CLARK EQUIPMENT INDUSTRIAL TRUCK DIVISION CLARK EQUIPMENT

OPERATORS MANUAL

ELECTRIC CLARKLIFT	EC30E
ELECTRIC CLARKLIFT	EC40E
ELECTRIC CLARKLIFT	EC50E

1st REVISION

0-217-1

CLARK EQUIPMENT COMPANY

PUBLISHED BY

TECHNICAL SERVICE DEPARTMENT,

BATTLE CREEK, MICHIGAN, U.S.A.

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.

Example: (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

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INDUSTRIAL TRUCK DIVISION

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TROUBLE SHOOTING GUIDE

CLARK EQUIPMENT

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CLARK EQUIPMENT

LUBRICATION AND PREVENTIVE MAINTENANCE

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

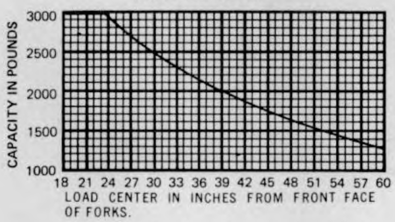
SPECIFICATIONS FOR EC30E

EC-30-E

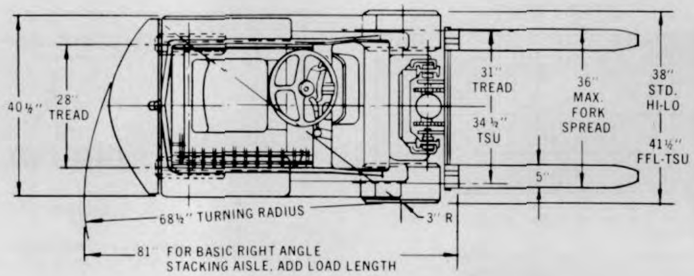
36 VOLT CLARKLIFT ELECTRIC

3,000 pound capacity at 24 inch load center

CAPACITY CHART



—Rated capacities shown above are computed with uprights in vertical position. Lifts above 154" maximum fork height, contact factory. Specific capacities will be shown on truck nameplate.



UPRIGHT DIMENSION TABLE

MFH		Overall Height Lowered	FREE LIFT	
Std. & Hi-Lo	FFL TSU		Std.	Hi-Lo & FFL TSU
*106	*153	71	16	50½
112	162	74	16	53½
118	*171	77	16	56½
124	180	80	16	59½
*130	*189	83	16	62½
136	—	86	16	65½
—	198	88	—	67½
142	—	89	16	68½
148	—	92	16	71½
—	207	93	—	72½
*154	—	95	16	74½
—	216	98	—	77½
160	—	99	16	78½
166	—	102	16	81½
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172	—	106	16	85½
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184	—	112	16	91½
190	—	116	16	95½
196	—	121	16	100½
202	—	124	16	103½

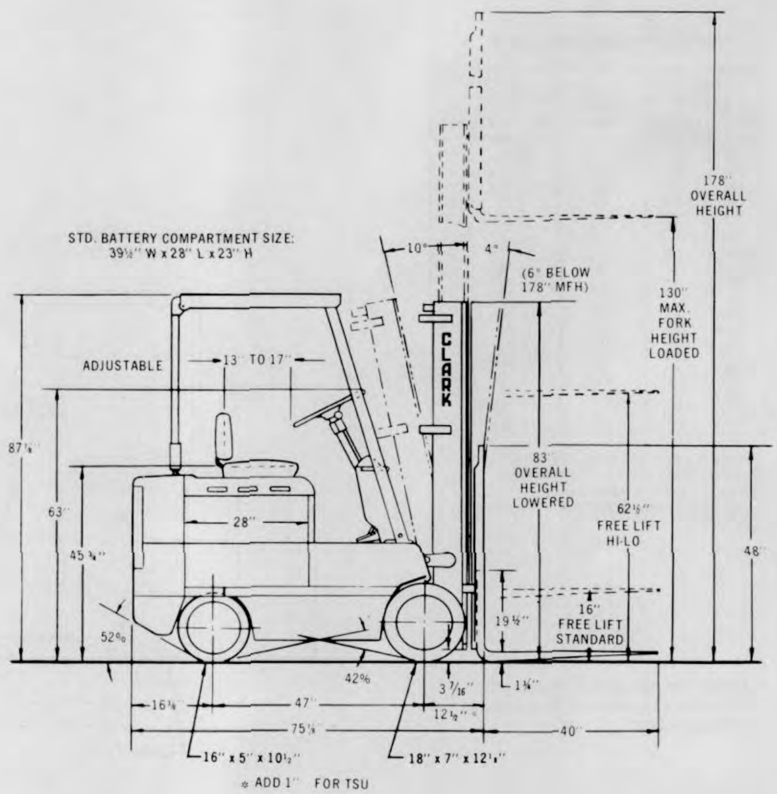
For overall height fully raised, add 49" to maximum fork height with LBRE; 20⅛" without LBRE.

Indicates preferred standard sizes.

Intermediate Heights Available in Increments of 3" MFH.

CERTIFIED BY CLARK ENGINEERING DEPT.

Clark products and specifications are subject to improvements and changes without notice.



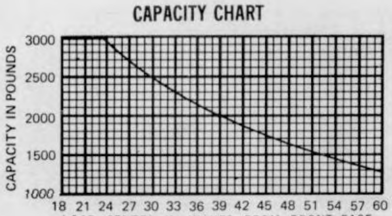
SPECIFICATIONS FOR EC30E

EC-30-E

48 VOLT CLARKLIFT ELECTRIC

3,000 pound capacity at 24 inch load center

CAPACITY CHART



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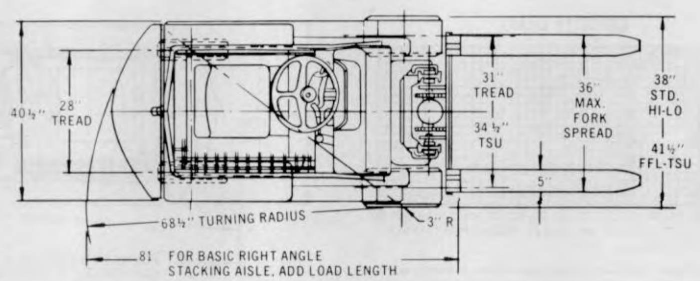

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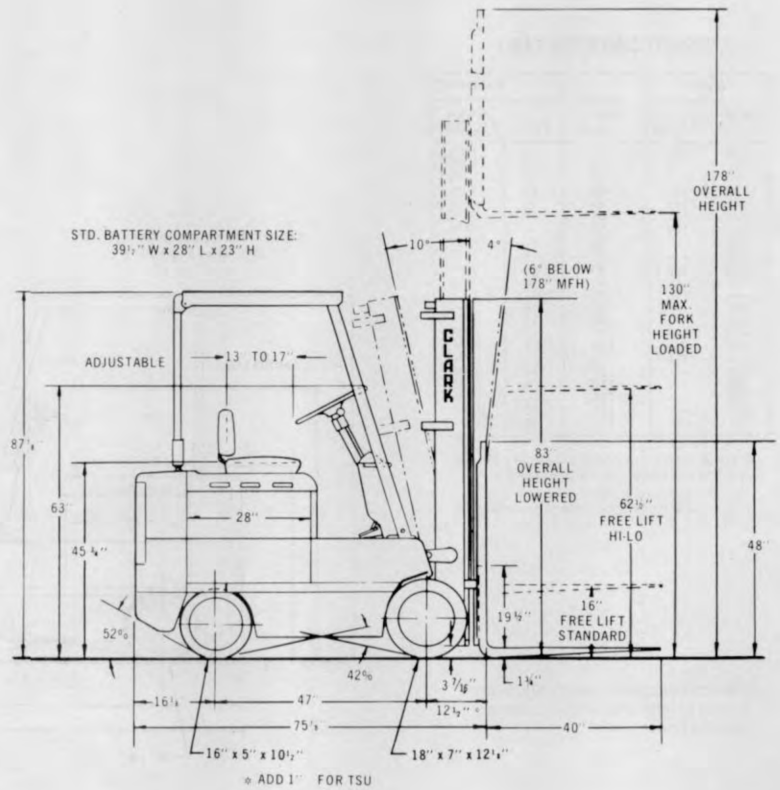

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INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

SPECIFICATIONS FOR EC30E

GENERAL:

Type of vehicle .... Electric Clarklift

HYDRAULIC SYSTEM:

Relief setting (PSI) 1850-1900

Hydraulic Pump (gear type):

Max. pressure .... 2500 PSI

Sump filter (cleanable):

Micron size 25

Capacity (GPM) 15

By-pass relief (PSI) 2.5

Sump Tank Capacity .... 4 1/2 gal.

Sump Tank Breather .... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)........
.... 800

Steering wheel turning diameter (Inside drive tire) .... 4 in.

* With Standard Battery Compartment

WHEELS AND TIRES:

Front (size) 18x9x12 1/8

Rear (size) 16x5x10 1/2

Single Drive:

Tread (drive tires) .... 31 in.

Tread (steer tires) .... 28 in.

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel .... 115 to 150

2. Drive wheel;

a. Wide drive axle ends .... 275 to 350

b. All others .... 275 to 350

3. Axle Mounting Ring Bolts:

Body Fit .... 950 to 1000

Tapered Head .... 650 to 700

4. Counterweight bolt .... 175 to 225

4A. Counterweight extension bolts.. 375 to 425

5. Pitman arm locknut....... 100 to 140

6. Outboard Pitman shaft support bolts ....
.... 60 to 70

7. Tilt cylinder yoke clamp bolt ....
.... 80 to 90

8. Hand wheel to steer gear shaft nut ....
.... 35-40 lbs ft

9. Pump motor mounting nuts .... 218 lbs ft

10. Counterweight to spacer mounting bolts.....
.... 375-425 lbs ft

11. Axle end to adaptor bolt ....
.... 200 to 250 lbs ft

12. Axle end to adaptor Stud ....
.... 180 to 200 lbs ft

13. Axle end to adaptor stud nut ....
.... 180 to 200 lbs ft

14. Steer axle mounting bolts - silent block to axle .... 130 to 180 lbs ft

15. Motor mounting bracket to motor and frame bolts .... 75 to 85 lbs ft

16. Steer sector mounting bolts .... torque 60-70 lb/ft

17. Tilt cylinder rod end lock bolt .... torque 80-90 lb/ft

18. Steer cylinder rod end lock bolt .... torque 25-30 lb/ft

RIGHT FOOT BRAKE PEDAL:

Free play .... 3/8-1/2 in.

Parking Brake Effectiveness:

Brake must be capable of holding a truck with fully rated load on a maximum grade of up to .... 15 %

Greadeability with rated load @ 1 MPH ....
.... 10 %

POWER SUPPLY, 36 Volts:

Lead acid battery in steel trays 30 to 36volt, having adequate kilowatt hours capacity.
15 cells, 21 to 23 plate, 3 x 5 layout
16 cells, 19 plate, 4 x 4 layout
18 cells, 19 to 27 plate, 4 x 5 layout
Exide Types: TG, TGP, TSC
Gould Types: 60X, 72X, 72T, 85T
C & D Types: HC, HYL, CDS, HY
K-W Types: FH, HT

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

SPECIFICATIONS FOR EC30E

POWER SUPPLY, 36 Volts Continued:

For Ready Power installation, contact factory
For Nickel-Alkaline batteries, contact factory
Standard compartment size ....
39 1/2" W x 28" L x 23" H
Optional compartment size ....
39 1/2" W x 32 3/4" L x 23" H

POWER SUPPLY, 48 Volts:

Lead acid battery in steel trays 48 volt, having adequate kilowatt hours capacity.
24 cells, 15 to 19 plate, 6 x 4 layout
Exide Types: TG, TGP, TSC
Gould Types: 60X, 72X, 72T, 85T
C & D Types: HC, HYL, HY
K-W Types: FH, FT
For Ready Power installation, contact factory
For Nickel-Alkaline batteries, contact factory
Standard compartment size ....
39 1/2 W x 28" L x 23" H
Optional compartment size ....
39 1/2 W x 32 3/4" L x 23" H

DRIVE MOTOR:

Brush Spring Tension:

Initial .... 60-63 oz.
Final .... 40-42 oz.

PUMP MOTOR:

Brush Spring Tension:

Initial .... 60-63 oz.
Final .... 40-42 oz.

STEER PUMP MOTOR:

Brush Spring Tension:

Initial .... 28-34 oz.
Final .... 18-22 oz.

Battery Connector:

Std. - Type SB-350 AMP
Opt. - Type SB-175 AMP
Opt. - Type N-150 AMP
Opt. - Type EC-300 AMP
Opt. - Type YC-125 AMP
Opt. - Russell & Stoll - 100 AMP
Opt. - Yale & Towne - 125 AMP

Forward Contactor *(with new tips):

1. Nominally rated at: 200 AMP
2. Normally open contact gap: 3/8 - 13/32
3. Normally closed contact gap: within tol. per no. setting
4. Normally open contact pressure: 40-48 oz.
5. Normally closed contact pressure: 32-38 oz.
6. Electrical interlock adjustment:

(a) With .035 shim between armature and core. Snapping noise indicates interlock has operated. This adjustment is preset at the factory. If adjustment is reqd. bend interlock bracket.
7. Contactor tip fastening nut tightening torque .... 80 to 100 in. lbs.

Pump Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/16 to 7/32
3. Normally open contact pressure: 56-64 oz's
4. Contactor tip fastening nut tightening torque: 80 to 100 in. lbs.

Reverse Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/8-13/32
3. Normally closed contact gap: within tol. per. N.O. setting
4. Normally open contact pressure: 40 to 48 oz.
5. Normally closed contact pressure: 32 to 38 ozs.
6. Electrical interlock adjustment:

(a) With .035 shim between amature and core. Snapping noise indicates interlock as operated. This adjustment is preset at factory. If adjustment is reqd. bend interlock bracket.
7. Contactor tip fastening nut tightening torque: 80-100 in. lbs.

1A Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/16-7/32
3. Normally clos̍ted contact gap: If wipe & gap are correct, gap should be within limits
4. Normally open contact pressure: 56 to 64
5. Normally closed contact pressure: 32-38
6. Electrical interlock adjustment:

(a) With 0.015 shim between amature and core. Snapping noise indicates interlock operated, same as F & R.
7. Contactor tip fastening nut tightening torque: 80-100 in. lbs.

N O T E

All contactors for 36 and 48 volt systems.

Drive Motor (brush spring tension):

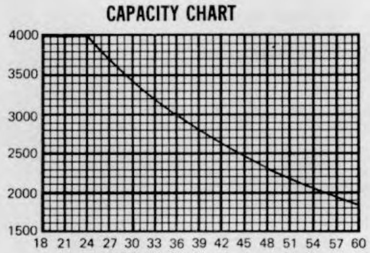
New brushes (initial) .... 60-63 oz.
Used brushes (finial) .... 40-42 oz.

SPECIFICATIONS FOR EC40E

EC-40-E 36 VOLT CLARKLIFT ELECTRIC

4,000 pound capacity at 24 inch load center

CAPACITY CHART



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UPRIGHT DIMENSION TABLE

MFH		Overall Height Lowered	FREE LIFT	
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For overall height fully raised, add 49" to maximum fork height with LBRE; 20⅛" without LBRE.

* Indicates preferred standard sizes.
Intermediate Heights Available in Increments of 3" MFH.

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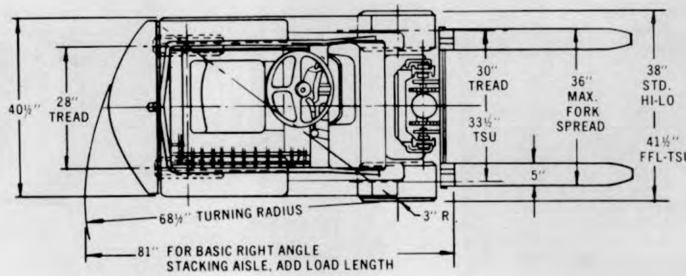
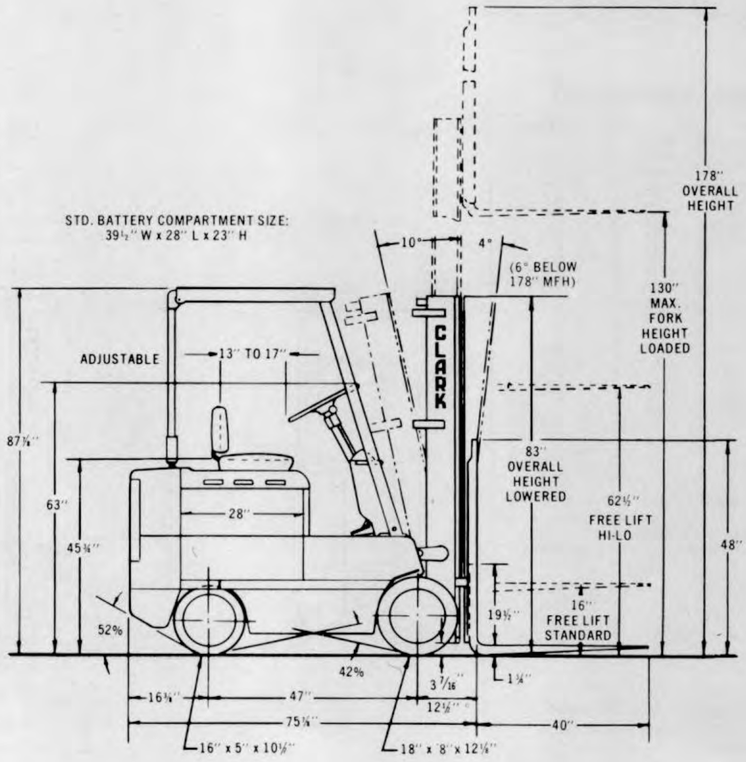




ADD 1" FOR TSU

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

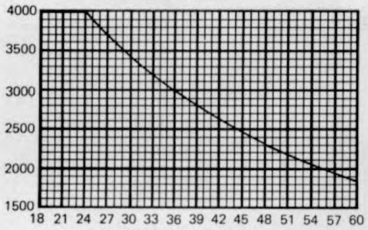
SPECIFICATIONS FOR EC40E

EC-40-E

48 VOLT CLARKLIFT ELECTRIC

4,000 pound capacity at 24 inch load center

CAPACITY CHART



LOAD CENTER IN INCHES FROM FRONT FACE OF FORKS.

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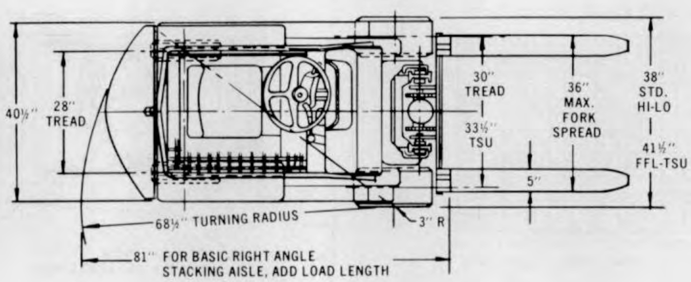

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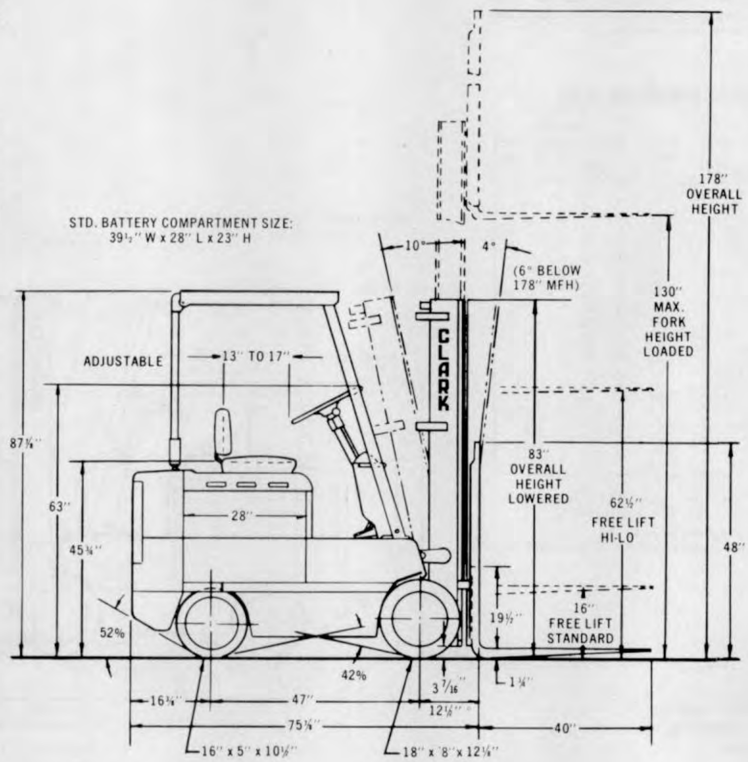

ADD 1" FOR TSU

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INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS FOR EC40E

GENERAL:

Type of vehicle .... Electric Clarklift

HYDRAULIC SYSTEM:

Relief setting (PSI) 1850-1900

Hydraulic Pump (gear type):

Max. pressure .... 2500 PSI

Sump filter (cleanable):

Micron size 25

Capacity (GPM) 15

By-pass relief (PSI) 2.5

Sump Tank Capacity .... 4 1/2 gal.

Sump Tank Breather .... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)........
.... 800

Steering wheel turning diameter (Inside drive tire) .... 4 in.

* With Standard Battery Compartment

WHEELS AND TIRES:

Front (size) 18x9x12 1/8

Rear (size) 16x5x10 1/2

Single Drive:

Tread (drive tires) .... 31 in.

Tread (steer tires) .... 28 in.

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel .... 115 to 150

2. Drive wheel;

a. Wide drive axle ends .... 275 to 350

b. All others .... 275 to 350

3. Axle Mounting Ring Bolts:

Body Fit .... 950 to 1000

Tapered Head .... 650 to 700

4. Counterweight bolt .... 175 to 225

4A. Counterweight extension bolts.. 375 to 425

5. Pitman arm locknut....... 100 to 140

6. Outboard Pitman shaft support bolts .... 60 to 70

7. Tilt cylinder yoke clamp bolt .... 80 to 90

8. Hand wheel to steer gear shaft nut .... 35-40 lbs ft

9. Pump motor mounting nuts .... 218 lbs ft

10. Counterweight to spacer mounting bolts..... .... 375-425 lbs ft

11. Axle end to adaptor bolt .... 200 to 250 lbs ft

12. Axle end to adaptor Stud .... 180 to 200 lbs ft

13. Axle end to adaptor stud nut .... 180 to 200 lbs ft

14. Steer axle mounting bolts - silent block to axle .... 130 to 180 lbs ft

15. Motor mounting bracket to motor and frame bolts .... 75 to 85 lbs ft

16. Steer sector mounting bolts .... torque 60-70 lb/ft

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18. Steer cylinder rod end lock bolt .... torque 25-30 lb/ft

RIGHT FOOT BRAKE PEDAL:

Free play .... 3/8-1/2 in.

Parking Brake Effectiveness:

Brake must be capable of holding a truck with fully rated load on a maximum grade of up to .... 15 %

Greadeability with rated load @ 1 MPH .... 10 %

POWER SUPPLY, 36 Volts:

Lead acid battery in steel trays 30 to 36volt, having adequate kilowatt hours capacity.
- 15 cells, 21 to 23 plate, 3 x 5 layout
- 16 cells, 19 plate, 4 x 4 layout
- 18 cells, 19 to 27 plate, 4 x 5 layout
- Exide Types: TG, TGP, TSC
- Gould Types: 60X, 72X, 72T, 85T
- C & D Types: HC, HYL, CDS, HY
- K-W Types: FH, HT

SPECIFICATIONS FOR EC40E

POWER SUPPLY, 36 Volts Continued:

For Ready Power installation, contact factory
For Nickel-Alkaline batteries, contact factory
Standard compartment size ....
39 1/2" W x 28" L x 23" H
Optional compartment size ....
39 1/2" W x 32 3/4" L x 23" H

POWER SUPPLY, 48 Volts:

Lead acid battery in steel trays 48 volt, having adequate kilowatt hours capacity.
24 cells, 15 to 19 plate, 6 x 4 layout
Exide Types: TG, TGP, TSC
Gould Types: 60X, 72X, 72T, 85T
C & D Types: HC, HYL, HY
K-W Types: FH, FT
For Ready Power installation, contact factory
For Nickel-Alkaline batteries, contact factory
Standard compartment size ....
39 1/2 W x 28" L x 23" H
Optional compartment size ....
39 1/2 W x 32 3/4" L x 23" H

DRIVE MOTOR:

Brush Spring Tension:

Initial .... 60-63 oz.
Final .... 40-42 oz.

PUMP MOTOR:

Brush Spring Tension:

Initial .... 60-63 oz.
Final .... 40-42 oz.

STEER PUMP MOTOR:

Brush Spring Tension:

Initial .... 28-34 oz.
Final .... 18-22 oz.

Battery Connector:

Std. - Type SB-350 AMP
Opt. - Type SB-175 AMP
Opt. - Type N-150 AMP
Opt. - Type EC-300 AMP
Opt. - Type YC-125 AMP
Opt. - Russell & Stoll - 100 AMP
Opt. - Yale & Towne - 125 AMP

Forward Contactor *(with new tips):

1. Nominally rated at: 200 AMP
2. Normally open contact gap: 3/8 - 13/32
3. Normally closed contact gap: within tol. per no. setting
4. Normally open contact pressure: 40-48 oz.
5. Normally closed contact pressure: 32-38 oz.
6. Electrical interlock adjustment:

(a) With .035 shim between armature and core. Snapping noise indicates interlock has operated. This adjustment is preset at the factory. If adjustment is reqd. bend interlock bracket.
7. Contactor tip fastening nut tightening torque .... 80 to 100 in. lbs.

Pump Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/16 to 7/32
3. Normally open contact pressure: 56-64 oz's
4. Contactor tip fastening nut tightening torque: 80 to 100 in. lbs.

Reverse Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/8-13/32
3. Normally closed contact gap: within tol. per. N.O. setting
4. Normally open contact pressure: 40 to 48 oz.
5. Normally closed contact pressure: 32 to 38 ozs.
6. Electrical interlock adjustment:

(a) With .035 shim between amature and core. Snapping noise indicates interlock as operated. This adjustment is preset at factory. If adjustment is reqd. bend interlock bracket.
7. Contactor tip fastening nut tightening torque: 80-100 in. lbs.

1A Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/16-7/32
3. Normally closted contact gap: If wipe & gap are correct, gap should be within limits
4. Normally open contact pressure: 56 to 64
5. Normally closed contact pressure: 32-38
6. Electrical interlock adjustment:

(a) With 0.015 shim between amature and core. Snapping noise indicates interlock operated, same as F & R.
7. Contactor tip fastening nut tightening torque: 80-100 in. lbs.

N O T E

All contactors for 36 and 48 volt systems.

Drive Motor (brush spring tension):

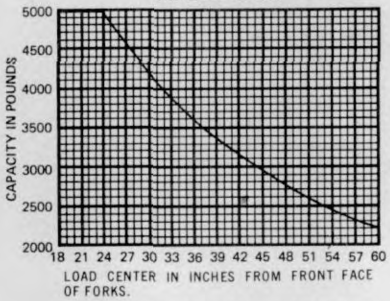
New brushes (initial) .... 60-63 oz.
Used brushes (finial) .... 40-42 oz.

EC-50-E

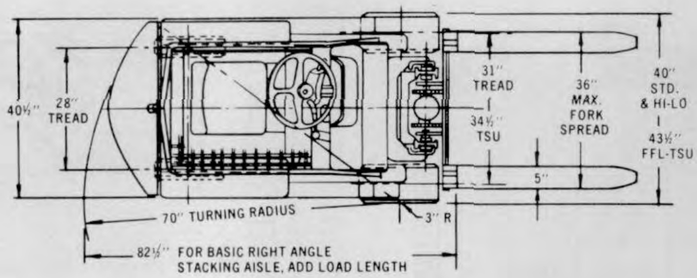
36 VOLT CLARKLIFT ELECTRIC

5,000 pound capacity at 24 inch load center

CAPACITY CHART



—Rated capacities shown above are computed with uprights in vertical position. Lifts above 144" maximum fork height, contact factory. Specific capacities will be shown on truck nameplate.



UPRIGHT DIMENSION TABLE

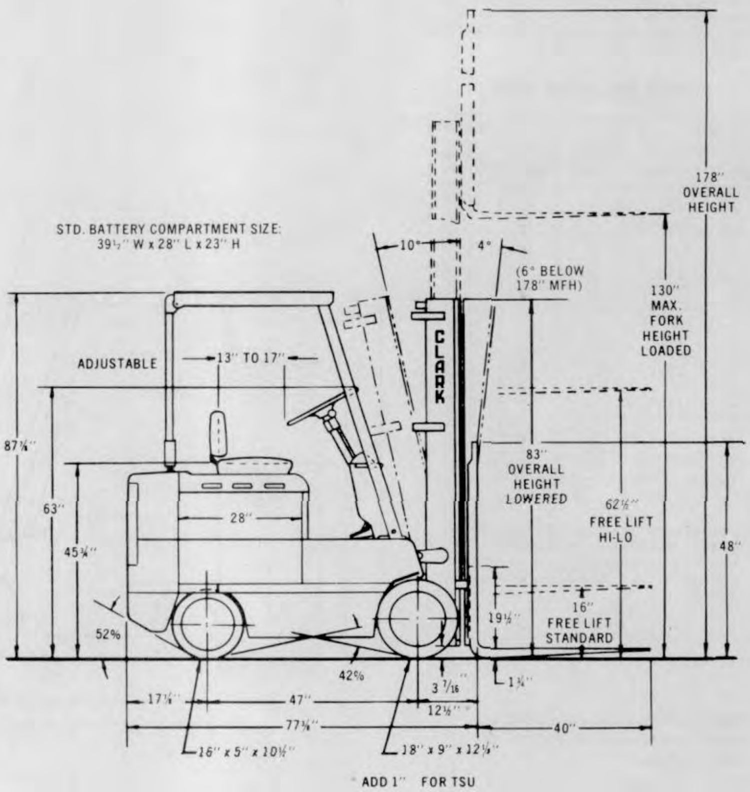
MFH		Overall Height Lowered	FREE LIFT	
Std. & Hi-Lo	FFL TSU		Std.	Hi-Lo & FFL TSU
*106	*153	71	16	50½
112	162	74	16	53½
118	*171	77	16	56½
124	180	80	16	59½
*130	*189	83	16	62½
136	—	86	16	65½
—	198	88	—	67½
142	—	89	16	68½
148	—	92	16	71½
—	207	93	—	72½
*154	—	95	16	74½
—	216	98	—	77½
160	—	99	16	78½
166	—	102	16	81½
—	225	103	—	82½
172	—	106	16	85½
—	234	108	—	87½
*178	—	109	16	88½
184	—	112	16	91½
190	—	116	16	95½
196	—	121	16	100½
202	—	124	16	103½

For overall height fully raised, add 49" to maximum fork height with LBRE; 20⅛" without LBRE.

* Indicates preferred standard sizes.
Intermediate Heights Available in Increments of 3" MFH.

CERTIFIED BY CLARK ENGINEERING DEPT

Clark products and specifications are subject to improvements and changes without notice.

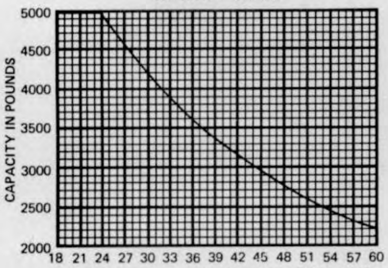


SPECIFICATIONS EC50E

EC-50-E 48 VOLT CLARKLIFT ELECTRIC

5,000 pound capacity at 24 inch load center

CAPACITY CHART



LOAD CENTER IN INCHES FROM FRONT FACE OF FORKS.

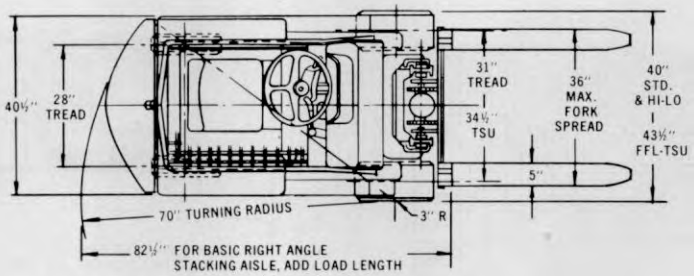
–Rated capacities shown above are computed with uprights in vertical position. Lifts above 144" maximum fork height, contact factory. Specific capacities will be shown on truck nameplate.

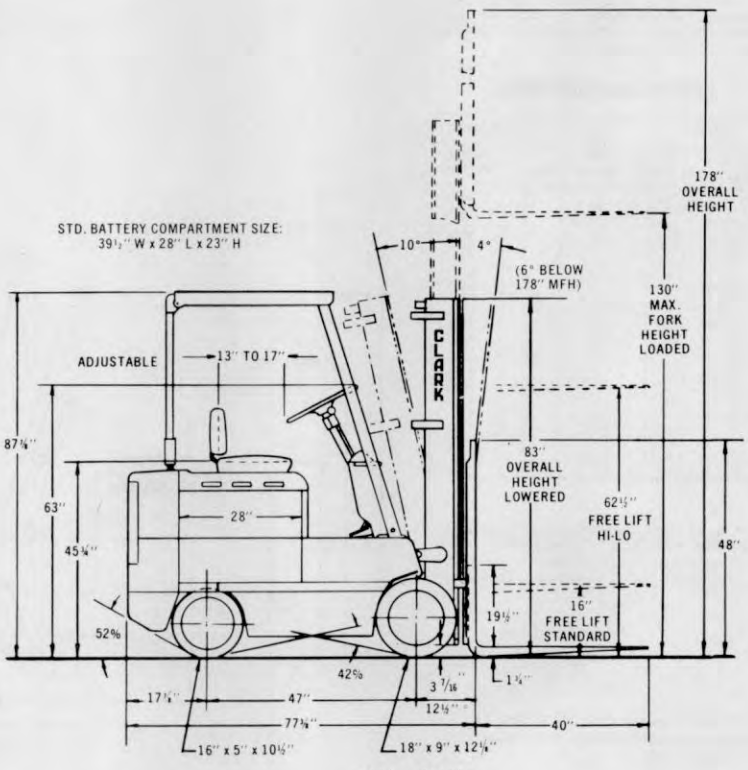
UPRIGHT DIMENSION TABLE

MFH		Overall Height Lowered	FREE LIFT	
Std. & Hi-Lo	FFL TSU		Std.	Hi-Lo & FFL TSU
*106	*153	71	16	50½
112	162	74	16	53½
118	*171	77	16	56½
124	180	80	16	59½
*130	*189	83	16	62½
136	—	86	16	65½
—	198	88	—	67½
142	—	89	16	68½
148	—	92	16	71½
—	207	93	—	72½
*154	—	95	16	74½
—	216	98	—	77½
160	—	99	16	78½
166	—	102	16	81½
—	225	103	—	82½
172	—	106	16	85½
—	234	108	—	87½
*178	—	109	16	88½
184	—	112	16	91½
190	—	116	16	95½
196	—	121	16	100½
202	—	124	16	103½

For overall height fully raised, add 49" to maximum fork height with LBRE; 20⅛" without LBRE.

* Indicates preferred standard sizes.
Intermediate Heights Available in Increments of 3" MFH.





Clark products and specifications are subject to improvements and changes without notice.

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

SPECIFICATIONS FOR EC50E

GENERAL:

Type of vehicle .... Electric Clarklift

DRAW BAR PULL:

Draw bar pull loaded W/1A:
36 Volt, 4600 lbs at 12" coupler height
48 Volt, 5700 lbs at 12" coupler height

Draw bar pull empty (SCR):
36 Volt, 1490 lbs at 12" coupler height
48 Volt, 1950 lbs at 12" coupler height

HYDRAULIC SYSTEM:

Relief setting (PSI) 1850-1900

Hydraulic Pump (gear type):

Max. pressure .... 2500 PSI

Sump filter (cleanable):

Micron size 25

Capacity (GPM) 15

By-pass relief (PSI) 2.5

Sump Tank Capacity .... 4 1/2 gal.

Sump Tank Breather .... 10 micron

STEERING SYSTEM:

Relief setting (PSI) (Location in pump)........
.... 800

Steering wheel turning diameter (Inside drive tire) .... 4 in.

* With Standard Battery Compartment

WHEELS AND TIRES:

Front (size) 18x9x12 1/8

Rear (size) 16x5x10 1/2

Single Drive:

Tread (drive tires) .... 31 in.

Tread (steer tires) .... 28 in.

MAJOR BOLT TORQUE (ft-lbs, dry thread):

1. Steer wheel .... 115 to 150

2. Drive wheel;

a. Wide drive axle ends .... 275 to 350

b. All others .... 275 to 350

3. Axle Mounting Ring Bolts:

Body Fit .... 950 to 1000

Tapered Head .... 650 to 700

4. Counterweight bolt .... 175 to 225

4A. Counterweight extension bolts.. 375 to 425

5. Pitman arm locknut....... 100 to 140

6. Outboard Pitman shaft support bolts ....
.... 60 to 70

7. Tilt cylinder yoke clamp bolt ....
.... 80 to 90

8. Hand wheel to steer gear shaft nut ....
.... 35-40 lbs ft

9. Pump motor mounting nuts .... 218 lbs ft

10. Counterweight to spacer mounting bolts.....
.... 375-425 lbs ft

11. Axle end to adaptor bolt ....
.... 200 to 250 lbs ft

12. Axle end to adaptor Stud ....
.... 180 to 200 lbs ft

13. Axle end to adaptor stud nut ....
.... 180 to 200 lbs ft

14. Steer axle mounting bolts - silent block to axle .... 130 to 180 lbs ft

15. Motor mounting bracket to motor and frame bolts .... 75 to 85 lbs ft

16. Steer sector mounting bolts ....
torque 60-70 lb/ft

17. Tilt cylinder rod end lock bolt ....
torque 80-90 lb/ft

18. Steer cylinder rod end lock bolt ....
torque 25-30 lb/ft

RIGHT FOOT BRAKE PEDAL:

Free play .... 3/8-1/2 in.

Parking Brake Effectiveness:

Brake must be capable of holding a truck with fully rated load on a maximum grade of up to .... 15 %

Greadeability with rated load @ 1 MPH ....
.... 10 %

SPECIFICATIONS FOR EC50E

POWER SUPPLY, 36 Volts:

Lead-acid battery in steel trays, 36 volt, having adequate dilowatt hours capacity.
18 cells, 23 to 27 plate, 3 x 6 layout
Exide Types: TSC, TGP, TG
Gould Types: 60X, 72X, 72T, 85T
C & D Types: HYL, HY, HC, CDS
K-W Types: HT, FH

Standard compartment size ....
39 1/2" W x 28" L x 23" H
Optional compartment size ....
39 1/2" W x 32 3/4" L x 23" H
(24 cell - 21 plate battery requires 34" long compartment.)

POWER SUPPLY, 48 Volts:

Lead-acid battery in steel trays, 48 volt, having adequate kilowatt hours capacity.
24 cells, 17 to 19 plate, 6 x 4 layout
Exide Types: TG, TGP, TSC
Gould Types: 60X, 72X, 72T, 85T
C & D Types: HYL, HY
K-W Types: FH, FT

Standard compartment size ....
39 1/2" W x 28" L x 23" H
Optional compartment size ....
39 1/2" W x 32 3/4 L x 23" H
(24 cell - 21 plate battery requires 34" long compartment.)

DRIVE MOTOR:

Brush Spring Tension:

Initial .... 60-63 oz.
Final .... 40-42 oz.

PUMP MOTOR:

Brush Spring Tension:

Initial .... 60-63 oz.
Final .... 40-42 oz.

STEER PUMP MOTOR:

Brush Spring Tension:

Initial .... 28-34 oz.
Final .... 18-22 oz.

Battery Connector:

Std. - Type SB-350 AMP
Opt. - Type SB-175 AMP
Opt. - Type N-150 AMP
Opt. - Type EC-300 AMP
Opt. - Type YC-125 AMP
Opt. - Russell & Stoll - 100 AMP
Opt. - Yale & Towne - 125 AMP

Forward Contactor *(with new tips):

1. Nominally rated at: 200 AMP
2. Normally open contact gap: 3/8 - 13/32
3. Normally closed contact gap: within tol. per no. setting
4. Normally open contact pressure: 40-48 oz.
5. Normally closed contact pressure: 32-38 oz.
6. Electrical interlock adjustment:

(a) *With .035 shim between armature* and core. Snapping noise indicates interlock has operated. This adjustment is preset at the factory. If adjustment is reqd. bend interlock bracket.
7. Contactor tip fastening nut tightening torque .... 80 to 100 in. lbs.

Pump Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/16 to 7/32
3. Normally open contact pressure: 56-64 oz's
4. Contactor tip fastening nut tightening *torque:* 80 to 100 *in.* lbs.

Reverse Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/8-13/32
3. Normally closed contact gap: within tol. per. N.O. setting
4. Normally open contact pressure: 40 to 48 oz.
5. Normally closed contact pressure: 32 to 38 ozs.
6. Electrical interlock adjustment:

(a) With .035 shim between amature and core. Snapping noise indicates interlock as operated. This adjustment is preset at factory. If adjustment is reqd. bend interlock bracket.
7. Contactor tip fastening nut tightening torque: 80-100 in. lbs.

1A Contactor *(with new tips):

1. Nominally rated at: 200
2. Normally open contact gap: 3/16-7/32
3. Normally closted contact gap: If wipe & gap are correct, gap should be within limits
4. Normally open contact pressure: 56 to 64
5. Normally closed contact pressure: 32-38
6. Electrical interlock adjustment:

(a) With 0.015 shim between amature and core. Snapping noise indicates interlock operated, same as F & R.
7. Contactor tip fastening nut tightening torque: 80-100 in. lbs.

N O T E

All contactors for 36 and 48 volt systems.

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

SPECIFICATIONS FOR EC50E

Drive Motor (brush spring tension):

New brushes (initial) .... 60-63 oz.
Used brushes (final) .... 40-42 oz.

LIFTING SPEEDS AND MOTOR AMPS (EC50E/36 VOLT):

STD Upright 154" MFH (no-load):
1st/2nd stage amps 144
FPM lift 87
FPM lower 80
1st Stage pump press. 440

STD Upright 154" MFH (capacity):
1st/2nd stage amps 344
FPM lift 52
FPM lower 70
1st stage pump press. 1700

HILO Upright (no-load):
1st/2nd stage amps 144
FPM lift 80
FPM lower 80
1st stage pump press. 430
2nd stage pump press. 450

HILO Upright (capacity):
1st/2nd stage amps 362
FPM lift 47
FPM lower 70
1st stage pump press. 1770
2nd stage pump press. 1810

STD Triple Upright (no-load):
1st/2nd stage amps 144
FPM lift 80
FPM lower 80
1st stage pump press. 430
2nd stage pump press. 450

STD Triple Upright (capacity):
1st/2nd stage amps 362
FPM lift 47
FPM lower 70
1st stage pump press. 1770
2nd stage pump press. 1810

Tilting Speeds and Motor Amps:
6 deg. forward and 10 deg. back.
Rated capacity:
154 MFH - EC30,40E
144 MFH - EC50E

No-load, forward:
3.7 seconds
114.0 amps

Capacity, forward:
3.0 seconds
98.4 amps

No-load, back:
3.0 seconds
91.2 amps

Capacity, back:
3.5 seconds
138.0 amps

LIFTING SPEEDS AND MOTOR AMPS (EC50E/48 VOLT):

STD Upright (no-load):
1st/2nd stage amps 160
FPM lift 115
FPM lower 80
1st stage pump press. 580

STD Upright (capacity):
1st/2nd stage amps 352
FPM lift 70
FPM lower 70
1st stage pump press. 1730

HILO Upright (no-load):
1st/2nd stage amps 160
FPM lift 102
FPM lower 80
1st stage pump press. 600
2nd stage pump press. 620

HILO Upright (capacity):
1st/2nd stage amps 372
FPM lift 70
FPM lower 70
1st stage pump press. 1800
2nd stage pump press. 1840

STD Triple Upright (no-load):
1st/2nd stage amps 160
FPM lift 102
FPM lower 80
1st stage pump press. 600
2nd stage pump press. 620

STD Triple Upright (capacity):
1st/2nd stage amps 372
FPM lift 70
FPM lower 70
1st stage pump press. 1800
2nd stage pump press 1840

Tilting Speeds and Motor Amps:
6 deg. forward and 10 deg. back.
Rated capacity:
154 MFH, EC30,40E
144 MFH, EC50E
178 MFH (cut-off)

No-load, forward:
3.7 seconds
105.0 amps

Capacity, forward:
3.0 seconds
78.0 amps

No-load, back:
3.0 seconds
81.5 amps

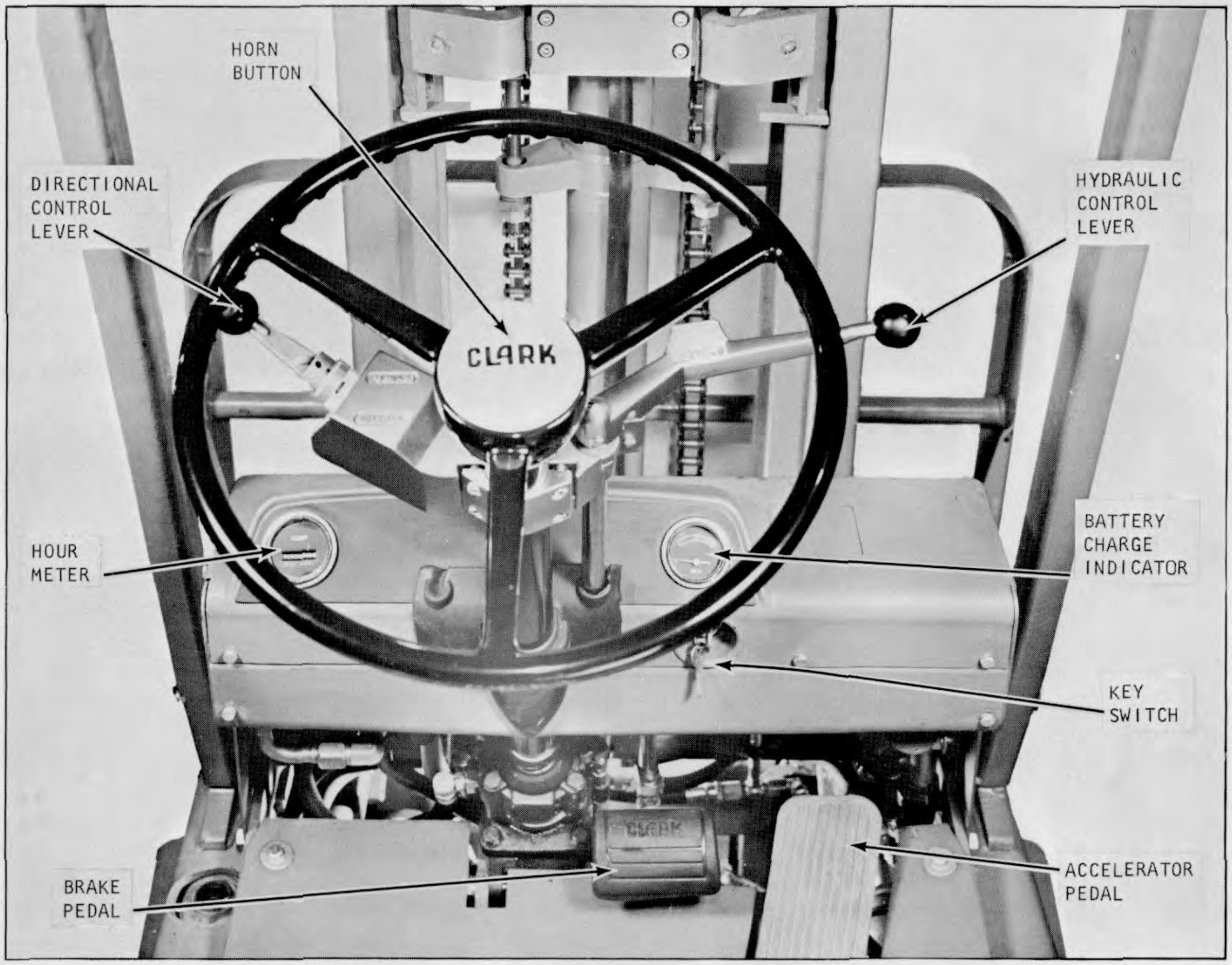


Plate 10198. Typical Overall Controls

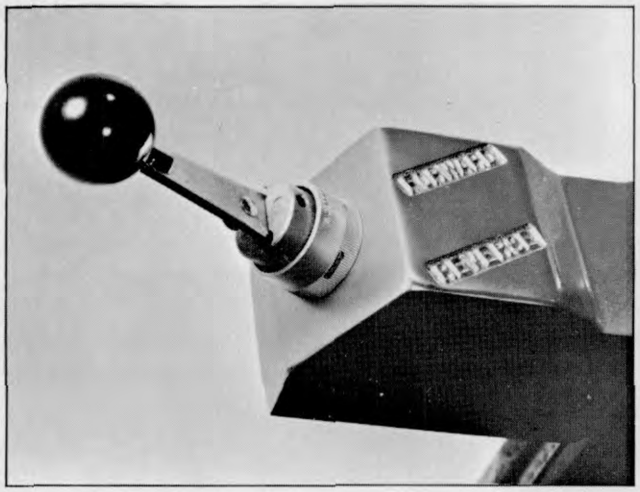


Plate 7216. Directional Control Lever

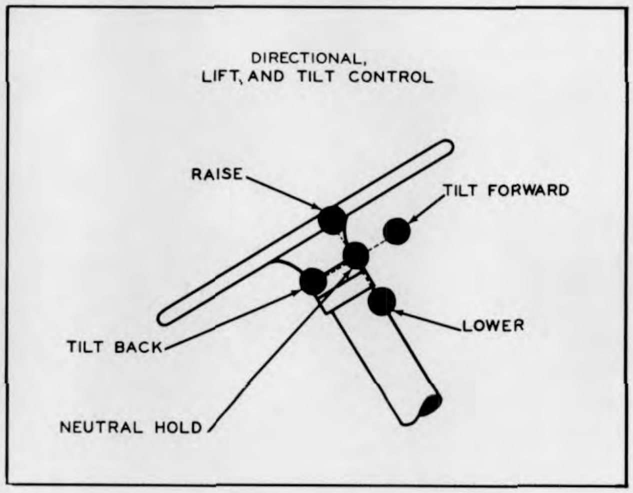


Plate 4448. Hydraulic Control Lever

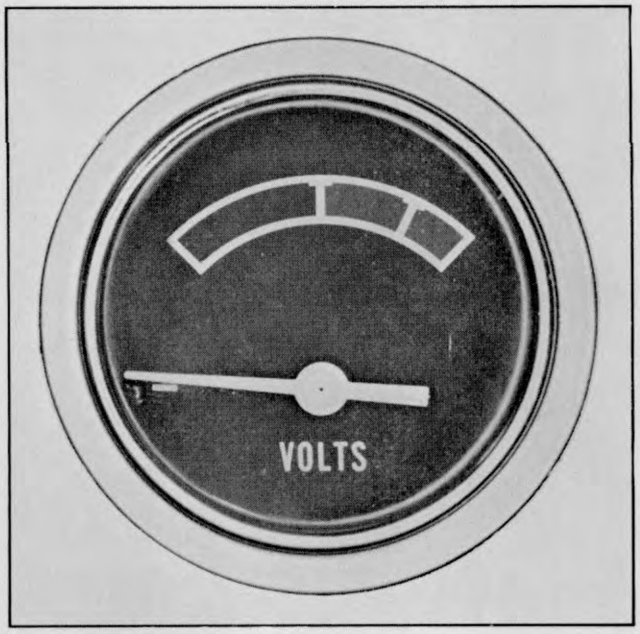


Plate 10199. Battery Charge Indicator

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 preventative maintenance services.

TO OPERATE MACHINE

1. When the driver's seat is occupied, the seat safety brake (deadman brake) will be released.

2. Place directional control lever in neutral position.

3. Turn switch key to the "on" position, allow accelerator pedal and brake pedal to assume its free or undepressed position.

4. Move the directional lever in position for the desired direction of travel.

5. Depress accelerator pedal as required for the speed desired.

TO STOP MACHINE

Remove foot from accelerator pedal and depress brake pedal sufficiently to allow a safe smooth stop. If the machine is to be parked, turn switch key to "off" and place directional control lever in neutral (centered) position. When the driver's seat is unoccupied, the (deadman brake) parking brake is applied.

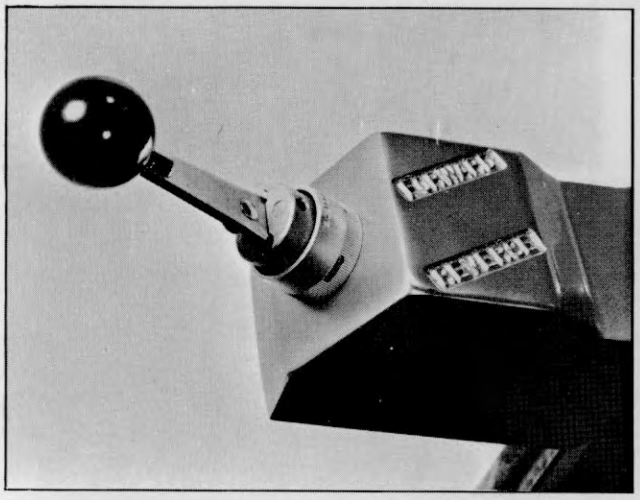


Plate 7216. Directional Control Lever

SOLID STATE CONTROL UNITS ONLY
(GENERAL ELECTRIC SCR UNIT)

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

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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W A R N I N G

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

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10. Use only approved industrial trucks in hazardous locations.

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 at 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.

WIRING DIAGRAM

On the inner side of the coverplate for the contactor panel, will be found, in an envelope, a wiring diagram for the electrical system/s of the machine.

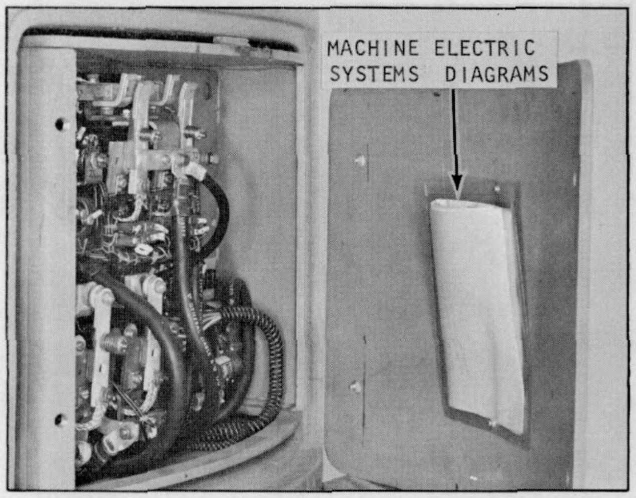


Plate 8924. Electric System Diagram

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 rise 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:

NOTE

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 shiphon 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.

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.

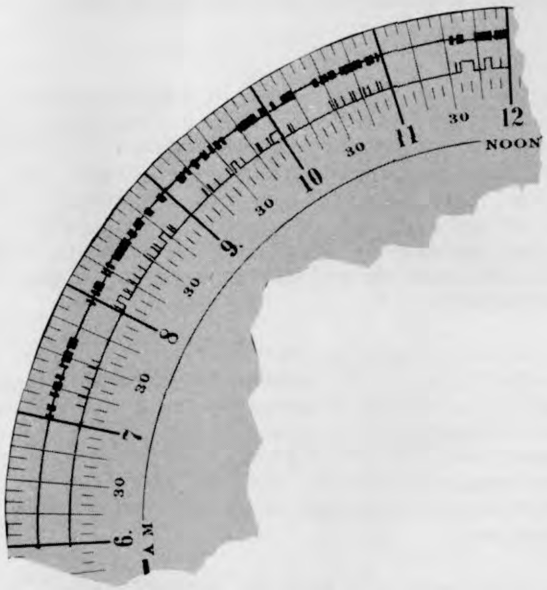


Plate 10161. Service Recorder Chart

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 over-wind. 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.

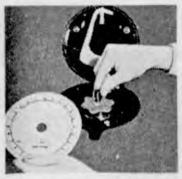


Plate 10165

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.

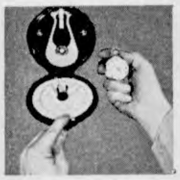


Plate 10166

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.

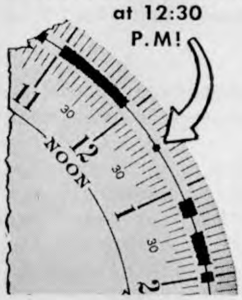


Plate 10162. Service Recorder Chart

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.

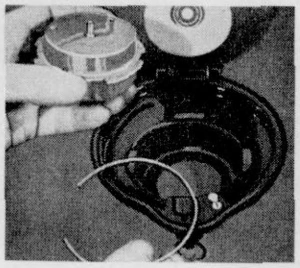


Plate 10163. Clock Exchange

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 Recorders 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.

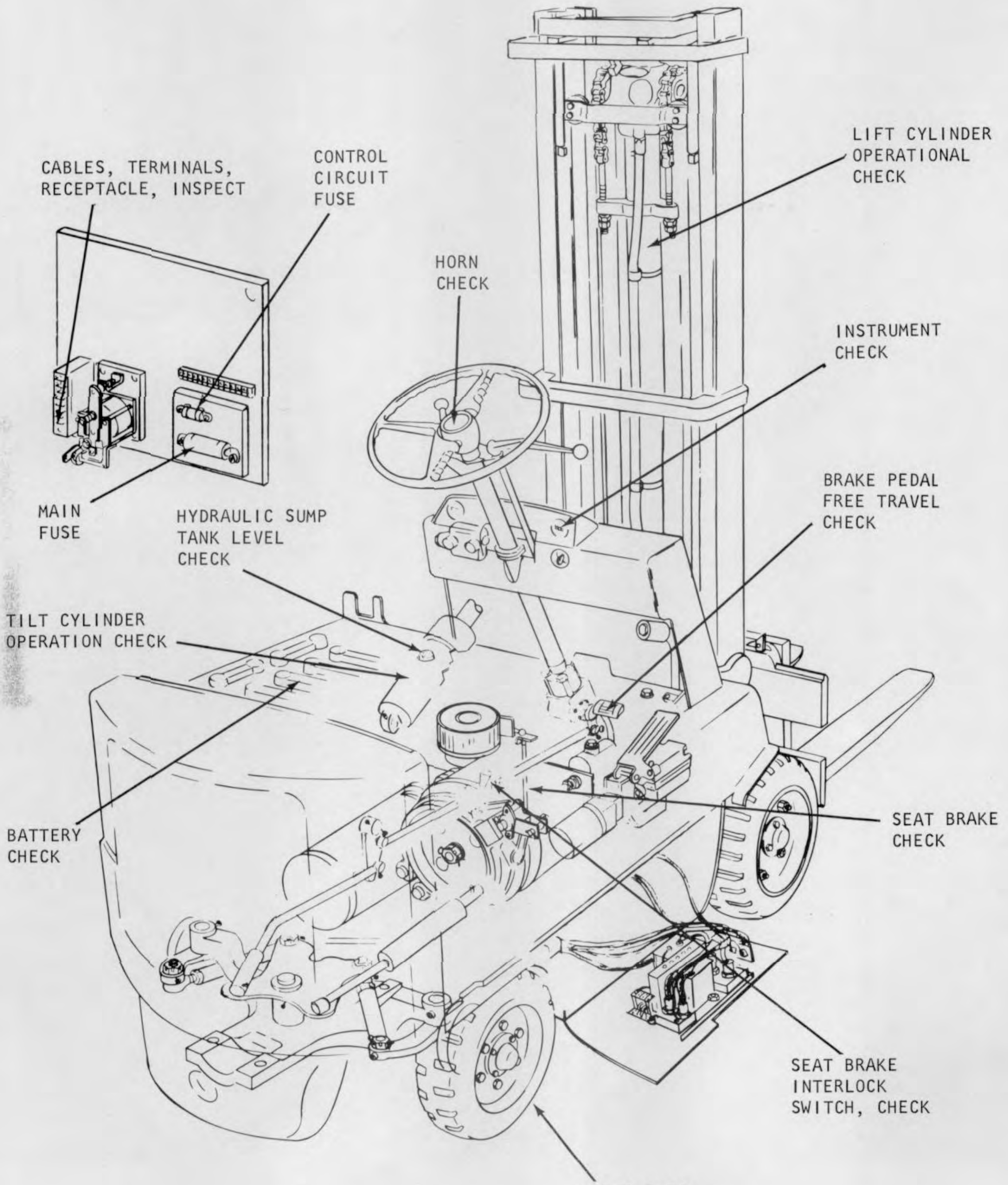
It is a good policy to have a spare clock movement in stock to insure uninterrupted service. Extra clocks are inexpensive.

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

LUBRICATION AND PREVENTIVE MAINTENANCE INDEX

8 HOURS



LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION

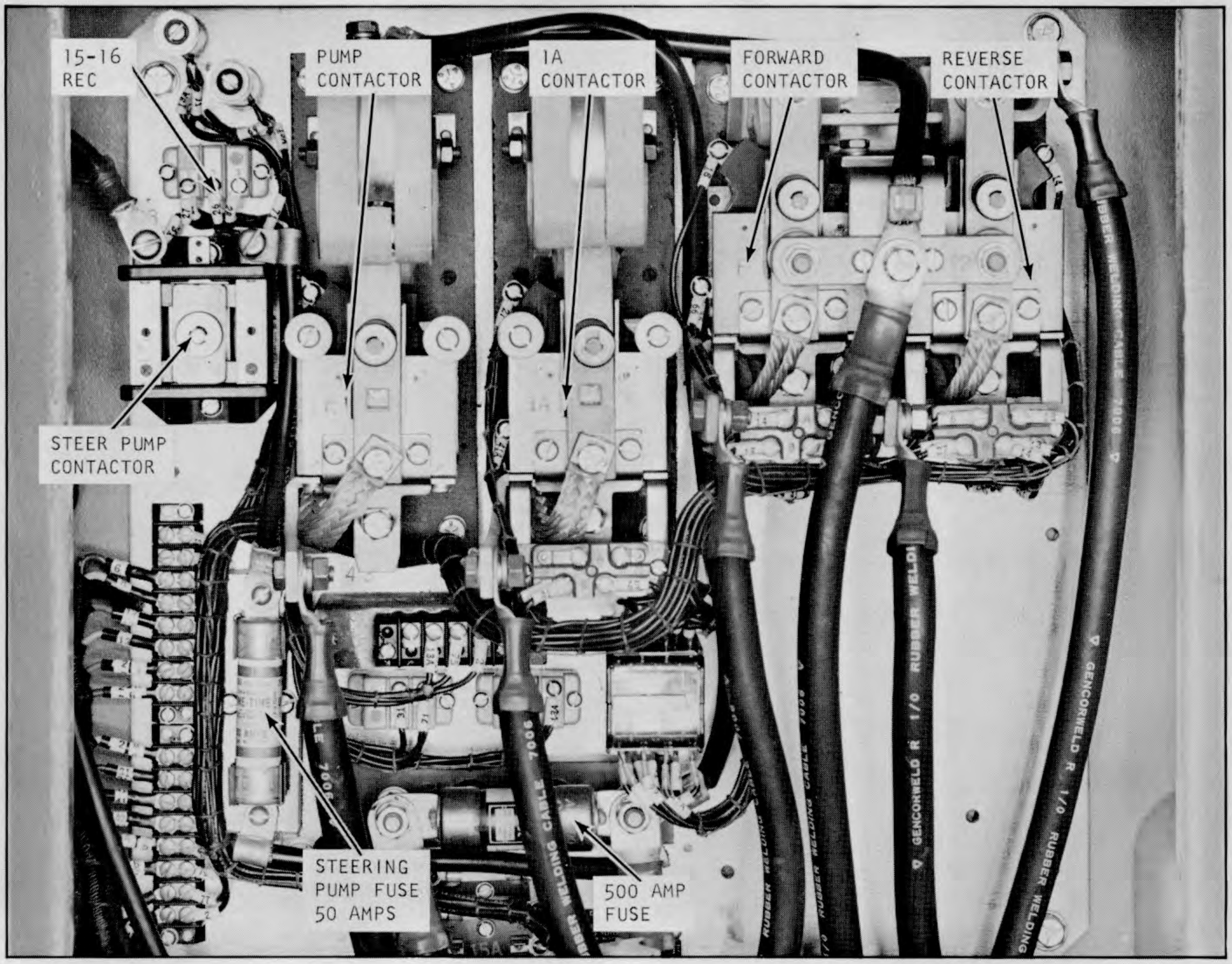


Plate 10201. Typical Contactor Panel

HORN:

Check to be sure the horn is working properly.

LIGHTS:

Check all lights to see if they are functioning properly.

SYSTEM FUSES:

Steer Pump Fuse.........................50 AMP

Main Fuse..............................500 AMP

Control Circuit Fuse...................15 AMP

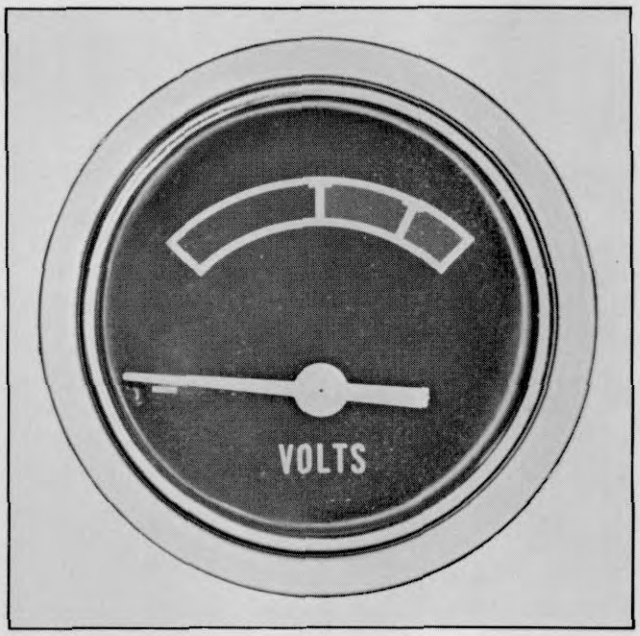


Plate 10199. Battery Charge Indicator

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 preventative maintenance services.

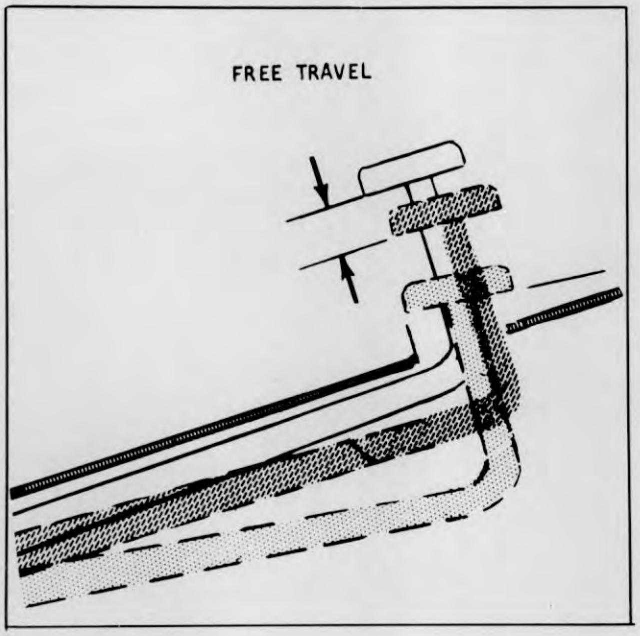


Plate 7048. Brake Pedal Free Travel

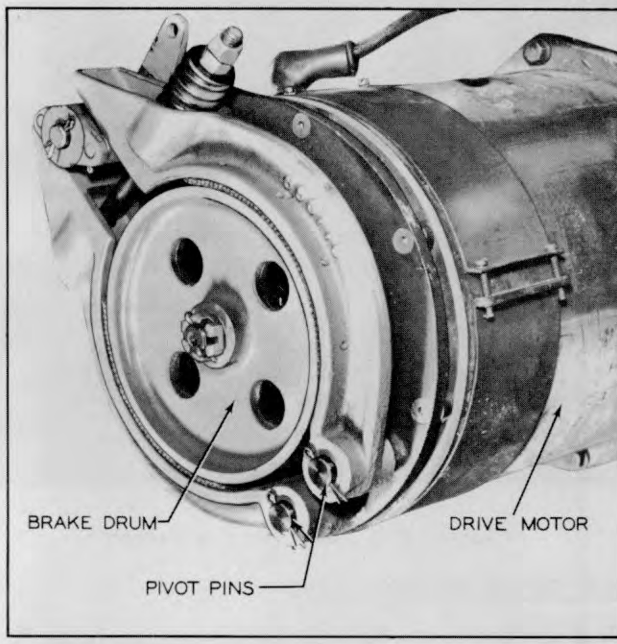


Plate 5031. Seat Safety Brake

BRAKE PEDAL

1. Brake pedal should have 1/2 inch free travel. Depress pedal by hand. When pedal meets resistance from the master cylinder, the distance traveled should be as specified.

2. Depress brake pedal and hold foot pressure for at least ten seconds. Pedal must be solid, not be spongy or drift under foot pressure.

SEAT SAFETY BRAKE

The Safety Brake (Dead man Brake) is mounted to the end of the drive motor and is operated by means of linkage attached to the driver's seat.

SEAT BRAKE EFFECTIVENESS

The brake must be capable of holding the truck, with full rated load on a 15% grade. To test: Remove seat linkage pin (Plate 7410). The driver's seat should be occupied and truck power off.

Plate 7410. Seat Linkage Disconnect Pin

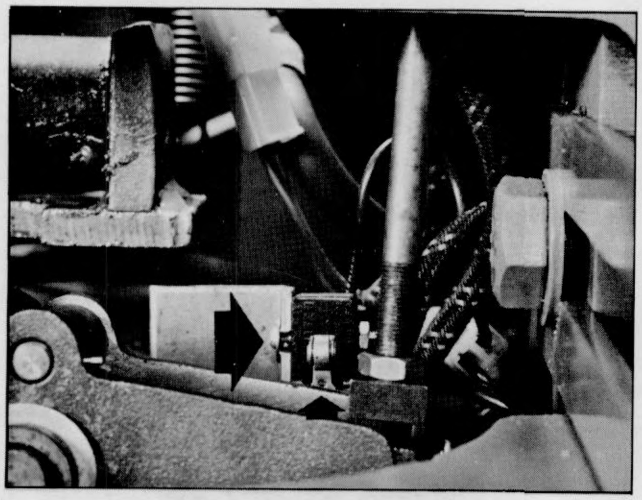


Plate 7207. Seat Safety Switch

SEAT SAFETY SWITCH:

This normally open switch should actuate when the seat frame bumpers are approximately 2 to 3 inches from the battery compartment hood during the seat downward travel. In this manner the switch will close as soon as the safety brake is released thus providing a complete circuit.

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 voltage 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 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.*

C A U T I O N S

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.

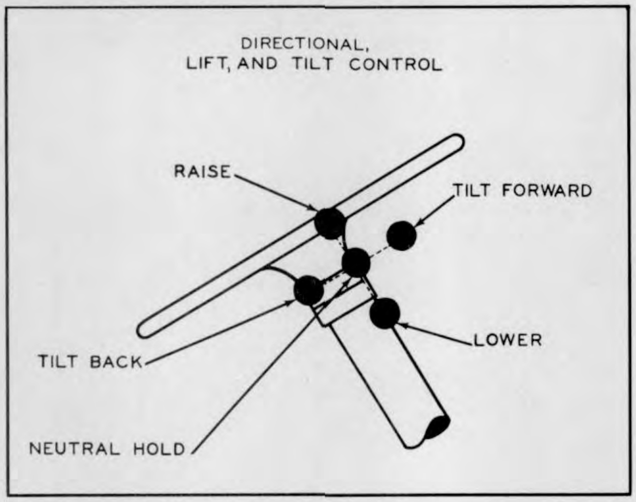


Plate 4448. Lift and Tilt Lever

LIFT AND TILT OPERATION:

Check lift and tilt operation. The lift and tilt cylinders should actuate when lift or tilt levers are moved either way from neutral position.

When load is elevated and control lever returned to neutral position, load should remain in elevated position with no noticeable downward drift. If load drifts downward excessively, this may indicate lift cylinder U-cup or seal damage. Report to designated person in authority.

With tilt lever in neutral position, upright should remain steady with no noticeable backward or forward drift. If upright drifts excessively either way, this may indicate tilt cylinder seal or U-cup damage. Also report to designated person in authority.

CAUTION

NEVER ALLOW LOADED OR UNLOADED LIFT CARRIAGE TO REMAIN IN AN ELEVATED POSITION FOR ANY PROLONGED PERIODS. LIFT CARRIAGE SHOULD BE LOWERED WHEN NOT IN USE. DO NOT HOLD CONTROL LEVERS IN EXTREME POSITIONS AFTER A LOAD HAS REACHED ITS LIMITS. TO DO SO WILL RESULT IN HIGH OIL PRESSURE THAT MAY RESULT IN HEATING OF THE HYDRAULIC OIL.

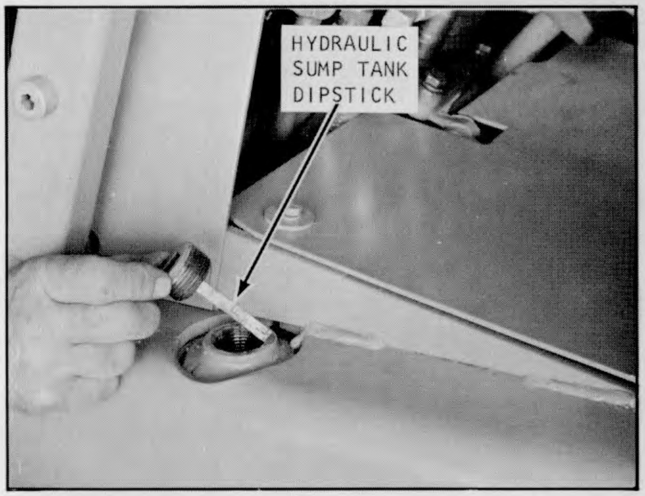


Plate 10202. Typical Sump Level Check

SUMP TANK LEVEL CHECK:

With the upright in the full down position, the fluid level in the sump tank should be 2" from the top of the fill opening....leaving a 1" air space at the top of the tank. This can be checked by the dipstick as shown in Plate 10202.

Fill if necessary with Clark Specification MS-68, part number 885385.

LUBRICATION AND PREVENTIVE MAINTENANCE

TIRE AND RIM MAINTENANCE

1. Inspect tires regularly - remove all sharp objects picked up by treads before they have a chance to cut further into the rubber and cause chipping or possible separation of the rubber from the base metal.

2. Avoid overloading and do not allow vehicle to stand under heavy loads for prolonged periods as this will cause a "flat" spot on the tires.

3. Check steering axle alignment regularly to protect against fast, irregular tread wear and separation.

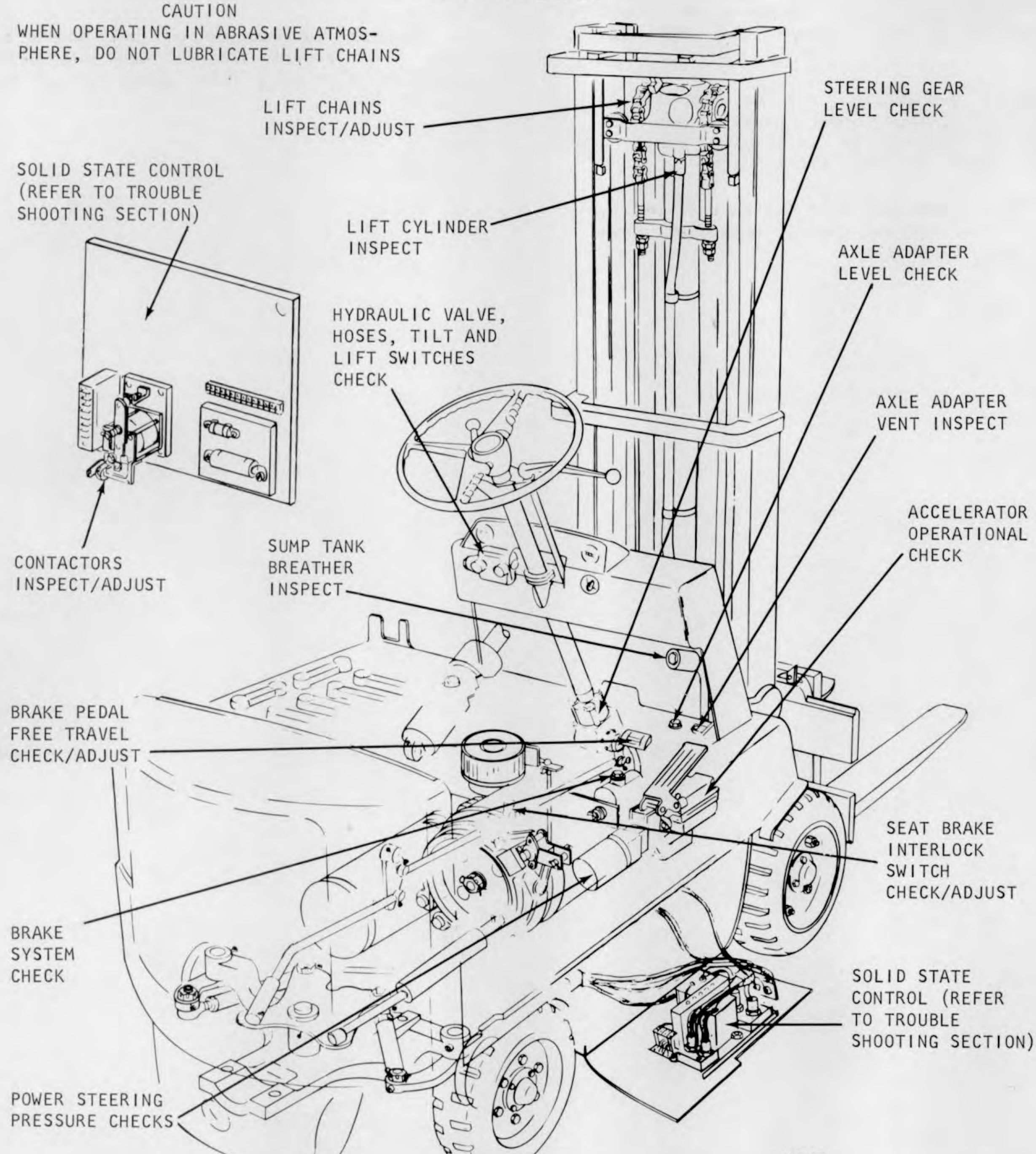
4. If rubber tires come in contact with oils, grease, and gasoline they should be wiped off without delay.

5. Regular lubrication of all wheel bearings will assure free-rolling and elimination of tire drag when stopping or starting.

100 HOURS

LUBRICATE MACHINE

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



NOTE

AFTER EACH 100 HOURS OF OPERATION, PERFORM THE ABOVE SERVICES IN ADDITION TO THE ONES LISTED ON THE 8 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION

LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION

AXLE ADAPTOR FLUID LEVEL CHECK:

Verify fluid level....fill if necessary until level reaches the height of the Axle Adaptor LEVEL PLUG OPENING (E).

1. Clean dirt from around filler plug (D), and remove plug.

2. Fill until level reaches the height of the level plug opening. Replace plugs.

Do not overfill as the excess quantity will serve no useful purpose. If the oil is too high, it will cause excessive oil churning, high oil temperature and possible leakage.

AXLE ADAPTOR VENT:

Inspect Axle Vent (C) to be sure it is free of obstructions. If vent is not open, remove and clean in a Stoddard type cleaning solvent. Be sure vent is completely dry before replacing in the axle adaptor.

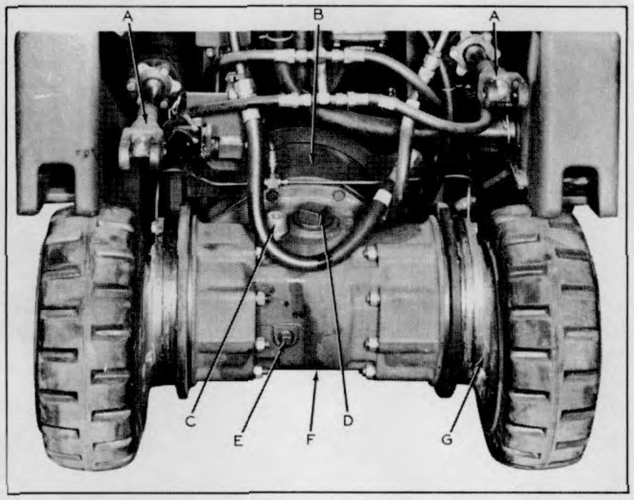


Plate 5988. Typical Axle Adaptor

LUBRICATION RECOMMENDATIONS:

Use Type "A", Suffix "A" Automatic Transmission Fluid. Fluid Containers must display a qualification number prefixed by AQ-ATF. Clark Part No. 879803. Alternate fluid, Dexron.

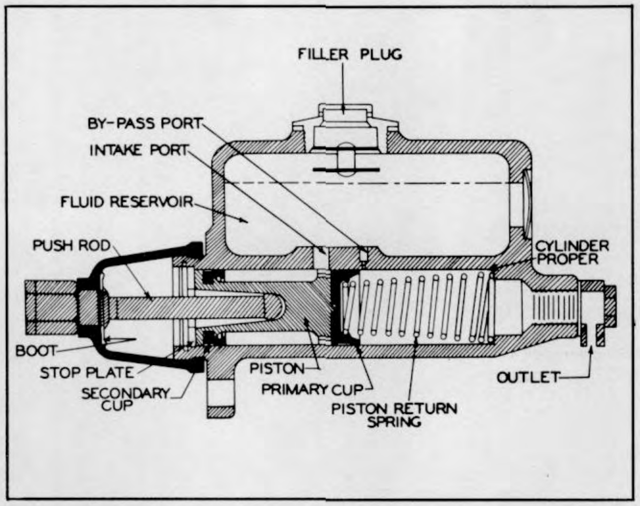


Plate 5772. Speed Control Cylinder (EC MODELS)

Speed Control Cylinder: Verify fluid level. Fluid should be within 1/4 inch of the top. Fill with S.A.E. 70R3 Heavy Duty Brake fluid.

Cylinder Filler Cap Vent Hole: Check cap vent hole for obstruction. Vent hole must be open at all times. Clean if necessary.

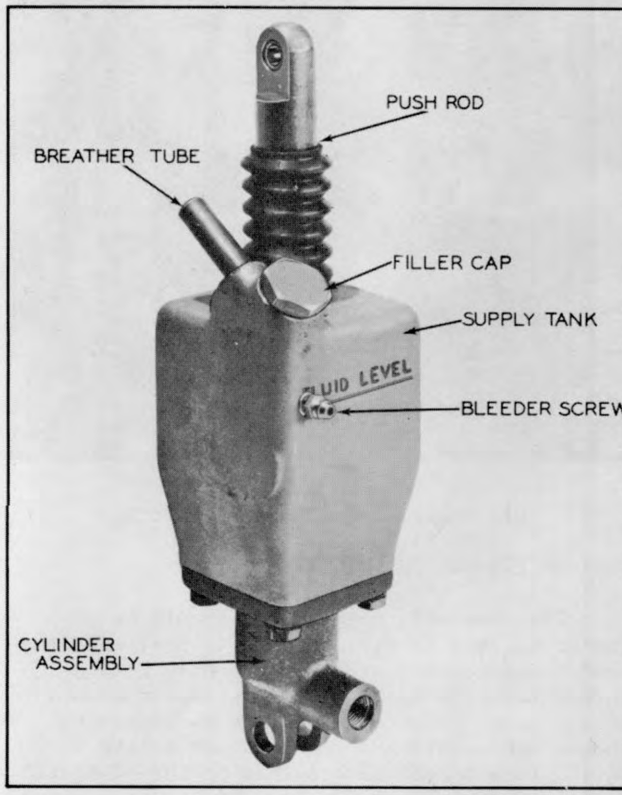


Plate 5334. Speed Control Cylinder (ECLS MODELS)

Speed Control Cylinder: Verify fluid level. Fluid should be to the height of the level bleed screw. Fill if necessary with S.A.E. 70R3 Heavy Duty Brake fluid.

Cylinder Vent Tube: Cylinder vent must be open at all times. Clean vent hole if necessary.

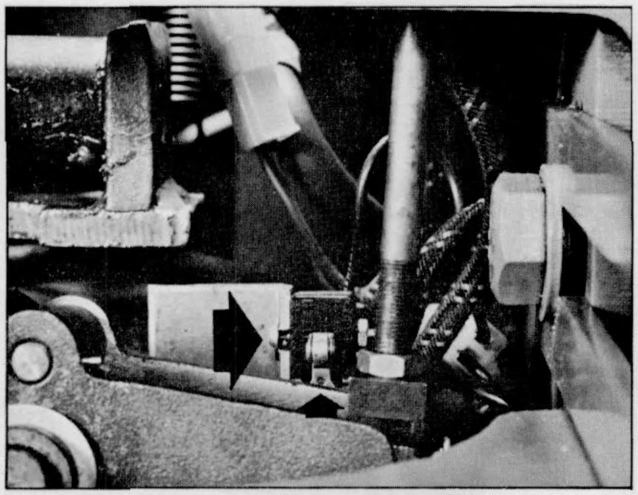


Plate 7207. Seat Safety Switch

SEAT SAFETY SWITCH ADJUSTMENT

This normally open switch should be adjusted so that it will actuate (close) when the seat frame bumpers are approximently 2 to 3 inches from the hood during the seat downward travel. The adjustment is made by loosening the switch mounting screws and moving the switch fore or aft as required on the elongated mounting bracket holes. Securely tighten mounting screws when correct adjustment is obtained.

BRAKE PEDAL FREE TRAVEL

Using a rule, measure pedal free travel at either of the two places shown below.

Depress brake pedal by hand. When pedal meets resistance from the master cylinder, the distance traveled should be 1/2 inch — if free travel is incorrect, adjust as follows:

1. Loosen lock nut, see Plate 6633.

2. Rotate adjuster to obtain specified pedal free travel.

3. Tighten lock nut to hold adjustment.

ACTUATION STROKE

The Automatic Brake Adjustors will maintain pedal stroke, with little variation, until such time as the brake linings require replacement. At this time the brake pedal will drop toward the floor board.

If brake pedal travels beyond this point------ this indicates either lack of fluid in the master cylinder; air in the system, or the brake linings require replacement.

CLEARANCE - measured here -

TOP PEDAL POSITION -TO- WHERE PEDAL

MEETS RESISTANCE FROM THE MASTER

CYLINDER.

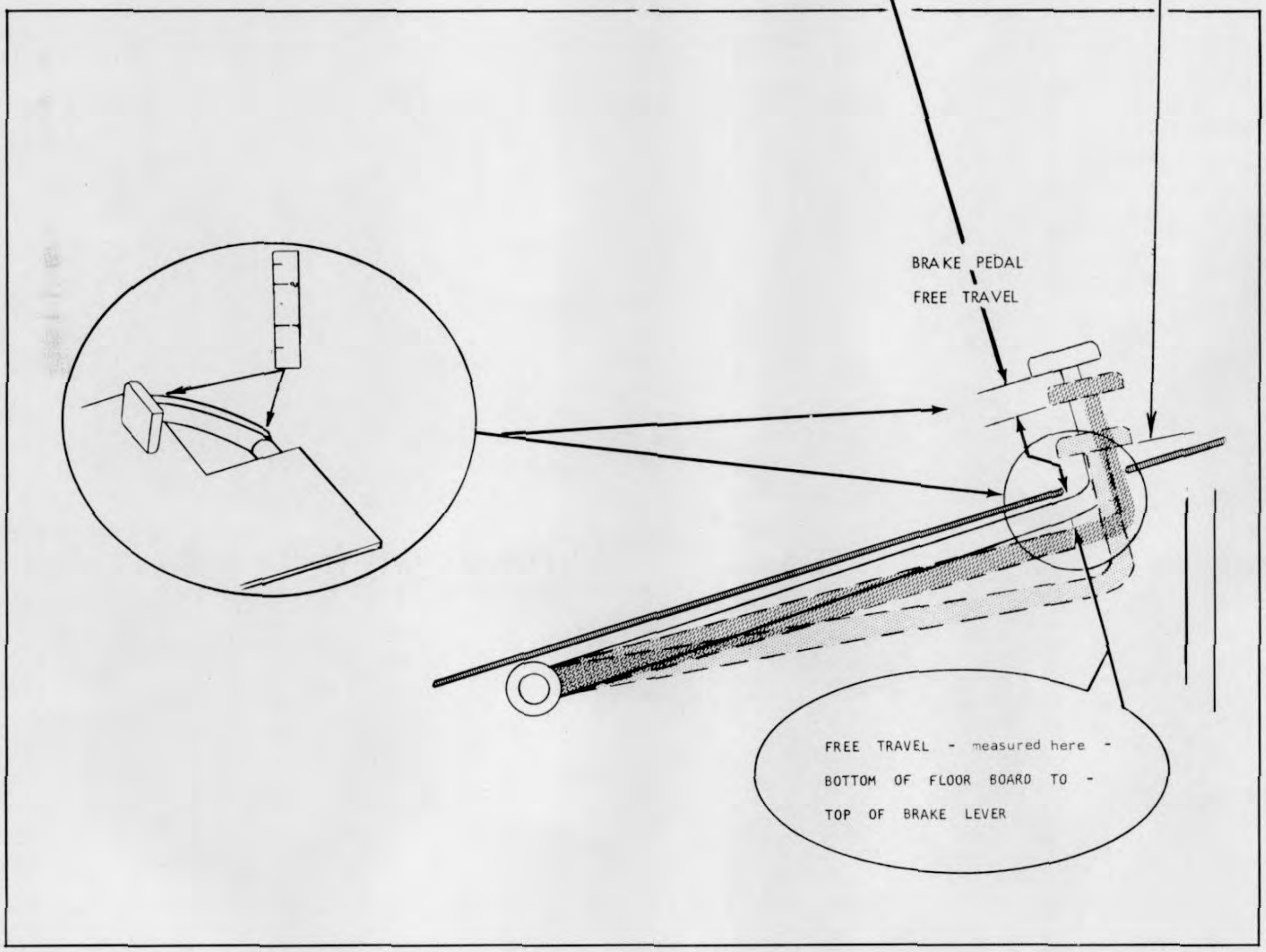


Plate 7042. Brake Pedal Check and Adjustment

BRAKE SYSTEM

Check brake fluid level in the master cylinder. Brake fluid should be within 1/4 inch of the top. Fill with S.A.E. 70 R3 Heavy Duty Hydraulic Brake Fluid.

Master Cylinder Filler Cap Vent Hole: Check cap vent hole for obstruction. Vent hole must be open at all times. Clean if necessary, see Plate 6633.

BRAKE PEDAL

WARNING

CORRECT BRAKE PEDAL FREE TRAVEL IS IMPORTANT FOR SAFE OPERATING BRAKES.

A correctly adjusted brake pedal is important so that the internal ports in the master cylinder are not blocked by the cylinder piston. The following lists two important reasons for proper brake pedal free travel.

Inadequate pedal free travel will block the internal ports so that upon releasing the brake pedal fluid will be trapped in the lines and hold the brake linings in contact with the brake drums. Resulting in lining wear and premature discharge of the battery.

Brake Pedal Adjustment: Refer to Plate 7042 and follow the instructions and diagrams.

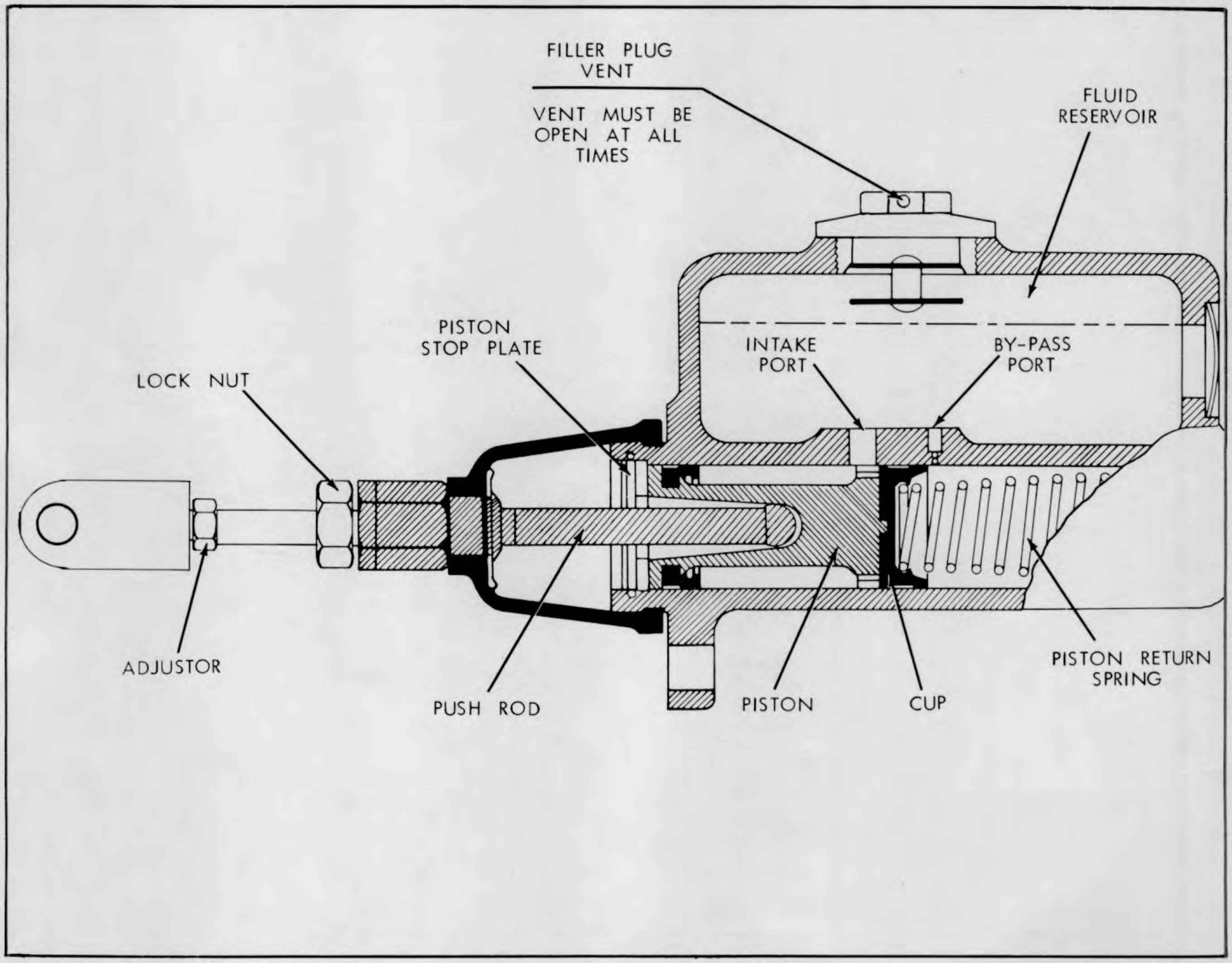


Plate 6633. Brake Pedal Adjustment

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 X X X X X X X X X X X X X X X X X X X X X

WARNING

KEEP CLEAR OF LOAD AND CARRIAGE WHEN MAKING ADJUSTMENTS TO AVOID INJURY IF ANY MALFUNCTION SHOULD OCCUR AND CAUSE LOAD OR CARRIAGE TO FALL.

X X X X X X X X X X X X X X X X X X X X X 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.

NOTE

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 <u>bottom carriage roller</u> 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.)

CAUTION

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.

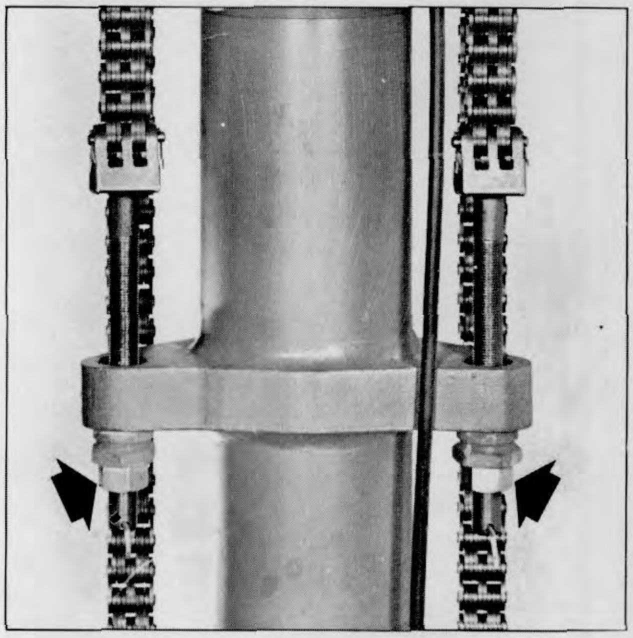


Plate 6634. Lift Chain Adjustment (Chain Anchor Rods)

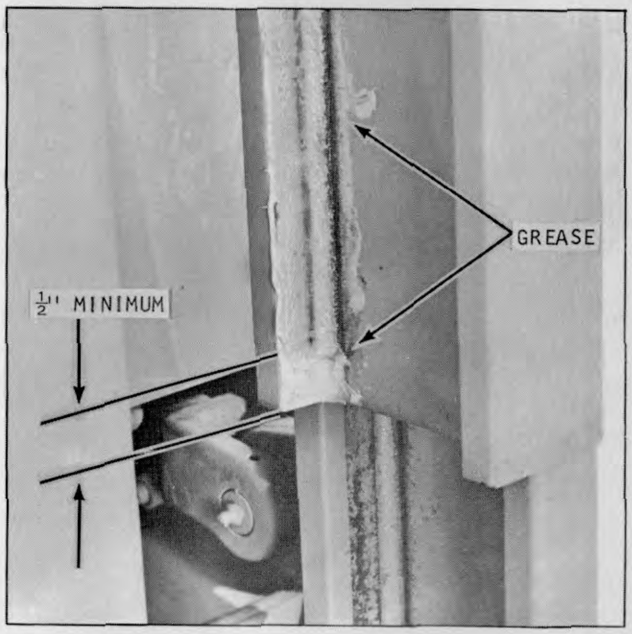


Plate 8622. Lift Chain Adjustment

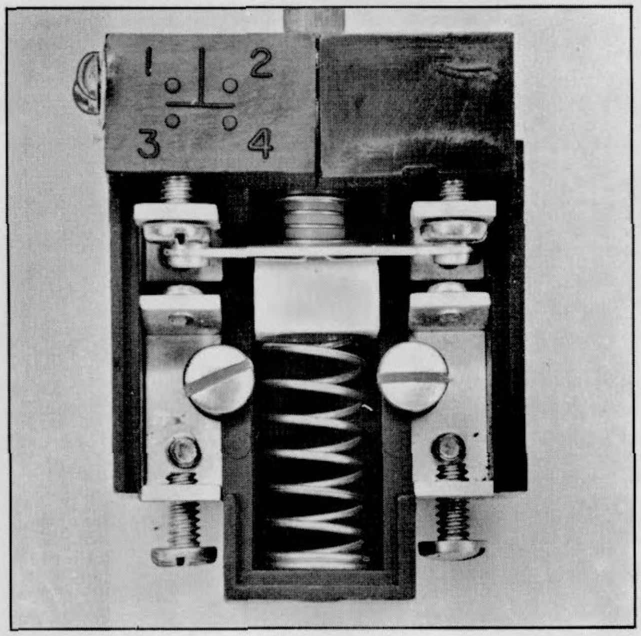


Plate 7443. Typical Pump Control Switch

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.

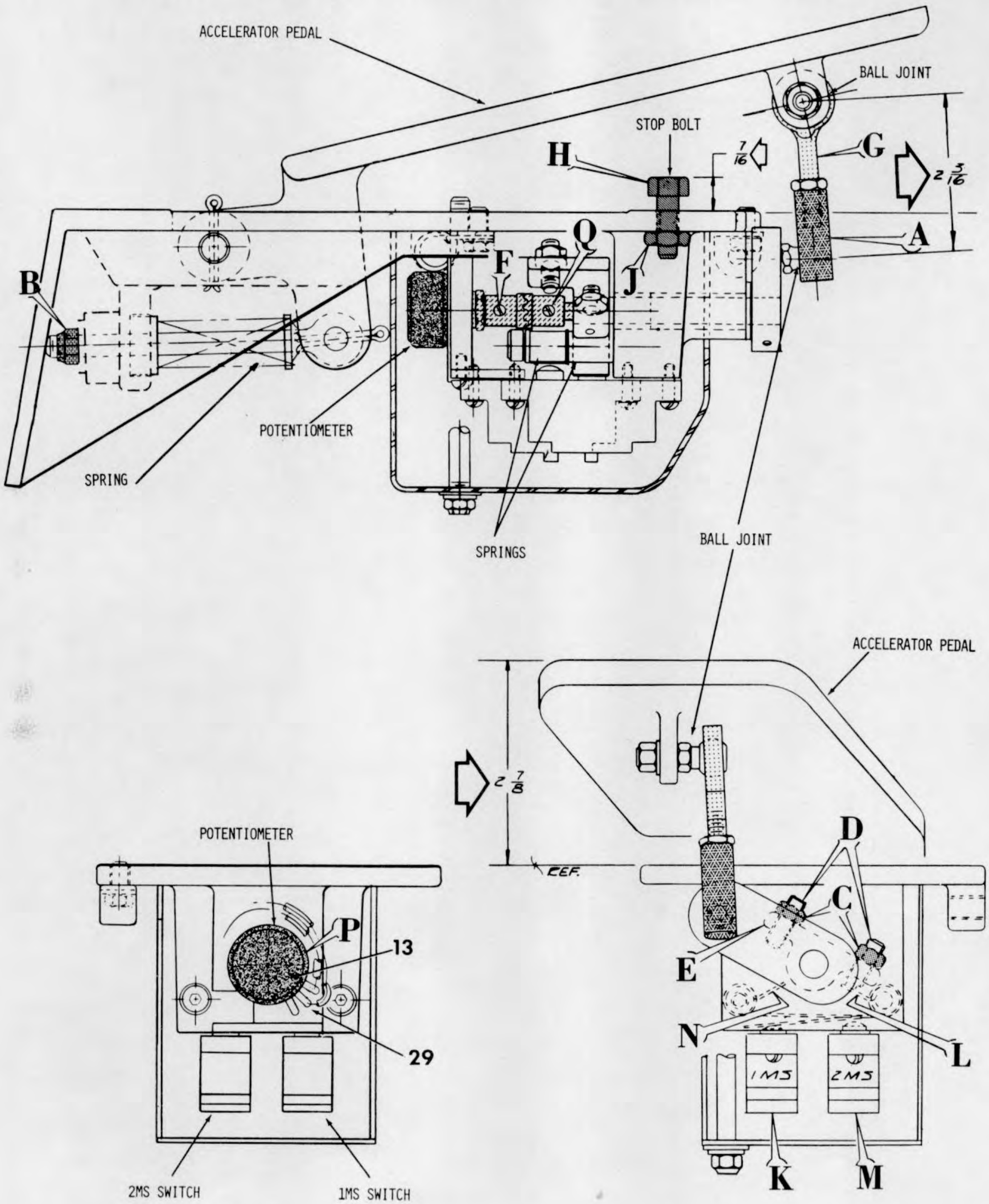
2. Position switch on spool end cover so that movable switch contacts are centered between stationary contacts. (Switch contacts are viewed thru clear plastic cover on switch.)

NOTE

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

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

ACCELERATOR ADJUSTMENT......C-185 SCR CONTROL......SOLID STATE CONTROL SYSTEM...



ACCELERATOR CONTROL ASSEMBLY ADJUSTMENT

SOLID STATE CONTROL

ACCELERATOR ADJUSTMENT

EC30E, EC40E, and EC50E

STEP #1

A. Disconnect BALL JOINT (ItemA), position pedal to 2-7/8" dimension, from machined surface of casting.

B. Turn STOP NUT (Item B) to hold this position.

STEP #2

A. Loosen NUTS (Item C) and back off (2) SET SCREWS (Item D) until flush with cast surface of SPRING ACTUATOR (Item E).

B. Do not tighten SET SCREWS (Item F) in coupler at this time.

STEP #3

A. Adjust LINKAGE ROD (Item G) to 2-3/16" dimension.

STEP #4

A. Adjust PEDAL STOP BOLT (Item H) to 7/16" dimension, and lock in place with JAM NUT (Item J).

STEP #5

A. Adjustment of 1MS SWITCH with PEDAL in the UP position:
...adjust 1MS switch (Item K) with SET SCREW (Item D) by turning screw in against SPRING (Item L) until 1MS just actuates. Turn SCREW an additional 1/4 turn...tighten LOCK NUT (Item C).

B. Depress PEDAL several times to be certain 1MS is actuated each time. If not, unlock NUT (Item C) and turn SCREW (Item D) in an additional 1/4 turn... ...lock NUT and repeat above.

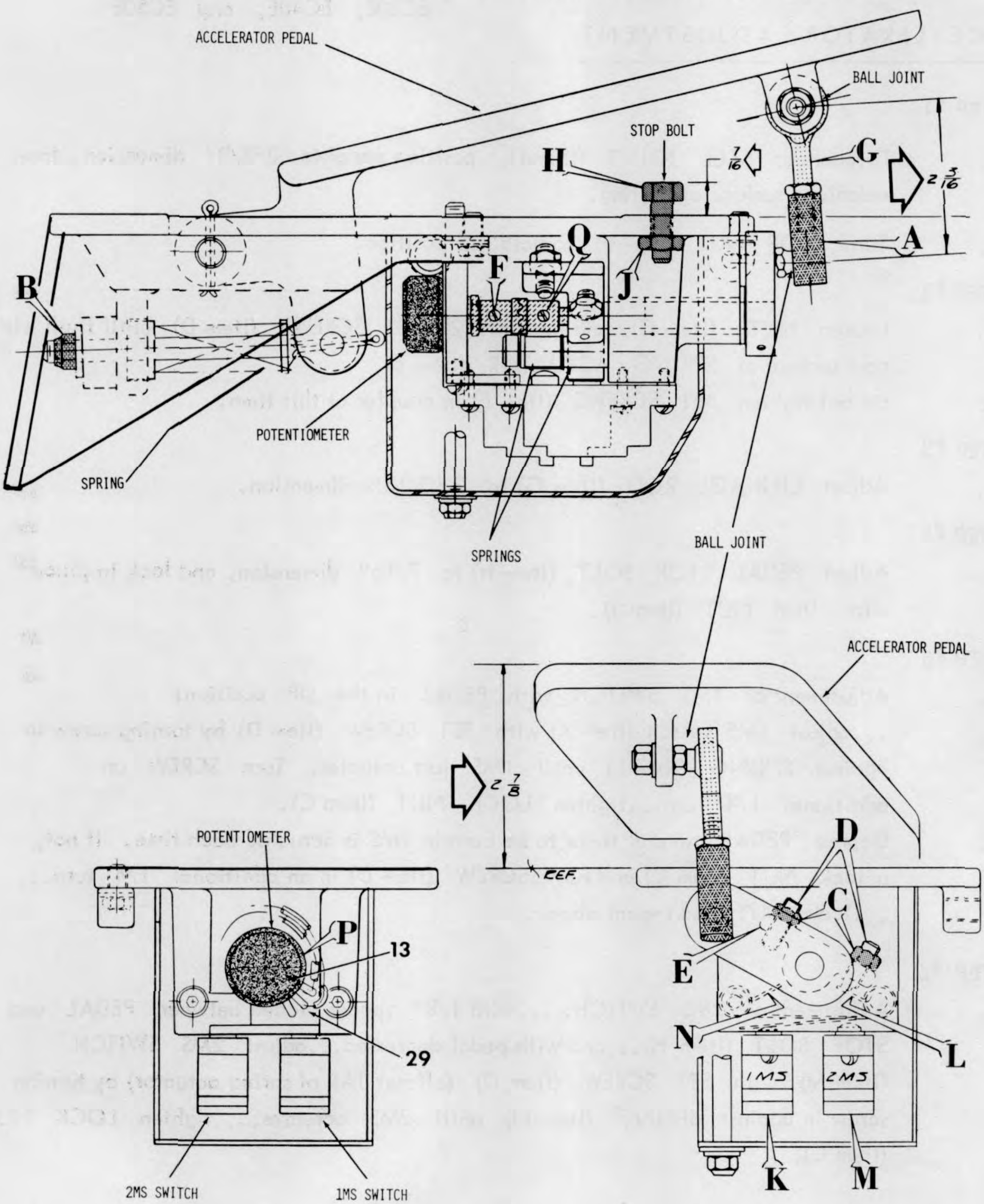
STEP #6

A. Adjustment of 2MS SWITCH: ...with 1/8" spacer placed between PEDAL and STOP BOLT (Item H)...and with pedal depressed...adjust 2MS SWITCH (Item M) with SET SCREW (Item D) (off-set TAB of spring actuator) by turning screw in against SPRING (Item N) until 2MS actuates....tighten LOCK NUT (Item C).

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

ACCELERATOR ADJUSTMENT......C-185 SCR CONTROL......SOLID STATE CONTROL SYSTEM...



Accelerator Control Assembly Adjustment

- continued -

SOLID STATE CONTROL
ACCELERATOR ADJUSTMENT

EC30E, EC40E, and EC50E

STEP #6 - continued -

B. Remove 1/8" spacer and depress PEDAL fully to be certain that 2MS SWITCH actuates each time.

STEP #7

A. Adjustment of POTENTIOMETER (Item P) with SET SCREW (Item F) tightened, and SET SCREW (Item Q) loosened...disengage COUPLER halves.

B. With OHMMETER connected between WIRES 13 & 29...RS100 scale...revolve coupler half & potentiometer until ohmmeter reads approximately 10,000 ohms.

C. Engage coupler halves and tighten SET SCREWS (Item Q).

D. Depress PEDAL until 1MS actuates...ohmmeter should read between 8,500 ohms and 9,500 ohms...terminals 13 & 29...RS100 scale. If not, minor adjustment can be made by loosening the coupler SET SCREW (Item Q) and revolving coupler and potentiometer SHAFT (with 1MS just actuated) to within range...tighten set screw.

E. Depress PEDAL until 2MS just actuates...ohmmeter should read 300 or less ohms...RS1 scale.

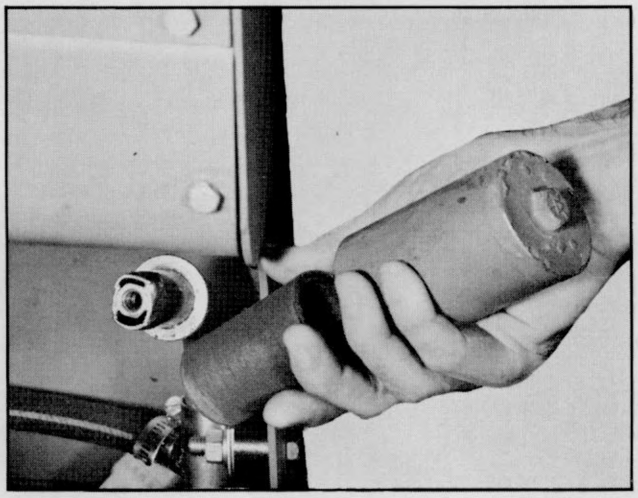


Plate 10200. Typical Sump Tank Breather

HYDRAULIC SUMP TANK BREATHER:

Check breather to be sure it is not dirty or clogged with foreign matter. Clean in a Stoddard type cleaning solvent, if necessary.

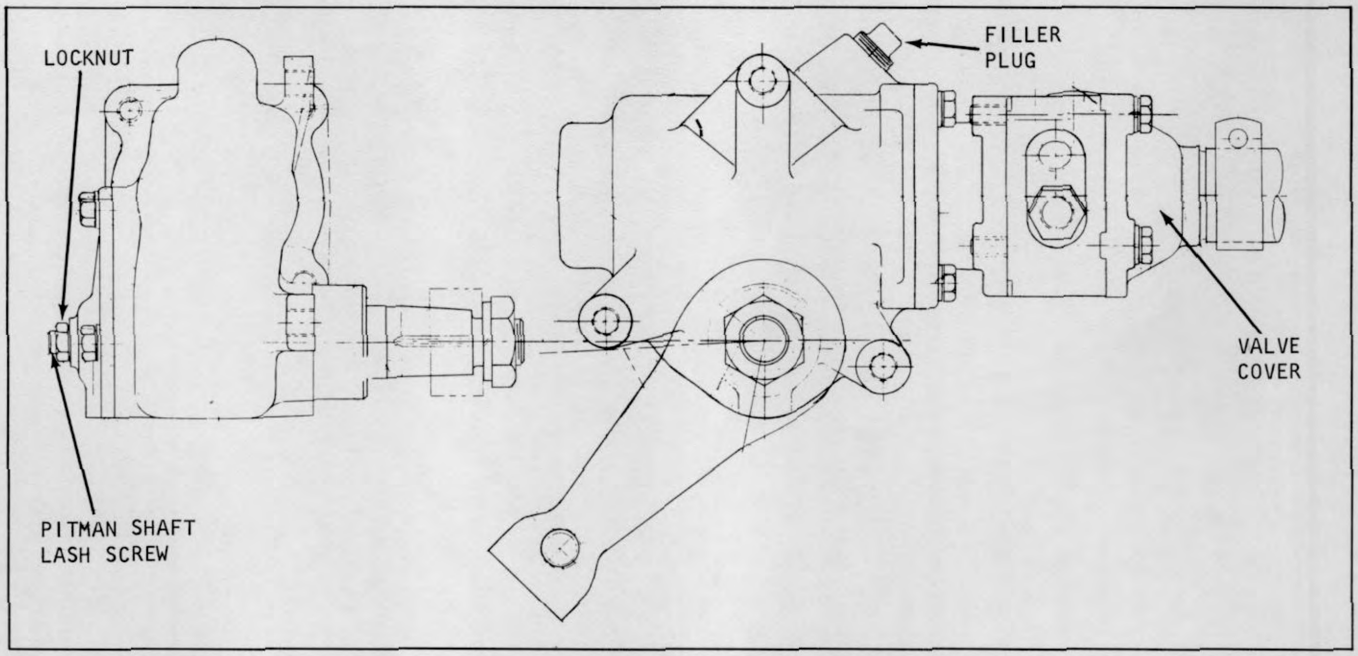


Plate 10172. Typical Steering Gear

STEERING GEAR:

The gear lubricant level should be checked every 100 operating hours and filled if necessary with NLGI #1 (Amolith grease EP #1 or its equivalent). Fill to level of filler plug opening only. Replace plug after filling.

NOTE

Before removing fill/level plug, be sure to wipe all dirt from around the plug and opening.

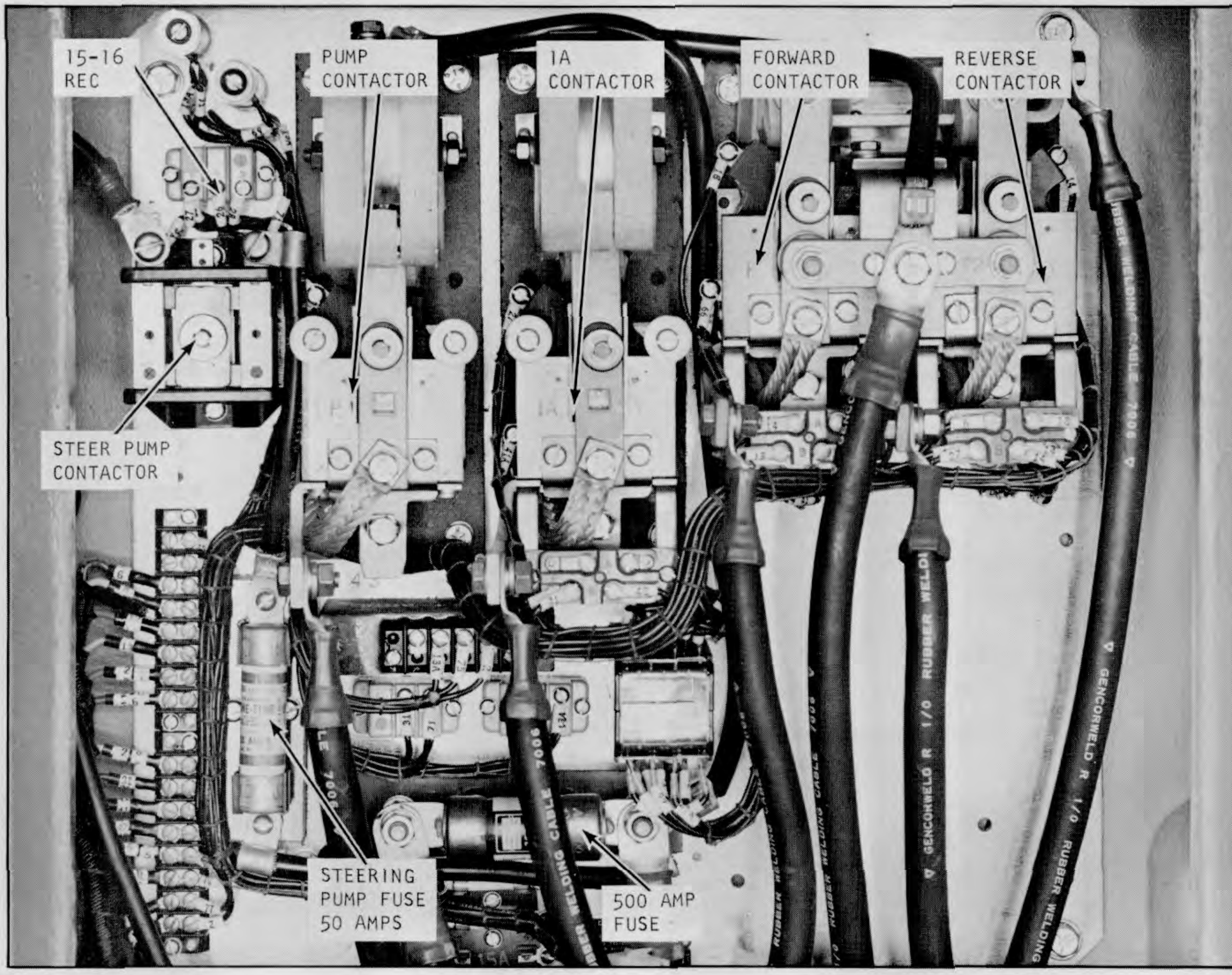


Plate 10201. Typical Contactor Panel

CONTACTOR PANEL:

Darkening of contacts does not indicate burning; this darkening is normal. Burning is judged by actual loss of contact material or droplets of molten contact material being displaced. The contact itself may be used until the contact material has been almost completely worn away; however, it is sometimes advisable to replace tips when, in the opinion of the maintenance department, there is not enough tip material remaining to last until the next regular maintenance check. The silver alloy portion of the tip is usuable copper and serves as a backing for the tip.

Contacts should not be filed for the purpose of removing discoloration or minor surface irregularities. Such action wastes contact material and introduces contact surface which is susceptible to sticking. A discolored appearance is normal in the proper operation of the contact. Occasionally a cone and crater may develop. To insure continuous service of such contacts, remove the cone only with a file. Do not use sandpaper or emery cloth and avoid any further filling.

WARNING

BEFORE MAKING ANY ADJUSTMENTS, DISCONNECT THE BATTERY AT RECEPTACLE.

CONTACTOR PANEL ADJUSTMENTS

Tools Required

Before going into the adjustment procedures, you should have with you (or available at the job-site) all of the tools and gages we illustrate and list.

Tools 0-1 and 0-3 are ones you can make and will save you considerable time in making these special adjustments. Seeing they cannot be purchased, they call for more discussion.

Tool # 0-1 make from 3/8" diameter drill rod and form to shape shown. Slot with a hacksaw with two blades inserted if necessary to obtain in one cut a proper width slot to dimensions shown....Plate 9731.

Tool # 0-3 pusher rod. Make from 3/32" welding rod and remove flux. Point end as shown for best results. Form an S shape on opposite end as shown....Plate 9678.

Before starting adjustments you should be prepared and have a full set of normally open moveable and normally open stationary arms and replaceable tips with you for each machine to be serviced or checked.

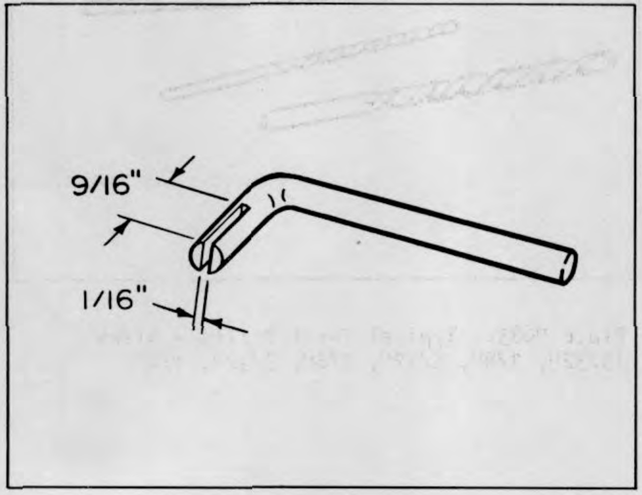


Plate 9731. Typical Tool # 0-1

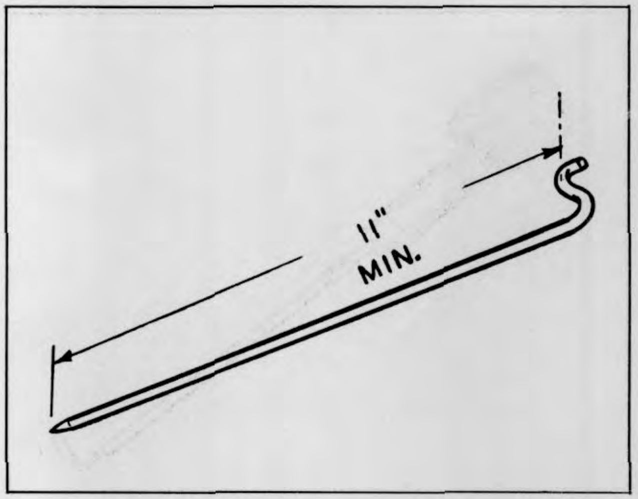


Plate 678. Typical Pusher Rod - Tool # 0-3 (Used only in connection with type "T" Chatillon Spring Tension Gage).

Plate 9679. Typical Instrument Type "T" - Chatillon Spring Tension Gage, Mfg. by Chatillon Inst. Co., New York, N.Y.

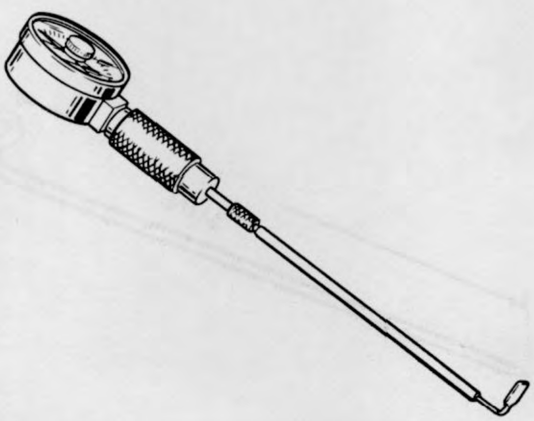


Plate 9680. Typical Spring Tension Gage..... Clark Part # 886717.

NOTE

It is not necessary that you have both types of Spring Tension Gages we have illustrated. Either type will suffice.

Plate 9681. Typical 8" Crescent Wrench.

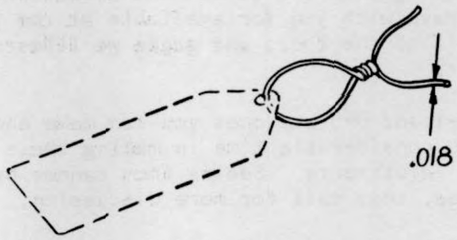


Plate 9682. Typical Tag Wire .018 Diameter Maximum.

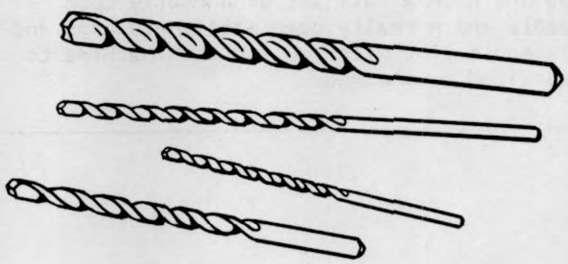


Plate 9683. Typical Twist Drills - Sizes 13/32", 3/8", 5/32", 1/8", 3/32", 1/4".

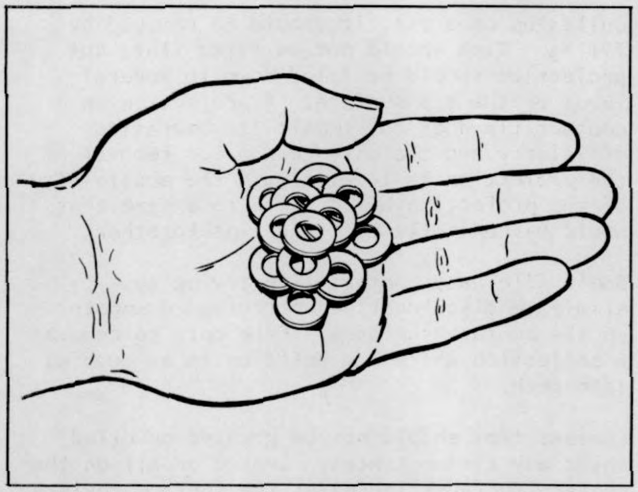


Plate 9684. Typical Handful of 1/4" Flat Washers.

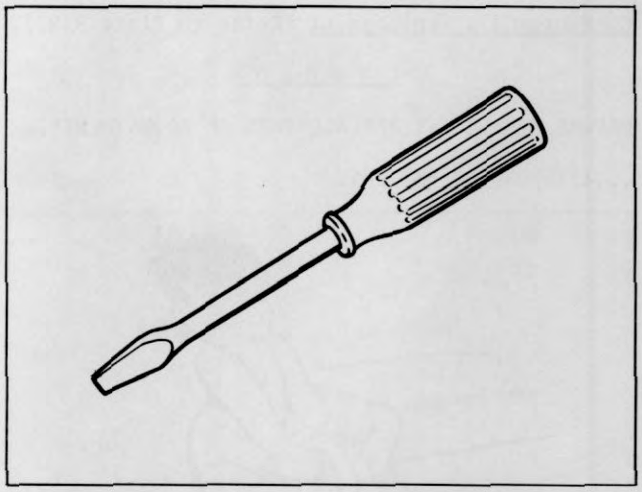


Plate 9686. Typical Screwdriver approximately 8" length.

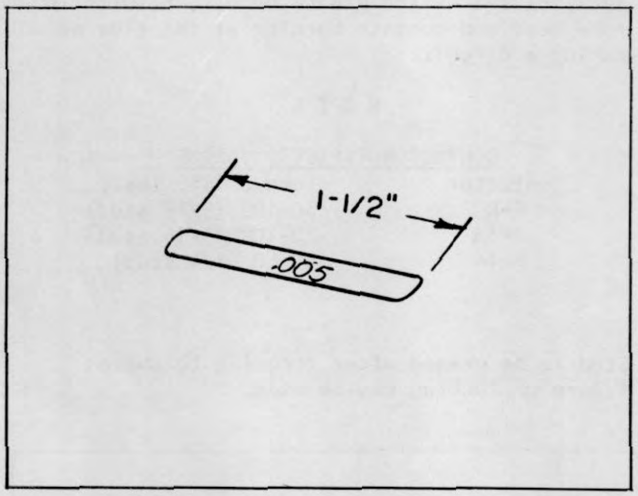


Plate 9685. Typical Brass or Steel Shim Stock .005" Thick.

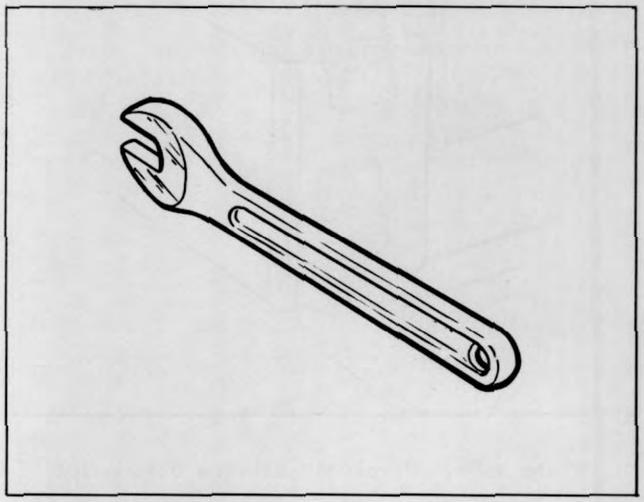


Plate 9687. Typical Open End Wrenche size - 7/16".

Contactor Tip Replacement *(Refer to Plate 3197).*

C A U T I O N

BEFORE MAKING ANY REPLACEMENTS OR ADJUSTMENTS..

....DISCONNECT BATTERY.

Plate 9688. "Typical" Battery Disconnect

Actual replacement of contacts should only be made after 90% of the tip material has been burned away.

The following figures show six contacts in various stages of wear. These are reference numbered from 1 through 6. Of these six illustrated, only the contact numbered 1 is worn or burned badly enough that it should be replaced. All of the other contacts shown have a great deal of life left in them, although the contact surfaces are burned to a dark color and they show pitting.

Refer to contact number 6. This is the worst of the five contacts that are still serviceable. The pits in this contact are 1/16 inch deep, yet despite the appearance, 80% of the contact tip material is still present, hence 70% of the original life expectancy could be obtained by continued use of this contact.

When a projection of as much as 1/16 inch high builds up on a tip, it should be removed by filing. Tips should not be filed flat, but projection should be filed down to general level of the tip surface. A projection on a contact tip does not impair its operating efficiency and the only reason for removal of the projection is to eliminate the possibility of the projection building up to a size that would mechanically lock the tips together.

Don't file away contact life trying to eliminate discoloration or trying to smooth up the contact surfaces. File only to remove a projection which has built up to as much as 1/16 inch.

Contact tips should not be greased or oiled under any circumstances. Grease or oil on the contact surfaces increases the surface resistance and may be the cause of collecting sufficient dirt to prevent contacts closing and making a circuit. In addition, the high resistance, caused by the grease or oil, results in more heat and contact burning at the time of making a circuit.

N O T E

CONTACTOR TIP STUD TORQUE

Contactor	Torque (in. lbs.)
F-R	80-100 (5/16 stud)
P-1A	80-100 (5/16 stud)
P-1A	45-60 (1/4 stud)

Stud to be peened after torquing to above figure or locking device used.

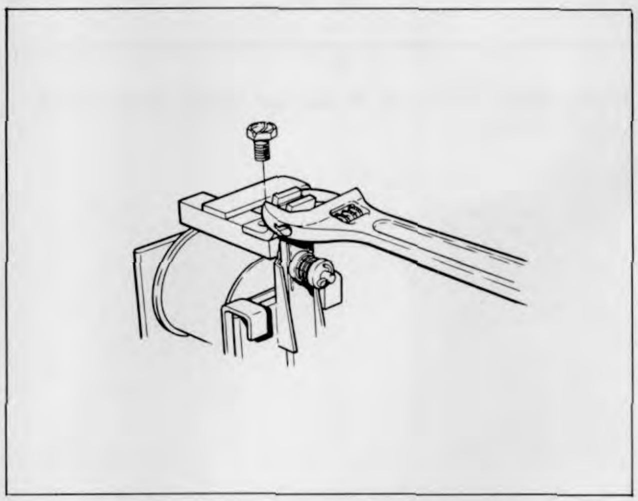


Plate 9690. Typical Contactor Arm Alignment

Use Plate 9690 for an easy approach to aligning normally open stationary and moveable tips.

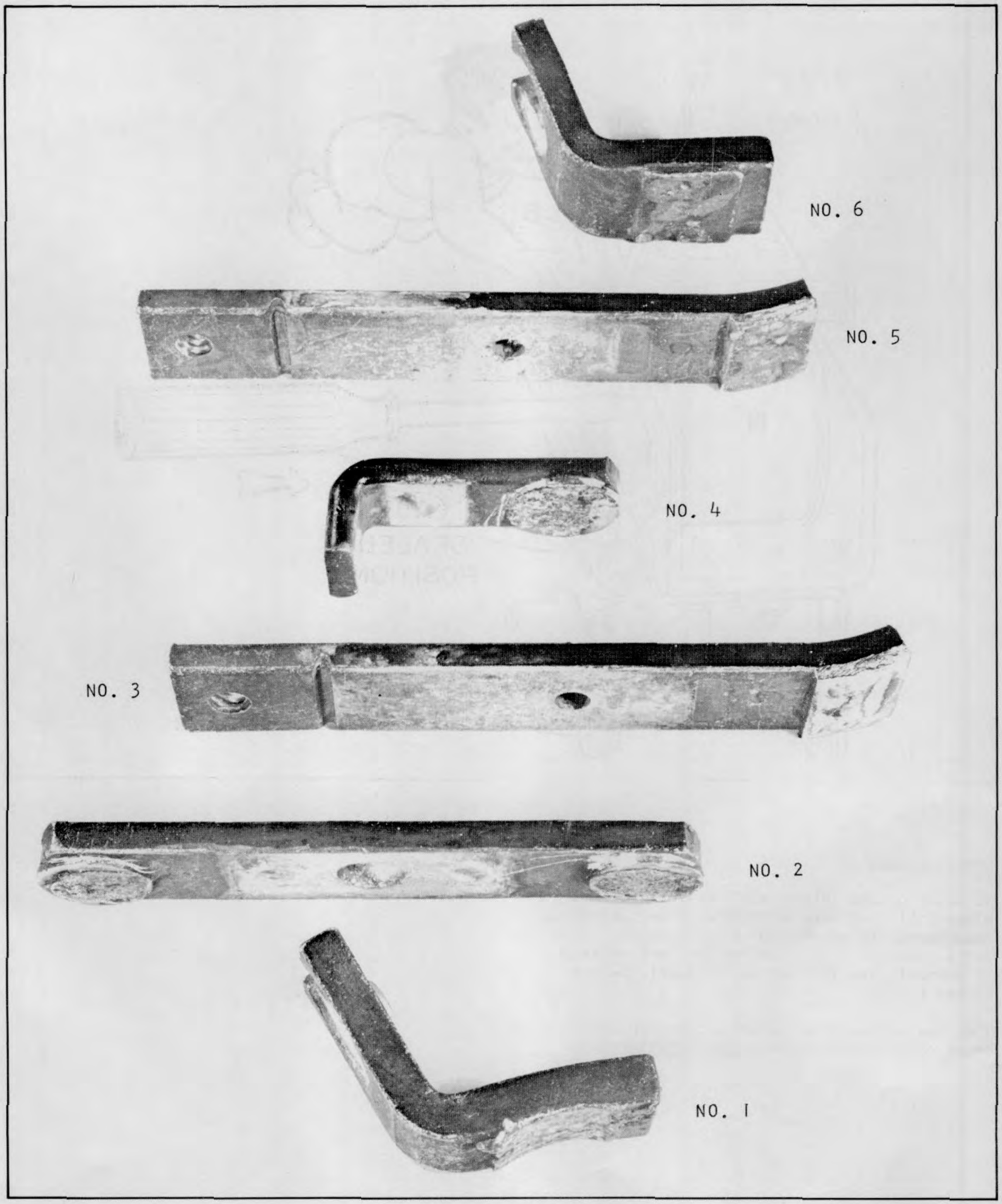


Plate 3197. Typical Contactor Tips

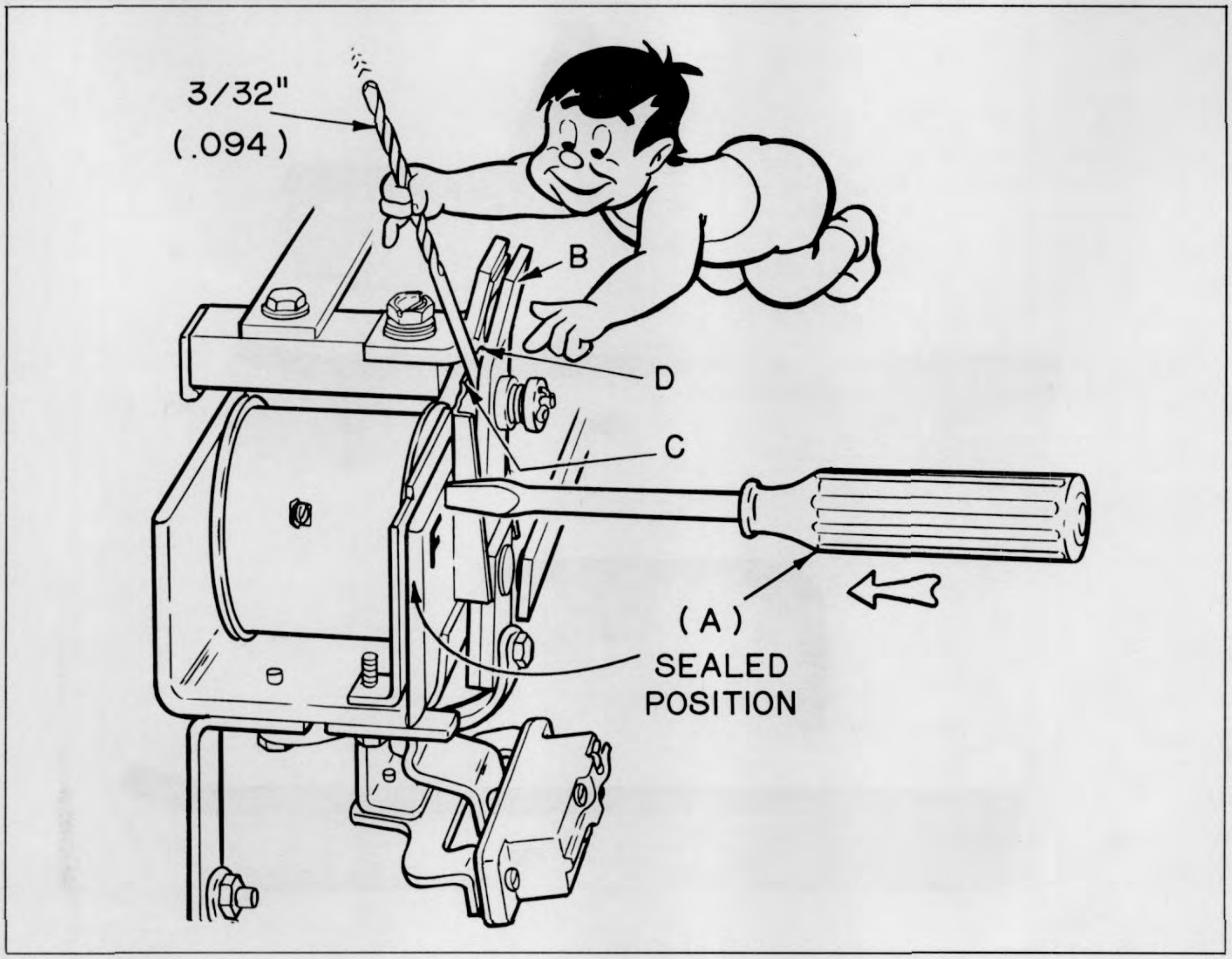


Plate 9691. Typical Wipe Check

Checking Wipe

To measure wipe (Plate 9691) seal the armature plate fully and hold with screwdriver (A) while measurement is taken with a 3/32" drill. This drill, when held parallel to the back surface of moveable arm (B) must slide freely between points C & D.

The wipe is found in specifications in the front of this manual under CONTACTORS.

Adjusting Wipe

Wipe is controlled by three conditions:

(1) Stationary normally open tip, (new or worn).

(2) Improper (off brand) tips or tip kits supplied by anyone but Clark which could have wrong angle bends in the moveable or stationary arms.

(3) Angle at end (A) Plate 9692 of moveable contact arm support stop. Correct wipe can be obtained by the bending of (A) which will either increase or decrease wipe. When bending must be done to get proper wipe, then a special tool (C) # 0-1 is recommended. This tool, if used carefully, will guarantee the whole surface of the stop will be bent evenly and kept parallel to the back surface of the moveable tip (D). To increase wipe bend up (E). To decrease wipe bend down (F).

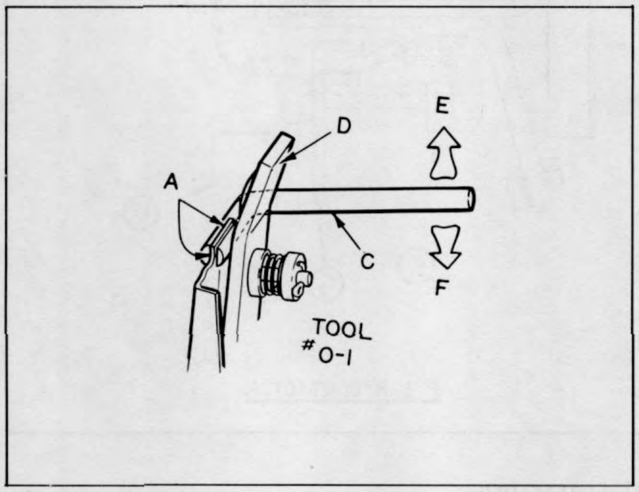


Plate 9692. Typical Wipe Adjustment

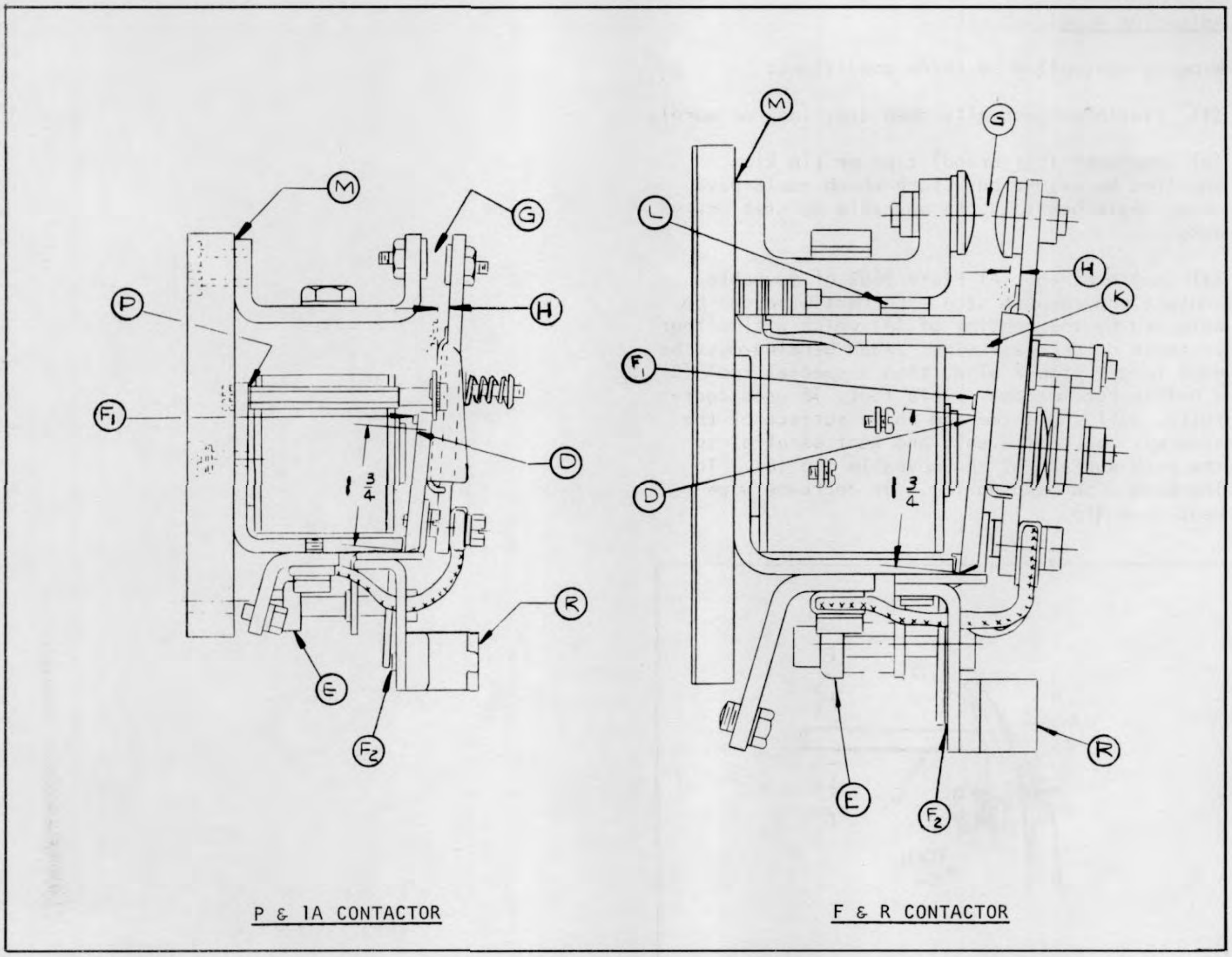


Plate 9703. Typical Contactors

Adjustment of Interlock (R)

The electrical interlock must operate with a (0.015 in. P and 1A or 0.035 in. F and R) thick shim (F1) between armature and core. Snapping noise indicates interlock (R) has operated. Also, with a 0.015 in. thick shim (F2 - all contactors) between interlock operator and plunger. Plunger must not bottom with armature seated against core.

Contactor Tip Gap Check

Proper settings can best be measured by using new twist drills of proper sizes. See Plate 9693. The air gaps are listed in specifications in the front of this manual under CONTACTORS.

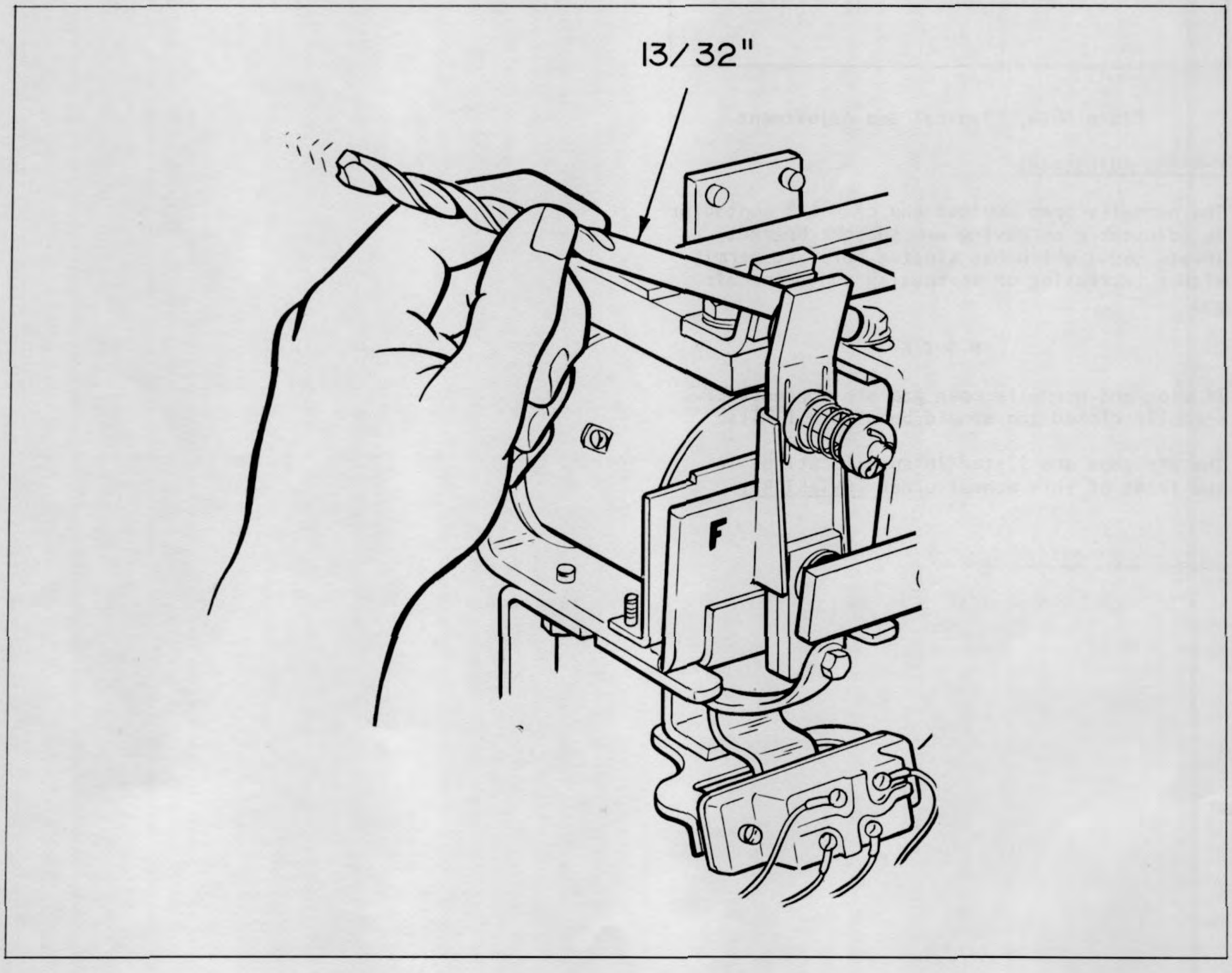


Plate 9693. Typical Gap Check

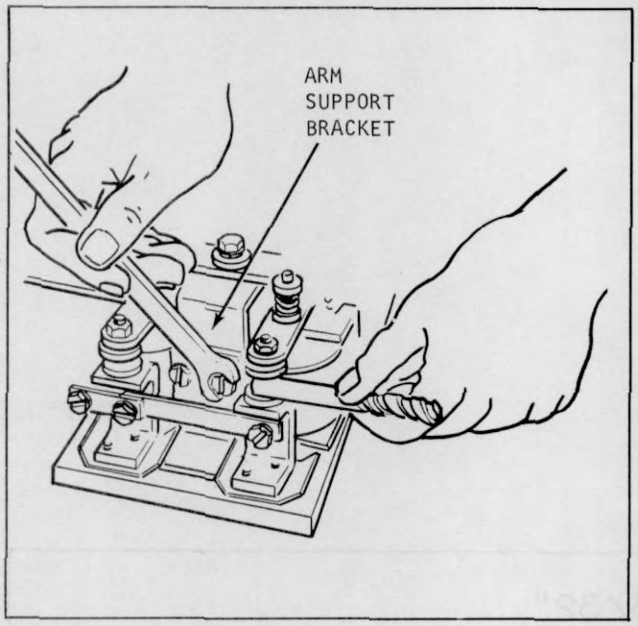


Plate 9694. Typical Gap Adjustment

F-R Gap Adjustment

The normally open contact gap of F & R contactor is adjustable by moving arm support bracket (Plate 9694) which has slotted holes to permit either increasing or decreasing contactor air gap.

N O T E

If wipe and normally open gap are correct...... normally closed gap should be within limits.

The air gaps are listed in specifications in the front of this manual under CONTACTORS.

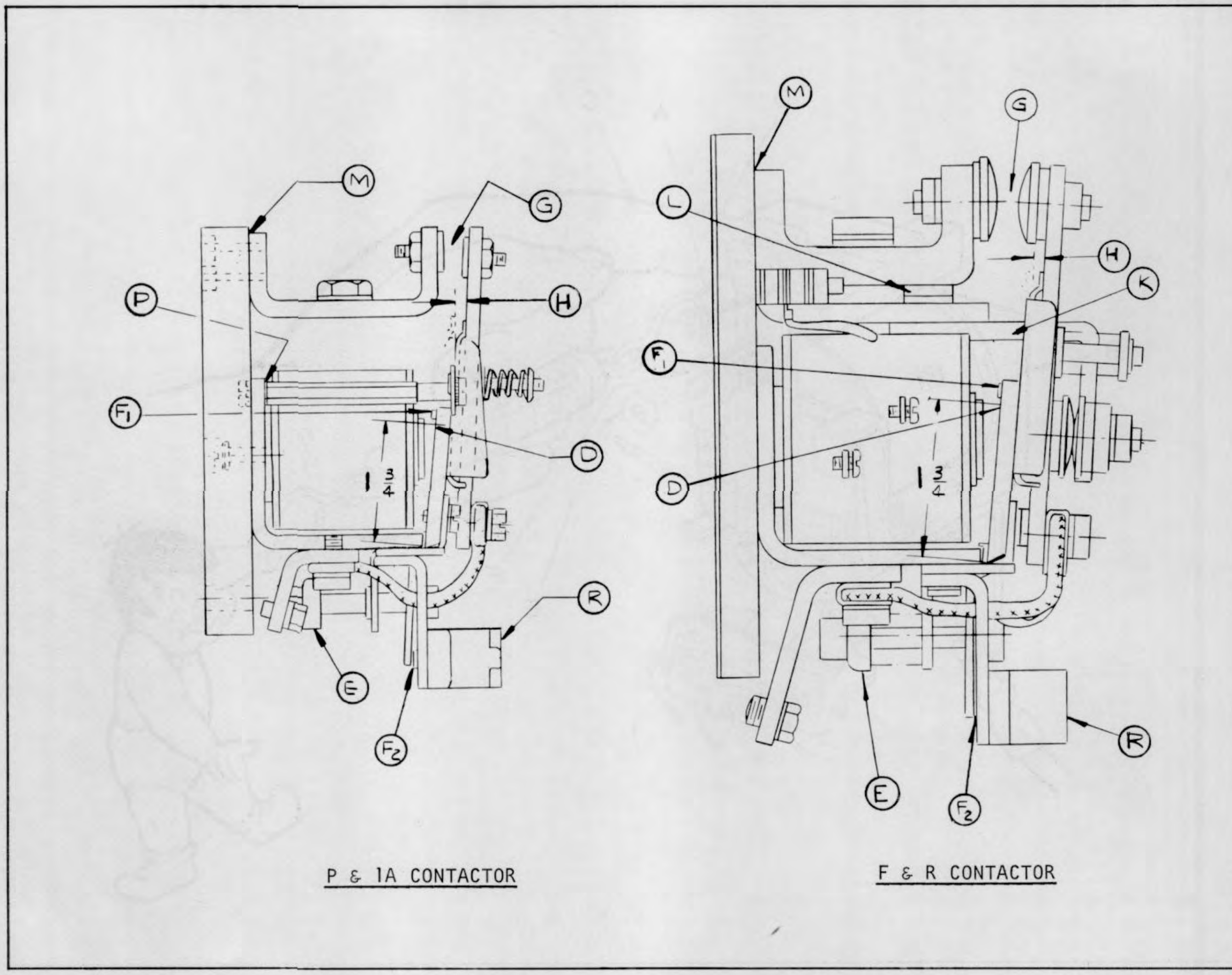


Plate 9703. Typical Contactors

P-1A Gap Adjustment

To obtain proper gaps on 1A and pump tips, adjust by adding or removing equal number of washers under armature stop posts (P). The air gaps are listed in specifications in the front of this manual under CONTACTORS.

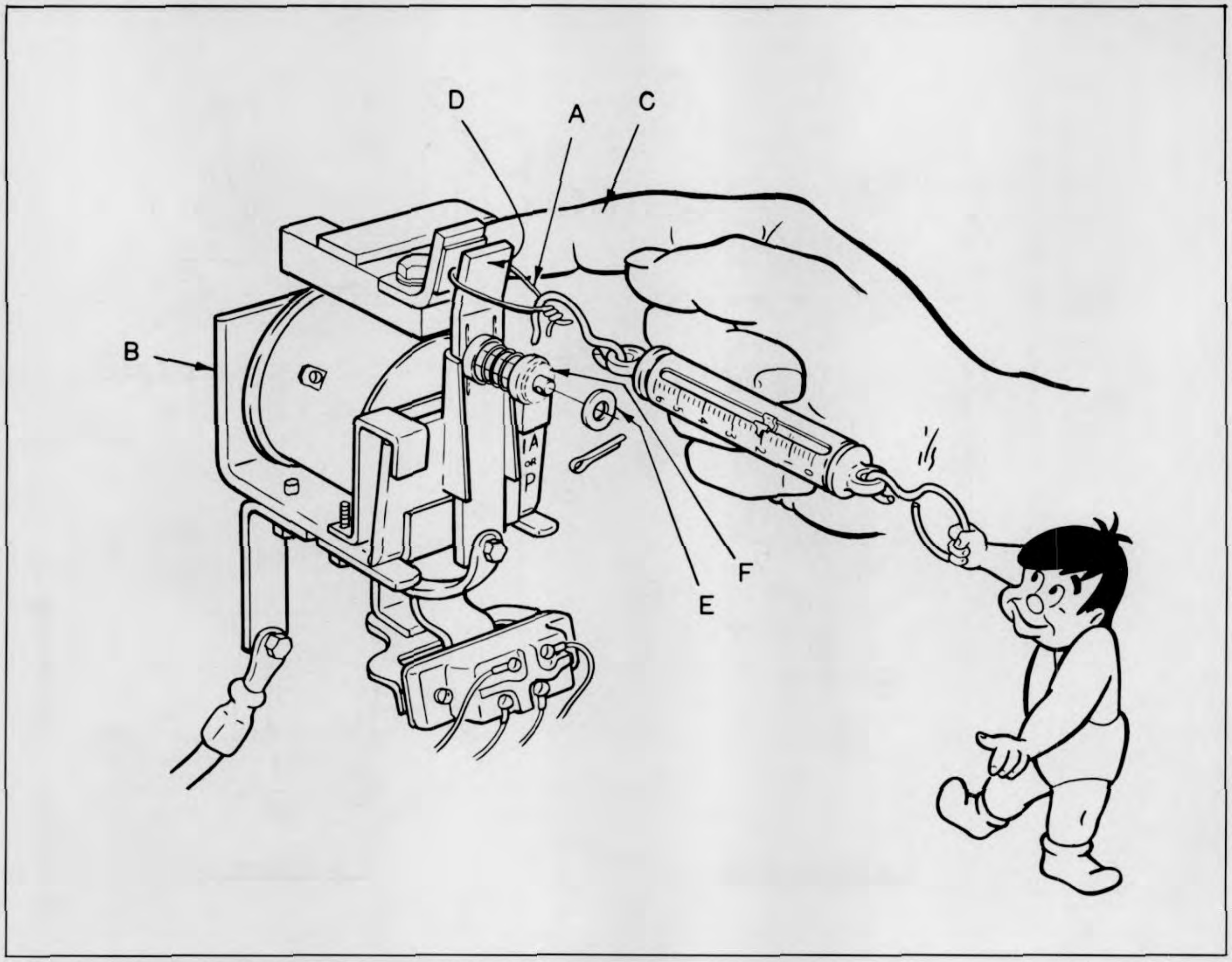


Plate 9696. Typical Spring Adjustment

Spring Tension Adjustments

Spring tensions consists of three to each contactor (1A-P-F & R). All three are explained and illustrated in detail. The three spring tensions can be identified as follows:

1. Initial
2. Armature Opening Force
3. Final

Starting with Initial, known as Initial, Normally Open Tip Pressure refer to Plate 9696 for P & 1A and Plate 9697 for F & R.

Pump and 1A Adjustments

To avoid confusion let's take them separately, starting with 1A and P.

With contactor in its normal open position, insert tag wire (A) at a vertical mid point on the tip surface and attach spring tension gage of either type, being sure it is held at a right angle to surface (B). Using index finger placed lightly in position (C) to detect slightest movement of normally open tip (D) read scale when tip first begins to re-seat on its stop after being slightly moved away from stop. Proper spring tension is 56 - 64 oz.

If pressure is less than minimum, add a plain 1/4" flat washer (E) as shown in its proper position just under cotter key or "E" ring (indicated by dotted lines) (F) and reassemble. Repeat procedure of reading pressure and add additional washer if necessary.

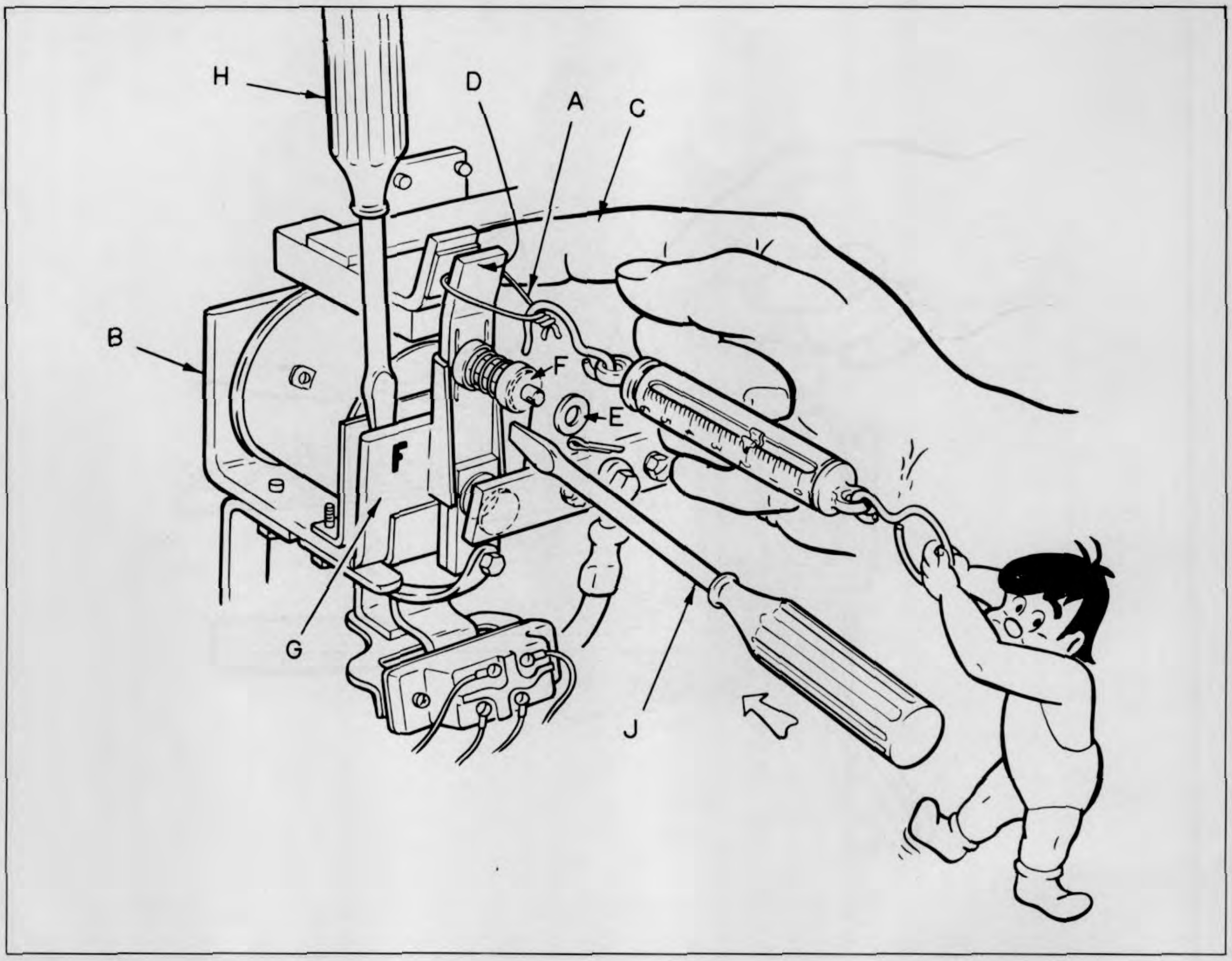


Plate 9697. Typical Spring Adjustments

F-R Spring Tension Adjustments

The adjustment of F & R (Plate 9697) has a slightly different approach and set-up.

The change in set-up is due to the F & R contactors having both normally open and normally closed tips. We must then block the armature plate (G) at a mid point to be sure both sets of tips (normally open and normally closed) are in an open position so the initial contact tip pressure can be read correctly. To accomplish this we utilize two screwdrivers (H & J). Screwdriver H to limit action of armature plate (G) at a mid point and screwdriver (J) to hold armature in mid position. Insert tag wire (A) at a vertical mid point on the tip surface and attach spring tension gage of either type being sure it is held at a right angle to surface (B).

Using index finger placed lightly in position (C) to detect slightest movement of normally open tip (D) read scale when tip first begins to re-seat on its stop after being slightly moved away from stop. Proper spring tension is listed in specifications in front of this manual under CONTACTORS.

If pressure is less than minimum, add a plain 1/4" flat washer (E) as shown in its proper position just under cotter key (indicated by dotted lines) (F), and reassemble. Repeat procedure of reading pressure and add additional washers if necessary.

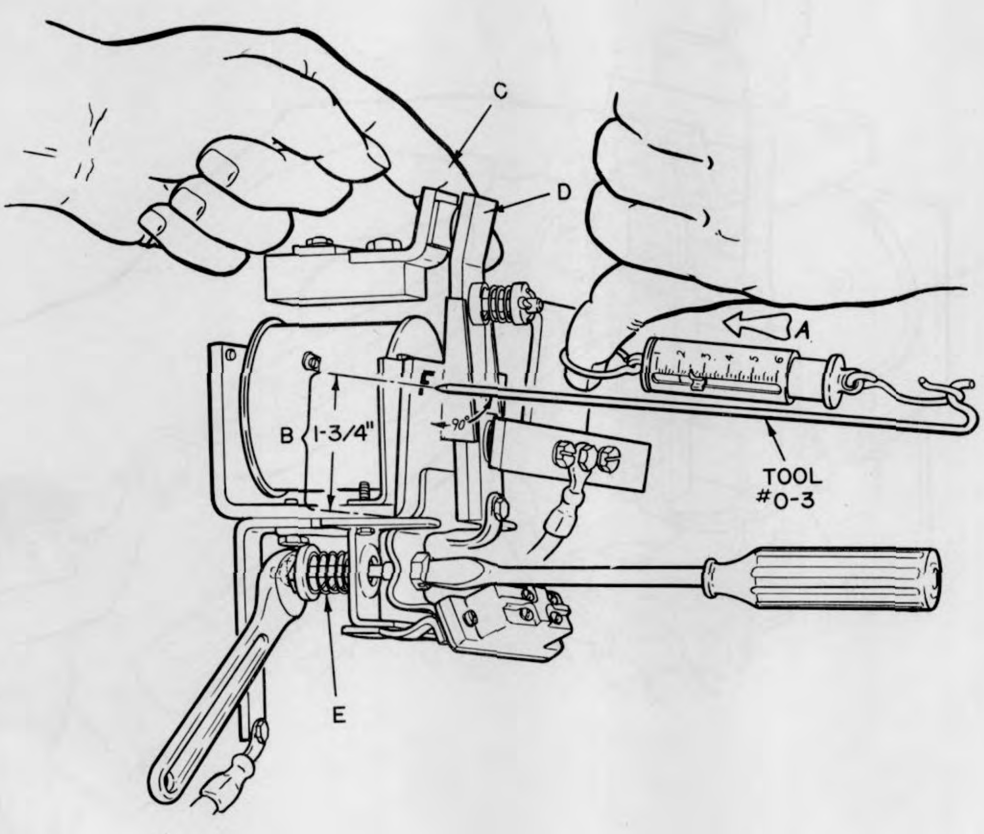


Plate 9698. Typical Armature Adjustment

Armature Spring Pressure Adjustment

Depending upon type of spring tension gage used, follow either Plate 9698 or 9699. Proper spring tension is 32 - 38 oz. on all contactors.

A push action (A) (Plate 9698) from the spring tension gage is utilized here to check pressure.

With the contactor in its normal open position, place spring tension gage and tool # 0-3, Plate 9698 at a point 1 3/4" up from pivot point (B). Use index finger (C) to again detect slightest movement of normally open tip (D). Read scale when armature first begins to contact stop after being moved away slightly. If high or low, adjustmnet can be made through varying tension of spring (E) to bring to proper setting.

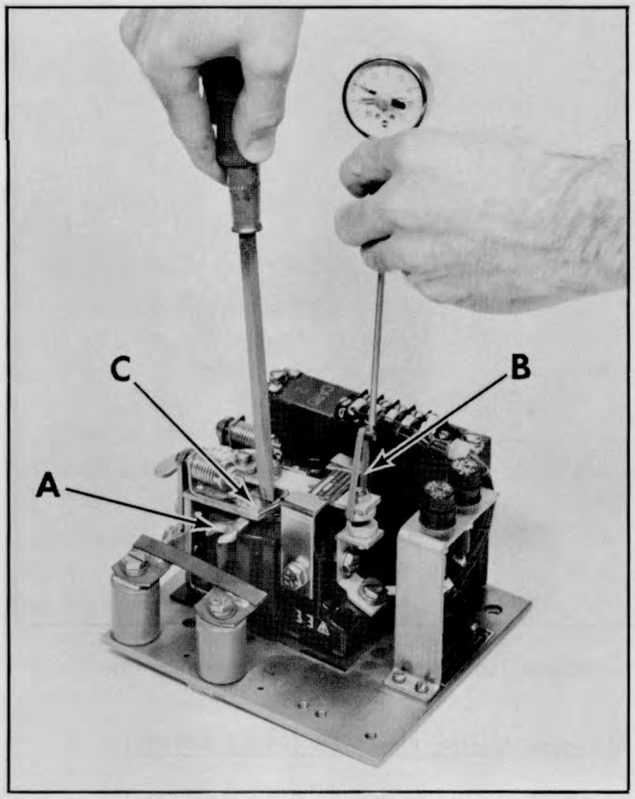


Plate 10600. Typical Initial Spring Pressure

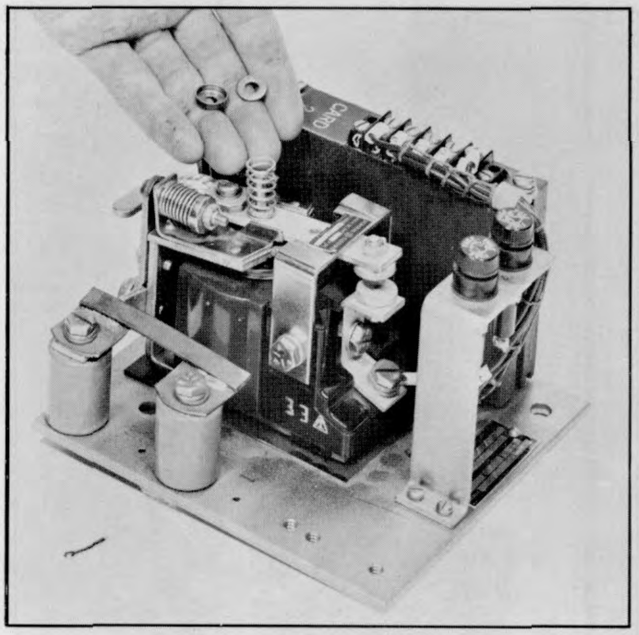


Plate 10601. Typical Spring Pressure Adjustment

FIELD WEAKENING CONTACTOR ADJUSTMENT:

Initial Spring Pressure (Plate 10600):

1. Place a small wrench between the armature and armature plate (A).

2. Hook a gauge to the contactor tip with a tag wire (B).

3. Push the armature plate down with a screw driver and hold (C).

4. Now....pull up on the gauge and take your reading when it first moves up.

5. This initial pressure should be between 40-48 oz. If not, adjust tension by adding a washer as shown in Plate 10601.

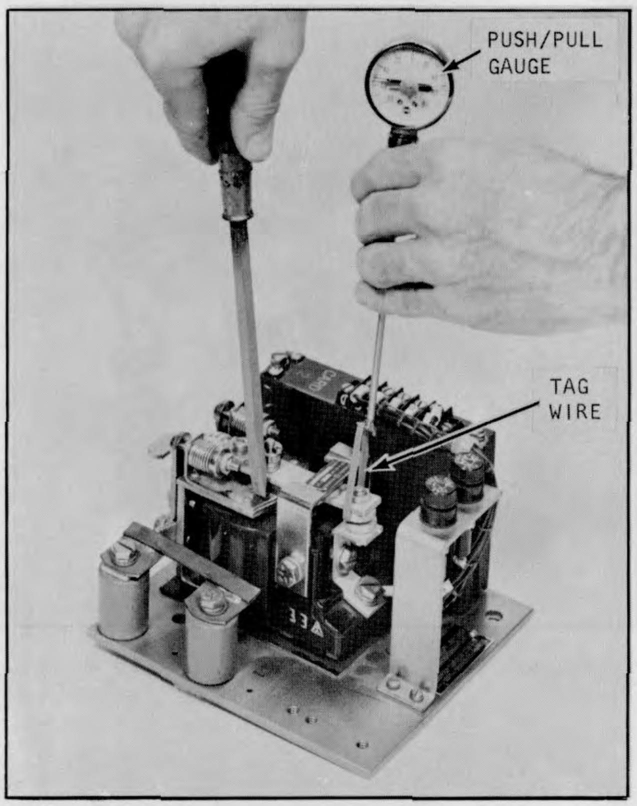


Plate 10602. Typical Final Spring Pressure

Final Spring Pressure (Plate 10602):

1. Attach gauge to contactor tip with a tag wire.

2. Push down on armature plate with screw driver and hold.

3. Take your *reading when the tip first moves up.

4. No adjustment should be necessary once initial pressure is set properly.

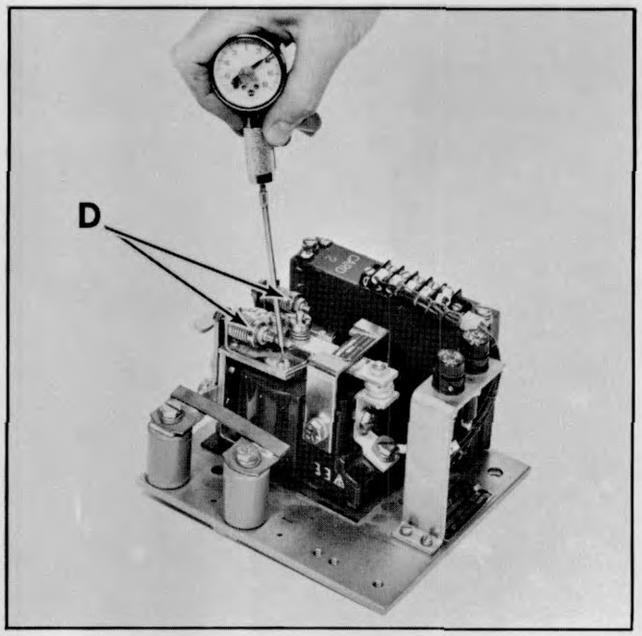


Plate 10603. Typical Armature Spring Pressure

Armature Spring Pressure (Plate 10603):

1. With a spring gauge, push down on the armature plate.

2. Take your reading when the plate first moves down.

3. If *pressure is not right, make adjustments at nuts (D) so that the same amount of threads is shown on each bolt.

*
Final Spring Pressure: 45-56 oz.

Armature Spring Pressure: 32-38 oz.

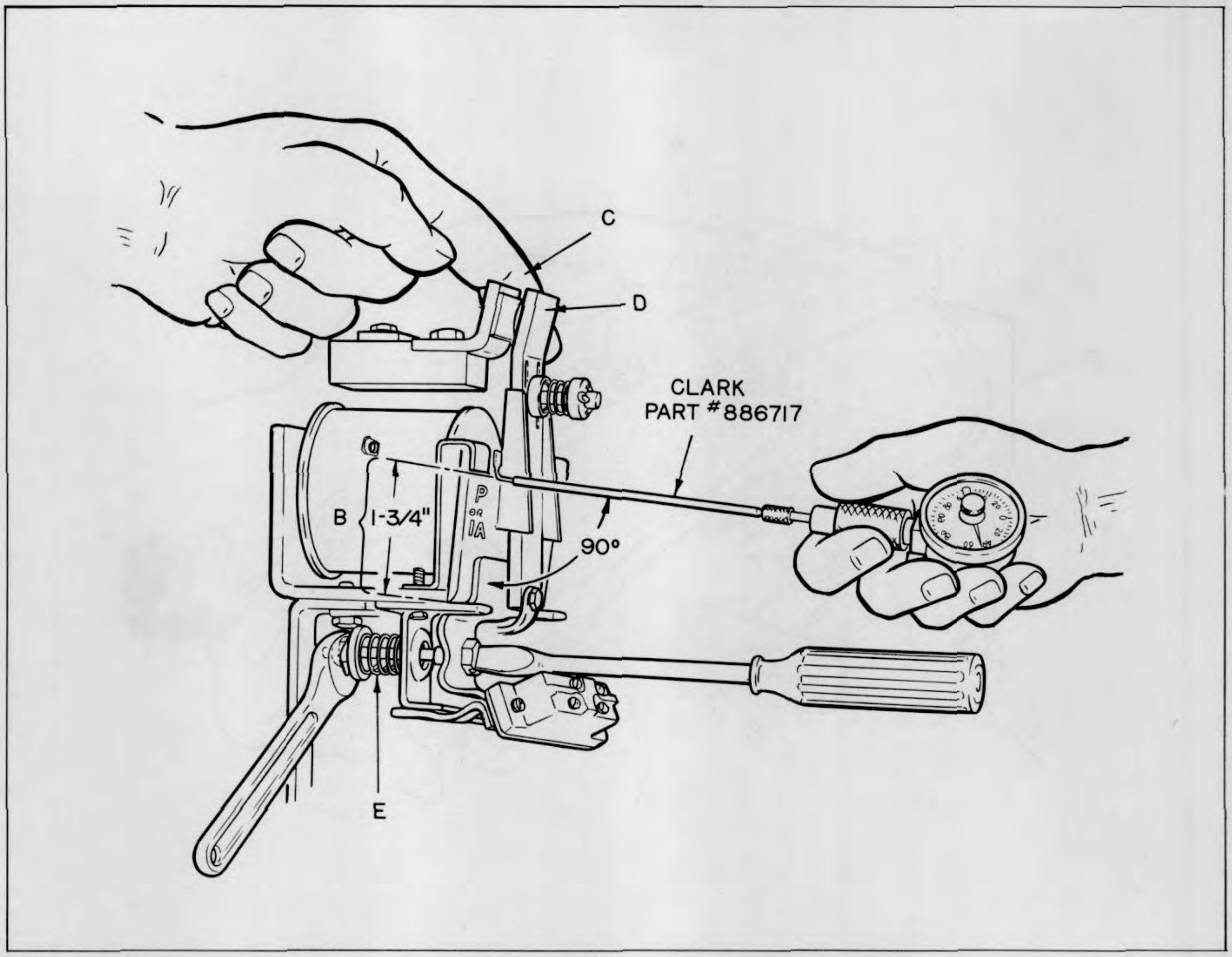


Plate 9699. Typical Armature Adjustment

Armature Spring Pressure Adjustment (Cont.)

Plate 9699 merely shows use of a different type of spring tension gage. Your procedure, however, is the same. But for your convenience we will repeat this procedure.

Proper spring tension is 32 - 38 oz. for all contactors.

A push action (Plate 9699) from the spring tension gage is utilized here to check pressure.

With the contactor in its normal open position, place spring tension gage at a point 1 3/4" up from pivot point (B). Use index finger (C) to again detect slightest movement of normally open tip (D). Read scale when armature first begins to contact stop after being moved away slightly. If high or low, adjustment can be made through varying tension of spring (E) to bring to proper setting.

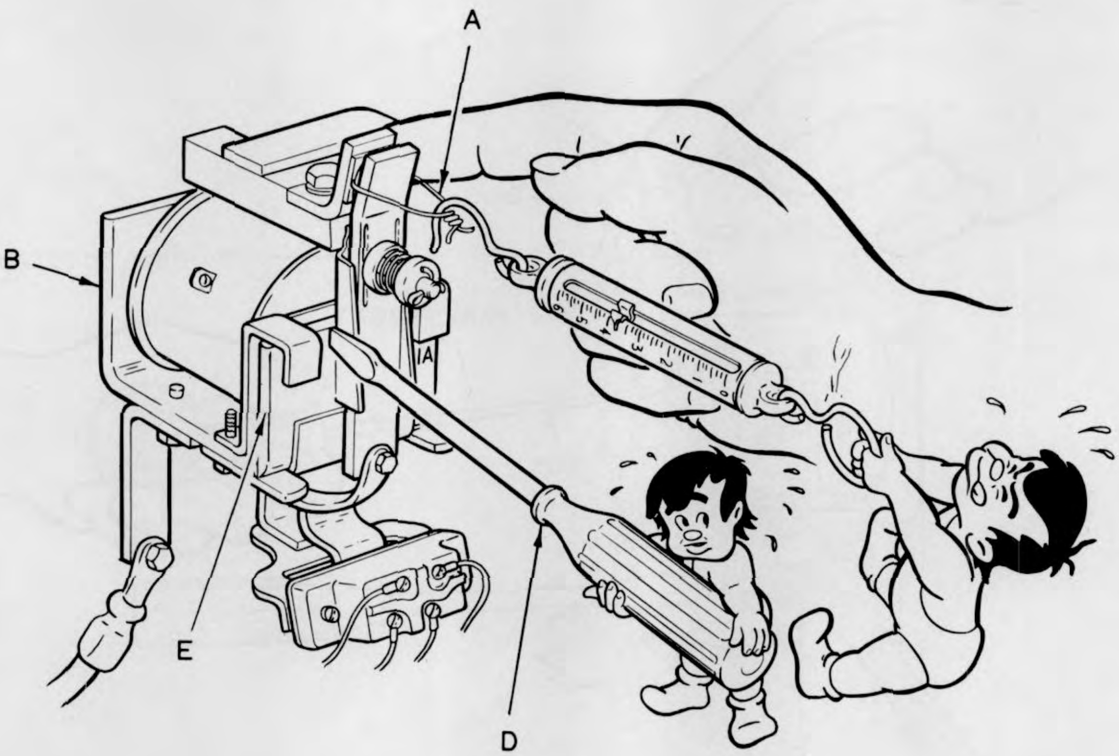


Plate 9700. Typical Spring Check

Final Normally Open Contact Tip Pressure

Follow the one procedure explained and illustrated above for all contactors (1A-P-F & R). See Plate 9700.

With tag wire (A) positioned at a mid point vertically on the tip itself and spring tension gauge held at a right angle to surface (B), seal the armature plate (E)....and while keeping sealed with a screwdriver (D)....read spring tension gauge when tips first begin to re-seat after being slightly separated.
tension for machine serial

Proper spring tension is listed in specifications in the front of this manual under CONTACTORS.

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

LUBRICATION AND PREVENTIVE MAINTENANCE

TRANSMISSION FLUID.........................
Automatic Transmission Fluid, Type "A", Suffix "A". Fluid Containers must display a qualification number prefixed by AQ-ATF. Clark Part Number 879803. (Alternate fluid: Dexron)

Shell Automatic Transmission Fluid Donax T-6
Sunoco Automatic Trans. Fluid Type "A", Suffix "A"
Sinclair Automatic Trans. Fluid Type "A", Suffix "A"
Gulf Automatic Trans. Fluid Type "A", Suffix "A"
AMOCO Automatic Trans. Fluid Type "A", Suffix "A"
Citgo Automatic Trans. Fluid Type "A", Suffix "A"
Texamatic Automatic Trans. Fluid Type "A" 1826-3528
Purelube Automatic Trans. Fluid Type "A", Suffix "A" or the equivalent to the above.

BRAKE MASTER CYLINDERS.....................
SAE 70R3 (Heavy Duty Brake Fluid), Clark Part Number 1800200.

Shell Super Heavy Duty Hydraulic Brake Fluid
Gulf Heavy Duty Hydraulic Brake Fluid
Atlas Heavy Duty Hydraulic Brake Fluid
Texaco Super Heavy Duty Hydraulic Brake Fluid
Pure Super Heavy Duty Hydraulic Brake Fluid
or the equivalent to the above.

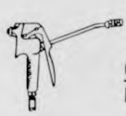
HYDRAULIC SUMP TANK.........................
Hydraulic Fluid per Clark Specifications MS-68.
Clark Part Number 885385.

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 Oil
Texaco 729 Rando Oil HD-A
Puropale RX Hydraulic Oil #150
Molub-Alloy Industrial Hydraulic Oil #601
or the equivalent to the above.

ENGINE OIL:
S.A.E. 90

AXLE END/STEER WHEEL BEARINGS..............
NLGI #1 or NLGI #2....A smooth multi-purpose grease or refined mineral oil blended with a lithium soap thickner containing anti-wear, anti-rust and anti-oxidants with "EP" additives. To meet or exceed Clark Specifications MS-107 and Timken Test 40# minimum.

Shell Aluania "EP" Grease #1 or #2
Sun Prestige 741 "EP" #1 or 742 "EP" #2
Gulfcrown Grease "EP" #1 or #2
Amolith Grease "EP" #1 or #2
Citgo HEP Grease #1 or #2
Texaco Multifak "EP" #1 or Marfak All Purpose #2
Poco HT Grease "EP" #1 or #2
Molub-Alloy General Purpose Grease #1 or #2
or the equivalent to the above.



CHASSIS LUBRICANT..........................
NLGI #2 (same as stated above)

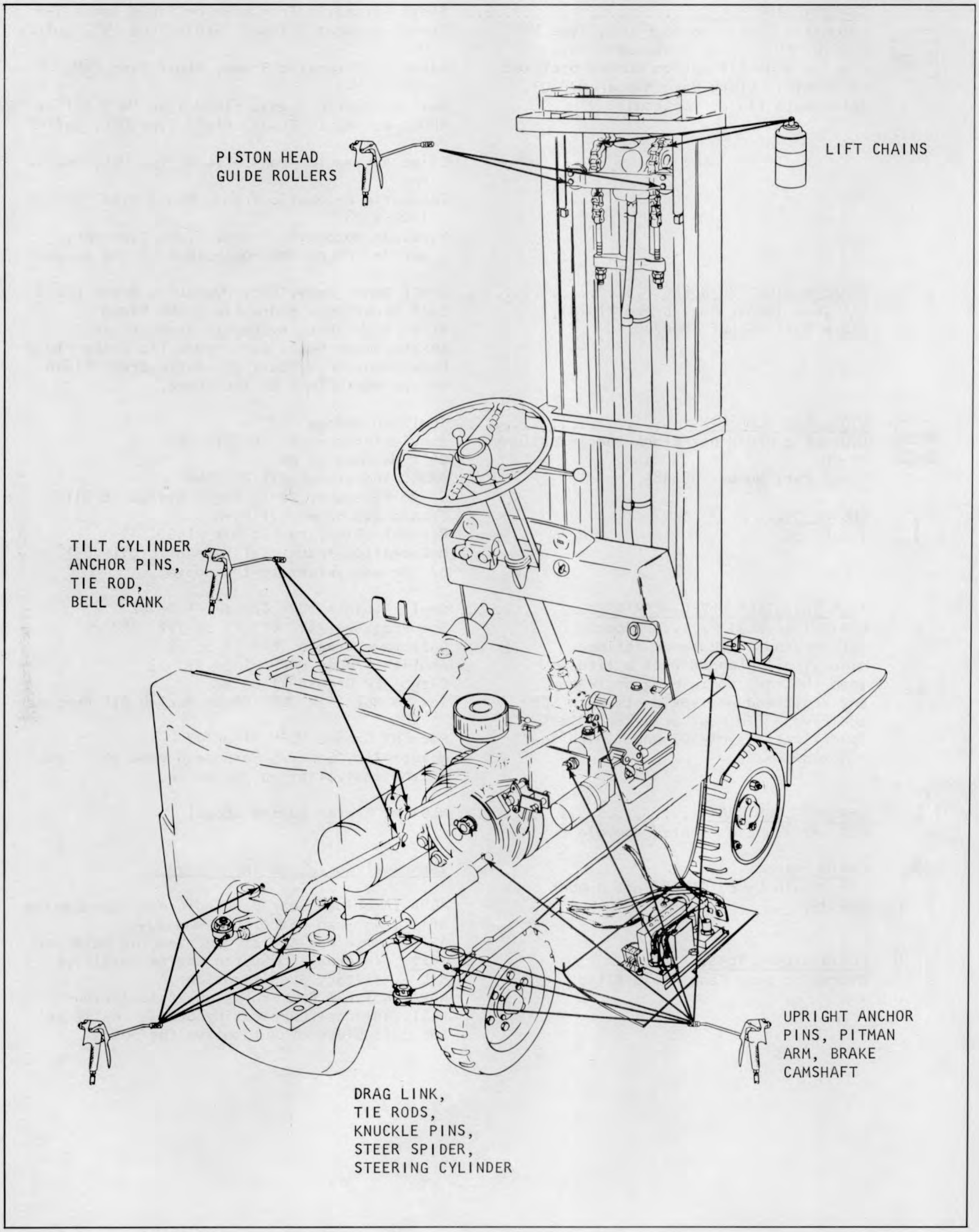
NLGI #2 (refer to the above)

CHAIN LUBE:
Lift Chain Lube, Clark Part Number 886399.

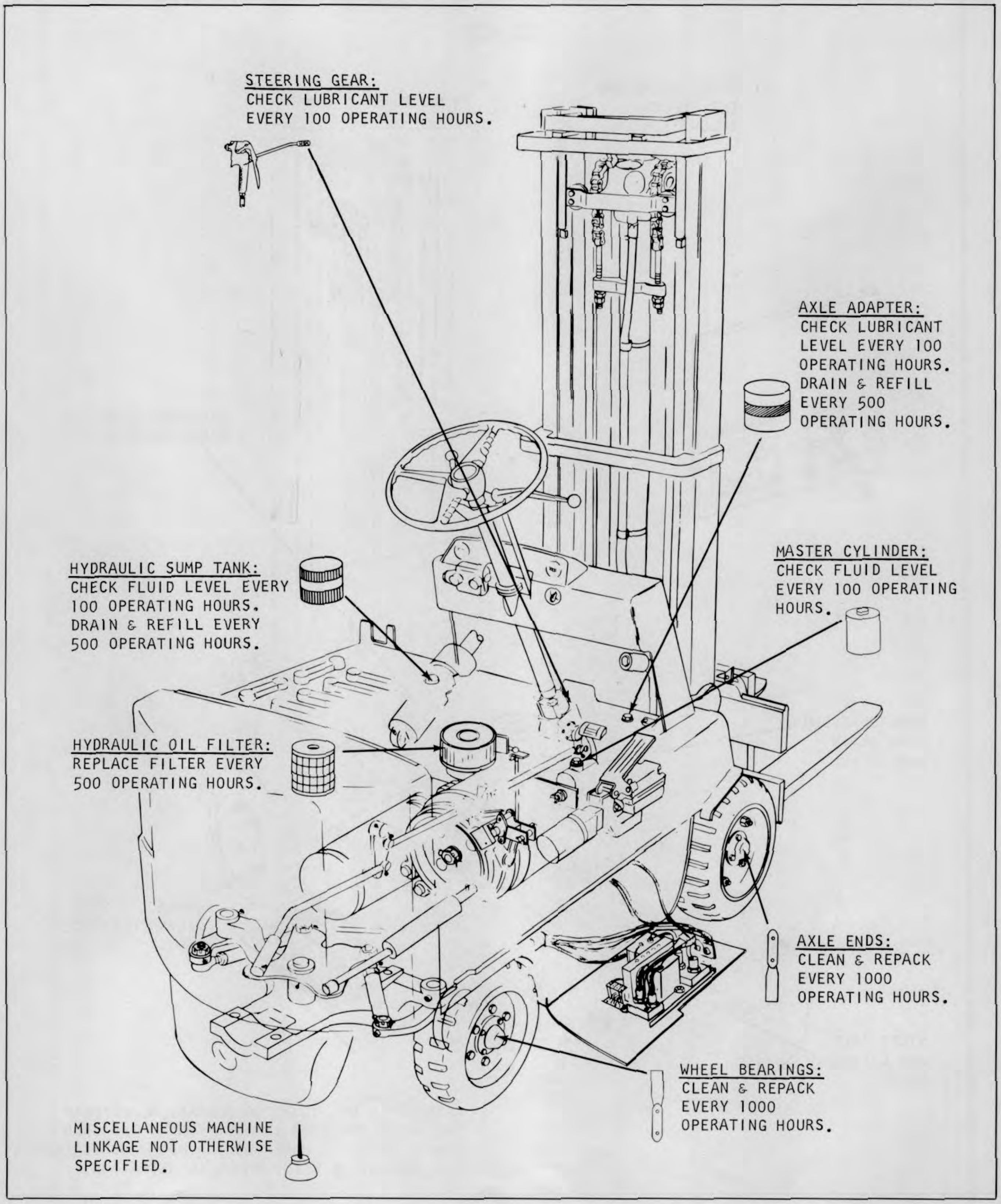
FLUID/OIL FILTERS:
Hydraulic Sump Tank Fluid Filter

Technical Societies in Reference:

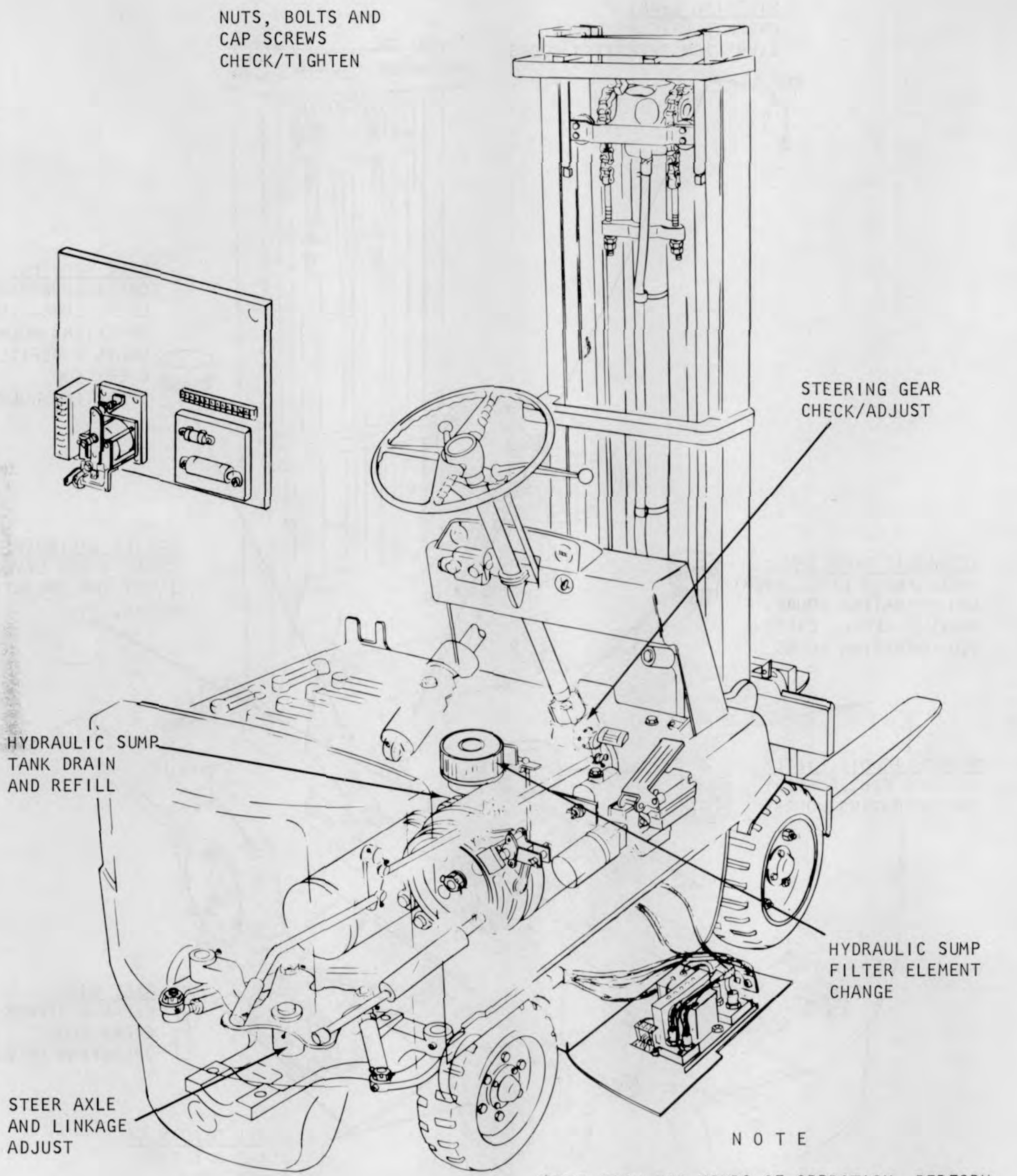
AGMA..American Gear Manufacturers Association
API....Amrican Petroleum Institute
ASTM...American Society for Testing Materials
ICEI...Internal Combuston Engine Institute
MIL...Military Specification
NGPA..Natural Gas Processors Association
NLGI..National Lubricating Grease Institute
SAE....Society of Automotive Engineers


PISTON HEAD
GUIDE ROLLERS
LIFT CHAINS
TILT CYLINDER
ANCHOR PINS,
TIE ROD,
BELL CRANK
UPRIGHT ANCHOR
PINS, PITMAN
ARM, BRAKE
CAMSHAFT
DRAG LINK,
TIE RODS,
KNUCKLE PINS,
STEER SPIDER,
STEERING CYLINDER

LUBRICATION AND PREVENTIVE MAINTENANCE



500 HOURS



NOTE

AFTER EACH 500 HOURS OF OPERATION, PERFORM THE ABOVE SERVICES IN ADDITION TO THE ONES LISTED ON THE 8 HOUR AND 100 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION.

LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION

HYDRAULIC SUMP TANK DRAIN AND FILTER CHANGE:

1. Lower upright, turn power switch off and open the left hand frame door to allow access to the sump tank drain plug and hydraulic filter (Plate 10205).

2. Take a piece of cardboard or similar material about 6"x2', fold this to form a trough, place this under the drain plug, rest the other end on a container (large enough to hold the full capacity of the tank) and remove the plug (Plate 10206).

3. Allow the tank to drain completely. Then flush the tank with at least 2 quarts of clean hydraulic fluid.

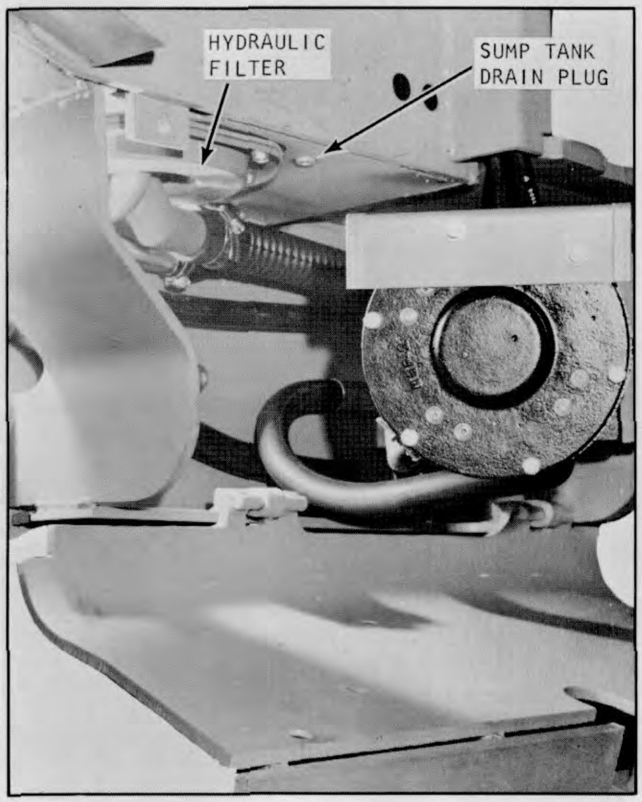


Plate 10205. Typical Sump Drain Plug

CAUTION

DO NOT OPERATE THE HYDRAULIC PUMP WHILE THE SUMP TANK IS EMPTY AS DAMAGE TO THE HYDRAULIC PUMP WILL RESULT.

4. Remove filter assembly by disconnecting hose and removing retaining bolts.

NOTE

Remove any remaining gasket material from the mounting flanges.

5. Clean out any residue left in the sump cavity.

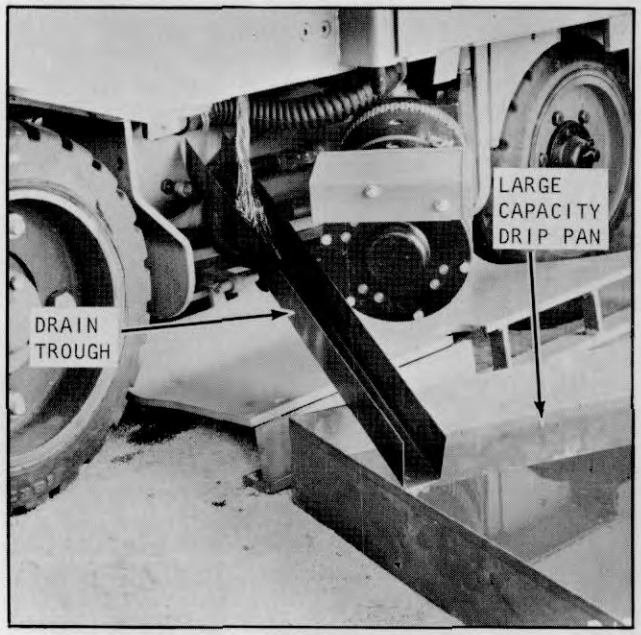


Plate 10206. Typical Sump Tank Drain

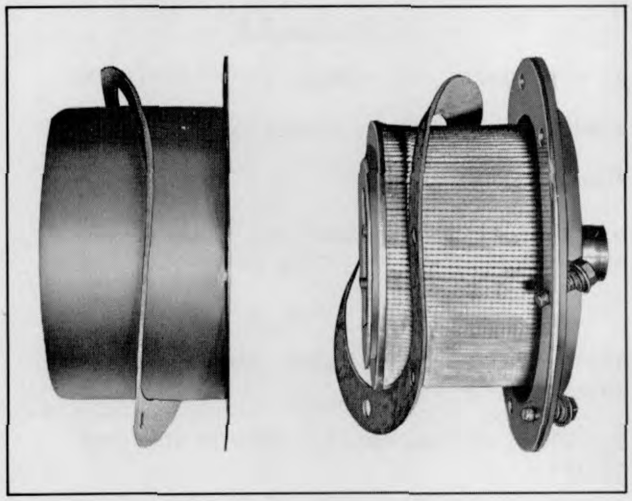


Plate 5274. Hydraulic Oil Filter

6. Install new filter element and gaskets to the filter housing and secure housing to the sump tank with the attaching capscrews.

NOTE

The filter attaching bolts should be tightened to 40-50 inch pounds. If this torque is exceeded, distortion of the housing may occur, causing leakage.

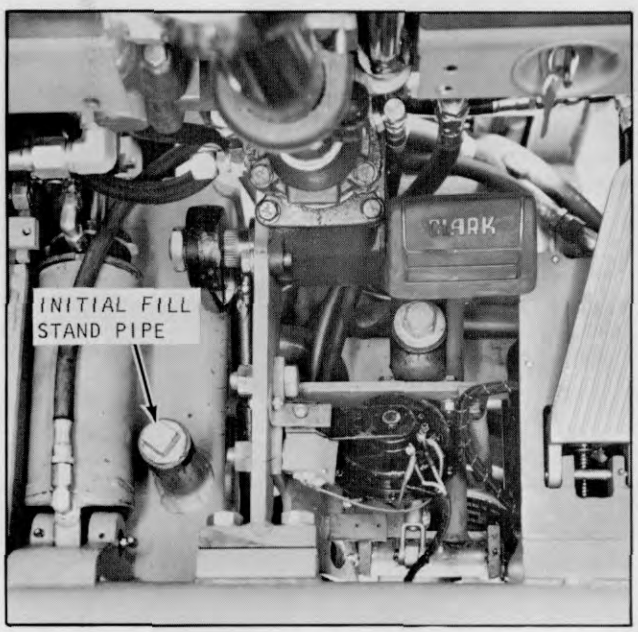


Plate 10207. Typical Initial Sump Fill

7. Install pump hose to filter and tighten hose connections.

10. Replace drain plug and fill sump tank to capacity (see specifications).

NOTE

On any initial fill (after sump has been drained) always remove the floor plate and fill at stand pipe till fluid has reached the top of the stand pipe (Plate 10207).

Only use hydraulic fluid per Clark Specifications MS-68, Clark Part #885385. Operate hydraulic cylinders and recheck system for leaks. If there are no leaks present, close both the access frame doors and secure with fasteners provided. Replace fill plug.

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 HYDRAULIC FLUID FOR EVIDENCE OF DIRT, SLUDGE OR ANY FOREIGN MATTER AT PERIODIC INTERVALS. IF SUMP BREATHER BECOMES DIRTY REPLACEMENT IS NECESSARY.

SUMP TANK FLUSHING PROCEDURE:

Whenever there is evidence of dirt, sludge or any foreign matter in the sump tank, a complete flushing is recommended.

The flushing procedure is as follows:

1. Remove sump plug (A) and attach a line from a hand operated pump or similar device.

2. Remove the sump tank filter and place a drain trough under the opening and run into a large flat drip pan.

3. Pump hydraulic fluid through the sump tank until fluid running down the trough is free of foreign matter...do not use the hydraulic system pump for cleaning purposes.

4. Remove sump plug (B) and pump some fluid thru here also.

5. After removing battery, provide a protective cover for the parking brake assembly and remove sump back plate.

Wipe out residue from this area as well as what can be reached thru the sump filter opening.... using a lint free cloth.

CAUTION

DO NOT ALLOW HYDRAULIC FLUID TO COME IN CONTACT WITH THE PARKING BRAKE OR....WITH THE PUMP DRIVE MOTOR.

6. Replace sump back plate, both plugs and sump filter (with new gasket).

7. Refill sump tank (Ref. 500H 174) with Clark spec. MS-68 hydraulic fluid (part #885385). Operate hydraulic cylinders and check for leaks.

8. If none are found, replace fill plug and close the access door.

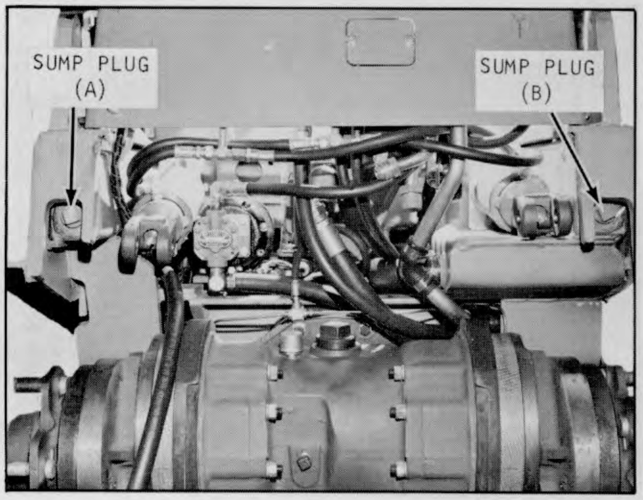


Plate 10209. Typical Sump Plugs

Plate 10208. Typical Sump Back Plate

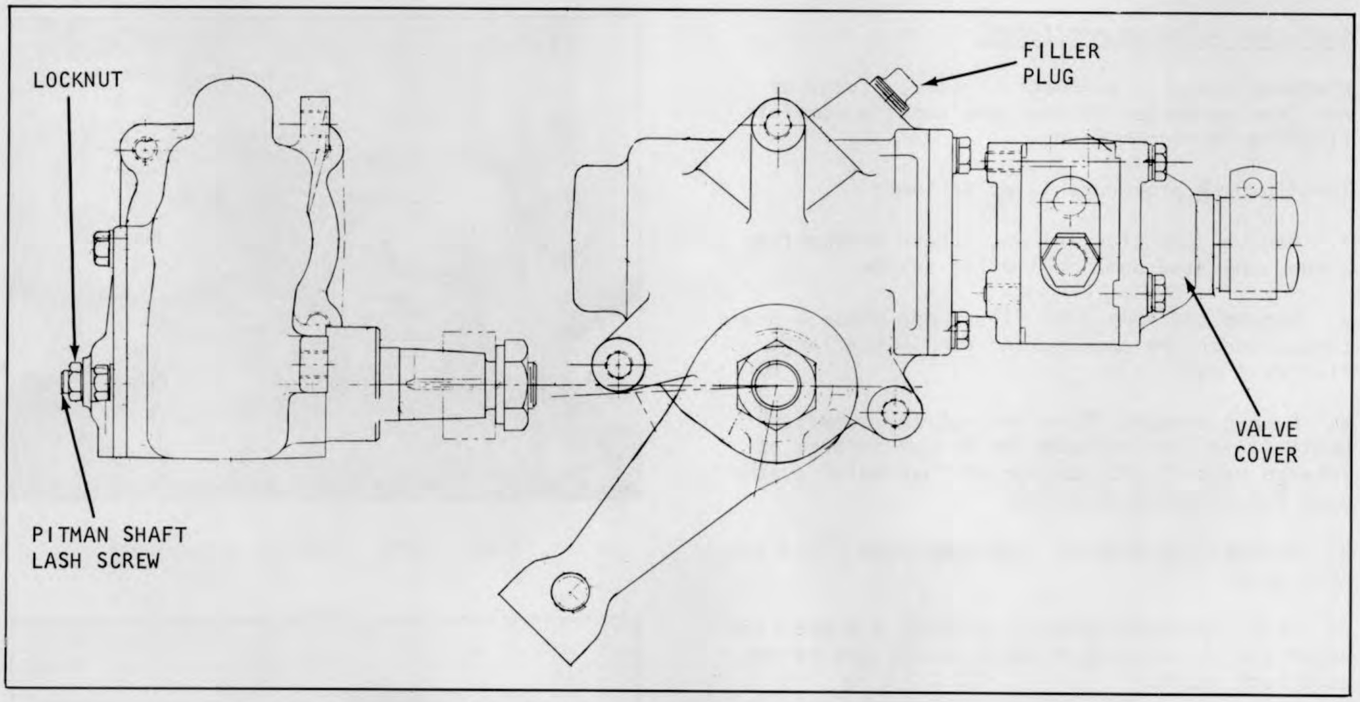


Plate 10172. Typical Steering Gear

STEERING GEAR:

Adjust steering gear as follows:

1. Disconnect drag link from pitman arm.

2. Check lubricant level in steering gear housing. If low, add enough lubricant to bring level up to filler plug hole. (Use NLGI #1, Amolith grease EP #1 or its equivalent.)

3. Tighten steering gear housing to frame side member bolts.

4. Determine straight ahead position of steering gear as follows:

C A U T I O N

APPROACH EXTREME ENDS CAUTIOUSLY. WORM BALL NUT MUST NOT STRIKE END FORCEFULLY.

a. Turn steering wheel to extreme right. Then turn to extreme left.....counting the exact number of turns from right to full left. Then turn wheel back one-half the number of turns. Mark wheel with respect to steering column so center position may readily be found.

5. The overcenter (or pitman shaft) adjustment is as follows:

a. With gear on center, adjust pitman shaft lash screw so that pull on the rim of an 18" wheel through a 3" arc (at the rim) is 1 1/4 to 1 1/2 pounds. Then tighten locknut. (Plate 10172)

6. As a recheck of total overcenter load; the pull on the rim of an 18" wheel through a 3" arc (at the rim) with gear overcenter, must be 1 1/8 to 2 pounds.

7. After adjustments are made, install drag link on pitman arm.

N O T E

If steering linkage adjustment is necessary do not install drag link to pitman arm.

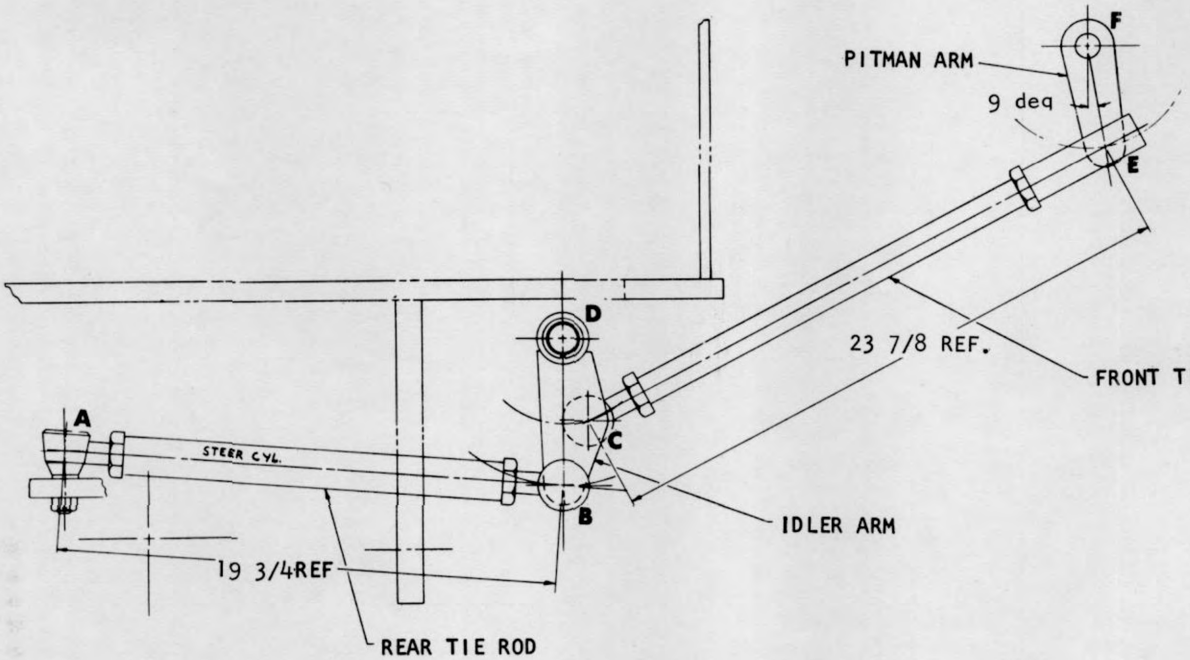


Plate 10190. Typical Steer Axle and Linkage Adjustments

STEERING AXLE AND LINKAGE ADJUSTMENTS:

1. Raise the steering wheels far enough to clear the floor and allow accessibility to the Idler Arm. See Plate 10190 for these adjustments.

> **W A R N I N G**
>
> AFTER RAISING MACHINE AND BEFORE MAKING ANY ADJUSTMENTS OR ADJUSTMENT CHECKS, PLACE ADEQUATE (HEAVY) BLOCKING (SUFFICIENT TO SUPPORT THE WEIGHT OF THE MACHINE) UNDER THE FRAME TO PREVENT ACCIDENTAL LOWERING OR FALLING OF THE VEHICLE, THUS PREVENTING PERSONAL INJURY TO MECHANIC OR BYSTANDERS.

2. Check steering gear support bolts for security of mounting. Tighten mounting bolts and clamp bolts to 90 foot pounds torque.

3. Now...loosen the locknuts on the steering column U-bolt. Then...draw the U-bolt adjusting nuts up evenly so that the U-bolt applies slight compression on the steering column...and tighten the nuts securely. To prevent crushing the rubber grommet inside the U-bolt...exercise care to avoid drawing the adjusting nuts up too tightly. Lockwashers are used under nuts.

4. The steering wheels should be parallel with the sides of the truck so that the steer axle spider is centered and so that the tires track square with the drive wheels with no toe-in or toe-out.

If adjustment is necessary, loosen the locknuts at the tie rod ends and turn each tie rod in a manner so they will be the same length when the correct adjustment is obtained. Tighten tie rod locknuts to secure this adjustment.

5. Rear drag link should be adjusted so that distance between points "A" and "B" is 19 3/4.

If adjustment is necessary, loosen the locknuts at the drag link rod ends and turn drag link until the correct adjustment is obtained. Tighten drag link locknuts to secure this adjustment.

6. Center to R.H. turn, without drag link attached, takes 2.79 turns of hand wheel.

Center to L.H. turn, without drag link attached, takes 2.76 turns of hand wheel.

Total number of turns of hand wheel from full cramp to full cramp with the drag link attached is 5 turns.

7. Loosen locknut on front drag link and adjust so that distance between "C" and "E" is 23 7/8 inches which will give an angle of 22 degrees from vertical at points "E" and "F".

Tighten Pitman arm nut to the torque listed in Specifications in front of this manual.

8. Check steer wheels for correct turning geometry by turning the wheels all the way to the left -- this should allow the right steer wheel to attain an angle of 54 1/4 degrees to the frame.

If adjustment is necessary, the axle stops on the right hand side of the axle are turned "in" or "out", whichever is necessary to achieve the correct angle. Repeat this procedure with the left wheel.

9. Turn steer wheels to the straight ahead position.

10. Refer to Plate 10190 on page 500H 302. As you will note the rear drag link is connected to the spider steer arm (at item "A") of the steer axle. The rod end of the steer cylinder is connected to another arm on the spider assembly, while the base end or anchor end of the steer cylinder is attached to the vehicle frame.

11. With cylinder in retracted position, measure the distance between center line of rod end to center line at anchor end (center line of retainer pin that anchors the steer cylinder to the vehicle frame). This distance should be 19 3/4 inches.

This adjustment w ll provide approximately 3/16 inches between the end of the piston and the end of the cylinder case, preventing the steer cylinder from bottoming out when turning in either direction.

If the distance is incorrect, rotate rod end until specified distance is obtained. Tighten clamp bolt nut to 30 - 40 lbs. torque.

Unless the steer cylinder is disconnected, removed for repair or replacement, adjustment should not be necessary after original factory installation.

12. Remove steer (hand) wheel and replace on steering column with the center spoke aligned + or - 10 degrees with the center line of the machine -- the center spoke pointing back.

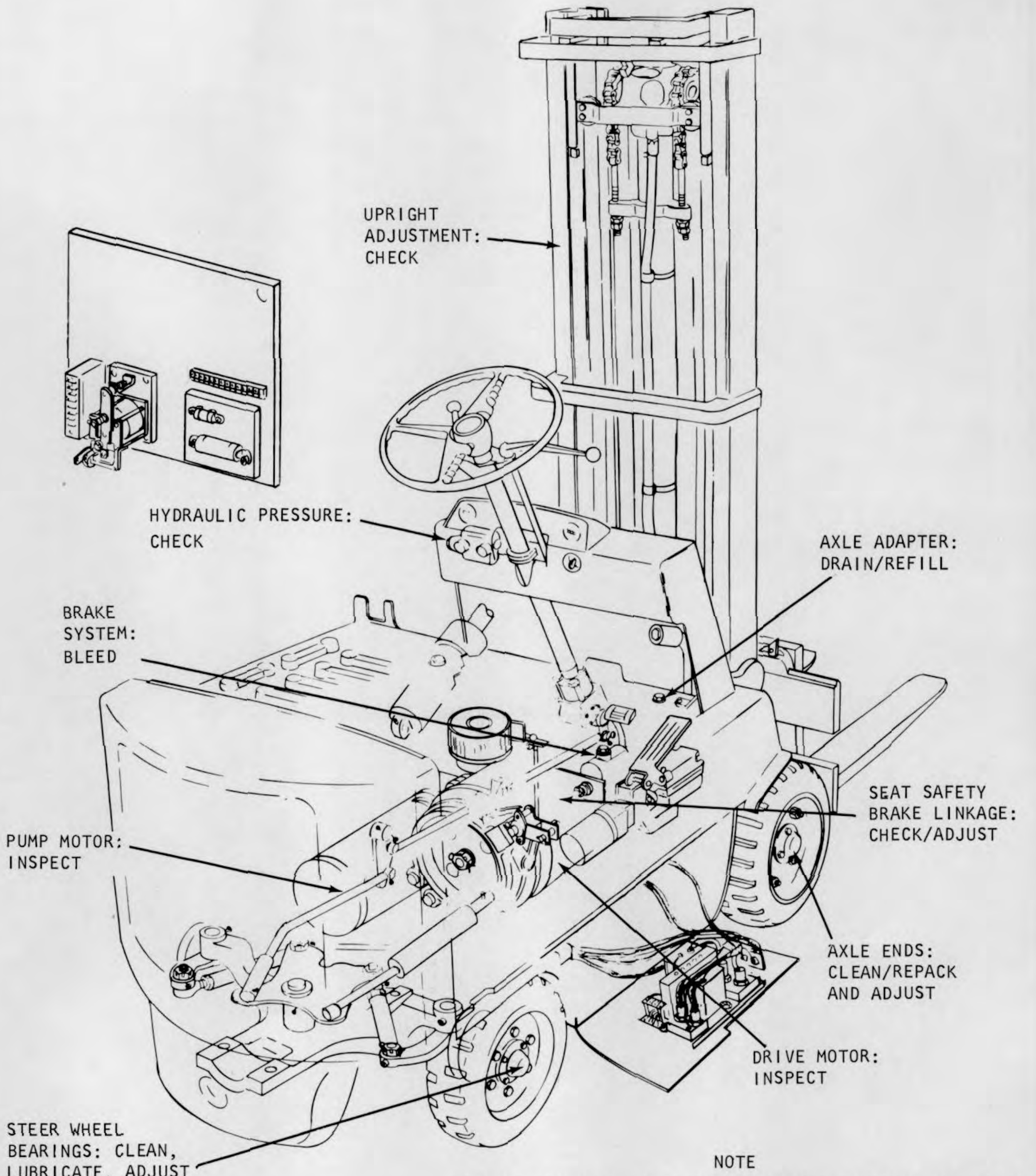
13. If interferences are encountered during steer linkage travel between full right to full left turn, linkage is misadjusted -- repeat Steps 2 thru 10 until correct adjustments are obtained. Repeat Steps 11 thru 13 if necessary, after completing Steps 2 thru 10.

14. Remove blocking from under machine frame and lower vehicle to the floor.

NOTE

If new components were installed for any reason, be sure to properly lubricate as instructed in the the Lubrication Chart on Page 100H 773.

1000 HOURS



NOTE

AFTER EACH 1000 HOURS OF OPERATION, PERFORM THE ABOVE SERVICES PLUS THE 8 HOUR, 100 HOUR AND 500 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATIONS.

MOTOR INSPECTION AND CHECKS

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 (worn beyond half the original length) 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.

NOTE

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

Check brush spring tension with a spring scale. To check reaction type brush springs, hook the scale under the brush spring near the brush and pull on a line parallel with the side of the brush. Take the reading just as the spring leaves the brush. To assist in telling the exact instant that the pressure is relieved, a small strip of paper can be placed under the brush. Pull slightly on the paper and the paper will slip out at the correct instant for reading the spring scale.

If the brush spring tension is too great, the commutator and brushes will wear excessively and result in short life. If the brush spring tension is too low, there will be a loss of efficiency due to poor brush contact.

To change brush spring tension, twist the spring at the holder with long nose pliers.

CAUTION

DO NOT ALLOW SPRING TO SNAP DOWN ON A BRUSH.

Refer to Specifications for correct brush spring tension.

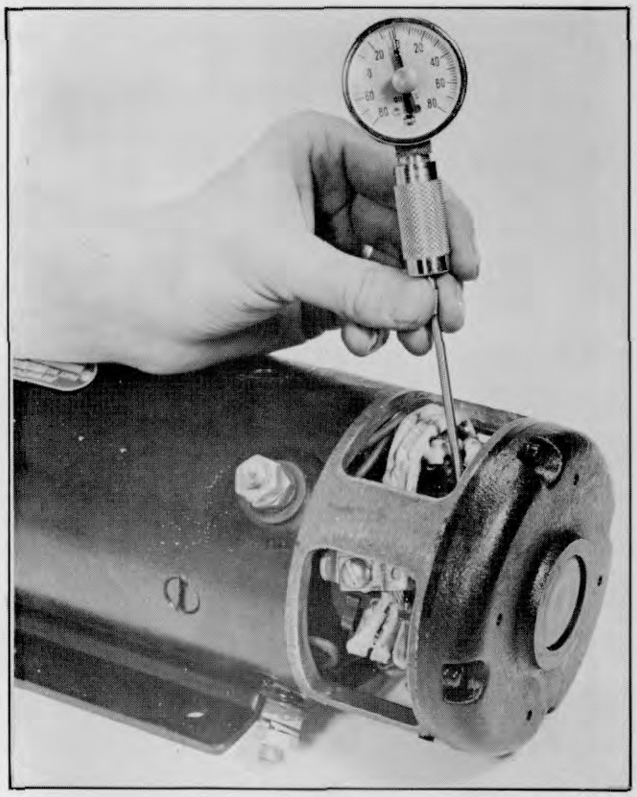


Plate 6560. Typical Method Checking Brush Spring Tension

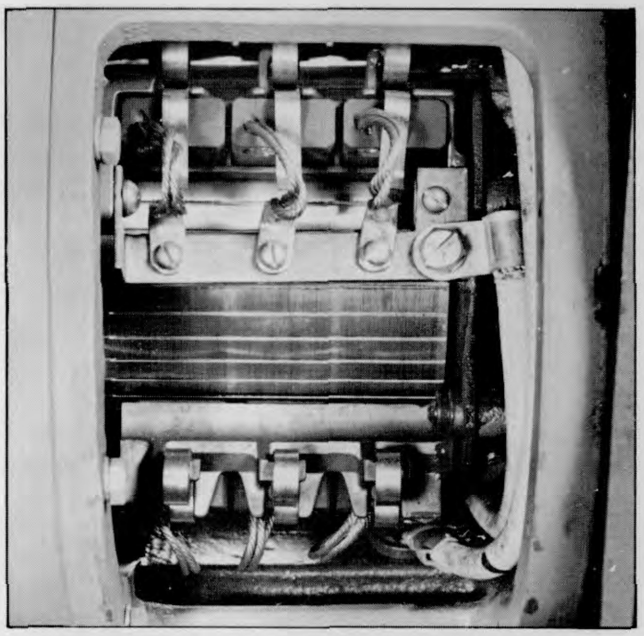


Plate 7564. Typical Motor Brushes

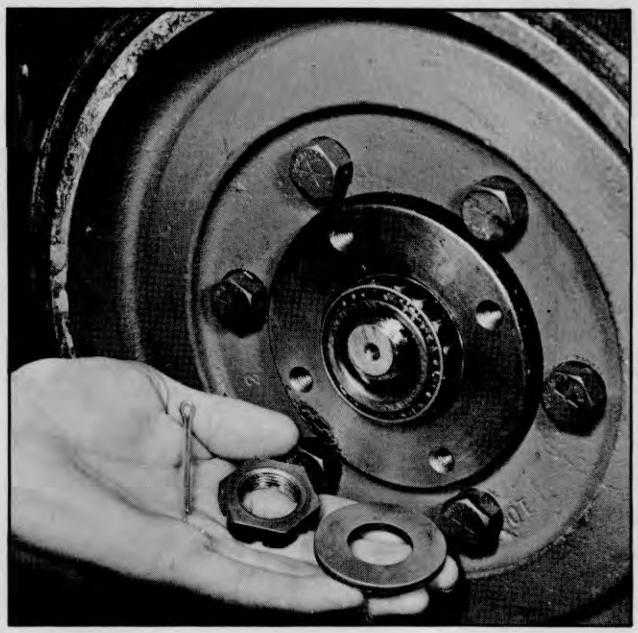


Plate 6640. Typical Wheel Bearings

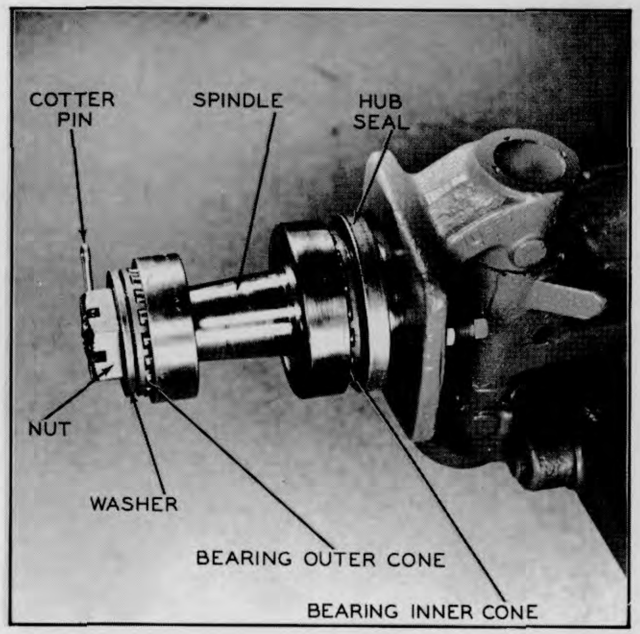


Plate 6703. Typical Wheel Bearings

STEERING WHEEL BEARINGS

Adjustment

1. Raise rear of machine so that tires clear floor.

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

WARNING

AFTER RAISING MACHINE AND BEFORE MAKING ANY ADJUSTMENTS OR ADJUSTMENT CHECKS, PLACE ADEQUATE (HEAVY) BLOCKING (SUFFICIENT TO SUPPORT THE WEIGHT OF THE MACHINE) UNDER THE FRAME TO PREVENT ACCIDENTAL LOWERING OR FALLING OF THE VEHICLE, THUS PREVENTING PERSONAL INJURY TO MECHANIC OR BYSTANDERS.

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

2. Inspect adjustment of bearings by gripping top and bottom of tire, chuck tire "in" and "out" to determine looseness or wobble.

NOTE

Before making wheel bearing adjustments, be sure play (looseness or wobble) is in the wheel bearings and not in the king pins.

NOTE

If wheel bearings need adjusting, clean and repack bearings before making adjustments. Refer to lubrication paragraph. Before repacking wheel bearings, check for any indication of leakage around hub seals. If such a condition exists, report to designated person in authority.

3. If looseness or wobble is in the wheel bearings, remove hub cap and spindle cotter pin, see (Plate 6640). Tighten nut with a 12" wrench, and at the same time rotate the wheel in one direction and then in the other until there is a slight bind to be sure all bearing surfaces are in contact. Then back off the nut 1/6 to 1/4 turn allowing the wheel to rotate freely. Secure nut at this position with a new cotter pin and replace hub cap.

Lubrication

1. Remove wheels after 1000 hours or every six months of operation. Clean bearings and repack with NLGI #1 (Amolith grease EP #1 or its equivalent.)

2. Install wheels and adjust wheel bearings as previously described.

CLEAN AND REPACK AXLE ENDS

Every 1000 operating hours remove and repack the axle ends with NLGI #1 (Amolith grease #1 or its equivalent).

1. Tilt upright back. Place solid heavy blocks under each upright rail. Tilt upright forward until vertical to the floor. This should allow the drive wheels to clean the floor. Remove drive wheels.

2. Remove hub cap, cotter pin, washer, spindle nut and pull hub assembly from spindle.

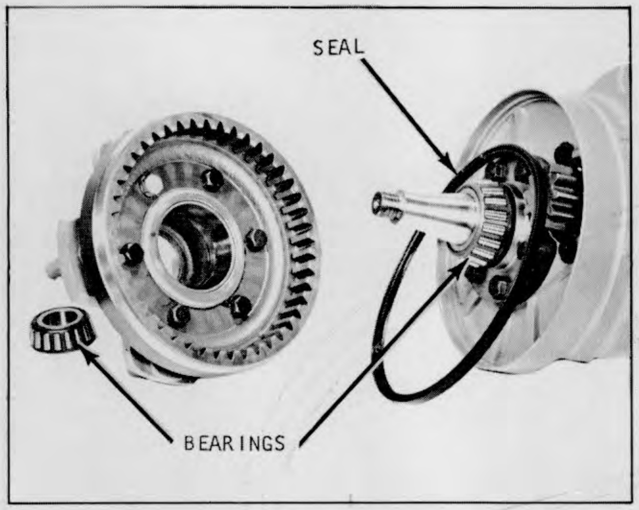


Plate 6892. Axle End Assembly

3. Remove bearings and clean in a Stoddard type cleaning solvent. Slosh bearings up and down in solvent. Remove and tap large side of bearing against a block of wood to dislodge solidified particles of lubricant. Repeat operation until bearings are thoroughly clean. Blow bearings dry with compressed air. Direct air stream across bearing to avoid spinning. Slowly rotate bearing by hand to facilitate drying. Dip bearings in gear oil and wrap in paper until they are to be reinstalled.

4. Clean ring gear, pinion drive shaft, hub assembly, spindle and spindle support.

5. Inspect seal for cuts, scratches and nicks. If is necessary to replace seal if such a condition is found.

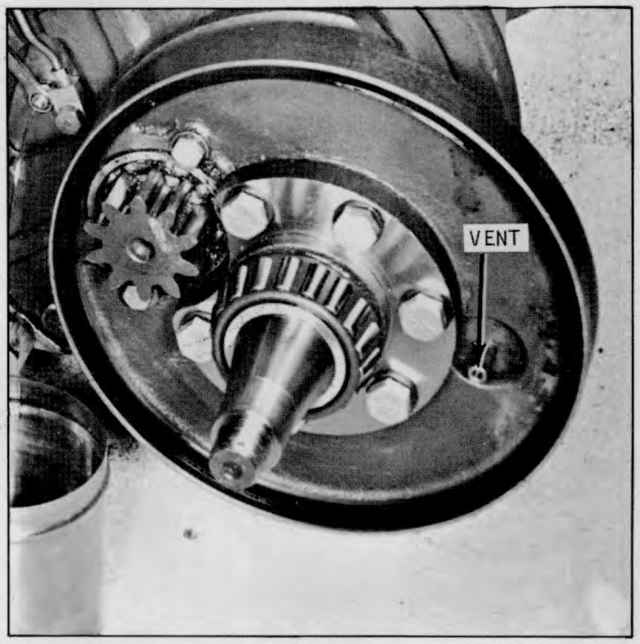


Plate 6893. Axle End Vent

6. Repack each axle end (bearings, spindle, ring gear and pinion) with one pound of NLGI #1 (Amolith grease #1 or its equivalent). Check the axle end vent for obstructions. the vent must be open.

7. Install bearings, seal and hub assembly.

8. Install washer, spindle nut and hub cap.

9. Tilt upright back and remove blocking.

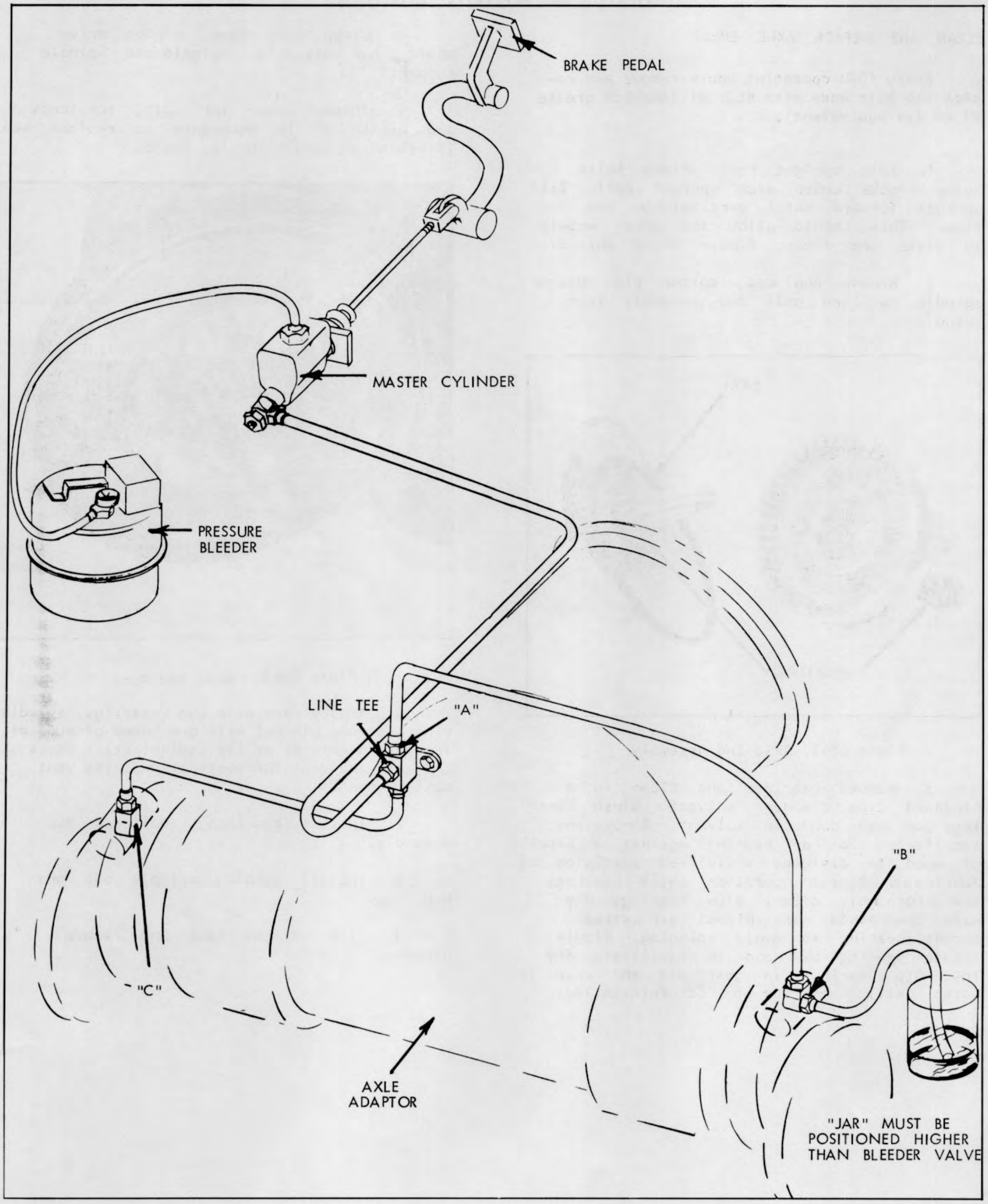


Plate 6883. Bleeding Brake System

BRAKE BLEEDING PROCEDURE

Proper operation of the hydraulic brake system requires a solid column of fluid without air bubbles at all points in the pressure system. Under certain conditions it becomes necessary to bleed fluid from the system in order to expel air bubbles which have become mixed with the fluid. The necessity of bleeding is indicated by a soft or spongy pedal, or at any time a brake line is removed (or broken) the system must be bled.

Step 1. Tilt upright back. Place solid heavy blocks under each upright rail. Tilt upright forward until vertical to the floor. This should allow the drive wheels to clear the floor. Remove drive wheels.

NOTE

MACHINES EQUIPPED WITH PNEUMATIC TIRES,

DEFLATE TIRES BEFORE REMOVING DRIVE WHEELS

FROM MACHINE.

Step 2. Check the brake pedal free travel (Refer to Specifications). Clean dirt from around the filler cap of the master cylinder reservoir. Brake fluid should be within 1/4" of the top. With filler cap off the master cylinder, depress and release brake pedal. A small displacement of fluid should be noticed in the cylinder reservoir. If this happens, the brake pedal (upon being released) is returning the master cylinder piston to its normal position to open a master cylinder port. This port must be open. If fluid does not return to the reservoir (when releasing brake pedal), this indicates improper pedal free travel and a pedal adjustment is required.

Step 3. To properly bleed the system it is recommended that a pressure bleeder filled with about two quarts of SAE 70R3 heavy duty brake fluid be connected to the master cylinder reservoir. Pressure bleeder should then be pressurized to approximately 30 P.S.I.

Step 4. Loosen line connection at highest position on "T" block point "A" (Plate 6883) and allow fluid and air to escape. Tighten fitting at this point when escaping fluid is free of air bubbles.

Step 5. Install a bleeder hose on one of the wheel cylinder bleeder screws and submerge the unattached end of the hose in a clean transparent jar containing several inches of brake fluid. NOTE: DURING BLEEDING OF THE WHEEL CYLINDERS THE JAR SHOULD BE ELEVATED TO A POSITION HIGHER THAN THE BLEEDER SCREWS MAKING SURE THAT THE END OF THE HOSE REMAINS SUBMERGED IN THE FLUID AT ALL TIMES. Loosen bleeder screw "B" (Plate 6883) enough to allow fluid and air to escape. Tighten bleeder screw at this point when escaping fluid is free of air bubbles.

Step 6. Install bleeder hose on the remaining bleeder screw and proceed as in step five. After all bleeding has been completed close the pressure bleeder shut-off cock and loosen hose connection at master cylinder to allow pressure to escape. Replace master cylinder cap.

Step 7. Replace drive wheels. (Inflate tires if they are of the pneumatic type).

Step 8. Tilt upright back and remove blocking from under each upright rail.

If a pressure bleeder is unavailable the system may be bled manually by following steps four thru eight. It must be remembered that the brake pedal should be depressed slowly and held to the floorboard until the line connections or bleeder screws are securely tightened. This prevents the possibility of air being drawn into the system during the bleeding operation. Check master cylinder reservoir level periodically during manual bleeding and fill to within 1/4 inch of the top as required.

BRAKE ADJUSTERS (3rd & 4th Design)

When the brake system is operating properly, the cam like action of the reaction arm allows self-adjustment for the total thickness of the brake linings, without any noticeable increase in brake pedal free travel. The self-adjustment feature eliminates the need for manual adjustment of the brakes.

When brakes become noisy during brake application, this may indicate the linings are worn enough to allow brake shoes to contact brake drum. If such a condition exists, the axle ends shall be removed and a brake lining inspection shall be made to determine further serviceability. Report to designated person in authority.

NOTE

When it is necessary to install new shoe and lining assemblies, consult your authorized Clark dealer.

When installing new shoe and lining assemblies, be sure to install new assemblies at each wheel. Refer to following instructions covering mounting bolt torque specifications and procedures.

Before installing new brake linings the adjuster mounting bolt torque should be checked with a torque wrench. This should be torqued to 23 to 26 ft. lbs. <u>The brake adjuster with nut and washer assembly has been preassembled and properly torqued and should never need to be changed</u>.

The backing plate and adjuster arm components must be clean, dry and free from rust when this torque test is made.

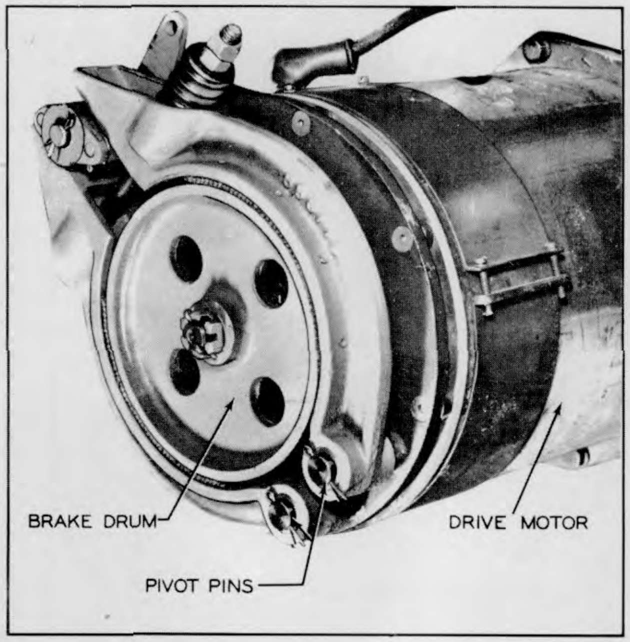


Plate 5031. Parking Brake

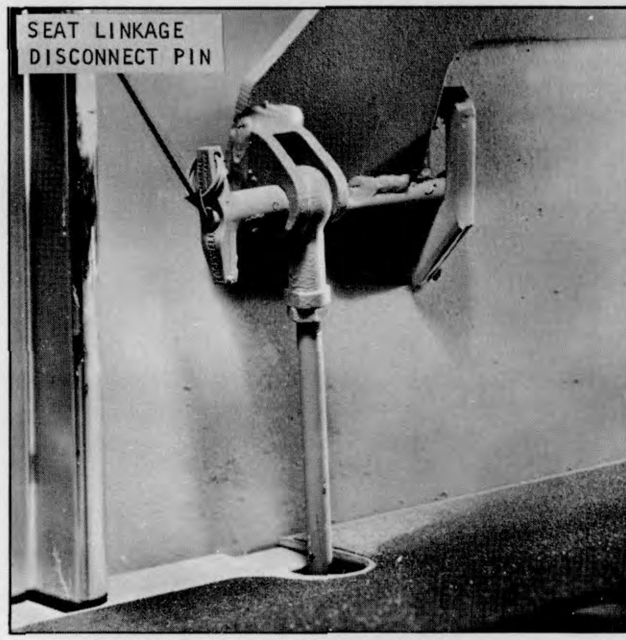


Plate 7410. Seat Linkage Disconnect Pin

SEAT SAFETY BRAKE (PARKING BRAKE)

1. The parking brake is mounted to the end of the drive motor and is operated by means of linkage attached to the driver's seat.

2. When properly adjusted, the brake cam will, with action of the seat linkage, raise new brake shoes off of the drum 1/8 inch at a point half way between the shoe pivot and the brake cam pivot. The gap will increase as the shoe lining wears.

3. Adjust seat return spring tension to allow the seat to raise as soon as the driver leaves the seat.

4. With the return spring installed the bottom of the seat plate should form an angle of 40 degrees with the top of the hood when brakes are applied.

5. The brake shoe return spring should be adjusted to a length of approximately 2 1/2 inches to enable the brake to meet the following specifications.

SEAT BRAKE EFFECTIVENESS

The brake must be capable of holding the truck with full rated load on a 15% grade. To Test: Disconnect seat linkage pin (Plate 7410). The driver should be seated on the truck with all power off.

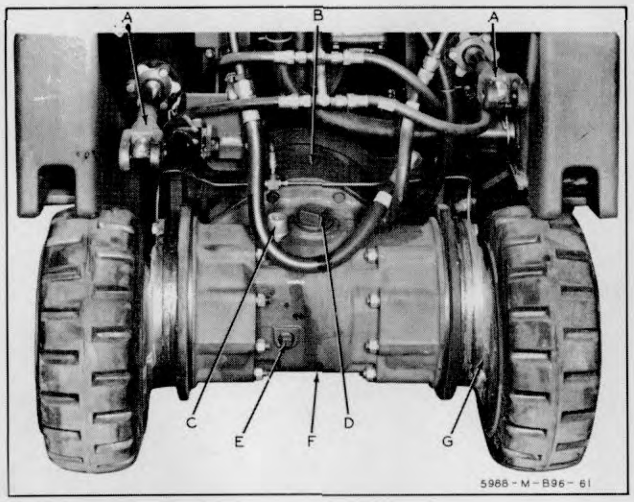


Plate 5988. Typical Axle Adaptor

AXLE ADAPTOR....DRAIN AND REFILL:

Drain and refill every 1000 operating hours at operating temperature. Remove drain plug (F) from bottom of adaptor allowing old lubricant (or fluid) to completely drain. Replace drain plug.

Clean dirt from level device (E) (plug or dipstick) and remove. Fill with the recommended lubricant or fluid....refer to following paragraph ....until fluid or lubricant reaches the plug opening or high mark on dipstick. Do not overfill as the excess quantity will serve no useful purpose. If the level is too high it will cause excessive churning and attendantly high lubricant or fluid temperature and possible leakage.

Use Type "A", Suffix "A", Automatic Transmission Fluid (fluid containers must display a qualification number prefixed by "AQ-ATF"...Clark Part Number 879803) or Dexron Automatic Transmission Fluid.

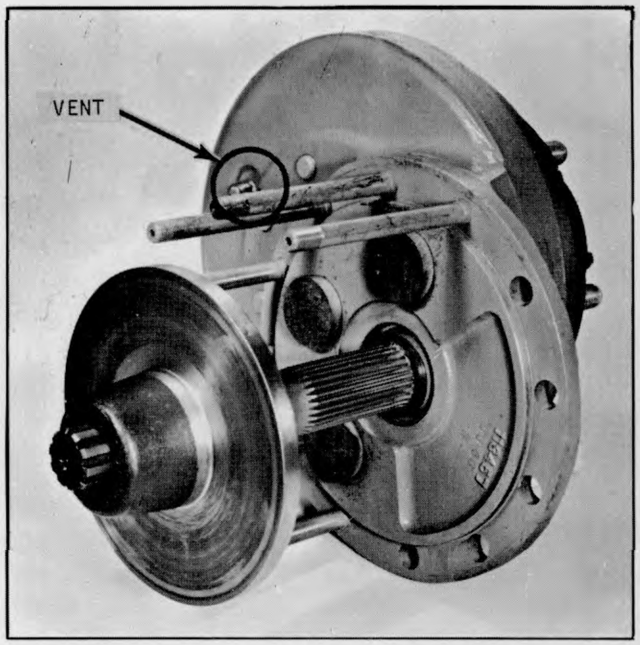


Plate 7550. Typical Axle Adaptor Vent

AXLE ADAPTOR VENT:

Inspect vent to be sure it is free of obstructions. If vent is not open, remove and clean in a Stoddard type cleaning solvent. Be sure vent is completely dry before replacing on axle adapter.

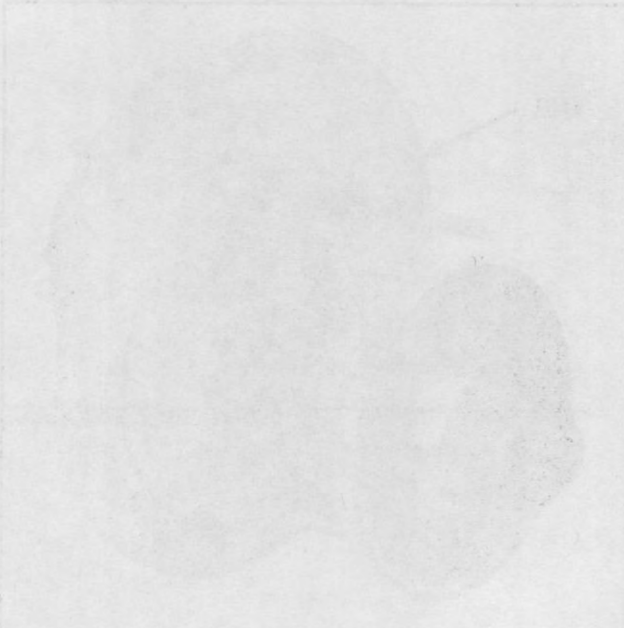


Plate 7558. Typical Axle Adapter Vent

AXLE ADAPTER VENT

Inspect vent to be sure it is free of obstructions. If vent is not open, remove and clean in a Stoddard type cleaning solvent. Be sure vent is completely dry before replacing on axle adapter.

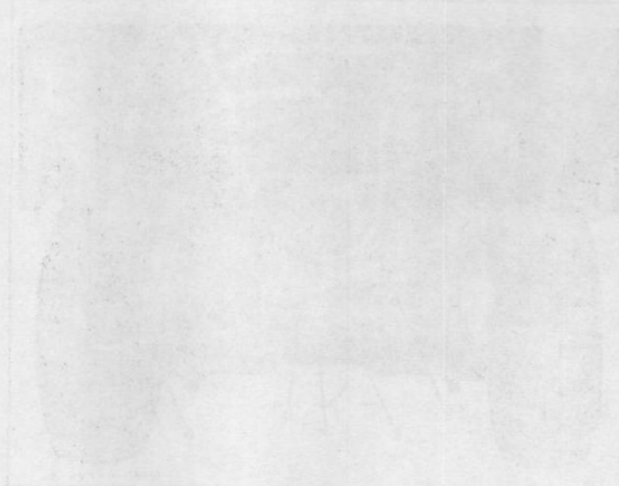


Plate 5588. Typical Axle Adapter

AXLE ADAPTER ... DRAIN AND REFILL

Drain and refill every 1000 operating hours at operating temperature. Remove drain plug (?) from bottom of adapter allowing old lubricant (or fluid) to completely drain. Replace drain plug.

Clean dirt from level device (? plug or dipstick) and remove. Fill with the recommended lubricant or fluid, ... to following paragraph ... until fluid or lubricant reaches the plug opening or high mark on dipstick. Do not overfill as the excess quantity will serve no useful purpose. If the level is too high it will cause excessive churning and a constantly high increase of fluid temperature and possible leakage.

Use Type "A", Suffix "A", Automatic Transmission Fluid (fluid containers must display a qualification number prefixed by "AQ-ATF"), Collins Part Number 879651 or Dexron Automatic Transmission Fluid.

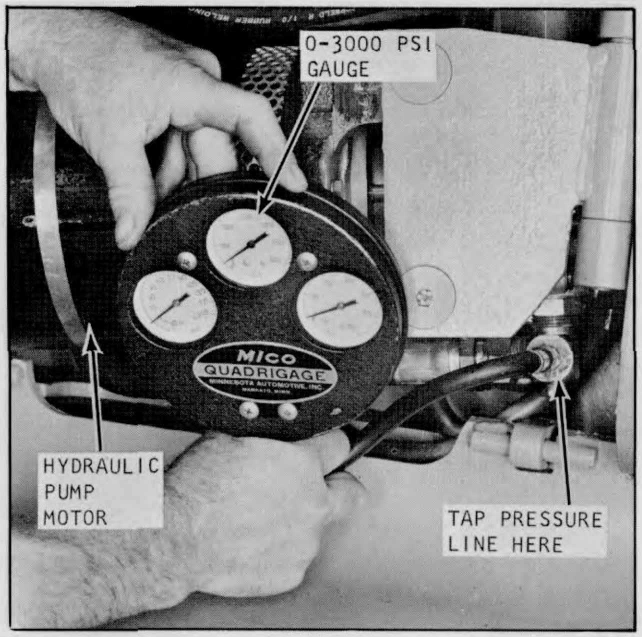


Plate 10203. Typcial Hydraulic Pressure Check

MAIN HYDRAULIC SYSTEM PRESSURE CHECK:

1. Pressure check at lift valve.

a. Tap and install a 0-3000 P.S.I. gauge as shown in Plate 10203.

b. Turn key switch on and move hydraulic control lever to the "lift" position. When the upright has reached its maximum height the gauge should register 1850 to 1900 P.S.I. If pressure is not within this range report to designated person in authority.

N O T E

Do not hold lift lever in "lift" position for any prolonged period after upright has reached it maximum height. This will cause heating of the hydraulic oil and should be avoided.

N O T E

Only representatives of an authorized Clark Industrial Truck Dealer or the Vendor should repair or adjust the control valves.

2. Pressure check at tilt valve.

b. Turn key switch on and hold tilt lever back until upright reaches maximum back tilt. With the lever held momentarily in this position the pressure gauge should register 1850 to 1900 P.S.I. If pressure is not within this range report to designated person in authority.

c. If pressure readings are satisfactory remove pressure gauge and plug tapped fitting.

CHECK STEERING SYSTEM PRESSURE AT THE STEER VALVE:

The steering releif valve setting may be checked with a Mico Quadrigage (Clark Part No. 1800106) or, by installing a conventional pressure gauge with a 0-3000 PSI scale...at the discharge (pressure) line of the steer pump. See illustration in opposite column.

1. Tap and install a 0-3000 PSI gauge on pressure line fitting at steer valve as shown in Plate 10204.

2. Place blocking between axle and axle stop so that when the wheels are turned the pressure relief valve will move off its seat when pressure builds up.

3. Apply parking brake. Start engine and run at governed rpm. Rotate hand wheel all the way in one direction and hold....avoid holding the hand wheel (axle against stop) longer than is necessary to check pressure reading on gauge.... take reading....release hand wheel and accelerator.

4. The pressure reading will indicate the setting of the relief valve. If reading taken is not reasonably close to those listed in specifications, appropriate repairs should be made. Report to designated person in authority.

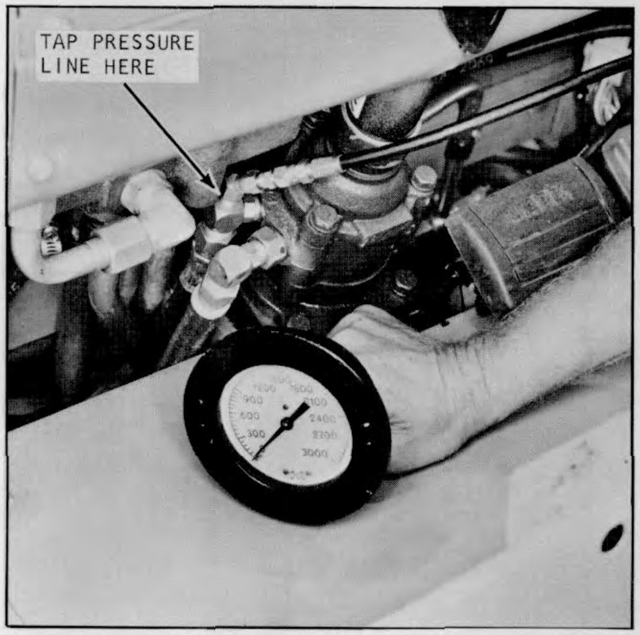


Plate 10204. Typical Steer System Pressure Check

A. CARRIAGE REMOVAL

Before working on the upright, set parking brake and block drive wheels.

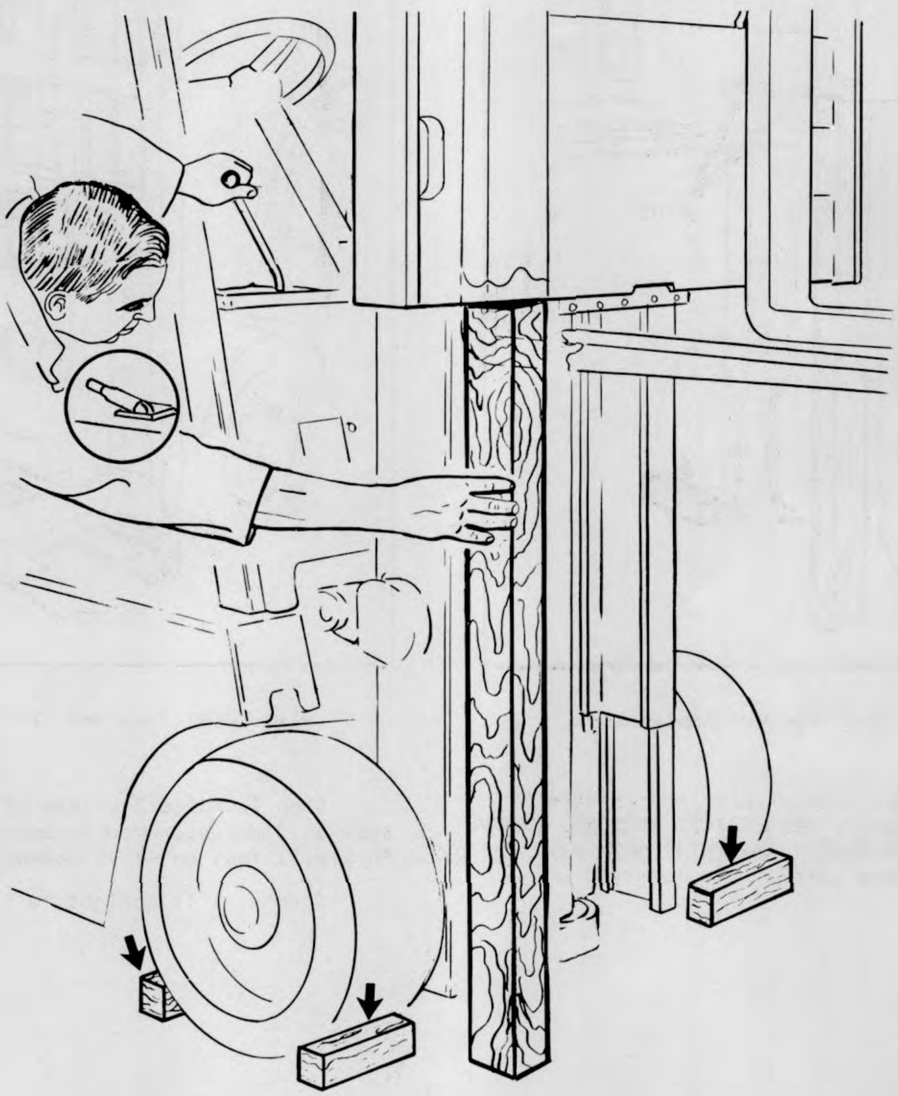


Plate 9559 Blocking Machine and Carriage

Step 1. Raise carriage about 4 feet. Place a 4" x 4" oak beam 3 to 4 feet in length between carriage and floor as shown. DO NOT STAND DIRECTLY UNDER FORKS. Standing to one side, lower carriage onto beam as shown.

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X BEFORE WORKING ON UPRIGHT, SET PARKING BRAKE AND BLOCK DRIVE WHEELS AS SHOWN X
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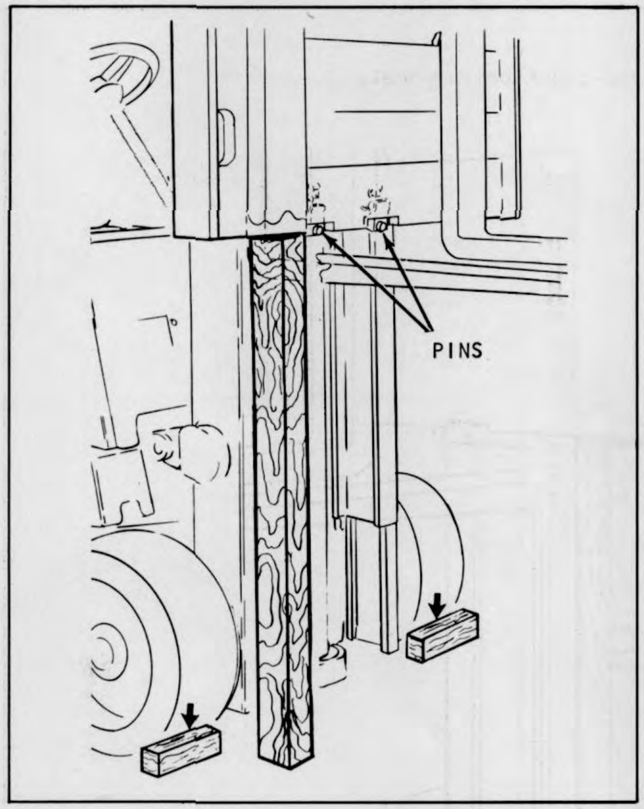


Plate 9593 Carriage Pin Replacement

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.

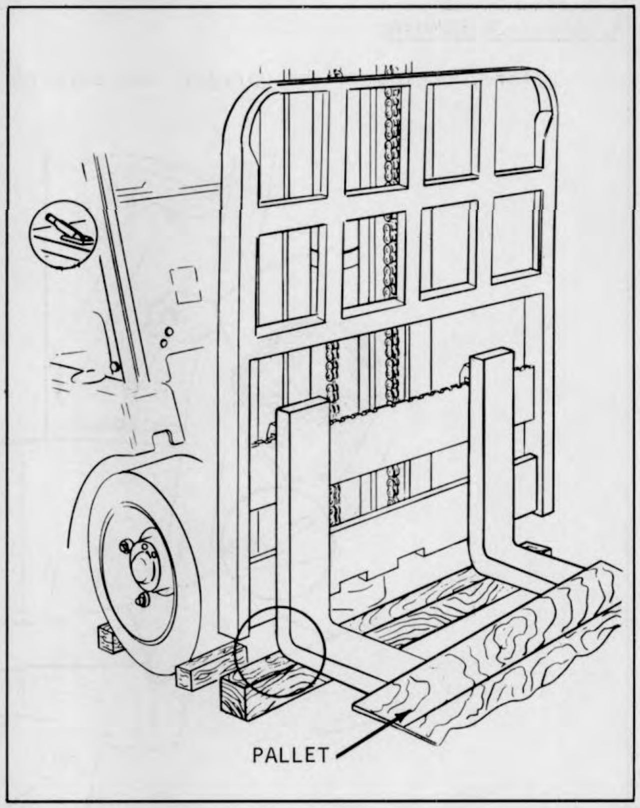


Plate 9560 Fork and Carriage Blocking

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

Step 4. Tilt upright full forward.

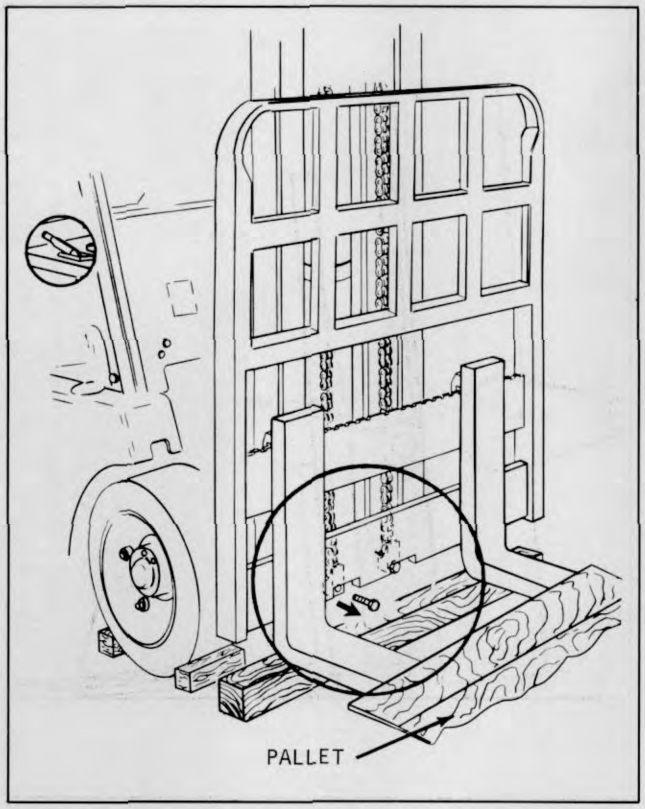


Plate 9561 Removing Bolts

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

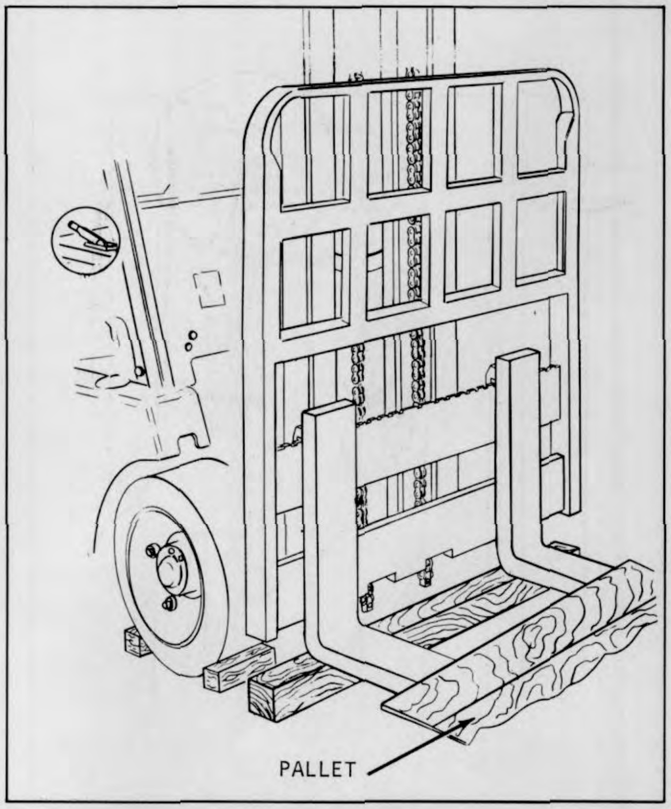


Plate 9562 Removing Chains From Anchors

Step 6. Pull chains out of carriage anchor brackets.

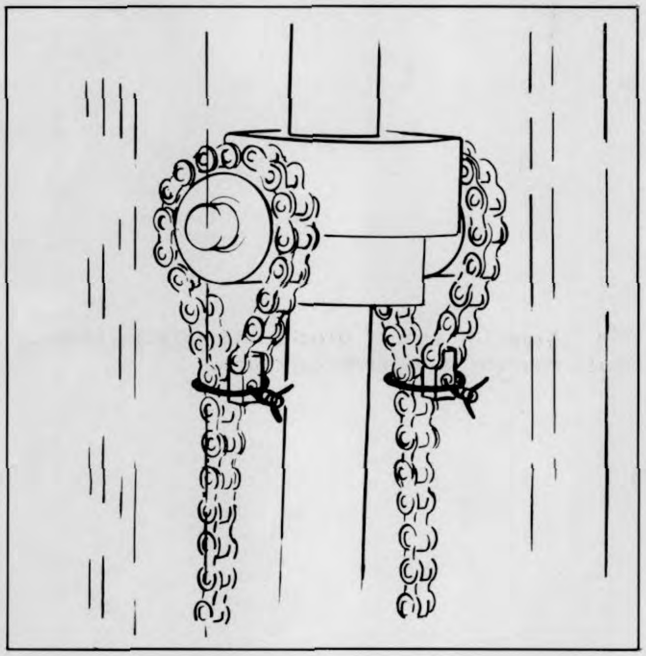


Plate 9563 Securing Chains (Typical)

Step 7. Wire chains around chain sheaves as shown

NOTE

Use the same method on all cylinders.

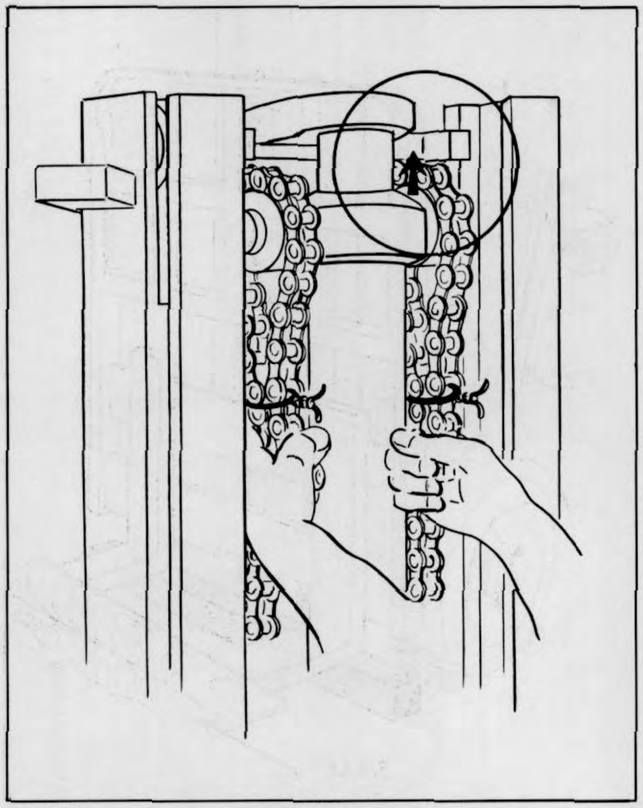


Plate 9564 Guiding Piston Head

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

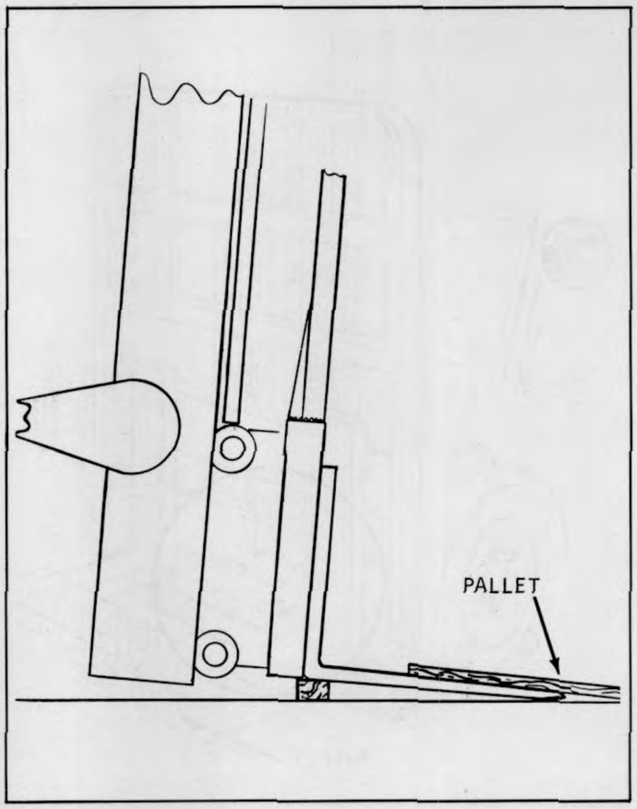


Plate 9565 Inner Rail Clearing Carriage Rollers

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

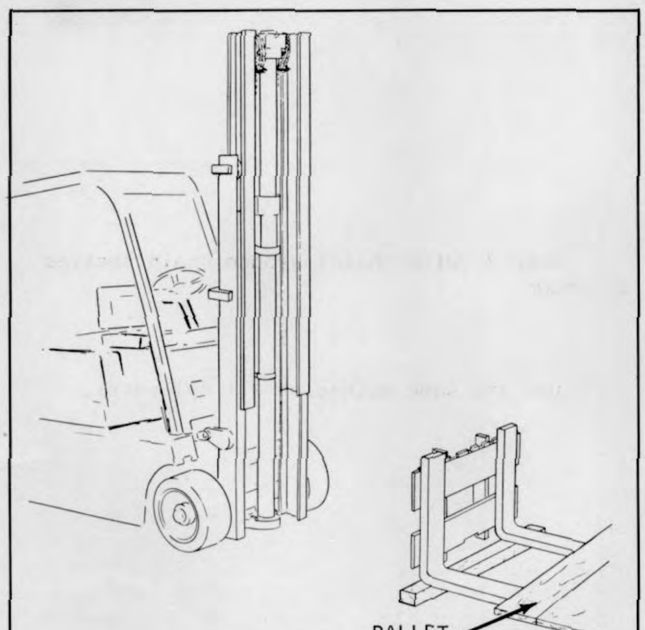


Plate 9566 Backing Machine Away From Carriage

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

B. CARRIAGE ROLLER ADJUSTMENT

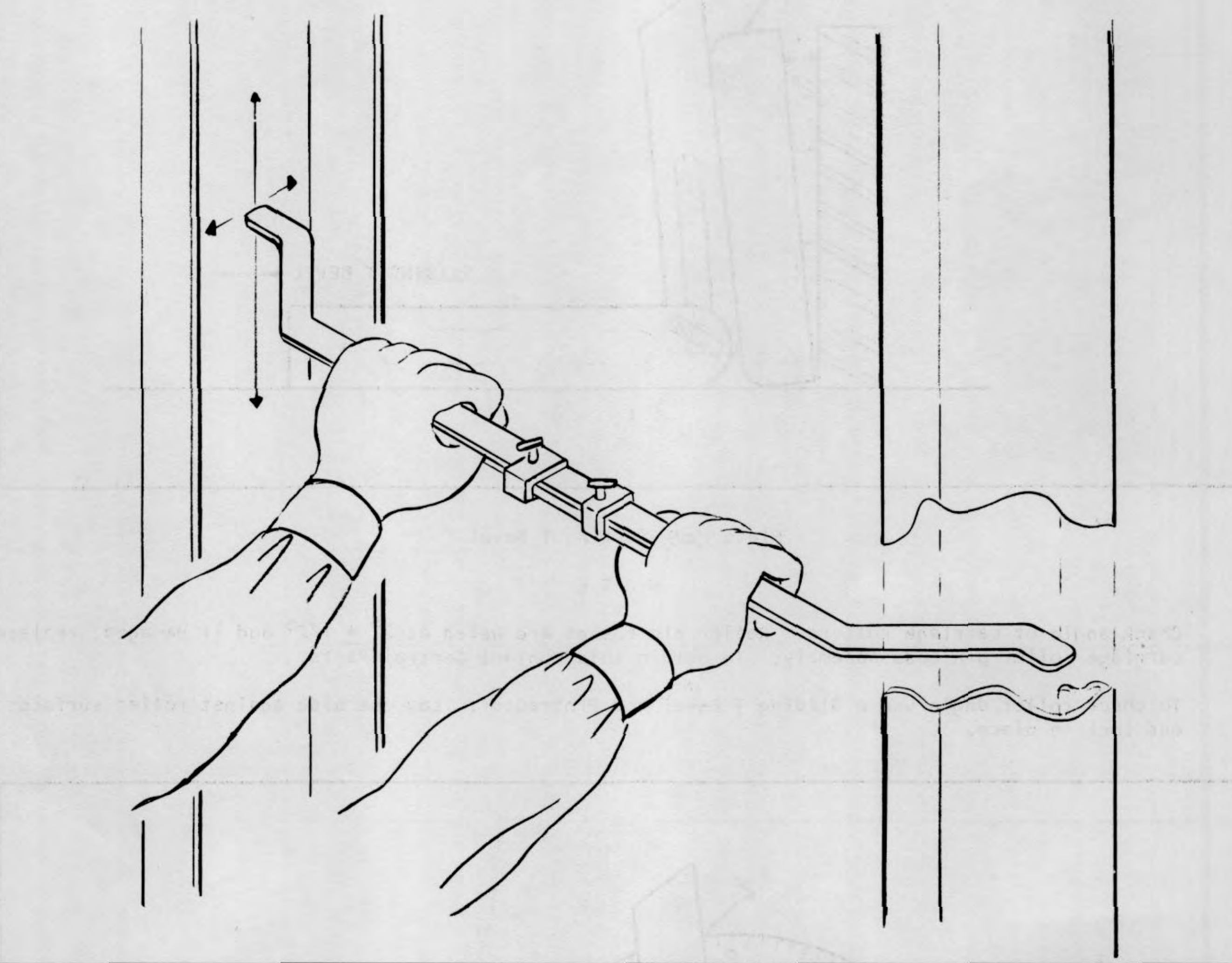


Plate 9567 Spanning Inner Rail

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

NOTE

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.

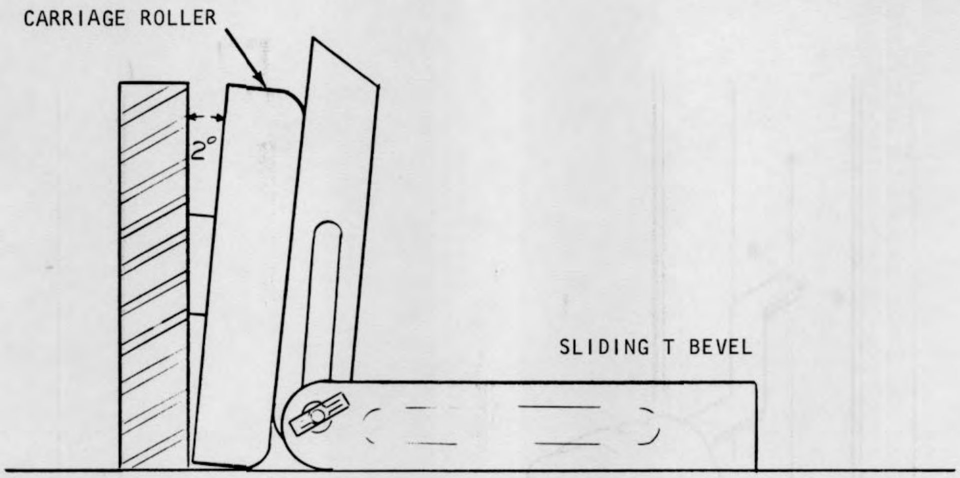


Plate 9589 Setting T Bevel

NOTE

Check angle of carriage rollers. Roller pin bosses are weled 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.

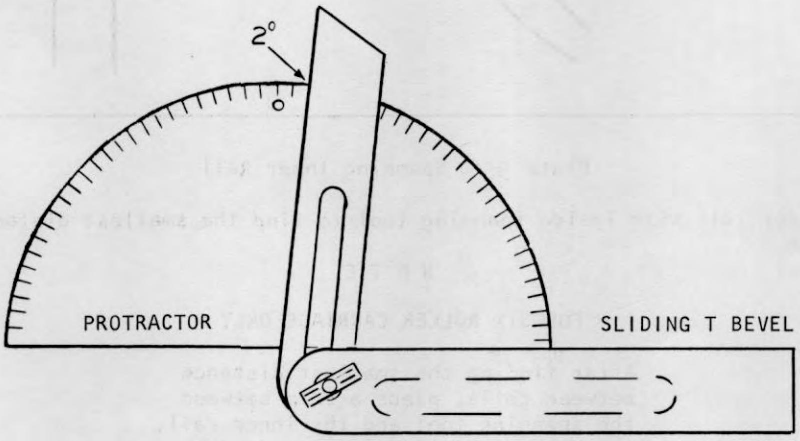


Plate 9590 Checking Roller Angle

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

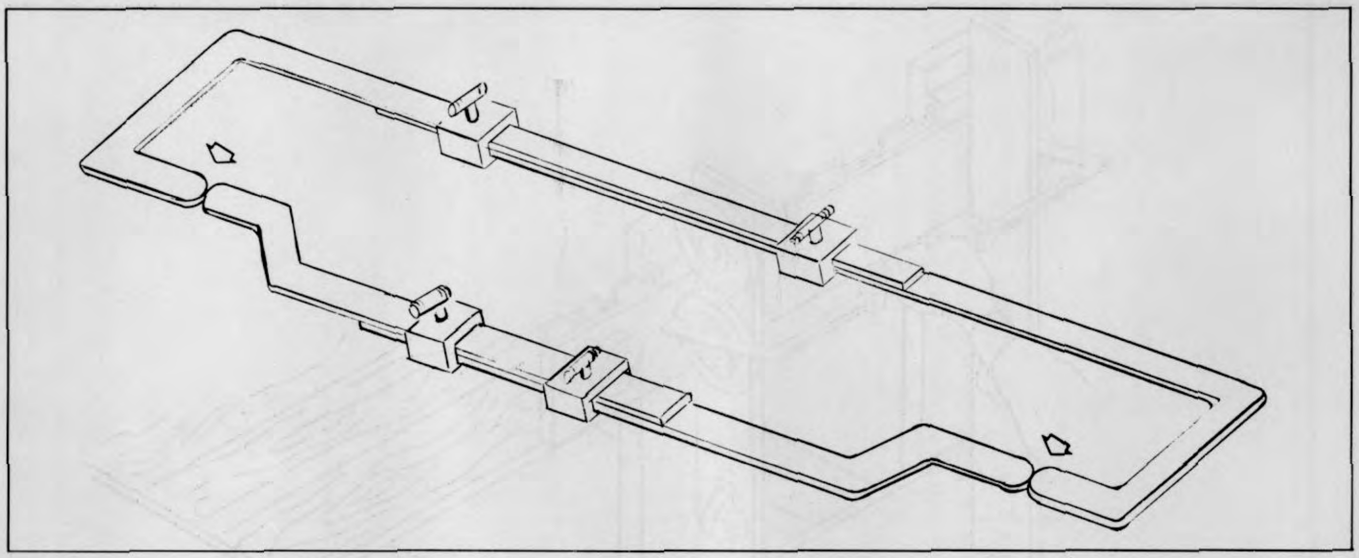


Plate 9568 Setting Outside Spanning Tool

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

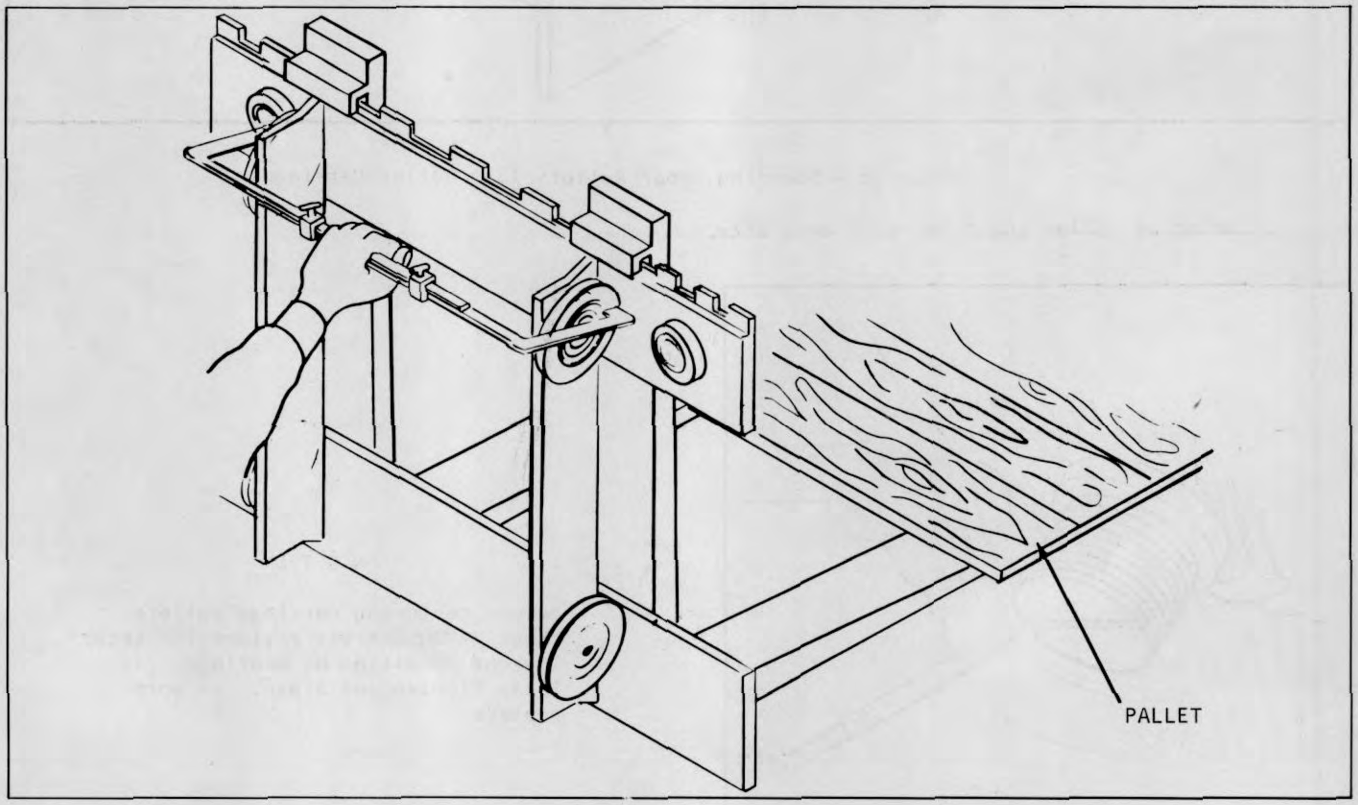


Plate 9569 Spanning Upper Rollers (Four Roller Carriage)

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

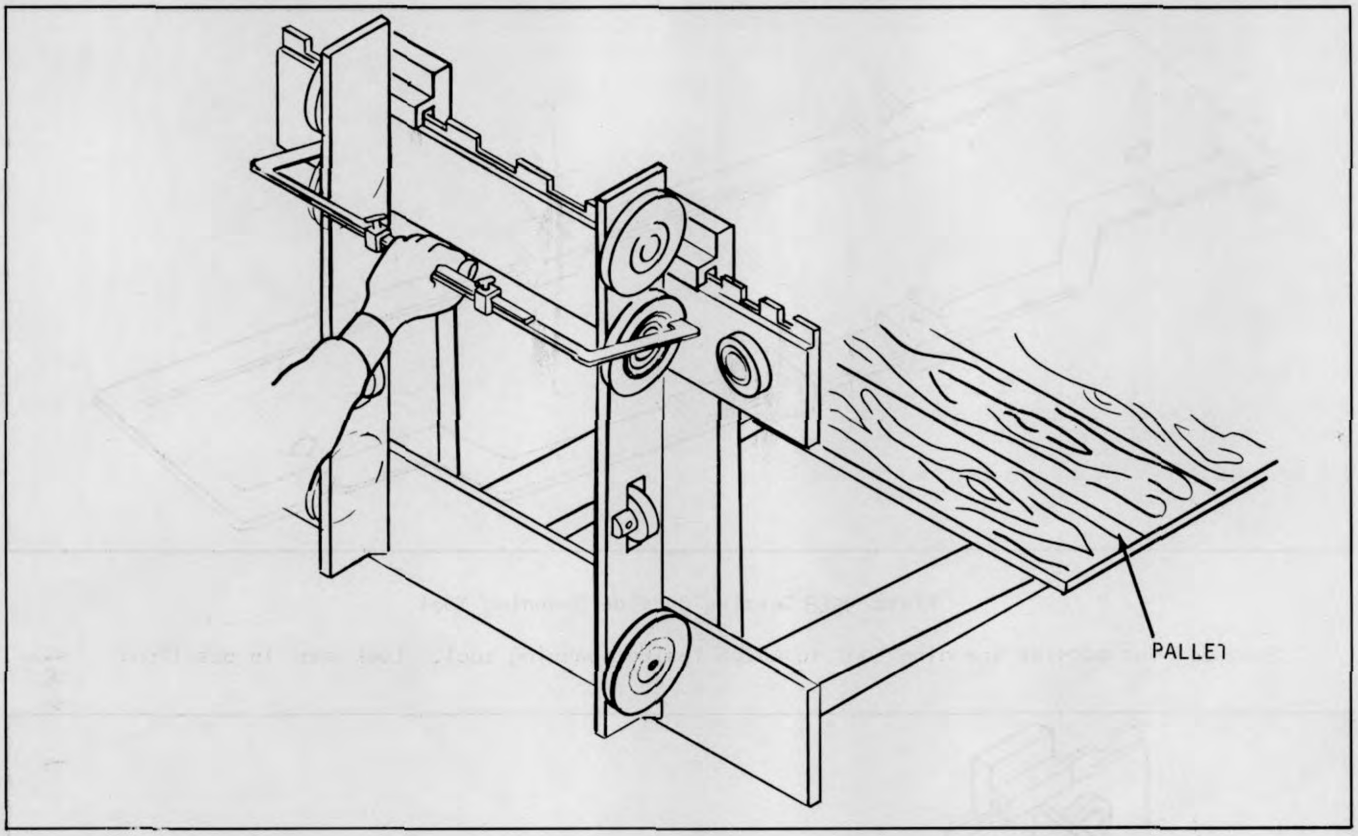


Plate 9570 Spanning Upper Rollers (Six Roller Carriage)

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

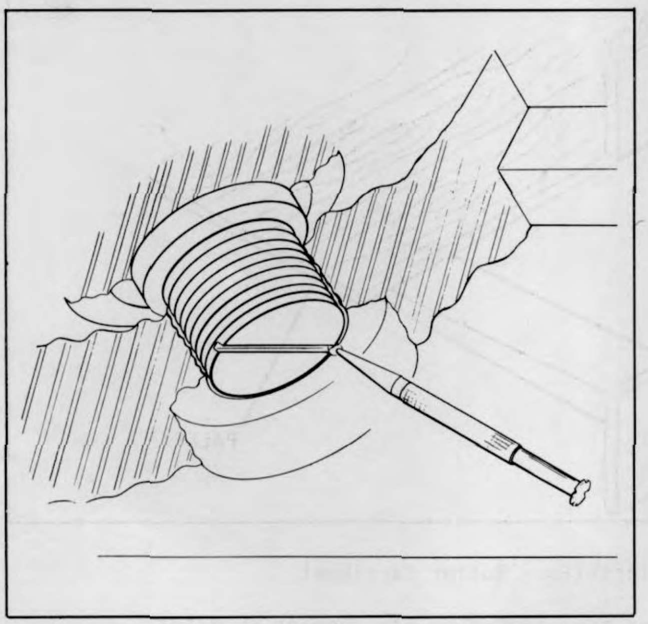


Plate 9571 Securing Outer Thrust Roller

NOTE

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

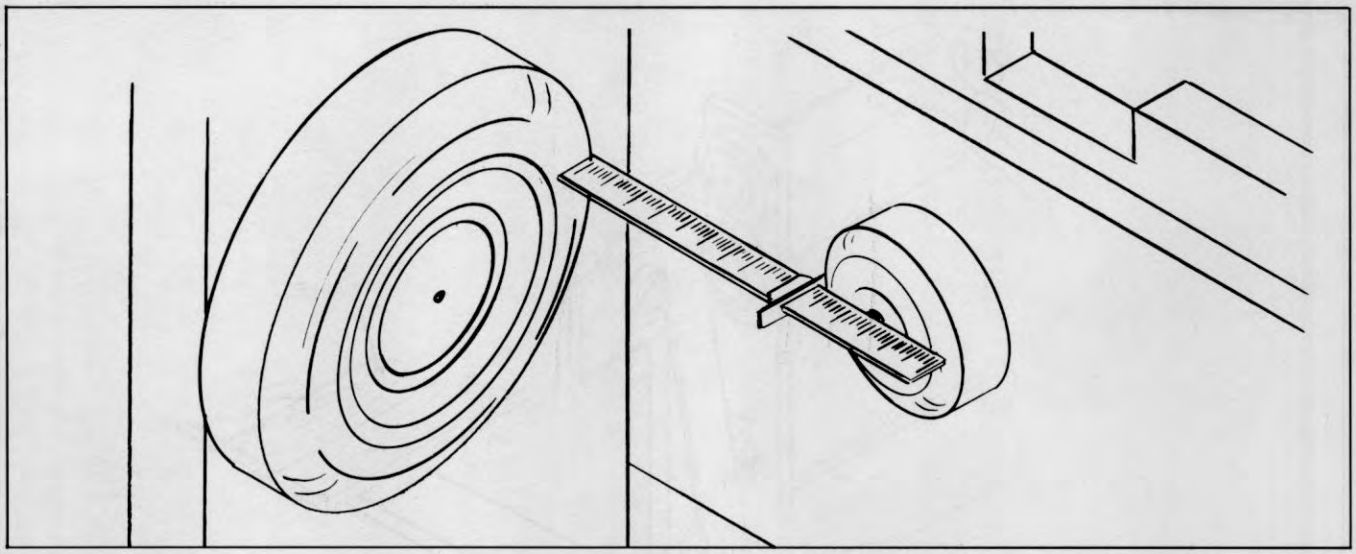


Plate 9572 Centering Carriage Rollers

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.

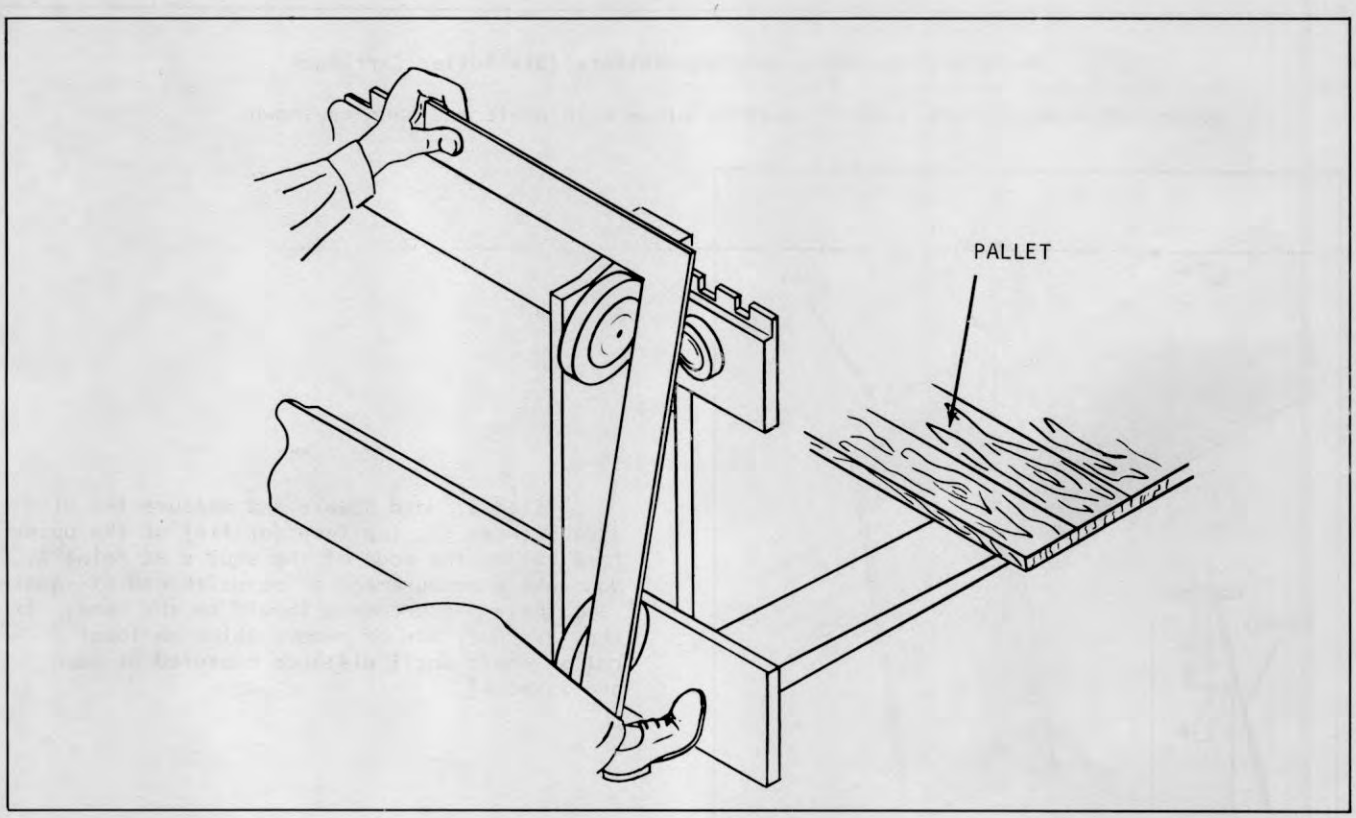


Plate 9573 Squaring Carriage Rollers (Four Roller Carriage)

Step 5. Square carriage rollers by placing carpenters square at the outer most camber of the ...

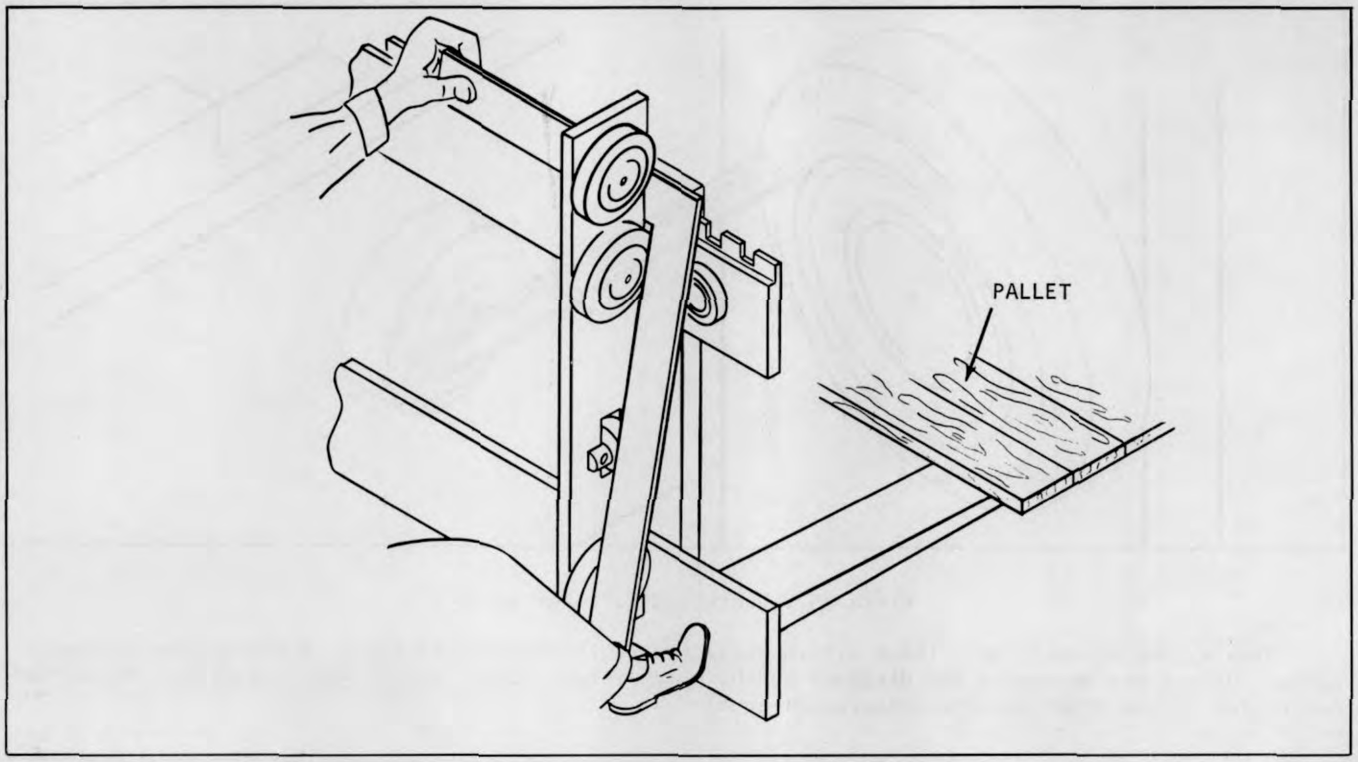


Plate 9574 Squaring Carriage Rollers (Six Roller Carriage)

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

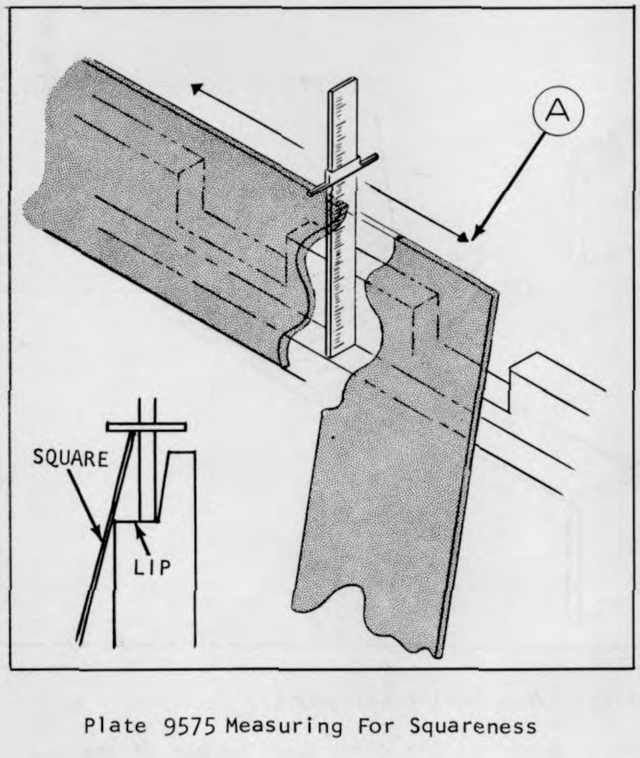


Plate 9575 Measuring For Squareness

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.

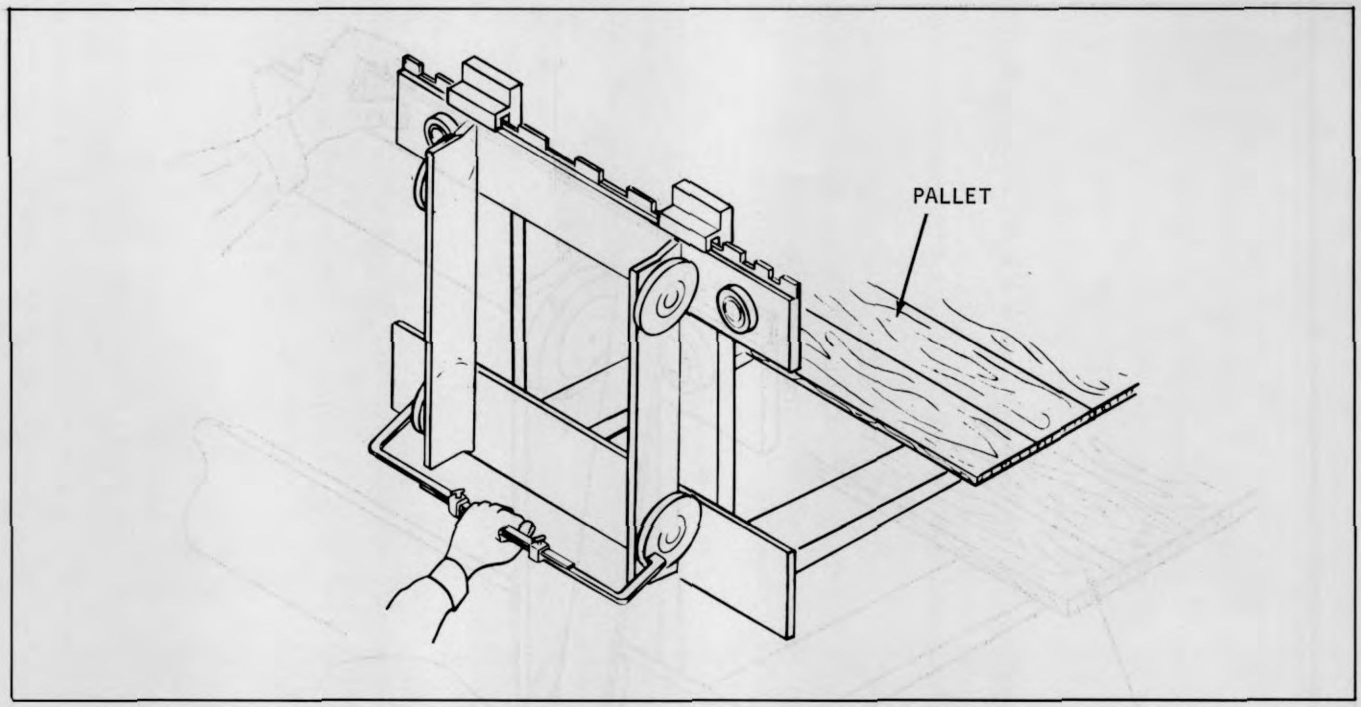


Plate 9576 Spanning Lower Rollers (Four Roller Carriage)

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

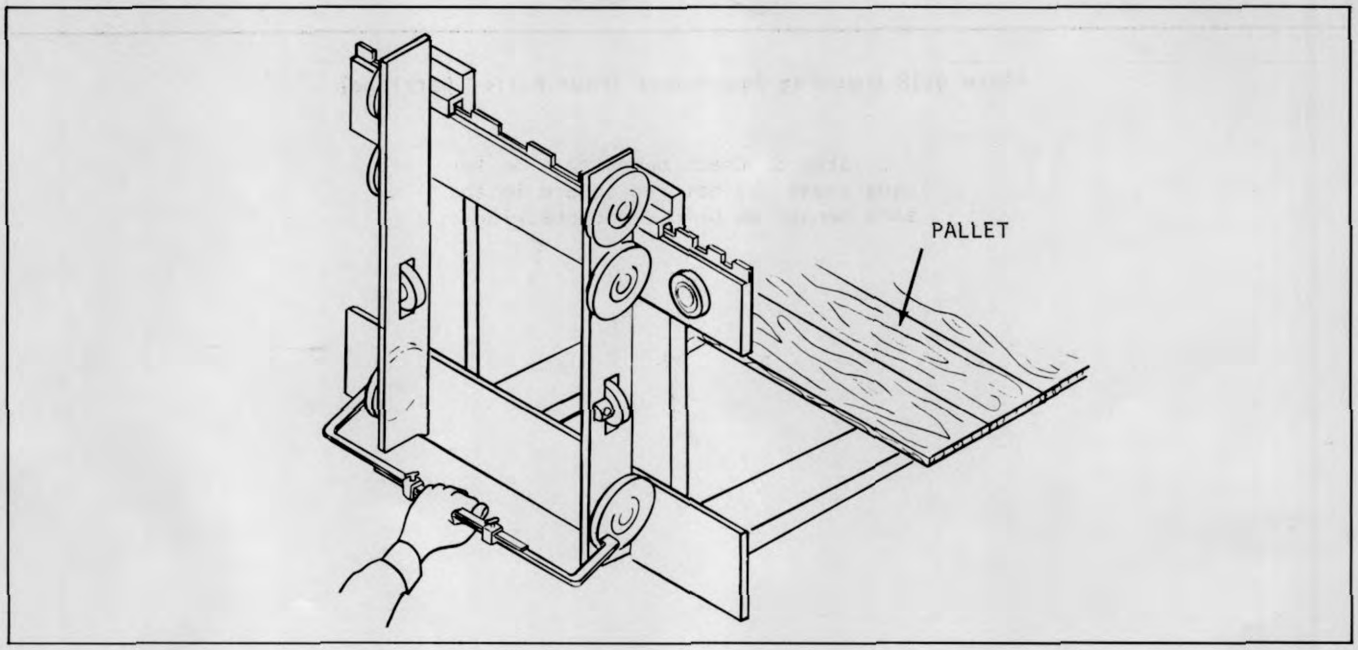


Plate 9577 Spanning Lower Rollers (Six Roller Carriage)

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

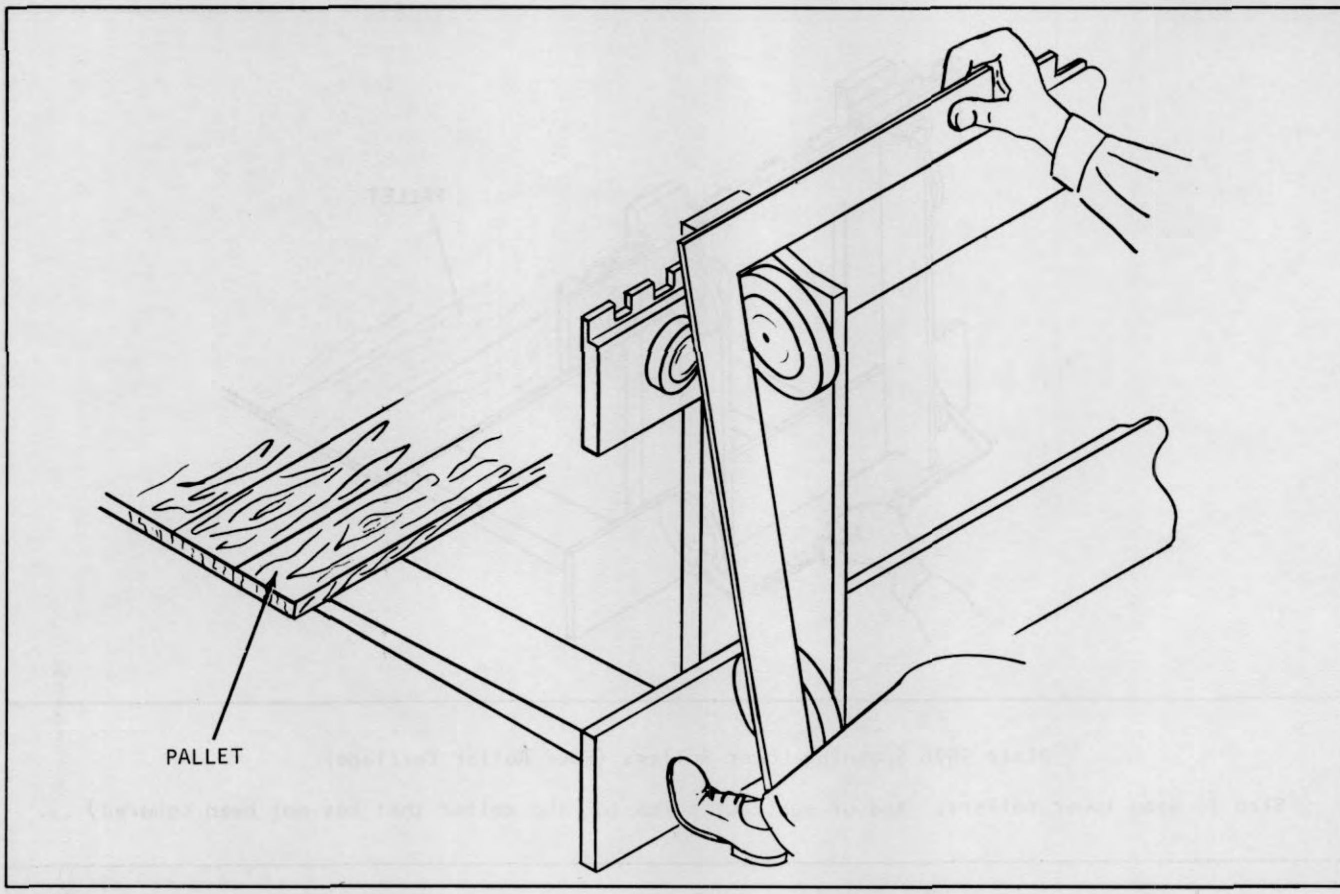


Plate 9578 Checking Squareness (Four Roller Carriage)

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

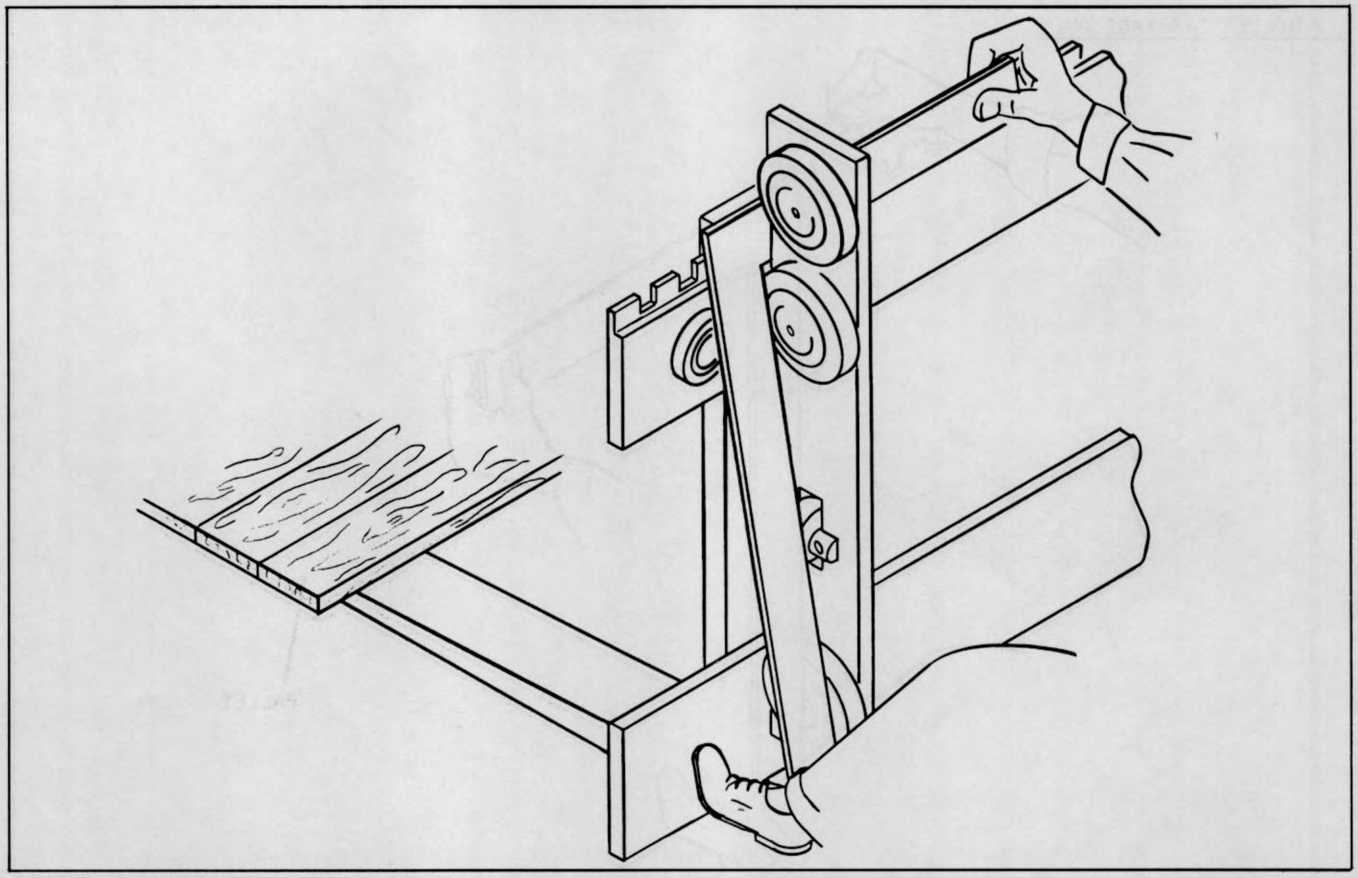


Plate 9579 Checking Squareness (Six Roller Carriage)

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

SIX ROLLER CARRIAGE ONLY

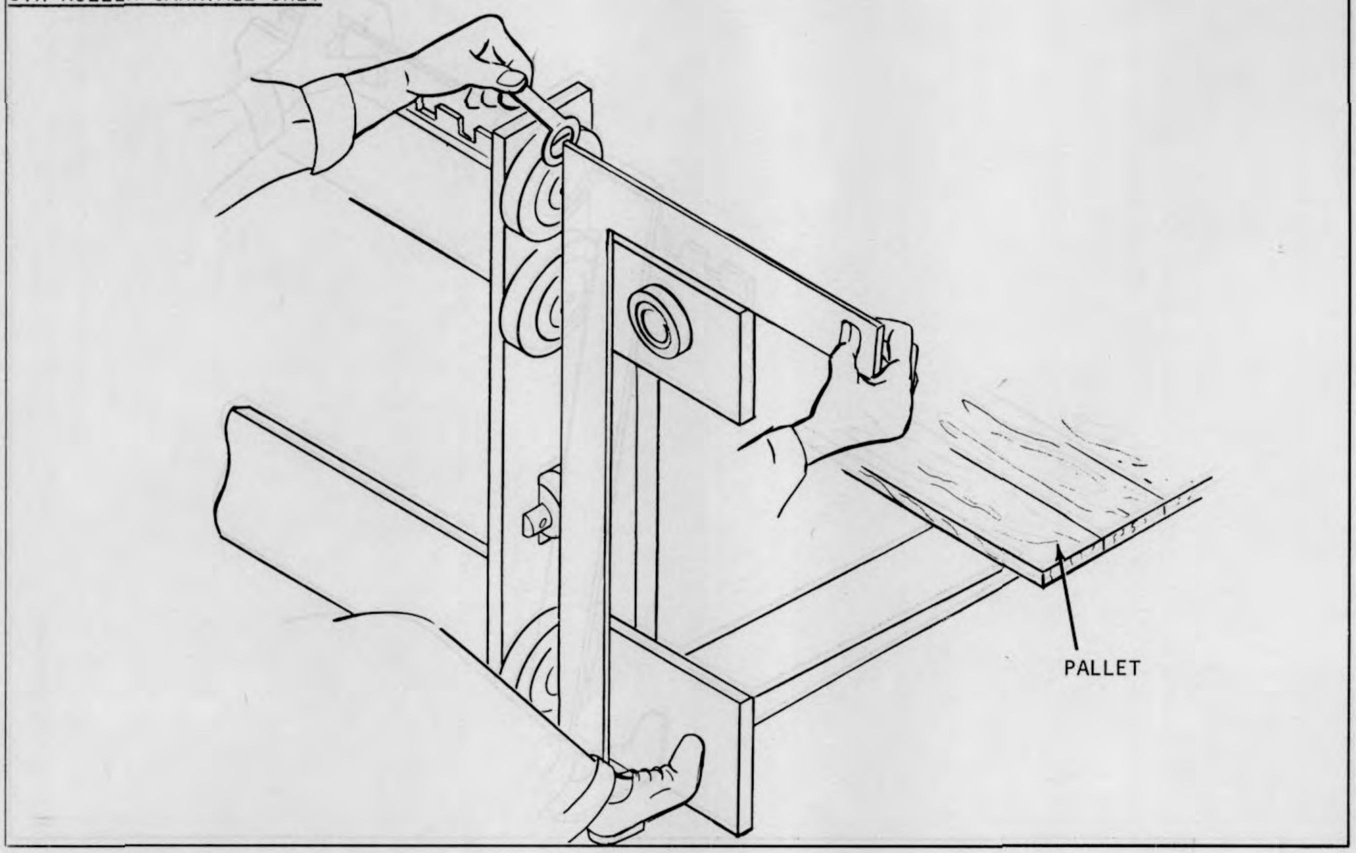


Plate 9580 Top Roller Clearance

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

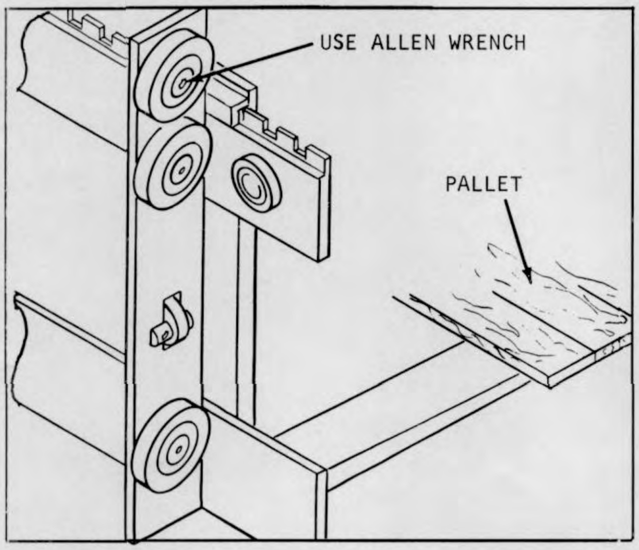


Plate 9581 Removing Top Roller

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.

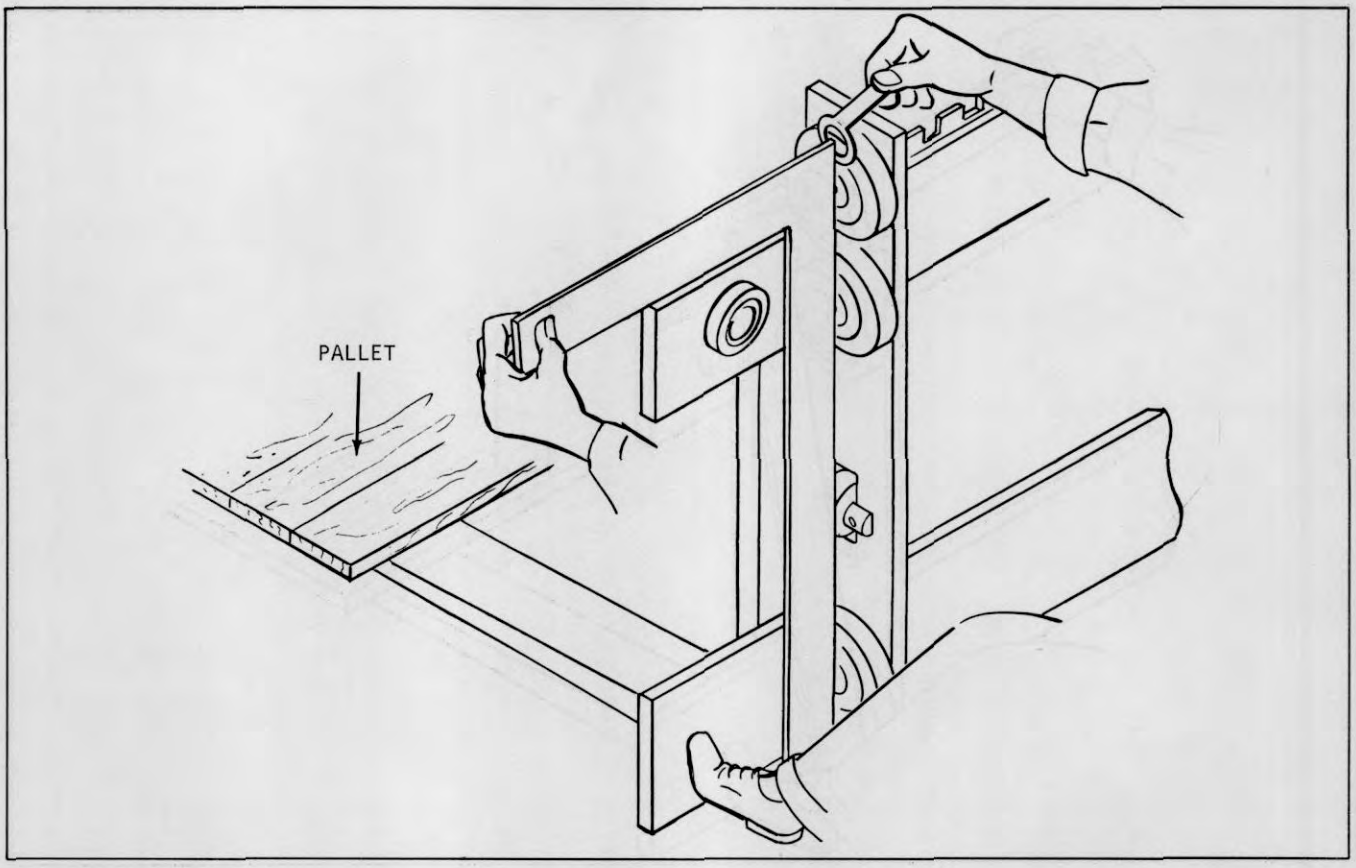


Plate 9582 Top Roller Clearance

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

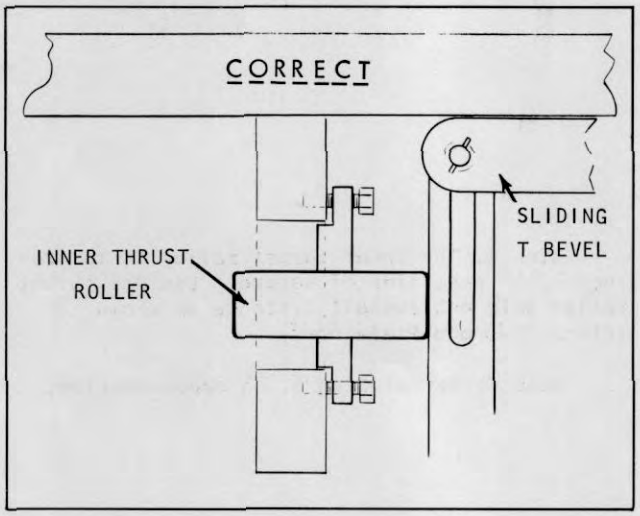


Plate 9583 Checking Squareness■CORRECT

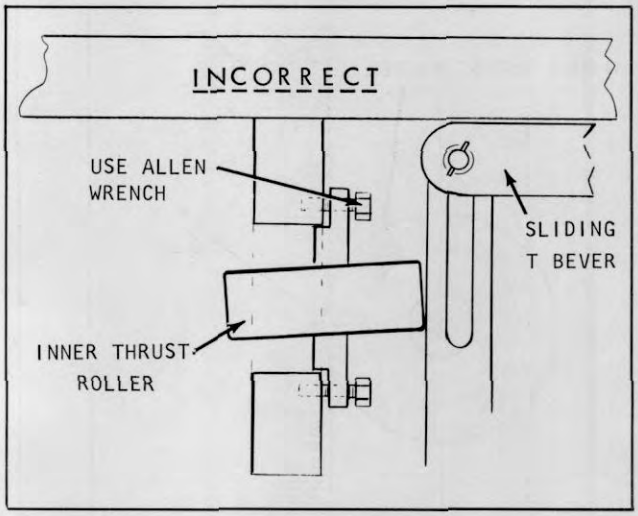


Plate 9584 Checking Squareness■INCORRECT

Step 4. Check squareness of inner thrust rollers with Sliding T Bevel. Set Sliding T Bevel to 90° using carpenters square.

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

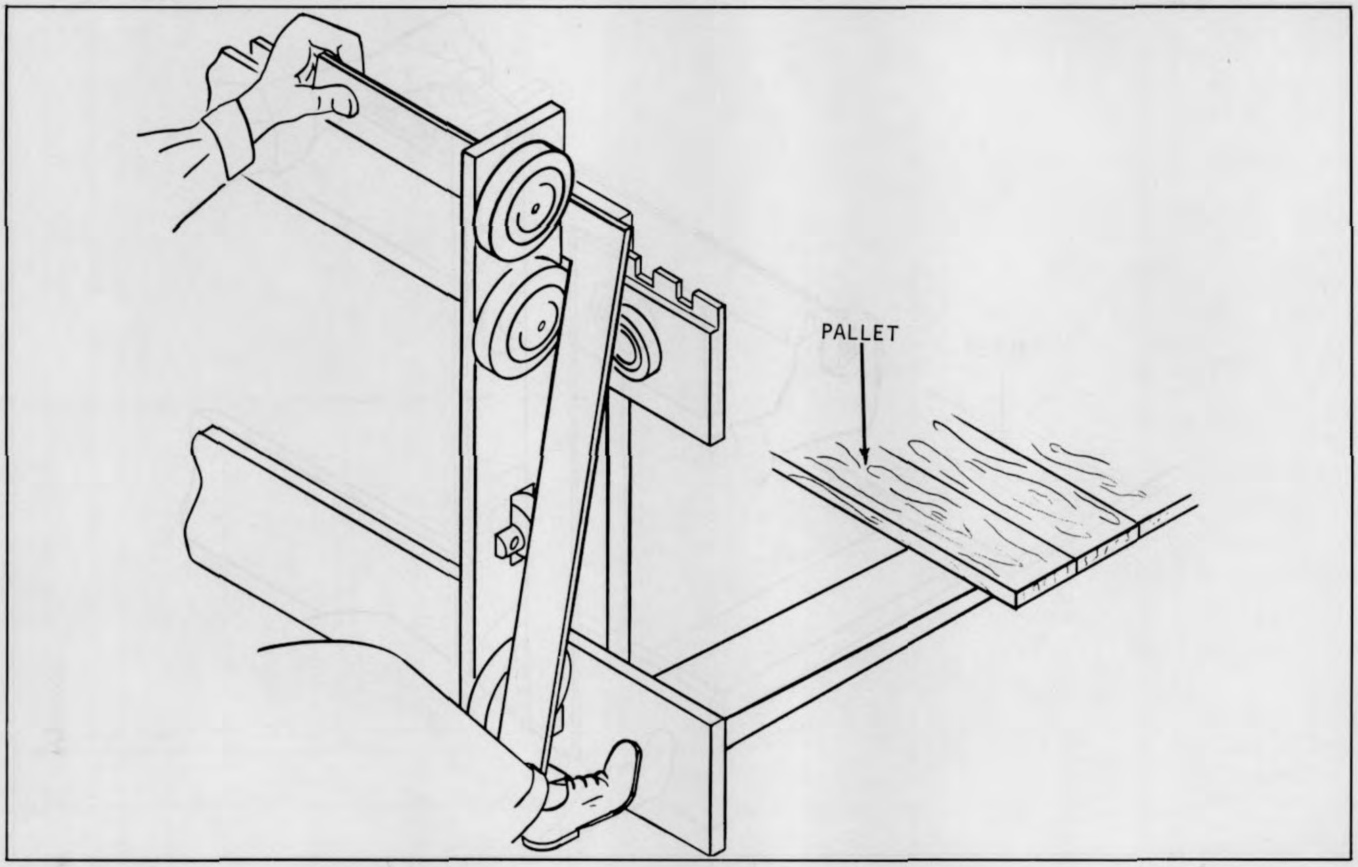


Plate 9574 Square And Side Thrust Roller

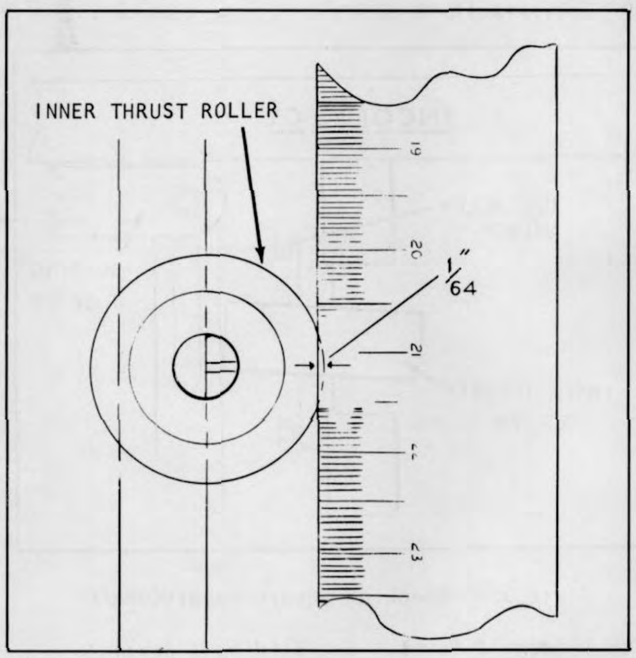


Plate 9585 Reading Roller Projection

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 adj-ustment.

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.

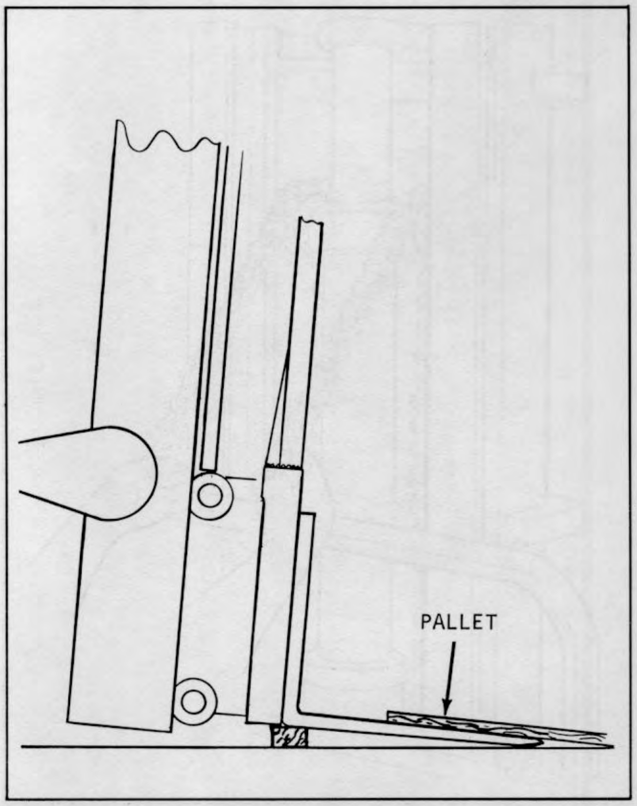


Plate 9565 Inner Rail Clearing Carriage Rollers

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

C A U T I O N

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

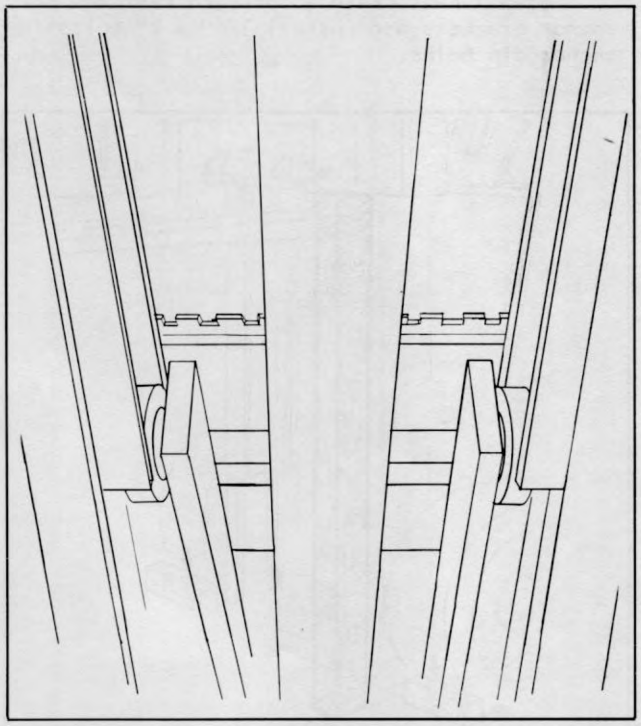


Plate 9591 Rollers Guiding Into Inner Rail

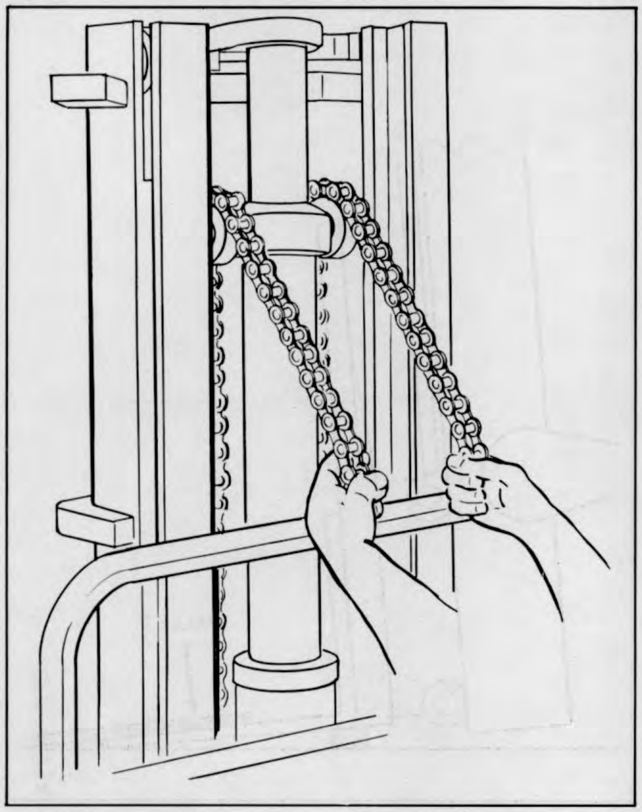


Plate 9586 Pulling Piston Head Down

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.

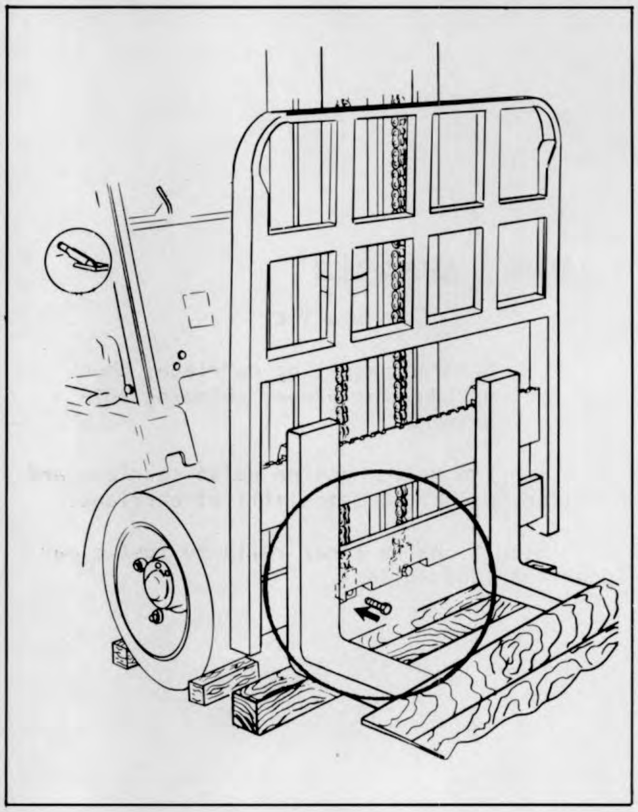


Plate 9587 Installing Bolts

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

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.

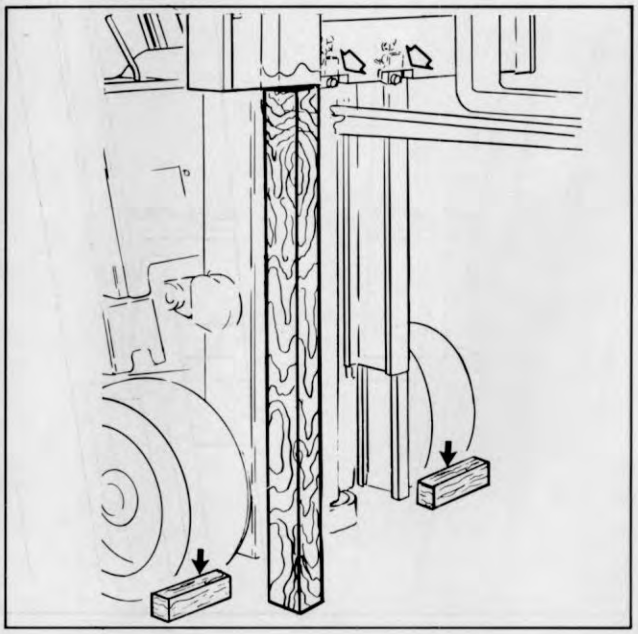


Plate 9593 Carriage Pin Replacement

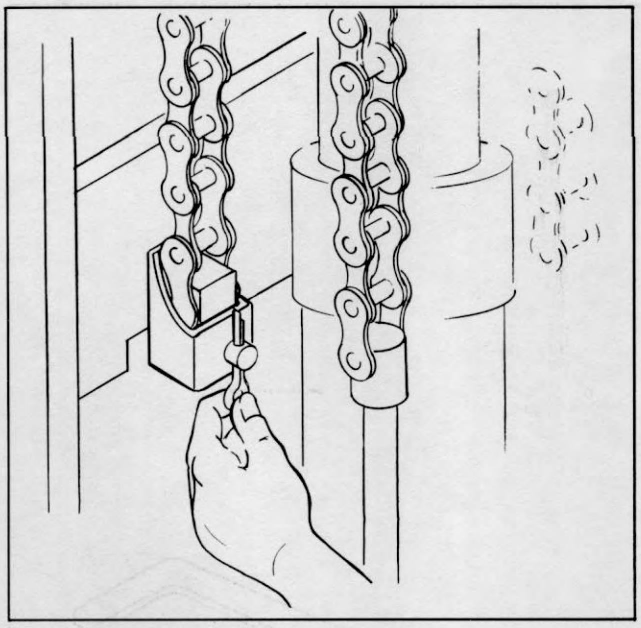
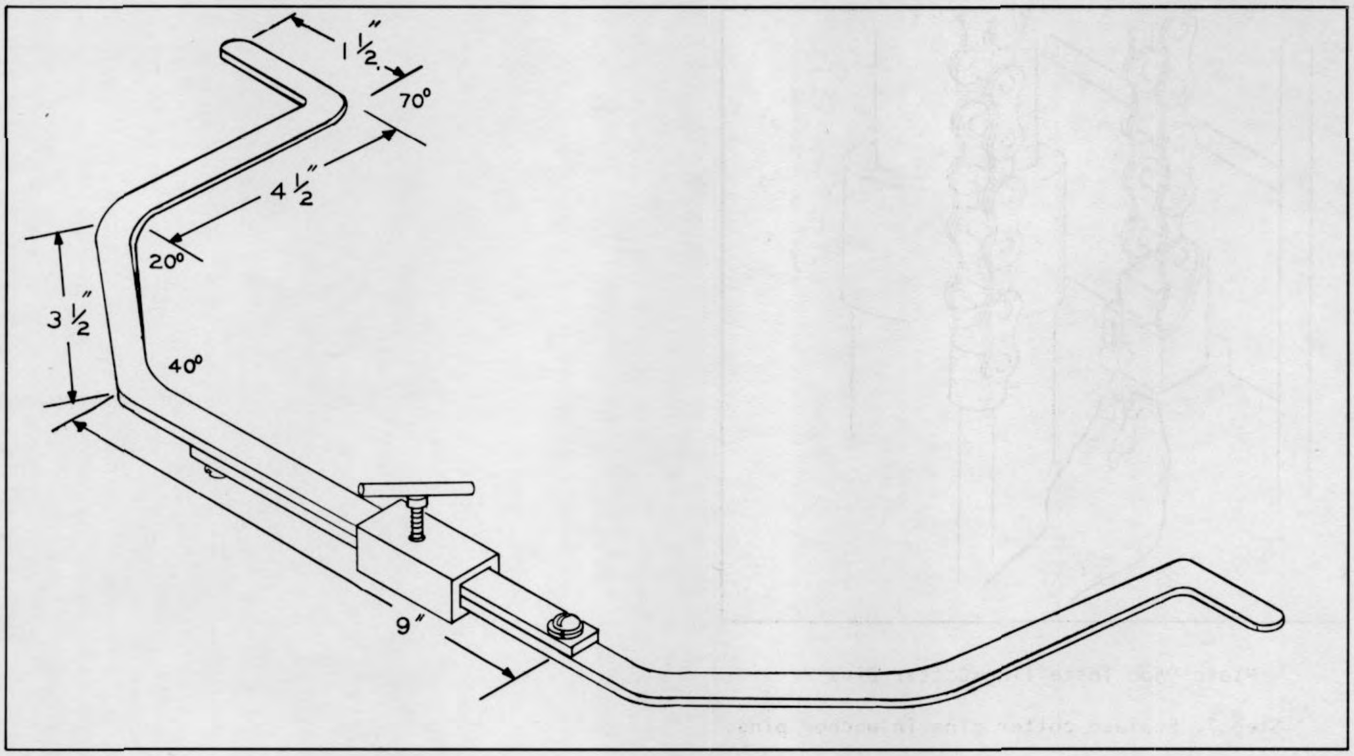


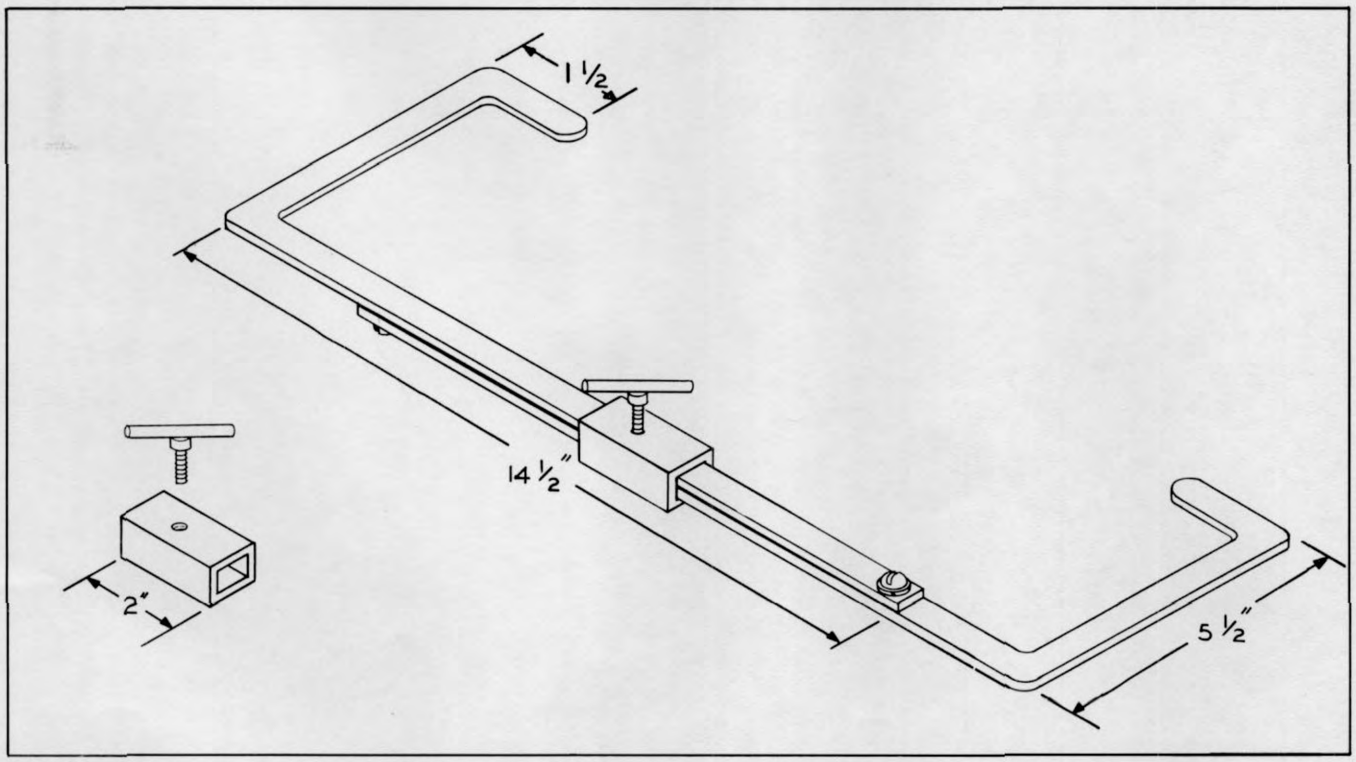
Plate 9588 Installing Cotter Pins

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

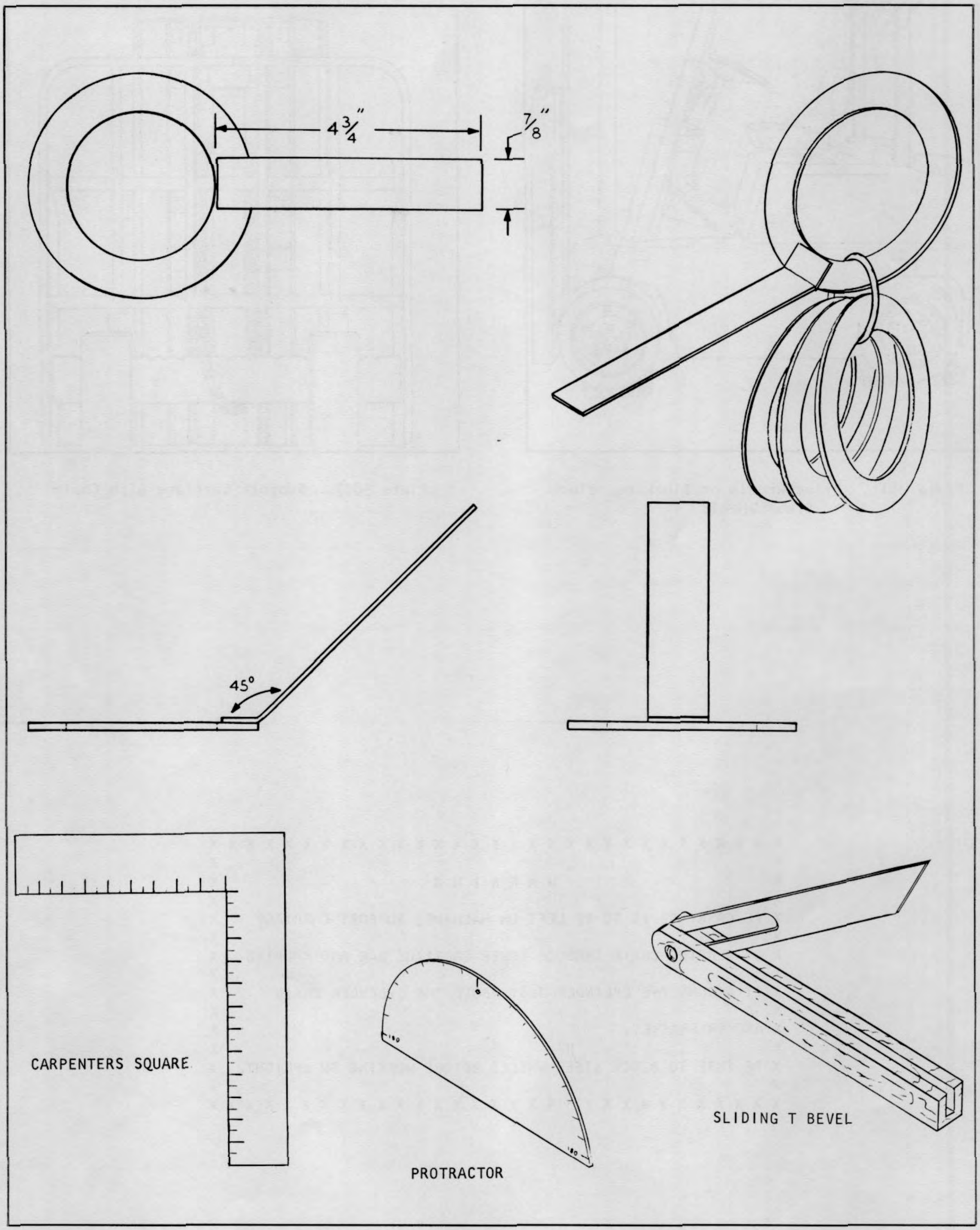

4 3/4"
7/8"
45°
CARPENTERS SQUARE
PROTRACTOR
SLIDING T BEVEL

Plate 9811. Drive Wheels on Blocking, Block Steer Wheels

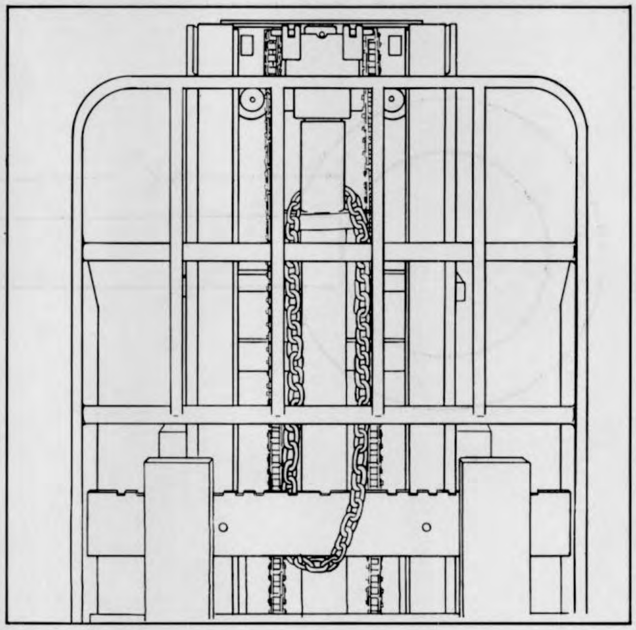
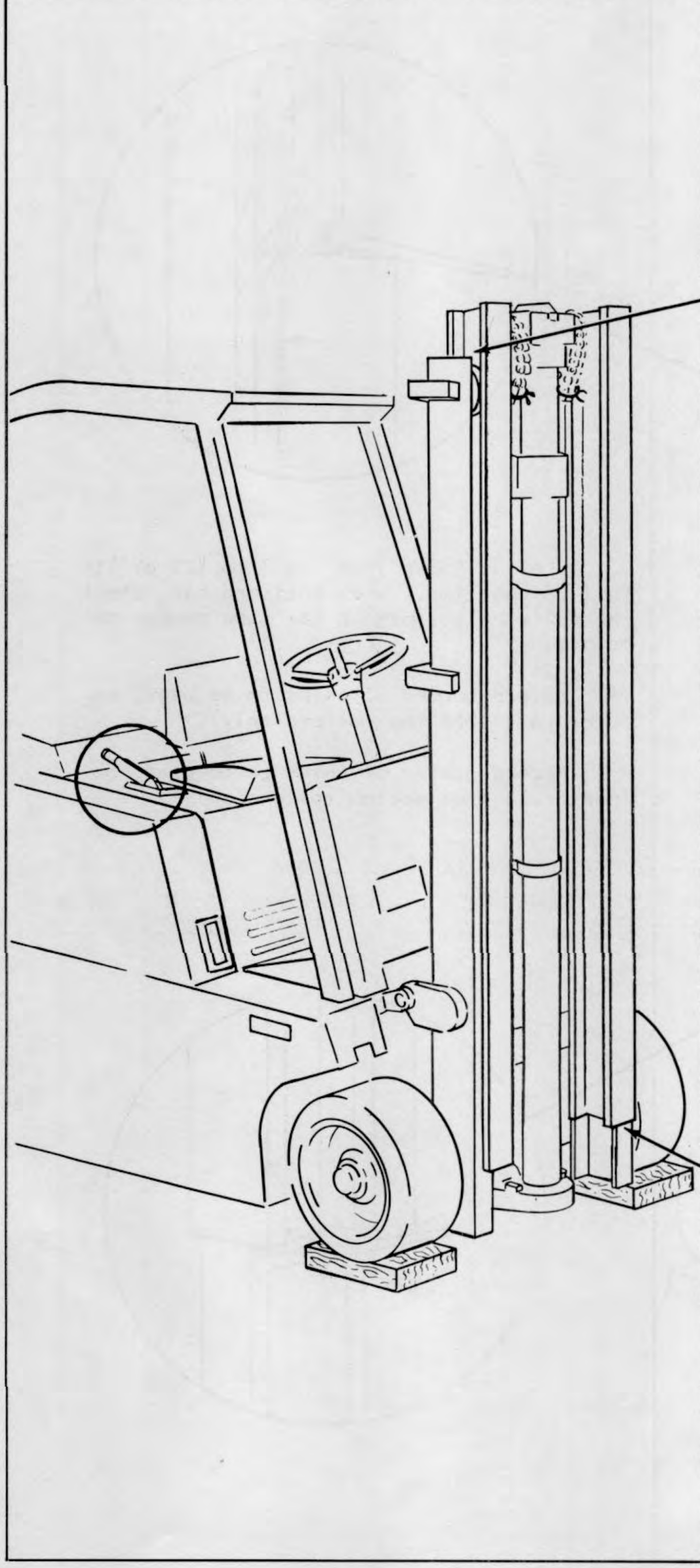
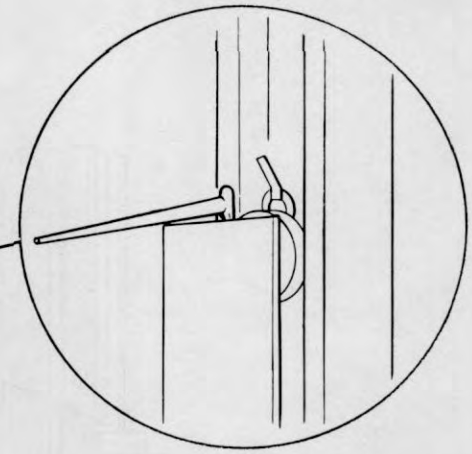


Plate 9807.. Support Carriage with Chain

```
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 X X X X
X                                                           X
X                        W A R N I N G                      X
X                                                           X
X IF CARRIAGE IS TO BE LEFT ON MACHINE, SUPPORT CARRIAGE     X
X                                                           X
X BY PLACING CHAIN THROUGH LOWER CARRIAGE BAR AND RAPPING    X
X                                                           X
X IT AROUND THE CYLINDER JUST ABOVE THE CYLINDER CHAIN       X
X                                                           X
X ANCHOR BRACKET.                                           X
X                                                           X
X BE SURE TO BLOCK STEER WHEELS BEFORE WORKING ON UPRIGHT.   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 X X X X X X X
```

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".

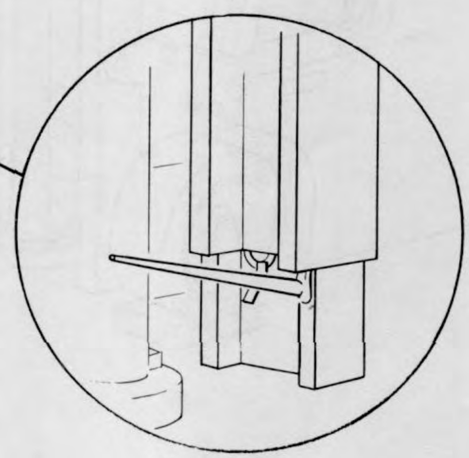
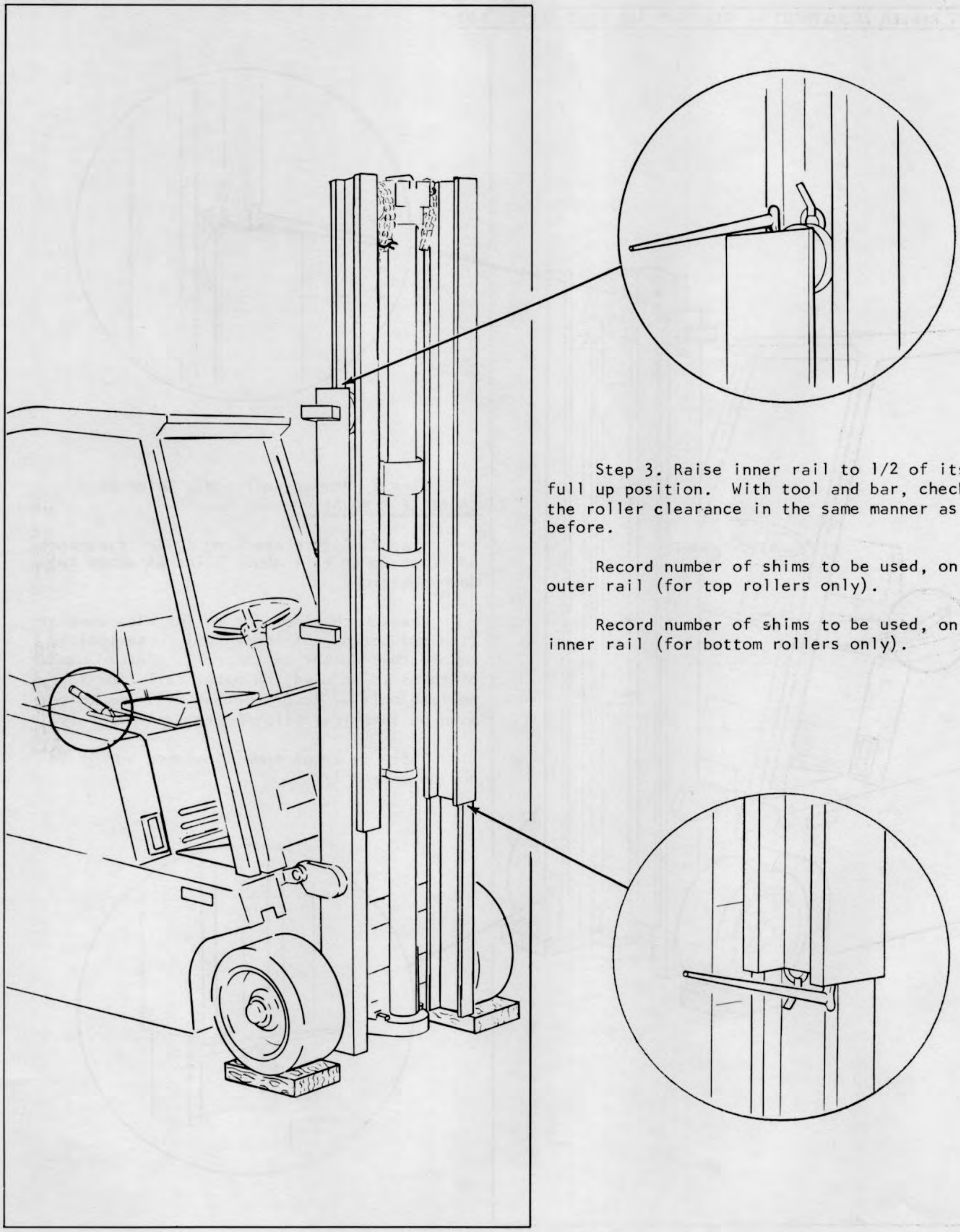


Plate 9804

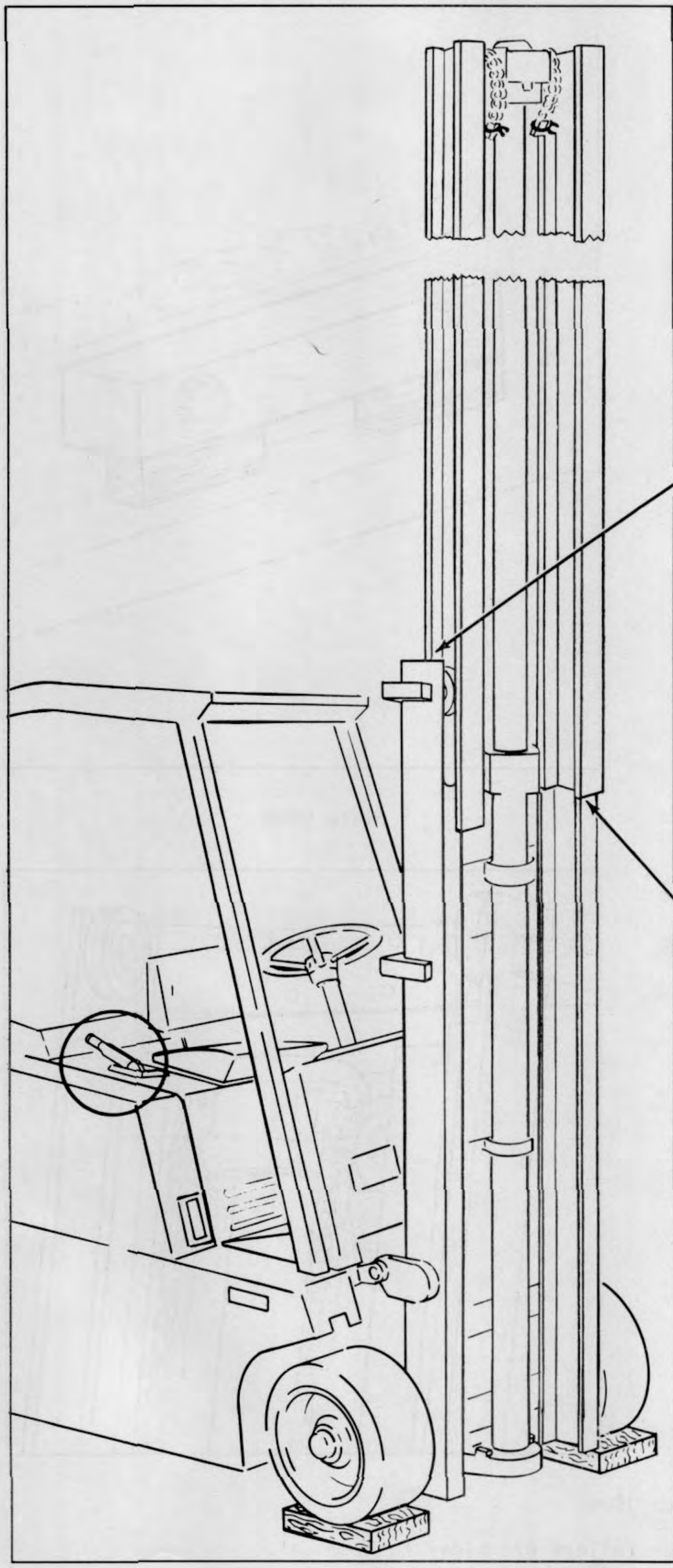


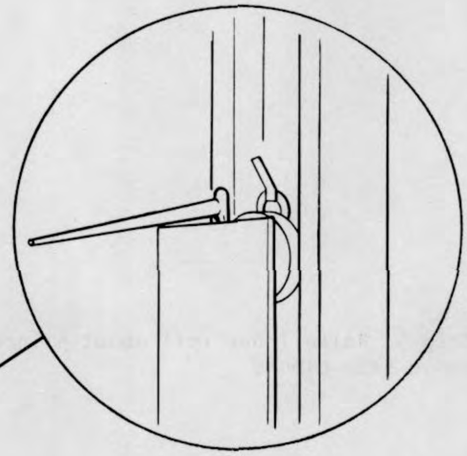
Step 3. Raise inner rail to 1/2 of its full up position. With tool and bar, check the roller clearance in the same manner as before.

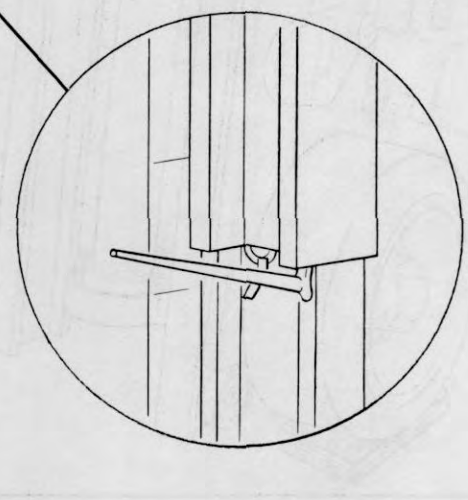
Record number of shims to be used, on outer rail (for top rollers only).

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

Plate 9805







Step 4. Riase inner rial 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.

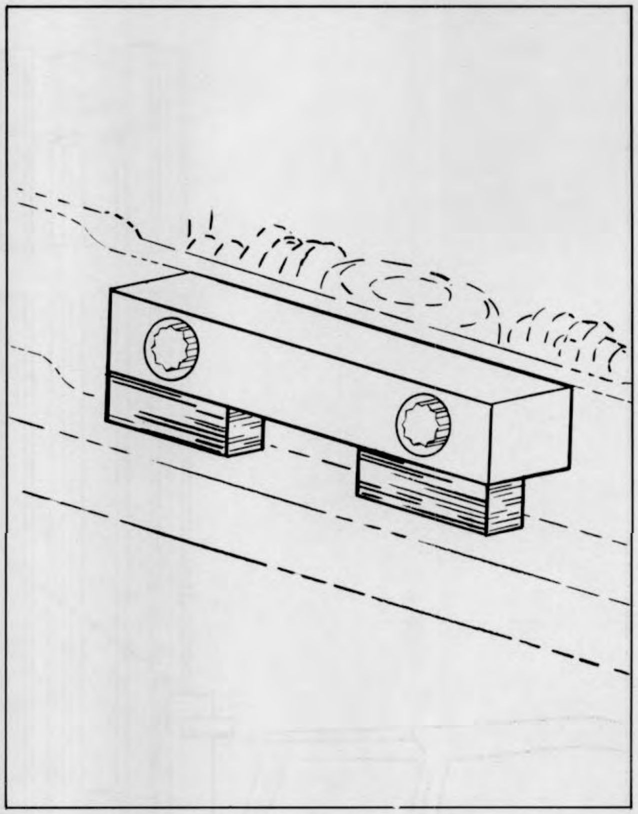
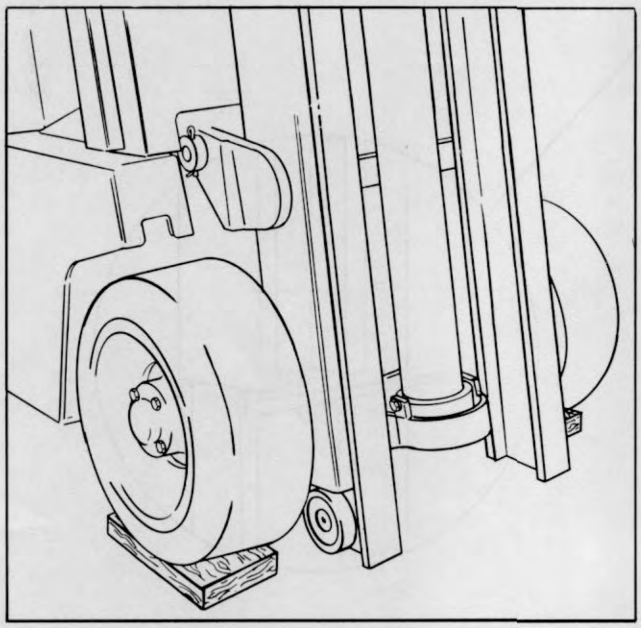


Plate 9808



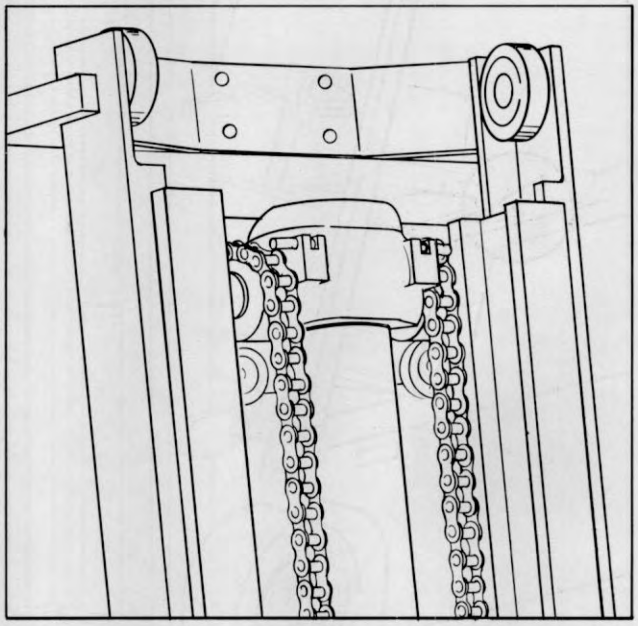
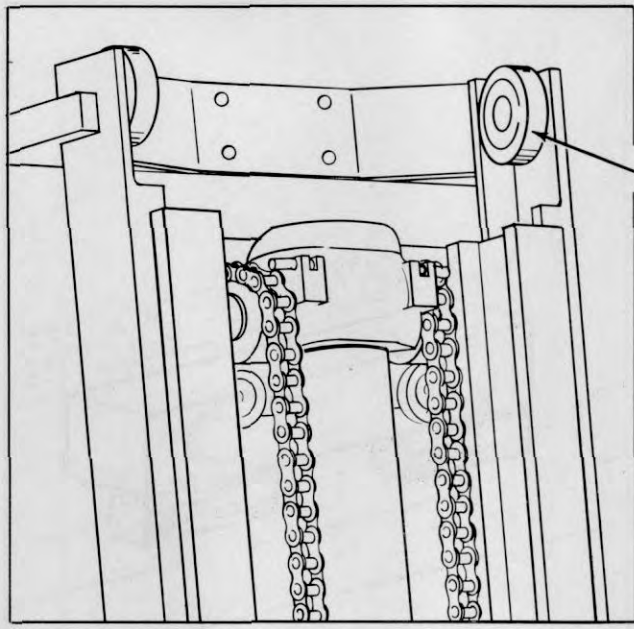


Plate 9809

Step 6. Lower inner rail until upper and lower rollers are clear for removal.



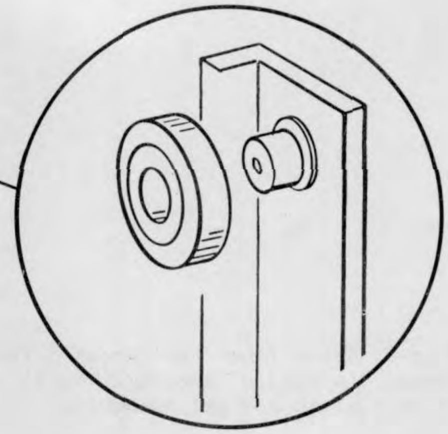


Plate 9810

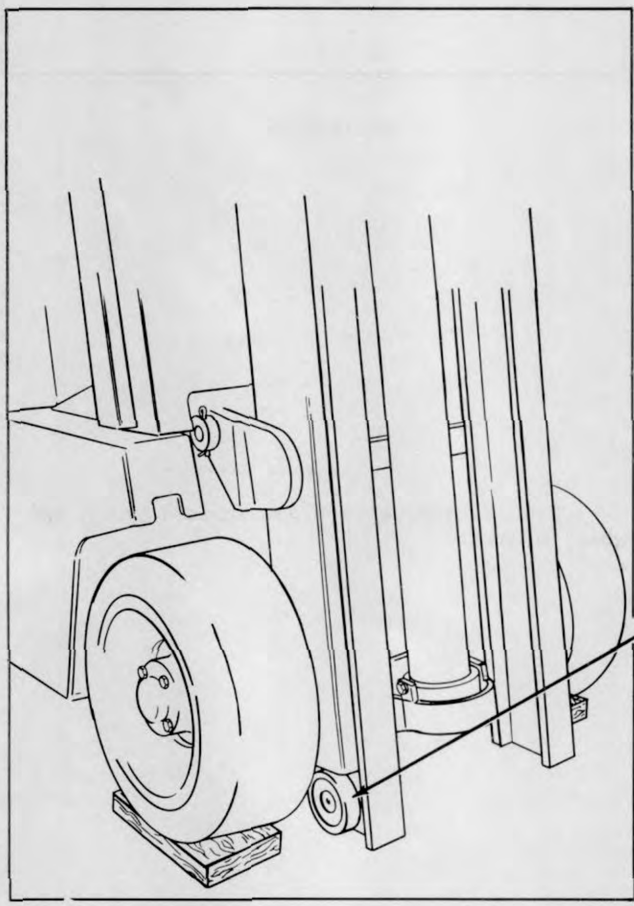
Step 7. Adjusting upright rollers:

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.



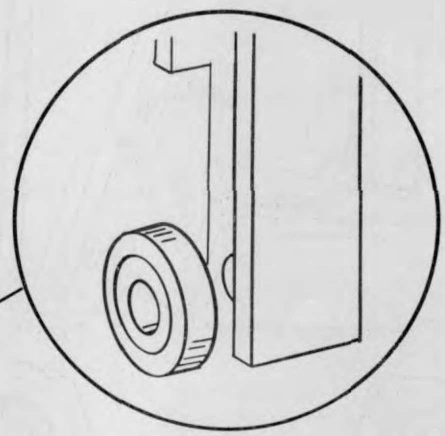


Plate 9812

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, besure 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.

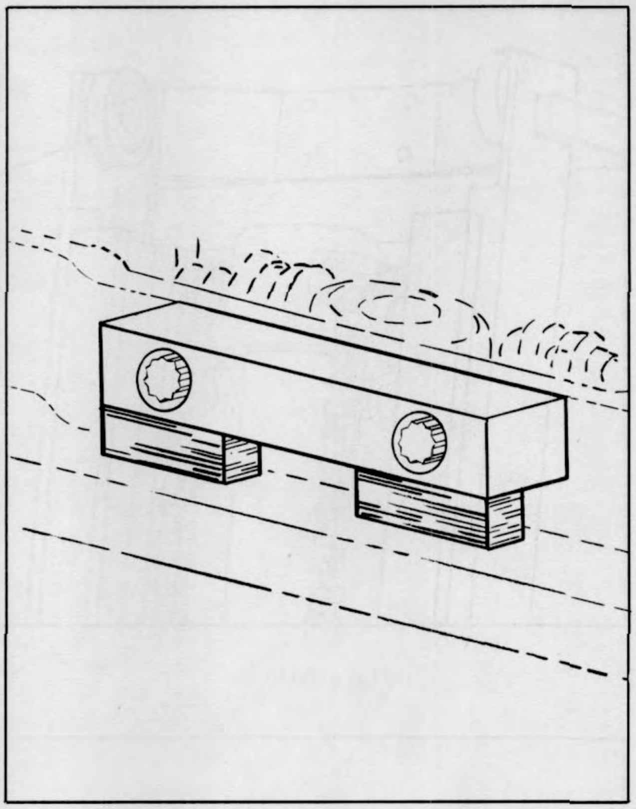


Plate 9808

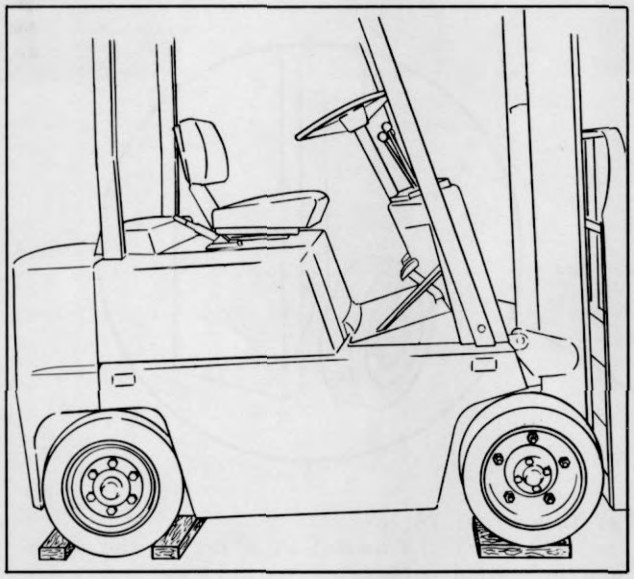


Plate 9811

Step 9. Remove carriage support chain and wheel blocks.

TROUBLE SHOOTING GUIDE

DRIVE AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Continuous Axle Noise.	Badly worn parts.	Replace worn parts with new.
	Unevenly worn tires.	Replace tires.
	Improperly adjusted wheel bearing.	Adjust correctly.
	Lack of lubricant.	Add sufficient lubricant of correct grade.
Axle Noise on Drive or on Coast Only.	Differential pinion gear and ring gear out of adjustment or worn excessively.	Adjust, repair or replace entire unit if conditions warrants.
Excessive Backlash in Axle Driving.	Loose axle shaft drive flange cap screws.	Tighten cap screws.
	Flange loose on axle shaft.	Reweld flange to shaft.
	Worn splines on axle shaft at differential end.	Replace drive flange and shaft assembly.
	Differential drive pinion gear and ring gear out of adjustment or worn excessively.	Adjust or replace as condition warrants.
Complete Failure to Function.	Broken axle shaft.	Replace axle shaft.
	Broken teeth on ring gear or pinion gear.	Replace ring gear and pinion and other parts of differential necessary. Adjust ring gear and pinion gear correctly.

TROUBLE SHOOTING GUIDE

STEERING AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Damaged axle.	Replace axle.
	Lubrication leaks.	Replace oil seals. (Refer to Lubrication Section). Report to designated individual in authority.
	Incorrect caster or camber.	Report to designated individual in authority.
	Uneven tire wear.	Inflate tires properly. Check wheel alignment.

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

TROUBLE SHOOTING GUIDE

BRAKES

TROUBLE	PROBABLE CAUSE	REMEDY
Brakes drag.	Improper pedal adjustment.	Adjust brake pedal free travel.
	Brake pedal return spring broken or weak.	Replace spring.
	Brakes improperly adjusted.	Adjust brakes.
	Brake shoe anchor pin tight in shoe.	Free-up pin and lubricate lightly.
	Brake shoe return spring broken or weak.	Replace spring.
	Loose or damaged wheel bearings.	Adjust or replace wheel bearings.
	Insufficient brake shoe clearance, or improper brake anchor pin adjustment.	Adjust brakes.
	Brake backing plate loose.	Tighten plate.
	Grease on linings.	Correct grease leakage; clean or install new shoes and lining assemblies.
	Dirt imbedded in lining.	Clean lining with wire brush.
	Drums scored or rough.	Replace drum and brake shoe and lining assemblies.
Severe brake action on light pedal pressure.	Brake shoes improperly adjusted.	Adjust brakes.
	Grease on linings.	Correct grease leakage; clean or install new shoes and lining assemblies.
	Loose brake shoe anchor.	Adjust and tighten.
Brake locked.	Brake pedal lacks free travel.	Adjust pedal free travel.
	Brakes frozen to drums (cold weather).	Break loose by driving vehicle.
Brake noisy or chatters.	Brake lining worn.	Replace shoe and lining assemblies.
	Grease on linings.	Correct leakage; clean or replace shoe and lining assemblies.
	Dirt embedded in linings.	Clean lining with wire brush.
	Improper or loose linings.	Replace shoe and lining assemblies.
	Brake shoe or drum distorted.	Straighten or replace.

TROUBLE SHOOTING GUIDE

BRAKES (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive pedal travel.	Lining worn.	Adjust or replace shoe and lining assemblies.
	Brake improperly adjusted.	Adjust brake.
	Scored brake drums.	Repair or replace drums.
Excessive pedal pressure.	Grease on linings; worn or glazed lining.	Correct grease leakage; clean up and replace shoe and lining assemblies.
	Warped brake shoes, or defective brake linings.	Replace shoe and lining assemblies.
	Shoes improperly adjusted.	Adjust brakes.
	Brake drum scored or distorted.	Repair or replace drums.
	Shoes improperly adjusted.	*Adjust brakes.*
	Insufficient fluid in master cylinder.	Fill master cylinder to within 1/4 inch of the top.
Wheel troubles.	Wheel wobbles; bent.	Inspect mounting on hub, spindles, and drive axle; replace defective wheel or mounting.
	Wheel loose on hub.	Tighten.
	Wheel out of balance.	Balance wheel.
	Wheel bearings run hot.	Adjust, lubricate wheel bearings.

INDUSTRIAL TRUCK DIVISION

TROUBLE SHOOTING GUIDE

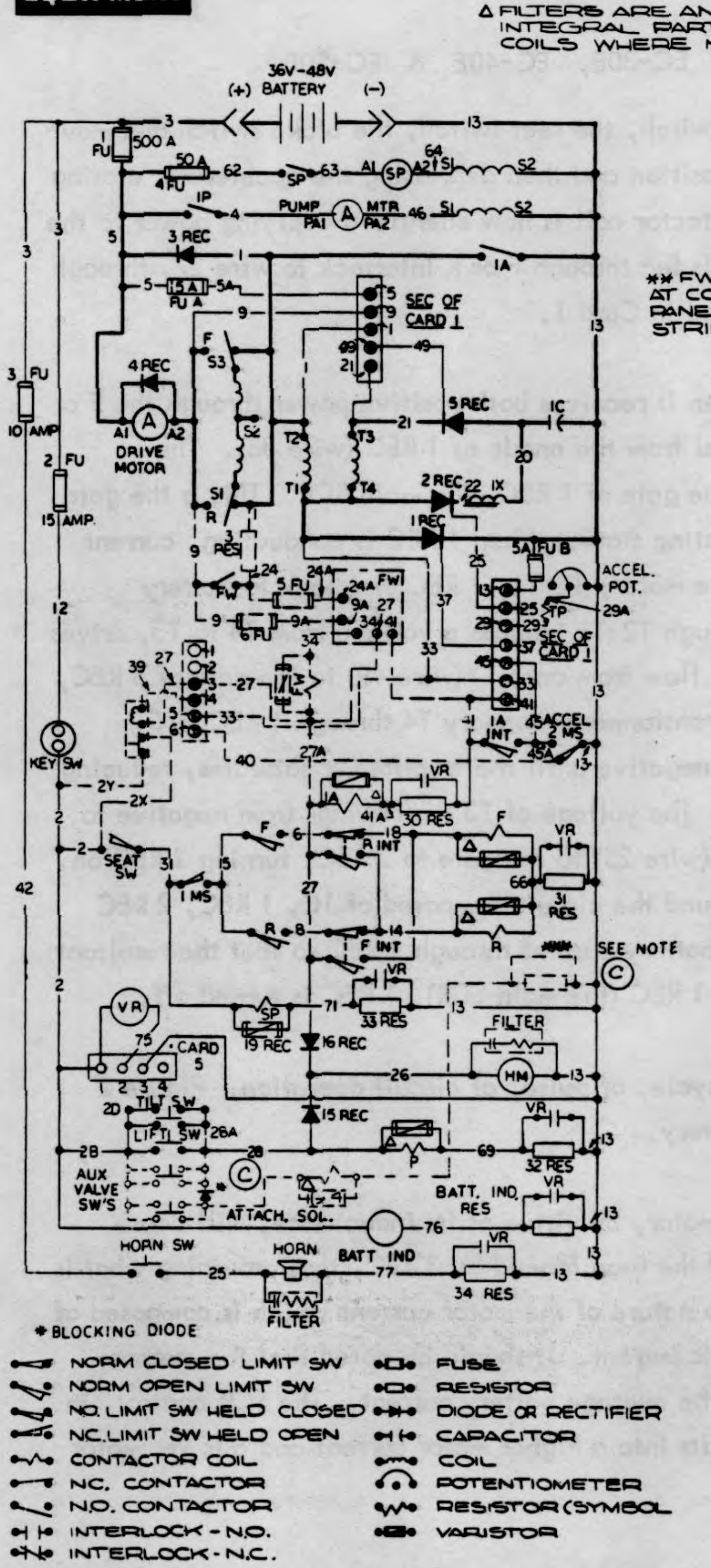
HYDRAULIC SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Pump not delivering oil.	Wrong direction of rotation.	Must be reversed immediately to prevent seizure and breakage of parts due to lack of oil.
	Tank oil level low.	Add recommended oil.
	Oil intake pipe or suction filter plugged.	Replace filter cartridge, clean strainer if so equipped.
	Air leak in suction line.	Will prevent priming, or cause noise and irregular action of control circuit.
	Oil viscosity too heavy to pick up prime.	Thinner oil should be used, per recommendations for given perature and service.
	Broken pump shaft or gear.	Report to designated individual in authority.
Pump not developing pressure.	Pump not delivering oil for any of the above reasons.	Check oil circulation by watching oil in tank.
	Relief valve setting not high enough.	Refer to relief valve instructions.
	Relief valve sticking open.	Dirt under pressure adjustment valve. Refer relief valve instructions.
	Leak in hydraulic control system (cylinders or valves).	Find leak and correct.
	Partially clogged intake line, intake filter or restricted intake pipe.	Pump must receive intake oil freely or cavitation will take place.
Pump making noise.	Small air leak at pump intake piping joints.	Test by pouring oil on joints while listening for change in operation. Tighten as required.
	Air leak at pump shaft packing.	Repair or replace.
	Tank air vent plugged.	Must be open thru breather opening or air filter.
	Too high oil viscosity.	Use recommended oils.
	Shaft packing worn.	Replace shaft packing per preceding instructions.
	Oil filter dirty.	Replace filter element.
Forks do not lift to maximum height.	Hydraulic Oil level low.	Fill sump tank.

TROUBLE SHOOTING GUIDE

HYDRAULIC SYSTEM CONTINUED

TROUBLE	PROBABLE CAUSE	REMEDY
Lift or tilt action fails.	Loss of oil pressure.	Report to designated individual in authority.
Oil leak at top of lift cylinder assembly.	Worn or damaged lift piston seal.	Replace seal.
	Scored cylinder wall.	Replace cylinder.
	Plugged vent line.	Clean out vent line. Replace if collapsed.
Oil leak around piston rod at tilt cylinder.	Worn seal.	Replace seal.
	Scored piston rod.	Replace rod and eliminate cause of scoring which may be caused by misalignment, worn bearing or foreign matter.
With load centered on lift forks load is lifted unevenly.	Lift chains out of adjustment.	Adjust chains.



INSTRUCTIONS FOR ADDITION OF HIGH SPEED OR FIELD WEAKENING KIT, IF USED CONNECT TWO POWER LEADS AS SHOWN--- CONTROL LEADS-- CONNECT PER NOTE (SEE SCHEMATIC)
INSTRUCTIONS FOR FAULT DETECTOR (SEE PICTORIAL-UPPER RIGHT)

EC30E

EC40E

EC50E

SOLID STATE CONTROL SYSTEM

Check - Out Procedures. . . . .

Trouble Shooting Procedures - and -

General Maintenance Instructions.

EC-30E, EC-40E & EC-50E

CIRCUIT OPERATION

The circuit is energized by closing the key switch, the seat switch, the brake switch and moving the Forward or Reverse Lever to either position and then depressing the accelerator closing the accelerator start switch. The F or R contactor coil is now energized applying power to the drive motor circuit. Positive control power is fed through F or R interlock to wire 27, through the 1A coil to wire 41 to an oscillator located in Card 1.

The oscillator section will oscillate only when it receives both positive power through the F or R interlock and a synchronizing control signal from the anode of 1 REC (wire 33). The oscillator output is fed from terminal 37 to the gate of 1 REC, the main SCR. This is the gate signal which will switch 1 REC to the conducting state. When 1 REC is conducting, current flow from battery positive through 1FU, drive motor, T2-T1, 1 REC and back to battery negative. The initial rising d-c current through T2-T1 induces a voltage from T4 to T3, drives T3 below battery negative, causes current to flow from card 1 (wire 49) to the gate of 5 REC, turning 5 REC on. Current then flows from transformer secondary T4 through 1 REC, 1C, 5 REC and back to T3 charging 1C (wire 20) negative until the transformer saturates, reducing this current flow to zero, turning off 5 REC. The voltage of T3 then swings from negative to positive, causes current to flow from Card 1 (wire 25) to the gate to 2 REC, turning 2 REC on. 2 REC conducts, capacitor 1C discharges around the circuit composed of 1C, 1 REC, 2 REC and 1X. This discharge current opposes the battery current through 1 REC so that the resultant current is zero. With reverse voltage across 1 REC (the main SCR), 1 REC is turned off.

This explanation has been for one complete cycle, or pulse, of circuit operation. Figure 2 illustrates the pulsing of current from the battery.

During the off time the energy stored in the motor, by virtue of its inductance, will cause current to circulate through the motor around the loop formed by 3 REC, thus providing what is called "flyback current." Figure 3 shows the nature of the motor current which is composed of both battery current and the inductive flyback current. It should be noted that the average motor current measured will be greater than the average battery current. The SCR control, in effect, converts battery current at battery volts into a higher motor current and a lower motor volts.

The time for the next cycle to start is determined by the time that the oscillator section of the card takes to oscillate. This frequency of oscillation is controlled by the potentiometer in the accelerator. Slow speed is obtained by having maximum ohms in the potentiometer. As the resistance in the pot decreases, the speed of the motor increases. With level operation, the SCR circuit is capable of delivering approximately 70-90% speed. For full-speed operation, the 1A contactor is closed to apply full battery voltage to the motor. 1A coil is energized by closing the 1A switchette in the accelerator.

CARD 1

CURRENT LIMIT: The current-limit section of Card 1 provides protection to the motor and control by limiting currents during acceleration and stall. This circuit is sensitive to load current and overrides the oscillator under heavy loads so as to limit the pulse frequency (thus the average current) to a value based on the maximum rating of 1 REC. Because of the flyback current through 3 REC, the motor current usually runs 2 to 3 times this current-limit value. The CURRENT LIMIT is adjustable by means of a trimpot on Card 1.

OSCILLATOR: The oscillator section of the card has two adjustable modes and one fixed feature. With the accelerator pot at maximum resistance, the CREEP SPEED can be adjusted with a trimpot on the card. With the accelerator pot at minimum resistance, the TOP SCR SPEED is adjustable by means of a trimpot on the card. The fixed feature is controlled acceleration. When the accelerator is set for maximum speed and the directional switch is closed, the controlled acceleration provides a gradual buildup of pulses, thus giving a smooth acceleration to top SCR speed. This feature also provides a smooth reacceleration during a plugging reversal of direction.

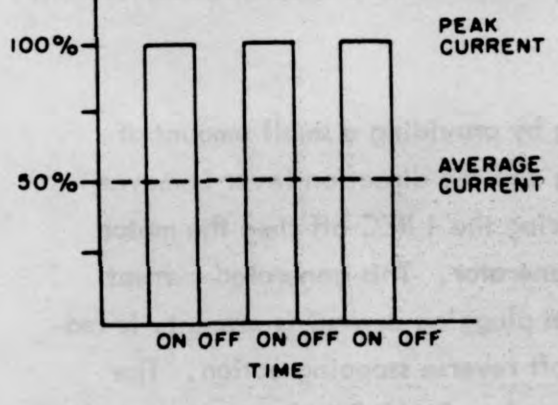
PLUGGING: Slowdown is accomplished when reversing by providing a small amount of retarding torque for deceleration. If the truck is moving and the direction lever is moved from forward to reverse, the motor field is reversed. During the 1 REC off time the motor armature, driven by the inertia of the truck, acts as a generator. This generated current passes through 4 REC. A signal taken from 4 REC, when plugging current is present, is fed to Card 1 retarding the pulse frequency and provides a soft reverse stopping action. The distance or severity of the reversal is adjustable by means of a PLUGGING trimpot on the card.

1A TIMER: A time-delay pickup of 1A is provided by a circuit in Card 1. This allows the truck to accelerate through the SCR range before 1A picks up even if the accelerator 1A switch is closed immediately. This time delay is adjustable by means of a 1A TIME trimpot on Card 1. An additional feature of the timer circuit is that 1A is rendered inoperative any time plugging is in process.

1A CONTACTOR (By-pass contactor around the SCR control): The 1A contactor is used to provide top truck speed, torque, and efficiency when called for. The 1A contactor is picked up when the accelerator is moved to its extreme end of travel.

THERMAL PROTECTOR: A thermal protector (TP) is mounted on the heat sink between 1 REC and 2 REC. This is a temperature sensitive device which increases resistance with an increase in temperature. During the normal operating range, the thermal protector has a resistance of approximately 50 ohms. If the temperature of the 1 REC heat sink exceeds 80° C., the resistance of the thermal protector increases. Being in series with the accelerator potentiometer, this increased resistance decreases the speed of the truck. The truck will operate at a reduced speed until the temperature reaches a safe value, then full SCR power will be available.

EC30E, EC40E, EC50E



Fibure 2 — Battery Current

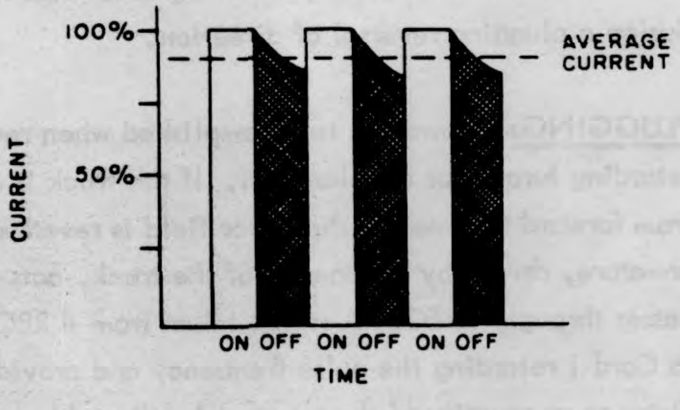


Figure 3 — Motor Current

GENERAL MAINTENANCE INSTRUCTIONS

The SCR control, like all electrical apparatus, does have some thermal losses. The semiconductor junctions have finite temperature limits above which these devices may be damaged. For these reasons, normal maintenance should guard against any action which will expose the components to excessive heat, such as steam cleaning; or which will reduce the heat dissipating ability of the control, such as restricting air flow.

The following DO'S and DON'TS should be observed:

1. Any controls that will be used in altitudes of 5000 feet or over and in ambients of 100° F (40° C) or over should be brought to the attention of the Clark Dealer.

2. The control should not be steam cleaned. In dusty areas, use low pressure air to blow off the control. In oily or greasy areas, a mild solution of detergent can be used to wash off the control and then blow completely dry with low pressure air or Freon TF (registered trademark)* degreaser. *(Registered trade mark of the DuPont Company)

3. Terminal boards and other exposed SCR control parts should be kept free of dirt and paint which might change the effective resistance between points.

4. The truck should not be plugged when the truck is jacked up and the drive wheels are in a free wheeling position. This can create excessive voltages that can be harmful to the control.

EC-30E
EC-40E
EC-50E

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

DEALER CHECK-OUT SHEET FOR GE C-185 SOLID STATE CONTROL SYSTEM

EC-30E, EC-40E AND EC-50E

TRUCK SERIAL NO. ______________________________ DATE ______________

1. BATTERY POLARITY CHECKED? __________ BATTERY VOLTAGE __________ VOLTS
2. TRUCK POLARITY
   - A. POSITIVE LEAD TO 1FU FUSE CHECKED? ______________________
   - B. NEGATIVE LEAD TO PUMP CONTACTORS CHECKED? ______________________
3. GROUND TEST (+) TO FRAME __________ OHMS, (-) TO FRAME __________ OHMS
4. CHECKING CONTROL WIRING.
   - A. TERMINALS 12 (+) TO 13 (-) (ALL SWITCHES OPEN) __________ OHMS
   - B. TERMINALS 12 (+) TO 13 (-) (KEY SWITCH CLOSED) __________ OHMS
   - C. TERMINALS 12 (+) TO 13 (-) (KEY, SEAT, 1MS & DIRECTIONAL SWITCH CLOSED)
     - DIRECTIONAL SWITCH .... FORWARD CLOSED __________ OHMS
     - DIRECTIONAL SWITCH .... REVERSE CLOSED __________ OHMS
5. SPEED POTENTIOMETER 1MS AND 2MS AND 1A SWITCHETTE OPERATION
   - A. WIRES 29A AND NEGATIVE (-) .... 1MS SWITCH ACTUATES __________ OHMS
   - B. WIRES 29A AND NEGATIVE (-) .... 2MS 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
10. PLUGGING DISTANCE ______________________ FEET
11. FIELD WEAKING: PICKUP CURRENT ______________________ AMPS

    DROPOUT CURRENT ______________________ AMPS

    SEAL ADJUSTMENT TRIMPOTS ON CARD #1

MECHANIC ______________________ HOUR METER READING ______________________

CHECK-OUT PROCEDURE FOR GE C-185 SOLID STATE CONTROL SYSTEM

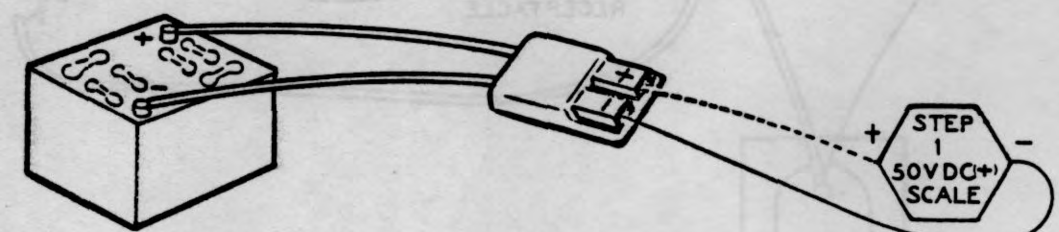
NOTE

IF METER READINGS ARE NOT WITHIN SPECIFICATIONS OF EACH STEP, REFER TO ADDITIONAL TROUBLE SHOOTING INSTRUCTIONS FOLLOWING THIS CHECK-OUT PROCEDURE.

EC-30E, EC-40E AND EC-50E

1. CHECKING BATTERY POLARITY AND BATTERY VOLTAGE.

WITH VOLTMETER SET ON 50 V DC (+) SCALE, PLACE THE RED LEAD ON POSITIVE (+) AND BLACK LEAD ON NEGATIVE (-) BATTERY CONNECTOR........YOU SHOULD READ BATTERY VOLTS........IF METER NEEDLE MOVES BACKWARDS, THE POWER CABLES ARE CONNECTED WRONG ON THE BATTERY AND SHOULD BE REVERSED BEFORE CONNECTING TO MACHINE.



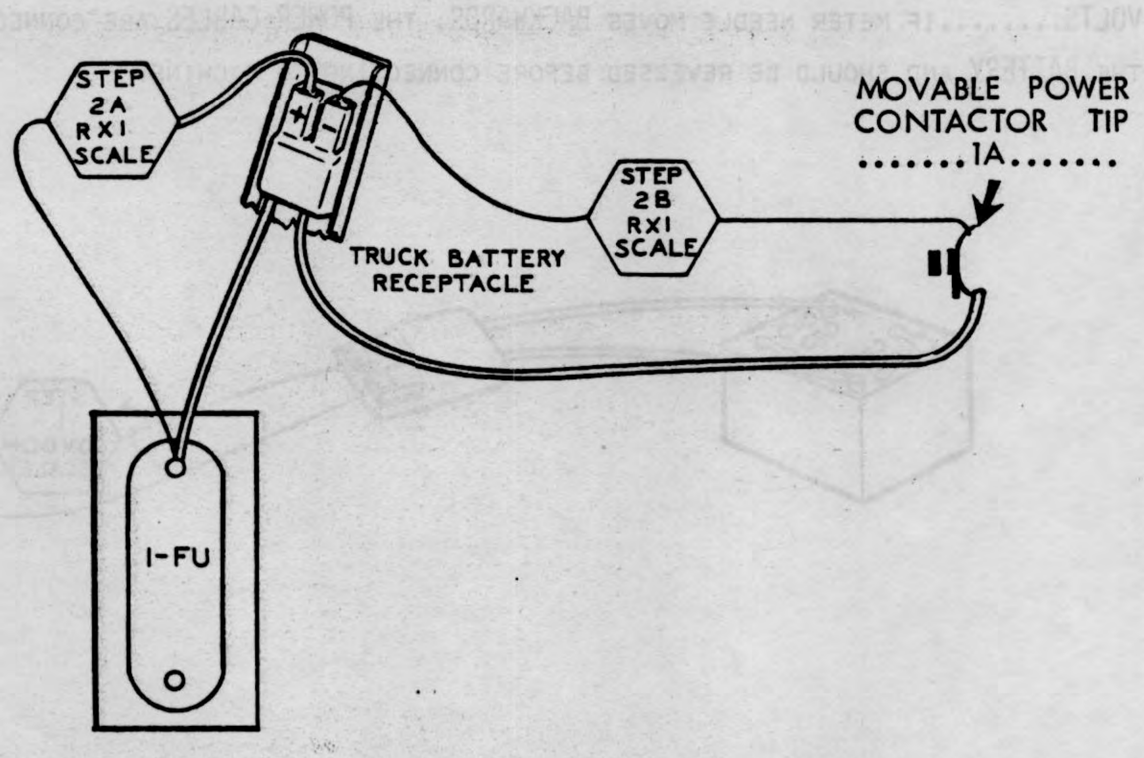
STEP #1

2. CHECKING TRUCK POLARITY.

CHECKING CONTINUITY OF POWER CABLES FOR PROPER POLARITY.

A) WITH OHMMETER ON RX1 SCALE, CONNECT EITHER LEAD (RED OR BLACK) ON THE POSITIVE SIDE OF TRUCK BATTERY RECEPTACLE.......THE OTHER LEAD ON THE 1FU FUSE.......SHOULD HAVE NO RESISTANCE.

B) With OHMMETER *still set on* RX1 *scale...connect either* (RED or BLACK) meter lead to the NEGATIVE side of the truck BATTERY RECEPTACLE ...connect the other lead to the movable power tip of the 1A contactor and the meter should indicate...no resistance.



EC30E, EC40E, and EC50E

STEP #2

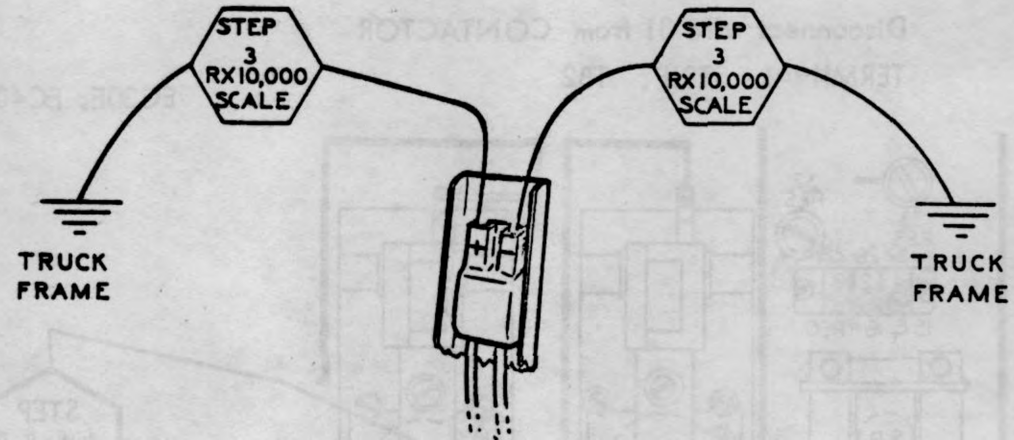
3. GROUND TEST.

WITH OHMMETER SET ON RX10,000 OHM SCALE........CHECK FOR GROUNDS.

A) CONNECT POSITIVE (+) OF TRUCK RECEPTACLE TO TRUCK FRAME.

B) CONNECT 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.



EC30E, EC40E, and EC50E

STEP #3

4. CHECKING CONTROL WIRING USING OHMMETER.

A) With ALL SWITCHES open, measure OPEN CIRCUIT between wires 12(+) and 13(-)........meter set on RX 100 scale.

B) Close KEY SWITCH and measure approximately 935 ohms between wires 12(+) and 13(-)........meter set on RX 100 scale.

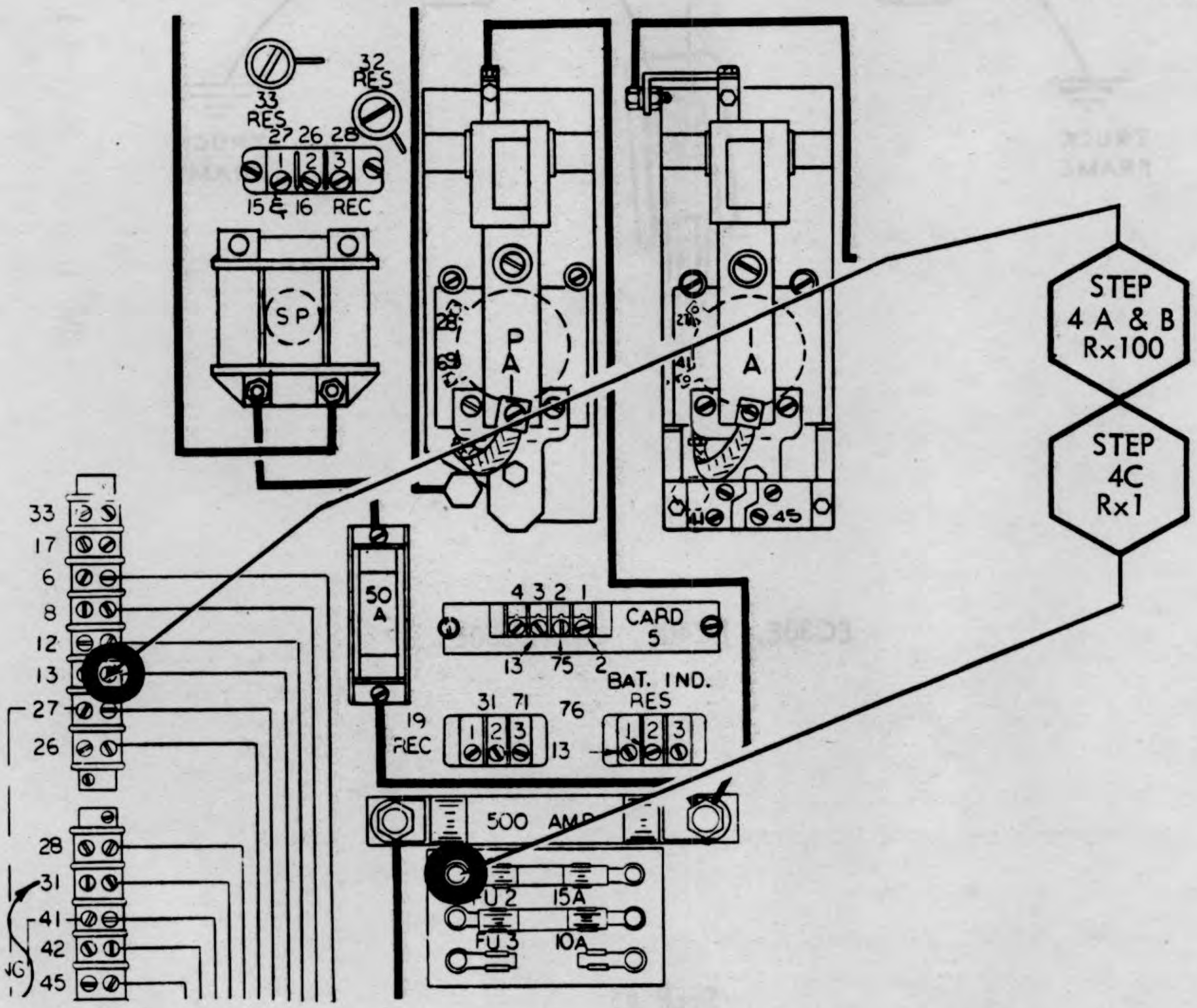
C) Close KEY, SEAT, ACCELERATOR 1MS AND DIRECTIONAL (FORWARD) SWITCHES and measure approximately 35 ohms between wires 12(+) and 13(-)........meter set on RX 1 scale.

NOTE

Remove BACKUP LIGHT (if used) at the REVERSE CONTACTOR.

Disconnect wire 31 from CONTACTOR TERMINAL STRIP. TB2

EC30E, EC40E, EC50E



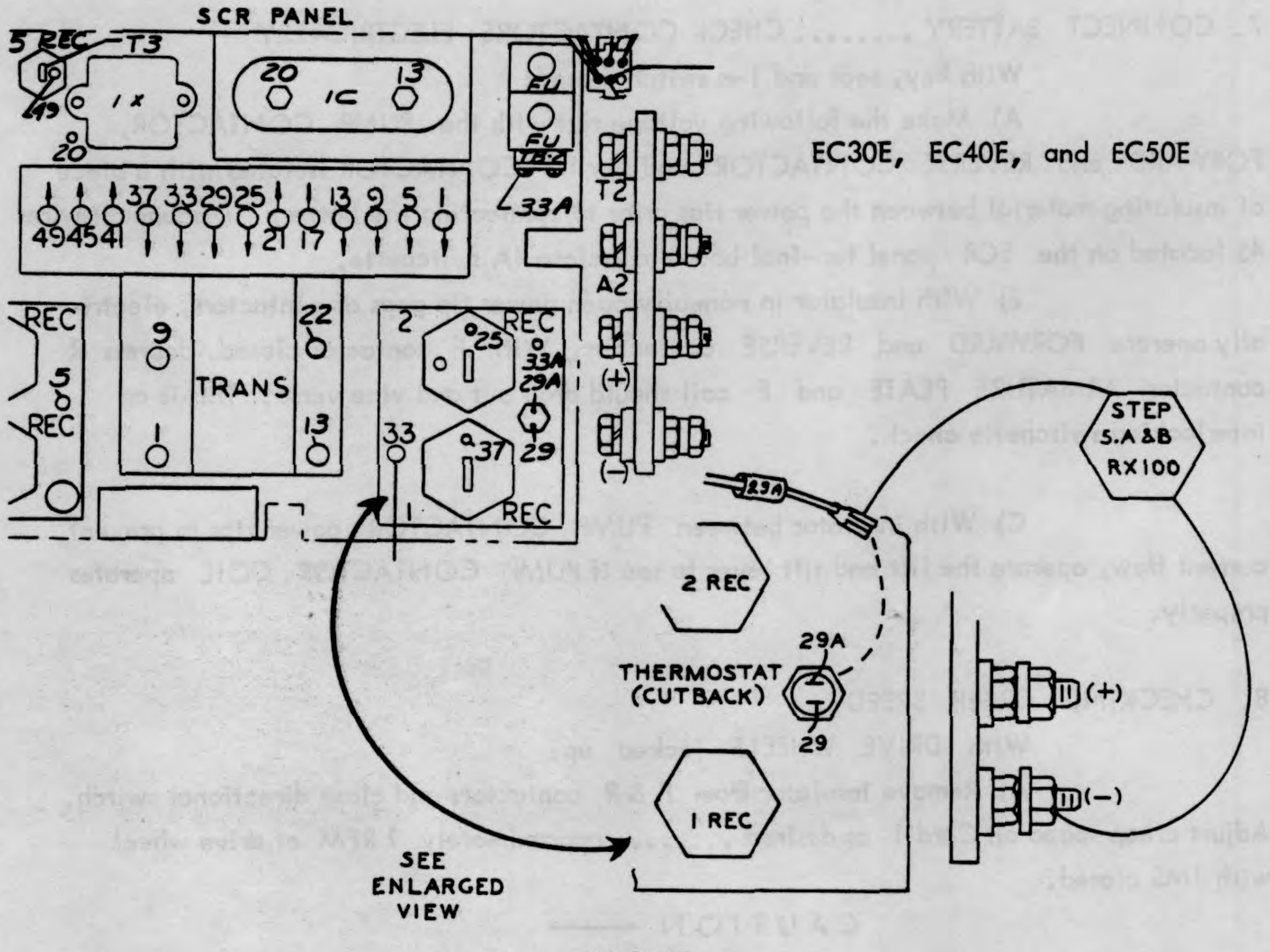
5. CHECKING SPEED POTENTIOMETER, 1MS AND 2MS SWITCHETTE OPERATION.

A) DISCONNECT WIRE SPADE 29A ON SCR PANEL THERMOSTAT (CUTBACK). CONNECT OHMMETER .... RX100 SCALE .... ON WIRE 29A AND NEGATIVE POWER TERMINAL ON SCR PANEL .... MEASURE 8,500 TO 9,500 OHMS AS 1MS SWITCH CLICKS, WHEN PEDAL IS DEPRESSED SLIGHTLY.

B) WITH OHMMETER ON RX1 SCALE .... DEPRESS ACCELERATOR COMPLETELY .... 2MS SWITCH SHOULD CLICK .... OHMMETER SHOULD READ 300 OHMS OR LESS.

NOTE

IF 1MS, 2MS OR SPEED POTENTIOMETER ARE IMPROPERLY ADJUSTED .... REFER TO WRITE-UP COVERING THIS ADJUSTMENT.



STEP #5

6. CHECKING CONTACTORS MANUALLY.

Before connectinb BATTERY .... manually push the ARMATURE PLATE in until power tips CONTACT and WIPE.

NOTE

Interlocking switches 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.

CAUTION

DO NOT USE ANY OTHER POWER SOURCE........BATTERY ONLY AND WITH NO POWER CABLE EXTENSIONS.

NOTE

If FAULT DETECTOR is used, jump 2X and 2Y wires.

7. CONNECT BATTERY .... CHECK CONTACTORS ELECTRICALLY

With key, seat and 1ms switch closed:

A) Make the following voltage test with the PUMP CONTACTOR, FORWARD and REVERSE CONTACTORS and the 1A CONTACTOR isolated with a piece of insulating material between the power tips prior to connecting the battery. Disconnect wires 45 located on the SCR panel terminal board to isolate 1A switchette.

B) With insulator in normally open power tip gaps of contactors, electrically operate FORWARD and REVERSE contactors. With F contactor closed, depress R contactor ARMATURE PLATE and F coil should drop out and vice versa. This is an interlocking switchette check.

C) With insulator between PUMP CONTACTOR power tips to prevent current flow, operate the lift and tilt lever to see if PUMP CONTACTOR COIL operates properly.

8. CHECKING CREEP SPEED

With DRIVE WHEELS jacked up:

A) Remove insulator from F & R contactors and close directional switch. Adjust creep speed on Card 1 as desired .... approximately 1 RPM of drive wheel with 1MS closed.

CAUTION ——

CAUTION

WITH INSULATOR IN POWER TIPS 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.

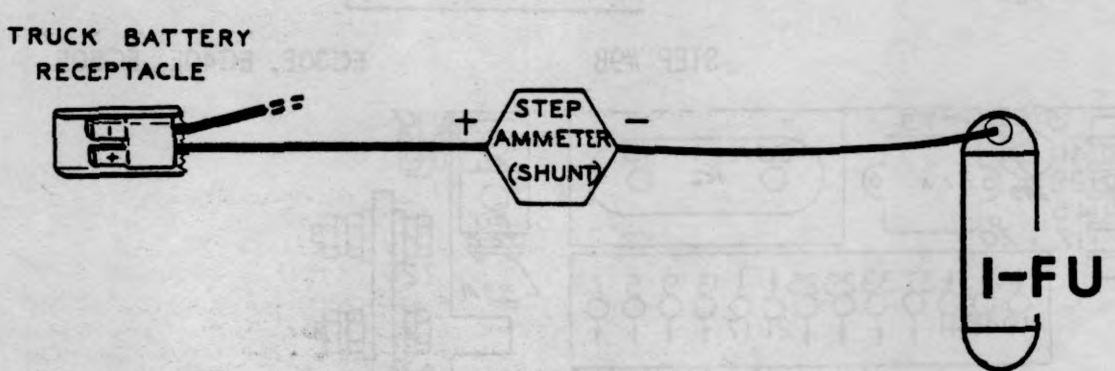
CAUTION

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. 50 MV 600 AMP Shunt and 50 MV 600 Ammeter........ or........Sun Ammeter, Clark Part #1800979.

A) Disconnect the POSITIVE POWER CABLE from 1FU fuse and connect the ammeter (shunt) between the power cable and the 1FU fuse.



STEP #9A

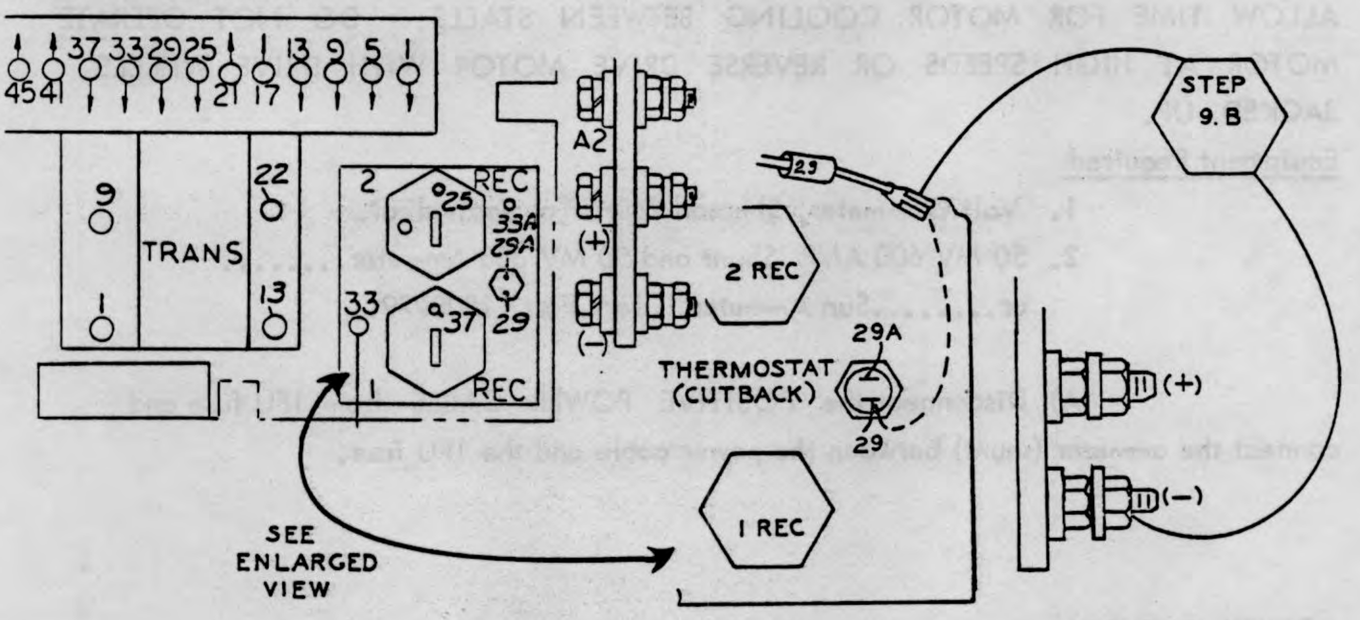
EC30E, EC40E, EC50E

b) Remove wire spade 29 from the thermostat (cut back). Connect a jumper from wire spade 29 to NEGATIVE of the SCR panel.

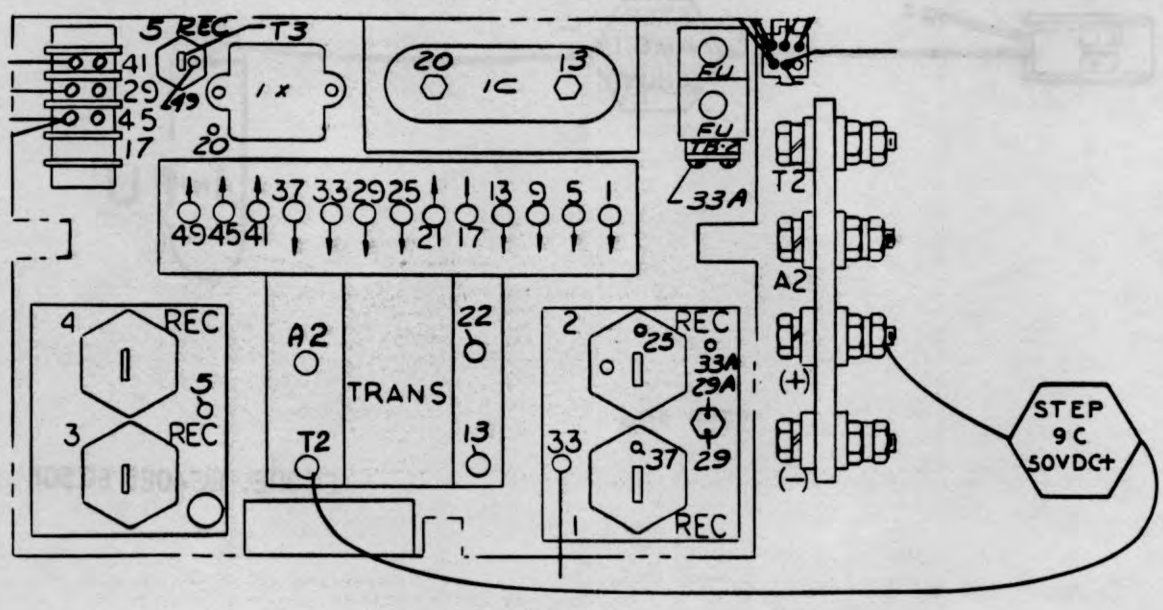
CAUTION

THIS PRODUCES FULL SCR WITH ACTUATION OF 1MS WHEN DIRECTIONAL CONTACTOR IS PICKED UP.

c) Connect the volt meter between the positive terminal and T2 on the SCR panel.



STEP #9B EC30E, EC40E, EC50E



STEP #9C

D) Check MAXIMUM SPEED VOLTAGE first by depressing ACCELERATOR PEDAL for full SCR speed and applying the brakes until battery current is 75 to 80 amps.....volt meter reading should be:

25 - 32 volts 36 Volt Battery

34 - 43 volts 48 Volt Battery

If not, adjust the top SCR speed on Card 1.

E) Now....check CURRENT LIMIT by depressing ACCELERATOR PEDAL for maximum SCR and applying the brakes until the wheels come to a standstill .....there must be no rotation of drive wheel/s for this check. The meter should read:

190 amps minimum	200 amps maximum	36 Volt Battery
175 amps minimum	185 amps maximum	48 Volt Battery

If not.....adjust the current limit on Card 1.

F) Remove jumper and reconnect wire spade 29 to thermostat (cutback). Remove voltmeter and ammeter (shunt).

10. OPERATION

Reconnect wires 45, remove insulator from 1A contactor tips and check 1A contactor pick up time for approximately 1 second: If adjustment is required, adjust 1A TIMER on Card 1. (Clockwise to increase time delay.) With DRIVE 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 (Clockwise to decrease distance). If unable to adjust plugging, see TABLE 6, Note Item F in this table. SEAL ALL TRIMPOTS ON CARD 1.

11. TRUCKS EQUIPPED WITH FIELD WEAKING KIT

Install ammeter (shunt) per STEP #9 and remove insulators from all contactors. With wheels jacked up......check FW CONTACTOR picks up and drops out at correct values of current......stall the DRIVE MOTOR by depressing the brake pedal, then......release brake pedal until pick-up occurs and then depress brake pedal until drop out occurs.

EC-30E, EC-40E, EC-50E .... PICK-UP 150 to 175 amps

... DROP OUT 300 to 350 amps

11. TRUCKS EQUIPPED WITH FIELD WEAKENING KIT:

Install ammeter (shunt) per STEP #9 and remove insulators from all contactors. With wheels jacked up...check FW CONTACTOR picks up and drops out at correct values of current...stall the DRIVE MOTOR by depressing the brake pedal, then...release brake pedal until pick-up occurs ...then depress brake pedal until drop out occurs.

EC 30, 40, 50E

Pick-Up	150-175 amps
Drop-Out	300-350 amps

If values are incorrect...adjust CURRENT TRIMPOT at CARD #2, (counterclockwise to increase current values and vice-versa to decrease values).

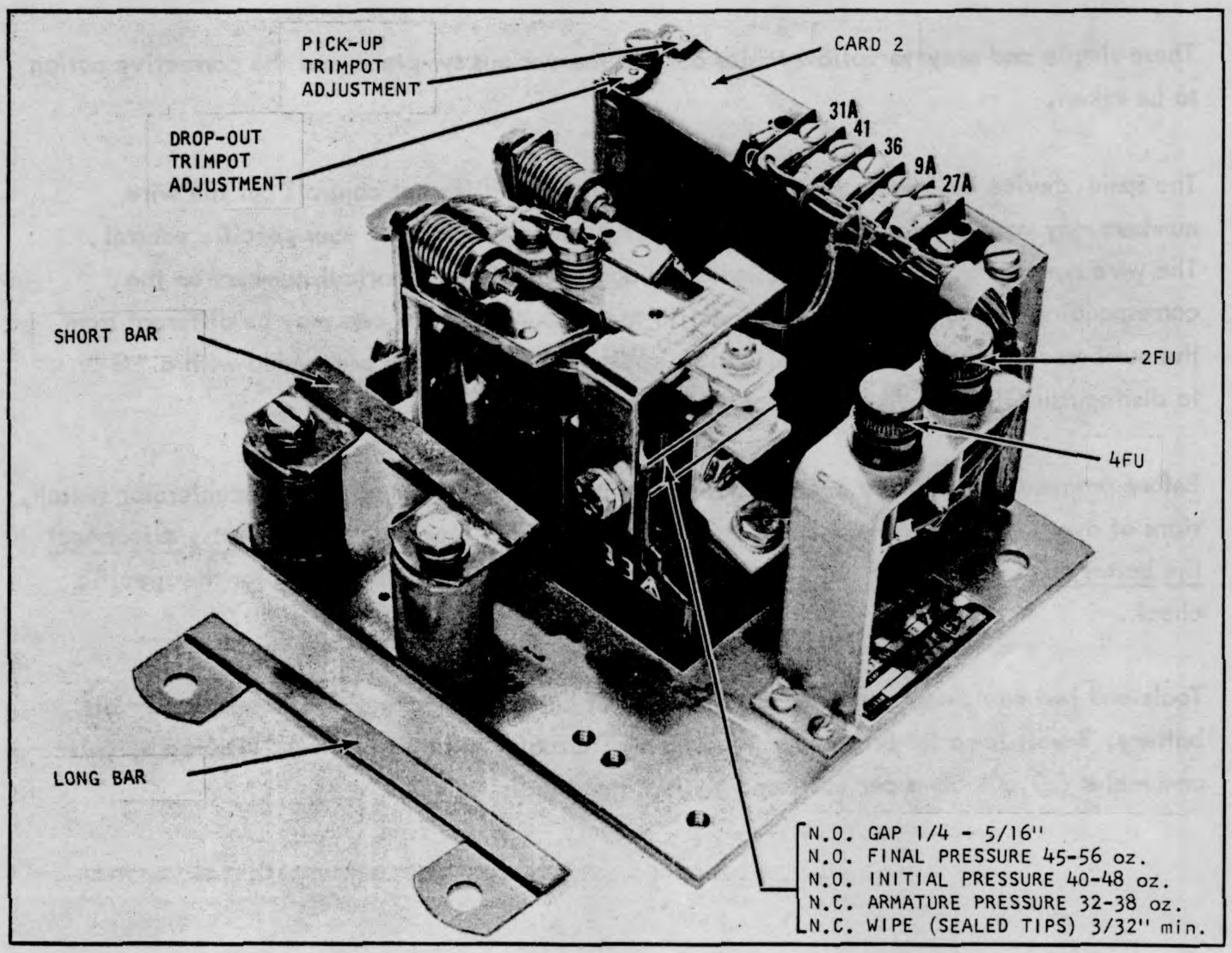


Plate 10595. Typical Field Weakening Unit

TROUBLE SHOOTING INSTRUCTIONS

EC-30E, EC-40E and EC-50E -Solid State Control System

The pulsing of the main SCR is too fast for conventional instruments to measure. When the control is functioning properly, a low hum can be heard.

Malfunctions of the SCR will generally fall into one of two categories. They are either no power (TABLE 1) or full power (TABLE 2), when operating in the SCR control range.

These simple and easy-to-follow tables outline the various symptoms and the corrective action to be taken.

The same device designations have been maintained on different controls but the wire numbers may vary. Refer to the elementary and wiring diagram for your specific control. The wire numbers shown on the elementary diagram will have identical numbers on the corresponding wiring diagrams for a specific truck, but these numbers may be different from the numbers referenced in this publication. Wire numbers may be preceeded with a "G" to distinguish GE numbers from truck manufacturer's wires.

Before proceeding, visually check for loose wiring, maladjusted linkage to accelerator switch, signs of overheating of components, etc. Before touching electrical components, disconnect the battery and discharge capacitor 1C. Reconnect the battery as needed for the specific check.

Tools and test equipment required are 36-volt test battery, 25-ohm 2-watt resistor, 3-volt battery, 3-volt lamp (or Bright Star No. 1618CT circuit continuity tester), clip leads, volt-ohm meter (20,000 ohms per volt) and general hand tools.

INDUSTRIAL TRUCK DIVISION

TROUBLE SHOOTING INSTRUCTIONS

Failures Which Cause No Motor Torque With SCR Control GE C-185 SCR Control... Solid State

EC30-E, EC40-E, & EC50-E

SYMPTOMS	WHAT TO DO
1A. Contactors do not pick up. No control voltage from positive to negative.	Check power fuses. Check battery for low specific gravity, connections for looseness or broken fittings.
1B. Contactors do not pick up. Control volts present from positive to negative.	(For these tests, if fault detector is used, disconnect wire 27 from fault dector 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) (Truck/s with 36 Volt Battery) Connect jumper from negative side F or R Coil to negative (by passing F & R Contactor Resistor). If device does pick-up, check operation of voltage relay. (See Note #1) With jumper on battery positive move other end to wire 8 on F interlock or wire 6 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, seat switch and key switch by moving end of jumper to positive side of each of these devices.
1C. Contactors Close. No power and no SCR hum with accelerator in SCR range.	(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

SYMPTOMS	WHAT TO DO
1C. (Continued)	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.

... continued next page ...

EC30E, EC40E, and EC50E

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 ACCELERATOR POTENTIOMETER 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 ACCELERATOR 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 ACCELERATOR AND THE TRUCK SHOULD NOW RUN AT TOP SCR SPEED. IF TOP SPEED IS OBTAINED, CHECK ACCELERATOR POTENTIOMETER PER TABLE #4I. IF MOTOR FAILS TO OPERATE, CHECK CARD PER TABLE #4A. CHECK #1 REC FOR OPEN CIRCUIT OR OPEN GATE (SEE 4H). CHECK CARD (SEE 4A)
1D.	CONTACTORS CLOSE, BUT VERY LITTLE POWER AND HIGH-PITCH SCR HUM.	CHECK #2REC FOR A SHORTED CONDITION IN THE CONDUCTING DIRECTION (SEE 4E).
1E.	CONTACTORS CLOSE. VERY LITTLE OR NO POWER WITH LOW SCR HUM, EVEN WHEN ACCELERATOR IS IN TOP SCR POSITION.	(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 ADJUSTED TO FULL COUNTERCLOCKWISE POSITION, SPEED WILL BE SLOW.
1F.	CONTACTORS CLOSE. VERY LITTLE POWER WITH A NORMAL SCR HUM.	CHECK 3REC FOR OPEN CONDITION (SEE 4D) IF 3 REC IS FOUND TO BE OPEN, CHECK 1,2, AND 5 REC FOR PROPER OPERATION. CHECK #4 REC FOR SHORT (SEE 4D).

NOTE #1: DRIVE WHEELS SHOULD BE OFF THE FLOOR.

Failures Which Cause Full Motor Torque With SCR Control

TABLE 2

2A. Contactors close. Full SCR speed immediately with audible hum.	Check potentiometer for proper resistance (see #41).
	Check for grounds in wires #29 and #29A or shorted accelerator potentiometer.
2B. Contactors close. Full speed immediately with no audible hum.*	Check for welded power tips on 1A contactor.
	Check timer section of card (See #4Ad).
2C. Contacts close. Full speed immediately with no audible hum.* Capacitor not charged.	Check for open gate circuit to 5 REC (See 4E and 4Aa).
	Check 5 REC for shorted condition (See 4E). 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 4B).
	Check 1 REC for short (See 4E).
2D. Contactors close. Full speed immediately with no audible hum.* Capacitor Charged.	Check for open 2 REC (See 4E).
	Check for open gate in 2 REC (See 4E).
	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 instructions listed in following pages.

EC30E, EC40E, and EC50E

Misoperation of Special Features

TABLE 3

3A. Failure of 1A contactor to operate.	(See Note #1) With all direction switches closed, jumper negative to SCR terminal board (wire #41). 1A should pick up immediately. This checks the 1A coil.
	(See Note #1) Move negative jumper to SCR terminal board (wire #45). 1A should pick up after approximately 1 delay. This checks the timer section of Card #1.
3B. Failures in FW circuit.	Refer to procedures in this section.
3C. Severe reversal.	Check settings of plugging trimpot on Card #1 (See 6b ...Card Tune-Up Instruc).
	Check 4 REC (See 4D).
	Check continuity of wires #5 and #9.
3D. Very soft reversal.	Check FUA (if used). Check same as 3C.

NOTE #1: Drive wheels should be off the floor.

TABLE 4

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 ro 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: NOTE: The 6-trim pot card does not have a transformer filter.....no test required on 6-trim pot card units.
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.

4B. 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 scale. Meter should read zero ohms and then swing to above 100,000 ohms. Replace capacitor if above reading is not obtained.

EC30E, EC40E, EC50E

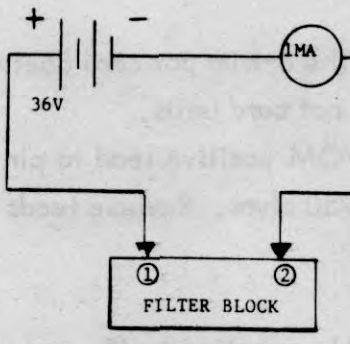
4C. CONTACTOR COIL AND ACCESSORY FILTER

(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 ounted 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 1. 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.



EC30E, EC40E, EC50E

Figure 1

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.

4D. 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 ((+ ▶| −)) measured on the RX1 scale, and infinite resistance in the nonconducting direction ((− ▶| +)) measured on the RX10,000 scale.

15 and 16 REC: Disconnect one lead. Check same as 3 and 4 REC on preceding page.

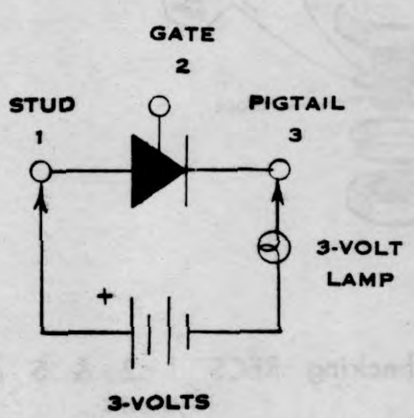
4E. SCR'S (1REC, 2REC, 5REC)

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, or equivalent, 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 2 below.

Figure 2



a) The lamp should not light...if the lamp does light, the SCR is shorted and must be replaced.

b) 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.

c) If lamp cannot be lit under step (b) the SCR is open and must be replaced.

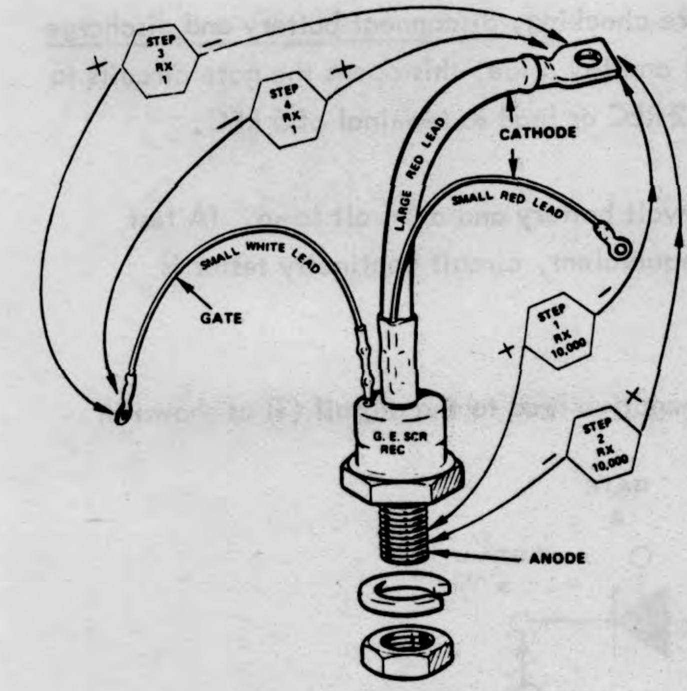
Ohmmeter Method of Checking RECS

EC30E, EC40E, EC50E

- continued next page -

4C. - continued -

ALTERNATE OHMMETER METHOD OF CHECKING REC'S
(if light is not available)



---- REC #1 ------------

STEP 1 & 2	100,000 ohms min.
STEP 3	Acceptable reading: 1 to 1,000 ohms
STEP 4	70 ohms min.

---- REC #2 ------------

STEP 1 & 2	same as #1 REC
STEP 3	same as #1 REC
STEP 4	100 ohms min.

---- REC #5 ------------

STEP 1 & 2	same as #1 REC
STEP 3	same as #1 REC
STEP 4	700 ohms min.

EC30E, EC40E, EC50E

When checking RECS 1-2 & 5 on all G.E. SCR Systems

WHAT IS AN SCR?

Since the heart of the control is a silicon controlled rectifier (SCR), a general understanding of the characteristics of the device will be helpful. The SCR is a semiconductor rectifier used as a latching switch; i.e., it may assume either a conducting or nonconducting state (On or Off).

The SCR can be turned on by a momentary application of control current to the gate. To turn it off, it is necessary in addition to remove the turn-on signal from the gate, eigher to remove all power from the SCR or to apply momentary reverse voltage between cathode and anode.

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.

TABLE 6

Number 1 Card Tuneup Procedure EC30E, EC40E, EC50E

1. Turn CURRENT LIMIT trimpot fully clockwise.
2. Turn PLUGGING trimpot fully clockwise.

NOTE: Some cards have six trimpots. The sixth trimpot is a coarse plug trimpot, is not marked and is located in the side slot. (STEPS 'a' and 'b' prevent any interaction when setting the speed adjustment.

3. Adjust CREEP SPEED as desired.
4. TOP SCR SPEED....(refer to checkout procedure for specific truck).
5. 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 TRIMPOTS are fully clockwise. Depress the accelerator until F or R operate but not the 1A. 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 the desired value for the specific truck.

NOTE: Do not stall the motor for more than 30 seconds at a time.

6. STATIC PLUGGING

To adjust the static plugging, the truck should be in its normal running condition and on the ground. Turn the COARSE PLUGGING TRIMPOT approximately 3/4 of a turn counterclockwise, then...adjust the plugging distance with the marked STATIC PLUG trimpot for the desired stopping distance.

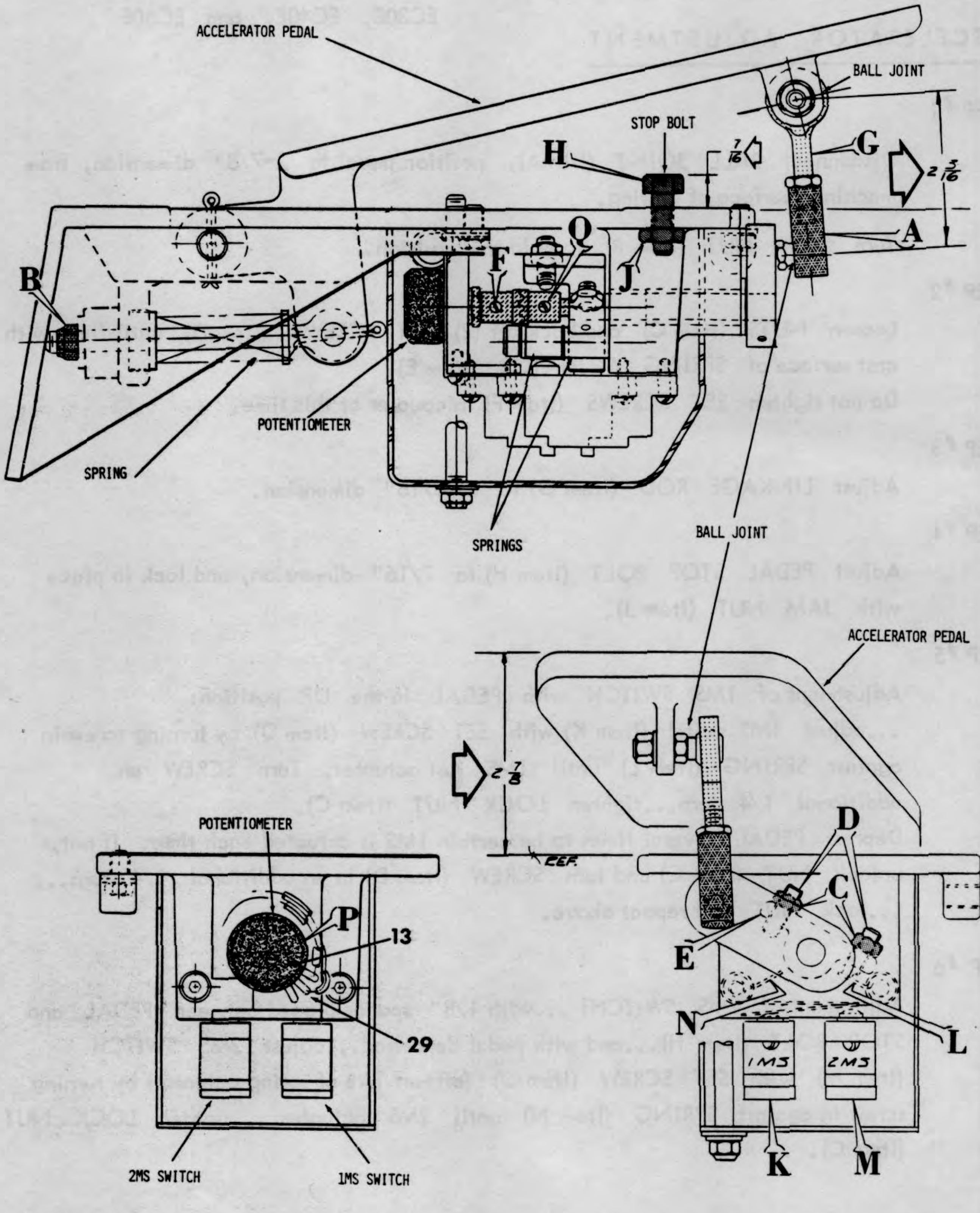
7. 1A TIMER

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.

EC30E, EC40E, EC50E

ACCELERATOR ADJUSTMENT......C-185 SCR CONTROL......SOLID STATE CONTROL SYSTEM...



ACCELERATOR CONTROL ASSEMBLY ADJUSTMENT

SOLID STATE CONTROL

ACCELERATOR ADJUSTMENT

EC30E, EC40E, and EC50E

STEP #1

A. Disconnect BALL JOINT (ItemA), position pedal to 2-7/8" dimension, from machined surface of casting.

B. Turn STOP NUT (Item B) to hold this position.

STEP #2

A. Loosen NUTS (Item C) and back off (2) SET SCREWS (Item D) until flush with cast surface of SPRING ACTUATOR (Item E).

B. Do not tighten SET SCREWS (Item F) in coupler at this time.

STEP #3

A. Adjust LINKAGE ROD (Item G) to 2-3/16" dimension.

STEP #4

A. Adjust PEDAL STOP BOLT (Item H) to 7/16" dimension, and lock in place with JAM NUT (Item J).

STEP #5

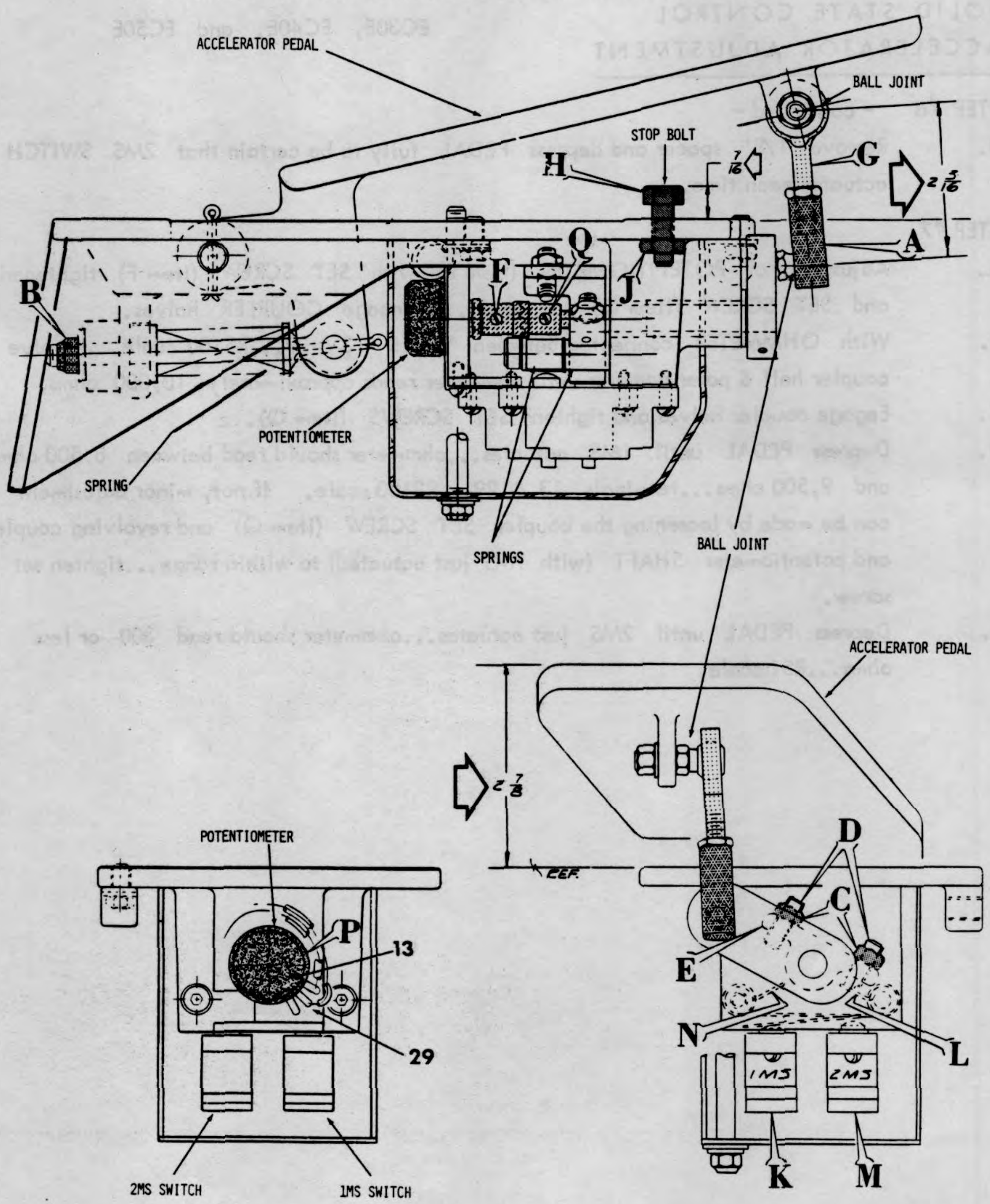
A. Adjustment of 1MS SWITCH with PEDAL in the UP position: ...adjust 1MS switch (Item K) with SET SCREW (Item D) by turning screw in against SPRING (Item L) until 1MS just actuates. Turn SCREW an additional 1/4 turn...tighten LOCK NUT (Item C).

B. Depress PEDAL several times to be certain 1MS is actuated each time. If not, unlock NUT (Item C) and turn SCREW (Item D) in an additional 1/4 turn... ...lock NUT and repeat above.

STEP #6

A. Adjustment of 2MS SWITCH: ...with 1/8" spacer placed between PEDAL and STOP BOLT (Item H)...and with pedal depressed...adjust 2MS SWITCH (Item M) with SET SCREW (Item D) (off-set TAB of spring actuator) by turning screw in against SPRING (Item N) until 2MS actuates....tighten LOCK NUT (Item C).

ACCELERATOR ADJUSTMENT......C-185 SCR CONTROL......SOLID STATE CONTROL SYSTEM...



ACCELERATOR CONTROL ASSEMBLY ADJUSTMENT

- continued -

SOLID STATE CONTROL
ACCELERATOR ADJUSTMENT

EC30E, EC40E, and EC50E

STEP #6 - continued -

B. Remove 1/8" spacer and depress PEDAL fully to be certain that 2MS SWITCH actuates each time.

STEP #7

A. Adjustment of POTENTIOMETER (Item P) with SET SCREW (Item F) tightened, and SET SCREW (Item Q) loosened...disengage COUPLER halves.

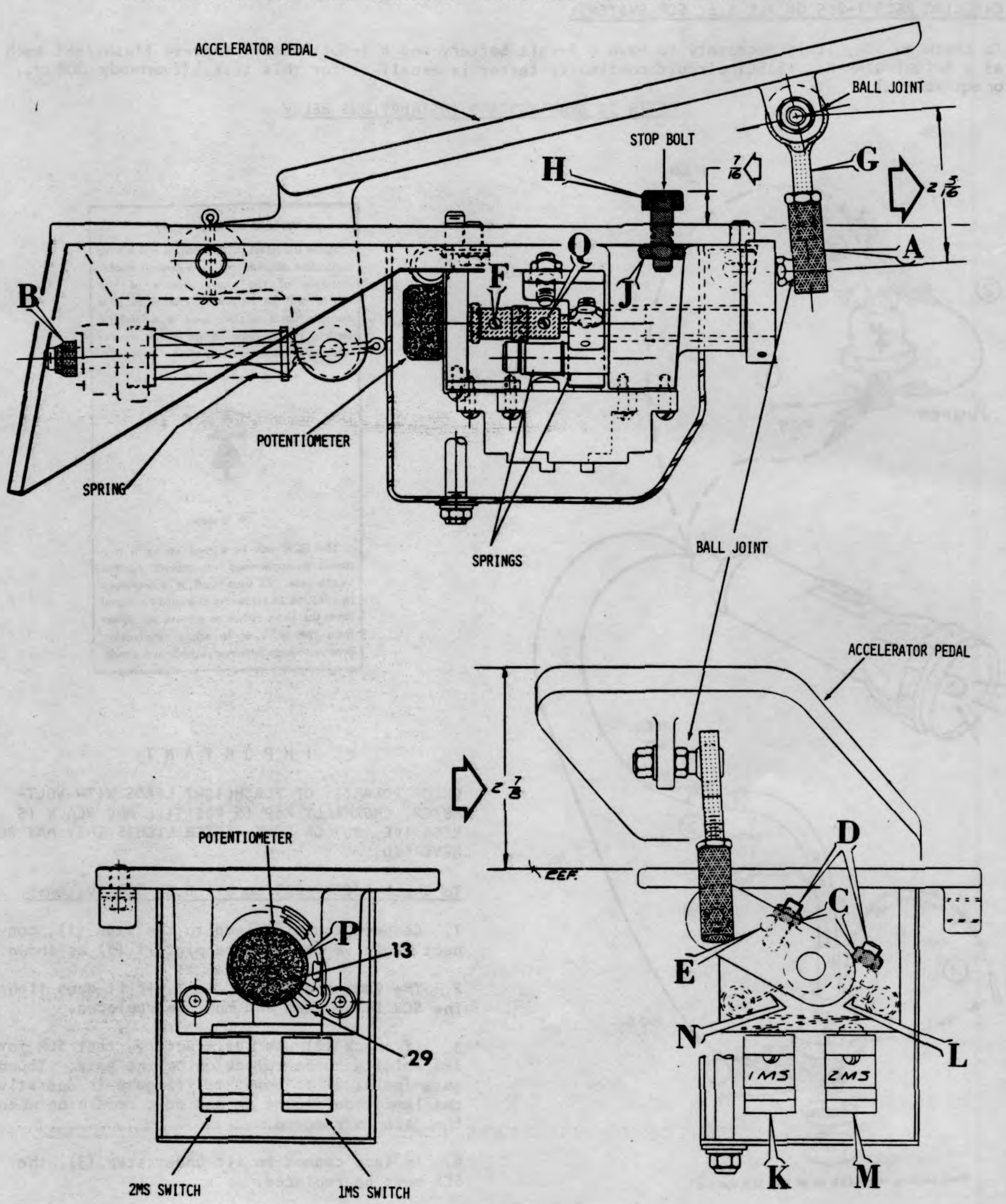
B. With OHMMETER connected between WIRES 13 & 29...RS100 scale...revolve coupler half & potentiometer until ohmmeter reads approximately 10,000 ohms.

C. Engage coupler halves and tighten SET SCREWS (Item Q).

D. Depress PEDAL until 1MS actuates...ohmmeter should read between 8,500 ohms and 9,500 ohms...terminals 13 & 29...RS100 scale. If not, minor adjustment can be made by loosening the coupler SET SCREW (Item Q) and revolving coupler and potentiometer SHAFT (with 1MS just actuated) to within range...tighten set screw.

E. Depress PEDAL until 2MS just actuates...ohmmeter should read 300 or less ohms...RS1 scale.

ACCELERATOR ADJUSTMENT......C-185 SCR CONTROL......SOLID STATE CONTROL SYSTEM...

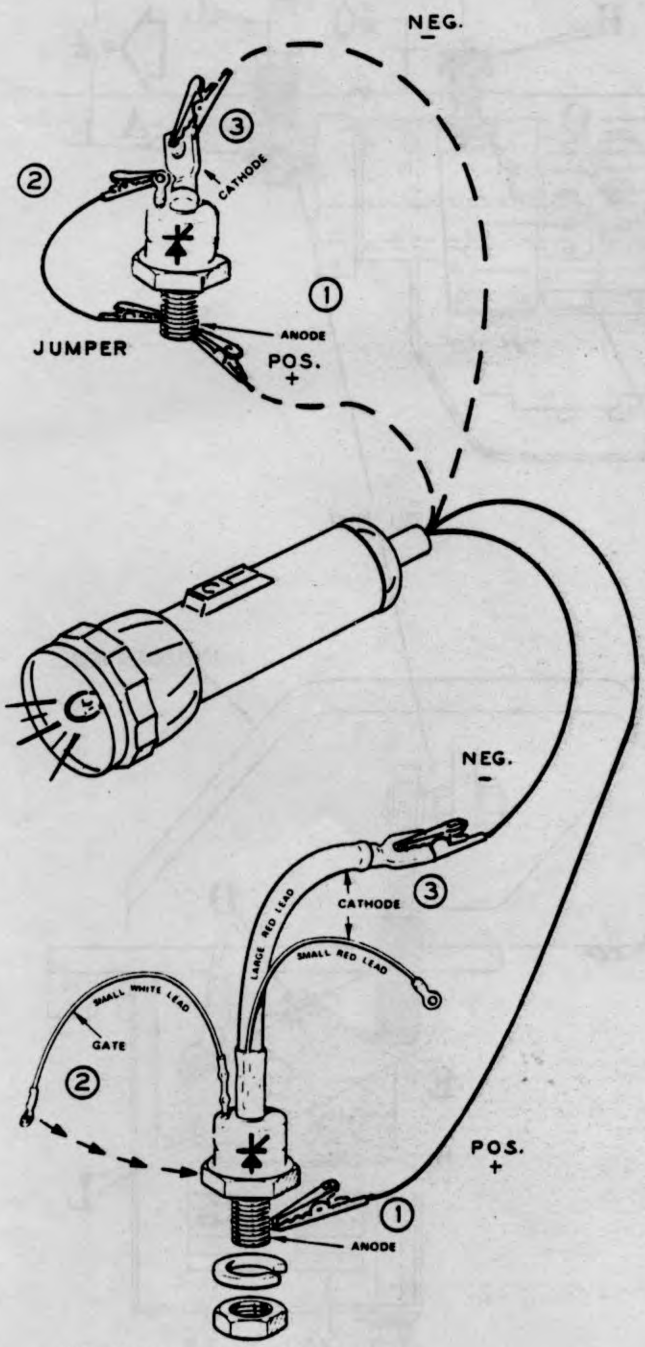


ACCELERATOR CONTROL ASSEMBLY ADJUSTMENT

CHECKING RECS 1-2&5 ON ALL G.E. SCR SYSTEMS:

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.) (Everready 308 ct., or equivalent.)

REFER TO DRAWINGS AND INSTRUCTIONS BELOW



When checking recs 1-2&5 on all G.E. SCR systems

WHAT IS AN SCR?

Since the heart of the control is a silicon controlled rectifier (SCR), a general understanding of the characteristics of the device will be helpful. The SCR is a semiconductor rectifier used as a latching switch; i.e., it may assume either a conducting or nonconducting state (On or Off).

The SCR can be turned on by a momentary application of control current to the gate. To turn it off, it is necessary in addition to removing the turn-on signal from the gate, either to remove all power from the SCR or to apply momentary reverse voltage between cathode and anode.

I M P O R T A N T

CHECK POLARITY OF FLASHLIGHT LEADS WITH VOLT-METER. NORMALLY RED IS POSITIVE AND BLACK IS NEGATIVE, BUT ON SOME TESTER LIGHTS THEY MAY BE REVERSED.

To Check RECS 1-2&5 on all G.E. SCR systems:

1. Connect the plus lead to the stud (1), connect negative lead to the pigtail (3) as shown.

2. The lamp should not light. If it does light, the SCR is shorted and must be replaced.

3. If check (2) was satisfactory, test 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.

4. If lamp cannot be lit under step (3), the SCR must be replaced.