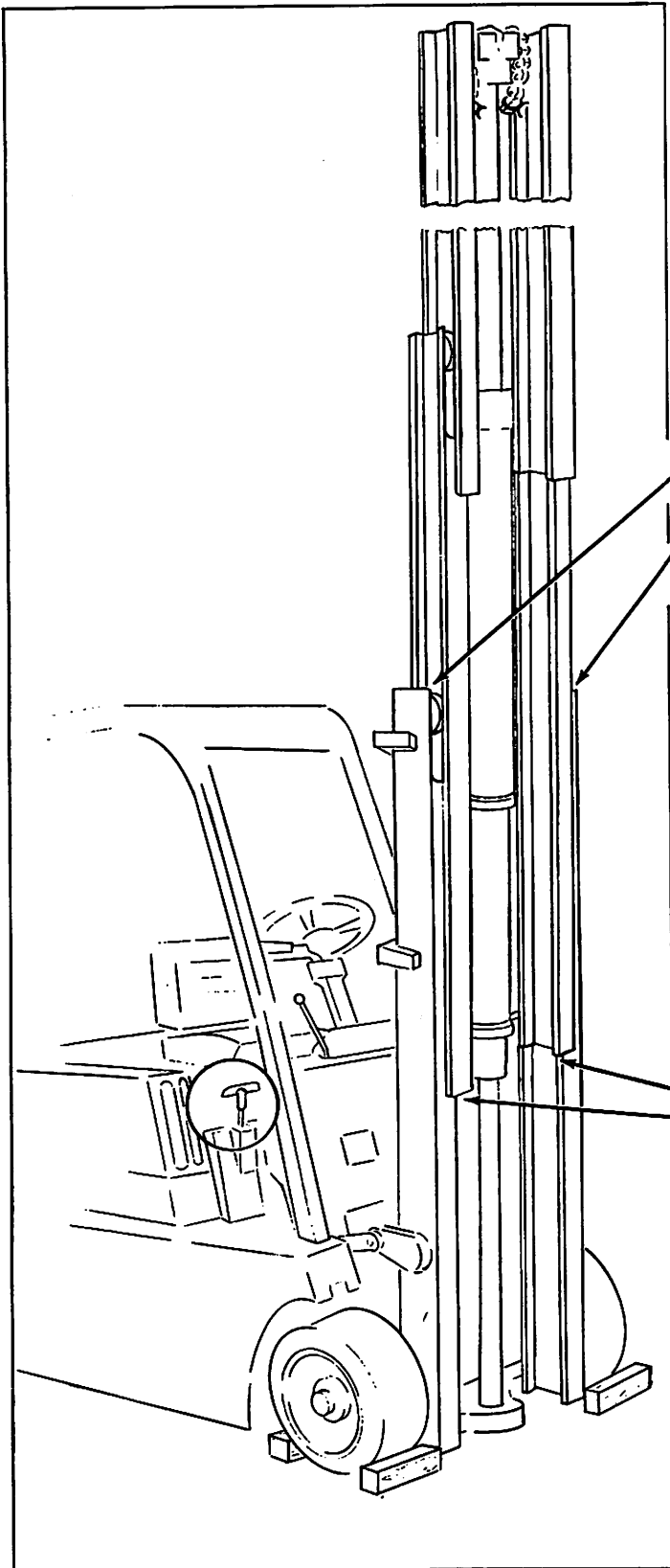
Plate 9638



Step 2(a). Raise intermediate rail about 5 inches. Check roller clearance in the same manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on intermediate rail (for bottom rollers only).

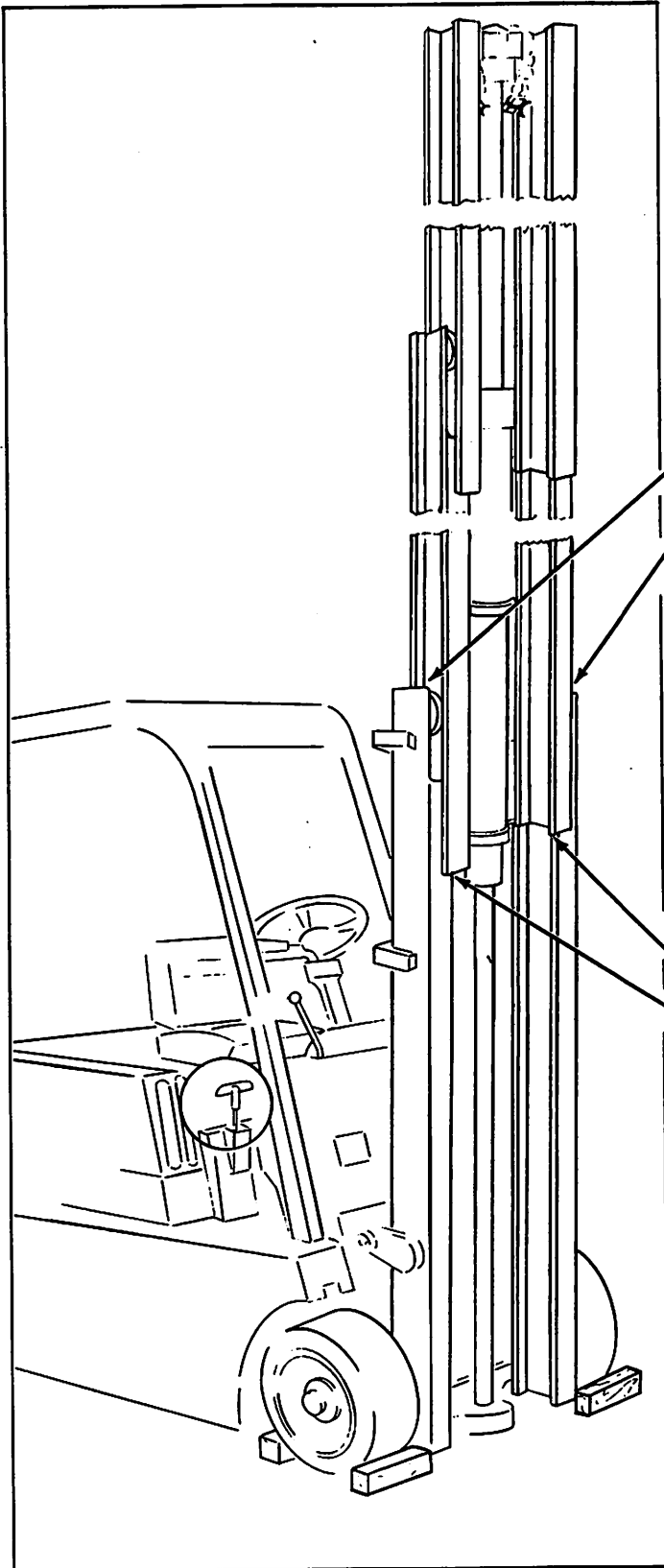


Step 2(b). Raise intermediate rail to 1/2 its full up position. Check roller clearance in the same manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on intermediate rail (for bottom rollers only).

Plate 9640



Step 2(c). Raise intermediate rail to full up position. Check roller clearance in the same manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rollers only).

Plate 9641

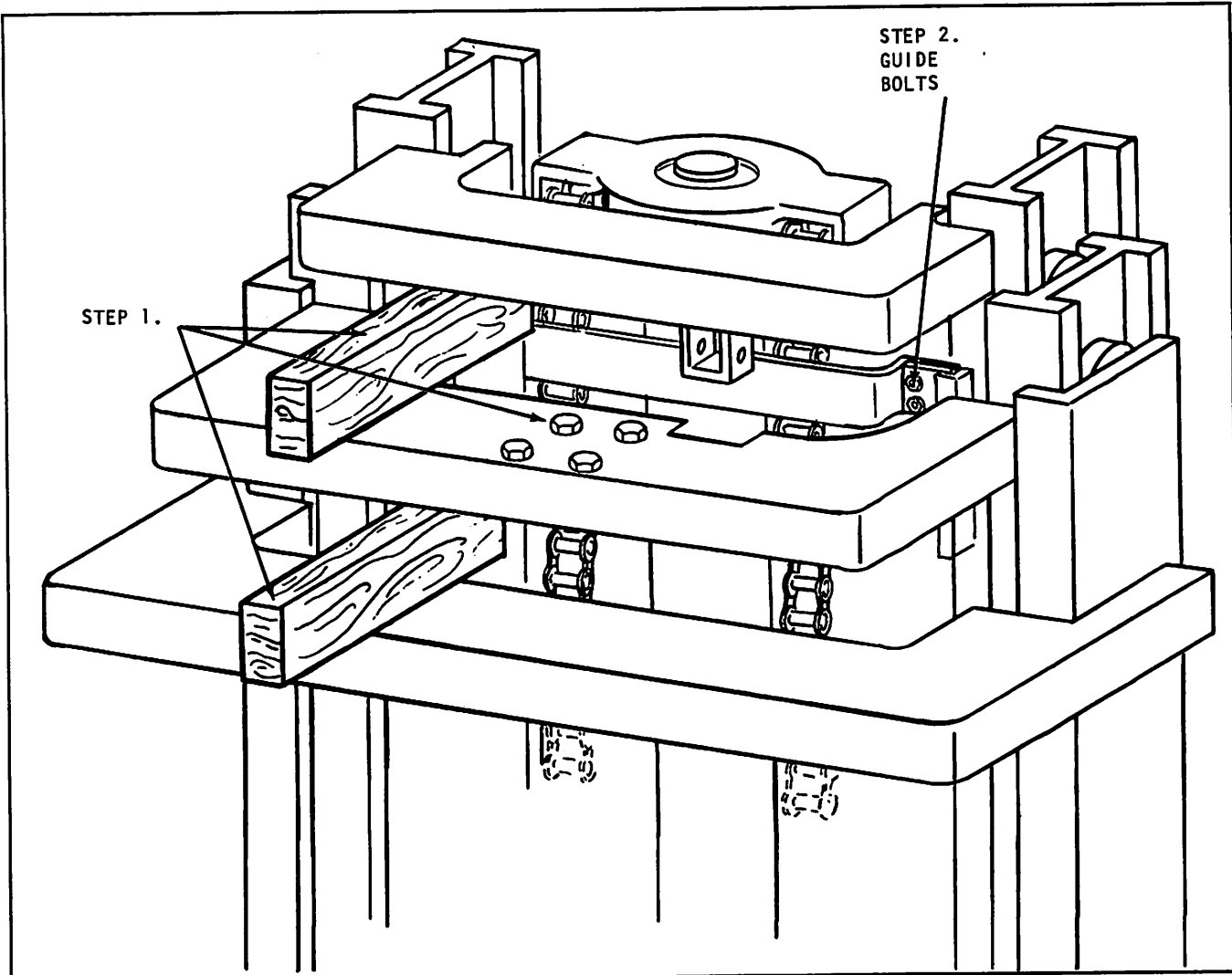


Plate 9642 Standard Triple Piston Head

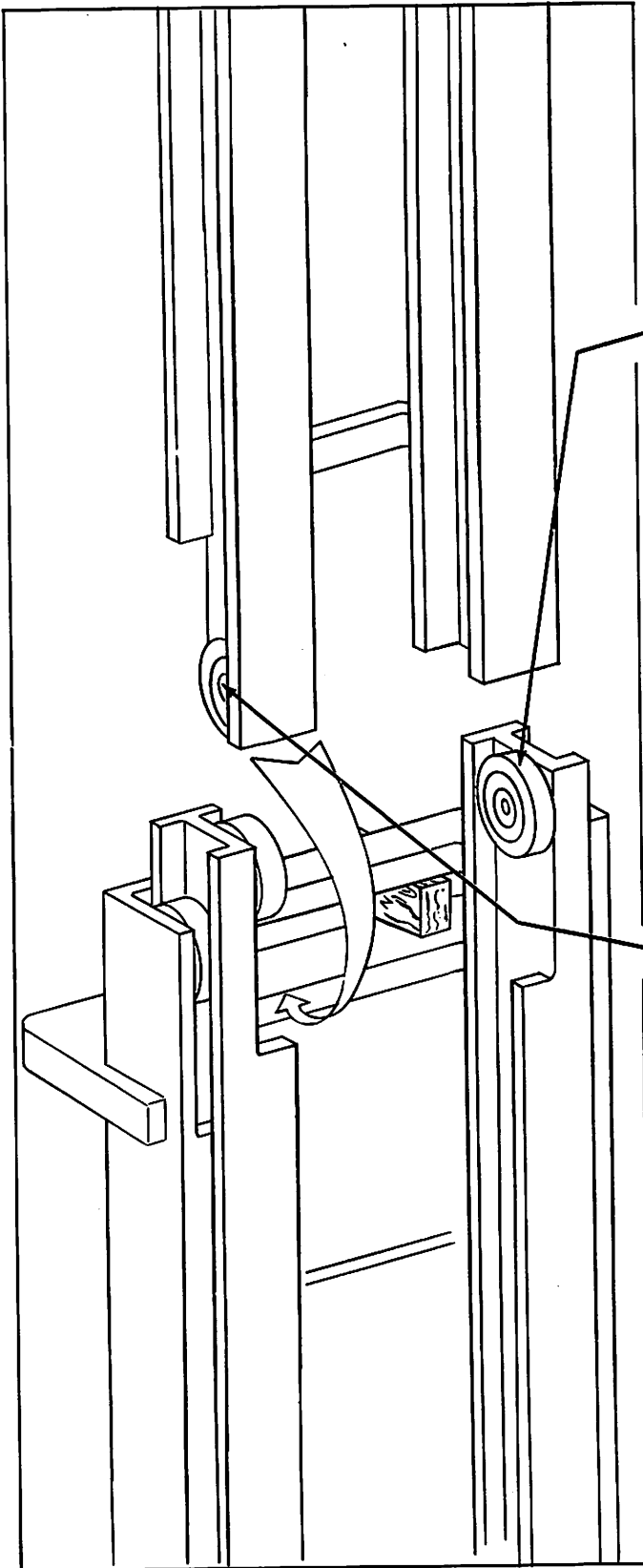
REMOVAL OF RAILS--STANDARD TRIPLE

Step 1. Place blocks between inner and intermedaite rail tie bars. Remove mechanical safety stops.

Step 2. Pull piston head down far enough to get at piston head guide bolts. Remove both piston head guides.

Step 3. Pull piston head to full down position.

Step 4. Remove inner rail and leave it in this position while adjusting rollers.



A. Intermediate rail rollers:

1. Count the number of shims at the right and left hand rollers.

2. Look at the three (3) numbers you recorded on the intermediate rail in Step 1. The smallest of these numbers is the total number of shims to be added. A "0" means DO NOT add shims.

3. Your target for adjusting is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.

B. Inner rail rollers.

1. Count the number of shims at the right and left hand rollers.

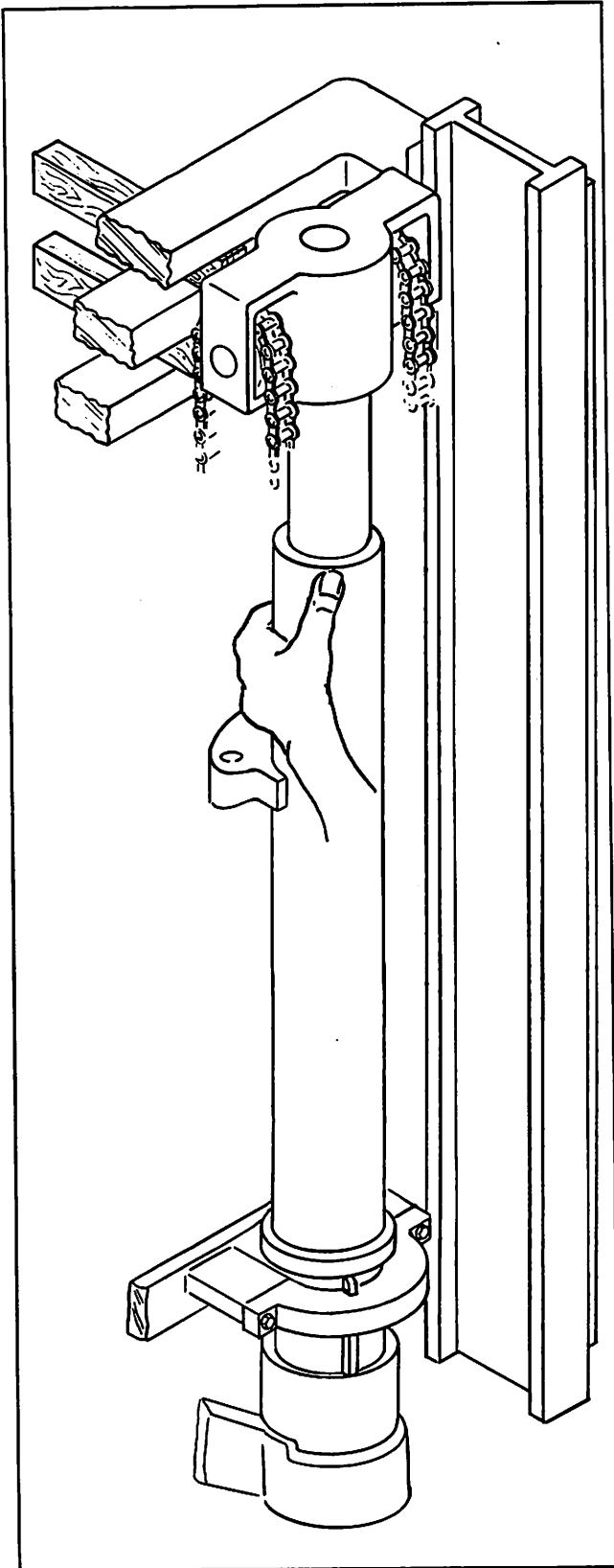
2. Look at the three (3) numbers you recorded on the inner rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.

3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace inner rail.

N O T E

Refer to next page.



N O T E

With one hand pull piston head forward to let tie bar pass by piston head freely.

Plate 9644

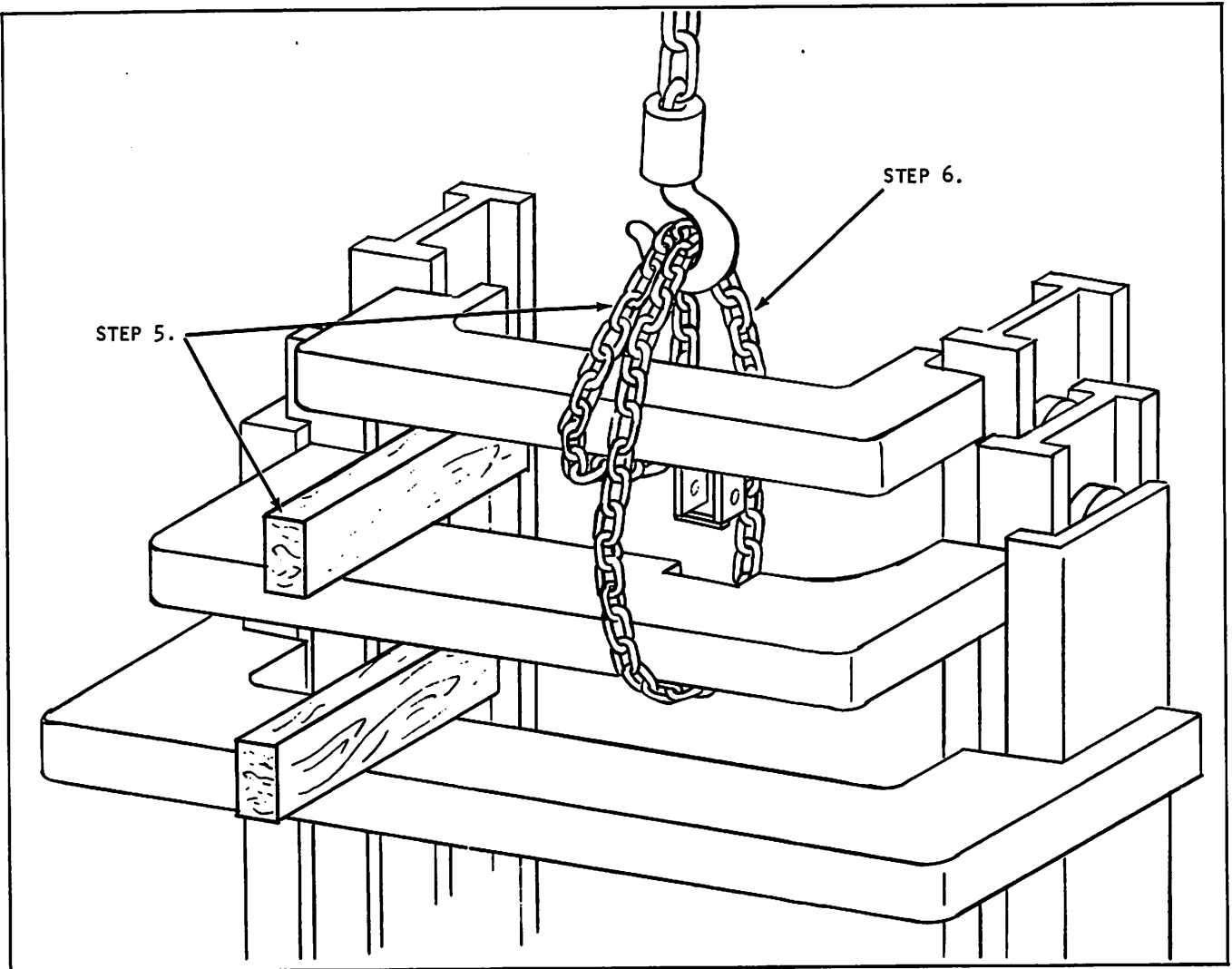


Plate 9645 Chain Placement

Step 5. Replace block and remove chain hoist.

Step 6. Remove intermediate rail assembly.

(a). Place chain around inner and intermediate rail assembly as shown above.

Step 6(b). Place a strap or chain around outer rail and secure. This will support lift cylinder.

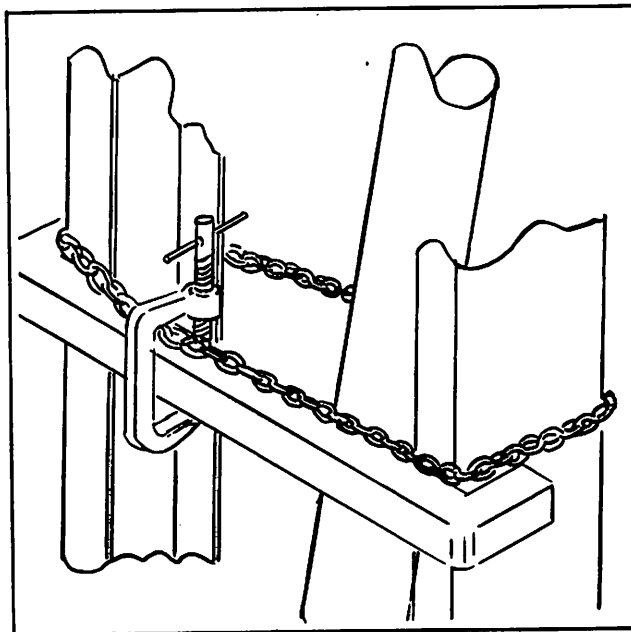


Plate 9628

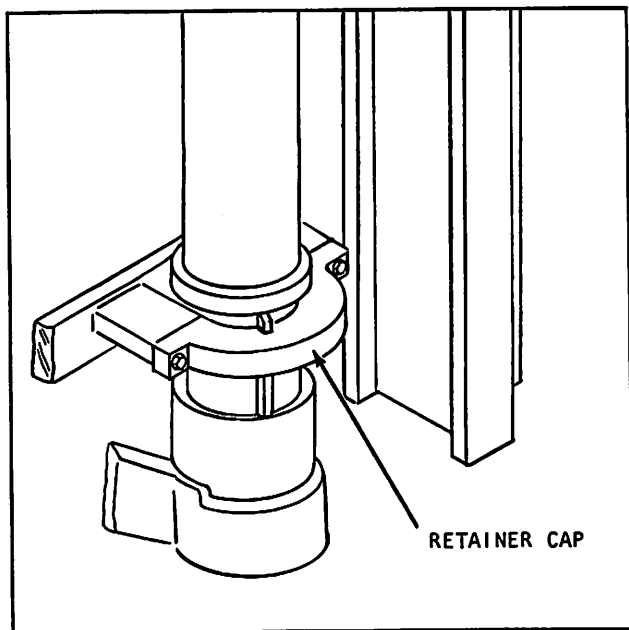
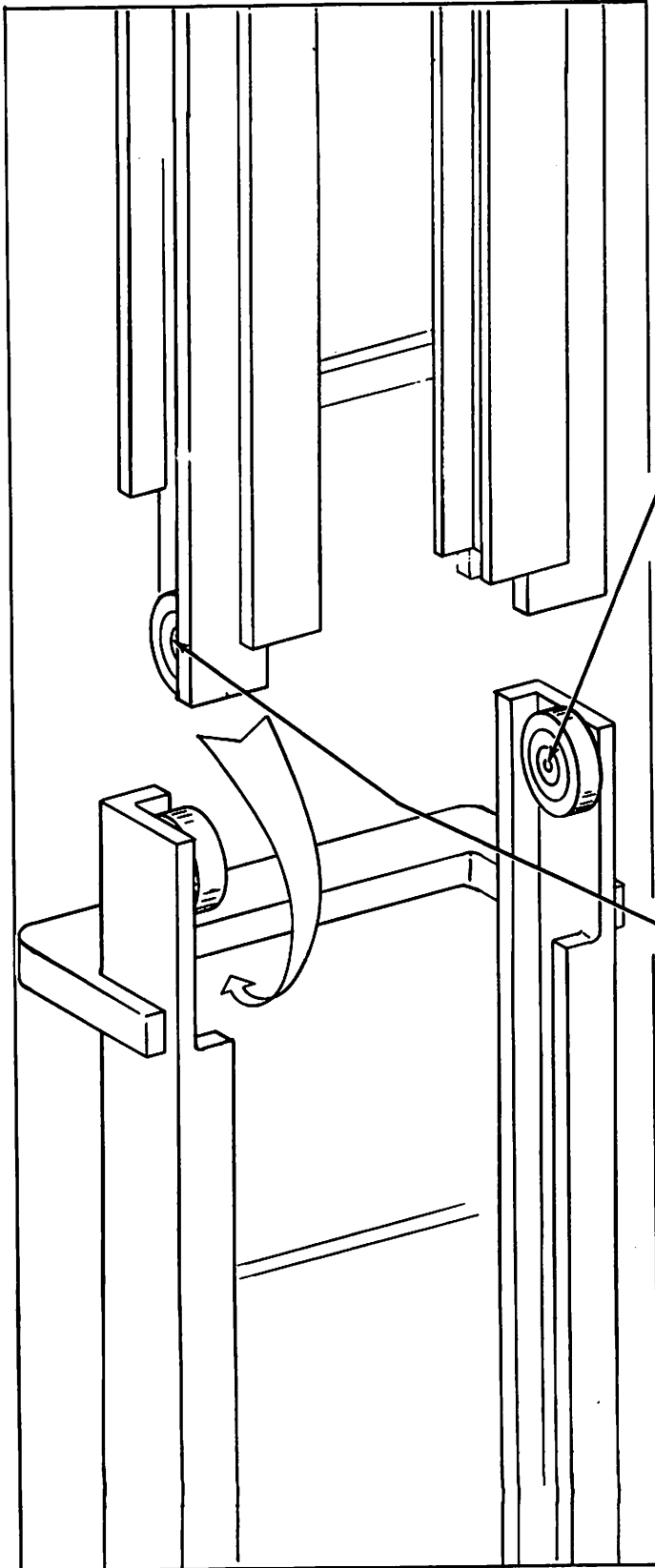


Plate 9646

Step 6(c). Remove lift cylinder retainer cap.



Step 6(d). Lean cylinder forward to rest on strap, as shown in Plate

Step 6(e). Leave intermediate rail assembly in this position while adjusting rollers.

A. Outer rail rollers:

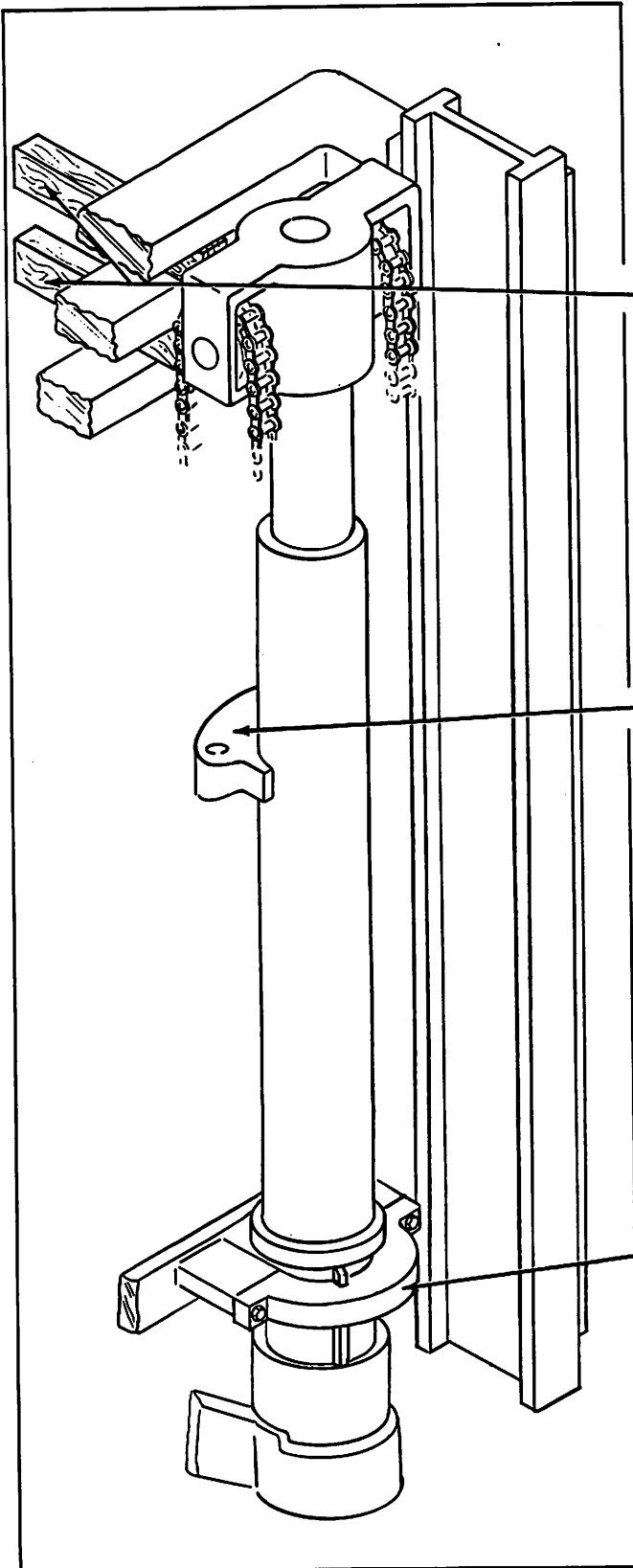
1. Count the number of shims at the right and left hand rollers.
2. Look at the three (3) numbers you recorded on the outer rail in Step 1. The smallest of these numbers is the total number of shims to be added. A "0" means DO NOT add shims.
3. Your target for adjustment is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.

B. Intermediate rail rollers:

1. Count the number of shims at the right and left hand rollers.
2. Look at the three numbers you recorded on the intermediate rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.
3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace intermediate rail assembly.

Plate 9647



Step 6(f). Replace block between intermediate rail assembly tie bar and remove chain.

Step 7. Place chain around chain anchors on cylinder. Use hoist to support cylinder.

Step 8. Remove supporting strap.

Step 9. Install cylinder retainer cap.

Plate 9648

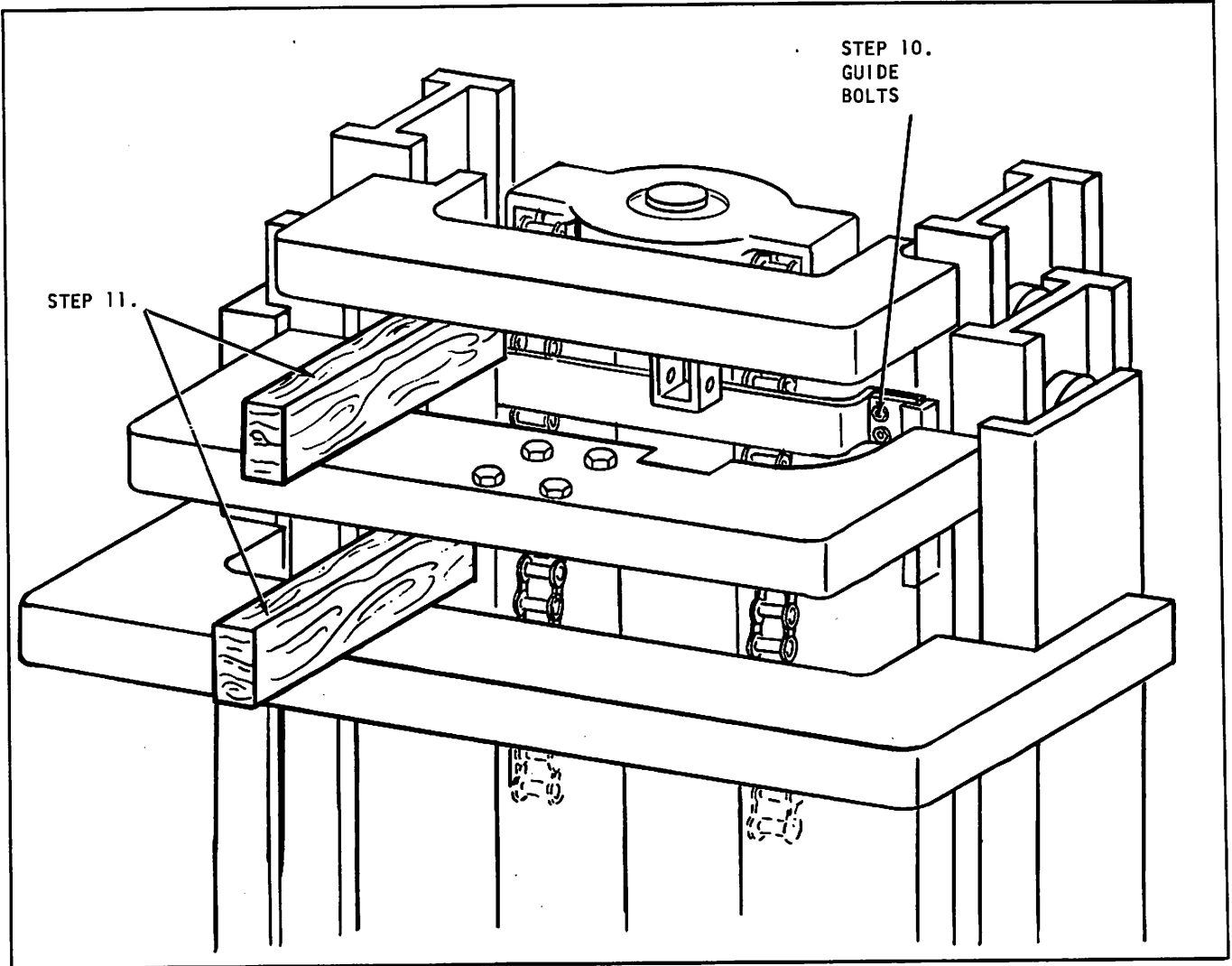


Plate 9649 Standard Triple Piston Head

Step 10. Install both piston head guides.

Step 11. Install mechanical stop. Raise rails and remove blocks.

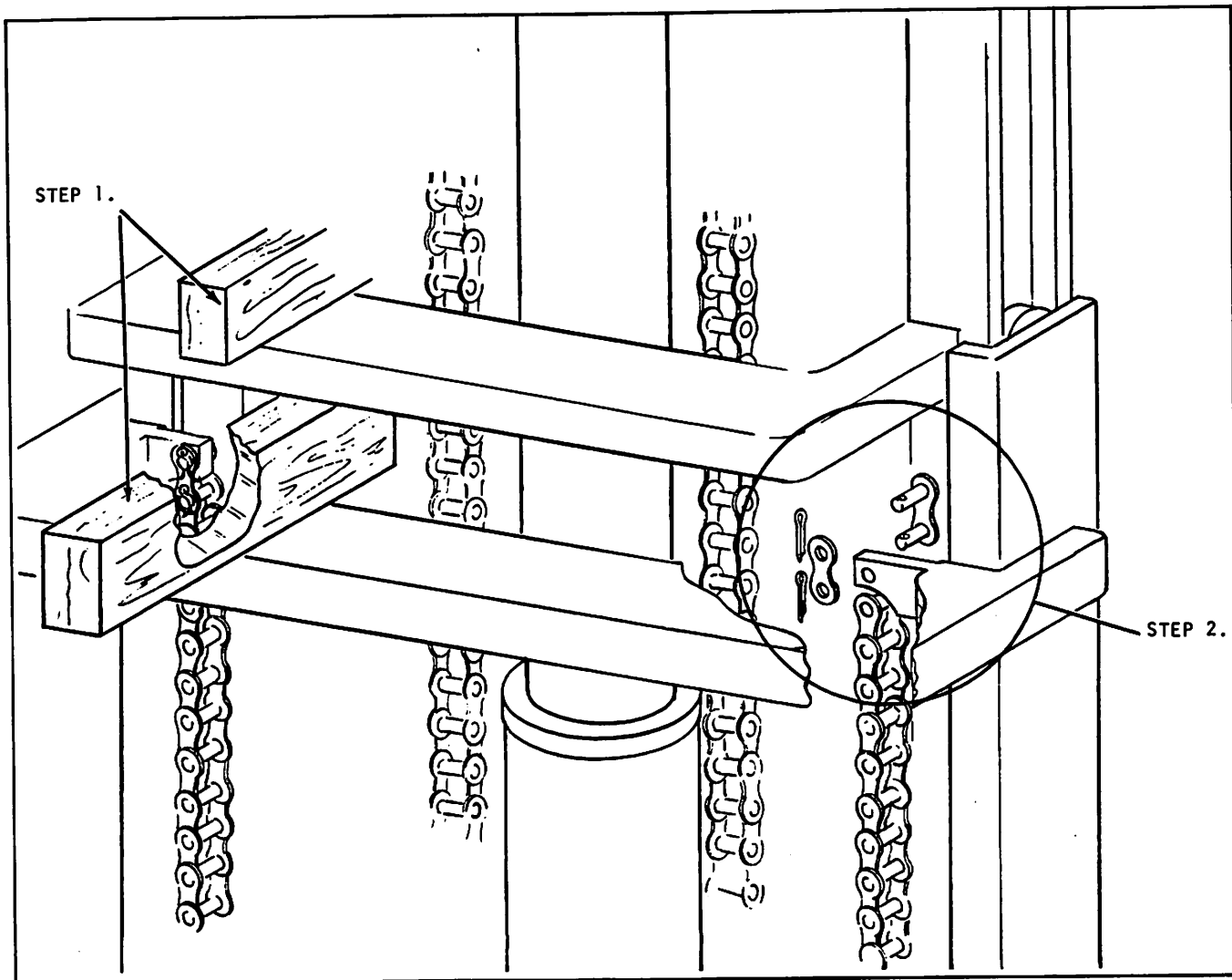


Plate 9650 Rear Lift Cylinder Removal

UPRIGHT REMOVAL--FULL FREELIFT TRIPLE

Step 1. Place blocks between inner and intermediate rail tie bars.

Step 2. Remove rear lift chains at the top or master link end.

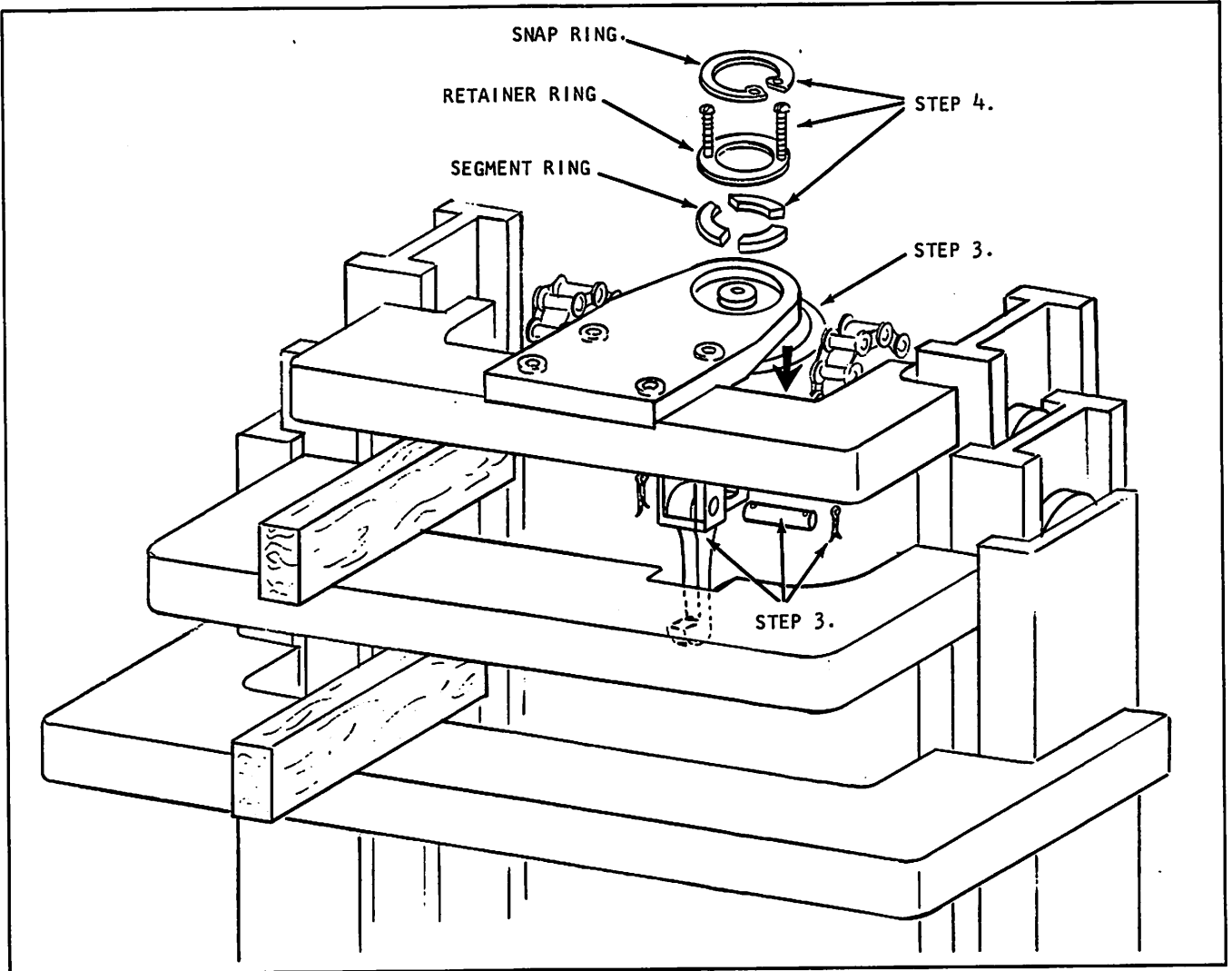


Plate 9651 F.F.T. Piston Head

Step 3. Pull piston head down

Remove mechanical safety stop pin and remove stop.

Step 4(a). Secure piston head with chain hoist.

(b). Remove lift cylinder from upper anchor.

1. Remove snap ring.

2. Place two (2) #6-32X2" round head slotted machine screws (in holes provided) in retainer ring.

(c). Remove segment ring.

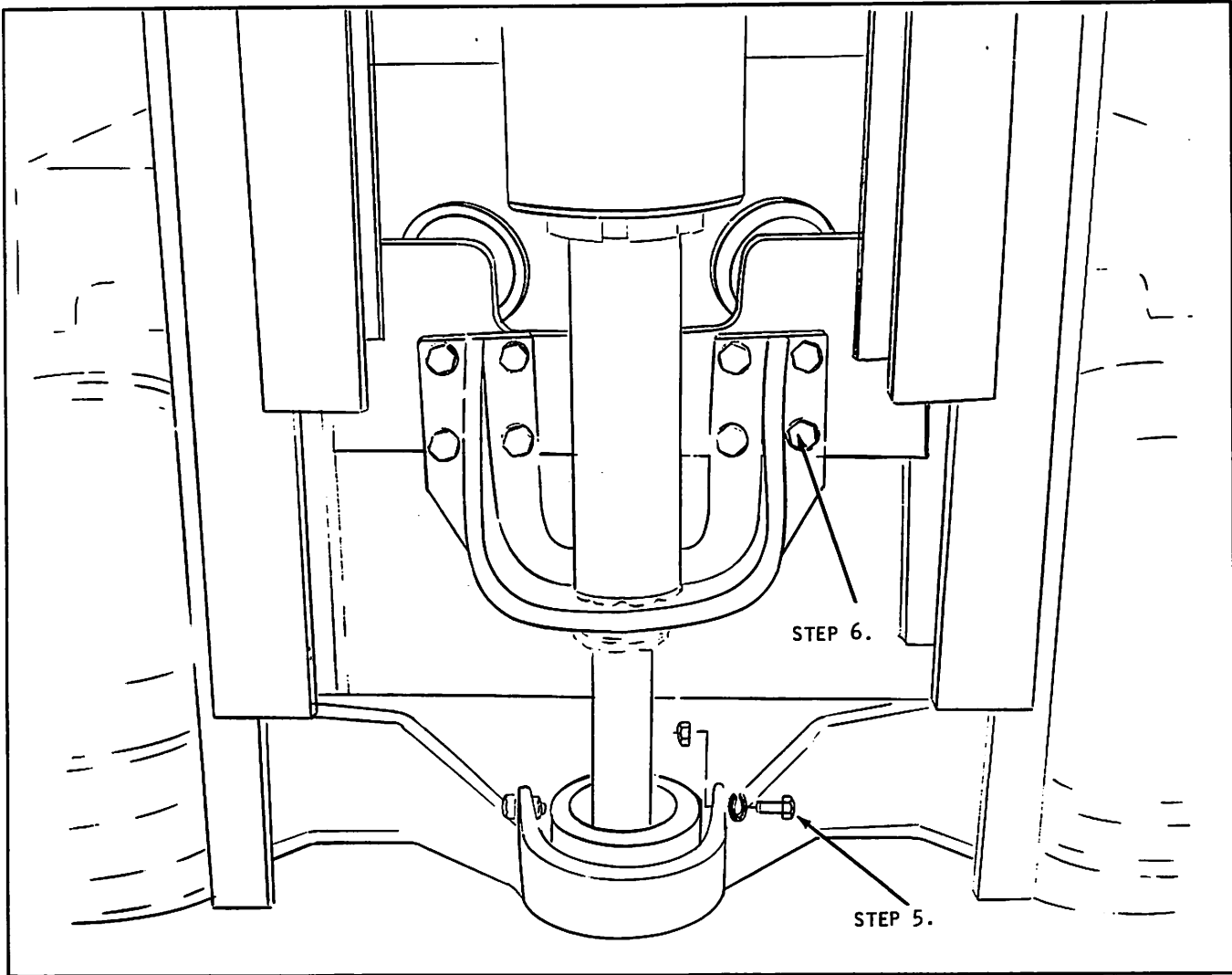


Plate 9652 Cylinder Lifting Bracket

Step 5. Remove lift cylinder support bolts.

Step 6. Remove cylinder lifting bracket.

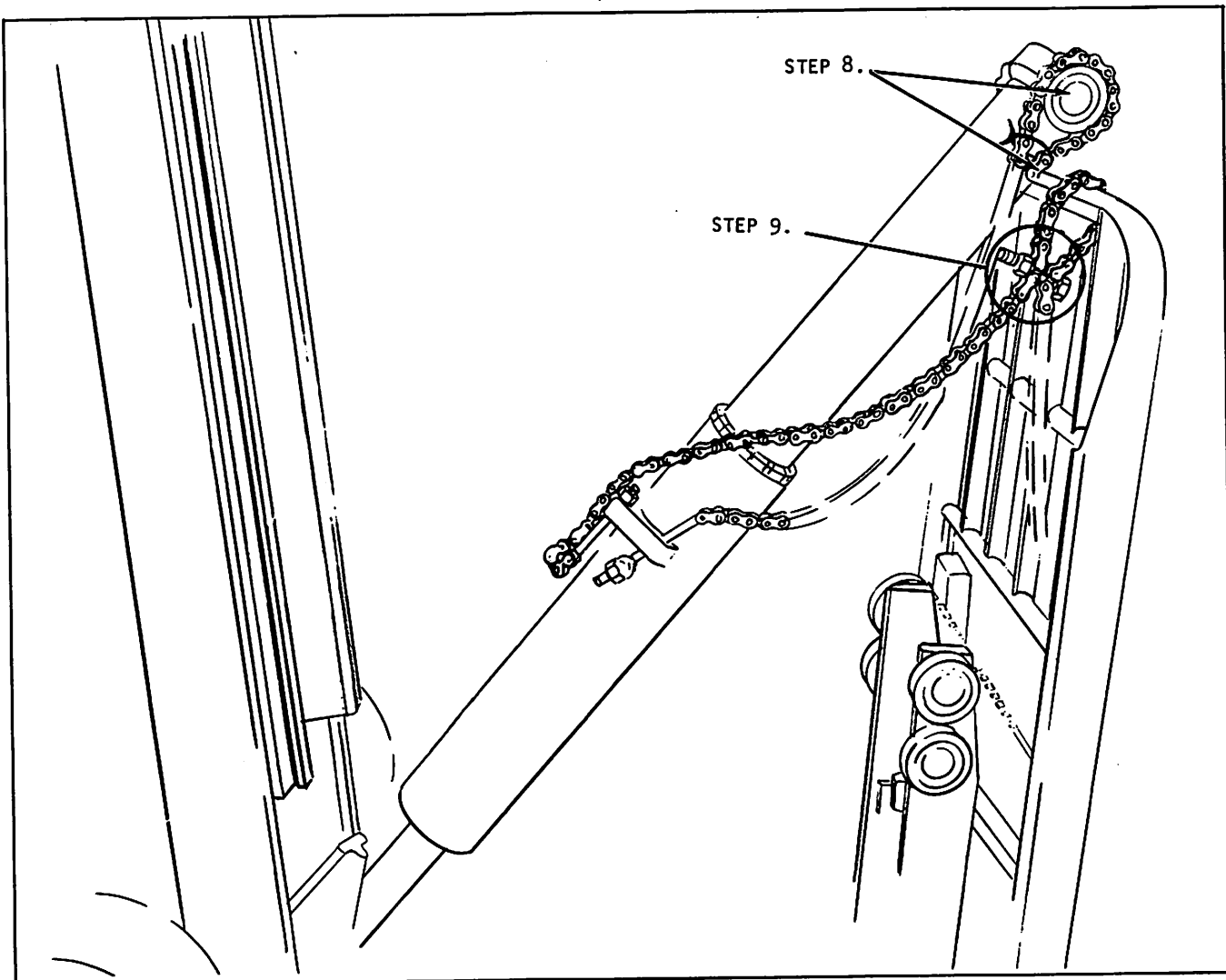


Plate 9653 Supporting Cylinder

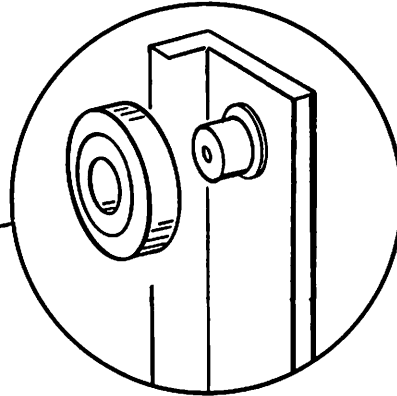
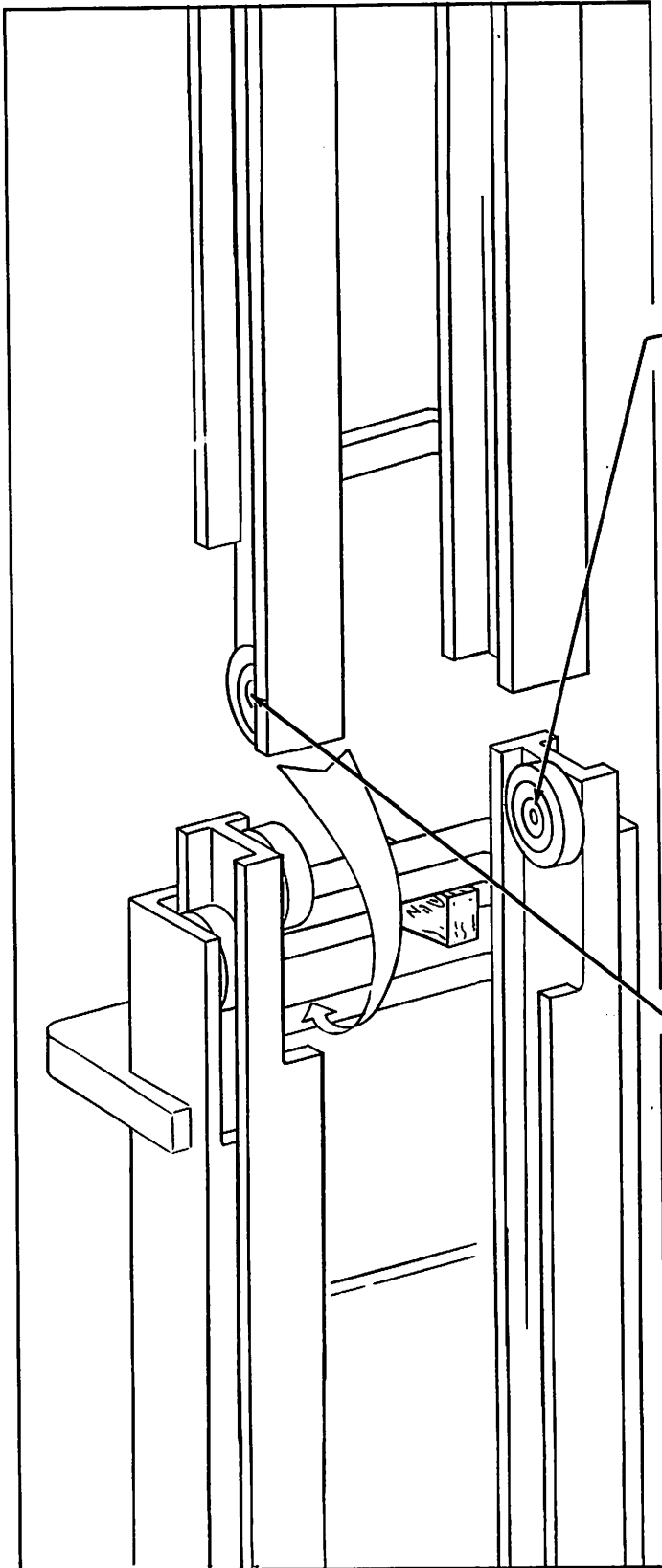
Step 7. Lower cylinder and lean it toward the load back rest (on the carriage).

Step 8. Place padding type material on the load back rest to prevent scoring of the cylinder.

Let cylinder rest onto load back rest.

Step 9. Place rear lift chains around top bar of load back rest and place bolts through chains, as shown above. This will prevent cylinder from falling.

Step 10. Remove inner rail and leave it in this position while adjusting rollers.

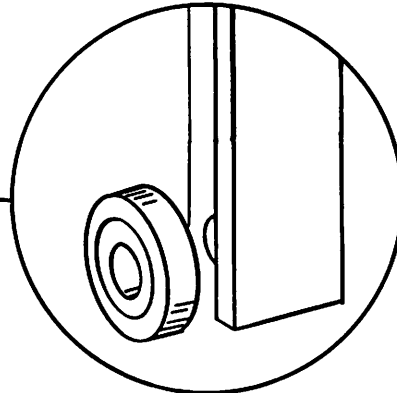


A. Intermediate rail rollers:

1. Count the number of shims at the right and left hand rollers.

2. Look at the three (3) numbers you recorded on the intermediate rail in Step 1. The smallest of these numbers is the total number of shims to be added. A "0" means DO NOT add shims.

3. Your target for adjusting is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.



B. Inner rail rollers.

1. Count the number of shims at the right and left hand rollers.

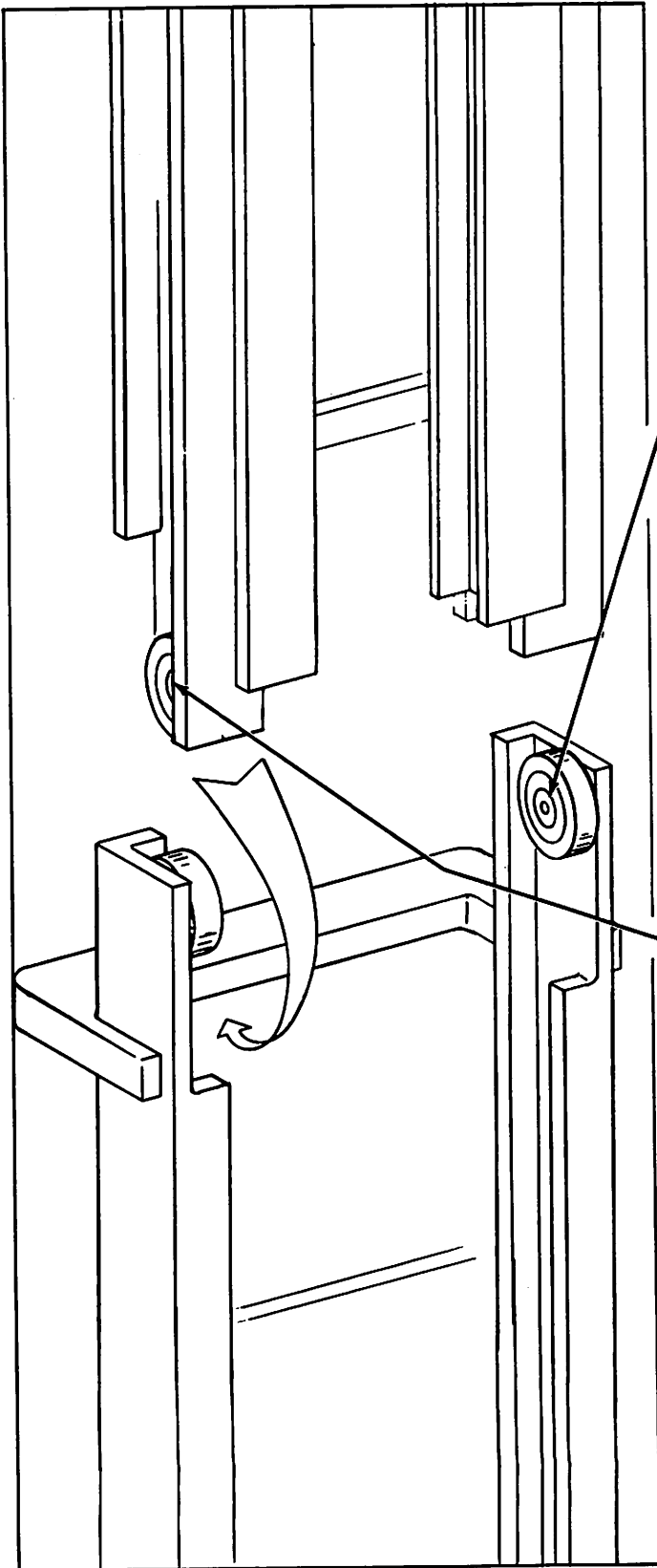
2. Look at the three (3) numbers you recorded on the inner rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.

3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace inner rail.

Plate 9654

Step 11. Leave intermediate rail assem. in this position while adjusting rollers.



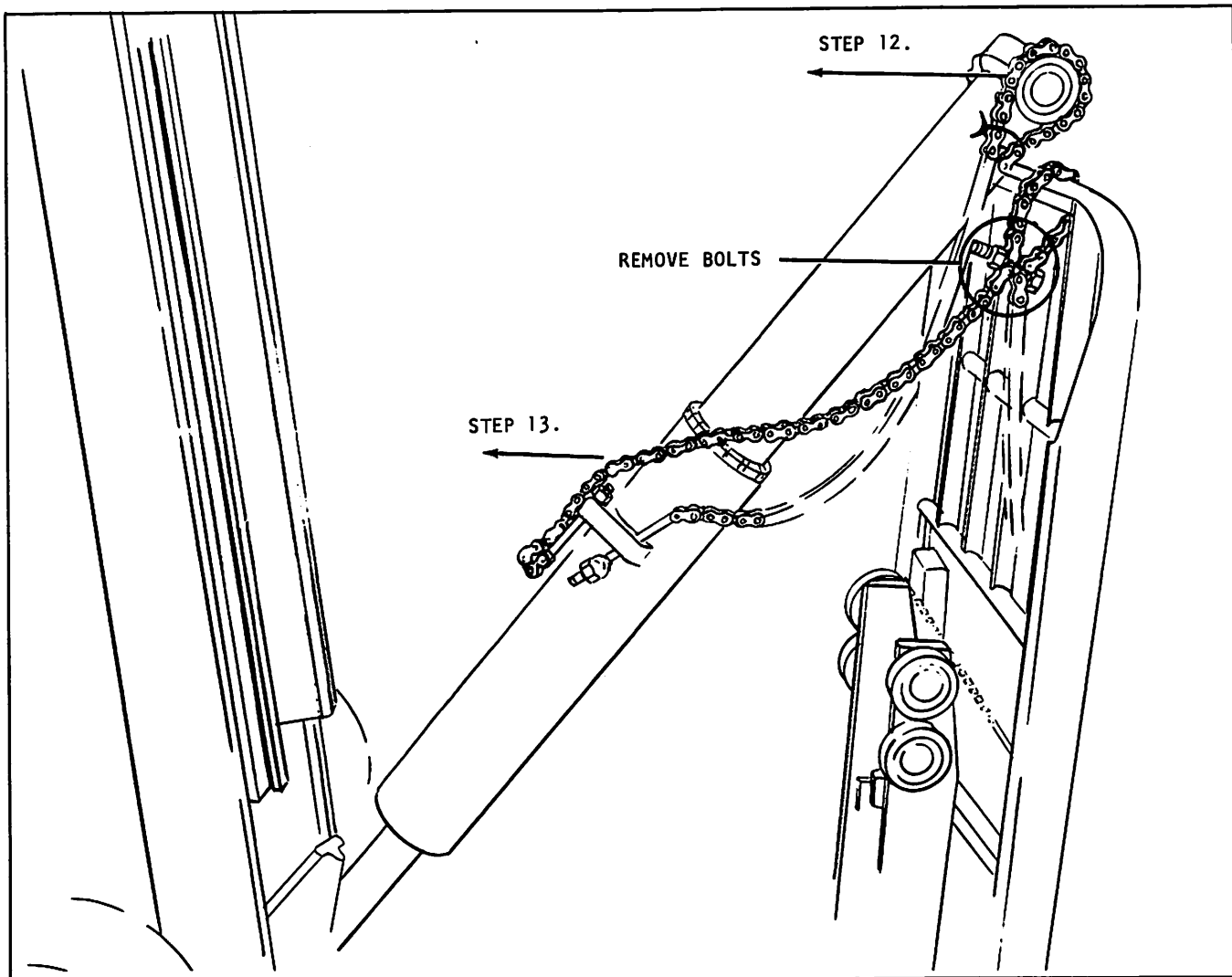
A. Outer rail rollers:

1. Count the number of shims at the right and left hand rollers.
2. Look at the three (3) numbers you recorded on the outer rail in Step 1. The smallest of these numbers is the total number of shims to be added. A "0" means DO NOT add shims.
3. Your target for adjustment is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.

B. Intermediate rail rollers:

1. Count the number of shims at the right and left hand rollers.
2. Look at the three numbers you recorded on the intermediate rail in Step 1. Go through the same steps you followed in adjusting the upper rollers.
3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

C. Replace intermediate rail assembly.

**Plate 9656 Cylinder Replacement**

Step 12. Using chain hoist, place cylinder back between rails.

N O T E

When installing cylinder watch position of cylinder line and tube, to prevent damage.

Step 13. Pull rear lift chains through back of upright.

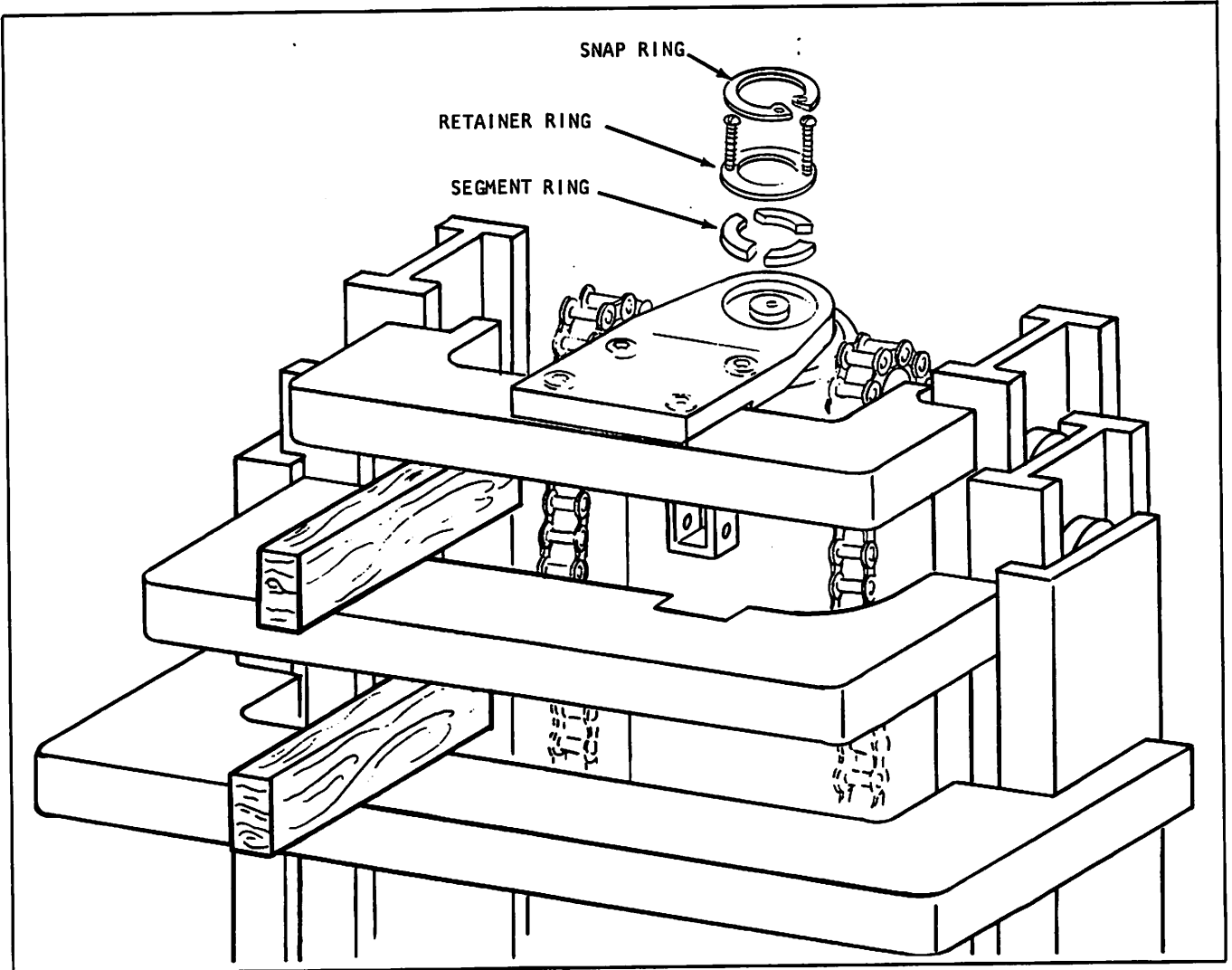


Plate 9657 Piston Head F.F.T.

Step 14(a). Install segment ring.

(b). Install retainer ring and remove both slotted machine screws.

(c). Install snap ring.

(d). Raise and lower to full positions checking piston and anchor. Remove blocks between tie bars.

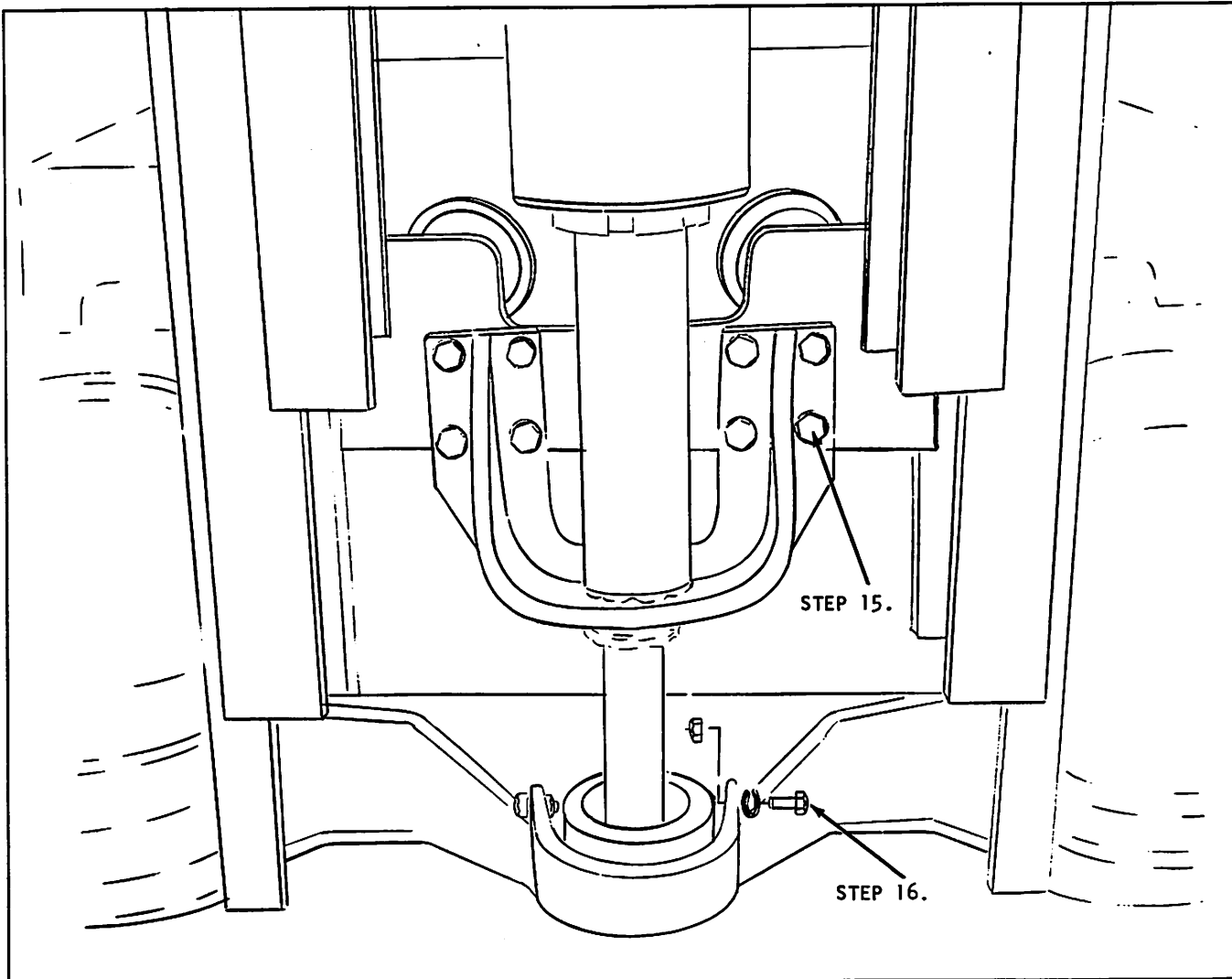


Plate 9658 Cylinder Lift Bracket

Step 15. Install cylinder lifting bracket.

Step 16. Install lift cylinder support bolts.

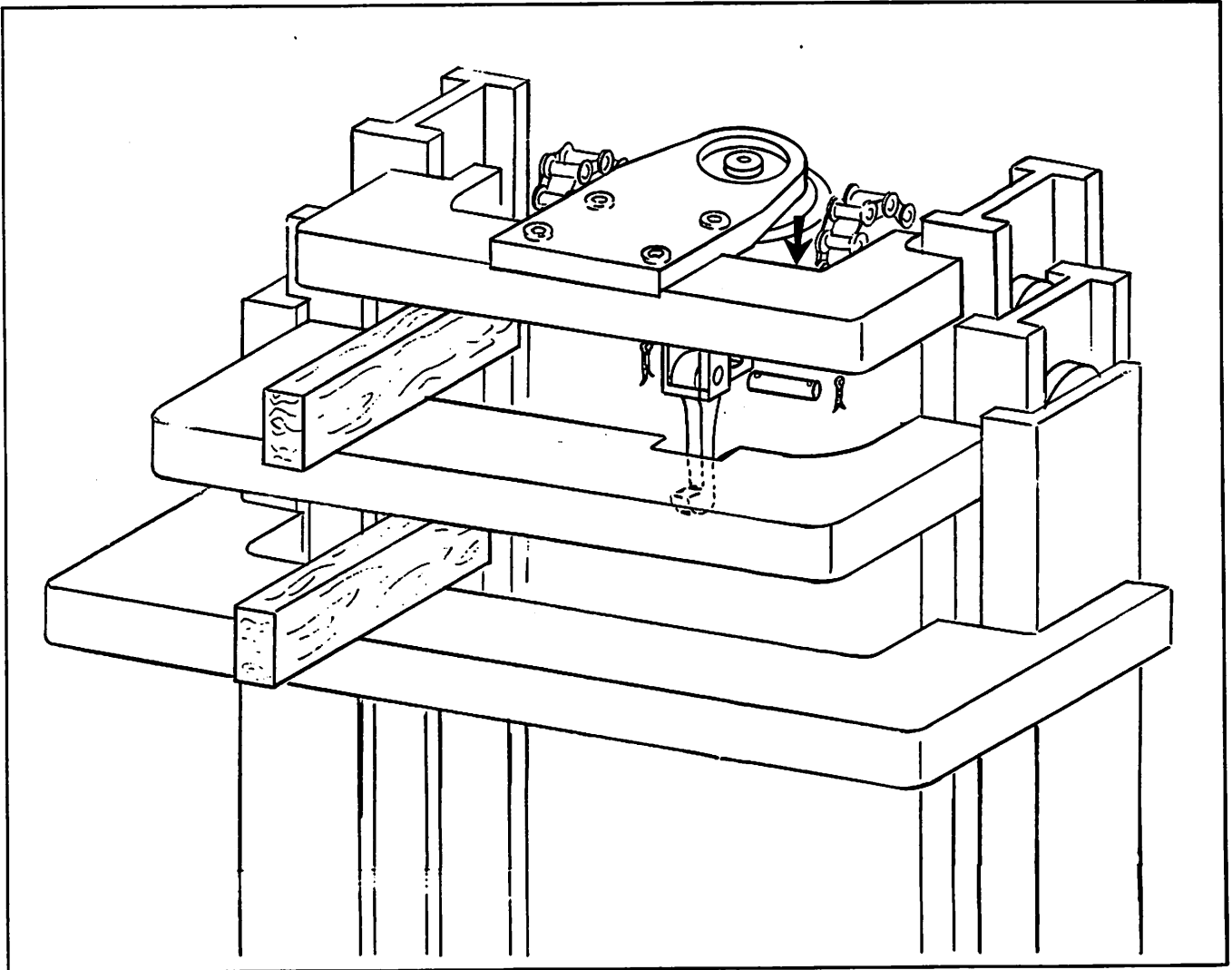


Plate 9659 Safety Stop

Step 17. Pull piston head down.

Install mechanical safety stop.

Replace cotter keys.

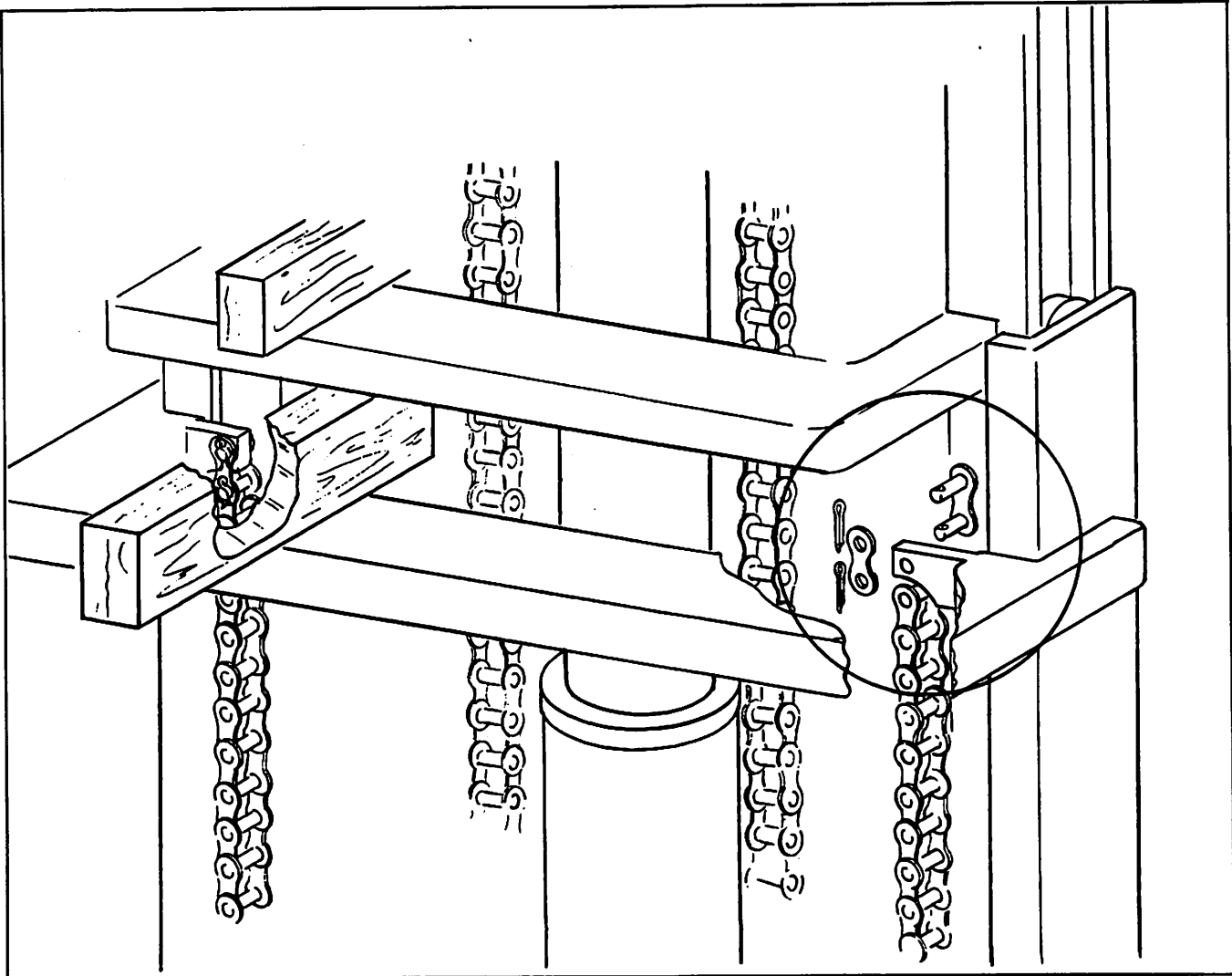


Plate 9660 Replacing Rear Lift Chains

Step 18. Install rear lift chains.

Check chain tension for adjustment. If adjustment is necessary be sure to secure adjusting nuts before operating machine.

PANTOGRAPH FRAME ROLLERS

Pantograph frame is adjusted in the same manner as a Standard carriage ... refer to page 1000H 1803.

THERE ARE TWO UPRIGHT MODELS COVERED IN THIS MANUAL ...

"B" MODEL UPRIGHTS - visual identification: The UPPER TIE BAR on the INNER RAIL ASSY., is welded HORIZONTALLY to the rails (narrow side of bar faces out).

"C" MODEL UPRIGHTS - visual identification: The UPPER TIE BAR on the INNER RAIL ASSY., is welded VERTICALLY to the rails (wide side of bar faces out).

Outer Side Thrust Rollers

1. Tighten the outer side thrust rollers to 150 pound feet torque.

The end these (thrust roller) shafts have a machined groove. On later models ... the shaft HAS A NYLON LIP and staking is not required.

2. On a shaft that requires staking ... stake with a punch at each end of groove to secure shaft to pantograph frame.

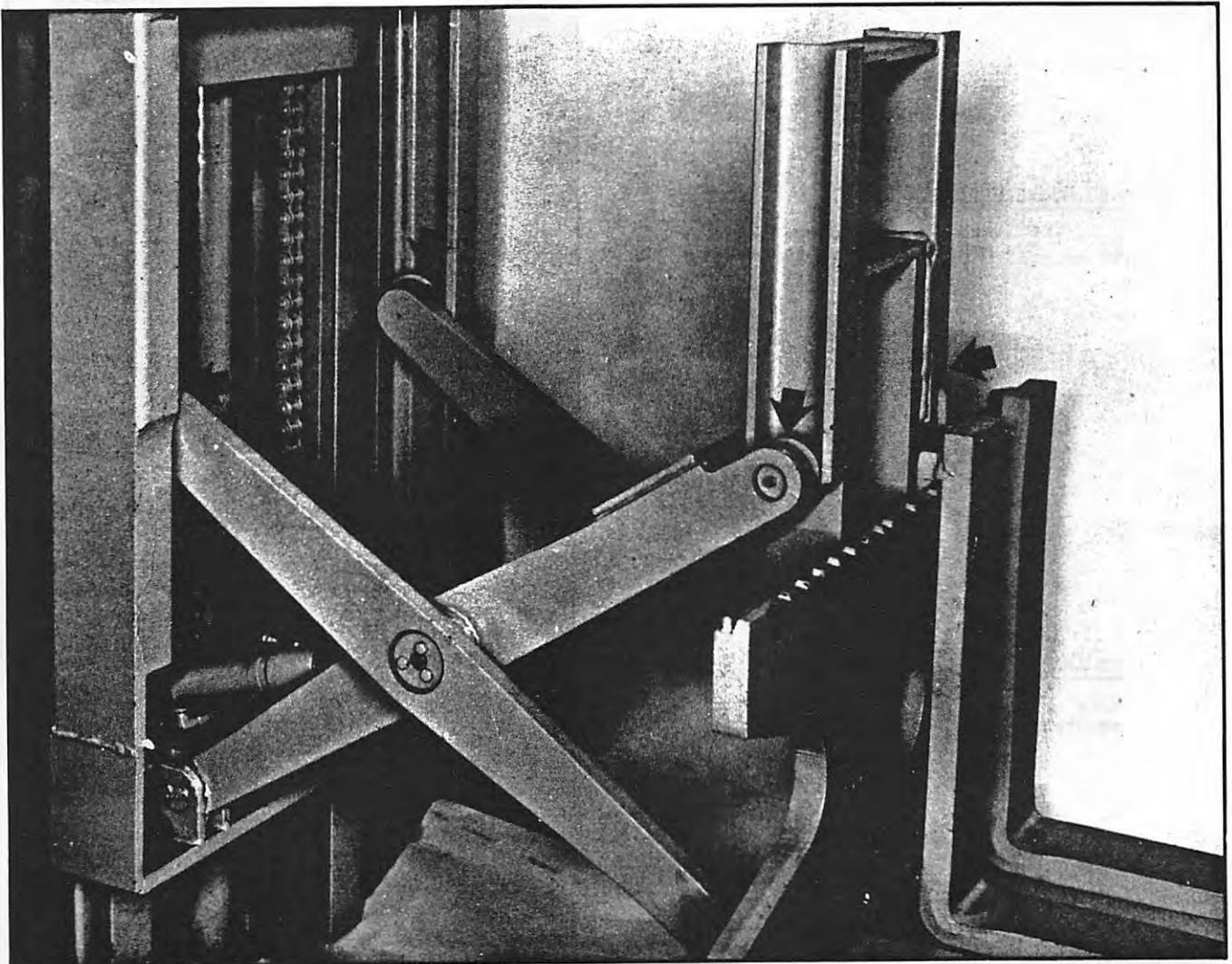


Plate 7509. Typical Pantograph Frame Roller Checks and Adjustments

HOW TO IDENTIFY THE:

"C" MODEL UPRIGHT

Note the INNER RAIL TIE BAR is mounted VERTICALLY to the rails.

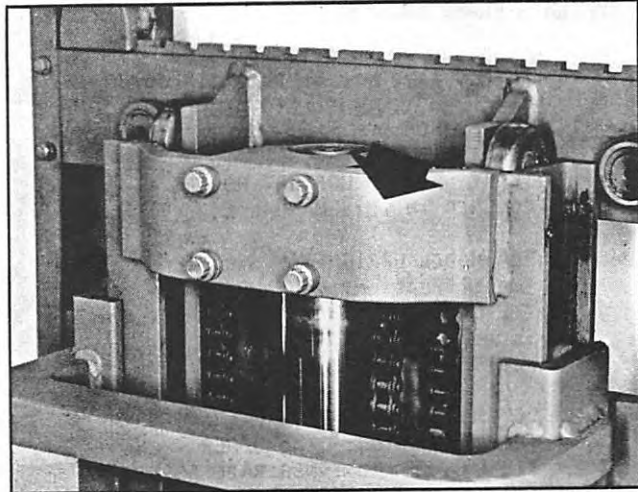


Plate 11847

"B" MODEL UPRIGHT

Note the INNER RAIL TIE BAR is mounted HORIZONTALLY to the rails.

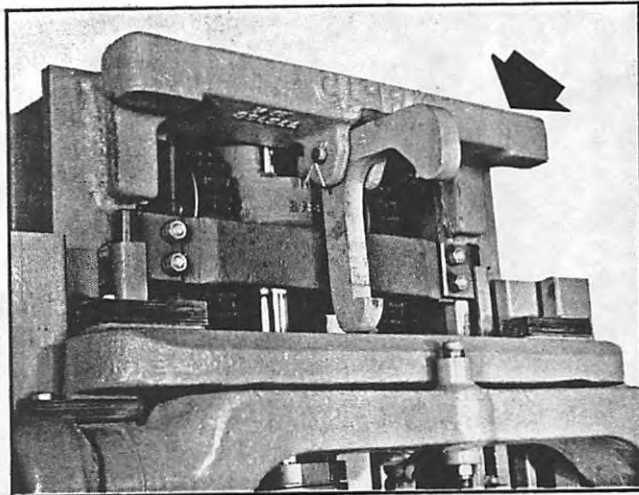


Plate 11848

"B" MODEL UPRIGHT

Note this upright has the TIE BAR mounted inbetween the rails.

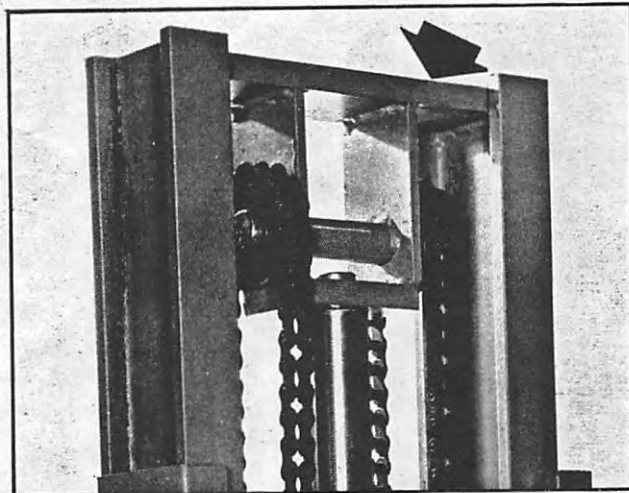


Plate 11849

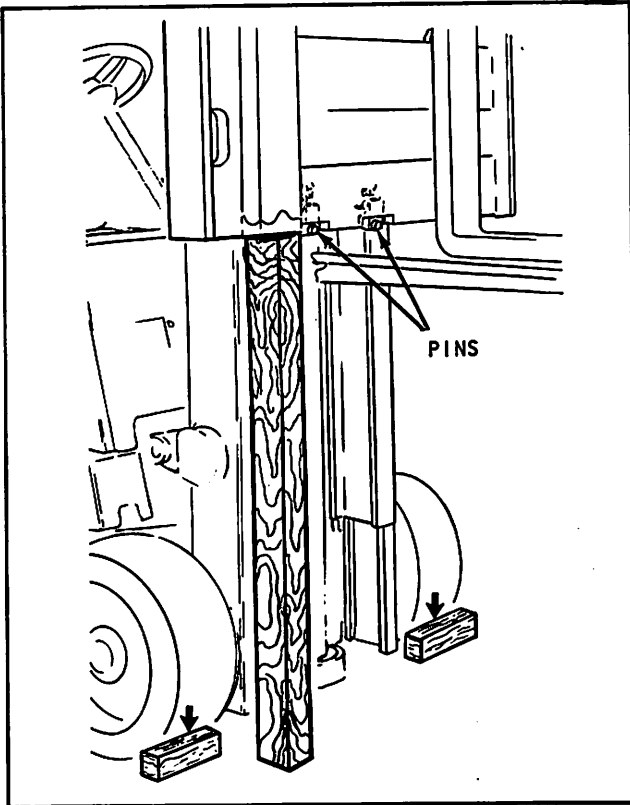


Plate 9593 Carriage Pin Replacement

Step 2. Remove anchor pins and replace with 3/8" x 2" bolts. **FOR SAFETY REASONS, REMOVE ONLY ONE PIN AT A TIME.** This will make pin removal easier when carriage is lowered.

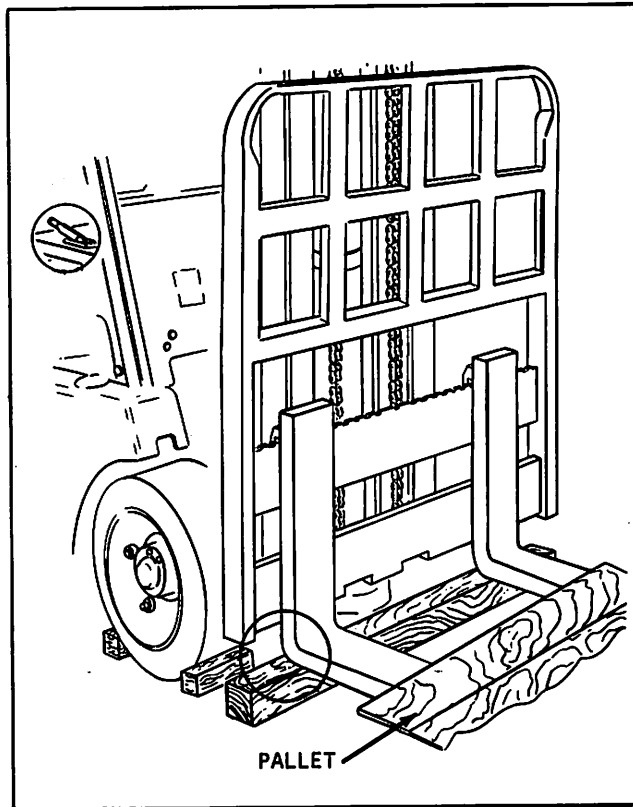


Plate 9560 Fork and Carriage Blocking

Step 3. Raise carriage off beam. Place beam on floor so, when lowered, the heel of the fork will rest on it as shown.

Step 4. Tilt upright full forward.

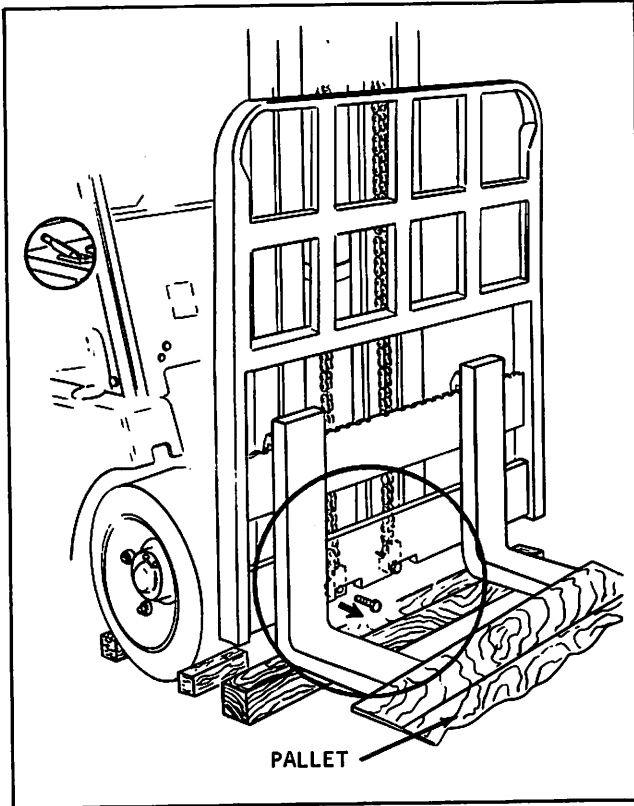


Plate 9561 Removing Bolts

Step 5. Remove 3/8" x 2" bolts. Place pallet on fork ends.

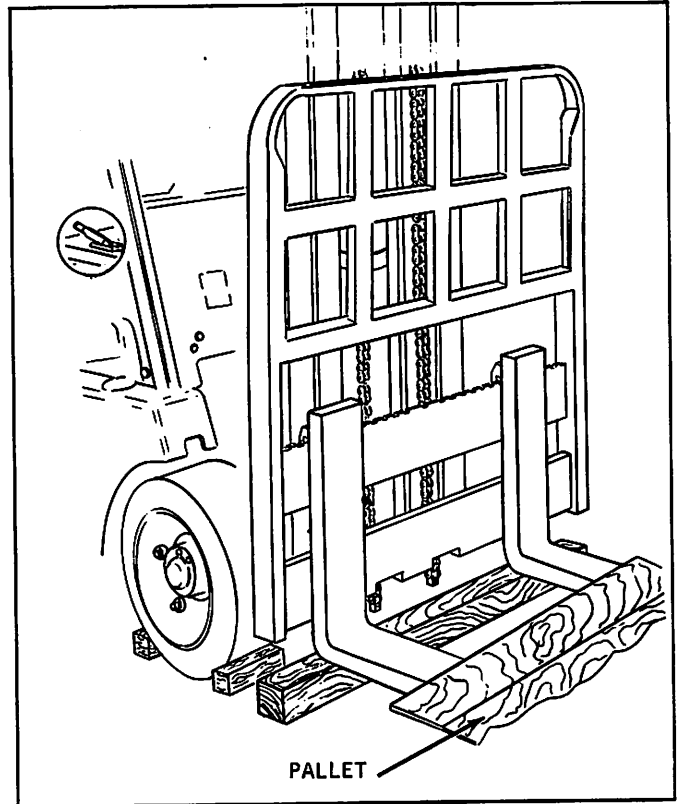


Plate 9562 Removing Chains From Anchors

Step 6. Pull chains out of carriage anchor brackets.

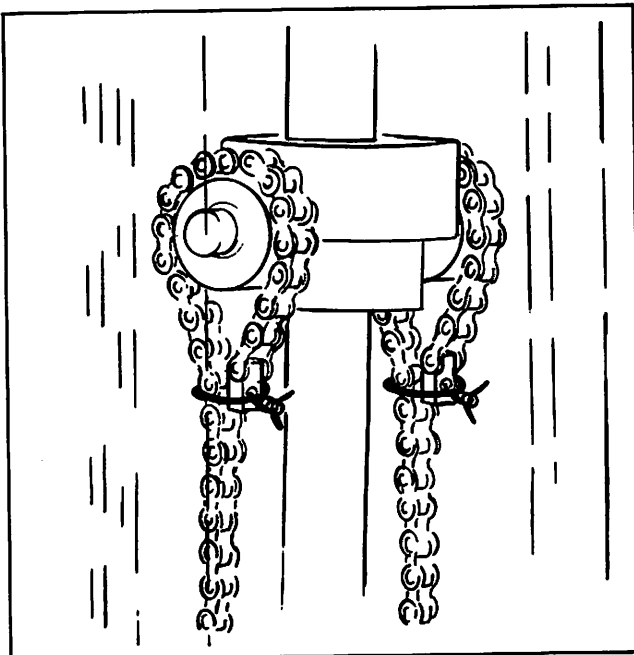


Plate 9563 Securing Chains (Typical)

Step 7. Wire chains around chain sheaves as shown

N O T E

Use the same method on all cylinders.

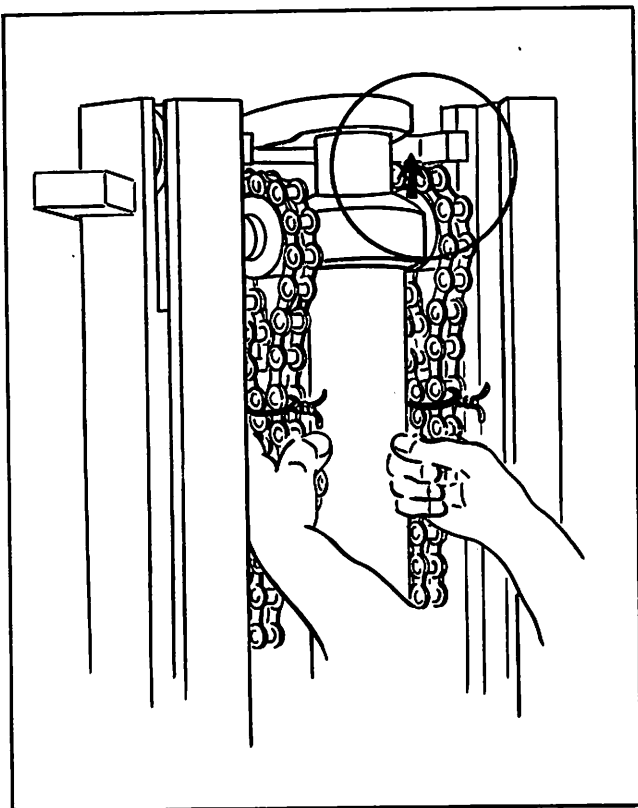


Plate 9564 Guiding Piston Head

Step 8. Guiding piston head with hands on chains raise piston to full up position.

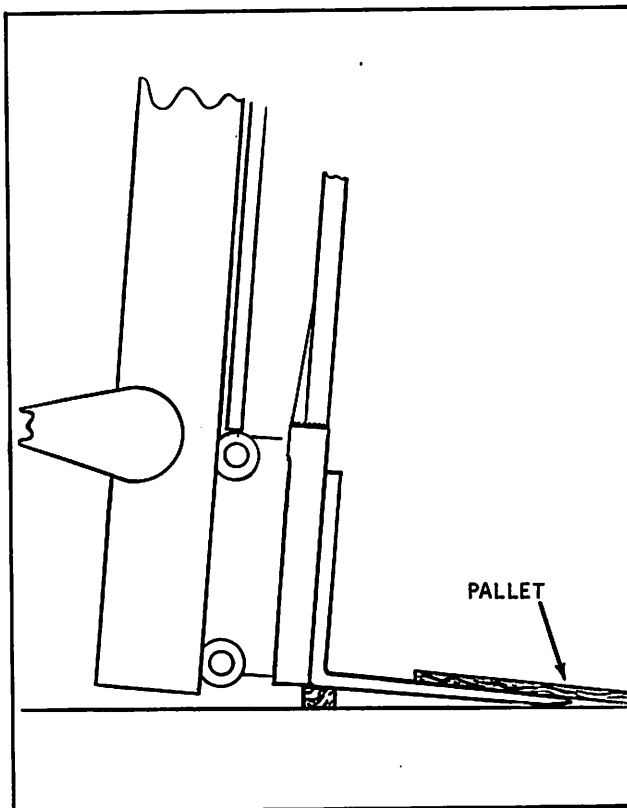


Plate 9565 Inner Rail Clearing Carriage Rollers

Step 9. Raise inner rail so it just clears upper carriage rollers. Leave upright at full forward tilt.

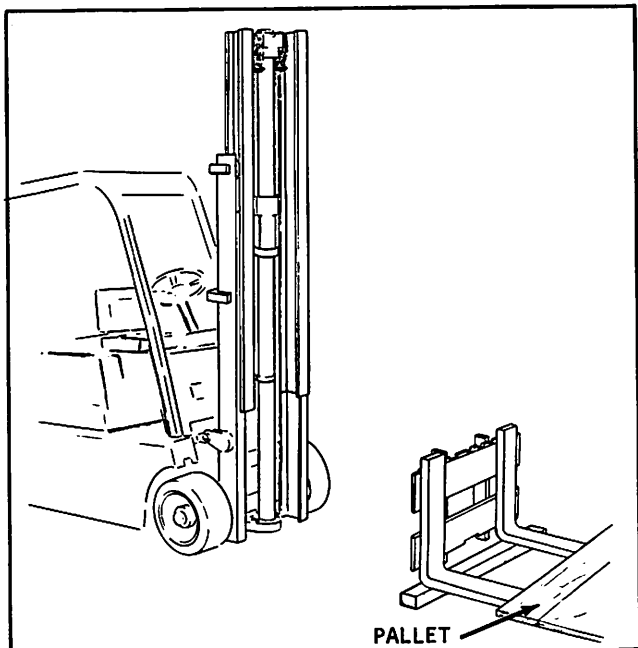


Plate 9566 Backing Machine Away From Carriage

Step 10. Remove blocks and release brake. Back machine away from carriage.

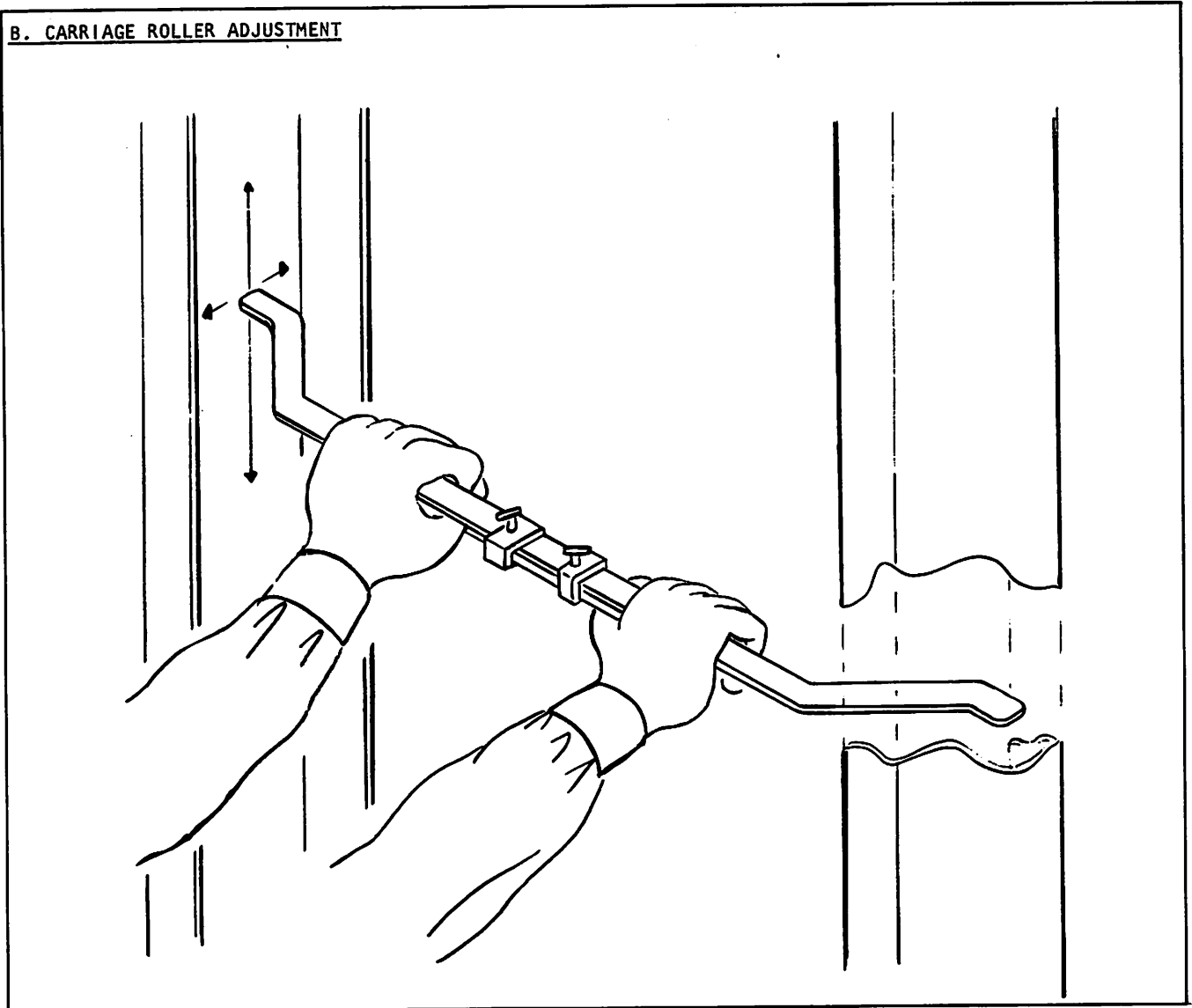
B. CARRIAGE ROLLER ADJUSTMENT

Plate 9567 Spanning Inner Rail

Step 1. Span inner rail with inside spanning tool to find the smallest distance between the rails. Lock tool in position.

N O T E**FOR SIX ROLLER CARRIAGE ONLY**

After finding the smallest distance between rails, place a shim between the spanning tool and the inner rail, then lock spanning tool in position.

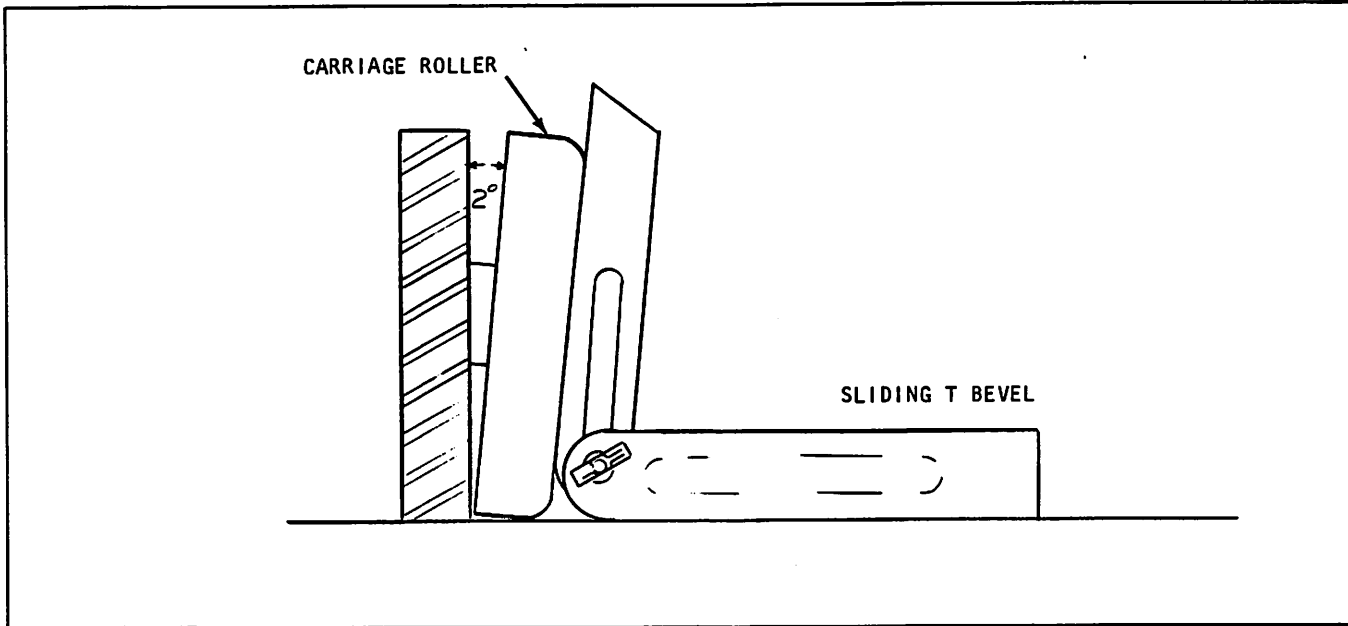


Plate 9589 Setting T Bevel

NOTE

Check angle of carriage rollers. Roller pin bosses are welded at $2^{\circ} \pm 1/2^{\circ}$ and if damaged, replace carriage roller pin boss assembly. To obtain this contact Central Parts.

To check roller angle use a Sliding T Bevel and Protractor. Lay one side against roller surface and lock in place.

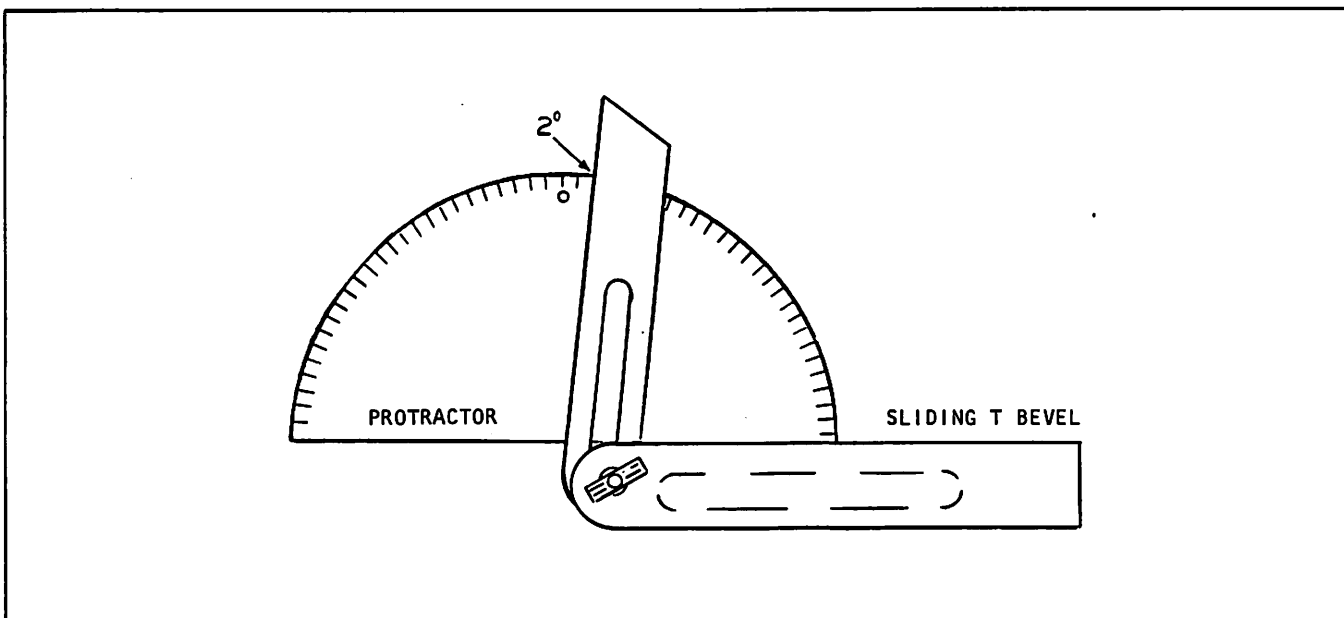


Plate 9590 Checking Roller Angle

Determine degree of angle by placing Protractor on Sliding T Bevel.

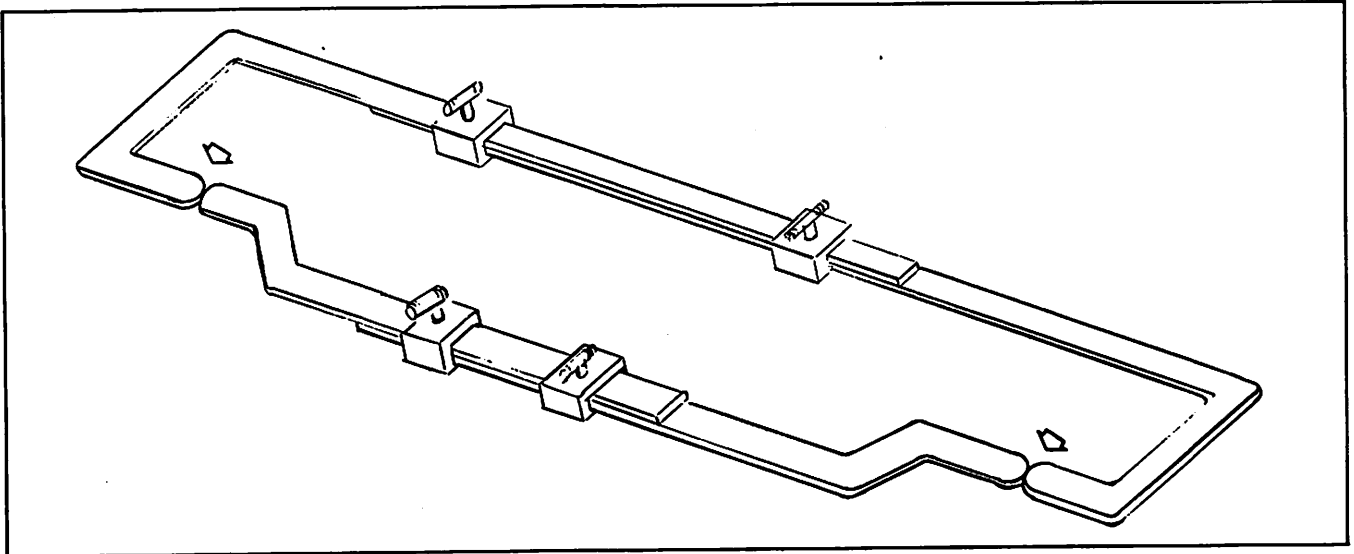


Plate 9568 Setting Outside Spanning Tool

Step 2. Set outside spanning tool to match inside spanning tool. Lock tool in position.

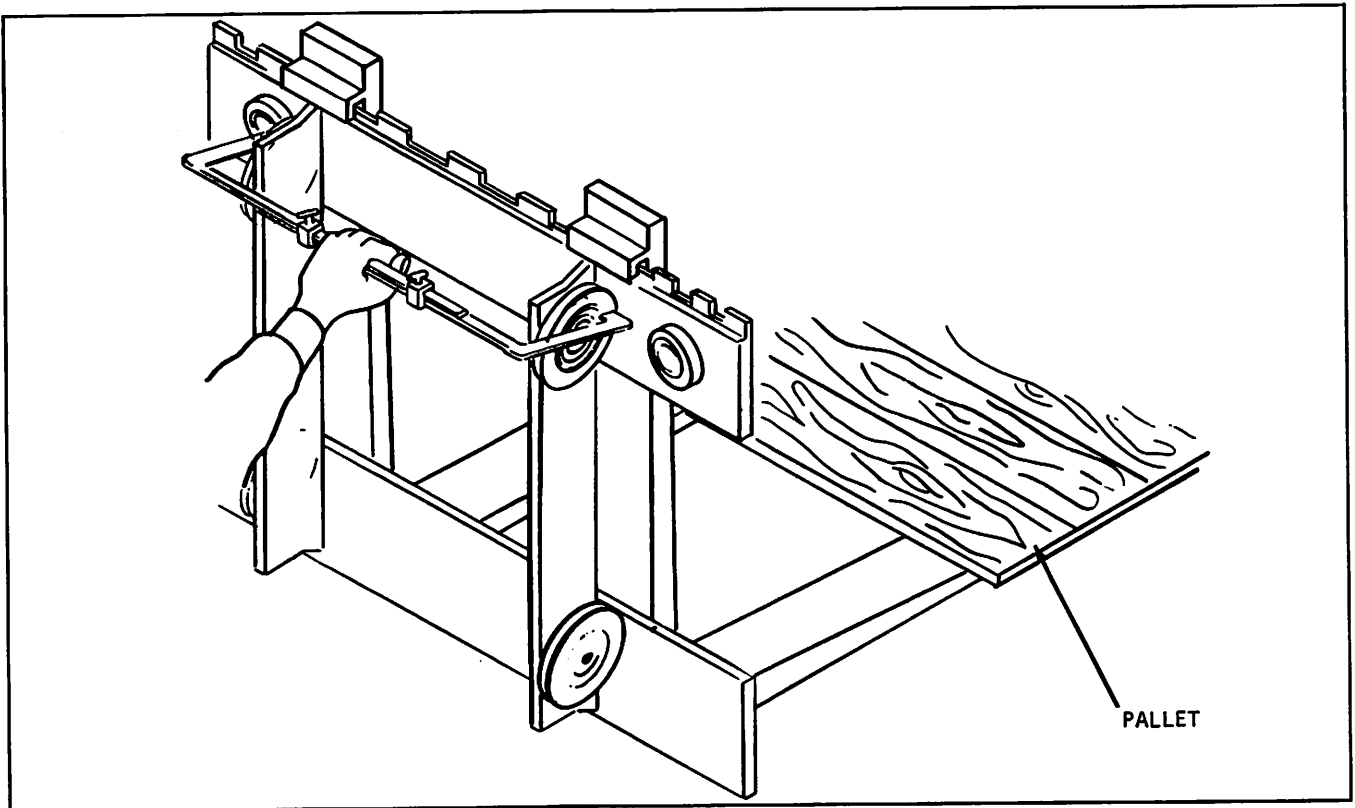


Plate 9569 Spanning Upper Rollers (Four Roller Carriage)

Step 3. Span upper carriage rollers at their outer most camber point. Add or subtract ...

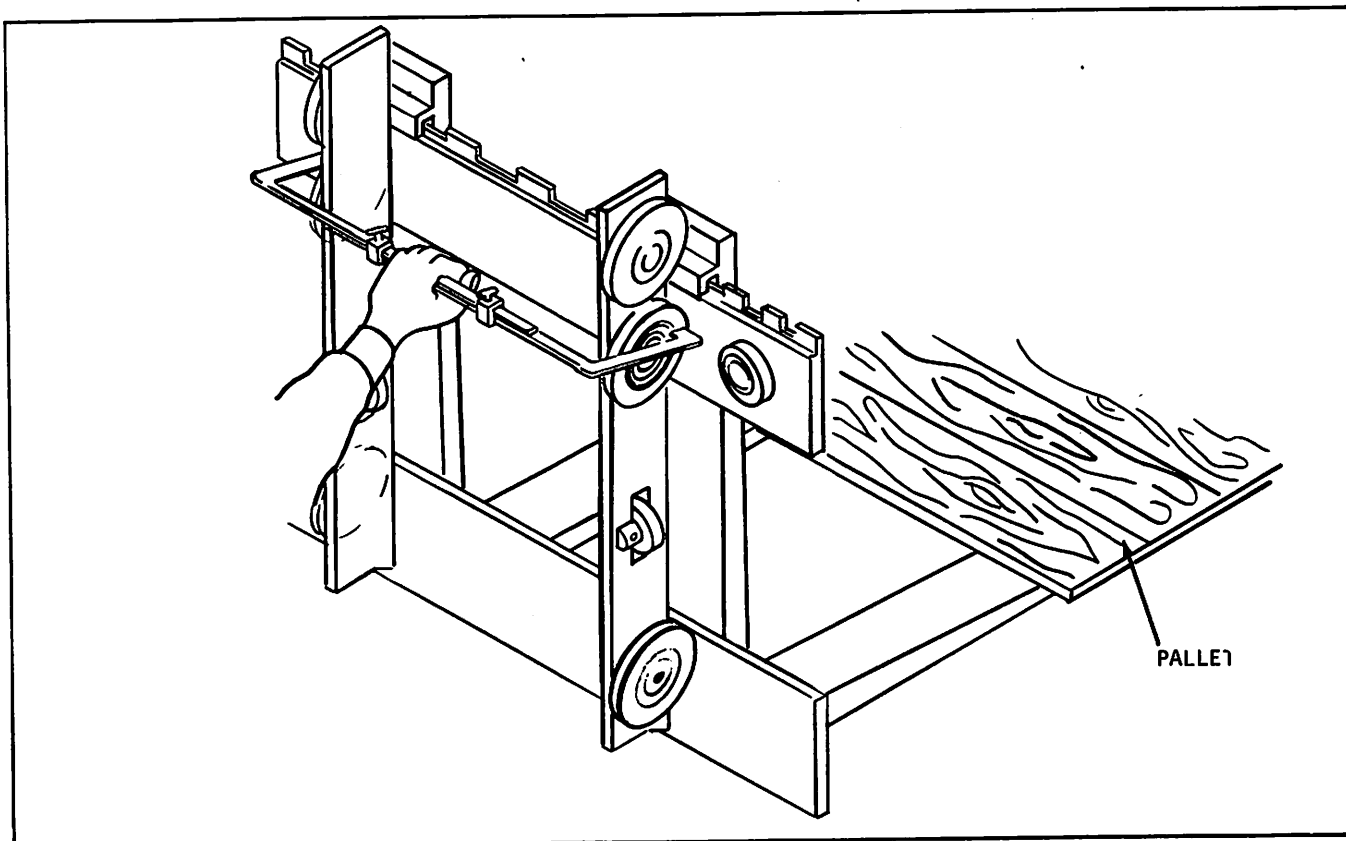


Plate 9570 Spanning Upper Rollers (Six Roller Carriage)

...shims at roller shaft to reach tool size.

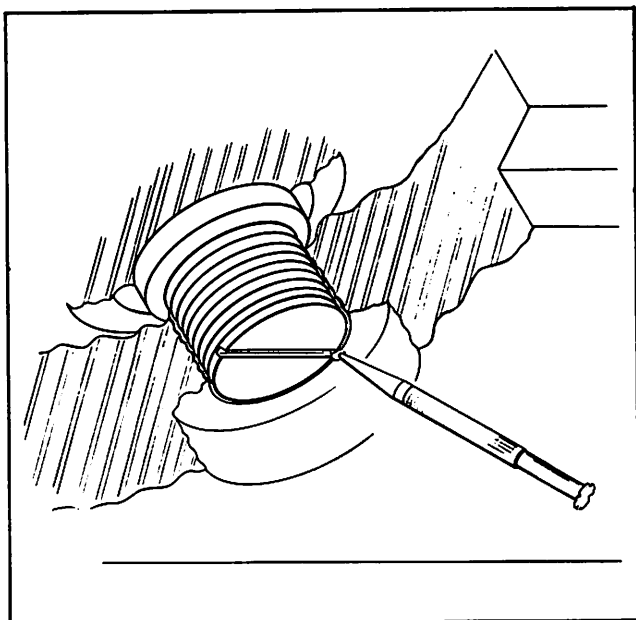


Plate 9571 Securing Outer Thrust Roller

NOTE

Before centering carriage rollers check outer thrust rollers for security and condition of bearings. If loose tighten and stake. If worn replace.

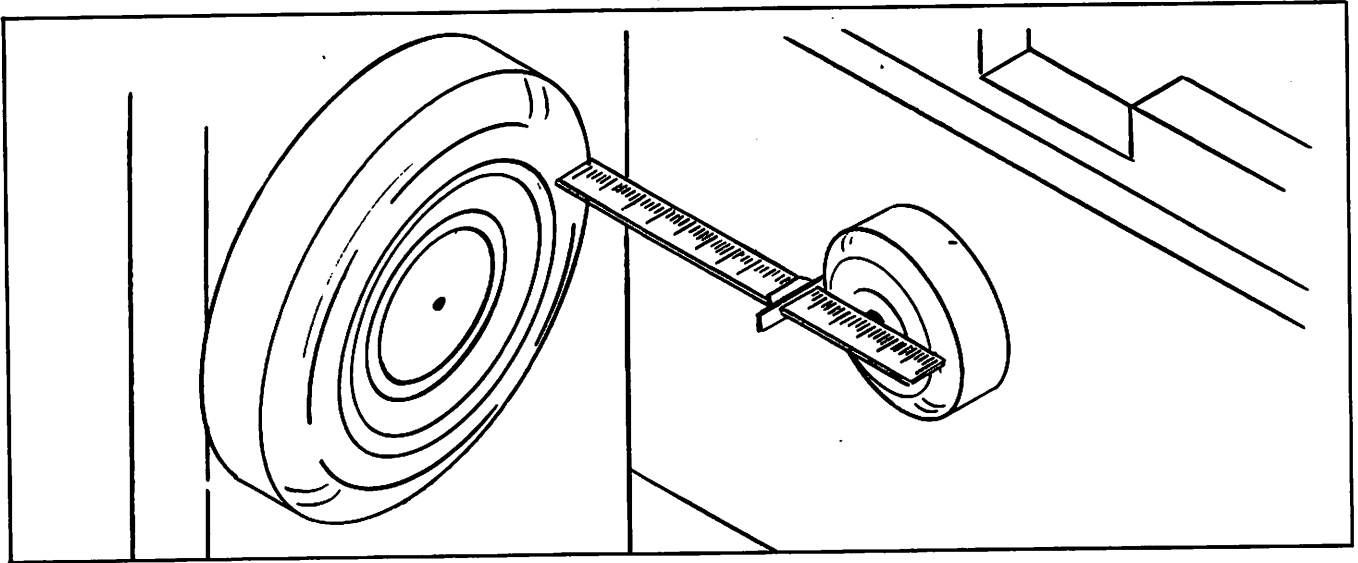


Plate 9572 Centering Carriage Rollers

Step 4. Center carriage rollers within outer thrust rollers by placing 6" scale on the carriage roller surface and measuring the distance to the outer thrust roller face. Add or subtract shims from one roller to the other to make measurement equal.

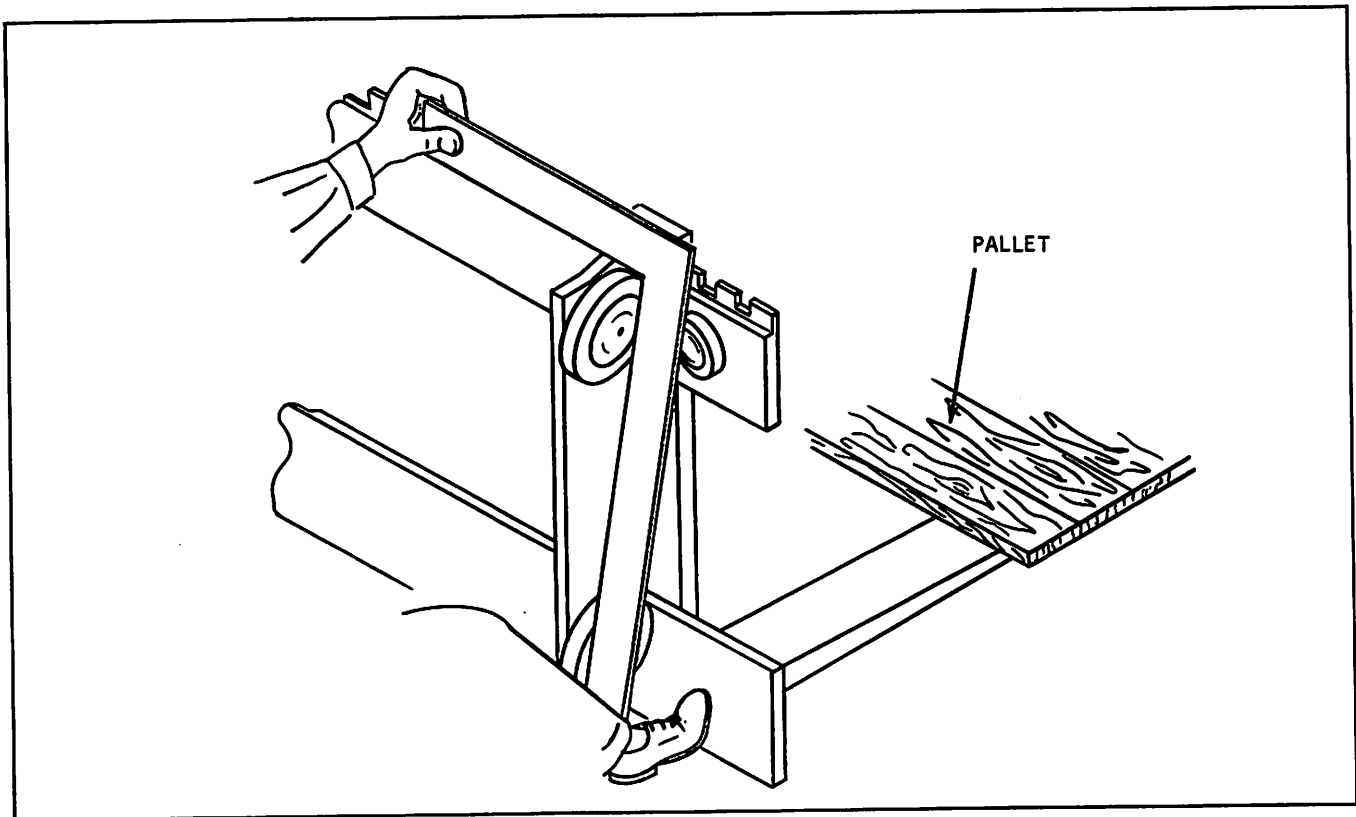


Plate 9573 Squaring Carriage Rollers (Four Roller Carriage)

Step 5. Square carriage rollers by placing carpenters square at the outer most camber of the ...

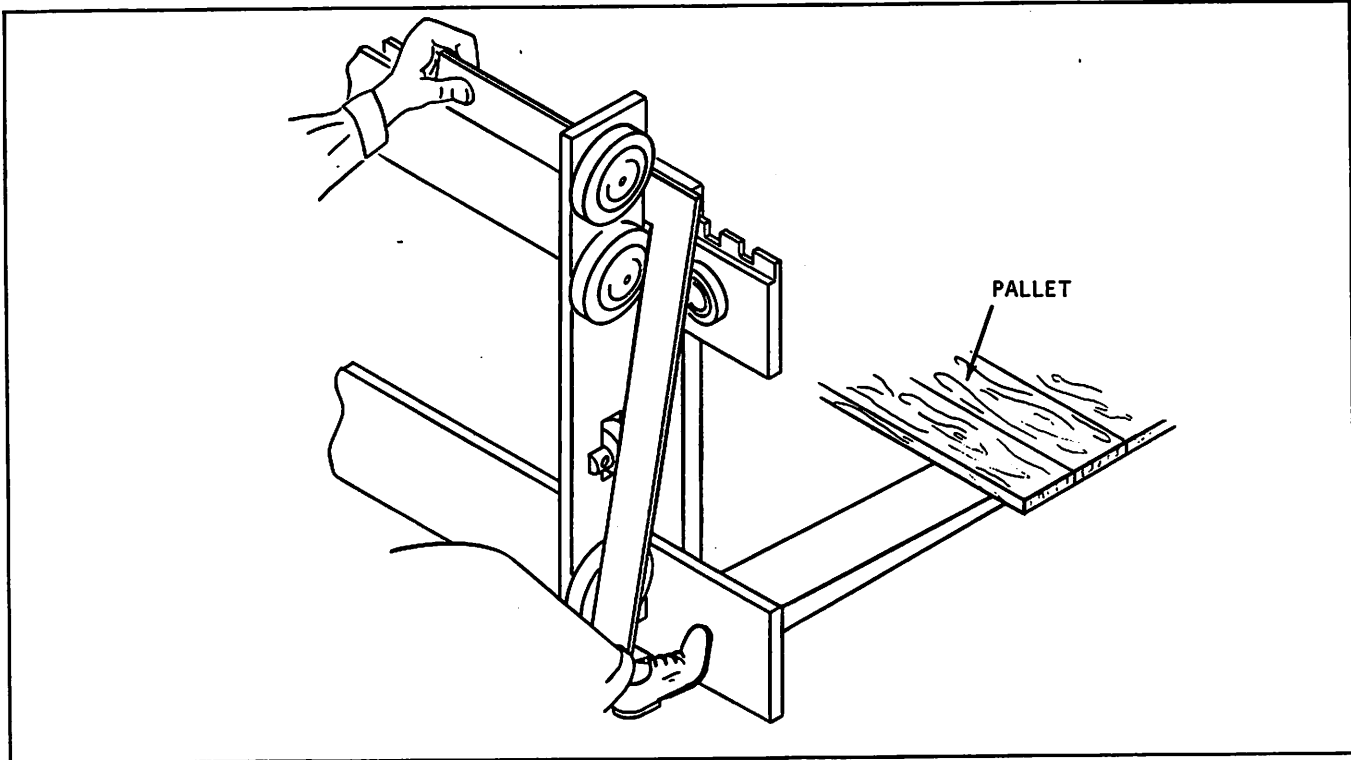
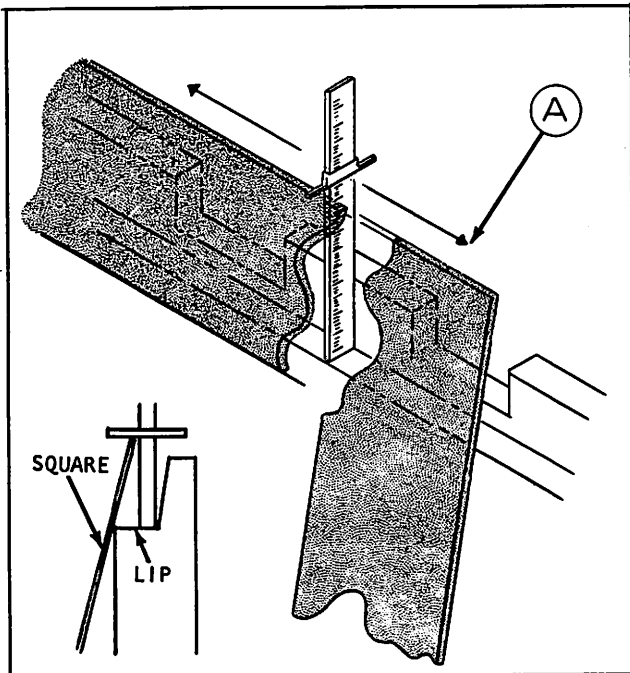


Plate 9574 Squaring Carriage Rollers (Six Roller Carriage)

... upper and lower rollers. Hold square in place with ankle and hand as shown.



Step 6. Hold square and measure the distance between the top face (or lip) of the upper fork bar to the edge of the square at Point A. Now take a measurement at opposite end of square these measurements should be the same. If they are not, add or remove shims on lower roller shaft until distance measured at each end is equal.

Plate 9575 Measuring For Squareness

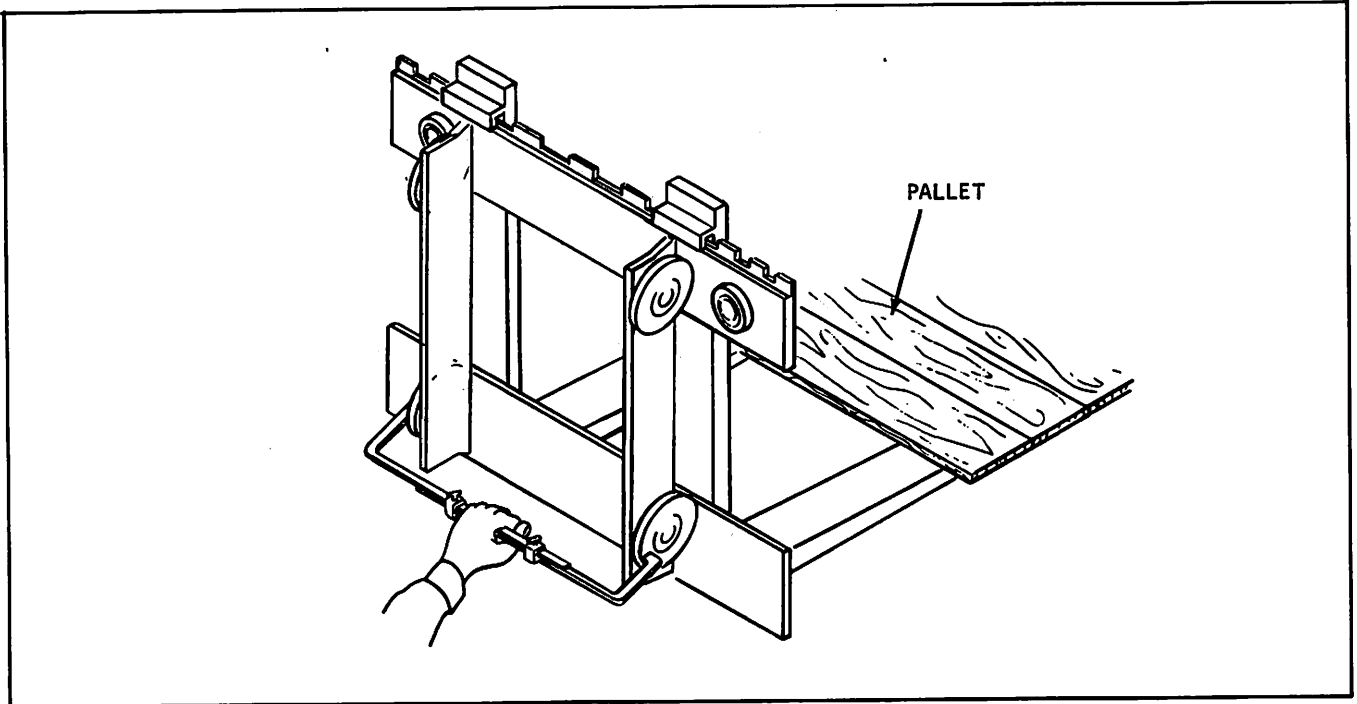


Plate 9576 Spanning Lower Rollers (Four Roller Carriage)

Step 7. Span lower rollers. Add or subtract shims to (the roller that has not been squared) ...

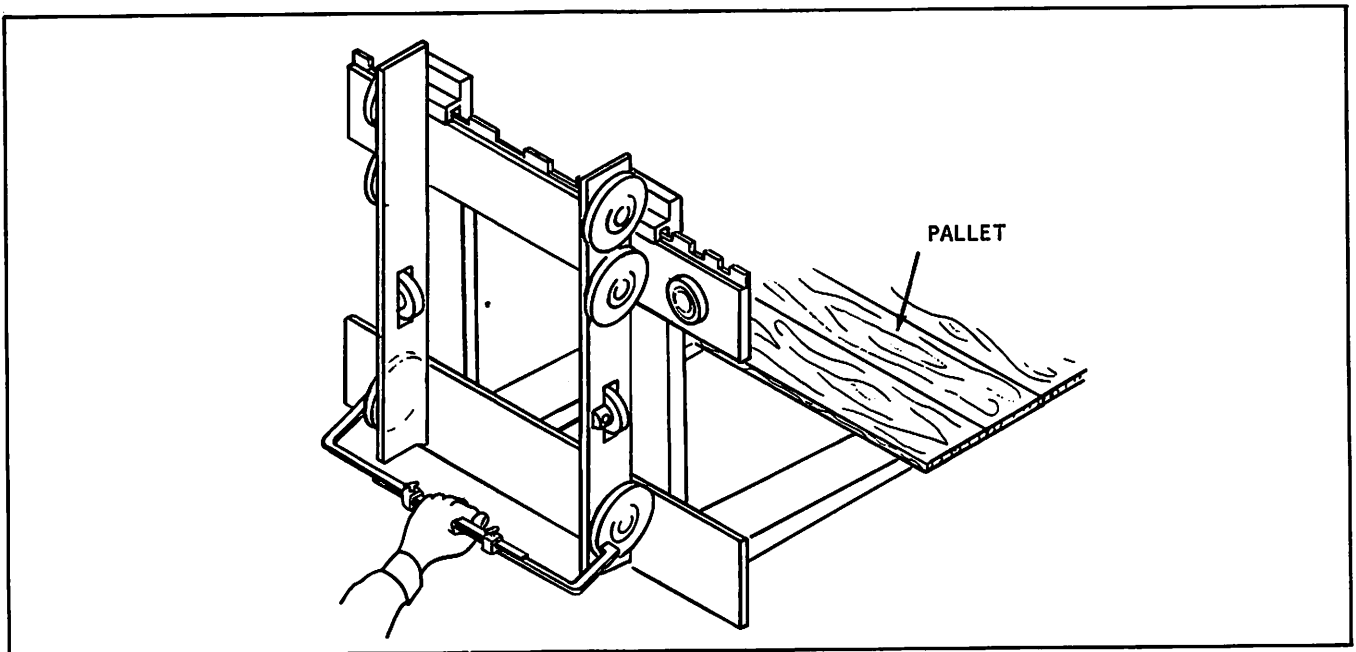


Plate 9577 Spanning Lower Rollers (Six Roller Carriage)

... reach the size of the outside spanning tool.

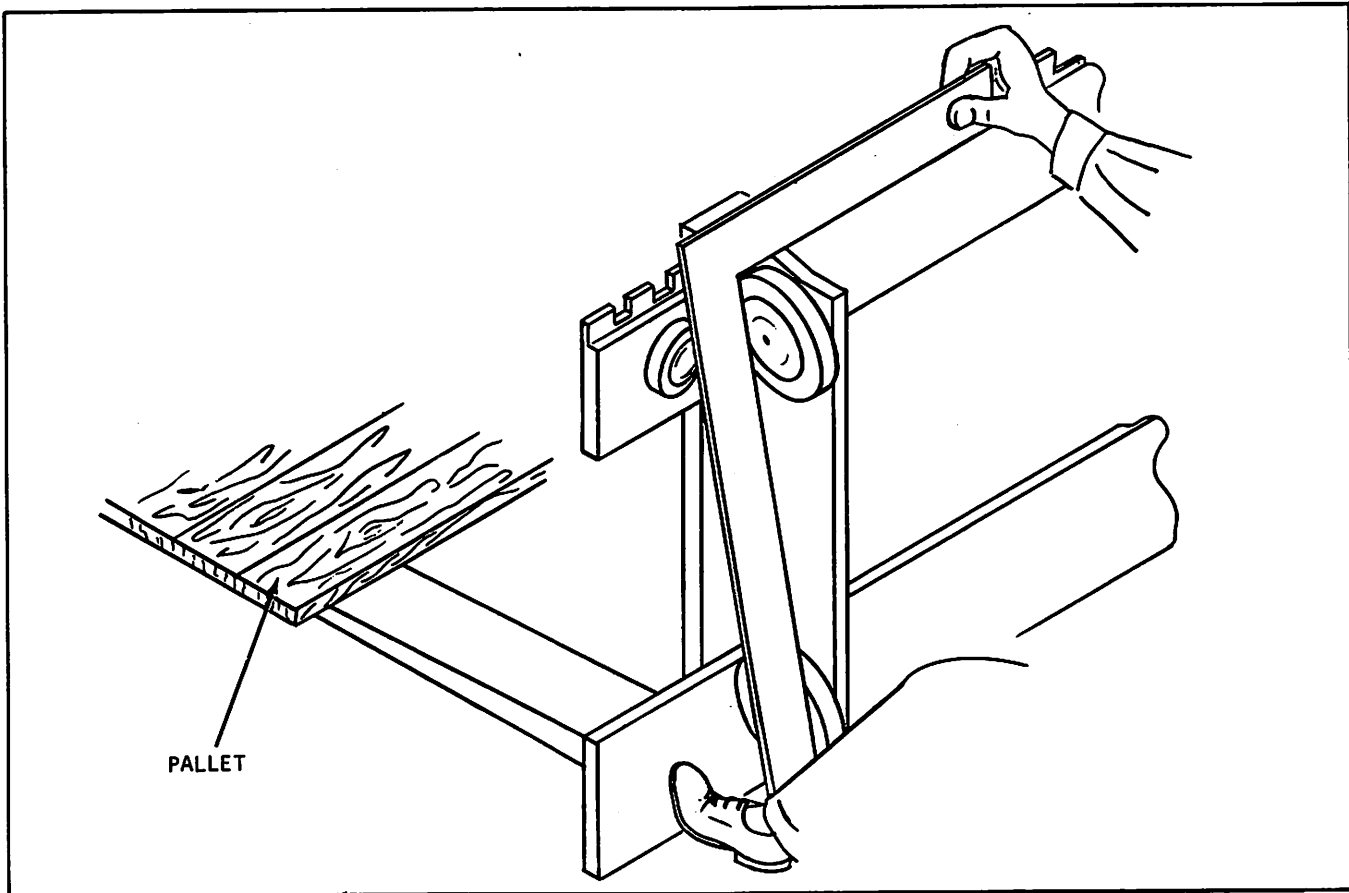


Plate 9578 Checking Squareness (Four Roller Carriage)

Step 8. Check opposite side for squareness (by holding square in the same manner as before and checking ...

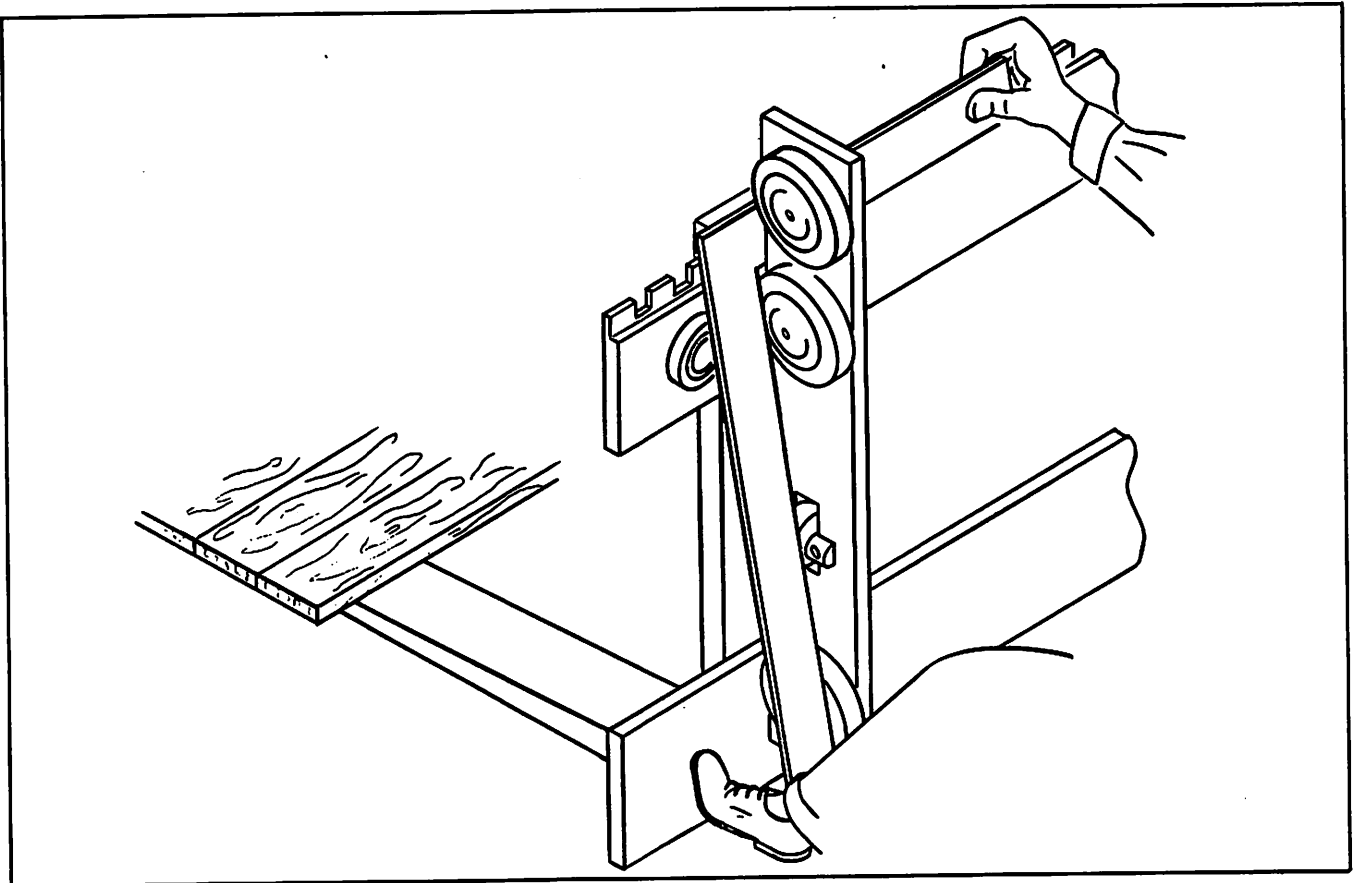


Plate 9579 Checking Squareness (Six Roller Carriage)

... measurement). This side will be square within $1/32''$; if not, return to Step 5. and repeat procedure.

SIX ROLLER CARRIAGE ONLY

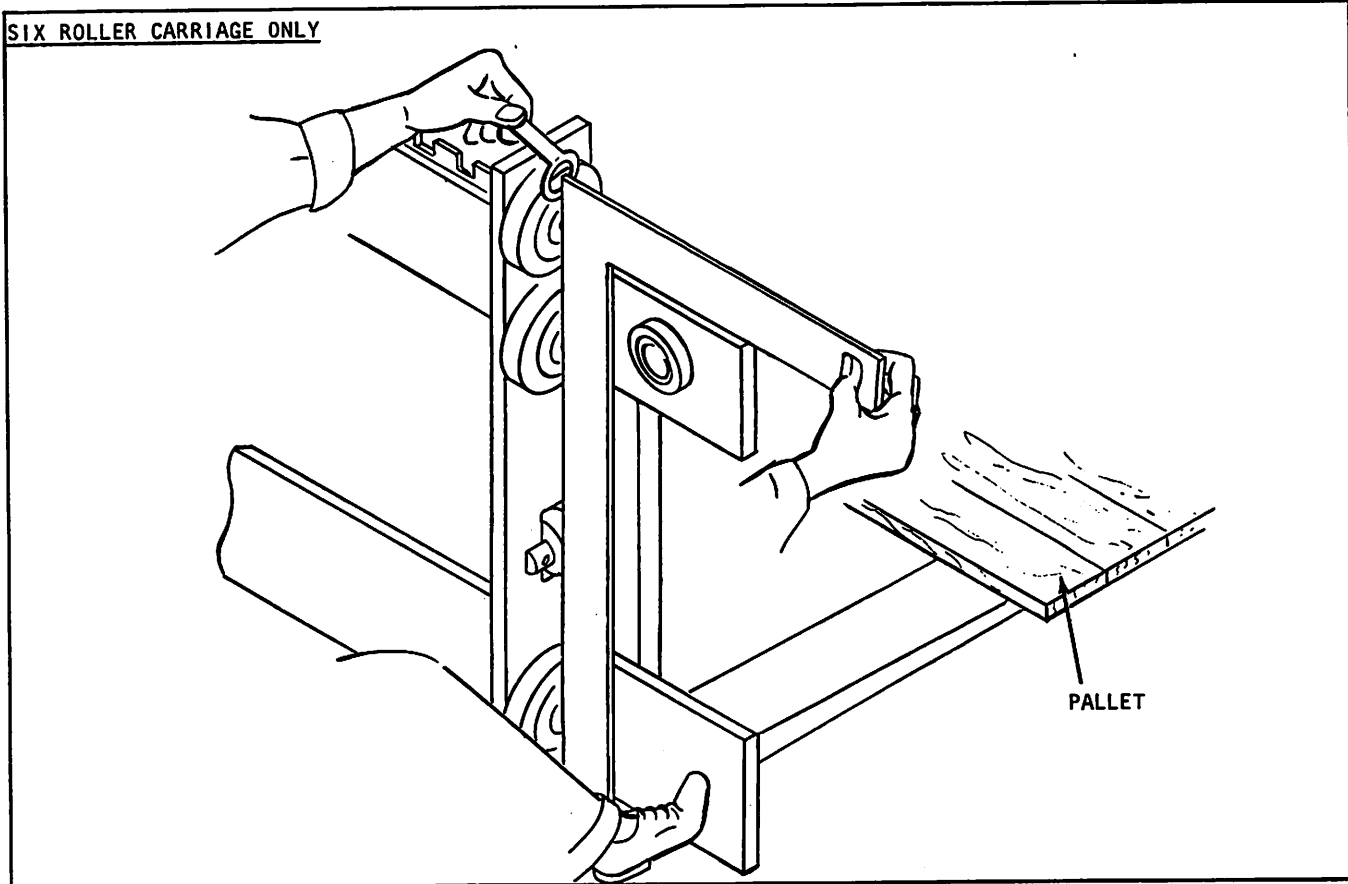


Plate 9580 Top Roller Clearance

Step 1. Place square on the vertical center line of the carriage rollers, as shown above. There must be some clearance between the square and the side surface of the top roller. This clearance should not exceed 1/32" or one shim

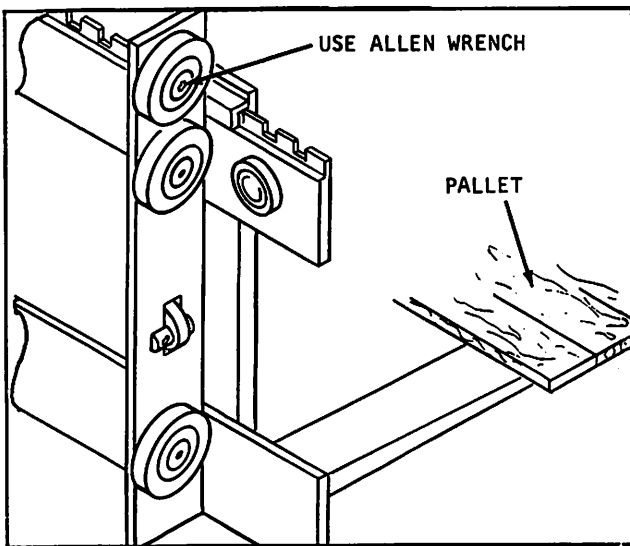


Plate 9581 Removing Top Roller

Step 2. If adjustment is necessary, remove allen screw, lock washer and flat washer to add or remove shims on shaft. Tighten screw securely after completing adjustment.

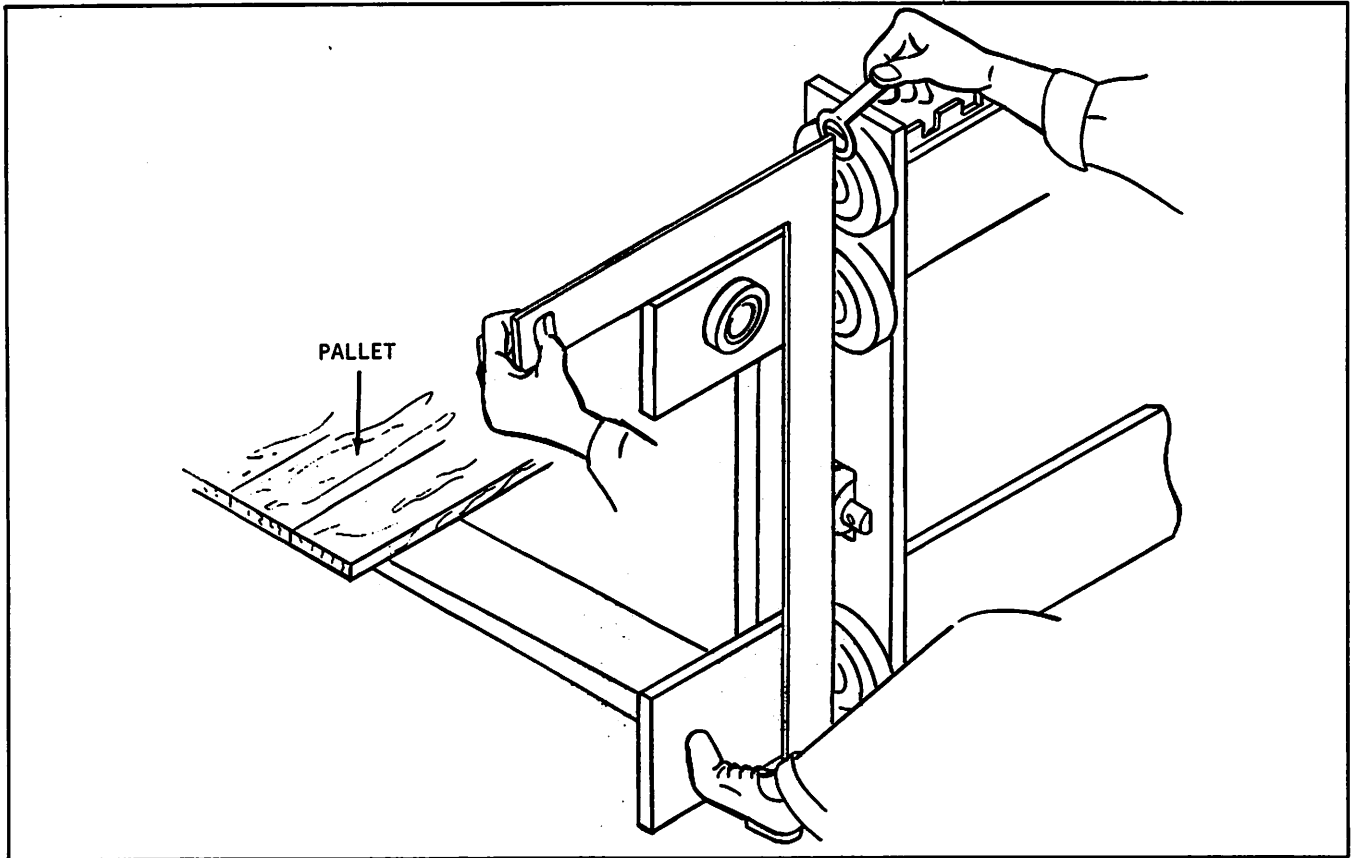


Plate 9582 Top Roller Clearance

Step 3. Check opposite upper roller in the same manner; adjust if necessary.

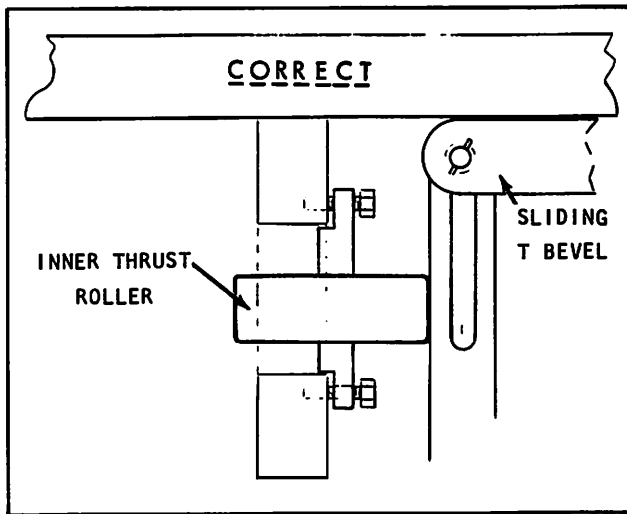


Plate 9583 Checking Squareness ■ CORRECT

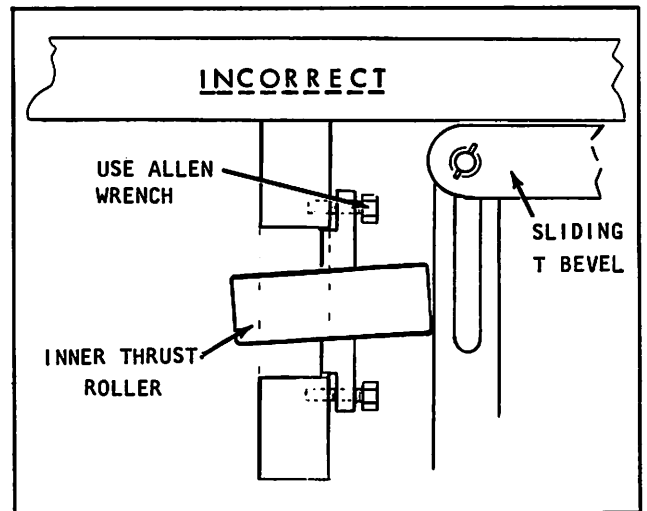


Plate 9584 Checking Squareness ■ INCORRECT

Step 4. Check squareness of inner thrust rollers with Sliding T Bevel. Set Sliding T Bevel to 90° using carpenter's square.

Step 5. Add or subtract shims for adjustment (Use allen wrench see Plate 9584).

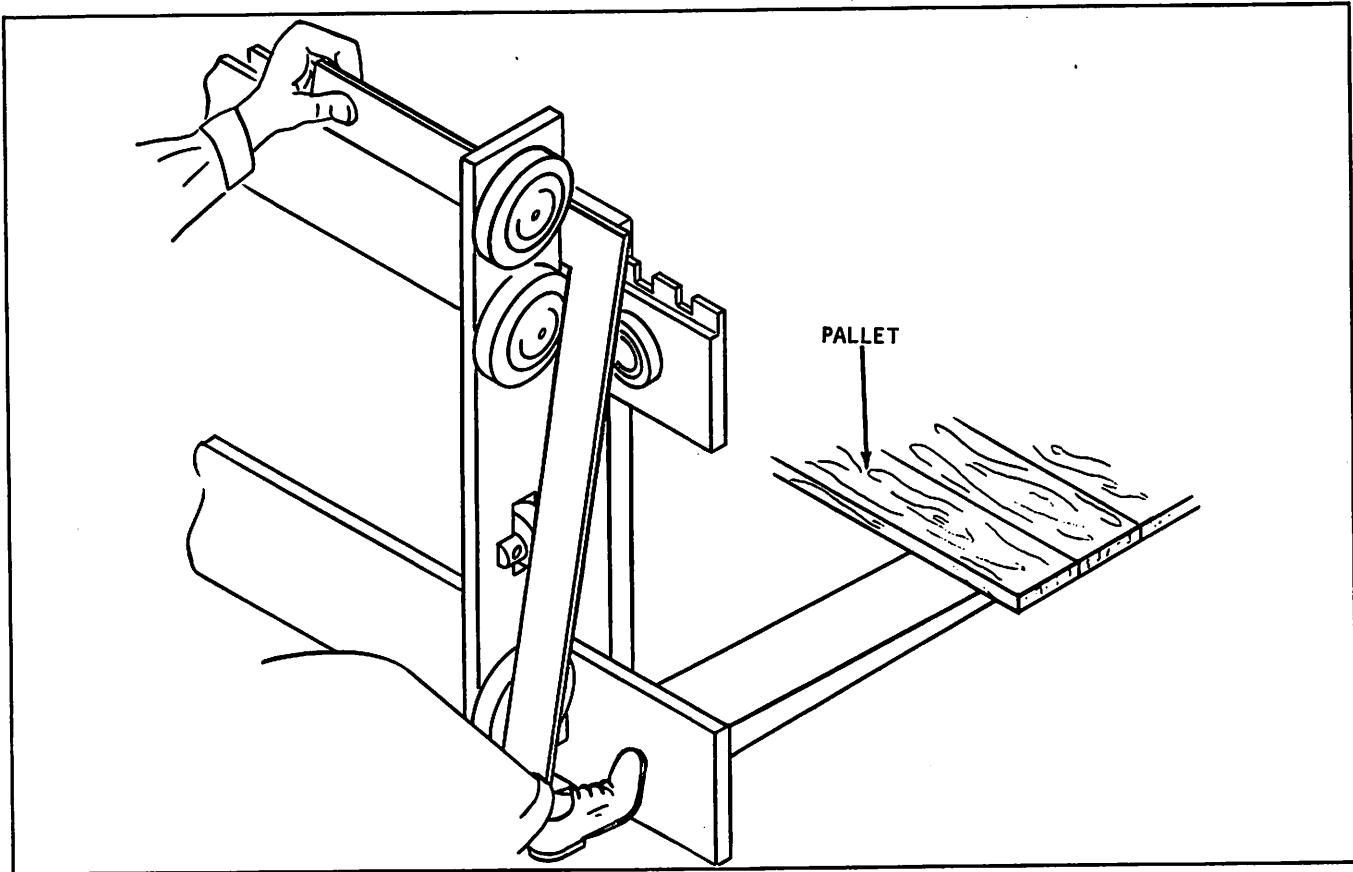
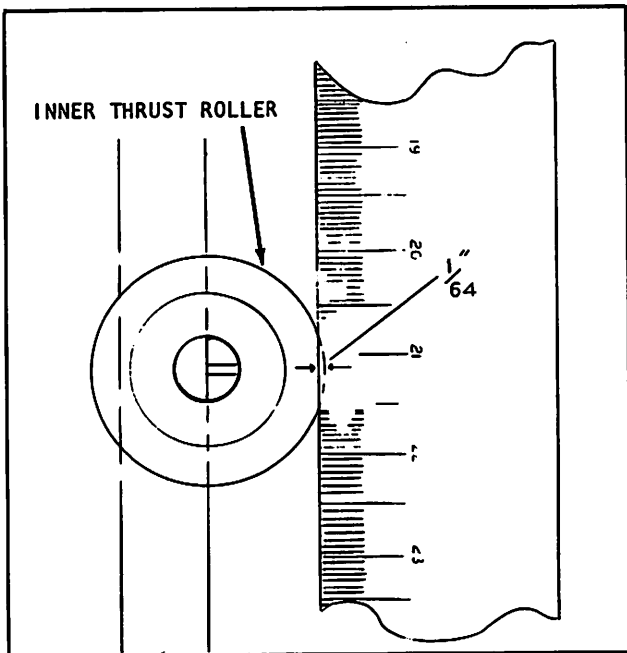


Plate 9574 Square And Side Thrust Roller



Step 6. The inner thrust roller is to project $1/64$ " past line of square. Use one thrust roller shim and eyeball distance as shown (Plate 9573 and Plate 9585).

Step 7. Repeat Step 6. on opposite side.

Plate 9585 Reading Roller Projection

C. CARRIAGE INSTALLATION

N O T E

Before installing carriage, check upright for proper shimming adjustment.

Step 1. Drive machine up to carriage and position upright to match tilt of carriage.

Step 2. Raise inner rails to just clear upper carriage rollers.

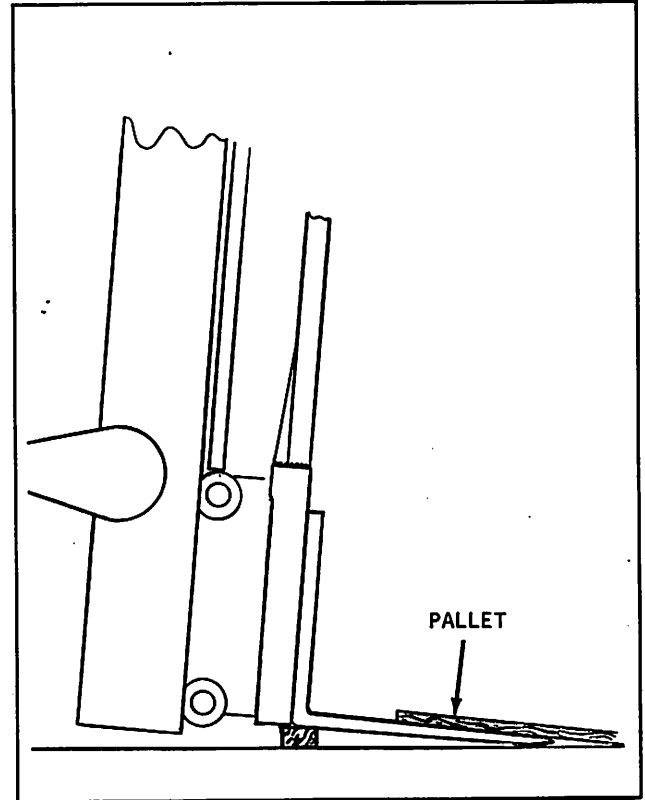


Plate 9565 Inner Rail Clearing Carriage Rollers

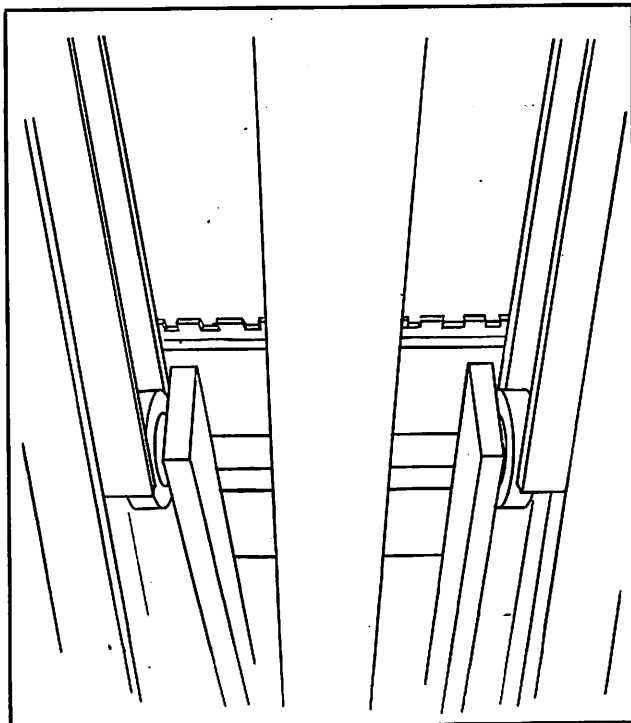


Plate 9591 Rollers Guiding Into Inner Rail

Step 3. Continue to drive machine forward until inner rails line up with upper carriage rollers, then... slowly lower inner rails to full down position.

CAUTION

CHECK TO BE SURE THE TOP CARRIAGE ROLLERS ARE GUIDING INTO INNER RAIL.

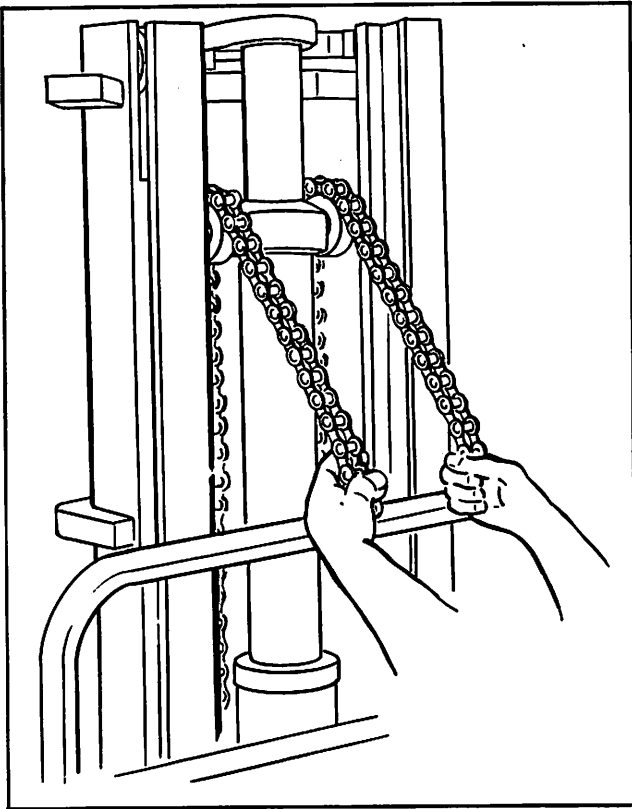


Plate 9586 Pulling Piston Head Down

Step 3(a). Remove wires holding lift chains.

(b). With a chain in each hand and someone holding the lift cylinder lever down, pull the piston to full down position. Place chains behind carriage.

Step 5. Raise carriage about 5' and place a 3' to 4' long 4"x4" wooden beam under it. DO NOT stand directly under forks. Lower carriage onto beam.

Step 6. Replace bolts with anchor pins.

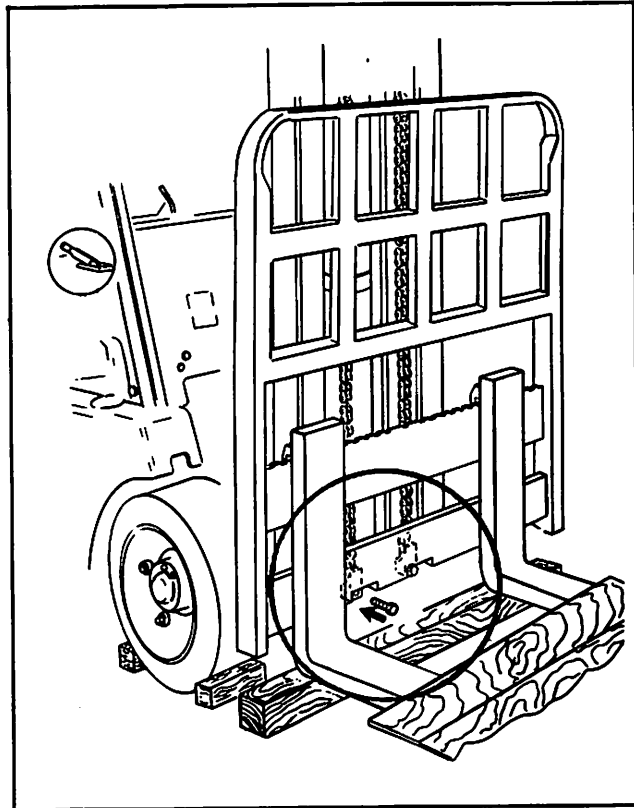


Plate 9587 Installing Bolts

Step 4. Put chain anchors in carriage anchor brackets and install 3/8" x 2" bolts in anchor pin holes.

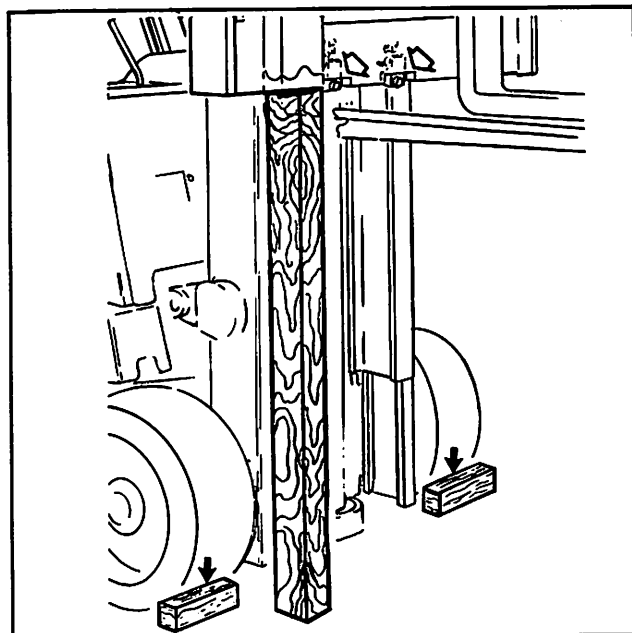


Plate 9593 Carriage Pin Replacement

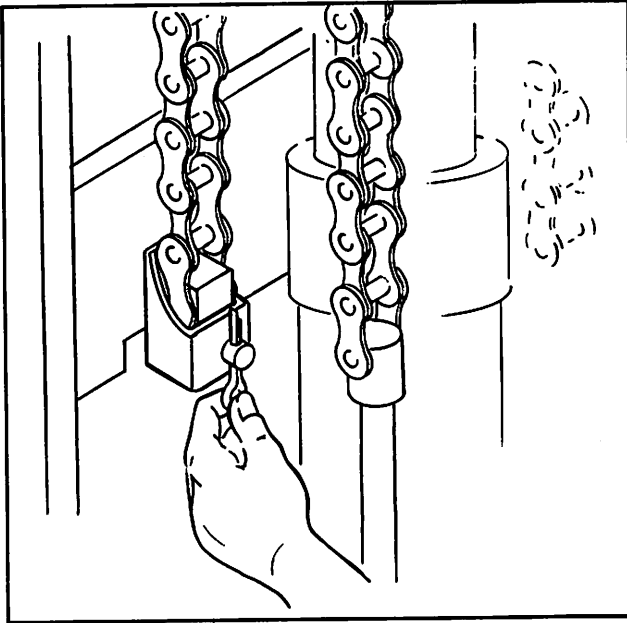
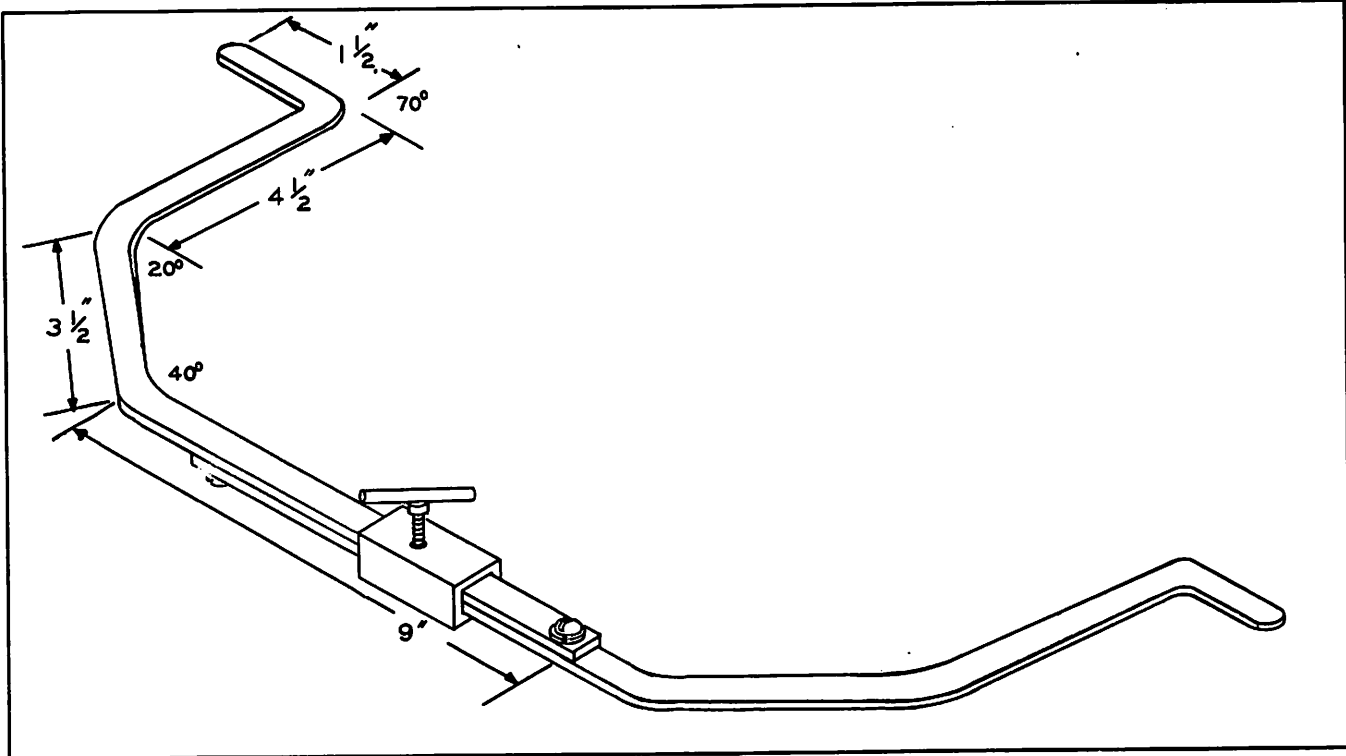


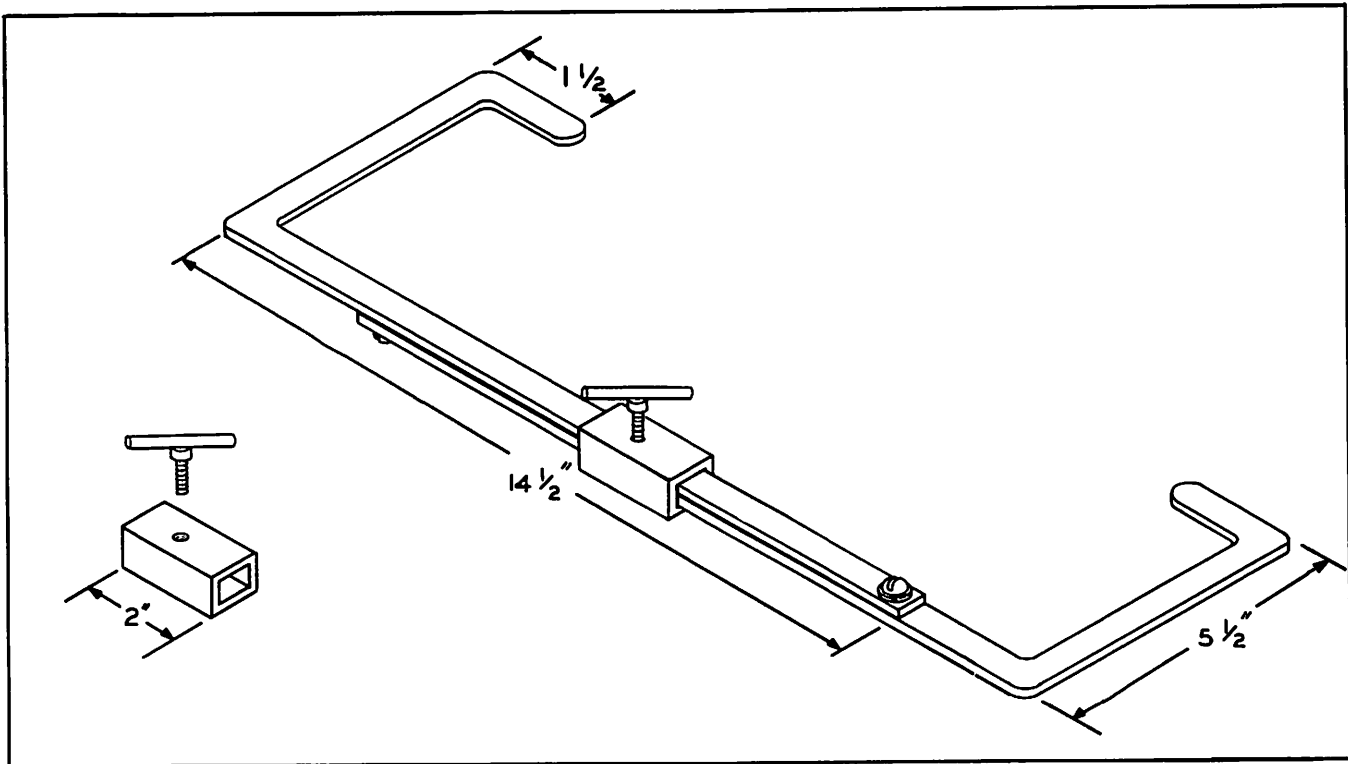
Plate 9588 Installing Cotter Pins

Step 7. Replace cotter pins in anchor pins.

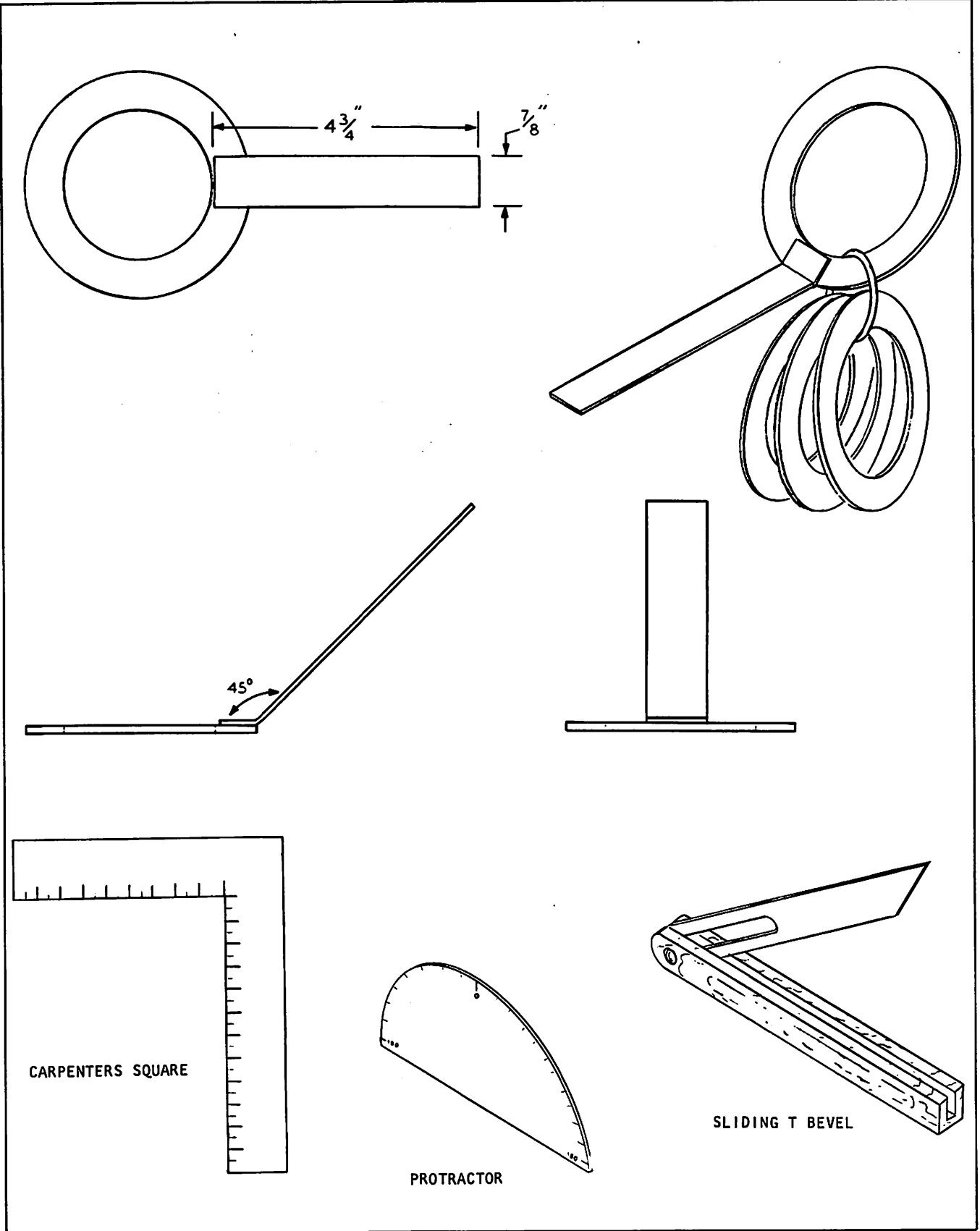
Step 8. Raise and lower carriage to full positions checking all phases of operation.



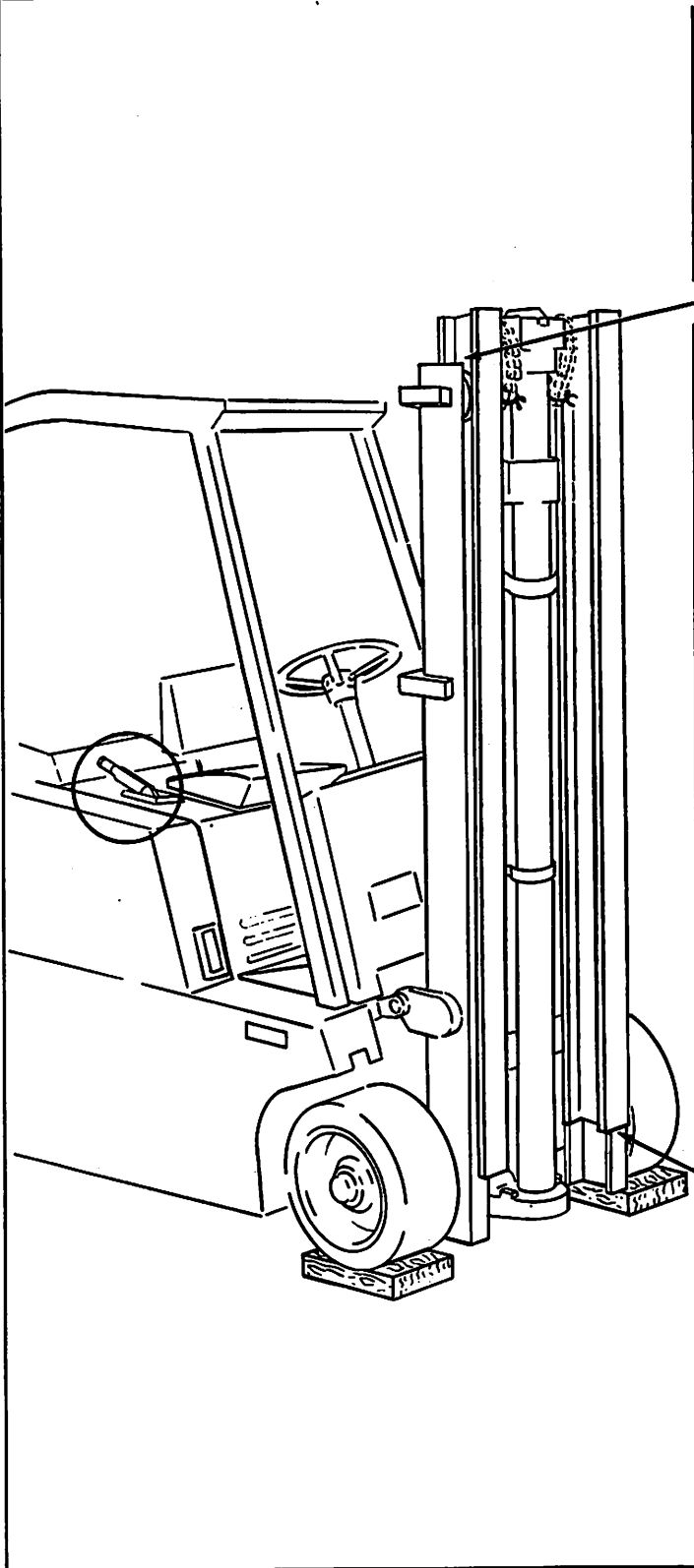
INSIDE SPANNING TOOL



OUTSIDE SPANNING TOOL



UPRIGHT ROLLER ADJUSTMENT -- STANDARD AND HILO SERIES '500

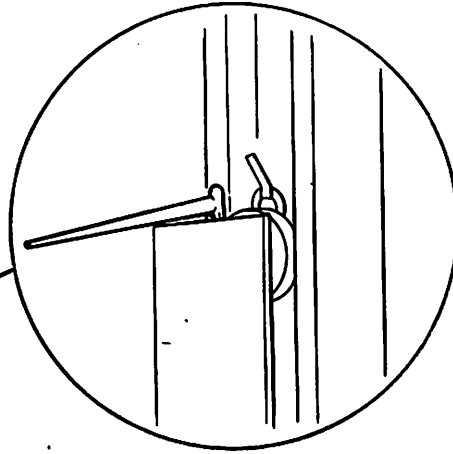
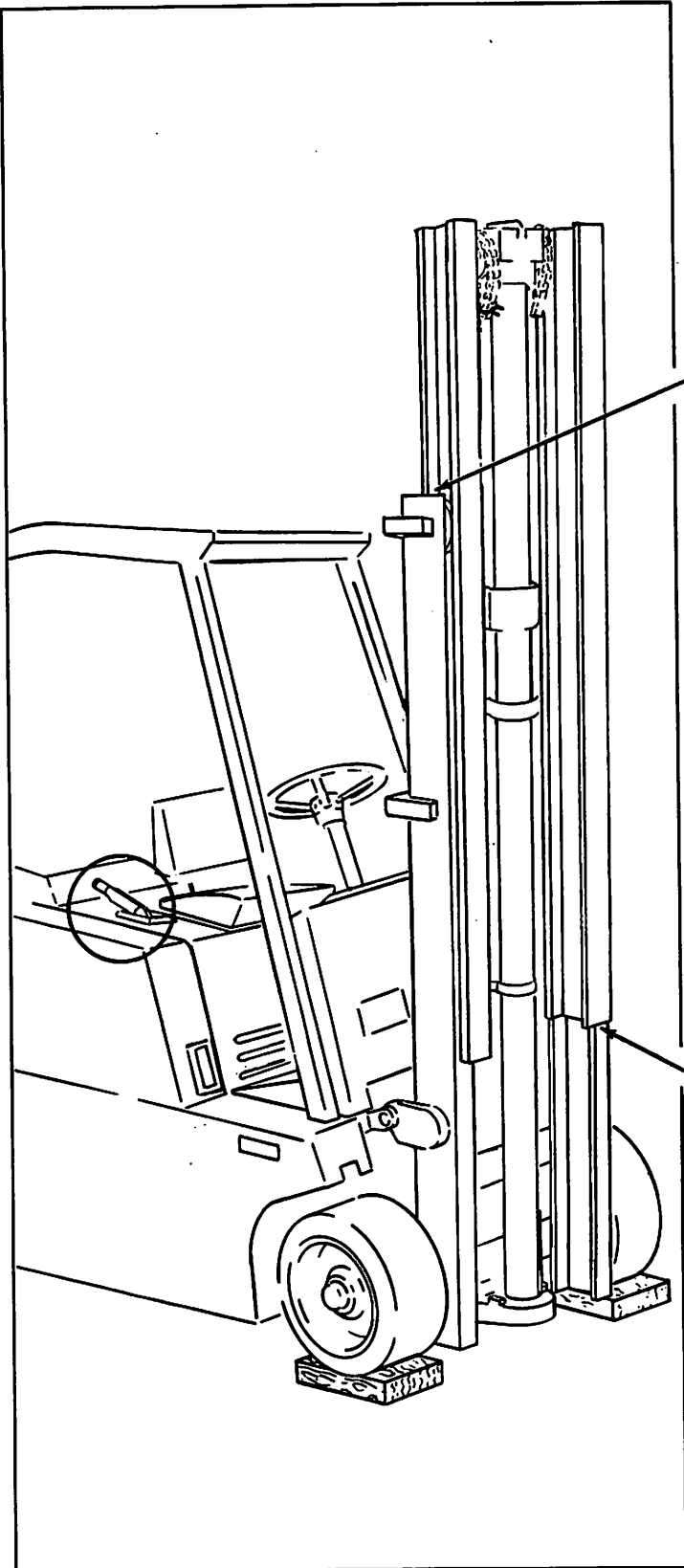


Step 1. Remove carriage. Refer to CARRIAGE REMOVAL.

Step 2. Before checking roller clearance, position inner rail about 5 inches above full down position.

Check both sides for roller clearance at (top and bottom) of inner rail. Use tool to record this number on the rail. Record number of shims to be used, on outer rail (for top rollers only). Record number of shims to be used on inner rail (for bottom rollers only).

There is to be some clearance but it is not to exceed $1/32$ ".



Step 3. Raise inner rail to 1/2 of its full up position. With tool and bar, check the roller clearance in the same manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rollers only).

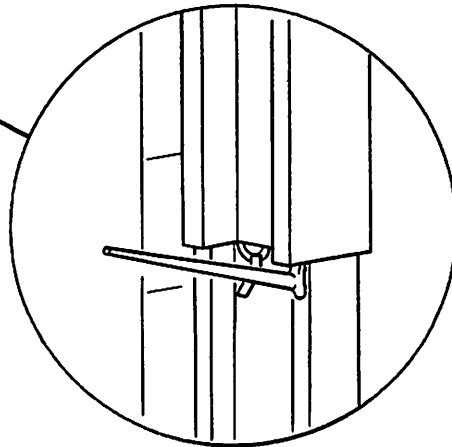
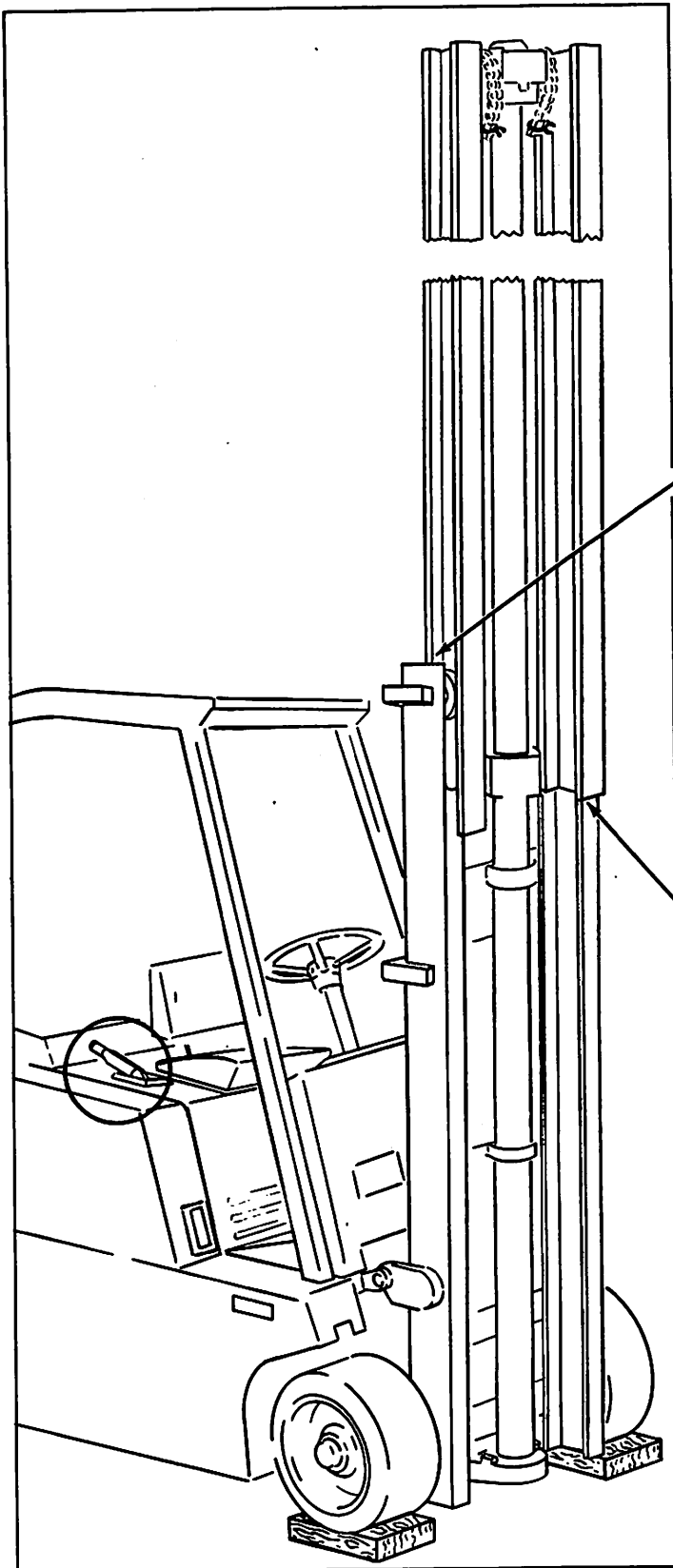


Plate 9805



Step 4. Raise inner rail to full up position and with tool and bar, check for roller clearance in the manner as before.

Record number of shims to be used, on outer rail (for top rollers only).

Record number of shims to be used, on inner rail (for bottom rollers only).

Plate 9806

Step 5. Raise inner rail about 5 inches and remove stop block.

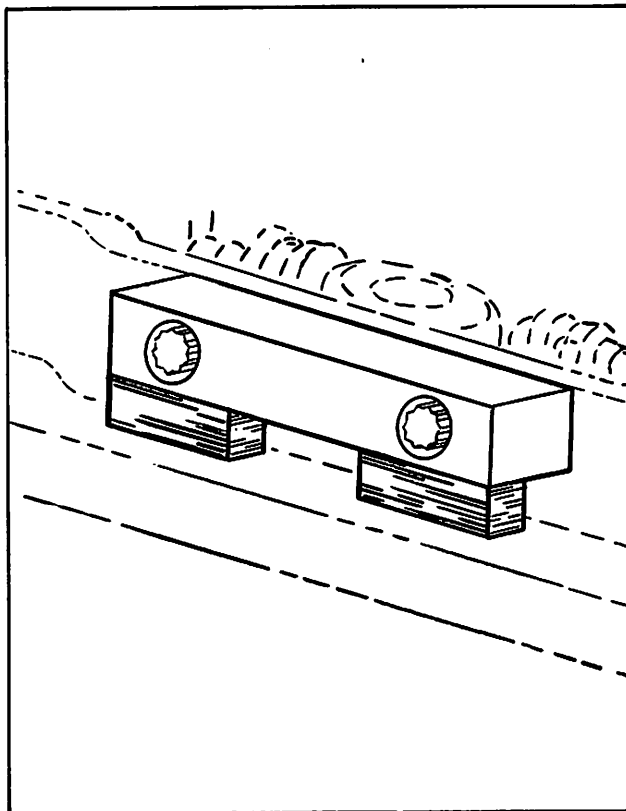


Plate 9808

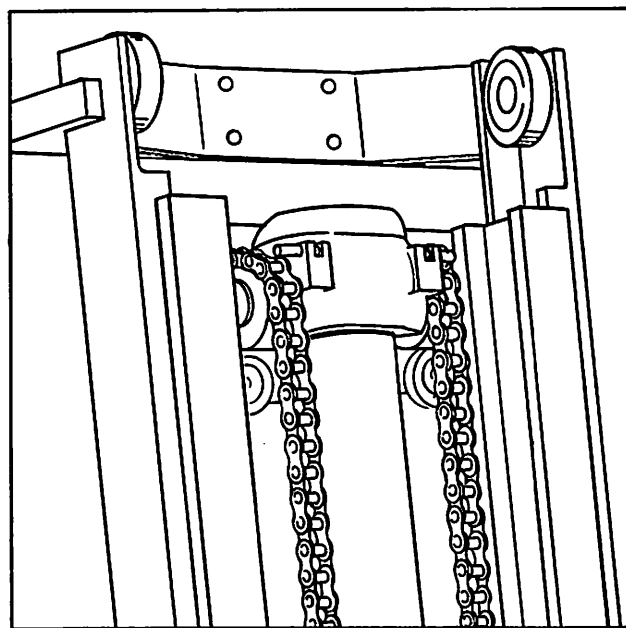
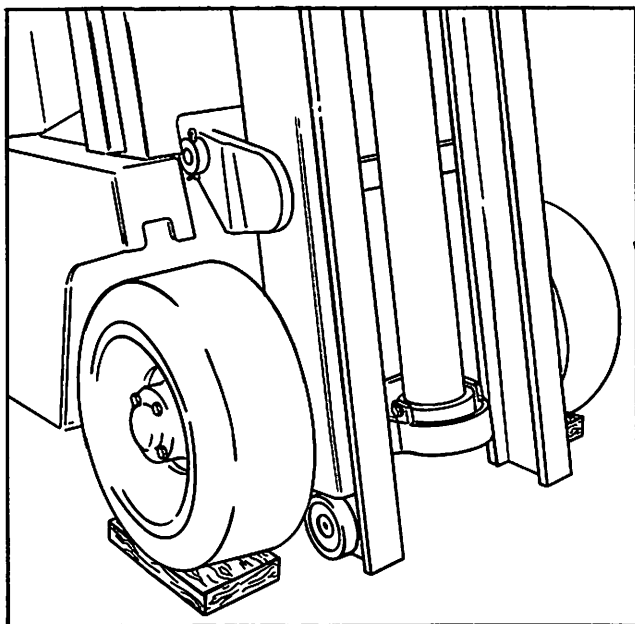


Plate 9809

Step 6. Lower inner rail until upper and lower rollers are clear for removal.

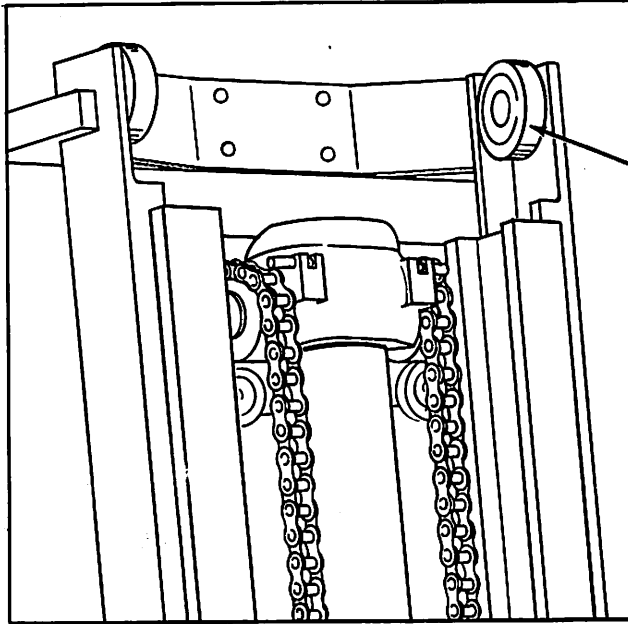


Plate 9810

Step 7. Adjusting upright rollers:

A. Outer rail rollers.

1. Count the number of shims at the right and left hand rollers.
2. Look at the three (3) numbers you recorded on the outer rail in Steps 2-3 & 4. The smallest of these numbers is the total number of shims to be added. A "0" means DO NOT add shims.
3. Your target for adjustment is to have the same number of shims at each upper roller. If you end up with an extra shim DO NOT remove it. Mark the side having an extra shim.

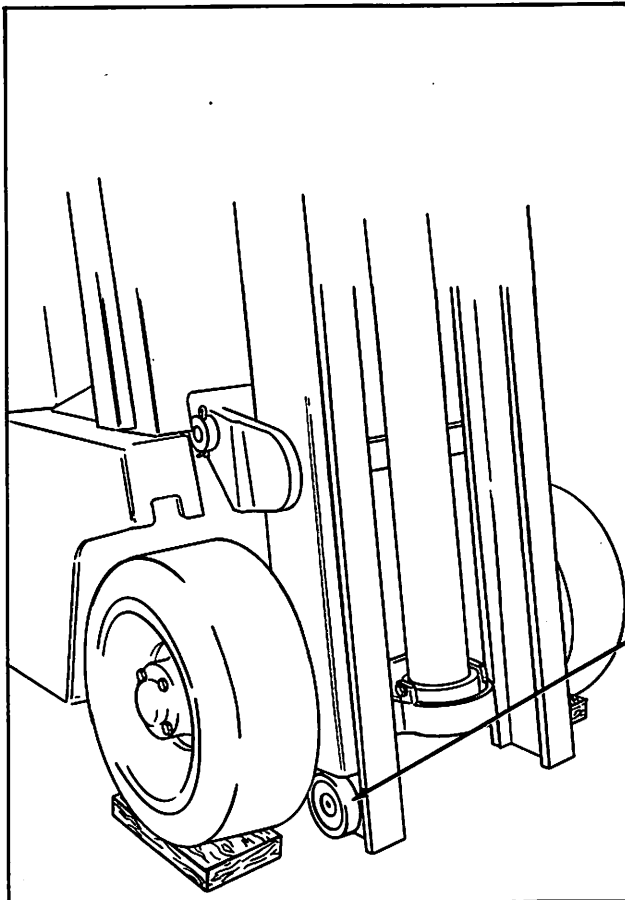


Plate 9812

B. Inner rail rollers.

1. Count the number of shims at the right and left hand rollers.
2. Look at the three(3) numbers you recorded on the inner rail in Step 2-3-& 4. Go through the same steps you followed in adjusting the upper rollers.
3. If you end up with an extra shim here too, be sure it is on the same side as the extra upper shim.

Step 8. Raise inner rail about 5 inches above upper tie bar (of the outer rail) and install stop block and pad assembly.

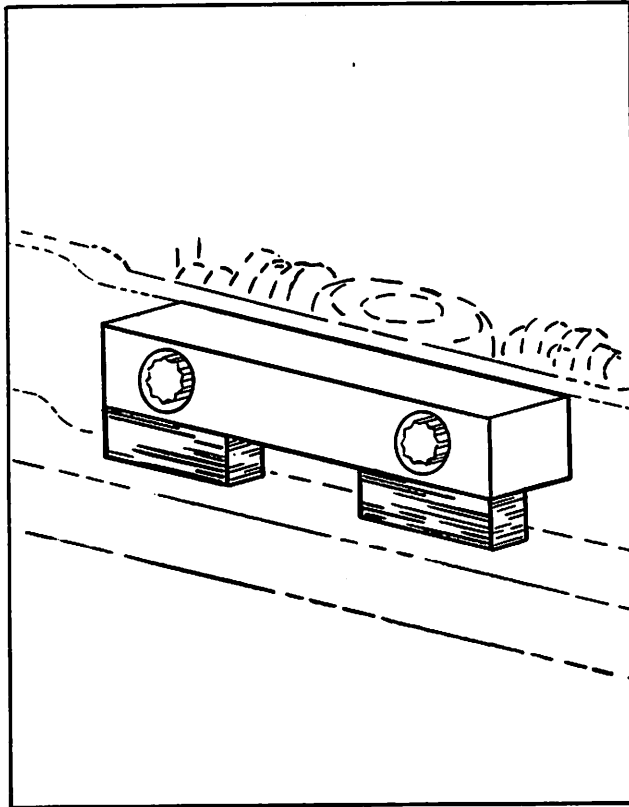


Plate 9808

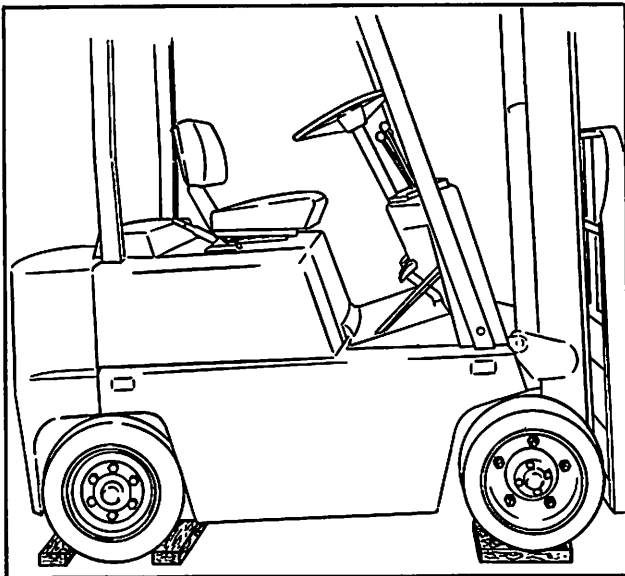


Plate 9811

Step 9. Remove carriage support chain and wheel blocks.

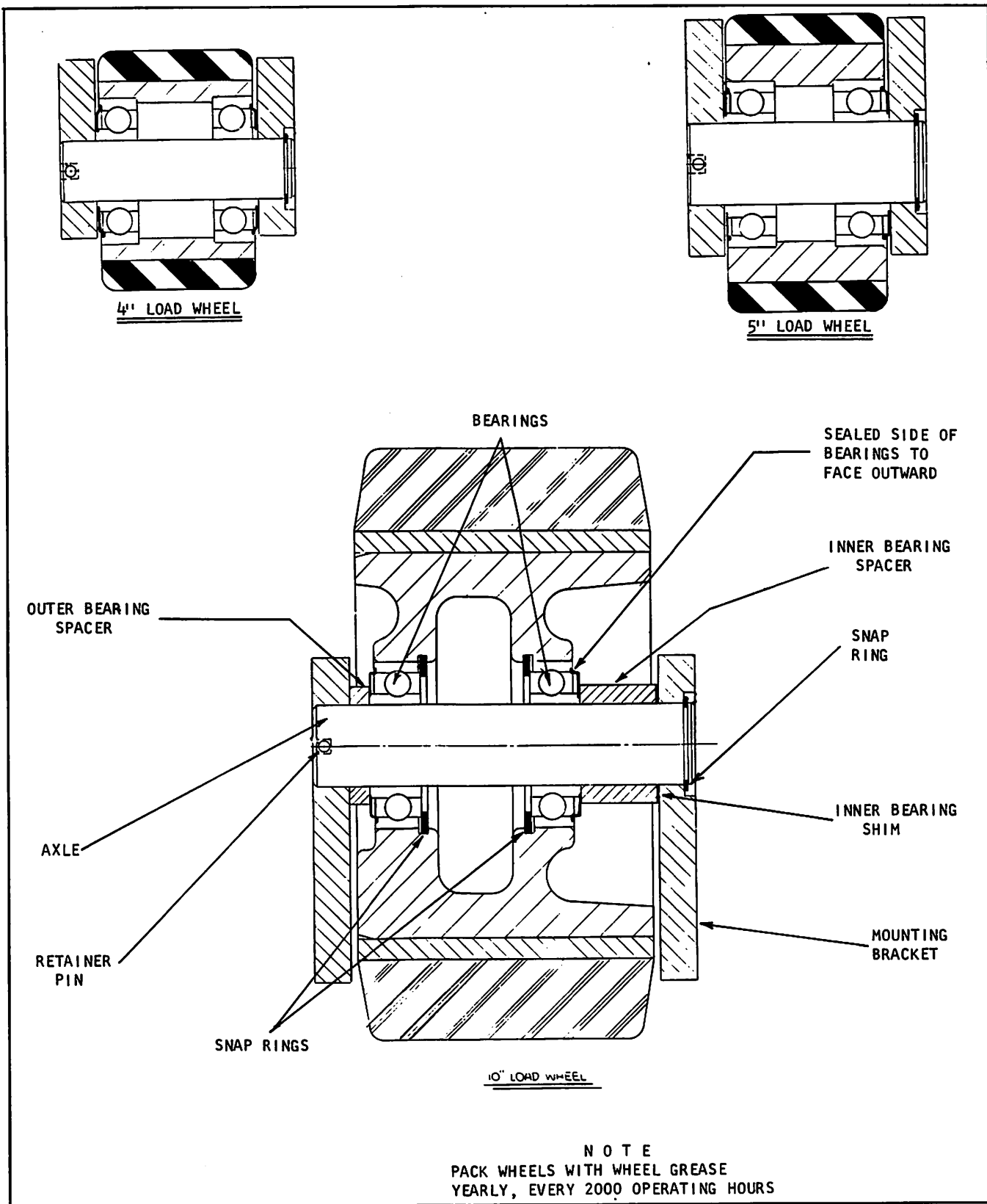


Plate 7461. Installation — Load Wheels



INDUSTRIAL TRUCK DIVISION



N O T I C E

THE WIRING DIAGRAM IN THIS MANUAL IS FOR
A STANDARD TRUCK, WITHOUT SPECIAL CUSTOM
FEATURES.

THE PARTS BOOK FOR THIS SERIAL NUMBER
INCLUDES WIRING DIAGRAM/S COVERING SPECIAL
CUSTOM OPTIONS INCORPORATED AT TIME OF
SHIPMENT.

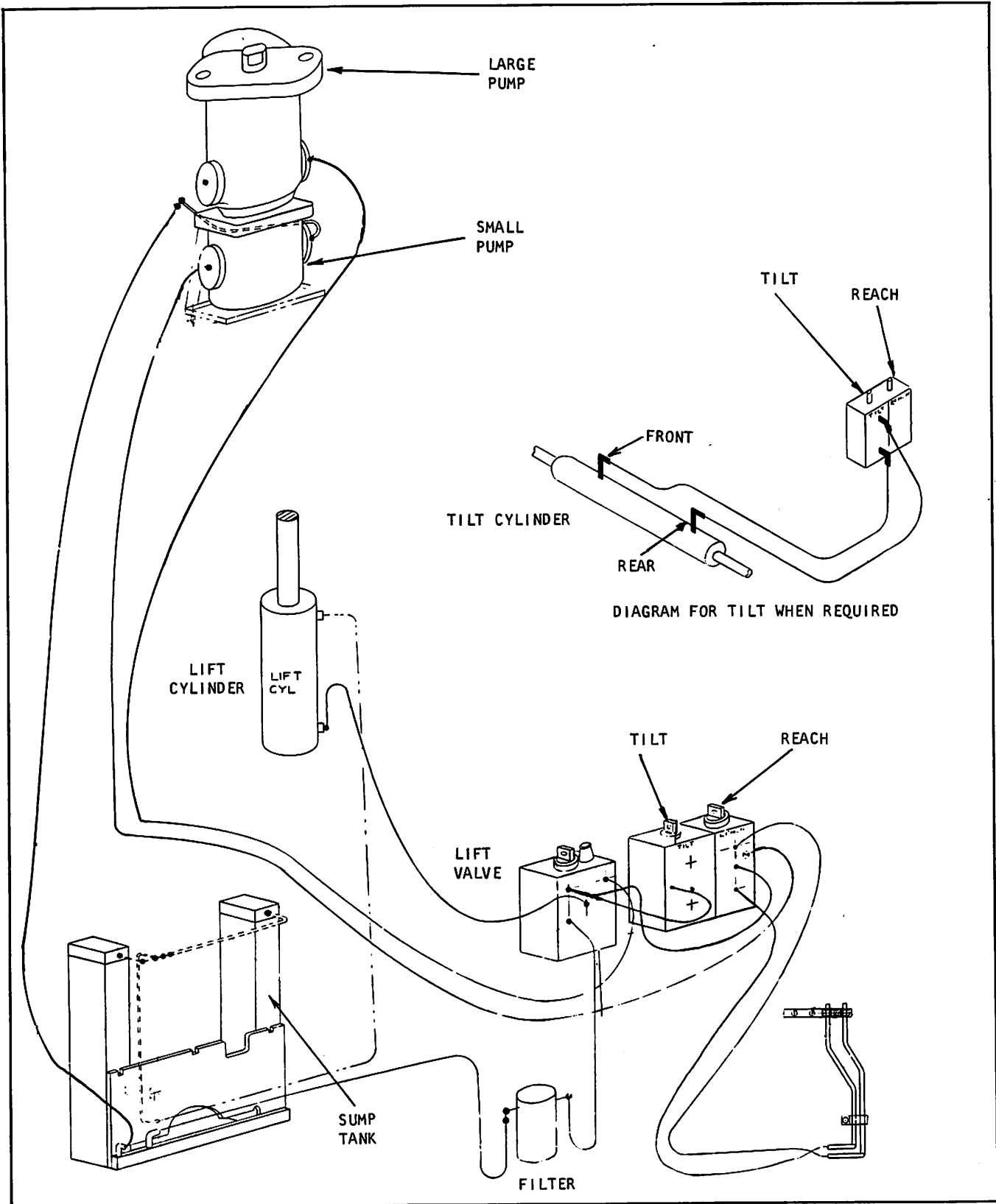


Plate 7462. NS20, 30, 40 Hydraulic Circuit Diagram

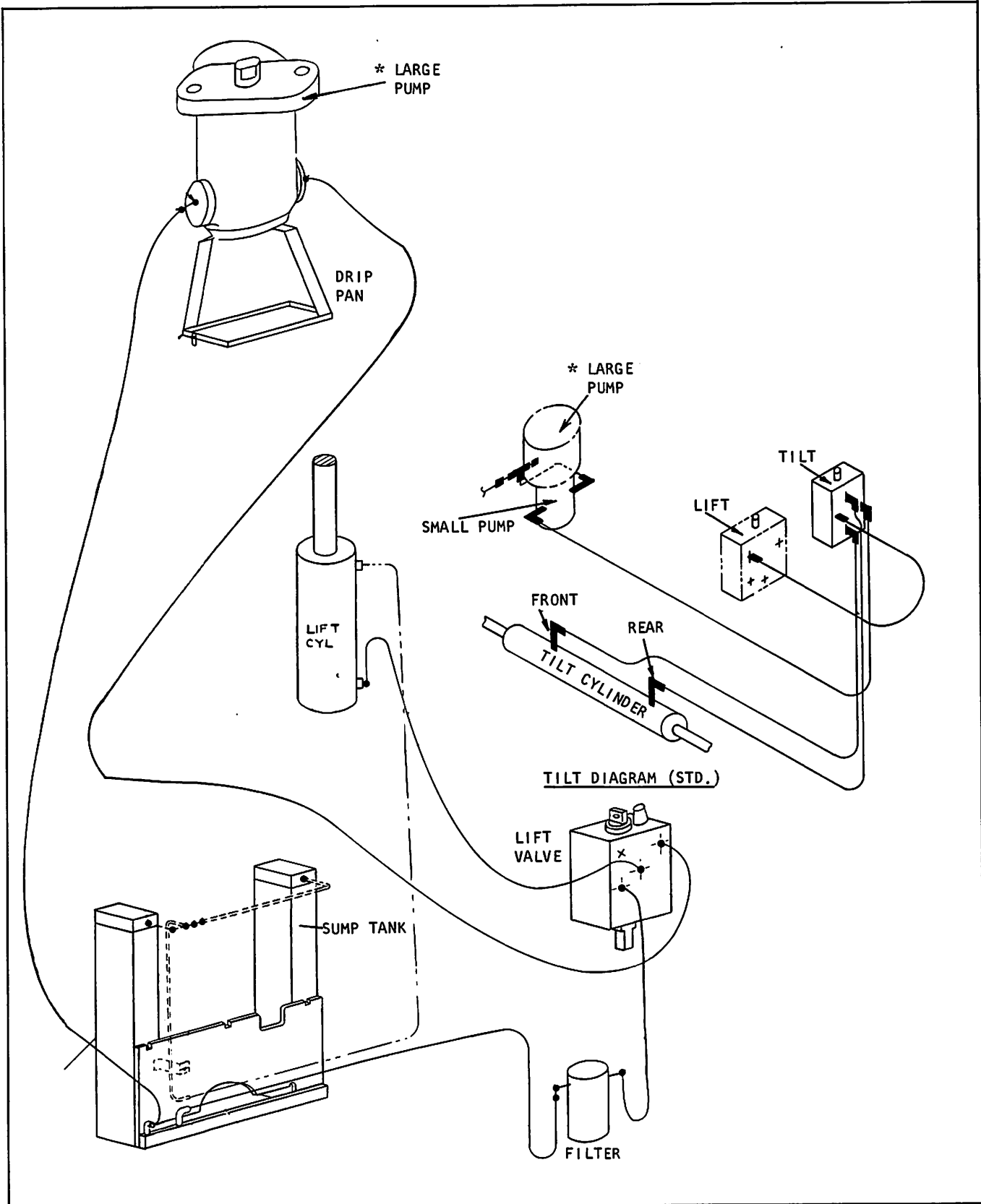
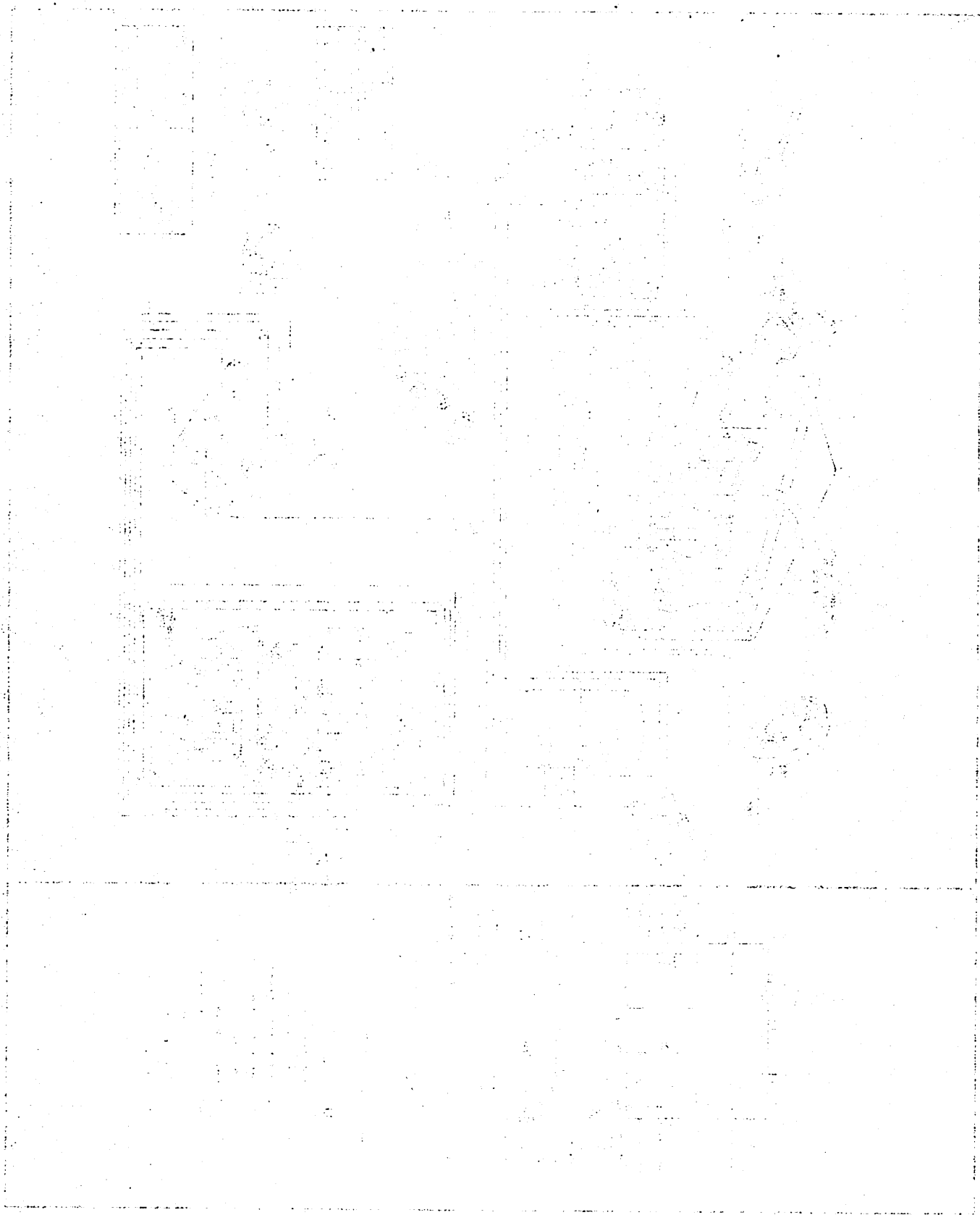


Plate 7463. NSP20, 30, 40 Hydraulic Circuit Diagram

SECRET



NS-NSP-NST/SG

GE C-185

SUBJECT: PROPER SCR CHECK OUT PROCEDURE FOR GE C 185 SYSTEM; NS-NSP and NST. IMPORTANT: Machines must be thoroughly checked before being put into service.

The attached CHECK OUT SHEET must be filled out and has to accompany the installation report before we will accept any warranty claims.

DO NOT use a motor generator unit such as Ready Power to move and/or check machines as serious damage may occur.

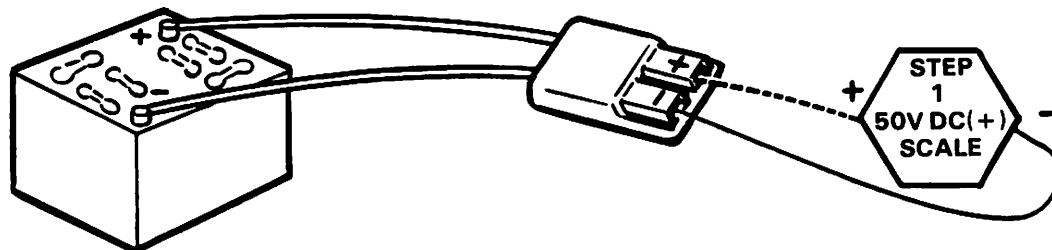
If, for any reason, a machine does not comply with the adjustment, inspection and test procedures, the figures you enter on the check out sheet will have to be known prior to contacting the factory.

The following checks MUST be made with a Simpson V-O-M 260 Meter or equivalent.

NOTE: IF METER READINGS ARE NOT WITHIN SPECIFICATIONS OF EACH STEP, REFER TO ADDITIONAL TROUBLESHOOTING INSTRUCTIONS FOLLOWING THE CHECK OUT PROCEDURE. DO NOT CONNECT BATTERY UNTIL STEP 7.

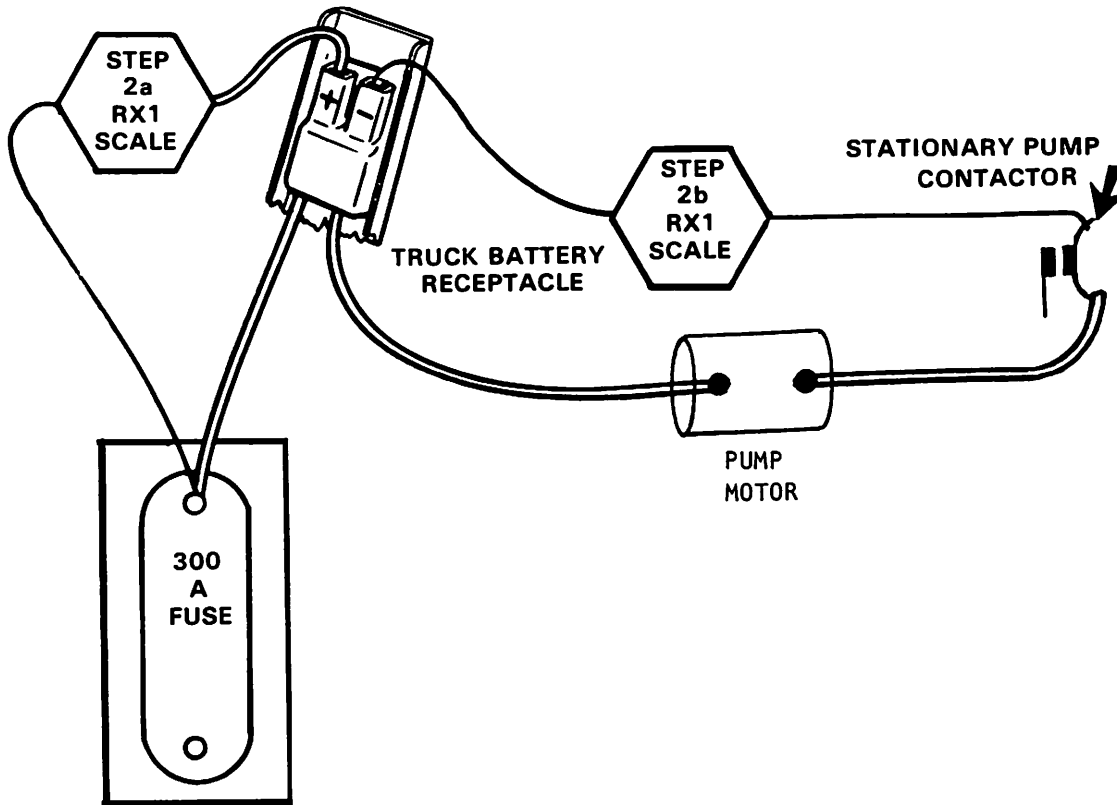
1. CHECKING BATTERY POLARITY & BATTERY VOLTAGE.

With voltmeter set on the 50 V DC (+) scale, place the red lead on positive (+) and the black lead on negative (—) battery connector. You should read battery volts. If meter needle moves backwards, the power cables are connected wrong in the battery and should be reversed before connecting battery to machine.



2. CHECKING TRUCK POLARITY. Checking continuity of power cables for proper polarity.

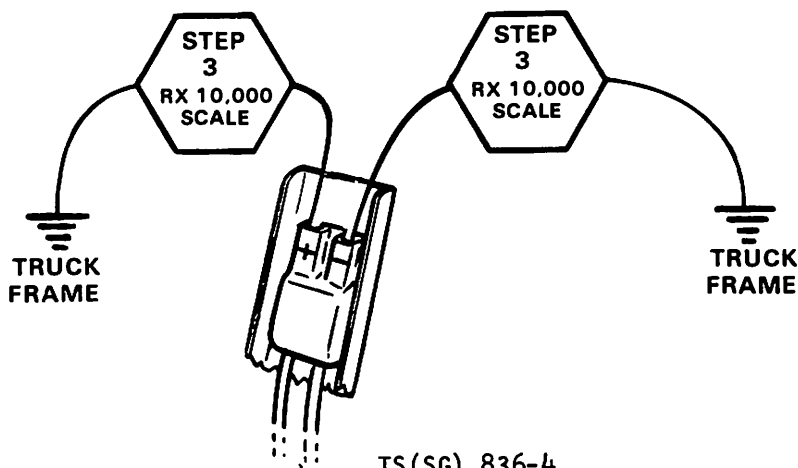
- a. With ohmmeter on RX1 scale, either lead red or black on the positive side of truck battery receptacle, the other lead on the 300A fuse. Should have no resistance.
- b. Still on the RX1 scale, either lead red or black on the negative side of truck battery receptacle, the other lead on the stationary pump contactor power tip, should have no resistance.



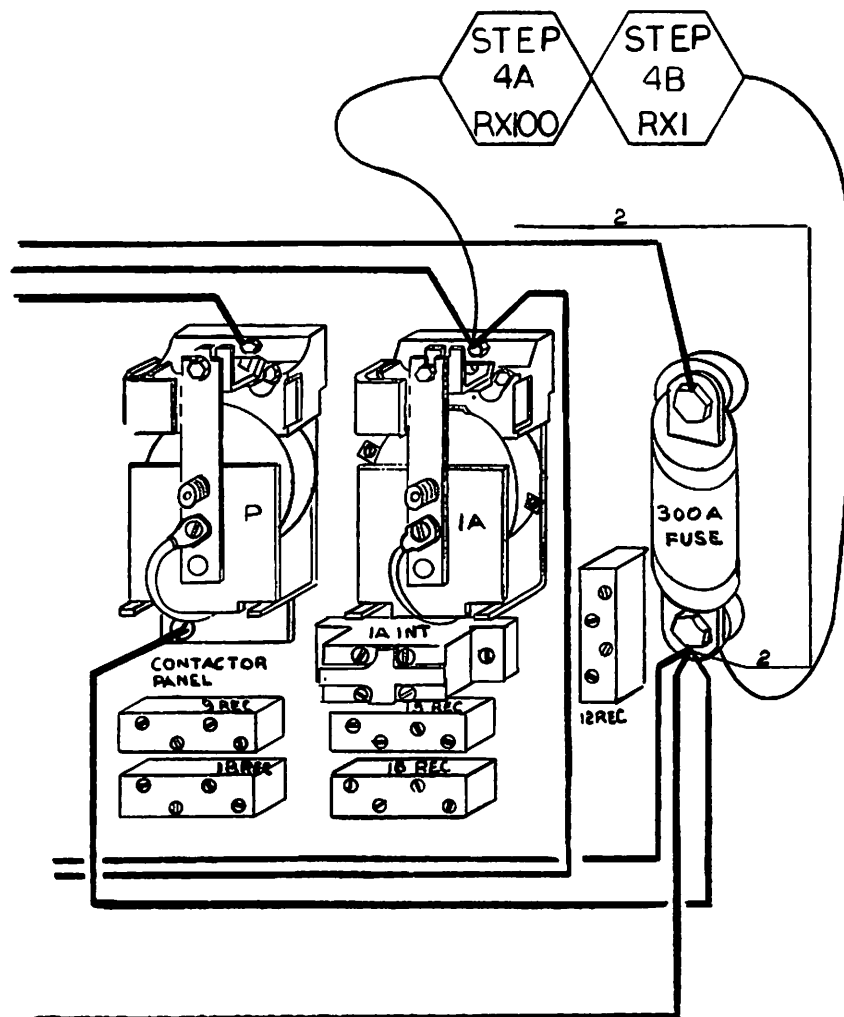
3. GROUND TEST.

With ohmmeter set on RX 10,000 ohm scale, check for grounds.

- a. Positive (+) of truck receptacle to truck frame.
 - b. Negative of truck receptacle to truck frame. With 1A contactor held closed.
- Resistance for 3a and 3b should be 50,000 ohms or higher on new trucks, 30,000 ohms is acceptable on used trucks.

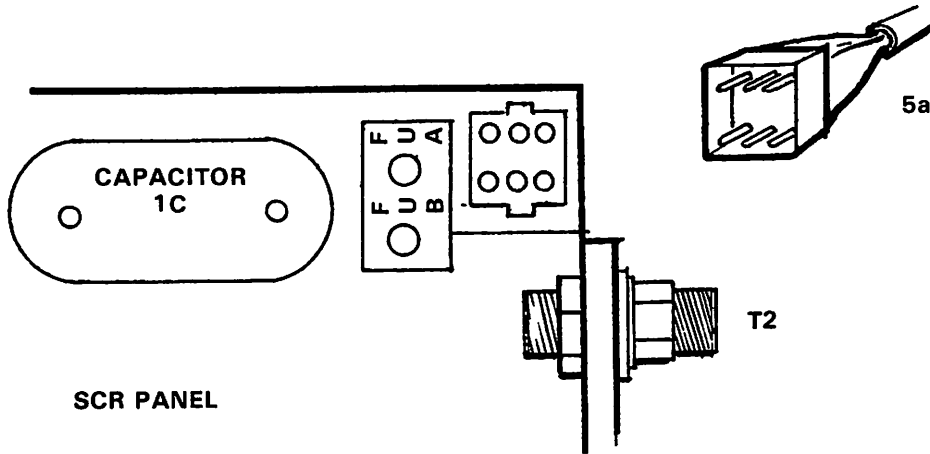


4. CHECKING CONTROL WIRING USING OHMMETER.
 - a. With all switches open, measure 1500 ohms (to infinity) between wires 2(+) on the 300 amp fuse and 13 (-) on the stationary 1A contactor power tip.
 - b. Close key and deadman switches. Place directional lever in forward and measure 30 or more ohms between wires 2(+) and 13(-) (RX1 scale). Remove back up light wire (if used) at Rev. contactor. Repeat above check with directional lever in Rev.



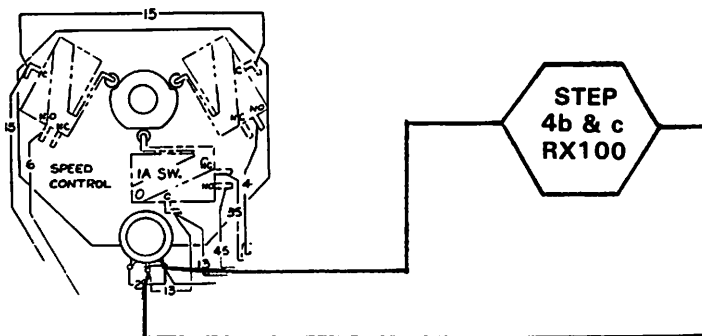
5. CHECKING SPEED POT, F, R AND 1A SWITCHETTE OPERATION.

a. Disconnect plug from SCR panel.



b. Connect ohmmeter (RX100 scale) on wires 29 and 13(—), push directional lever forward until forward start switch clicks. Meter at click should read between 5000 and 6000 ohms when control is moved slightly. Make same check with directional lever in rev.

c. With ohmmeter still connected to wires 29 and 13(—), push directional lever forward completely. 1A switch should click, meter at click should read 200 ohms or less when control hits stop. Make same check with directional lever in rev.



d. Reconnect plug in SCR panel.

6. CHECKING CONTACTORS MANUALLY.

Before connecting battery, manually push the armature plate in until power tips contact and wipe. NOTE: Interlocking switchette should not actuate until after power tips make contact. This check is performed to detect contactor binding, switchette operation and wire interference with contactor tips.

THE BATTERY SHOULD BE FULLY CHARGED AND SPECIFIC GRAVITY 1.250 OR HIGHER. CAUTION: DO NOT USE ANY OTHER POWER SOURCE — BATTERY ONLY AND WITH NO POWER CABLE EXTENSIONS.

NOTE: If fault detector is used, jump 61 and 65 wires.

7. CONNECT BATTERY. CHECK CONTACTORS ELECTRICALLY. — key on, deadman switch closed.

a. Make the following voltage test with the pump contactor and the forward and reverse contactors isolated with a piece of cardboard between power tips prior to connecting the battery. Disconnect wire #45 on the 1A switch located on the speed control to isolate "1A" contactor.

b. With insulator in normally open power tip gaps of contactors, electrically operate F & R. With F contactor closed, depress R contactor armature plate and F coil should drop out and vice versa. This is an interlocking switchette check.

Remove jumper from 61 and 65 wires.

8. CHECKING CREEP SPEED.

a. Remove insulator from F & R contactors and close directional switch. Adjust creep speed on Card 1 as desired. Approx. 1 RPM of drive wheel.

WITH DRIVE WHEELS JACKED UP AND INSULATOR IN POWER TIP GAPS OF 1A CONTACTOR, CHECK MAXIMUM SPEED VOLTAGE AND CURRENT LIMIT. THESE ADJUSTMENTS HAVE BEEN PRESET AT THE FACTORY AND SHOULD NOT REQUIRE ADJUSTMENT.

9. CHECKING SPEED VOLTAGE AND CURRENT LIMIT.

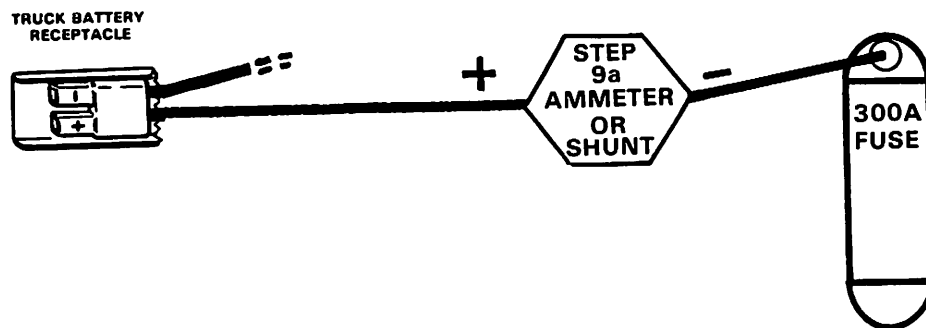
NOTE: DO NOT STALL MOTOR FOR MORE THAN 30 SECONDS AT A TIME. ALLOW TIME FOR MOTOR COOLING BETWEEN STALLS. DO NOT OPERATE MOTOR AT HIGH SPEEDS OR REVERSE DRIVE MOTOR WITH DRIVE WHEELS JACKED UP.

Equipment required:

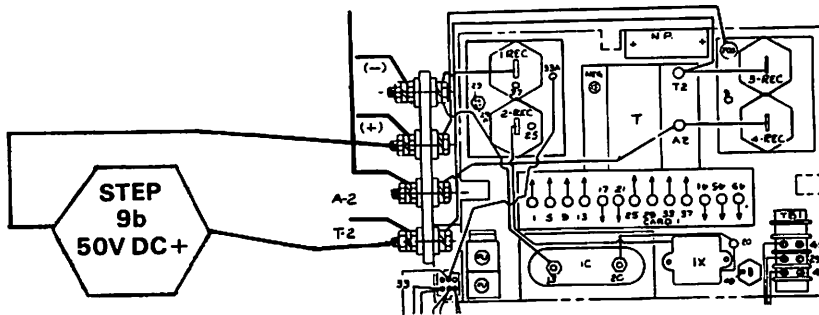
1. Volt Ohmmeter, Simpson 260-5P or equivalent.

2. Sun ammeter (part number 1800979) or 50 MV 600 amp shunt and 50 MV 600 ammeter.

a. Disconnect the positive power cable from 300A fuse and connect the ammeter (or shunt) between the power cable and the 300A fuse.



- b. Connect the volt meter between the positive terminal and T2 on the S.C.R. panel.



NOTE: 45 wire is still disconnected for C and D test.

- c. Check maximum speed voltage first by moving the directional lever to full SCR speed position and applying the brakes until battery current is 60 to 70 amps. Volt meter reading should be 16-18 volts. If not, adjust the top SCR speed on Card #1.
- d. Now check current limit by moving the directional lever to the full power position and applying the brakes until the wheels come to a standstill. There must be no rotation of drive wheel for this check. The meter should read between 190 amps minimum -- 210 amps maximum. If not, adjust current limit potentiometer on Card #1.

10. OPERATION.

Reconnect wire #45 and check 1A contactor pick up time for approximately 1 sec. With wheels on the ground, give truck a general operational check out, including plugging without load from various speeds. Adjust plugging distance with trimpot on Card #1 as desired (CW to decrease distance).

Table 1

Failures Which Cause No Motor Torque With SCR Control

SYMPTOMS	WHAT TO DO
<p>1A. Contactors do not pick up. No control voltage from positive to negative.</p>	<ul style="list-style-type: none"> ● Check power fuses. ● Check battery for low specific gravity and connections for looseness or broken fittings.
<p>1B. Contactors do not pick up. Control volts present from positive to negative.</p>	<ul style="list-style-type: none"> ● (For these tests, if fault detector is used, disconnect wire 24 from fault detector terminal 3). ● (See NOTE 1) Connect jumper from battery positive to positive side of F or R coil. If device does not pick up, check coil for continuity. Also jumper negative to opposite terminal to check for opens in negative connections. ● (See NOTE 1) With jumper on battery positive move other end to wire 6 on F interlock or 4 on R interlock. Coils should pick up. This proves F and R electrical interlocks. ● (See NOTE 1) Using jumper continue to check remaining components in circuit such as directional switch, brake switch, seat switch and key switch by moving end of jumper to positive side of each of these devices.
<p>1C. Contactors close. No power and no SCR hum with accelerator in SCR range.</p>	<ul style="list-style-type: none"> ● (See NOTE 1) With F or R picked up and wire 45 disconnected at SCR terminal board, check for control volts positive at SCR terminal board (wire 41) to negative (wire 13A). If there is zero volts at this point, check F or R normally open interlocks and 1A coil for continuity. ● (See NOTE 1) With F or R picked up and wire 45 disconnected at SCR terminal board, check for control volts positive at 1 REC heat sink (wire 33) to negative (wire 13A). If there is zero volts at this point, check: FUB, F or R power tips, and continuity of wiring from battery positive to 1 REC heat sink.

NOTE 1: Drive wheels should be off the floor.

1C (Continued)

- (See NOTE 1) With F or R picked up and wire 45 disconnected from SCR terminal board, measure approximately 3 volts from (wire 29) to negative (wire 13A) with directional lever pot near creep speed. Volts will drop to zero as accelerator is moved toward full speed. If readings are not correct, first place a jumper wire between wires 29 and 29A which bypasses the thermal protector. Depress the directional lever and check for the above voltage. If voltage readings are correct, replace thermal protector.

If the above tests will produce no voltage change, place a jumper between wires 29A and 13A. This bypasses the speed pot and the truck should now run at top SCR speed. If top speed is obtained, check speed pot per Table 4I. If motor fails to operate, check card per Table 4A.

1D. Contactors close, but very little power and high-pitch SCR hum.

- Check 1 REC for open circuit or open gate (See 4H).
- Check card (See 4A).

1E. Contactors close. Very little or no power with low SCR hum, even when accelerator is in top SCR position.

- Check 2 REC for a shorted condition in the conducting direction (See 4H).
- (See NOTE 1) Disconnect wire 5A from 3 and 4 REC heat sink and wire 9 from F and R contactors. Reapply power and if control operates normally, replace card.
- (See NOTE 1) Check setting on card, creep speed and top speed. Also if current limit is full counter-clockwise speed will be slow.

1F. Contactors close. Very little power with a normal SCR hum.

- Check 3 REC for open condition (See 4G). If 3 REC is found to be open, check 1, 2, and 5 REC for proper operation.
- Check 4 REC for short (See 4G).

NOTE 1: Drive wheels should be off the floor.

Table 2

Failures Which Cause Full Motor Torque With SCR Control

SYMPTOMS	WHAT TO DO
<p>2A. Contactors close. Full SCR speed immediately with audible hum.</p>	<ul style="list-style-type: none"> ● Check potentiometer for proper resistance (see 4I). ● Check for grounds in wires 29 and 29A or shorted accelerator pot.
<p>2B. Contactors close. Full speed immediately with no audible hum.*</p>	<ul style="list-style-type: none"> ● Check for welded power tips on 1A contactor. ● Check timer section of card (See 4Ad).
<p>2C. Contacts close. Full speed immediately with no audible hum.* <u>Capacitor not charged.</u></p>	<ul style="list-style-type: none"> ● Check for open gate circuit to 5 REC (See 4H and 4Aa). ● Check 5 REC for shorted condition (see 4H). If 5 REC shorted, also check 4Ac. ● Check continuity of wiring from 1C to 5 REC and from 5 REC through T3, T4 to T1 and 1 REC wire 33. ● Check capacitor 1C (See 4D). ● Check 1 REC for short (See 4H).
<p>2D. Contactors close. Full speed immediately with no audible hum.* <u>Capacitor Charged.</u></p>	<ul style="list-style-type: none"> ● Check for open 2 REC (See 4H). ● Check for open gate in 2 REC (See 4H). ● Check for open gate circuit to 2 REC (See 4Ab).

* If truck is equipped with a fault detector and it fails to shut down the control on the above faults, check fault detector per GEK-7940.



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3F. Severe reversal.

- Adjust static-plug trimpot on Card 1, turning the pot counterclockwise for softer plug.
- Check 4 REC (See Table 4-E).
- Check current limit (See Table 5).

3G. Severe reversal.
(Deceleration smooth but severe as vehicle changes direction).

- Check adjustment and operation of timer card. (See Table 4B).

3H. Reversal too soft.

- Check static-plug trimpot on Card 1 (Adj. clockwise to stiffen plug).

TABLE 4
Checking Components

4A. CARD 1

Tune up card per Table 6. If these adjustments cannot be made or if control fails to operate satisfactorily, check all other components. If all check good, replace card with a known operating card.

4B. CARD 3 (1A Timer)

Disconnect leads to Card 3. Connect a voltmeter (50V scale on 36 volt battery or 250V scale on 72 volt battery) from terminal 3 to 2. Apply battery volts negative to terminal 2 and positive to terminal 1. The voltmeter should read about one volt and then raise to battery volts at the end of the timer interval, .3 to 2.5 seconds. Turning trimpot should adjust time (CW to increase). Remove battery volts and voltmeter should drop to zero.

4C. CAPACITOR 1C

Disconnect battery and discharge capacitor. Remove wire No. 34 from all capacitors. Measure ohms through each capacitor using the RX10,000 scale. Meter should read zero ohms and then swing to above 100,000 ohms. If not, replace capacitors.

NOTE: Control is arranged so that F and R do not break current. Contactor 1A drops out ahead of F or R.

4E. RECTIFIERS

When checking diodes, disconnect battery and discharge capacitor 1C to prevent burning out the ohmmeter. When reassembling hardware on rectifiers, refer to Table 5 for proper torque settings.

To check 3, 4, 15 and 16 REC, disconnect one side of the rectifier. These are diodes with about 7 to 12 ohms in the conducting direction $(\begin{array}{c} + \\ \rightarrow \end{array})$ measured with scale RX1, and infinite resistance in the non-conducting direction $(\begin{array}{c} - \\ \rightarrow \end{array})$ measured with scale RX10,000. (On some meters about 75 to 160 ohms are obtained in the conducting direction.)

Table 4

Checking Components

Before touching electrical components, disconnect the battery and discharge capacitor 1C.

4A CARD 1 (See Table 6 for tuneup of Card 1).

The following is a list of simple tests that can be performed with a volt-ohm meter. Remove card from panel by loosening two screws at bottom of box, pull box straight up to disengage from receptacle. Connection can be made to card pins with insulated clips.

a) 5 REC FIRING CIRCUIT:

VOM on RX100 scale. Connect VOM positive lead to pin 13, negative lead to pin 49, circuit should read 1700 to 2100 ohms. Reverse leads and read infinity.

b) 2 REC FIRING CIRCUIT:

VOM on RX100 scale. Connect VOM positive lead to pin 21, negative lead to pin 25; circuit should read 1170 to 1430 ohms. Reverse leads and read infinity.

c) TRANSFORMER FILTER:

VOM on RX100 scale. Connect VOM positive lead to pin 21, negative lead to pin 33; circuit should read 2050 to 2750 ohms. Reverse leads and read infinity.

d) 1A TIMER:

Connect volt-ohm meter positive to 41, negative to 45, and set scale to 50-volts d-c. Using a 36-volt test battery, connect battery positive through a 25-ohm 2-watt resistor to terminal 41. Connect battery negative through a normally open switch to terminal 45. Close switch and observe battery voltage on VOM, after approximately 1 second voltage should drop to 0 volts indicating timer action. Do not hold power on after timer turns on.

4D CAPACITOR 1C

Disconnect battery and discharge capacitor. Remove Card 1. Measure ohms through the capacitor using the RX10,000 scale. Meter should read zero ohms and then swing to above 100,000 ohms. Replace capacitor if above reading is not obtained.

4F CONTACTOR COIL AND ACCESSORY FILTER
(7, 8, 9, and 12 REC)

On some magnetic panels, the contactor coils will either be varnish tape-wound or encapsulated in green epoxy. For the varnish tape-wound type, a separate filter is required and will be mounted adjacent to the coil. The new green epoxy encapsulated coil contains the necessary filtering and is not visible from the exterior of the device.

a) **Separate Filter (Typical Cat. No. 148B6203G14)**

These are varistors and should be checked as follows: Disconnect battery and discharge capacitor 1C. Disconnect the leads to the filter block. Connect a 36-volt d-c test battery in series with the varistor and a volt-ohm meter set on the 1ma. scale as shown in Figure 7. If the varistor is good, there will be a noticeable deflection of the meter needle when the leads are touched to the filter block terminals. If no deflection is obtained, replace the filter block.

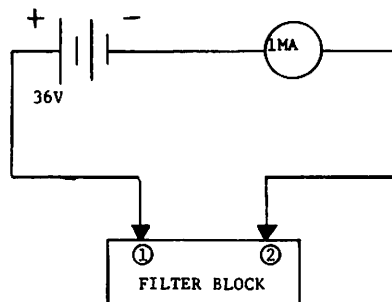


Figure 7

b) **Integral Coil Filter**

When this filter fails, it will be evident by a severe cracking of the coils in the vicinity of the coil terminals.

4G RECTIFIERS

When checking diodes, disconnect battery and discharge capacitor 1C to prevent burning out the ohmmeter. When reassembling rectifiers, refer to Table 5.

3 and 4 REC: Disconnect pigtail. 3 and 4 REC are diodes with about 7 to 12 ohms in the conducting direction ($\begin{matrix} + & \rightarrow & - \\ \text{---} & & \text{---} \end{matrix}$) measured on the RX1 scale, and infinite resistance in the non-conducting direction ($\begin{matrix} - & \rightarrow & + \\ \text{---} & & \text{---} \end{matrix}$) measured on the RX10,000 scale.

15 and 16 REC: Disconnect one lead. Check same as 3 and 4 REC above.

4H SCR'S (1 REC, 2 REC, 5 REC)

These are silicon control rectifiers. Before checking, disconnect battery and discharge capacitor 1C. Remove card and box from panel and lay aside, this opens the gate circuits to all three devices. Disconnect pigtail of 1 and 2 REC or lead to terminal of 5 REC.

To check an SCR, it is necessary to have a 3-volt battery and a 3-volt lamp. (A test flashlight such as a BRIGHT STAR No. 1618CT circuit continuity tester is excellent for this test.)

Connect the plus lead to the stud (1), connect negative lead to the pigtail (3) as shown in Figure 8.

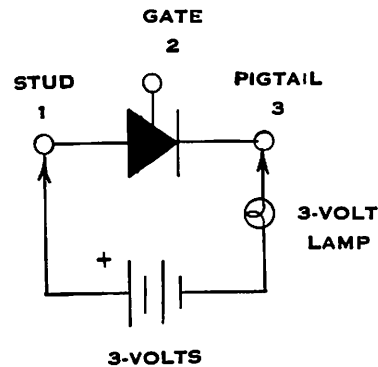


Figure 8

- The lamp should not light. If the lamp does light, the SCR is shorted and must be replaced.
- If check (a) was satisfactory, test the SCR for its ability to be turned on by the gate. Touch gate (point 2) to point 1. If gate is operative, the lamp should come on and must remain on when the gate is removed.
- If lamp cannot be lit under step (b) the SCR is open and must be replaced.

When reassembling SCR's, refer to Table 5.

4I POTENTIOMETER IN DIRECTIONAL CONTROL

To check operation of the potentiometer, disconnect battery and disconnect wire 29A from thermal protector or SCR terminal board. Connect VOM from wire 29A to negative (13A) with scale set to RX 100. With accelerator in creep-speed position, the ohm reading should be 3,500 to 6,600 ohms; with accelerator in top-speed position, reading should be 200 ohms or less. If these readings are not obtained, loosen pinion gear clamp and adjust rotation of pot shaft relative to accelerator shaft or replace.

With wires disconnected as above, check for resistance of 1 megohm or higher from pot wires to truck frame.

4J THERMAL PROTECTOR (TP)

Remove both connections from TP and with a VOM read approximately 50 ohms terminal to terminal, if heat sink is at room temperature. Set VOM to highest ohm scale and check pins to heat sink, reading should be infinity.

4K FILTER BLOCK (HF)

To check, disconnect all wires from filter block. With VOM on RX10,000 scale, touch the leads to the filter terminals to charge the filter. After a few seconds, reverse the meter leads and touch the filter terminals. The VOM needle will deflect and return to infinity. If this capacitor action is not observed, replace the filter block.



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Table 5 **Replacement of Semiconductors**

When replacing semiconductors such as 1, 2, 3, 4 and 5 REC; it is not necessary to torque these devices to a specific value. However, the device should be screwed into the heat sink and tightened to a snug fit.

The use of a heat transfer grease (such as GE Versilube G-350-M or equivalent) is recommended.

Locking devices must be properly adjusted to prevent semiconductor from becoming loose.



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Table 6

Tuneup for New or Mistuned Card 1

IMPORTANT NOTES

1. Panels are factory adjusted for a particular motor and truck and should not need adjustment when used with this motor and truck. However, checks and or touchup adjustments may be made per Table 6A because these adjustments are so designed that they do not interact when near their proper setting.
2. The TOP SCR SPEED setting is a factory made and sealed setting! Under normal conditions, this setting should not be touched. If setting is required, the complete tuneup procedure, Table 6B, must be followed.
3. If the panels are used to control motors or trucks for which they were not factory adjusted, the settings may be out of optimum adjustment to the extent that they do interact and the complete tuneup procedure, Table 6B, must be followed.
4. All adjustments are such that CW rotation increases function being adjusted.
5. Connect the shunt, the millivoltmeter and the voltmeter to measure battery current and motor volts. Connect the shunt and millivoltmeter between battery negative and 1 REC (or between truck receptacle and battery plug.) Connect voltmeter between battery positive and T2 on the SCR panel. Remove wire 29 from the thermal protector and connect a jumper from wire 29 to negative (pigtail of 1 REC).

NOTE: Be sure to insulate or wrap the jumper connection to wire 29 to prevent accidental contact of this point to the truck frame. If this point touches the truck frame, it will damage the control card.

Jack up the truck so that the drive wheels are free to rotate.
If a brake interlock is used, jumper it out so that power and brakes can be applied at the same time.

6. Equipment required:

50-millivolt d-c shunt*

50-millivolt d-c meter (d'Arsonval movement)

50-volt d-c meter (d'Arsonval movement) (250 volt scale needed for 72V)

Battery with equal or greater ampere-hour capacity than used on truck, charged to 1200 or higher specific gravity.

* Typical Shunt Ratings	SCR Model
200 Amp	100
300 or 400 Amp	200
400 or 500 Amp	300

NOTE: Shunt rating must be greater than current to be measured. Best results are obtained when reading is between half and full scale on meter. If a shunt of too high a rating is used (ie. a 500 amp rating to read 100 amps), it will be hard to read and the accuracy of the reading will be poor.

7. Check that the ohms in accelerator potentiometer are less than 200 ohms in top SCR range (See Table 41). Refer to Figure 3 for potentiometer locations.



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Table 6A Checking of Card Settings

Checks and/or minor touchup adjustments can be made without following complete tuneups as given in Table 6B.

a) **CREEP SPEED**

With truck on the ground check creep speed of truck as F or R contactor operate.

b) **TOP SCR SPEED**

Refer to Note 5.

Check TOP SCR SPEED by first moving the accelerator until the F or R contactor operate.
Do not move accelerator to the point where 1A picks up.

Apply brakes until battery current reads per the value as given in Table 6Bd and read motor volts to see if it falls within values given in Table 6Bd.

Disconnect shunt, voltmeter, and jumper to wire 29, and reconnect wire 29 on the thermal protector.

c) **CURRENT LIMIT**

Refer to Note 5.

Check CURRENT LIMIT by first moving the accelerator until the F or R contactor operate.
Do not move accelerator to the point where 1A picks up.

Apply brakes until wheels come to a STANDSTILL (the wheels must not be turning) and read current to see if it falls below the maximum rating given in Table 6Bd and within the rating specified by the truck manufacturer.

NOTE: DO NOT STALL the motor for more than 30 seconds at a time. Allow time for motor cooling between stalls. Do not operate motor at high speeds or plug the motor with wheels jacked up.

Disconnect shunt, voltmeter, and jumper to wire 29, and reconnect wire 29 on the thermal protector.

d) **STATIC PLUGGING**

With truck on the ground plug truck from top speed. If stopping distance is not as desired, adjust plugging trimpot.

NOTE: There may be a coarse trimpot adjustment on the card accessible from the slot on the side of the card box.

e) **1A TIMER**

With truck on the ground check operation on a full acceleration. If 1A contactor picks up too early or if truck is sluggish, adjust trimpot to obtain desired operations.

Table 6B
Tuneup Procedure

COMPLETE ALL STEPS a thru e.

- a) Turn CURRENT-LIMIT trimpot fully clockwise.
- b) Turn PLUGGING trimpot fully clockwise. (Steps a and b prevent any interaction when setting the speed adjustment.)
- c.) Adjust CREEP SPEED as desired.
- d) TOP SCR SPEED

Refer to Note 5

Check TOP SCR SPEED by first moving the accelerator until the F or R contactor operate. Do not move accelerator to the point where 1A picks up.

Apply the brakes until battery current is about 70 to 80 percent of the loaded level amperes with motor directly across the battery and motor fields connected the same as are used in the SCR control.

<u>Typical Battery Current</u>	<u>SCR Model</u>
45 - 50 Amps	100
75 - 80 Amps	200
120 - 130 Amps	300

Adjust the TOP SCR SPEED trimpot until the voltmeter reads motor volts as indicated below:

<u>Battery Volts</u>	<u>Motor Volts</u>	<u>CURRENT LIMIT AMPS (MAXIMUM)</u>		
		<u>C155 Model 100</u>	<u>C185 Model 200</u>	<u>C290 Model 300</u>
12	7 - 9	100	200	300
18	13 - 16	100	200	300
24	17 - 22	100	200	300
36	25 - 32	100	200	300
48	34 - 43	NA	185	300
72	50 - 65	NA	150	300

e) CURRENT LIMIT

Turn the current limit trimpot fully counterclockwise. When the trimpot is fully counterclockwise, the card is designed so that the control may be cut off (no pulsing occurs).
 Check to be sure the plugging trimpot is turned fully clockwise.
 Depress the accelerator until F or R operate but not the 1A contactor.
 Apply the brakes until the wheels come to a standstill and remain at a standstill.
 Slowly turn the CURRENT LIMIT TRIMPOT in a clockwise direction until the current reaches a value as shown in the above table, or as specified by the truck manufacturer.

NOTE: The current limit values as given in the table above represent the typical maximum values that we suggest for each control when operated on a given voltage and these values must not be exceeded.



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Since these controls are used on a variety of types and sizes of trucks for various applications, it is common for the truck manufacturer to set the current limit at some value below the maximum. For this reason it is recommended that you obtain the actual current limit setting for your particular truck from the truck manufacturer.

NOTE: Do not stall the motor for more than 30 seconds at a time. Allow time for motor cooling between stalls. Do not operate motor at high speeds or plug the motor with wheels jacked up.

After setting to correct value, disconnect meter and reconnect wire 29 to the thermal protector.

f) STATIC PLUGGING

To adjust the static plugging, the truck should be in its normal running condition and on the ground. Turn the PLUGGING trimpot fully counterclockwise (this may cut off control operation no pulsing). This will give the longest distance for stopping. If pulsing of the control has stopped, turn plugging trimpot clockwise (clockwise rotation decreases stopping distance) until control just starts to pulse. Then turn the trimpot about 30 degrees more clockwise rotation and try truck for stopping distance. If stopping distance is too short or too long, continue to adjust trimpot until desired stopping distance is obtained.

If the desired stopping distance cannot be obtained, there may be a coarse trimpot adjustment on the card that is accessible from the slot on the side of the card box. This may be turned CW or CCW to give extended range to the normal plugging trimpot.

g) 1A TIMER

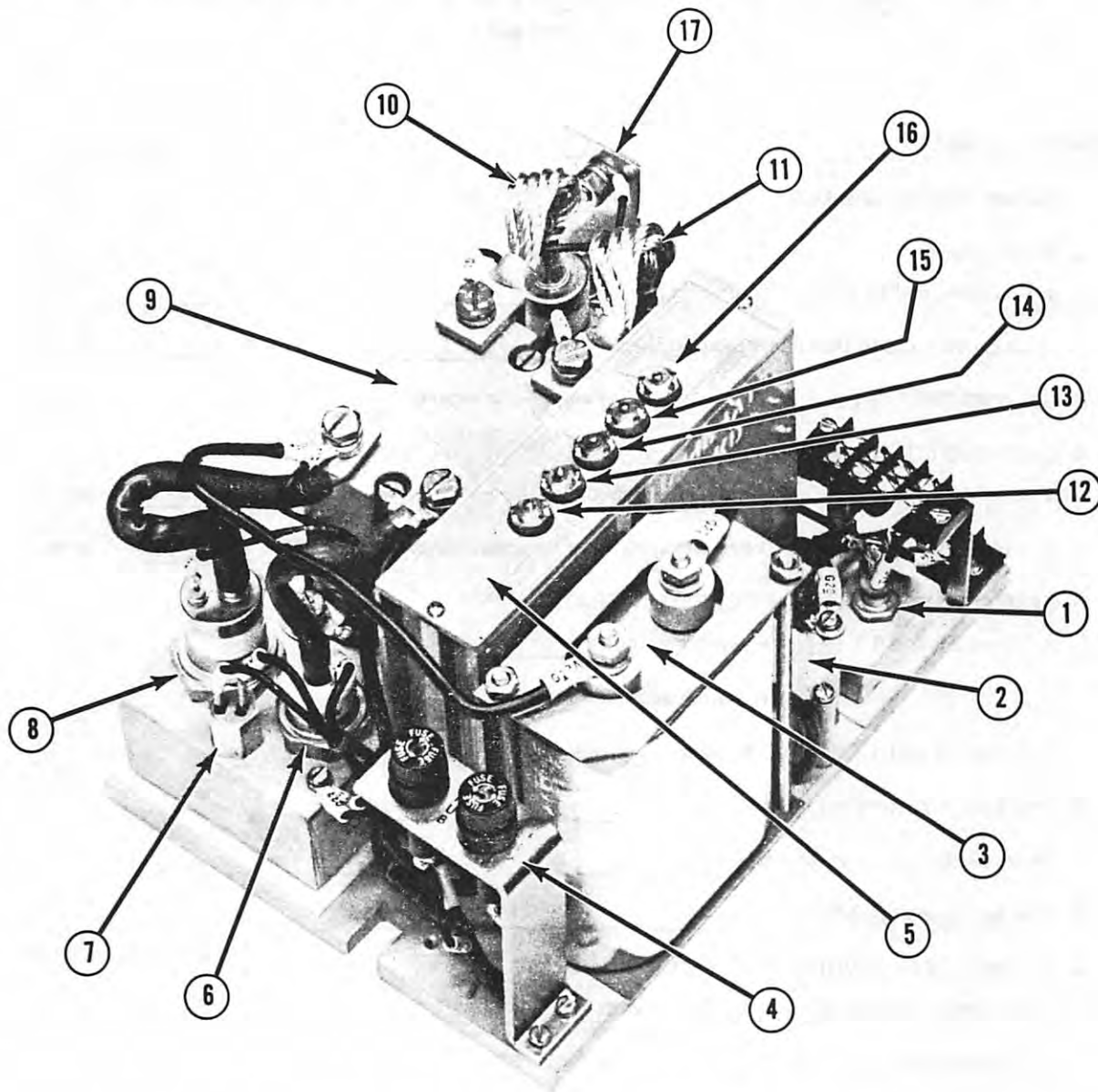
The 1A TIMER is factory set at approximately 1 second on all models.

Check truck performance. If the 1A contactor picks up too early, resulting in jerky operation, turn the 1A Timer trimpot CW to increase time delay, to a value that provides desired operation.

After all the trimpots have been set, each should be sealed with a silicon rubber compound such as RTV (bath-tub sealer). This will discourage further adjusting by unauthorized personnel.

TYPICAL PHYSICAL ARRANGEMENT AND IDENTIFICATION OF COMPONENTS

(Refer to wiring diagram furnished with truck for precise arrangement of components.)



- | | |
|-----------------------------------|---------------------------------|
| (1) BLOCKING SCR (5 REC) | (9) PULSE TRANSFORMER (1T) |
| (2) CURRENT-LIMITING REACTOR (1X) | (10) FLY-BACK DIODE (3 REC) |
| (3) COMMUTATING CAPACITOR (1C) | (11) PLUGGING DIODE (4 REC) |
| (4) CONTROL CIRCUIT FUSES | (12) CREEP-SPEED ADJUSTMENT |
| (5) OSCILLATOR CARD (CARD 1) | (13) TOP-SPEED ADJUSTMENT |
| (6) TURN-OFF SCR (2 REC) | (14) STATIC-PLUGGING ADJUSTMENT |
| (7) THERMAL PROTECTOR | (15) CURRENT-LIMIT ADJUSTMENT |
| (8) MAIN SCR (1 REC) | (16) 1A TIMER ADJUSTMENT |
| | (17) PLUGGING SENSOR |

Figure 9—Typical SCR Static Panel.



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DEALER CHECK-OUT SHEET FOR GE C-185 SYSTEM NS, NSP, NST

Truck Serial No. _____ Date _____

1. Battery Polarity Checked? _____ Battery Voltage _____ Volts

2. Truck Polarity _____ Specific Gravity _____

a. Positive Lead to 300A fuse Checked? _____

b. Negative Lead to Pump Contactors Checked? _____

3. GROUND TEST (+) to Frame _____ ohms, (-) to Frame _____ ohms.

4. CHECKING CONTROL WIRING.

a. Term's 2 (+) to 13 (-) (all switches open) _____ ohms

b. Term's 12 (+) to 16 (key, deadman & directional switches closed) _____ ohms

5. SPEED POT, F, R, & 1A SWITCHETTE OPERATION

a. Wires 29 and 13 (-) — F switch actuates _____ ohms.

R switch actuates _____ ohms.

b. Wires 29 and 13 (-) — 1A switch actuates _____ ohms.

6. Checked contactors manually? _____

7. Checked contactors electrically? _____

8. Checked creep speed? _____

9. CHECKING SPEED VOLTAGE AND CURRENT LIMIT

c. Maximum speed voltage _____ volts.

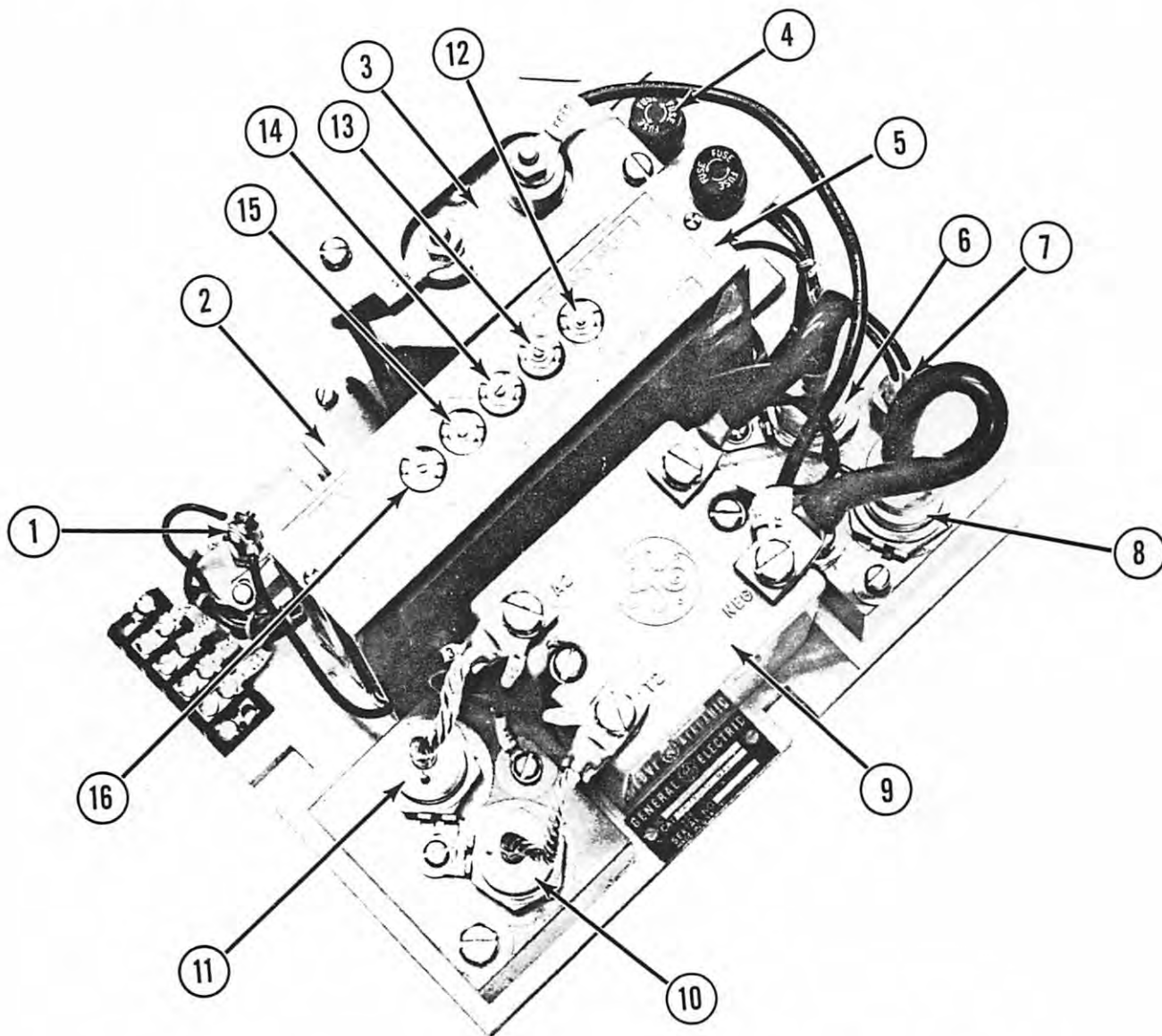
d. Current limit _____ amps.

Adjustments sealed on card 1.

Mechanic _____ Hour Meter Reading _____

TYPICAL PHYSICAL ARRANGEMENT AND IDENTIFICATION OF COMPONENTS

(Refer to wiring diagram furnished with truck for precise arrangement of components.)



- | | |
|----------------------------------|--------------------------------|
| 1. Blocking SCR (5 REC) | 9. Pulse Transformer (1T) |
| 2. Current-Limiting Reactor (1X) | 10. Fly-Back Diode (3 REC) |
| 3. Commutating Capacitor (1C) | 11. Plugging Diode (4 REC) |
| 4. Control Circuit Fuses | 12. Creep-Speed Adjustment |
| 5. Oscillator Card (Card 1) | 13. Top-Speed Adjustment |
| 6. Turn-Off SCR (2 REC) | 14. Static-Plugging Adjustment |
| 7. Thermal Protector | 15. Current-Limit Adjustment |
| 8. Main SCR (1 REC) | 16. 1A Timer Adjustment |

Figure 9 — Typical SCR Static Panel.

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