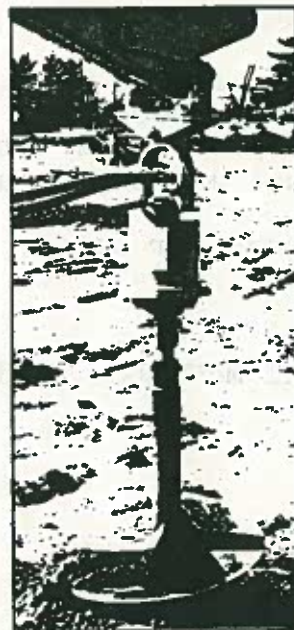


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McMILLEN HYDRAULIC DIGGERHEAD

OPERATOR'S MANUAL & PARTS LIST
FOR

McMILLEN DIGGERHEAD MODELS
3000PB, 4800PB, 8000PB,
13000, 18000,
23000B, 27000B, 32000B



THE **McMILLEN** DIVISION
4419 ARDMORE AVENUE • FORT WAYNE, IN 46809
CALL US TOLL FREE (800) 348-0964
INDIANA RESIDENTS CALL COLLECT (219) 747-6195

FORM 203 (REVISED 3-1-88)



TO THE OWNER:

We would like to take this opportunity to thank you for purchasing your McMillen Hydraulic Digger. You have invested in a quality piece of equipment backed by years of experience in the field, but only by proper installation, operation, and maintenance can you expect to receive the dependable performance and long life for which the digger was designed.

This operator's manual contains information regarding the installation, operation, safe use, care, and maintenance of your McMillen Hydraulic Digger. Please be sure all operator's study this manual carefully and keep it on file for future reference.

After reading this manual, if you have any questions about your McMillen Hydraulic Digger please contact us immediately as follows:

CONTINENTAL U.S.(except Indiana), (800) 348-0964

INDIANA, ALASKA, HAWAII, CANADA, (219) 747-6195

Once again, thank you for putting your trust in our product. If we may be of further assistance to you in the future, please feel free to contact our office at your convenience.

Yours for better digging,

THE McMILLEN DIVISION

PLEASE REGISTER YOUR
WARRANTY AND OWNERSHIP
WITHIN TEN DAYS BY 
RETURNING REGISTRATION
CARD, THANK YOU.

The McMillen Division
of States Engineering Corporation
4419 Ardmore Avenue
Fort Wayne, IN 46809-9723

(219) 747-6195
Toll Free: (800) 348-0964

WARRANTY POLICY

The McMillen Division warrants its products to be free of defects in materials and workmanship for a period of 24 MONTHS from date of retail sale to the original purchaser.

Our obligation under this warranty is limited only to replacement or repair at a point designated by the manufacturer.

To apply for warranty, contact your McMillen dealer who will obtain written return authorization. All warranty returns must be accompanied by a McMillen Return Goods Authorization Letter.

The portion of the product returned for warranty consideration and determined to be defective will be repaired or replaced free of charge. Any additional parts or labor required to rebuild or replace items not covered under our warranty will be charged to the customer. Freight charges for the return of product covered under warranty to the customer will be prepaid by The McMillen Division. The incoming freight must be prepaid by the customer. If the product is covered under warranty, credit will be allowed for incoming freight.

All warranty claims must include detailed information regarding date of purchase, make and model of machine equipment was mounted on, hours of use, summary of events leading to the failure, and any other information that would help in evaluating the claim.

ITEMS NOT COVERED BY THIS WARRANTY INCLUDE BUT ARE NOT LIMITED TO:

1. WARRANTY WILL AUTOMATICALLY BE VOIDED FOR ANY ATTEMPT TO MAKE FIELD REPAIRS TO HYDRAULIC MOTORS OR PLANETARY GEAR REDUCTIONS. IN ORDER TO MAKE AN EVALUATION, THE COMPLETE UNIT MUST BE INSPECTED. ABSOLUTELY NO EXCEPTIONS TO THIS POLICY WILL BE MADE.
2. This warranty does not obligate The McMillen Division to bear any cost of labor for field replacement or repair.
3. Warranty will not be allowed for failures caused by alterations or modifications made without the expressed written consent of The McMillen Division.
4. The McMillen Division is not obligated for any repair or replacement by anyone other than manufacturer without the expressed written consent of McMillen.
5. Bent augers and extensions are caused by misuse or operator error and are not covered by this warranty.
6. The McMillen Division will not be responsible for normal wear parts such as auger teeth and points or damage occurring as a result of failure to replace wear parts as needed.
7. No warranty will apply for damage caused by accident, misapplication, abuse, or environmental elements.

The only warranty extended to the purchaser by The McMillen Division, is the above expressed warranty and there are no other warranties, expressed or implied, of merchantability, fitness for a particular purpose, or otherwise, which extend beyond the face hereof. The McMillen Division shall in no event be liable for labor or freight charges or for consequential or incidental damages including, but not limited to, injury to the person or property of the purchaser or any others, machine down time, and losses or expenses incurred by the purchaser arising from the use of this equipment or from this agreement. This warranty constitutes the entire warranty of the manufacturer, The McMillen Division, and no oral representations, warranties, or guarantees by any agent of manufacturer or seller shall be binding on The McMillen Division, and no part of this warranty may be modified or extended except by expressed written consent of The McMillen Division.

IMPROVEMENTS

McMillen is continually attempting to make product improvements. We reserve the right to make changes or improvements without incurring any obligation to make these changes or additions to equipment sold previously.

ALWAYS REFER TO WARRANTY REGISTRATION NUMBER, MODEL NUMBER, AND SERIAL NUMBER WHEN MAKING INQUIRIES ABOUT YOUR DIGGERHEAD OR WHEN ORDERING PARTS.



STAPLE WARRANTY
CARD HERE

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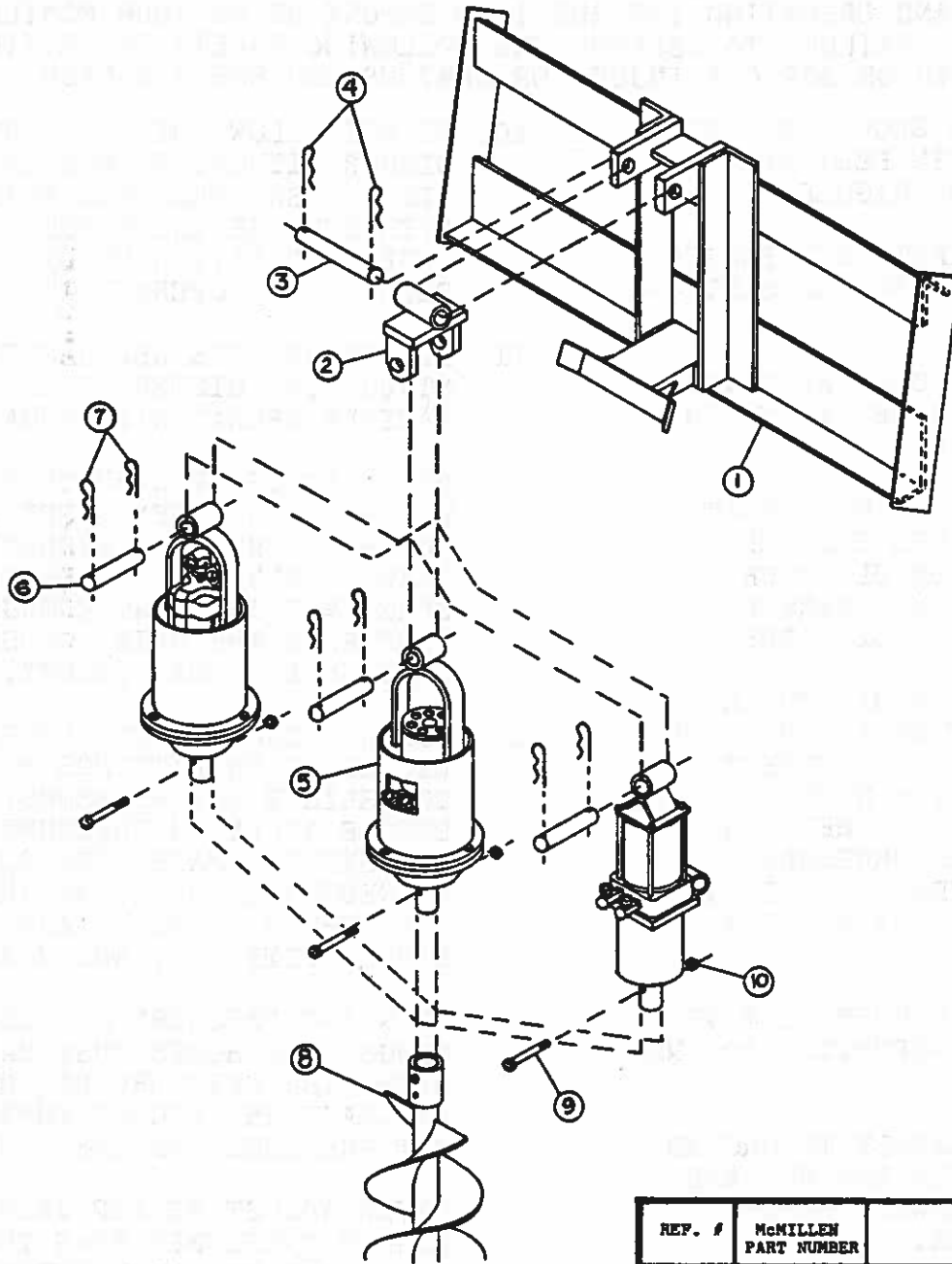
SAFETY INFORMATION

THE USE OF THIS EQUIPMENT IS SUBJECT TO CERTAIN HAZARDS THAT CANNOT BE PROTECTED AGAINST BY MECHANICAL MEANS OR PRODUCT DESIGN, READ AND UNDERSTAND ALL SAFETY AND OPERATING INSTRUCTIONS BEFORE USING YOUR MCMILLEN HYDRAULIC DIGGER. FAILURE TO OBSERVE THE FOLLOWING SAFETY PRECAUTIONS CAN RESULT IN DEATH OR SERIOUS INJURY OR SERIOUS EQUIPMENT DAMAGE.

1. ALL BYSTANDERS SHOULD BE KEPT A MINIMUM OF TEN FEET AWAY FROM WORKING AREA OF DIGGER.
2. ALWAYS WEAR SAFETY EYE PROTECTION WHEN OPERATING OR SERVICING DIGGER.
3. ALWAYS WEAR AN OSHA APPROVED SAFETY HAT WHEN OPERATING OR SERVICING DIGGER.
4. AVOID STEEP HILLSIDE OPERATION WHICH COULD CAUSE THE VEHICLE TO OVERTURN. CONSULT YOUR VEHICLE OPERATOR'S MANUAL FOR MAXIMUM INCLINE ALLOWABLE.
5. TRAVEL ONLY WITH DIGGER IN A SAFE TRANSPORT POSITION TO PREVENT UNCONTROLLED MOVEMENT. DRIVE SLOWLY OVER ROUGH GROUND AND ON SLOPES. TETHER DIGGER WITH A CHAIN IF NECESSARY TO PREVENT UNCONTROLLED SWINGING OF DIGGER WHEN MOVING FROM HOLE TO HOLE.
6. ALWAYS REMOVE DIGGER FROM VEHICLE WHEN TRANSPORTING TO AND FROM JOB SITE.
7. LOWER DIGGER SAFELY TO GROUND, TURN OFF VEHICLE ENGINE, AND LOCK VEHICLE BRAKES BEFORE EXITING VEHICLE.
8. ALWAYS LOCATE UNDERGROUND ELECTRICAL WIRES, TELEPHONE CABLES, GAS, WATER, AND SEWER LINES BEFORE DIGGING.
9. MAINTAIN SAFE CLEARANCE FROM OVERHEAD ELECTRICAL POWER LINES AND AVOID CONTACT WITH ANY ELECTRICALLY CHARGED CONDUCTOR.
10. DO NOT ALLOW ANYONE TO OPERATE DIGGER WITHOUT PROPER INSTRUCTION. OSHA REQUIRES THAT ALL OPERATORS BE INSTRUCTED ON THE PROPER OPERATION OF DIGGER BEFORE THEY OPERATE IT.
11. ALWAYS OBSERVE ALL SAFETY INSTRUCTIONS LISTED IN THE VEHICLE OPERATOR'S MANUAL.
12. USE A PIECE OF CARDBOARD OR WOODEN GUARD WHEN INSPECTING FOR HIGH PRESSURE HYDRAULIC LEAKS. FLUID IS UNDER PRESSURE THAT IS GREAT ENOUGH TO PENETRATE THE SKIN, CAUSING SERIOUS PERSONAL INJURY.
13. BEFORE DISCONNECTING HYDRAULIC LINES OR FITTINGS BE SURE TO RELIEVE ALL PRESSURE. BEFORE APPLYING PRESSURE TO THE SYSTEM, MAKE SURE ALL CONNECTIONS ARE TIGHT AND THAT THERE IS NO DAMAGE TO LINES, FITTINGS, AND HOSES.
14. FLOW AND PRESSURE GAUGES, FITTINGS, AND HOSES MUST HAVE OPERATING PRESSURE RATINGS OF AT LEAST 25% HIGHER THAN HIGHEST PRESSURES OF THE SYSTEM.
15. NEVER ADJUST RELIEF VALVES TO HIGHER PRESSURES THAN THOSE SPECIFIED BY THE EQUIPMENT MANUFACTURER.

OSHA REQUIREMENTS NOW MAKE IT THE EMPLOYERS RESPONSIBILITY TO FULLY INSTRUCT EACH OPERATOR IN THE PROPER AND SAFE OPERATION OF EQUIPMENT. BOTH EMPLOYER AND EMPLOYEE SHOULD THOROUGHLY FAMILIARIZE THEMSELVES WITH THIS MANUAL.

SKID STEER LOADER AND OTHER QUICK ATTACH MOUNTINGS ASSEMBLY & PARTS LIST



REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D
1	VARIES	Quick Attach Mounting Bracket	1
2	80-M2-24	Swivel Weldment	1
3	85-M2-9	Pin - 1 $\frac{1}{4}$ " \varnothing x 7 $\frac{1}{2}$ " Long	1
4	85-P1-37	Pin Clip	2
5	*	Diggerhead Assembly	1
6	*	Pin - 1 $\frac{1}{4}$ " \varnothing x 6" Long	1
7	*	Pin Clip	2
8	VARIES	Auger	1
9	*	Grade 5 Bolt	1
10	*	Nut	1

* PART OF DIGGERHEAD ASSEMBLY. REFER TO DIGGERHEAD ASSEMBLY PAGE FOR YOUR MODEL.

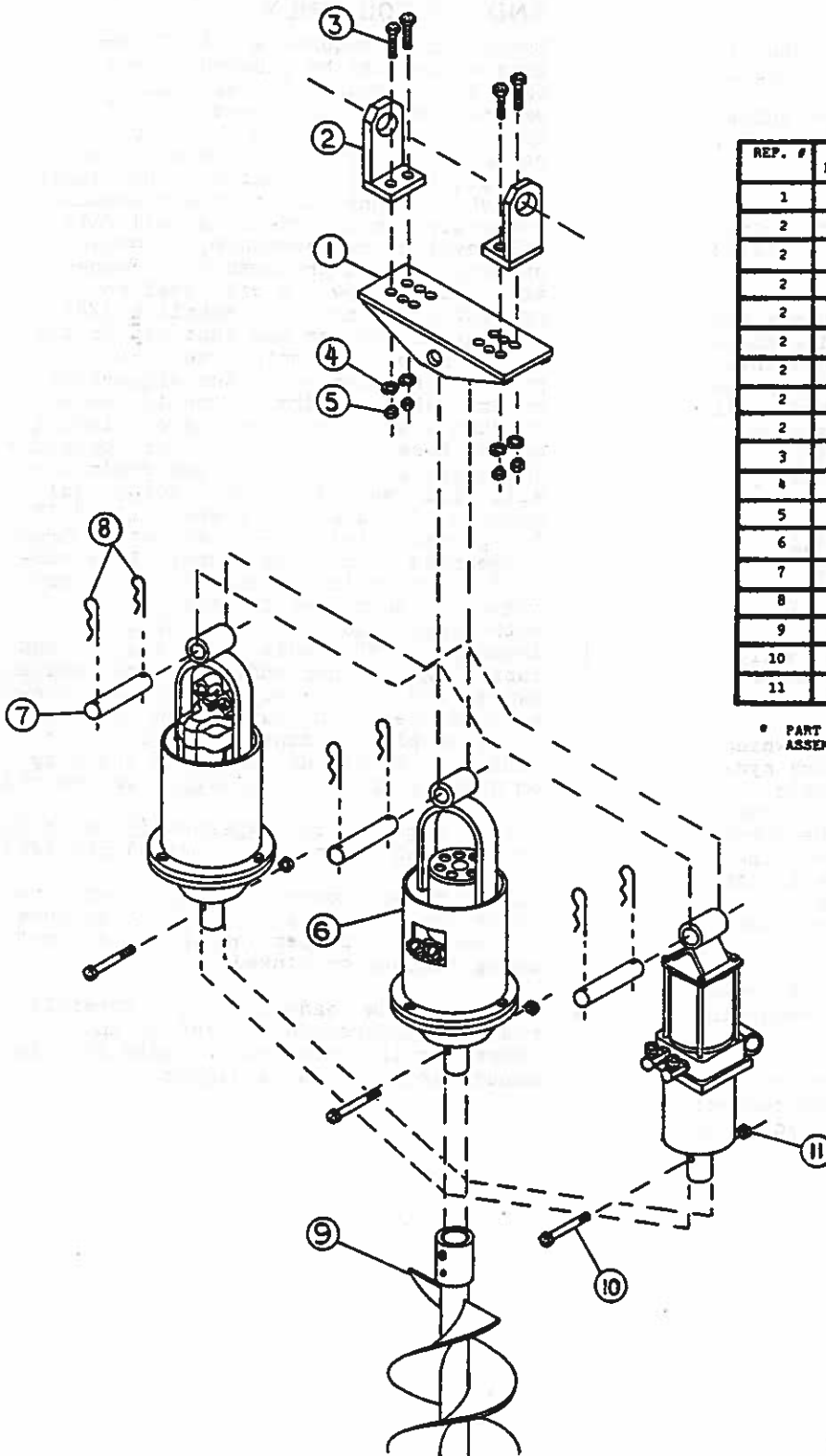
INSTALLATION INSTRUCTIONS FOR SKID STEER LOADERS AND OTHER MACHINES WITH QUICK ATTACH MECHANISM

1. Remove bucket from vehicle quick attach mechanism.
2. Attach quick attach mounting bracket(1) to the vehicle quick attach mechanism.
3. Attach swivel weldment(2) to the quick attach mounting bracket(1) with pin(3). Secure pin(3) with pin clips(4) provided.
4. Attach diggerhead assembly(5) to swivel weldment(2) with pin(6). Secure pin(6) with pin clips(7) provided.
5. Determine length of hydraulic hoses and brand and size of hydraulic quick couplers required to plumb diggerhead into auxiliary hydraulic outlets. For pumps with 1-15 GPM output, 1/2" ID hydraulic hose should be used. For pumps with over 15 GPM output, 3/4" ID hydraulic hose should be used. Models 3000PB, 4800PB, 8000PB, 13000, and 18000 have 1/2" female N.P.T. fittings so one end of each hose should have 1/2" male N.P.T. fittings. Models 23000B, 27000B, and 32000B have 3/4" female N.P.T. fittings so one end of each hose should have 3/4" male N.P.T. fittings. Other ends of hoses should match hydraulic quick couplers to be used.
6. Attach hydraulic quick couplers, which match quick couplers at auxiliary hydraulic outlets, to one end of each hose. (Note: one layer of joint tape should be used on all taper pipe thread fittings. Do not let tape extend inside of fitting and do not over tighten fittings). Always use dust caps and plugs on hydraulic quick couplers when not in use.
7. Attach other ends of hoses to diggerhead fittings. (See note in step 6 regarding joint connections).
8. Remove dust plug and cap from quick couplers on diggerhead hoses and connect to quick couplers on auxiliary hydraulic outlets.

9. FOR MODELS 23000B, 27000B, AND 32000B ONLY.

- These models require a 3/8" ID drain line which must be plumbed directly back to the hydraulic reservoir. Permanently attach one piece of 3/8" ID low pressure hose from the hydraulic reservoir along one of the auxiliary hydraulic lines to auxiliary hydraulic outlets. Connection to the hydraulic reservoir can be made at an oil fill, oil level check, breather, or drain opening. It is preferable to connect at a point below the oil level to prevent oil foaming. Install a 3/8" male quick coupler and dust cap to the other end of the drain line. To prevent seal damage to the diggerhead motor, make sure drain line is routed in such a way that pinching or kinking of the hose cannot occur. Back pressure in excess of 50 lbs. through drain line will also cause diggerhead motor seal damage. Cut a second piece of 3/8" ID low pressure hydraulic hose to run from diggerhead to permanent drain line connection on vehicle. Install the female swivel to push lock fitting provided with diggerhead to one end of hose. Install a 3/8" female quick coupler and dust plug to other end. Connect female swivel end of hose to diggerhead. Connect female quick coupler end to male quick coupler permanently attached to vehicle. Always use dust cap and plug on quick couplers when digger is removed.
10. Attach auger(8) to diggerhead(5) with bolt(9) and secure with nut(10) provided.
 11. Slowly raise, lower, and tilt loader to check for interference and to make sure all hoses are proper length and are not being pinched or kinked.
 12. Digger is now ready for use. Carefully read and understand all safety and operating instructions provided in this manual prior to using digger.

BACKHOE MOUNTING ASSEMBLY & PARTS LIST



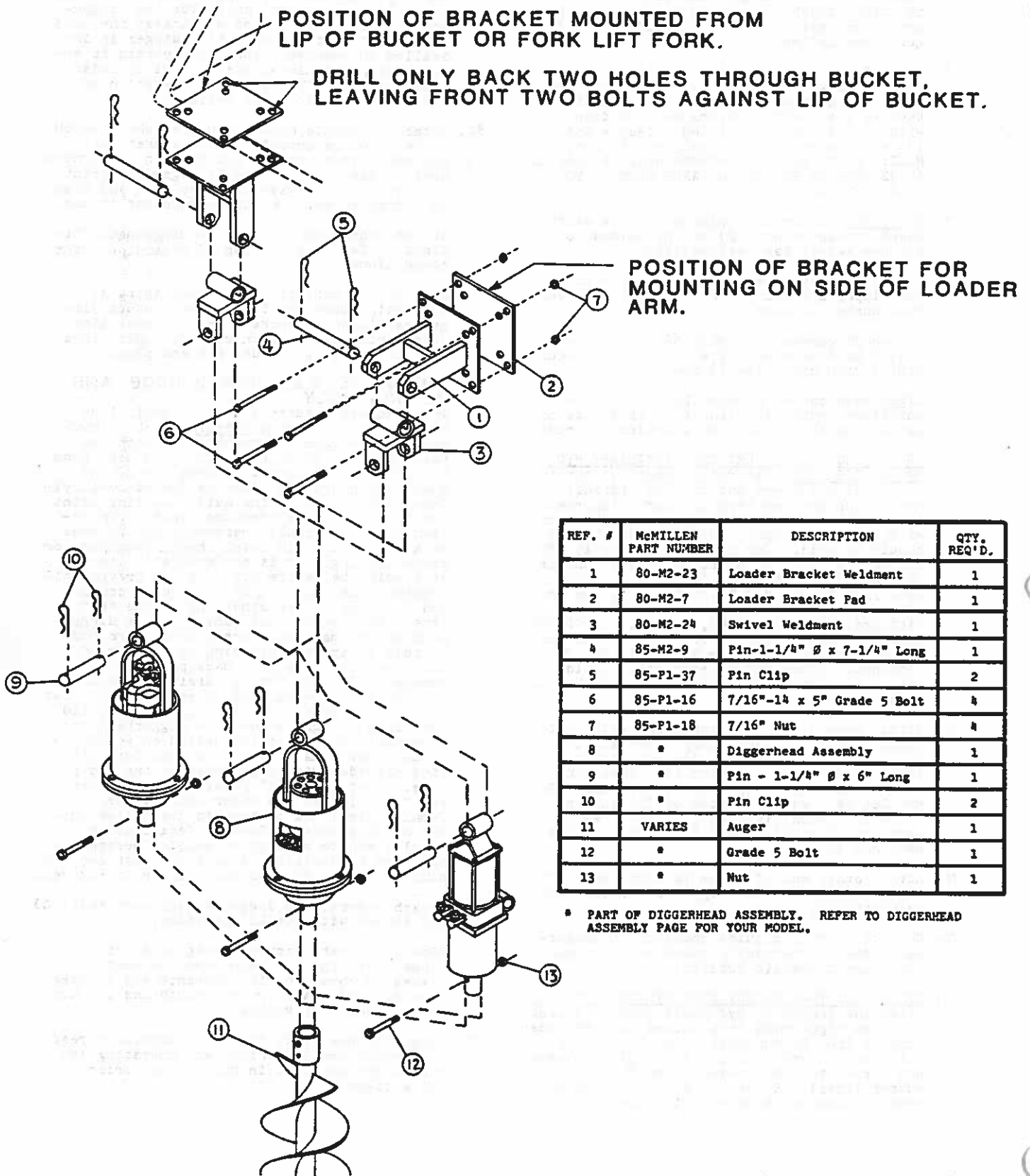
REP. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	80-M2-21	Backhoe Swivel Base Weldment	1
2	80-M2-16A	1" Backhoe Adaptor Ear	2
2	80-M2-14A	1-1/4" Backhoe Adaptor Ear	2
2	80-M2-14B	1-3/8" Backhoe Adaptor Ear	2
2	80-M2-14	1-1/2" Backhoe Adaptor Ear	2
2	80-M2-15	1-3/4" Backhoe Adaptor Ear	2
2	80-M2-16	2" Backhoe Adaptor Ear	2
2	80-M2-16B	2-1/2" Backhoe Adaptor Ear	2
2	80-M2-16C	2-3/4" Backhoe Adaptor Ear	2
3	85-P2-45	1/2"-13 x 1-3/4" Grade 5 Bolt	4
4	85-P2-32	1/2" Lockwasher	4
5	85-P1-15	1/2" Nut	4
6	"	Diggerhead Assembly	1
7	"	Pin - 1-1/4" ϕ x 6" Long	1
8	"	Pin Clip	2
9	VARIES	Auger	1
10	"	Grade 5 Bolt	1
11	"	Nut	1

* PART OF DIGGERHEAD ASSEMBLY. REFER TO DIGGERHEAD ASSEMBLY PAGE FOR YOUR MODEL.

INSTALLATION INSTRUCTIONS FOR BACKHOES

1. Remove bucket from dipper arm and curl pin connection. The dipper arm pin will be used to attach backhoe mounting to backhoe dipper arm. Curl pin will not be required for digger installation.
2. Assemble the backhoe adaptor kit by spacing the two backhoe adaptor ears(2) to the same width as the backhoe dipper arm and attach them to the backhoe swivel base weldment(1) with four bolts(3) provided. Secure bolts (3) with lockwashers(4) and nuts(5) provided. NOTE: WIDTH BETWEEN BACKHOE ADAPTOR EARS IS ADJUSTABLE TO FIT DIPPER ARMS FROM 3" TO 12-1/4" WIDE.
3. OPTIONAL: After determining correct width, backhoe adaptor ears(2) can be welded to backhoe swivel base weldment(1).
4. Attach the assembled backhoe adaptor kit to the dipper arm using the bucket pin removed from bucket in step 1.
5. Attach diggerhead assembly(6) to backhoe swivel base weldment(1) with pin(7). Secure pin(7) with pin clips(8) provided.
6. Diggerhead can be plumbed by hooking into an auxiliary hydraulic circuit if it exists or by tapping into bucket curl cylinder circuit.
- 7A. IF HOOKING INTO AN EXISTING AUXILIARY HYDRAULIC CIRCUIT: Determine length of hydraulic hoses and brand and size of hydraulic quick couplers required to plumb diggerhead into auxiliary hydraulic outlets. For pumps with 1-15 GPM output, 1/2" ID hydraulic hose should be used. For pumps with over 15 GPM output, use 3/4" ID hydraulic hose. Models 3000PB, 4800PB, 8000PB, 13000, and 18000 have 1/2" female N.P.T. fittings so one end of each hose should have 1/2" male N.P.T. fittings. Models 23000B, 27000B, and 32000B have 3/4" female N.P.T. fittings so one end of each hose should have 3/4" male N.P.T. fittings. Other end of each hose should match the hydraulic quick couplers to be used.
- 7B. Attach hydraulic quick couplers, which match quick couplers at auxiliary hydraulic outlets, to one end of each diggerhead hose. (Note: one layer of joint tape should be used on all taper pipe thread fittings. Do not let tape extend inside of fitting and do not overtighten fittings). Always use dust caps and plugs on hydraulic quick couplers when not in use.
- 7C. Attach other end of hoses to diggerhead fittings. (See note in step 7B regarding joint connections).
- 7D. Connect hydraulic quick couplers on diggerhead hoses to hydraulic quick couplers on auxiliary hydraulic outlets.
- 8A. IF TAPPING INTO BUCKET CURL CYLINDER CIRCUIT: Determine length of hydraulic hoses required to plumb diggerhead into bucket curl cylinder circuit (can be run back to curl cylinder valve or to curl cylinder fittings on dipper arm where steel hydraulic lines turn into rubber lines). Refer to step 7A for correct hose ID size and hose end fittings.
- 8B. Install hydraulic quick couplers onto bucket curl cylinder line fittings. This now gives you a "quick-connect" point for the diggerhead hydraulic lines and eliminates the need to tighten fittings each time digger is installed or removed. (When diggerhead is removed simply "quick-connect" curl cylinder lines back together and full operation of bucket curl cylinder is restored).
- 8C. Attach hydraulic quick couplers, which match quick couplers installed into bucket curl cylinder lines, to one end of each diggerhead hose. (See note in step 7B regarding joint connections). Always use dust caps and plugs on hydraulic quick couplers when not in use.
- 8D. Attach other end of hoses to diggerhead fittings. (See note in step 7B regarding joint connections).
- 8E. Snap bucket curl cylinder lines apart at connection made in step 8B and connect diggerhead lines to bucket curl cylinder lines. Cover quick couplers on curl cylinder lines not being used with dust cap and plug.
9. **FOR MODELS 23000B, 27000B, AND 32000B ONLY.**
These models require a 3/8" ID drain line which must be plumbed directly back to hydraulic reservoir. Permanently attach one piece of 3/8" ID single wire braid hose from the hydraulic reservoir, along one of the auxiliary hydraulic lines or bucket curl cylinder lines, out to the quick coupling point for two diggerhead pressure lines. Connection to the hydraulic reservoir can be made at an oil fill, oil level check, breather, or drain opening. It is preferable to connect at a point below the oil level to prevent oil foaming. Install a 3/8" male quick coupler and dust cap to the other end of the drain line. To prevent seal damage to the diggerhead motor, make sure drain line is routed in such a way that pinching or kinking of the hose cannot occur. Back pressure in excess of 50 lbs. through drain line will also cause diggerhead motor seal damage. Cut a second piece of 3/8" ID single wire braid hose long enough to run from diggerhead to permanent drain line connection on vehicle. Install the female swivel to push lock fitting provided with diggerhead to one end of hose. Install a 3/8" female quick coupler and dust plug to the other end. Connect female swivel end of hose to drain line outlet on diggerhead. Connect female quick coupler end to male quick coupler permanently attached to vehicle. Always use dust cap and plug on quick couplers when digger is removed.
10. Attach auger(9) to diggerhead(6) with bolt(10) and secure with nut(11) provided.
11. Slowly activate backhoe swing left, right; dipper out, in; and boom down, up control valves to check for interference and to make sure all hoses are proper length and are not being pinched or kinked.
12. Digger is now ready for use. Carefully read and understand all safety and operating instructions provided in this manual prior to using digger.

80-A2-14 UNIVERSAL LOADER ADAPTOR ASSEMBLY & PARTS LIST



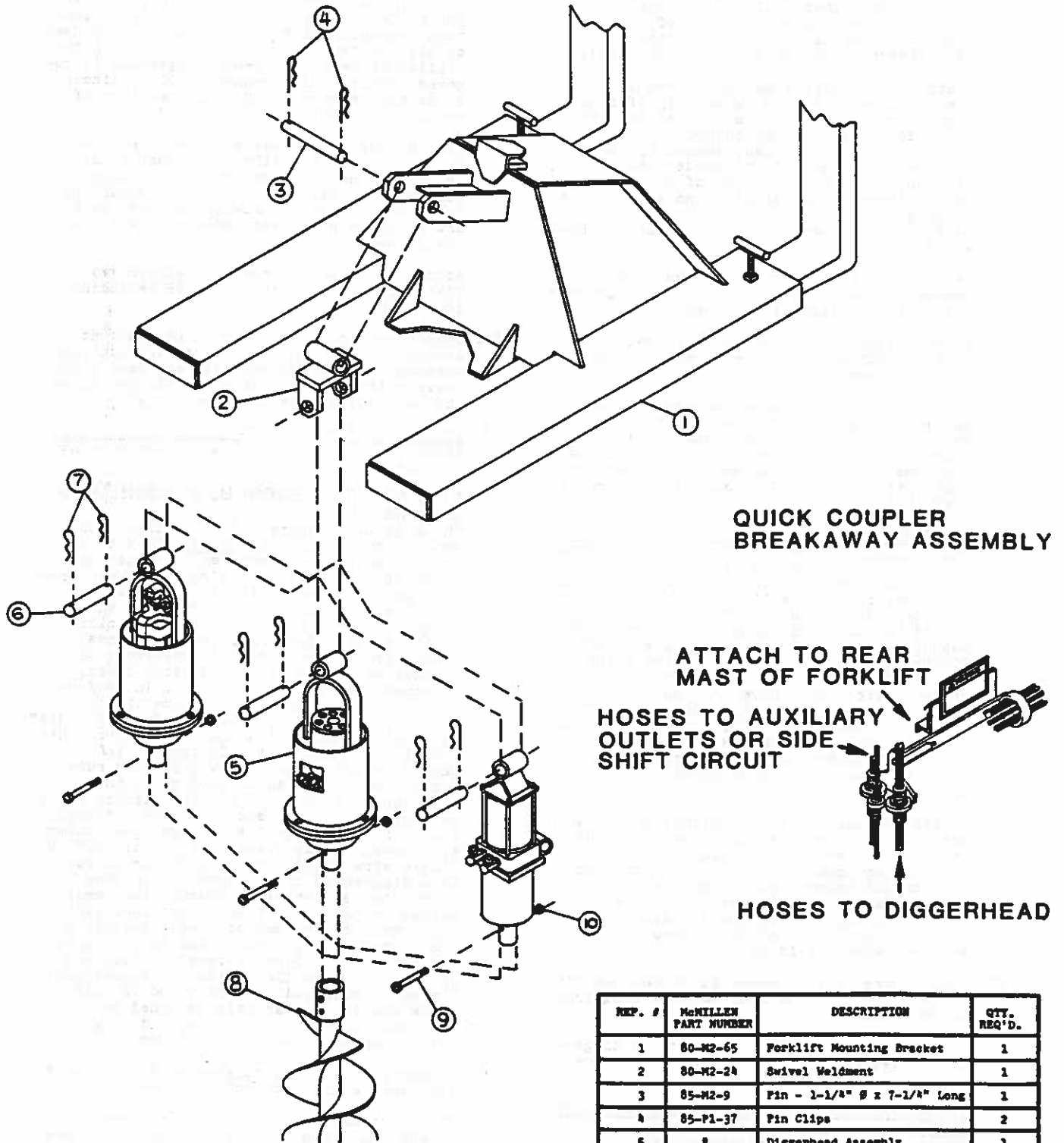
REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	80-M2-23	Loader Bracket Weldment	1
2	80-M2-7	Loader Bracket Pad	1
3	80-M2-24	Swivel Weldment	1
4	85-M2-9	Pin-1-1/4" ϕ x 7-1/4" Long	1
5	85-P1-37	Pin Clip	2
6	85-P1-16	7/16"-1 1/2 x 5" Grade 5 Bolt	4
7	85-P1-18	7/16" Nut	4
8	*	Diggerhead Assembly	1
9	*	Pin - 1-1/4" ϕ x 6" Long	1
10	*	Pin Clip	2
11	VARIES	Auger	1
12	*	Grade 5 Bolt	1
13	*	Nut	1

* PART OF DIGGERHEAD ASSEMBLY. REFER TO DIGGERHEAD ASSEMBLY PAGE FOR YOUR MODEL.

INSTALLATION INSTRUCTIONS FOR 80-A2-14 UNIVERSAL LOADER ADAPTOR ASSEMBLY

1. 80-A2-14 Universal Loader Adaptor can be used to adapt your McMillen Hydraulic Digger to the side of loader arm, lip of bucket, or fork lift fork as well as other applications. (See assembly diagram for clarification).
2. Place loader bracket pad(2) on the inside of the loader arm, top of bucket lip (for mounting on lip of bucket, you'll need to drill two 7/16" holes through bucket), or on top of fork lift fork. Place loader bracket weldment(1) on outside of loader arm, bottom of bucket lip, or on bottom of fork lift fork. Insert four bolts(6) and secure loader bracket pad(2) and loader bracket weldment(1) by tightening with four nuts(7) provided.
3. Attach swivel weldment(3) to the loader bracket weldment(1) with pin(4). Secure pin (4) with pin clips(5) provided.
4. Attach diggerhead assembly(8) to swivel weldment(3) with pin(9). Secure pin(9) with pin clips(10) provided.
5. Diggerhead can be plumbed by hooking into an auxiliary hydraulic circuit if it exists or by tapping into the loader bucket tilt cylinder circuit. When mounting on forklifts diggerhead could be hooked into hydraulic side shift circuit if an auxiliary hydraulic circuit is not available.
- 6A. IF HOOKING INTO AN EXISTING AUXILIARY HYDRAULIC CIRCUIT: Determine length of hydraulic hoses and brand and size of hydraulic quick couplers required to plumb diggerhead into auxiliary hydraulic outlets. For pumps with 1-15 GPM output, 1/2" ID hydraulic hose should be used. For pumps with over 15 GPM output, use 3/4" ID hydraulic hose. Models 3000PB, 4800PB, 8000PB, 13000, and 18000 have 1/2" female N.P.T. fittings so one end of each hose should have 1/2" male N.P.T. fittings. Models 23000B, 27000B, and 32000B have 3/4" female N.P.T. fittings so one end of each hose should have 3/4" male N.P.T. fittings. Other end of each hose should match the hydraulic quick couplers to be used.
- 6B. Attach hydraulic quick couplers, which match quick couplers at auxiliary hydraulic outlets, to one end of each diggerhead hose. (Note: one layer of joint tape should be used on all taper pipe thread fittings. Do not let tape extend inside of fitting and do not overtighten fittings). Always use dust caps and plugs on all hydraulic quick couplers when not in use.
- 6C. Attach other end of hoses to diggerhead fittings. (See note in step 6B regarding joint connections).
- 6D. Connect hydraulic quick couplers on diggerhead hoses to hydraulic quick couplers on auxiliary hydraulic outlets.
- 7A. IF TAPPING INTO LOADER BUCKET TILT CYLINDER CIRCUIT: Determine length of hydraulic hoses required to plumb diggerhead into bucket tilt cylinder circuit (can be run back to tilt cylinder valve or to curl cylinder fittings on loader arm where steel hydraulic lines turn into rubber lines). Refer to step 6A for correct hose ID size and hose end fittings.
- 7B. Install hydraulic quick couplers onto bucket tilt cylinder line fittings. This now gives you a "quick-connect" point for the diggerhead hydraulic lines and eliminates the need to tighten fittings each time digger is installed or removed. (When diggerhead is removed simply "quick-connect" tilt cylinder lines back together and full operation of bucket tilt cylinder is restored).
- 7C. Attach hydraulic quick couplers, which match quick couplers installed into bucket tilt cylinder lines, to one end of each diggerhead hose. (See note in step 6B regarding joint connections). Always use dust caps and plugs on hydraulic quick couplers when not in use.
- 7D. Attach other end of hoses to diggerhead fittings. (See note in step 6B regarding joint connections).
- 7E. Snap bucket tilt cylinder lines apart at connection made in step 7B and connect diggerhead lines to bucket tilt cylinder lines. Cover quick couplers on curl cylinder lines not being used with dust cap and plug.
8. IF TAPPING INTO FORKLIFT SIDE SHIFT CIRCUIT: Refer to Forklift Installation Instructions in this manual.
9. FOR MODELS 23000B, 27000B, AND 32000B ONLY. These models require a 3/8" ID drain line which must be plumbed directly back to hydraulic reservoir. Permanently attach one piece of 3/8" ID single wire braid hose from the hydraulic reservoir, along one of the auxiliary hydraulic lines or bucket tilt cylinder lines, out to the quick coupling point for two diggerhead pressure lines. Connection to the hydraulic reservoir can be made at an oil fill, oil level check, breather, or drain opening. It is preferable to connect at a point below the oil level to prevent oil foaming. Install a 3/8" male quick coupler and dust cap to the other end of the drain line. To prevent seal damage to the diggerhead motor, make sure drain line is routed in such a way that pinching or kinking of the hose cannot occur. Back pressure in excess of 50 lbs. through drain line will also cause diggerhead motor seal damage. Cut a second piece of 3/8" ID single wire braid hose long enough to run from diggerhead to permanent drain line connection on vehicle. Install the female swivel to push lock fitting provided with diggerhead to one end of hose. Install a 3/8" female quick coupler and dust plug to the other end. Connect female swivel end of hose to drain line outlet on diggerhead. Connect female quick coupler end to male quick coupler permanently attached to vehicle. Always use dust cap and plug on quick couplers when digger is removed.
10. Attach auger(11) to diggerhead(8) with bolt (12) and secure with nut(13) provided.
11. Slowly raise and lower loader to check for interference and to make sure all hoses are proper length and are not being pinched or kinked.
12. Digger is now ready for use. Carefully read and understand all safety and operating instructions provided in this manual prior to using digger.

80-A2-245 FORKLIFT MOUNTING ASSEMBLY & PARTS LIST



REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	80-M2-65	Forklift Mounting Bracket	1
2	80-M2-24	Swivel Weldment	1
3	85-M2-9	Pin - 1-1/4" Ø x 7-1/4" Long	1
4	85-P1-37	Pin Clips	2
5	*	Diggerhead Assembly	1
6	*	Pin - 1-1/4" Ø x 6" Long	1
7	*	Pin Clips	2
8	VARIES	Auger	1
9	*	Grade 5 Bolt	1
10	*	Nut	1

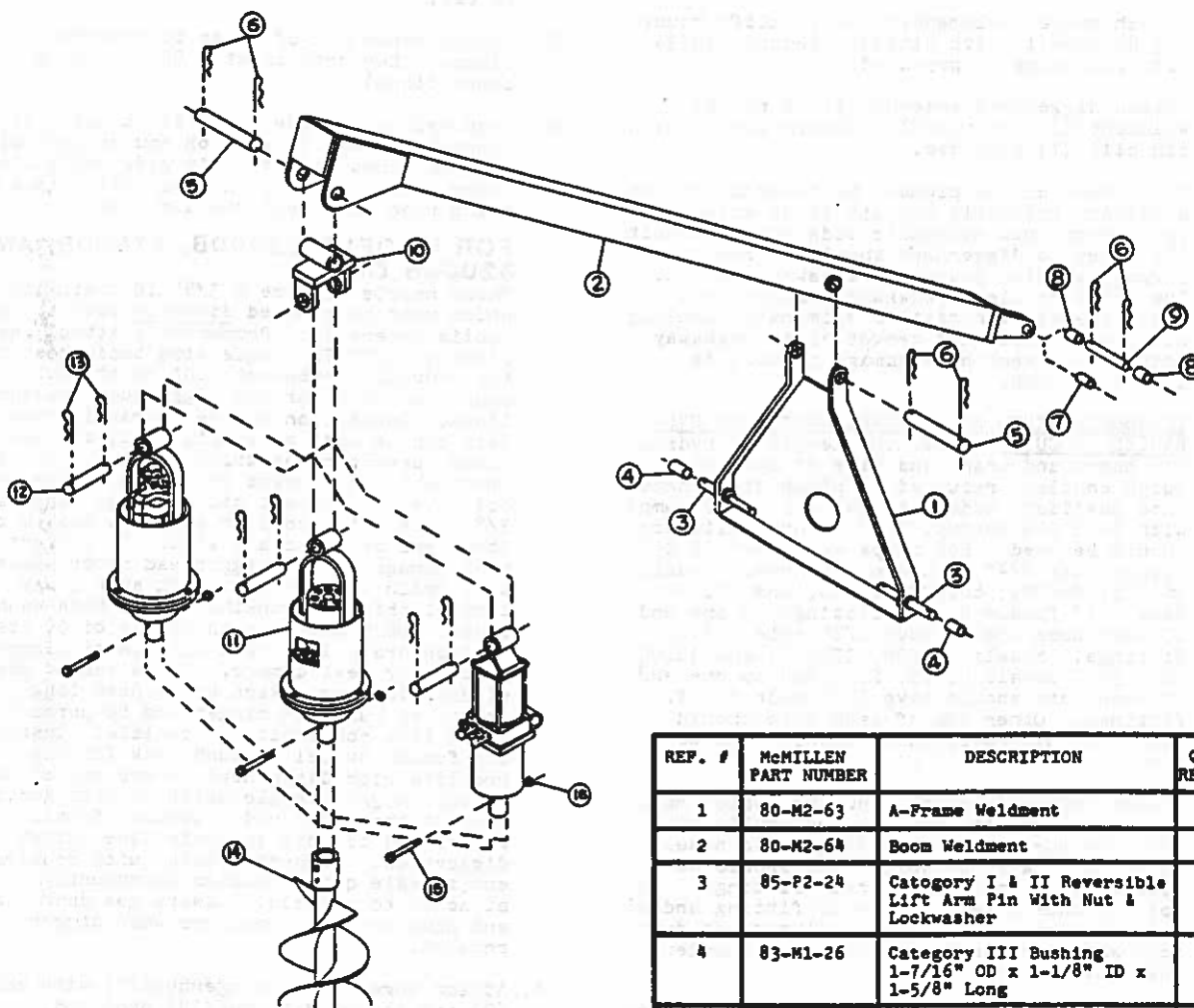
* PART OF DIGGERHEAD ASSEMBLY. REFER TO DIGGERHEAD ASSEMBLY FOR YOUR MODEL.

INSTALLATION INSTRUCTIONS FOR 80-A2-245 FORKLIFT MOUNTING ASSEMBLY

1. Make sure two "T" locking handles are screwed completely out of mounting bracket. Spread forks on fork lift to required width and drive machine into the forklift mounting bracket(1). Tighten both "T" locking handles securely.
2. Attach swivel weldment(2) to forklift mounting bracket(1) with pin(3). Secure pin(3) with pin clips(4) provided.
3. Attach diggerhead assembly(5) to swivel weldment(2) with pin(6). Secure pin(6) with pin clips(7) provided.
4. Diggerhead can be plumbed by hooking into an auxiliary hydraulic circuit if it exists or by tapping into hydraulic side shift circuit. All hoses to diggerhead should be routed through a quick coupler breakaway bracket. The quick coupler breakaway bracket lets hoses travel with mast to eliminate tangling of hoses in mast and serves as a breakaway point to prevent hose damage if mast is lifted to high.
- 5A. IF HOOKING INTO AN EXISTING AUXILIARY HYDRAULIC CIRCUIT: Determine length of hydraulic hoses and brand and size of hydraulic quick couplers required to plumb diggerhead into auxiliary hydraulic outlets. For pumps with 1-15 GPM output, 1/2" ID hydraulic hose should be used. For pumps with over 15 GPM output, use 3/4" ID hydraulic hose. Models 3000PB, 4800PB, 8000PB, 13000, and 18000 have 1/2" female N.P.T. fittings so one end of each hose should have 1/2" male N.P.T. fittings. Models 23000B, 27000B, and 32000B have 3/4" female N.P.T. fittings so one end of each hose should have 3/4" male N.P.T. fittings. Other end of each hose should match the hydraulic quick couplers to be used.
- 5B. Attach hydraulic quick couplers, which match quick couplers at auxiliary hydraulic outlets, to one end of each diggerhead hose. (Note: one layer of joint tape should be used on all taper pipe thread fittings. Do not let tape extend inside of fitting and do not overtighten fittings). Always use dust caps and plugs on hydraulic quick couplers when not in use.
- 5C. Attach other end of hoses to diggerhead fittings. (See note in step 5B regarding joint connections).
- 5D. Connect hydraulic quick couplers on diggerhead hoses to hydraulic quick couplers on auxiliary hydraulic outlets.
- 6A. IF TAPPING INTO HYDRAULIC SIDE SHIFT CIRCUIT: Determine length of hydraulic hoses required to plumb diggerhead into hydraulic side shift circuit. Refer to step 5A for correct hose ID size and hose end fittings.
- 6B. Install hydraulic quick couplers into hydraulic side shift circuit. This now gives you a "quick-connect" point for the diggerhead hydraulic lines and eliminates the need to tighten fittings each time digger is installed or removed. (When diggerhead is removed simply "quick-connect" hydraulic side shift circuit lines back together and full operation of side shift is restored.
- 6C. Attach hydraulic quick couplers, which match quick couplers installed into hydraulic side shift circuit, to one end of each diggerhead hose. (See note in step 5B regarding joint connections). Always use dust caps and plugs on hydraulic quick couplers when not in use.
- 6D. Attach other end of hoses to diggerhead fittings. (See note in step 5B regarding joint connections).
- 6E. Snap hydraulic side shift lines apart at connection made in step 6B and connect diggerhead lines to hydraulic side shift lines. Cover quick couplers on side shift lines not being used with dust cap and plug.
7. **FOR MODELS 23000B, 27000B, AND 32000B ONLY.**

These models require a 3/8" ID drain line which must be plumbed directly back to hydraulic reservoir. Permanently attach one piece of 3/8" ID single wire braid hose from the hydraulic reservoir out to the quick coupling point for two diggerhead pressure lines. Connection to the hydraulic reservoir can be made at an oil fill, oil level check, breather, or drain opening. It is preferable to connect at a point below the oil level to prevent oil foaming. Install a 3/8" male quick coupler and dust cap to the other end of the drain line. To prevent seal damage to the diggerhead motor, make sure drain line is routed in such a way that pinching or kinking of the hose cannot occur. Back pressure in excess of 50 lbs. through drain line will also cause diggerhead motor seal damage. Cut a second piece of 3/8" ID single wire braid hose long enough to run from diggerhead to permanent drain line connection on vehicle. Install the female swivel to push lock fitting provided with diggerhead to one end of hose. Install a 3/8" female quick coupler and dust plug to the other end. Connect female swivel end of hose to drain line outlet on diggerhead. Connect female quick coupler end to male quick coupler permanently attached to vehicle. Always use dust cap and plug on quick couplers when digger is removed.
8. Attach auger(8) to diggerhead(5) with bolt (9) and secure with nut(10) provided.
9. Slowly raise, lower, and tilt forklift forks to check for interference and to make sure all hoses are proper length and are not being pinched or kinked.
10. Digger is now ready for use. Carefully read and understand all safety and operating instructions provided in this manual prior to using digger.

80-A2-67 THREE POINT HITCH MOUNTING ASSEMBLY & PARTS LIST



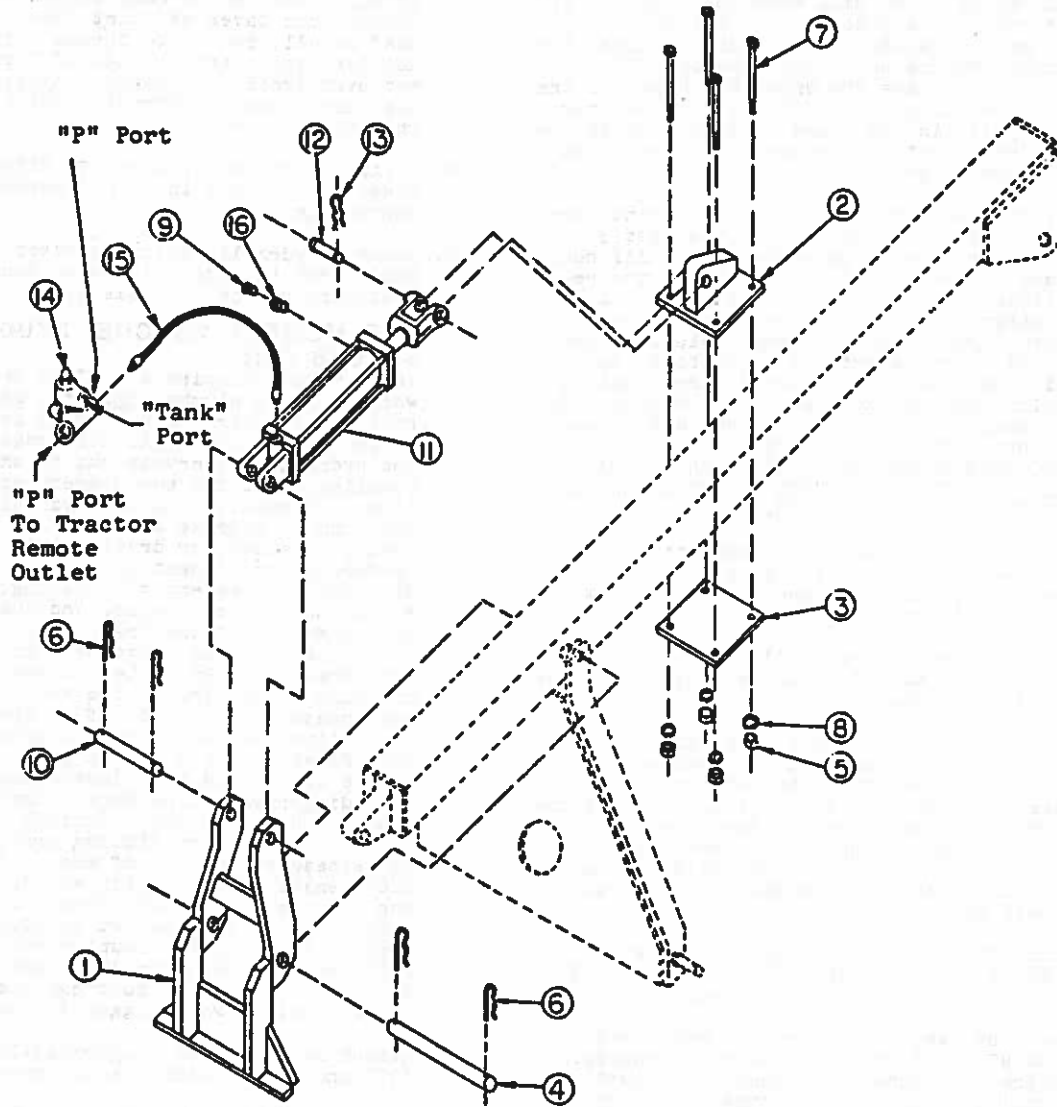
REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	80-M2-63	A-Frame Weldment	1
2	80-M2-64	Boom Weldment	1
3	85-P2-24	Category I & II Reversible Lift Arm Pin With Nut & Lockwasher	2
4	83-M1-26	Category III Bushing 1-7/16" OD x 1-1/8" ID x 1-5/8" Long	2
5	85-M2-9	Pin - 1-1/4" ϕ x 7-1/4" Lg.	2
6	85-P1-37	Pin Clip	6
7	83-M1-14	Category I Bushing 1" OD x 3/4" ID x 1-9/16" Long	1
8	83-M1-32	Category III Bushing 1-1/4" OD x 1" ID x 1-3/8" Long	2
9	85-M1-31	Pin - 1" ϕ x 5-3/4" Long	1
10	80-M2-24	Swivel Weldment	1
11	*	Diggerhead Assembly	1
12	*	Pin - 1-1/4" ϕ x 6" Long	1
13	*	Pin Clip	2
14	VARIES	Auger	1
15	*	Grade 5 Bolt	1
16	*	Nut	1

* PART OF DIGGERHEAD ASSEMBLY. REFER TO DIGGERHEAD ASSEMBLY PAGE FOR YOUR MODEL.

INSTALLATION INSTRUCTIONS FOR 80-A2-67 THREE POINT HITCH MOUNTING ASSEMBLY

1. Mount the boom weldment(2) to the upper hitch point on the tractor. If your tractor is Category I you will need bushing(7). If your tractor is Category II, bushing (7) will not be required but should be saved for possible future use. For Category III tractors, replace the upper hitch pin in the tractor with top link pin(9). Use the two bushings(8) in the holes on each side of the upper hitch point. Secure pin(9) with two pin clips(6) provided.
2. Slip the tractor lower link ball joints over the A-Frame weldment(1) lift arm pins(3). If your tractor is Category I you will need to use the smaller diameter end of the reversible lift arm pins(3). If your tractor is Category II you will need to use the larger diameter end of reversible lift arm pins(3). For Category III tractors, an additional set of bushings(4) are supplied to slip over category II pins. Secure lift arm pins(3) with pin clips provided on your tractor. **FOR BEST DIGGING RESULTS AND STRAIGHTER HOLES, IT IS RECOMMENDED THAT RIGID STABILIZERS BE USED ON THE LOWER LIFT ARMS OF THREE POINT HITCH.**
3. Raise the boom weldment(2) and attach A-Frame weldment(1) to the center tube on the boom with pin(5). Secure pin(5) with two pin clips(6) provided.
4. Attach swivel weldment(10) to the boom weldment(2) with pin(5). Secure pin(5) with pin clips(6) provided.
5. Before proceeding further, very slowly raise and lower the boom using the tractor lift control to check for interference at the upper hitch point. If there is interference, adjust the lower links as described in your tractor owners manual. For best results, the pin hole in the swivel weldment(10) should be 72 to 78 inches from the ground in the highest position.
6. Attach diggerhead assembly(11) to swivel weldment(10) with pin(12). Secure pin(12) with two pin clips(13) provided.
7. Determine length of hydraulic hoses and brand and size of hydraulic quick couplers required to plumb diggerhead into auxiliary hydraulic outlets. For pumps with 1-15 GPM output, 1/2" ID hydraulic hose should be used. For pumps with over 15 GPM output, use 3/4" ID hydraulic hose. Models 3000PB, 4800PB, 8000PB, 13000, and 18000 have 1/2" female N.P.T. fittings so one end of each hose should have 1/2" male N.P.T. fittings. Models 23000B, 27000B, and 32000B have 3/4" female N.P.T. fittings so one end of each hose should have 3/4" male N.P.T. fittings. Other end of each hose should match the hydraulic quick couplers to be used.
8. Attach hydraulic quick couplers, which match quick couplers at auxiliary hydraulic outlets, to one end of each diggerhead hose. (Note: one layer of joint tape should be used on all taper pipe thread fittings. Do not let tape extend inside of fitting and do not overtighten fittings). Always use dust caps and plugs on hydraulic quick couplers when not in use.
9. Attach other end of hoses to diggerhead fittings. (See note in step 8 regarding joint connections).
10. Connect hydraulic quick couplers on diggerhead hoses to hydraulic quick couplers on auxiliary hydraulic outlets.
11. **FOR MODELS 23000B, 27000B, AND 32000B ONLY.**
These models require a 3/8" ID drain line which must be plumbed directly back to hydraulic reservoir. Permanently attach one piece of 3/8" ID single wire braid hose from the hydraulic reservoir out to the quick coupling point for two diggerhead pressure lines. Connection to the hydraulic reservoir can be made at an oil fill, oil level check, breather, or drain opening. It is preferable to connect at a point below the oil level to prevent oil foaming. Install a 3/8" male quick coupler and dust cap to the other end of the drain line. To prevent seal damage to the diggerhead motor, make sure drain line is routed in such a way that pinching or kinking of the hose cannot occur. Back pressure in excess of 50 lbs. through drain line will also cause diggerhead motor seal damage. Cut a second piece of 3/8" ID single wire braid hose long enough to run from diggerhead to permanent drain line connection on vehicle. Install the female swivel to push lock fitting provided with diggerhead to one end of hose. Install a 3/8" female quick coupler and dust plug to the other end. Connect female swivel end of hose to drain line outlet on diggerhead. Connect female quick coupler end to male quick coupler permanently attached to vehicle. Always use dust cap and plug on quick couplers when digger is removed.
12. Attach auger(14) to diggerhead(11) with bolt (15) and secure with nut(16) provided.
13. Digger is now ready for use. Carefully read and understand all safety and operating instructions provided in this manual prior to using digger.

80-A2-226 DOWN PRESSURE KIT ASSEMBLY & PARTS LIST



REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	80-M2-147A	Pivot Push Arm Weldment	1
2	80-M2-147B	Push Block Weldment	1
3	80-M2-147B2	Push Block Pad	1
4	85-M2-105	Pin-1-1/4" Ø x 10-5/16" Lg	1
5	85-P1-15	1/2" Nut	4
6	85-P1-37	Pin Clip	4
7	85-P1-99	1/2"-13 x 6" Grade 5 Bolt	4
8	85-P2-32	1/2" Lockwasher	4

REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
9	88-P2-93A	1/4" NPT Breather Vent	1
10	85-M1-31	Pin-1" Ø x 5-3/8" Long	1
11	88-P2-204	2" x 8" Cylinder	1
12	88-P2-204A	Pin - 1" Ø x 3" Long	1
13	85-P2-204B	Pin Clip	1
14	88-P2-205	Relief Valve	1
15	88-P2-208	Hose Assembly	1
16	88-P2-209	Pipe Bushing	1

INSTALLATION INSTRUCTIONS FOR 80-A2-226 DOWN PRESSURE KIT

1. DOWN PRESSURE KIT ASSEMBLY IS DESIGNED FOR ADAPTATION TO McMILLEN # 80-A2-67 3-POINT HITCH MOUNTING ONLY. DO NOT ATTEMPT TO ADAPT TO ANY OTHER McMILLEN 3-POINT MOUNTINGS.
2. TRACTOR MUST BE EQUIPPED WITH 3-WAY OR 4-WAY REMOTE CONTROL VALVE AND OUTLETS.
3. TO AVOID POSSIBLE INJURY, REMOVE AUGER AND DIGGERHEAD FROM BOOM BEFORE INSTALLATION OF DOWN PRESSURE KIT.
4. Remove existing A-Frame to boom pin. Flat plate side of A-Frame must be facing tractor. Install pivot push arm weldment (1) to boom and A-Frame with pin(4). Secure pin(4) with two pin clips(6) provided. Reconnect boom to upper hitch point on tractor.
5. Raise boom to maximum lift height.
6. Attach rear of cylinder(11), with hose port up, to pivot push arm weldment(1) with pin(10) provided. Secure pin(10) with two pin clips(6) provided. Retract cylinder(11) to its minimum length. Push pivot push arm weldment(1) so that face is resting firmly against plate side of A-Frame.
7. Loosely assemble push block weldment(2) and push block pad(3) to boom using four bolts(7), nuts(5), and lockwashers(8) provided. Do not tighten bolts yet.
8. Attach rod end of cylinder(11) to push block weldment(2) using pin(12). Secure with pin clip(13) provided. Tighten four bolts(7) on push block weldment(2) and push block pad(3) evenly, making sure bracket is straight and square.
9. Attach hose assembly(15) to cylinder port facing up, at rear of cylinder. (Note: One layer of joint tape should be used on all taper pipe thread fittings. Do not let tape extend inside of fitting and do not over tighten fitting).
10. Attach other end of hose(15) to one of the "P" ports on relief valve(14). See note in step 9 regarding joint connections.
11. Attach a suitable quick coupler tip to the other "P" port on relief valve(14). The coupler tip is not included and must be obtained locally. Connect quick coupler tip and relief valve(14) to a remote hydraulic outlet on rear of tractor. If tractor is equipped with a 4-way remote control valve, there will be two outlets. Either one can be used depending upon which direction the operator prefers to move the control valve lever to apply down pressure.
12. The hose and fittings to connect the relief valve (port marked "tank") to the tractor reservoir should be obtained locally. Hose and fittings must have a minimum pressure rating of 2500 PSI and should be 1/2" ID hose. The connection to reservoir can be made at an oil fill, oil level check, breather, or drain opening. It is preferable to connect at a point below the oil level to prevent oil foaming. The "tank" port on relief valve is 1/2" NPTF.

OPERATING INSTRUCTIONS FOR 80-A2-226 DOWN PRESSURE KIT

1. BEFORE OPERATING DOWN PRESSURE KIT, MAKE SURE ALL HOSES ARE CLEAR OF ALL BOOM, A-FRAME, AND PIVOT PUSH ARM MOVEMENT.
2. To apply down pressure, move the remote outlet control valve lever in the proper direction. As long as lever is activated, down pressure will be applied. Use only enough down pressure to assure positive penetration of auger into the ground.
3. To raise the boom, return control valve lever for down pressure to the neutral position. Activate lift arm control valve lever to raise boom. (NOTE: NEVER ATTEMPT TO RAISE BOOM WITH DOWN PRESSURE CONTROL VALVE ACTIVATED. SERIOUS PERSONAL INJURY OR EQUIPMENT DAMAGE MAY RESULT).

Excessive down pressure will cause the auger to stall.

OPERATING INSTRUCTIONS FOR McMILLEN HYDRAULIC DIGGERS

1. After all installation instructions have been completed and safety information has been read, the McMillen Hydraulic Digger is now ready for use.
2. Lock vehicle brakes before starting to dig.
3. With the auger raised off of the ground, activate the digger control valve to determine position control valve lever must be in to turn auger in a forward (clockwise) rotation. This is the digging position.
4. Before beginning to dig, experiment with auger speed to determine a suitable auger RPM. To increase auger RPM, increase vehicle engine RPM. To decrease auger RPM, decrease vehicle engine RPM.
5. Return digger control valve to neutral position to stop the auger. Lower the auger to the ground so that only the center point penetrates the ground.
6. Activate digger control valve so auger is turning in a forward (clockwise) rotation. Use only enough down pressure to assure positive penetration of auger into the ground. Excessive down pressure will cause the auger to stall.
7. When the auger has penetrated the ground about 2⁴ inches, raise the auger from the hole to clear the dirt out. Repeat this procedure until the desired hole depth is obtained.
8. Once the required hole depth is reached, allow the auger to turn a few seconds at this depth to clean the hole. (Note: For cleaner holes that require no manual hole cleaning labor, refer to information on our patented Hole Top Sweep in this manual).
9. Return the digger control valve to the neutral position to stop the auger. Raise the auger out of the hole, move away from hole, then activate digger control valve to spin loose soil off of auger. (Note: do not reverse rotation of auger to remove from hole as loose soil on auger flights will fall back into the hole.
10. In some soil conditions or when excessive down pressure is applied auger may screw into ground and become stuck causing digger to stall. Do not attempt to raise the auger out of the ground. To remove the auger reverse the rotation (counter-clockwise) of the auger by moving the control valve lever to the reverse position and slowly raising the auger. Once unstuck, return the control valve lever to the forward (clockwise) rotation position and continue digging.
11. If the auger becomes stuck under rocks or tree roots, do not attempt to raise the auger out of the ground. See step 10 for proper procedure of relieving the auger.
12. If the auger hits a large obstruction, the vehicle hydraulic relief valve will open and bypass the oil to stop (stall) the auger. This does not damage the unit in anyway but serves as a protective device. Whenever this happens, simply reverse the auger rotation and raise the auger. Once unstuck, you can continue digging.
13. Avoid excessive side loading to hydraulic digger which can cause auger or output shaft damage.
14. Keep auger teeth and points in good condition. Always have spares on hand so they can be replaced as wear is detected to avoid damage to tooth holders and auger flighting.

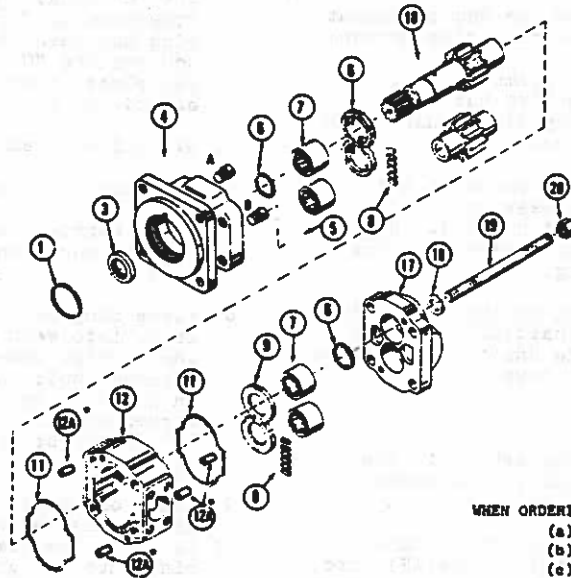
MODELS 13000, 18000 PLANETARY GEAR REDUCTION SERVICE PROCEDURES

(.....continued from previous page)

HUB-SHAFT SUB-ASSEMBLY

1. Oil output shaft(1A) and bearing cone(1D).
 2. Press bearing cone(1D) onto the end of output shaft(1A) that has the retaining ring groove.
 3. Stand hub(1G) on its small diameter end. Press bearing cup(1E) down into hub(1G). **NOTE:** Make sure that the cup sits square with the counterbore before pressing.
 4. Turn hub(1G) over so that it rests on its large diameter end. Press bearing cup(1C) into the small diameter end of hub(1G). **NOTE:** Make sure that the cup sits square with the counterbore before pressing.
 5. With hub(1G) still standing on its large diameter end, place output shaft(1A) into hub(1G) so that the end of the shaft with the retaining ring groove points down.
 6. Oil output shaft(1A).
 7. Press seal(1B) into the counterbore in the small diameter end of hub(1G). The closed face of the seal should be up.
 8. Turn hub(1G) over so that its small diameter end points down. Press bearing cone(1F) onto output shaft(1A). Rotate the hub while pressing the bearing. Stop pressing when the hub starts to resist rotating.
 9. Place spacer(1H) onto output shaft(1A) so that it rests on top of bearing cone(1F).
 10. Using retaining ring pliers, place retaining ring(1I) into the groove on output shaft(1A). Use a soft punch against the retaining ring to make sure that it is seated. **CAUTION:** Safety glasses should be worn during this procedure.
 11. Hit the end of output shaft(1A) once or twice with a soft face hammer. Turn the shaft in both clock-wise and counterclockwise directions while hitting the shaft. This will seat the bearing cone against the spacer and retaining ring, allowing necessary endplay in the hub-shaft sub-assembly.
 12. Turn hub(1G) over so that it rests on its large diameter end.
 13. Measure the endplay in the hub-shaft sub-assembly. To do this, follow steps a-c.
 - a. Mount a dial indicator on hub(1G). Locate the dial rod on top of output shaft(1A).
 - b. Lift up on the output shaft until the needle on the dial stops moving.
 - c. Read the dial. The reading on the dial should be no greater than 0.008 inch.
 14. Apply a light coat of "Never-Seize" to the three pipe plugs(1J).
 15. Tighten pipe plugs(1J) into the three pipe plug holes on hub(1G).
 16. At this point the hub-shaft sub-assembly is complete.
- ## MAIN ASSEMBLY
1. Position hub(1G) on its output shaft(1A) so that the hub's small diameter end points down.
 2. Mark the four shoulder bolt holes in hub(1G) with chalk so that they can be aligned with the shoulder bolt holes in the ring gear(2) in a later step.
 3. Grease "O" ring(5).
 4. Place "O" ring(5) into the counterbore of hub(1G). **CAUTION:** Beware of sharp edges and burrs around the counterbore when installing the "O" ring. **NOTE:** "O" rings may be stretched to fit the counterbore. If an "O" ring has been stretched too much, simply squeeze the "O" ring together bit by bit as you place it around the counterbore. It can be made to fit exactly.
 5. Oil all exposed surfaces inside hub(1G).
 6. Oil carrier sub-assembly(3).
 7. Place carrier sub-assembly(3), with spline connections down, into mesh with output shaft(1A).
 8. Place ring gear(2), with squared shoulder side down, into mesh with the planet gears(3F) of the carrier sub-assembly. Make sure that the shoulder bolt hole that is marked with an "X" on the ring gear aligns with any one of the marked shoulder bolt holes on the hub. The "X" should be on the cover side of the ring gear.
 9. Start one half of retaining ring(20) into the groove inside input gear(9). Use a soft punch to press the remaining half of the retaining ring into the groove.
 10. Insert input gear(9), with large diameter end down, into mesh with planet gears(3F).
 11. Place large thrust washer(11) over input gear(9) so that it rests on carrier housing(3A).
 12. Oil all exposed surfaces inside hub(1G).
 13. Grease "O" ring(5).
 14. Place "O" ring(5) into the counterbore of cover(6). **CAUTION:** Beware of sharp edges and burrs around the counterbore when installing "O" ring. **NOTE:** "O" rings may be stretched to fit the counterbore. If an "O" ring has been stretched too much, simply squeeze the "O" ring together bit by bit as you place it around the counterbore. It can be made to fit exactly.
 15. Place cover(6) on top of ring gear(2) so that the two pipe plug holes in the cover line up between the pipe plug holes in the hub. Align the bolt holes in the hub and cover.
 16. Place the four shoulder bolts(14) into the shoulder bolt holes marked on the hub and tighten by hand.
 17. Place the eight grade 8 bolts(12) into the remaining bolt holes and tighten.
 18. Apply 23-27 ft.-lbs. of torque to all bolts.
 19. Apply a light coat of "Never-Seize" to both pipe plugs(13).
 20. Tighten pipe plugs(13) into the two pipe plug holes on cover(6).
 21. Roll test the unit.
 22. Leak test the unit at a pressure of 5 psi for 2-3 minutes.
 23. At this point the unit is complete.

MODELS 23000B, 27000B, 32000B HYDRAULIC MOTOR ASSEMBLY



WHEN ORDERING PARTS PLEASE PROVIDE THE FOLLOWING:

(a) McMillen Model # _____

(b) Motor Part # _____

(c) Motor Serial # _____

(Items b & c are found on metal tag riveted to item #17 Cover)

MODELS 23000B, 27000B, 32000B HYDRAULIC MOTOR PARTS LIST

REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.	23000B	27000B	32000B
1	81-A3-500	Snap Ring	1	X	X	X
3	81-A3-501	Lip Seal	1	X	X	X
4	81-A3-502	Shaft End Cover	1	X	X	X
5	81-A3-503	Check Assembly	2	X	X	X
6	81-A3-504	Ring Seal	2	X	X	X
7	81-A3-505	Roller Bearing	4	X	X	X
8	81-A3-506	Pocket Seal Set	1	X	X	X
9	81-A3-507	Thrust Plate	2	X	X	X
10	81-A3-508	Shaft & Driven Gear Set	1	X		
10	81-A3-509	Shaft & Driven Gear Set	1		X	
10	81-A3-510	Shaft & Driven Gear Sst	1			X
11	81-A3-511	Gasket Seal	2	X	X	X
12	81-A3-512	Gear Housing	1	X		
12	81-A3-513	Gear Housing	1		X	
12	81-A3-514	Gear Housing	1			X
12A	81-A3-515	Dowel Pin	4	X	X	X
17	81-A3-516	Port End Cover	1	X	X	X
18	81-A3-517	Washer	4	X	X	X
19	81-A3-518	Cap Screw	4	X		
19	81-A3-519	Cap Screw	4		X	
19	81-A3-520	Cap Screw	4			X
NS	81-A3-521	Seal Retainer	1	X	X	X

MODELS 23000B, 27000B, 32000B

HYDRAULIC MOTOR SERVICE PROCEDURES

GENERAL INSTRUCTIONS

To facilitate the repair of these units - and before any work is done - we suggest that you first read all of the steps used in disassembly and all of the steps used in building up the unit.

Dirt is the enemy of any hydraulic system. The first requirement of good maintenance of hydraulic equipment is cleanliness. **MAKE SURE YOU DISASSEMBLE AND ASSEMBLE YOUR HYDRAULIC EQUIPMENT IN A CLEAN AREA.**

It is important to airblast all parts and wipe them with a clean, lintless cloth before assembly.

USE CAUTION IN GRIPPING ALL PARTS IN THE VISE TO AVOID DAMAGING MACHINED SURFACES.

CAUTION:

1. If prying off sections becomes necessary, take extreme care not to mar or damage machined surfaces. Excessive force while prying can result in misalignment and seriously damage parts.
2. If parts are stubborn during assembly, do not force them and never employ an iron hammer.
3. Gears are closely matched, therefore they must be kept together as sets when removed from a unit. Handle with care to avoid damage to the journals or teeth.
4. Never hammer roller bearings into bores. Use only an arbor press or other suitable tool.

MOTOR DISASSEMBLY

1. Mount the pump in a vise with the shaft end pointing down. Index mark all sections with a punch. Be sure to align these marks when reassembling.
2. Remove the 4 cap screws with a socket wrench.
3. Lift off the port end cover. If necessary to pry loose, refer to caution note. If the thrust plate remains in the gear housing, it can be tapped out later with a wooden hammer handle. Be careful not to distort the thrust plate.
4. Lift or pry off the gear housing. Be careful not to damage machined surfaces. If the thrust plate remains in the gear housing, remove as described in Step 3.
5. Remove the driven gear and the integral gear and drive shaft. Keep these together as they are a matched set. Examine and replace if necessary. Be careful not to damage the machined surfaces of the gears.

6. Pry the thrust plates from the shaft end cover, port end cover, or bearing carrier with a screwdriver or similar tool. Avoid distorting the thrust plates. Visually inspect thrust plates for wear or damage. Replace if necessary. Remove and discard all rubber pocket seals and gasket seals.
7. Examine all roller bearings for scoring, spalling, or pitting. If replacement is necessary, remove the bearings with a bearing puller.
8. It is generally advisable to replace ring seals when rebuilding unit. To replace, remove the drive gear bearing with a bearing puller and remove ring seal from the bottom of bearing bore.
9. Grip the shaft end cover in a vise with the mounting face down. Remove double lip seal by inserting a screwdriver into the notch between the double lip seal and the shaft end cover. Tap the seal out and discard.

MOTOR ASSEMBLY

1. Stone off all machined surfaces with a medium grit carborundum stone.
2. If bearings have been removed, deburr bearing bores. Rinse parts in a solvent. Air blast all parts and wipe with a clean lintless cloth before starting assembly.
3. Grip shaft end cover in vise with mounting face down. Examine plug or 2 check valves to be sure they're tightly in place. Replacement is necessary only if parts are damaged. Remove with screwdriver.
4. If plug or check valves are being replaced, screw in new parts tightly. Stake plug with prick punch at both ends of screwdriver slot and around edges. Screw check valves in tightly with tool. Peen edge of hole 1/32" to 1/16" with 1-1/2" diameter steel ball.
5. If ring seals are being replaced, insert into bottom of drive gear bearing bore. The notch in the ring seal **MUST BE VISIBLE**. This is a check to be certain the notched side is next to the bearing.
6. If any bearings have been removed from the shaft end cover or port end cover, replace the bearings by pressing them into the bearing bore with an arbor press.

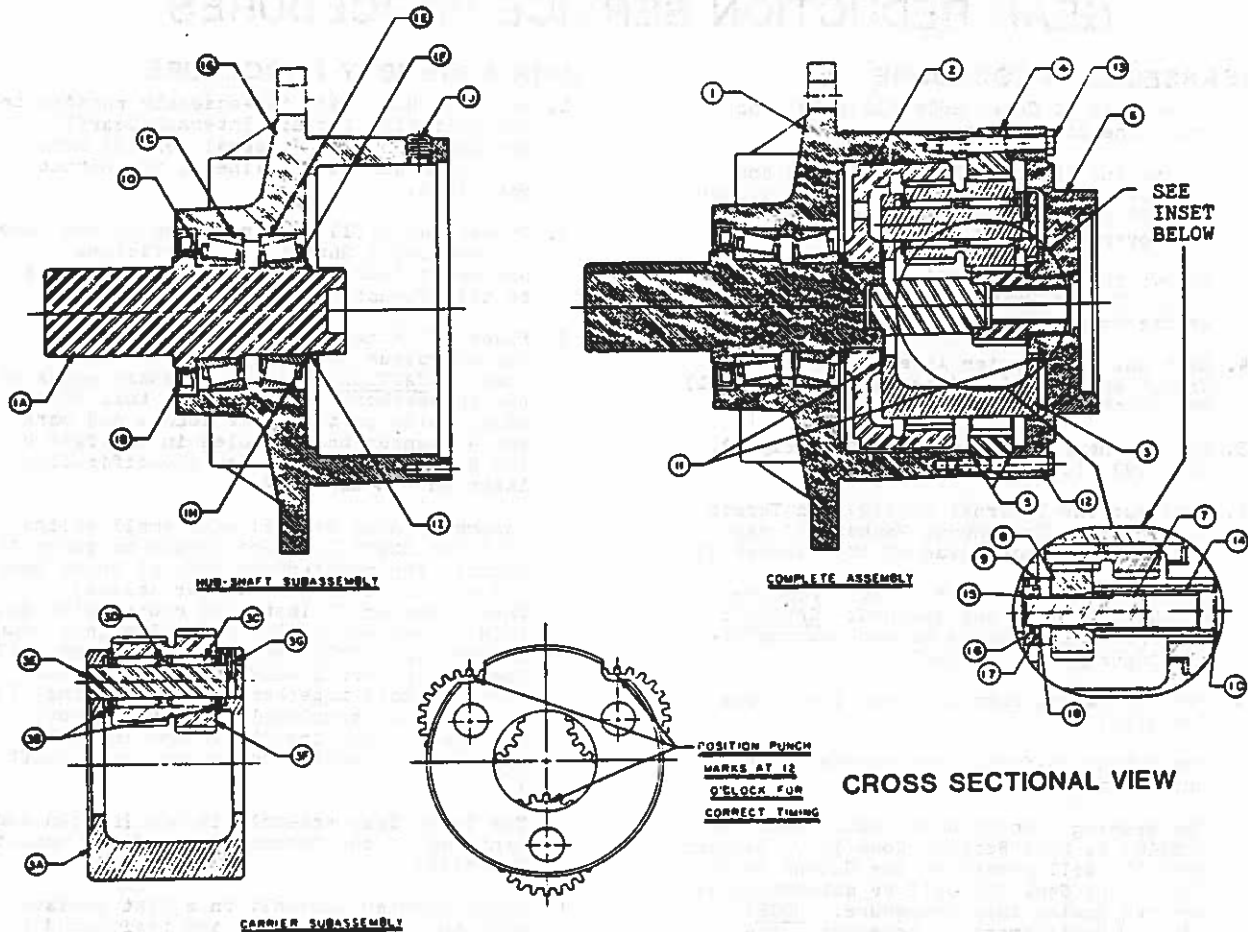
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MODELS 23000B, 27000B, 32000B HYDRAULIC MOTOR SERVICE PROCEDURES

(...continued from previous page)

7. Before inserting a new lip seal in the shaft end cover, coat the outer edge of the lip seal and its recess with Permatex Aviation Form-A-Gasket No. 3 Non-hardening Sealant or equivalent. With the metal side of the lip seal up, press it into the mounting flange side of the shaft end cover with an arbor press and bar. Do not attempt to bottom-out seal; press in only until it is flush with the face of the recess. Wipe off surplus sealant.
8. Check all thrust plates for wear. Replace if necessary.
9. Grip the shaft end cover in a vise with the mounting face down. Cut 2 pocket seals 7/32" long from the pocket seal strip. Grease these pocket seals well and insert them into the middle slots on the reverse side of the thrust plate.
10. With the pocket seals facing down, place the thrust plate over the bearings in the shaft end cover. Tap thrust plate with a soft hammer to about 1/32" from the machined surface.
11. Cut 4 pocket seals approximately 1/4" long from the pocket seal strip. Grease the pocket seals well and insert one pocket seal into each of the slots in the thrust plate. Push each pocket seal all the way in so that it touches the roller bearings. Tap the thrust plate down firmly against the machined surface with a soft hammer. Use a sharp razor blade to trim exposed end of the pocket seal square and flush with the thrust plate.
12. Apply masking tape to splines on drive shaft to prevent seal damage. Lightly grease the drive shaft. Insert the integral gear and drive shaft into the shaft end cover with a twisting motion. Be careful not to damage the double lip seal. Push down carefully until the gear rests against the thrust plate. Insert the driven gear.
13. Grease the new gasket seals and insert them into the grooves in both sides of all gear housings. Examine all dowel pins. Before inserting a pin, make certain the hole is clean and free from burrs. Start pin into hole gently and straight, tapping lightly with a soft hammer.
14. Slide the gear housing over the gears and tap it with a soft hammer until it rests tightly against the shaft end cover. Be careful not to pinch the gasket seal. Squirt oil over the gears to provide initial lubrication when pump is started. Line up the dowels with the matching holes. When parts are parallel, squeeze them together or gently tap alternately over dowels with a plastic hammer until the parts become parallel and move smoothly together. Do not force.
15. Place the port end cover over the gear journals and tap tightly against the gear housing. Be careful not to pinch the gasket seal. Align the dowels with the holes in the mating casting. Being careful not to pinch the gasket seal, tap the port end cover lightly in the center between bearing bores to engage the dowels and to move parts together in final seating.
16. Thread the 4 fasteners into the shaft end cover and tighten alternately or cross-corner. Rotate the drive shaft with a 6" wrench to make certain there is no binding in the pump.
17. After the fasteners are tight and you are sure there is no internal binding, torque the diagonally opposite fasteners to 200 ft. lbs. (2400 in. lbs.).

MODELS 23000B, 27000B, 32000B PLANETARY GEAR REDUCTION ASSEMBLY



MODELS 23000B, 27000B, 32000B PLANETARY GEAR REDUCTION PARTS LIST

WHEN ORDERING PARTS PLEASE PROVIDE THE FOLLOWING:

- (a) McMillen Model # _____
- (b) Planetary Model # _____
- (c) Planetary Serial # _____

(Items b & c are found on metal tag rivited to item #6 Cover)

REP. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1A	87-A3-301	2" Round Output Shaft	1
1A	87-A3-341	2" Hex Output Shaft	1
1B	87-A3-302	Seal	1
1C	87-A3-303	Bearing Cup	1
1D	87-A3-304	Bearing Cone	1
1E	87-A3-305	Bearing Cup	1
1F	87-A3-306	Bearing Cone	1
1G	87-A3-307	Hub	1
1H	87-A3-308	Spacer	1
1I	87-A3-309	Retaining Ring	1
1J	87-A3-310	Pipe Plug	3
2	87-A3-311	Internal Gear	1
3A	87-A3-313	Carrier	1
3B	87-A3-314	Thrust Washer	6
3C	87-A3-315	Needle Roller	96
3D	87-A3-316	Spacer	3
3E	87-A3-317	Planet Shaft	3

REP. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
3F	87-A3-318	Clueter Gear	3
3G	87-A3-319	Roll Pin	3
4	87-A3-320	Ring Gear	1
5	87-A3-321	"O" Ring	2
6	87-A3-322	Cover	1
7	87-A3-332	Input Shaft	1
8	87-A3-333	Input Gear	1
9	87-A3-334	Thrust Spacer	1
10	87-A3-335	Thrust Washer	1
11	87-A3-326	Thrust Washer	2
12	87-A3-327	Bolt	8
13	87-A3-328	Shoulder Bolt	4
14	87-A3-336	Coupling	1
15	87-A3-337	Retaining Ring	1
16	87-A3-338	Thrust Washer	1
17	87-A3-339	Thrust Bearing	1
19	87-A3-340	Thrust Washer	1

MODELS 2300B, 2700B, 3200B PLANETARY GEAR REDUCTION SERVICE PROCEDURES

DISASSEMBLY PROCEDURE

1. Loosen all 12 Cover Bolts(12)&(13) and drain the oil from the unit.
2. Remove the 12 Cover Bolts(12)&(13) and lift off the Cover(6). Remove and discard the "C" Ring(5) from the counterbore of the Cover(6).
3. Remove the Coupling(14) and Thrust Washer(10). Thrust Washer(10) may stick to Counterbore in Cover(6).
4. Lift out the Carrier Assembly(3) and top Thrust Washer(11). This Thrust Washer(11) may stick to the inside of the Cover(6).
5. Remove Input Shaft and Gear Assembly(7), (8), (9), (15), (16), and (17).
6. Lift out the Internal Gear(2) and Thrust Washer(11). The Thrust Washer(11) may stick to the under side of the Carrier(3).
7. Remove the Retaining Ring(11) from the Output Shaft(1A) and discard. **CAUTION:** Eye Protection should be worn during Retaining Ring(11) removal.
8. Remove Bearing Shim(1H) from the Output Shaft(1A).
9. The Output Shaft(1A) may now be pressed out of the Hub(1G).
10. The Bearing Cups(1C)&(1E) will remain in Hub(1G) as will Bearing Cone(1F). Bearing Cone(1D) will remain on the Output Shaft(1A). The Seal(1B) will be automatically removed during this procedure. **NOTE:** If Bearing replacement is necessary, the Bearing Cups can be removed with a slide hammer puller or driven out with a punch.
11. To remove the Cluster Gears(3F) from the Carrier(3A), drive the Anti-roll Pin(3G) into the Planet Shaft(3E). The Planet Shaft(3E) may now be tapped out of the Carrier. After Planet Shaft(3E) has been removed the Roll Pin(3G) can be driven out.
12. The Cluster Gear(3F) can now be removed from the Carrier(3A). The Thrust Washers(3B) will be removed with the Cluster Gear(3F).
13. The Needle Rollers(3C) and Spacer(3D) are now removed from the Cluster Gear(3F).

WARNING: When rebuilding or repairing the unit, the Retaining Ring(11), "O" Rings(5) and Seal(1B) should ALWAYS be replaced.

MAIN ASSEMBLY PROCEDURE

1. With the Hub Shaft Sub-assembly resting on the Shaft(1A) install Internal Gear(2). The Spline of the Internal Gear(2) bore will mesh with the Spline of the Output Shaft(1A).
2. Thrust Washer(11) is installed on the face of the Output Shaft(1A). Sufficient Grease or Petroleum Jelly should be used to hold Thrust Washer(11) in place.
3. Place "C" Ring(5) into Hub counterbore. Use petroleum jelly to hold "O" Ring in place. **CAUTION:** Beware of sharp edges of the counterbore while seating this "O" Ring. Also at this time locate and mark the 4 counter beamed holes in the face of the Hub(1G). This is for identification later in the assembly.
4. Assemble Input Gear(8) onto small spline of Input Shaft(7) [care should be taken to install the counterbore side of Input Gear(8) up, or to large diameter spline], Thrust Spacer(9) installed counterbore out, thin Thrust Washer(18) installed into counterbore out, followed by Thrust Bearing(17), then thick Thrust Washer(16). To hold this assembly together, Retaining Ring(15) is installed completely into the groove provided. Coupling(14) is now installed onto large diameter spline of Input Shaft(7).
5. The Input Gear assembly is now located and centered on the internal end of the Output Shaft(1A).
6. Place Carrier Assembly on a flat surface with the large gears up and positioned as shown. Find the punch marked tooth on each large gear and locate at 12 o'clock (straight-up) from each planet pin. Marked tooth will be located just under the Carrier on upper two gears.
7. With shoulder side of Ring Gear(4) facing down, place Ring Gear over (into mesh with) large gears. Be sure that punch marks remain in correct location during Ring Gear installation. The side of the Ring Gear with an "X" stamped on it should be up.
8. While holding Ring Gear(4) and Cluster Gears(3F) in mesh, place small side of Cluster Gears(3F) into mesh with the Internal Gear(2) and Input Gear(8). On the Ring Gear locate the hole marked "X" over one of the marked counterbored holes (Step 3) in Hub(1G). **NOTE:** If gears do not mesh easily or Carrier Assembly does not rotate freely, then remove the Carrier and Ring Gear and check the Cluster Gear timing.

continued to next page.....

MODELS 23000B, 27000B, 32000B PLANETARY GEAR REDUCTION SERVICE PROCEDURES

(.....continued from previous page)

9. Thrust Washer(10) is installed onto the Input Gear(8) and should locate on the gear teeth shoulder.
10. Thrust Washer(11) is installed into the counterbore of the Carrier(3).
11. Place "O" Ring(5) into Cover(6) counterbore. Use petroleum jelly to hold "O" Ring in place. **CAUTION:** Beware of sharp edges of the counterbore while seating this "O" Ring.
12. The Cover(6) is now installed on this assembly. Taking care to correctly align Pipe Plug hole(20) with those in the Hub(1J), usually 90° to one another. Locate the 4 counterbore holes in Hub(1G) [marked in Step 3] and install 4 shoulder Bolts(13). A slight tap with a hammer may be necessary to align Shoulder Bolt with Hub(1G) counterbore.
13. Install regular Grade 8 Bolts(12) into remaining holes.
14. Pipe Plugs(20) are to be installed into Cover(6) using a lubricant seal of some sort.
15. Torque Shoulder Bolts(13) to 23-27 ft.-lbs. and regular Grade 8 Bolts(12) to 23-27 ft.-lbs.

This completes the assembly. The unit must be filled with 2 fluid pints of EP 90 lubricant before operation.

HUB SHAFT SUB-ASSEMBLY

1. Press Bearing Cone(1D) onto Shaft(1A).
2. Press Bearing Cup(1C) into Hub(1G) taking care to insure cup start square with the bore of Hub(1G).
3. Invert Hub(1G) and press Bearing Cup(1E) into intercounterbore of Hub(1G).
4. Returning the Hub(1G) to locate on the large diameter end, the Output Shaft(1A) is carefully installed into the Hub(1G).
5. The Shaft Seal(1B) is installed over the Output Shaft(1A) and into the counterbore of the Hub(1G). Care should be taken to insure the Seal(1B) is being correctly installed (smooth face UP and located just flush with the counterbore face).
6. The Bearing Cone(1F) is an interference fit and has to be pressed or tapped on.
7. Pipe Plugs(1J & 1K) should be checked and/or installed at this time in the assembly.

8. Bearing Spacer(1H) is installed around the Output Shaft(1A) and locates on Bearing Cone(1F).
9. Retaining ring(1I) installed into the groove provided in the Output Shaft(1A). This Retaining Ring(1I) should never be reused in a repair or rebuild. **CAUTION:** Eye protection should be worn during this procedure.
10. A soft metal punch should be used to insure that this Retaining Ring(1I) is completely seated in the groove of the Output Shaft(1A). **CAUTION:** Eye protection should be worn during this procedure.
11. Upon completion of Step 10, rap the internal end of the Output Shaft(1A) twice with a piece of soft metal rod. This will release the preload which was on the Bearings.

This completes the Hub Shaft Sub-Assembly - Items(1A) through (1J). If this assembly is not going to be used right away, it should be oiled and covered to help prevent rusting.

CARRIER SUB-ASSEMBLY

1. Apply a coat of grease or petroleum jelly to Cluster Gear bore.
2. Place sixteen Needle Rollers into Cluster Gear bore.
3. Place Spacer washer into opposite side of Cluster Gear and against Needle Rollers.
4. Place second set of sixteen Needle Rollers into Cluster Gear.
5. Apply grease or petroleum jelly to the tang side of two Thrust Washers. Place Thrust Washers against bosses in Carrier with Washer tang fitting into slot in Carrier outside diameter. **NOTE:** Some old style Carriers will not have slots and tangs should be located inside boss relief.
6. While keeping Thrust Washers in place, slide Cluster Gear into Carrier with the larger gear on the side with the small pin hole.
7. Line up Cluster Gear and thrust Washers with hole in Carrier and slide Planet Shaft through. Line up chamfered side of hole in Planet Shaft with pin hole in Carrier.
8. Drive Anti-Roll Pin flush into Carrier hole, thereby locking Planet Shaft into place.

Repeat these steps for remaining two Cluster Gears to complete Carrier Sub-Assembly.

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MAINTENANCE

- CLEAN HYDRAULIC OIL IS ESSENTIAL!** 80% of all hydraulic component failures are caused by contamination of the hydraulic oil. Always keep all dirt and other contaminants from entering hydraulic system during disconnect and connect operations. Always use dust caps and plugs on all quick disconnects when not in use. Tightly cap all hydraulic openings to hold oil in and keep dirt and other contaminants from entering hydraulic system.
- Check hydraulic oil daily for contamination. If contamination is present, determine the source of the contamination and correct the problem.
- Inspect all hydraulic hose assemblies daily. Replacement of hoses before failure will prevent loss of hydraulic oil, time consuming "bleeding" of the system, hydraulic oil contamination, and component damage caused by cavitation. It will also reduce the chance of personal injury from hot hydraulic oil.
- Inspect all hydraulic hose assemblies daily for cracked and brittle covers caused by excessive heat. Reduced viscosity of hydraulic oil occurs at higher operating temperatures and causes a breakdown of fluid additives such as wear inhibitors. Excessive heat will cause higher internal leakage in diggerhead motor which will make the diggerhead run less efficient. It can also cause seals in the diggerhead motor to become brittle and crack.
- Check auger daily for loose, worn, or broken cutting teeth and point. Worn teeth or point can drastically affect auger penetration and greatly reduce auger life expectancy. Always keep spare teeth and points on hand. Some digging conditions may require checking teeth and point at more frequent intervals.
- Check diggerhead and all accessories daily for loose or worn bolts and fasteners. Always use grade 5 or harder replacement bolts. Always use lockwashers with standard hex nuts or self locking nuts.
- When using digger in extremely cold winter temperatures, start vehicle engine, activate digger control valve so auger is rotating. Allow auger to rotate until hydraulic fluid reaches it's normal operating temperature. Never allow hydraulic fluid which has reached it's normal operating temperature to circulate through diggerhead motor as thermal shock may occur, causing severe internal damage to the diggerhead motor.
- FOR MODELS 13000 & 18000 ONLY.** Change planetary gear reduction oil after first 50 hours of operation, then every 1000 hours of operation or in one year, whichever occurs first. Use 1-1/2 fluid pints of a EP 90 weight gear oil. NOTE: Detection of hydraulic oil in planetary gear reduction would indicate a blown motor seal which must be replaced. See Models 3000PB, 4800PB, 8000PB, 13000, 18000 Hydraulic Motor Parts List and Service Procedures for part number and replacement instructions of seal.
- FOR MODELS 23000B, 27000E, & 32000B ONLY.** Change planetary gear reduction oil after first 50 hours of operation, then every 1000 hours of operation or in one year, whichever occurs first. Use 2 fluid pints of a EP 90 weight gear oil. NOTE: Detection of hydraulic oil in planetary gear reduction would indicate a blown motor seal which must be replaced. See Models 23000B, 27000B, 32000B Hydraulic Motor Parts List and Service Procedures for part number and replacement instructions of seal.
- When storing diggerhead for any length of time be sure diggerhead motor and hoses are full of clean hydraulic oil. **FOR MODELS 13000, 18000, 23000B, 27000B, & 32000B only,** also be sure planetary gear reduction is full (to the recommended capacity for each model) of clean EP 90 weight gear oil.
- Diggerhead output shaft, inside of auger drive collar, variable auger extension shaft, and inside of variable auger extension drive collar should be coated liberally with grease, as required, to prevent rusting.
- Once paint has been worn off of auger, coat liberally with grease, as required, to prevent rusting.

SPECIFICATIONS

TORQUE SPECIFICATIONS								SPEED SPECIFICATIONS													
TORQUE SPECIFICATIONS SHOWN IN INCH POUNDS. DIVIDE BY 12 TO CONVERT TO FOOT POUNDS.								MAXIMUM AUGER RPM FOR GPM INPUT SHOWN. SLOWER & FINITE SPEED CONTROL POSSIBLE BY LOWERING ENGINE RPM AND/OR FEATHERING HYDRAULIC CONTROL VALVE.													
FOR PSI'S NOT SHOWN, MULTIPLY THIS FIGURE BY YOUR PSI TO DETERMINE TORQUE (IE: 1.88 x 2300 PSI = 4325 INCH POUNDS OF TORQUE).								FOR GPM'S NOT SHOWN, MULTIPLY THIS FIGURE BY YOUR GPM TO DETERMINE AUGER SPEED (IE: 18.61 x 8 GPM = 149 RPM).													
MODEL NUMBER	MAXIMUM AUGER DIAMETER APPROVED	1 PSI	1800 PSI	2300 PSI	2900 PSI	3600 PSI	MAXIMUM PSI APPROVED	1 GPM	SHOWN GPM APPROVED	MAXIMUM GPM APPROVED	5 GPM	10 GPM	15 GPM	20 GPM	25 GPM	30 GPM	35 GPM	40 GPM	50 GPM	60 GPM	70 GPM
3000PB	9"	1.88	2820	3760	4700	5640	3000	19.61	4	6	76	-	-	-	-	-	-	-	-	-	-
4800PB	12"	2.83	4245	5660	7075	8490	3000	13.04	6	12	-	130	-	-	-	-	-	-	-	-	-
8000PB	24"	4.62	6930	9240	11550	13860	3000	7.97	6	20	-	80	120	160	-	-	-	-	-	-	-
13000	36"	8.03	12045	16060	20075	24090	4000	4.56	14	25	-	-	69	92	115	-	-	-	-	-	-
18000	36"	11.68	17520	23360	29200	35040	3000	3.15	16	30	-	-	-	63	79	95	-	-	-	-	-
23000B	42"	13.87	20505	27340	34175	41010	3000	2.89	25	50	-	-	-	-	67	81	94	108	135	-	-
27000B	42"	15.63	23445	31260	39075	-	2800	2.35	26	55	-	-	-	-	-	71	82	94	118	-	-
32000B	48"	17.59	26385	35180	-	-	2300	2.09	30	70	-	-	-	-	-	63	73	84	105	125	145

McAllen reserves the right to change its products or their specifications at any time without notice or obligation.

TRUBLE-SHOOTING CHECKLIST

If your McMillen Diggerhead does not appear to have enough speed or power, use the following checklist to solve the problem.

Any hydraulic tool will perform only as well as the hydraulic system supplying it. Digger speed (RPM) is dependent upon the system pump output in gallons per minute (GPM). Digger torque (power) is dependent upon the relief valve pressure setting (PSI).

1. Pressure relief valve setting (PSI). See note below for correct procedure to follow to check pressure.
2. Hydraulic pump output (GPM). See note below for correct procedure to follow to check pump output.

NOTE: To check pressure relief valve setting (PSI) and hydraulic pump output (GPM), install a combination flow and pressure gauge test unit in the line supplying the diggerhead with oil. Test unit must be installed beyond all valves and quick disconnects in order to get a true reading at the head. It is imperative that the flow meter gauge be monitored closely as the digging operation progresses. The hydraulic system flow (GPM) should remain the same and not drop off all the way up to the stall pressure (PSI).

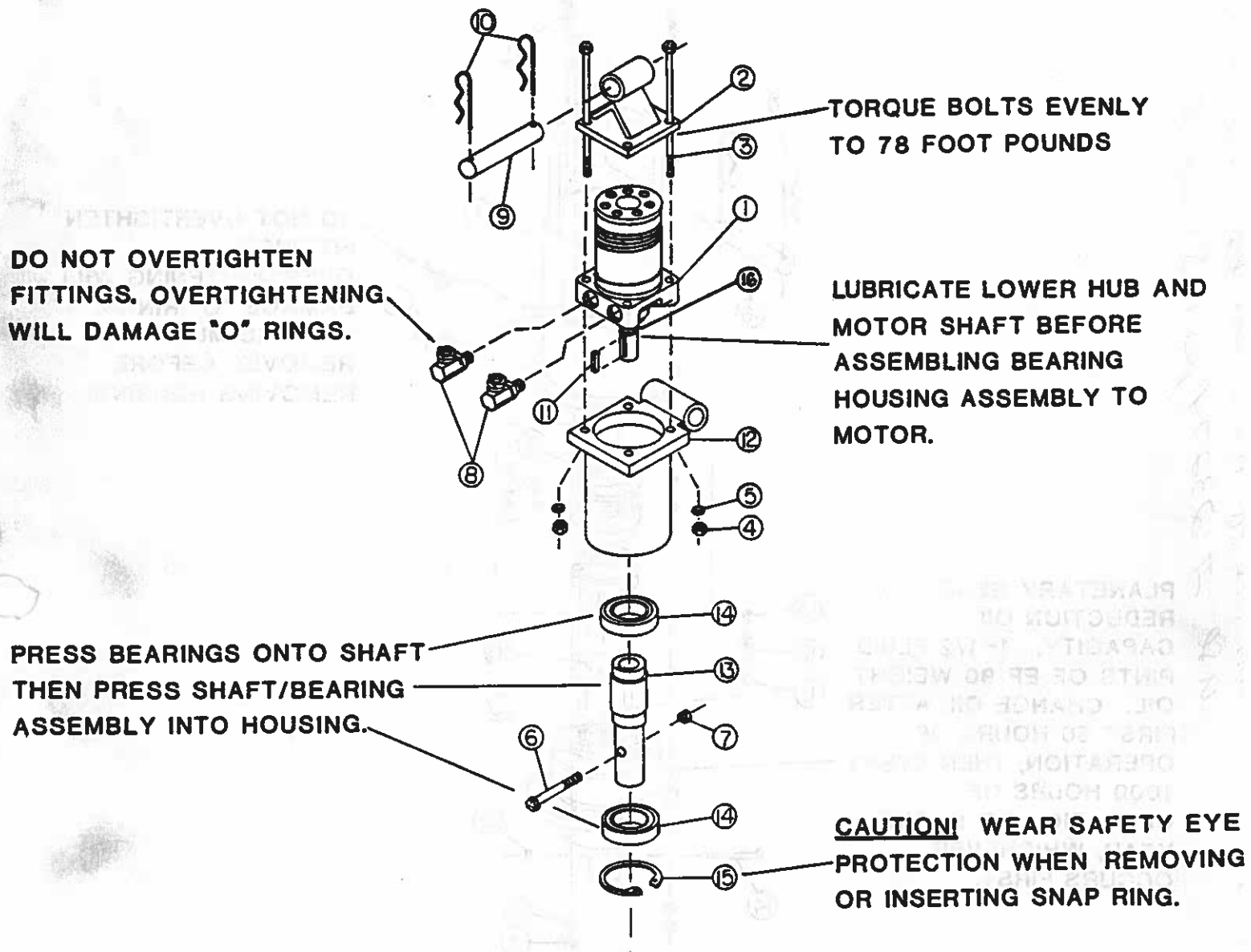
3. Check auger and teeth for excessive wear. A worn or tapered auger or worn or rounded cutting teeth and point will drastically reduce the auger's ability to penetrate the ground.
4. Are there any hydraulic line restrictions? Smaller than recommended valve and hose sizes, dirty or clogged filters, and faulty quick disconnects are examples of line restrictions that will affect diggerhead performance.
5. Is the oil heating excessively? If it is this will cause the diggerhead to perform less efficient. Line restrictions (see #4), insufficient reservoir size to pump output ratio, oil passing over relief valve frequently, low level of oil in reservoir, and dirty oil are all conditions which will cause oil to overheat.
6. Oil leaking from motor? If so, this will affect performance of diggerhead. Replace motor seals to correct the problem.

If the items do not resolve your problem please contact our service department as follows:

CONTINENTAL U.S. (EXCEPT INDIANA) (800)348-0964
INDIANA, ALASKA, HAWAII, CANADA (219)747-6195

MODELS 3000PB, 4800PB, 8000PB DIGGERHEAD ASSEMBLY & PARTS LIST

3000PB(#86-A1-35AB), 4800PB(#86-A1-35BB), 8000PB(#86-A1-35CB)

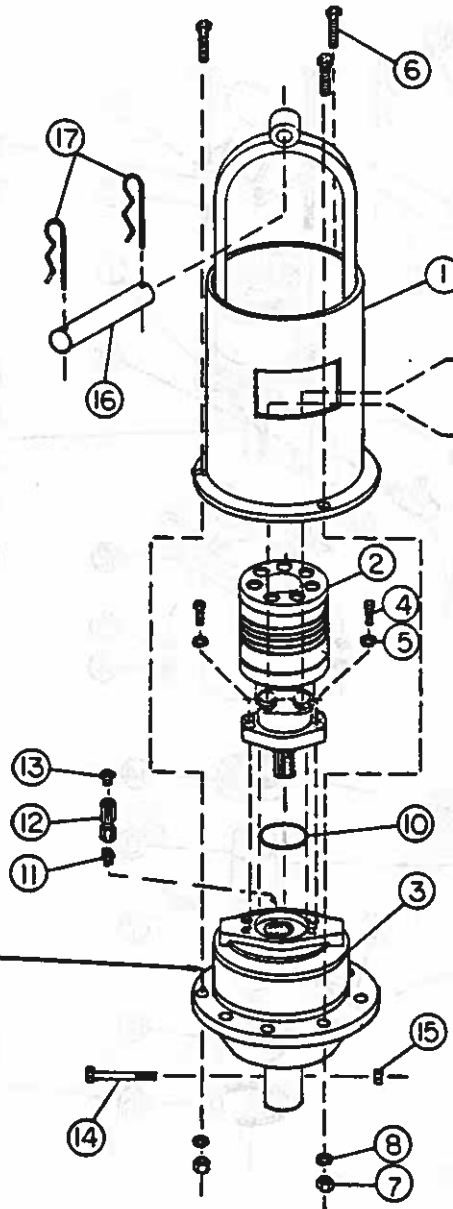


REP. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	81-P1-7A	3000PB Motor Only	1
1	81-P1-8A	4800PB Motor Only	1
1	81-P1-9A	8000PB Motor Only	1
2	80-M1-97	Motor Mount	1
3	85-P1-50	1/2"-13 x 8" Grade 5 Bolt (Model 3000PB Only)	4
3	85-P1-78	1/2"-13 x 8-1/2" Grade 5 Bolt (Model 4800PB Only)	4
3	85-P1-79	1/2"-13 x 9" Grade 5 Bolt (Model 8000PB Only)	4
4	85-P1-15	1/2" Nut	4
5	85-P2-32	1/2" Lockwasher	4

REP. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
6	85-P2-17	5/8"-11 x 3-1/2" Grade 5 Bolt	1
7	85-P2-18	5/8" Nut	1
8	88-P1-105	90 Degree "O" Ring Fitting	2
9	85-M2-17	1-1/4" Ø x 6" Long Pin	1
10	85-P1-37	1-1/4" Pin Clip	2
11	81-A3-636	Motor Shaft Key	1
12	80-M1-43	Bearing Housing	1
13	83-M1-44L	Output Shaft	1
14	84-P1-60	Bearing	2
15	85-P1-61	Snap Ring	1
16	81-A3-640	Snap-Ring(Motor Shaft)	1

MODELS 13000, 18000 DIGGERHEAD ASSEMBLY & PARTS LIST

13000(#86-A2-27), 18000(#86-A2-28)
 (86-A2-27-H2, 86-A2-28-H2 WITH HEX OUTPUT SHAFT)



DO NOT OVERTIGHTEN FITTINGS. OVERTIGHTENING WILL DAMAGE 'O' RINGS. FITTINGS MUST BE REMOVED BEFORE REMOVING HOUSING.

PLANETARY GEAR REDUCTION OIL CAPACITY: 1-1/2 FLUID PINTS OF EP 90 WEIGHT OIL. CHANGE OIL AFTER FIRST 50 HOURS OF OPERATION, THEN EVERY 1000 HOURS OF OPERATION OR IN ONE YEAR, WHICHEVER OCCURS FIRST.

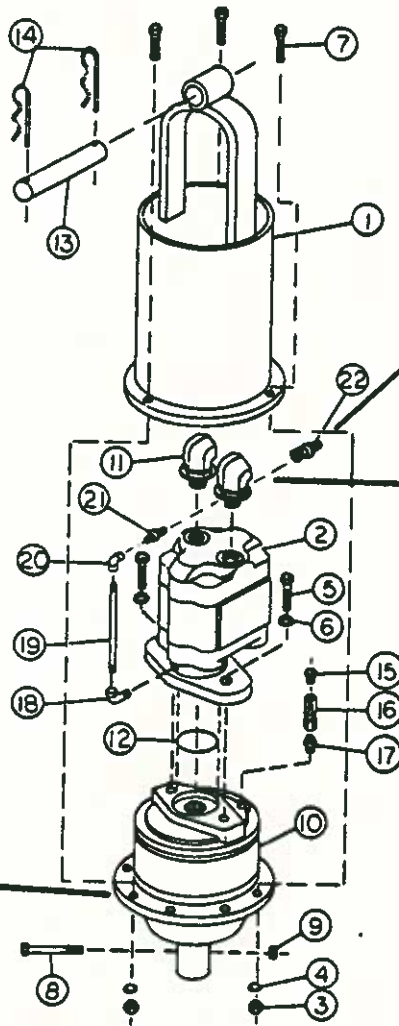
Full # 13 & 18 parts list # 11 u m per no longer available by use # 23274 per Steve A

REP. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	80-M2-22C	Housing	1
2	81-P2-187A	13000 Motor Only	1
2	81-P2-188A	18000 Motor Only	1
3	87-P2-7B	Planetary Gear Reduction (for round output shafts)	1
3	87-P2-7B-H2	Planetary Gear Reduction (for hex output shafts)	1
4	85-P2-19	1/2"-13 x 1-1/2" Grade 5 Bolt	4
5	85-P2-32	1/2" Lockwasher	4
6	85-P2-203	9/16"-12 x 2" Grade 5 Bolt	3
7	85-P2-14	9/16" Nut	3
8	85-P2-15	9/15" Lockwasher	3
9	88-P1-111	45 Degree "O" Ring Fitting	2

REP. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
10	88-P2-192	"O" Ring	1
11	88-P2-101	1/4" Hex Nipple	1
12	88-P2-100	5 Pound Check Valve	1
13	88-P2-93A	Bronze Breather Vent	1
14	85-P2-17	5/8"-11 x 3-1/2" Grade 5 Bolt (for round output shafts)	1
14	85-P1-92	1/2"-13 x 4" Grade 5 Bolt (for hex output shafts)	1
15	85-P2-18	5/8" Nut (for round shafts)	1
15	85-P1-15	1/2" Nut (for hex shafts)	1
16	85-M2-17	1-1/4" Ø x 6" Long Pin	1
17	85-P1-37	1-1/4" Pin Clip	2

MODELS 23000B, 27000B, 32000B DIGGERHEAD ASSEMBLY & PARTS LIST

23000B(≠86-A2-6B), 27000B(≠86-A2-5B), 32000B(≠86-A2-173B)
 (86-A2-6B-H2, 86-A2-5B-H2, 86-A2-173B-H2 WITH HEX OUTPUT SHAFT)



THIRD DRAIN LINE MUST RETURN UNRESTRICTED TO HYDRAULIC RESERVOIR. SEE INSTALLATION INSTRUCTIONS.

DO NOT OVERTIGHTEN FITTINGS. OVERTIGHTENING WILL DAMAGE 'O' RINGS.

PLANETARY GEAR REDUCTION OIL CAPACITY: 2 FLUID PINTS OF EP 90 WEIGHT OIL. CHANGE OIL AFTER FIRST 50 HOURS OF OPERATION, THEN EVERY 1000 HOURS OR IN ONE YEAR, WHICHEVER OCCURS FIRST.

REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1	80-M2-22A	Housing	1
2	81-P2-182	23000B Motor Only	1
2	81-P2-183	27000B Motor Only	1
2	81-P2-184	32000B Motor Only	1
3	85-P2-14	9/16" Nut	3
4	85-P2-15	9/16" Lockwasher	3
5	85-P2-19	1/2"-13 x 1-1/2" Grade 5 Bolt	2
6	85-P2-32	1/2" Lockwasher	2
7	85-P2-203	9/16"-12 x 2" Grade 5 Bolt	3
8	85-P2-17	5/8"-11 x 3-1/2" Grade 5 Bolt (for round shafts)	1
8	85-P1-92	1/2"-13 x 4" Grade 5 Bolt (for hex shafts)	1
9	85-P2-15	5/8" Nut (for round shafts)	1
9	85-P1-15	1/2" Nut (for hex shafts)	1
10	87-P2-7A	Planetary Gear Reduction (for round shafts)	1

REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
10	87-P2-7A-M2	Planetary Gear Reduction (for hex shafts)	1
12	88-P2-185	90° 'O' Ring Fitting	2
12	88-P2-16	'O' Ring	1
13	85-M2-17	1-1/4" ø x 6" Long Pin	2
14	85-P1-37	1-1/4" Pin Clip	2
15	88-P2-93A	Bronze Breather Vent	2
16	88-P2-100	5 Lb. Check Valve	1
17	88-P2-101	1/4" Hex Nipple	1
18	88-P2-189	1/4" 90° Street El	1
19	88-P2-193	1/4" ø 6" Long Nipple	1
20	88-P2-194	1/4" Elbow	1
21	88-P2-195	Connector/Adaptor Fitting	1
22	88-P2-196	Female Swivel To Hose Fitting	1

PARTS AND ACCESSORIES

McMILLEN VARIABLE / SELF STORING AUGER EXTENSION SYSTEM

VARIABLE EXTENSIONS ...



are self-storing inside auger tube * Adds only 6" when in stored position Various collars permit McMillen Augers to fit most competitive diggerheads May be coupled together for deeper holes

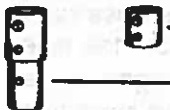
*12 dia. augers and over

For McMillen Diggerheads

For competitive diggerheads

EFFECTIVE EXTENSION LENGTH	LENGTH ADDED TO AUGER WHEN STORED	EXTENDABLE IN INCREMENTS OF:	USE PREFIX 82-A1- ON ALL PART NUMBERS SHOWN BELOW							
			ROUND DRIVES		SQUARE DRIVES		HEX DRIVES			
			2"	2 1/2"	2"	2 1/2"	2"	2 1/4"	2 1/2"	2 3/4"
6"	6"	8"	40B	44B	76B	77B	71B	73B	74B	75B
12"			40D	44D	78D	77D	71D	73D	74D	75D
18"			40E	44E	76E	77E	71E	73E	74E	75E
24"			40A	44A	78A	77A	71A	73A	74A	75A
48"	30"	12"	40	44	76	77	71	73	74	75
72"			40C	44C	76C	77C	71C	73C	74C	75C

ADAPTORS FOR McMILLEN DIGGERHEADS TO OTHER COMPETITIVE AUGERS



TYPE	APPLICATION	PART NUMBERS TO ADAPT TO:	
		2 1/4" I.D. COLLAR	2" HEX COLLAR
Collar	For field welding to existing auger *	83-M1-94A	83-M1-94A
Extension	Adds about 6" to auger	83-M1-99	83-M1-213

*Adapts any competitive Auger to McMillen Diggerheads.

PENGO BORING HEADS FOR FIELD WELDING TO EXISTING AUGER includes teeth & fishtail point



HEAD DIA.	NO. OF TEETH	PART NUMBER	HEAD DIA.	NO. OF TEETH	PART NUMBER
4"	None*	82-A2-26	18"	6	82-A2-36
6"	2	82-A2-59	24"	8	82-A2-85
9"	4	82-A2-33	30"	10	82-A2-86
12"	4	82-A2-34	36"	12	82-A2-87
15"	6	82-A2-35	42"	14	82-A2-194
			48"	16	82-A2-195

*Uses bolt-on point.

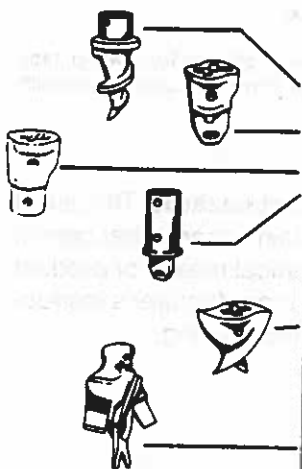
REPLACEMENT TEETH NOTE: The design style (offset-bolt on) of McMillen teeth permit using them as replacement teeth for many competitive augers.



TOOTH TYPE	PART NUMBER	STYLE		DESCRIPTION	SURFACE HARDNESS	SUGGESTED DIGGING APPLICATIONS
		McMILLEN*	PENGO†			
Hardened	82-F1-51	•		Heat treated to 52 RC	52 RC	Normal-rocky
Hard Faced	82-F1-52	•		Above plus electrode hardfaced	63 RC	Frozen-abrasive-rocky
Carbide Faced	82-F1-53	•		52 RC base plus carbide hardfaced	70 RC	Frozen-extreme abrasive
Hardened	82-P2-12		Wisdom	Heat treated to 52 RC	52 RC	Normal-rocky
Hard Faced	82-P2-12HF		Wisdom	Above plus electrode hardfaced	63 RC	Frozen-abrasive-rocky
Hardened	82-P2-21		Chisel	Heat treated to 52 RC	52 RC	Caliche-sandstone & hardpan soils
Hard Faced	82-P2-21HF		Chisel	Above plus electrode hardfaced	63 RC	
Carbide Inserts	82-P2-25		Flat	52 RC base plus carbide inserts	63 RC	Frozen-extreme abrasive
Hardened	82-P2-12ST		Split	Heat treated to 52 RC	52 RC	Fits Tooth Pilot 82-P-35

*McMillen teeth include hardened bolt, nut & lock washer. †Pengos teeth include rubber insert replacement.

REPLACEMENT POINTS AND EXTENSION ADAPTORS All Points include bolt, nut & lockwasher



STYLE	PART NUMBER	HEAD STYLE		APPLICATION
		McMILLEN	PENGO	
Screw	82-M1-4	•		For all H.D. & STD. Augers
	82-M1-4HF	•		Same as above plus Carbide Hardfaced
Extension	82-P2-22		•	2 1/4" Extension for Fishtail or Tooth Pilots
Adaptors	82-M1-209		•	Adapts Screw Point to Fishtail applications
	82-M1-212	•		Adapts Fishtail to Screw Point applications
Fishtail	82-P2-13	•	•	For Augers with Pengo Head (3 1/2" dia.)
	82-P2-13HF	•	•	Same as above plus Electrode Hardfaced
	82-P2-13C	•	•	Same as 82-P2-13 plus Carbide Chips
	82-A2-26	•		For 4" STD-PH, all XHD plus 24" thru 48" HD Augers (4 1/2" Dia.)
	82-A2-26HF	•	•	Same as above plus Electrode Hardfaced
Tooth Pilot	82-A2-26C	•	•	Same as 82-P2-26 plus Carbide Chips
	82-P-35	•	•	Adapts to all McMillen Augers for pre-cut and easier digging

McMILLEN HOLE TOP SWEEP

#82-A2-100A

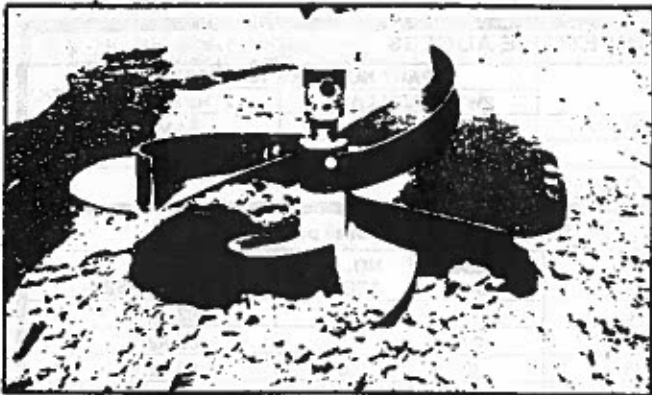
24" DIAMETER

FITS AUGERS 4" THRU 9" DIA.

#82-A2-100B

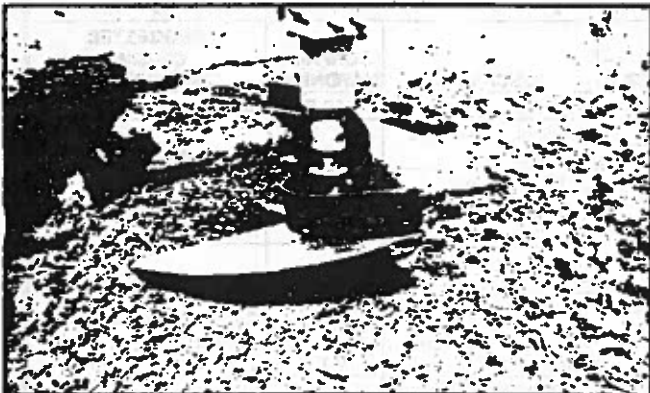
36" DIAMETER

FITS AUGERS 12" THRU 30" DIA.



The McMullen Hole Top Sweep saves time, labor, and money. Using slower RPMs, the auger approaches bottom of hole, the Hole Top Sweep stacks loose soil in a pattern 24" or 36" in diameter away from the hole. (This is for easier return of soil to hole.) Higher auger RPMs disperse soil or other debris up and away from hole top, eliminating soil handling labor and costs.

Universal Mount Hole Top Sweep can be quickly attached at any point on auger collar or extension. Easy-on, easy-off Split Collar design provides quick adjustment of depth even after auger is in ground.



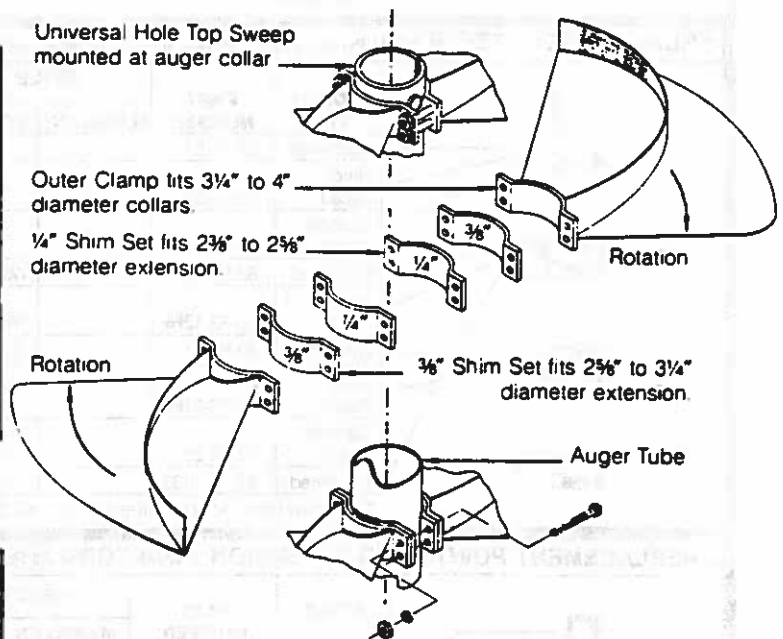
Universal Hole Top Sweep mounted at auger collar

Outer Clamp fits 3 1/4" to 4" diameter collars.

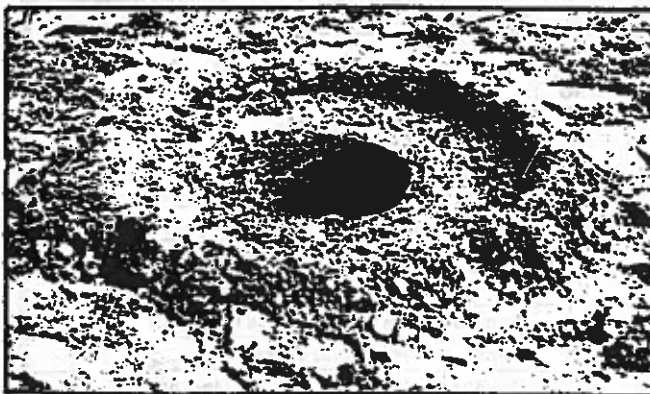
1/4" Shim Set fits 2 3/8" to 2 5/8" diameter extension.

Rotation

3/8" Shim Set fits 2 5/8" to 3 1/4" diameter extension.



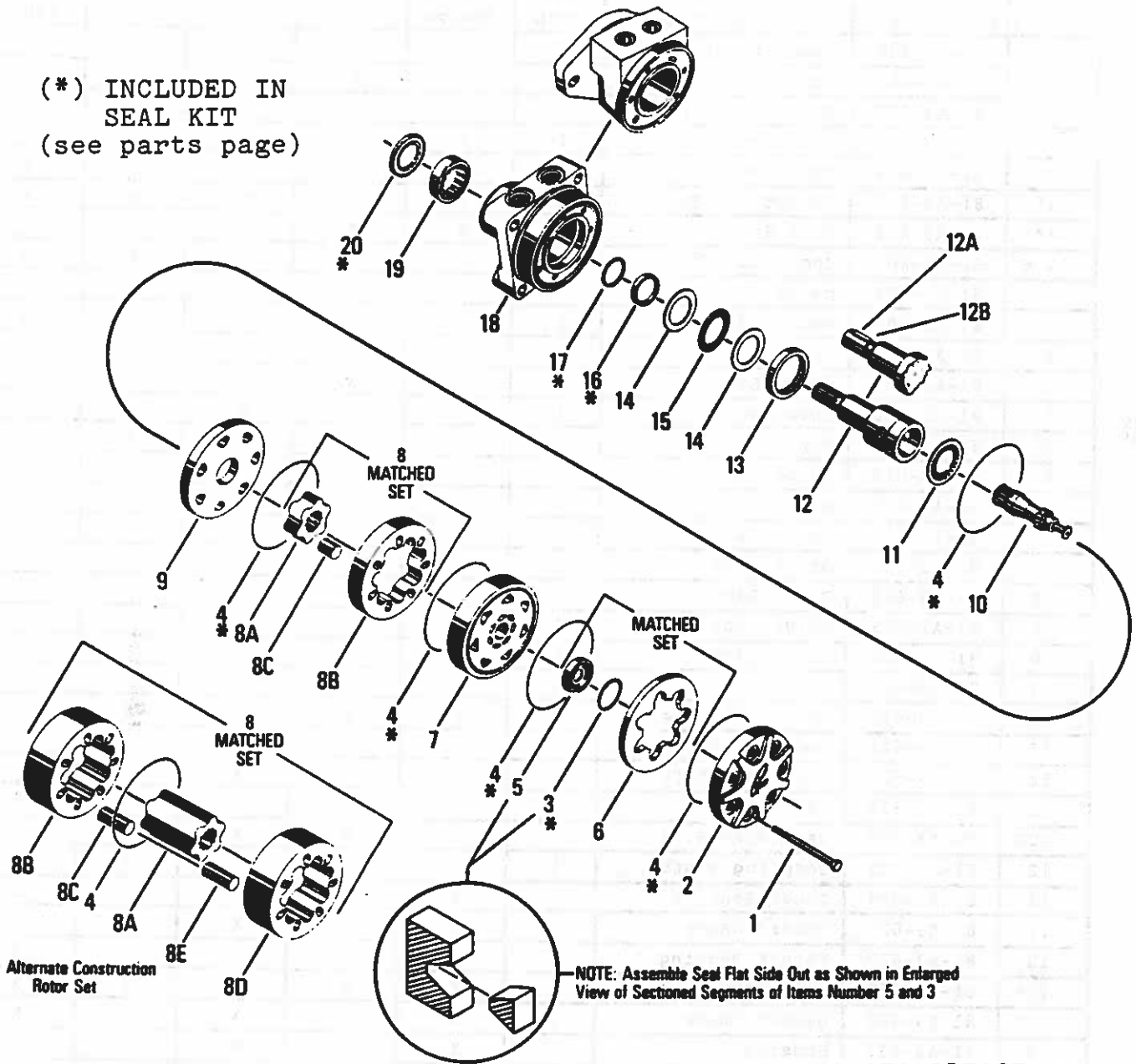
For semi-permanent attachment of Universal Hole Top Sweep, tack welding inner shim to tube is suggested. Providing consistent depth control. And easy removal later.



Exposed mechanical equipment hazards. The use of this equipment is subject to certain hazards that cannot be protected against by mechanical means or product design. Read and understand manufacturer's instructions and recommendations before using.

MODELS 3000PB, 4800PB, 8000PB, 13000, 18000 HYDRAULIC MOTOR ASSEMBLY

(*) INCLUDED IN
SEAL KIT
(see parts page)



WHEN ORDERING PARTS PLEASE
PROVIDE THE FOLLOWING:
(a) McMillen Model # _____
(b) Motor Code # _____
(c) Motor Spec # _____
(d) Warranty Reg. # _____
(items b & c are found on metal
tag rivited to item #18. Item
d on page 1 of this manual.)

MODELS 3000PB, 4800PB, 8000PB, 13000, 18000 HYDRAULIC MOTOR PARTS LIST

REF. #	MCMILLEN		QTY. REQ'D.	3000PB	4800PB	8000PB	13000	18000
	PART NUMBER	DESCRIPTION						
1	81-A3-600	Special Bolts	7	X			X	
1	81-A3-601	Special Bolts	7		X			X
1	81-A3-602	Special Bolts	7			X		
2	81-A3-603	End Cover	1	X	X			
2	81-A3-604	End Cover	1			X	X	X
3*	81-A3-605	Commutator Seal	1	X	X	X	X	X
4*	81-A3-606	Seal Ring	5	X	X	X	X	X
5 & 6	81-A3-607	Commutator Assy.	1	X	X	X	X	X
7	81-A3-608	Manifold	1	X	X			
7	81-A3-609	Manifold	1			X	X	X
8	81-A3-610	Rotor Set	1	X				
8	81-A3-611	Rotor Set	1		X			
8	81-A3-612	Rotor Set	1			X		
8	81-A3-613	Rotor Set	1				X	
8	81-A3-614	Rotor Set	1					X
9	81-A3-615	Wear Plate	1	X	X			
9	81-A3-616	Wear Plate	1			X	X	X
10	81-A3-617	Drive Link	1	X				
10	81-A3-618	Drive Link	1		X			
10	81-A3-619	Drive Link	1			X		
10	81-A3-620	Drive Link	1				X	
10	81-A3-621	Drive Link	1					X
11	81-A3-622	Thrust Bearing	1	X	X	X	X	X
12	81-A3-623	Coupling Shaft	1	X	X			
12	81-A3-624	Coupling Shaft	1			X		
12A	81-A3-636	Key	1	X	X	X		
12B	81-A3-640	Retaining Ring	1	X	X	X		
12	81-A3-625	Coupling Shaft	1				X	X
13	81-A3-626	Inner Bearing	1	X	X	X	X	X
14	81-A3-627	Thrust Washer	2	X	X	X	X	X
15	81-A3-628	Thrust Bearing	1	X	X	X	X	X
16*	81-A3-629	Inner Seal	1	X	X	X	X	X
17*	81-A3-630	Backup Washer	1	X	X	X	X	X
18	81-A3-631	Housing	1	X	X	X		
19	81-A3-632	Housing	1				X	X
19	81-A3-633	Outer Bearing	1	X	X	X	X	X
20*	81-A3-634	Dirt & Water Seal	1	X	X	X	X	X
*	81-A3-635	Seal Kit(Includes*)		X	X	X	X	X

NOTE: 81-A3-635 SEAL KIT INCLUDES-- (5) 81-A3-606, (1) 81-A3-605, (1) 81-A3-629, (1) 81-A3-630, (1) 81-A3-634, and grease pack.

NOTE: 81-A3-631 & 81-A3-632 HOUSINGS INCLUDE-- (1) 81-A3-626, (2) 81-A3-627, (1) 81-A3-628, and (1) 81-A3-633.

MODELS 3000PB, 4800PB, 8000PB, 13000, 18000

HYDRAULIC MOTOR SERVICE PROCEDURES

DISASSEMBLY AND INSPECTION

PREPARATION BEFORE DISASSEMBLY

Before disconnecting hoses, thoroughly clean off all outside dirt around fittings. (After disconnecting hoses and before removing from vehicle, immediately plug port holes.) Finish cleaning and drying assembly before placing on work bench.

CLEAN WORK CONDITIONS

If it is necessary to disassemble any of the component parts, make sure that a clean work bench or table is used. (A piece of clean paper makes an excellent disposable top.) All parts should be cleaned separately in clean solvent and blown dry with air to avoid nicks and burrs. **Caution:** Do not force or abuse closely fitted parts.

WARNING: SINCE THEY ARE FLAMMABLE, BE EXTREMELY CAREFUL WHEN USING ANY SOLVENT. EVEN A SMALL EXPLOSION OR FIRE COULD CAUSE INJURY OR DEATH.

WARNING: WEAR EYE PROTECTION AND BE SURE TO COMPLY WITH OSHA OR OTHER MAXIMUM AIR PRESSURE REQUIREMENTS.

CAUTION: Never steam or high pressure wash hydraulic components. Do not force or abuse closely fitted parts.

MOTOR DISASSEMBLY

1. Place the motor in a soft jawed vice, with coupling shaft (12) pointed down and the vise jaws clamping firmly on the sides of the housing (18) mounting flange or port bosses.
2. Scribe an alignment mark down and across the motor components from end cover (2) to housing (18) to facilitate reassembly orientation where required.
3. Remove the seven special ring head bolts (1) using an appropriate 1/2 or 9/16 inch size socket. Inspect bolts for damaged threads, or sealing rings, under the bolt head. Replace damaged bolts.
4. Remove end cover assembly (2) and seal ring (4). Discard seal ring.
5. Thoroughly wash end cover (2) in proper solvent and blow dry. Inspect end cover for cracks and the bolt head recesses for good bolt head sealing surfaces. Replace end cover as necessary.
6. Remove commutator ring (6). Inspect commutator ring for cracks, or burrs.
7. Remove commutator (5) and seal ring (3). Remove seal ring from commutator, using an air hose to blow air into ring groove until seal ring is lifted out and discard seal ring. Inspect commutator for cracks or burrs, wear, scoring, spalling or brinelling. If any of these conditions exist, replace commutator and commutator ring as a matched set.

8. Remove manifold (7) and inspect for cracks surface scoring, brinelling or spalling. Replace manifold if any of these conditions exist. A polished pattern on the ground surfaces from commutator or rotor rotation is normal. Remove and discard the seal rings that are on both sides of the manifold

NOTE: The manifold is constructed of plates bonded together to form an integral component not subject to further disassembly for service. Compare configuration of both sides of the manifold to ensure that same surface is reassembled against the rotor set.

9. Remove rotor set (8) and wearplate (9) together to retain the rotor set in its assembled form, maintaining the same rotor vane (8C) to stator (8B) contact surfaces. The drive link (10) may come away from the coupling shaft (12) with the rotor set, and wearplate. You may have to shift the rotor set on the wearplate to work the drive link out of the rotor (8A) and wearplate. Inspect the rotor set in its assembled form for nicks, scoring, or spalling on any surface and for broken or worn splines. If the rotor set component requires replacement, the complete rotor set must be replaced as it is a matched set. Inspect the wearplate for cracks, brinelling, or scoring. Discard seal ring (4) that is between the rotor set and wearplate.

NOTE: The rotor set (8) components may become disassembled during service procedures. Marking the surface of the rotor and stator that is facing UP, with etching ink or grease pencil before removal from motor will ensure correct reassembly of rotor into stator and rotor set into motor.

NOTE: Motors may have a rotor set with two stator halves with a seal ring (4) between them and two sets of seven vanes. Discard seal ring only if stator halves become disassembled during the service procedures.

NOTE: A polished pattern on the wear plate from rotor rotation is normal.

10. Place rotor set (8) and wear plate (9) on a flat surface and center rotor (8A) in stator (8B) such that two rotor lobes (180 degrees apart) and a roller vane (8C) centerline are on the same stator centerline. Check the rotor lobe to roller vane clearance with a feeler gage at this common centerline. If there is more than .005 inches (0.13mm) of clearance, replace rotor set.

NOTE: If rotor set (8) has two stator halves and two sets of seven vanes as shown in the alternate construction rotor set assembly view, check the rotor lobe to roller vane clearance at both ends of rotor.

CONTINUED TO NEXT PAGE . . .

MODELS 3000PB, 4800PB, 8000PB, 13000, 18000

HYDRAULIC MOTOR SERVICE PROCEDURES

DISASSEMBLY AND INSPECTION

11. Remove drive link (10) from coupling shaft (12) if it was not removed with rotor set and wear plate. Inspect drive link for cracks and worn or damaged splines. No perceptible lash (play) should be noted between mating spline parts.
12. Remove thrust bearing (11) from top of coupling shaft (12). Inspect for wear, brinelling, corrosion and a full complement of retained rollers.
13. Check exposed portion of coupling shaft (12) to be sure you have removed all signs of rust and corrosion which might prevent its withdrawal through the seal and bearing. Crocus cloth or fine emery paper may be used. Remove any key (12A), nut (12B), washer (12C), bolt (12D), lock washer (12E), or retaining ring (12F).
14. Remove coupling shaft (12), by pushing on the output end of shaft. Inspect coupling shaft bearing and seal surfaces for spalling, nicks, grooves, severe wear or corrosion and discoloration. Inspect for damaged or worn internal and external splines or keyway. Replace coupling shaft if any of these conditions exist.

NOTE: Minor shaft wear in seal area is permissible. If wear exceeds .020 inches (0.51mm) diametrically, replace coupling shaft.

NOTE: A slight "polish" is permissible in the shaft bearing areas. Anything more would require coupling shaft replacement.
15. Remove and discard seal ring (4) from housing (18).
16. Remove thrust bearing (15) and thrust washer (14). Inspect for wear, brinelling, corrosion and a full complement of retained rollers.

NOTE: Motors that have a thrust bearing (15) sandwiched between two thrust washers (14) cannot be removed from housing (18) unless bearing (13) is removed for replacement.
17. Remove seal (16) and back up washer (17) from housing (18). Discard both. To remove seal (16) and back up washer (17), work them around unseated thrust washers (14) and thrust bearing (15) and out of the housing.
18. Remove housing (18) from vise, invert it and remove and discard seal (20). A blind hole bearing or seal puller required.
19. Inspect housing (18) assembly for cracks, the machined surfaces for nicks, burrs, brinelling or corrosion. Remove burrs that can be removed without changing dimensional characteristics. Inspect tapped holes for thread damage. If the housing is defective in these areas, discard the housing assembly.
20. If the housing (18) assembly has passed inspection to this point, inspect the housing bearings/bushings (19) and (13) and if they are captured in the housing cavity the two thrust washers (14) and thrust bearing (15). The bearing rollers must be firmly retained in the bearing cages, but must rotate and orbit freely. All rollers and thrust washers must be free of brinelling and corrosion. A bearing, bushing, or thrust washer that does not pass inspection must be replaced. If the housing has passed this inspection, the disassembly of the motor is completed.

NOTE: The depth or location of bearing/bushing (13) in relation to the housing wear plate surface and the depth or location of bearing/bushing (19) in relation to the beginning of bearing/bushing counter bore should be measured and noted before removing the bearings/bushings. This will facilitate the correct reassembly of new bearings/bushings.
21. If the bearings, bushing or thrust washers must be replaced, use a suitable size bearing puller to remove bearing/bushings (19) and (13) from housing (18) without damaging the housing. Remove thrust washers (14) and thrust bearing (15) if they were previously retained in the housing by bearing (13).

MODELS 3000PB, 4800PB, 8000PB, 13000, 18000

HYDRAULIC MOTOR SERVICE PROCEDURES

MOTOR ASSEMBLY

- Replace all seals and seal rings with new ones each time you reassemble the motor unit. Lubricate all seals and seal rings with SAE 10W40 oil or clean grease before assembly.

NOTE: Unless otherwise indicated, do not oil or grease parts before assembly.

- Wash all parts in clean petroleum-based solvents before assembly. Blow them dry with compressed air. Remove any paint chips from mating surfaces of the end cover, commutator set, manifold rotor set, wear plate and housing and from port and sealing areas.

WARNING: SINCE THEY ARE FLAMMABLE, BE EXTREMELY CAREFUL WHEN USING ANY SOLVENT. EVEN A SMALL EXPLOSION OR FIRE COULD CAUSE INJURY OR DEATH.

WARNING: WEAR EYE PROTECTION AND BE SURE TO COMPLY WITH OSHA OR OTHER MAXIMUM AIR PRESSURE REQUIREMENTS.

1. If the housing (18) bearing components were removed for replacement, thoroughly coat and pack a new outer bearing/bushing (19) with clean corrosion resistant grease. Press the new bearing/bushing into the counterbore at the mounting flange end of the housing, using the appropriate sized bearing mandrel which will press bearing (19) into the housing to a required depth of .290/.310 inches (7.37/7.87 mm) from the outside end of the bearing counterbore.

NOTE: Bearing mandrel must be pressed against the lettered end of bearing shell. Take care that the housing bore is square with the press base and the bearing/bushing is not cocked when pressing a bearing/bushing into the housing.

CAUTION: If a bearing mandrel is not available and alternate methods are used to press in bearing/bushing (13) and (19) the bearing/bushing depths specified must be achieved to insure adequate bearing support and correct relationship to adjacent components when assembled.

CAUTION: Because the bearing/bushing (13) and (19) have a press fit into the housing, they must be discarded when removed. They must not be reused.

2. The motor housing (18) requires that you assemble a new backup washer (17), new seal (16), with the lip facing out, new thrust washer (14), new thrust bearing (15) and a new second thrust washer (14) in that order before pressing in the inner housing bearing (13). When these components are in place, press new bearing (13) into the housing (18) to a depth of .105/.125 inches (2.67/3.18) below the housing wear plate contact face.

3. Apply a small amount of clean grease to a new dirt and water seal (20) and press it into the housing (18) outer bearing counterbore.

The dirt and water seal (20) must be pressed in with the lip facing out and until the seal is flush to .020 inches (.51 mm) below the end of housing.

4. Apply masking tape around splines or keyway on shaft (12) to prevent damage to seal.
5. Be sure that a generous amount of clean corrosion resistant grease has been applied to the lower (outer) housing bearing/bushing (19). Install the coupling shaft (12) into housing (18), seating it against the second thrust washer (14).

CAUTION: The outer bearing (19) is not lubricated by the system's hydraulic fluid. Be sure it is thoroughly packed with the recommended grease, E/M Lubricant #K-70M.

The coupling shaft (12) on the motors will be approximately .10 inch (2.54 mm) below the housing wear plate surface to allow the assembly of thrust bearing (11). The coupling shaft must rotate smoothly on the thrust bearing package.

6. Install thrust bearing (11) onto the end of coupling shaft (12).
7. Apply a small amount of clean grease to a new seal ring (4) and insert it into the housing (18) seal ring groove.

NOTE: One or two alignment studs screwed finger tight into housing (18) bolt holes, approximately 180 degrees apart, will facilitate the assembly and alignment of components as required in the following procedures. The studs can be made by cutting off the heads of either 3/8-24 UNF 2A or 5/16-24 UNF 2A bolts as required that are over .5 inch (12.7 mm) longer than the bolts.

8. Install drive link (10) the long splined end down into the coupling shaft (12) and engage the drive link splines into mesh with the coupling shaft splines.

NOTE: Use any alignment marks put on the coupling shaft and drive link before disassembly to assemble the drive link splines in their original position in the mating coupling shaft splines.

9. Assemble wear plate (9) over the drive link (10) and alignment studs onto the housing (18).
10. Apply a small amount of clean grease to a new seal ring (4) and assemble it into the seal ring groove on the wear plate side of the rotor set stator (89).

CONTINUED TO NEXT PAGE

MODELS 3000PB, 4800PB, 8000PB, 13000, 18000

HYDRAULIC MOTOR SERVICE PROCEDURES

MOTOR ASSEMBLY

11. Install the assembled rotor set (8) onto wear plate (9) with rotor (8A) counterbore and seal ring side down and the splines into mesh with the drive link splines.

NOTE: It may be necessary to turn one alignment stud out of the housing (18) temporarily to assemble rotor set (8) or manifold (7) over the drive link.

NOTE: The rotor set rotor counterbore side must be down against wear plate for drive link clearance and to maintain the original rotor drive link spline contact. A rotor set without a counterbore and that was not etched before disassembly can be reinstalled using the drive link spline pattern on the rotor splines if apparent, to determine which side was down. The rotor set has a seal ring groove on the wear plate contact side of the stator (8B).

12. Apply clean grease to a new seal ring (4) and assemble it in the seal ring groove in the rotor set contact side of manifold (7).

NOTE: The manifold (7) is made up of several plates bonded together permanently to form an integral component. The manifold surface that must contact the rotor set has it's series of irregular shaped cavities on the largest circumference or circle around the inside diameter. The polished impression left on the manifold by the rotor set is another indication of which surface must contact the rotor set.

13. Assemble the manifold (7) over the alignment studs and drive link (10) and onto the rotor set. Be sure the correct manifold surface is against the rotor set.

14. Apply grease to a new seal ring (4) and insert it in the seal ring groove exposed on the manifold.

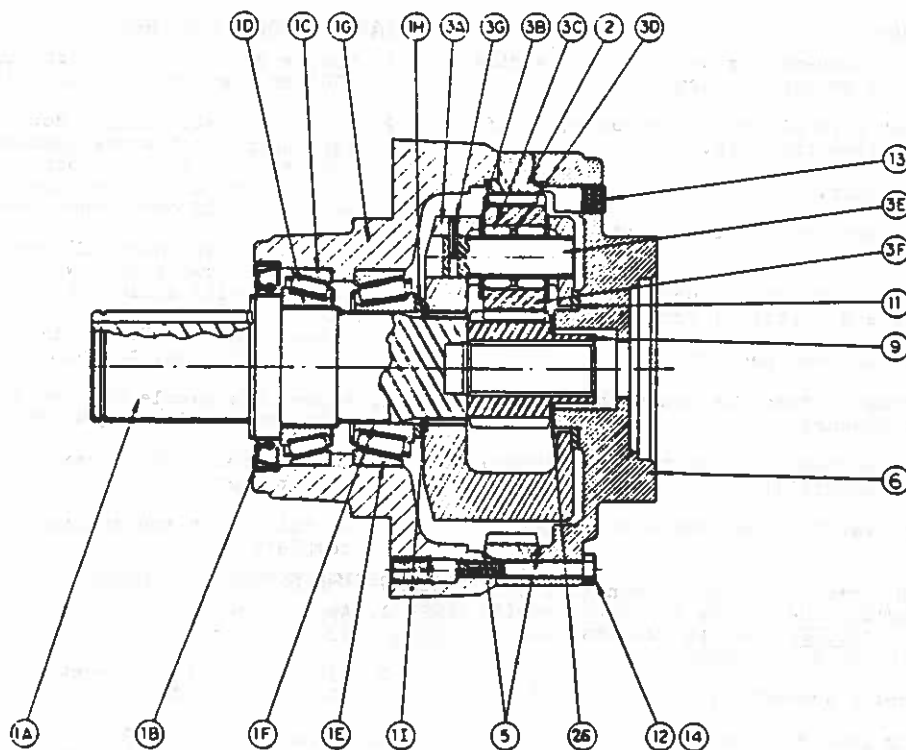
15. Assemble the commutator ring (6) over alignment studs onto the manifold.

16. Assemble a new seal ring (3) flat side up, into commutator (5) and assemble commutator over the end of drive link (10) onto manifold (7) with seal ring up.

17. Assemble a new seal ring (4) into end cover (2) and assemble end cover over the alignment studs and onto the commutator set.

18. Assemble the 7 special bolts (1) and screw in finger tight. Remove and replace the two alignment studs with bolts after the other bolts are in place. Alternately and progressively tighten the bolts to pull the end cover and other components into place with a final torque of 45-55 ft. lbs. (61-75 N m).

MODELS 13000, 18000 PLANETARY GEAR REDUCTION ASSEMBLY



CROSS SECTIONAL VIEW

MODELS 13000, 18000 PLANETARY GEAR REDUCTION PARTS LIST

REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
1A	87-A3-301	2" Round Output Shaft	1
1A	87-A3-341	2" Hex Output Shaft	1
1B	87-A3-302	Seal	1
1C	87-A3-303	Bearing Cup	1
1D	87-A3-304	Bearing Cone	1
1E	87-A3-305	Bearing Cup	1
1F	87-A3-306	Bearing Cone	1
1G	87-A3-342	Hub	1
1H	87-A3-343	Spacer	1
1I	87-A3-309	Retaining Ring	1
1J	87-A3-344	Pipe Plug	3
1K	87-A3-345	Pipe Plug	1
2	87-A3-320	Ring Gear	1
3A	87-A3-347	Carrier	1

REF. #	McMILLEN PART NUMBER	DESCRIPTION	QTY. REQ'D.
3B	87-A3-348	Thrust Washer	6
3C	87-A3-349	Needle Roller	96
3D	87-A3-316	Spacer	3
3E	87-A3-350	Planet Shaft	3
3F	87-A3-351	Planet Gear	3
3G	87-A3-319	Roll Pin	3
5	87-A3-321	"O" Ring	2
6	87-A3-352	Cover	1
9	87-A3-353	Input Gear	1
11	87-A3-326	Thrust Washer	1
12	87-A3-327	Bolt	8
13	87-A3-310	Pipe Plug	1
14	87-A3-328	Shoulder Bolt	4
26	87-A3-354	Thrust Washer	1

WHEN ORDERING PARTS PLEASE PROVIDE THE FOLLOWING:

(a) McMillen Model # _____.

(b) Planetary Model # _____.

(c) Planetary Serial # _____.

(items b & c are found on metal tag rivited to item #6 Cover)

MODELS 13000, 18000 PLANETARY GEAR REDUCTION SERVICE PROCEDURES

MAIN DISASSEMBLY

NOTE: Before disassembling unit, make a scribe line, to assure proper reassembly.

1. Remove the two pipe plugs(13) in cover(6) and drain the oil from the unit.
2. Roll test the unit.
3. Leak test the unit at a pressure of 5 psi for 2-3 minutes.
4. Loosen and remove the four shoulder bolts(14) and eight grade 8 bolts(12) from cover(6).
5. Remove cover (6) from hub(1G).
6. Remove "O" ring(5) from the counterbore in cover(6) and discard.
7. Remove thrust washer(11) from the counterbore in carrier housing(3A).
8. Remove input gear(9) from mesh with planet gears(3F).
9. Using a punch, remove retaining ring(20) from the groove around the inside of input gear(9) and discard. **CAUTION:** Safety glasses should be worn during this procedure.
10. Lift out carrier assembly(3) from hub(1G).
11. Lift out ring gear(2) from hub(1G).
12. Remove "O" ring(5) from the counterbore in hub (1G) and discard.
13. Remove the three pipe plugs(1J) from hub(1G).
14. Apply a preload to output shaft(1A) in order to remove retaining ring(1I).
15. Using retaining ring pliers, remove retaining ring(1I) and discard. **CAUTION:** Safety glasses should be worn during this procedure.
16. Remove spacer(1H) from output shaft(1A).
17. Raise hub(1G) above your work surface and support it from underneath in such a manner that will allow output shaft(1A) to fall through the bottom.
18. Press output shaft(1A) out of hub(1G). The output shaft may come out with bearing cone(1D) and seal(1B) attached. If so, remove seal(1B) from output shaft and discard. Use a soft punch and hammer to remove bearing cone(1D) from the shaft. Be very careful not to strike the shaft when using the punch.
19. If seal(1B) and bearing cone(1D) remain in the hub, press the seal and bearing cone out. Discard the seal.
20. Lift out bearing cone(1F) from hub(1G).
21. Stand hub(1G) on its small diameter end. Using a soft punch and hammer, remove bearing cup(1C) from the counterbore of hub(1G). Be very careful not to strike the counterbore when using the punch.
22. Turn hub(1G) over so that it rests on its large diameter end. Using a soft punch and hammer, remove bearing cup(1E) from the counterbore of hub(1G). Be very careful not to strike the counterbore when using the punch.
23. At this point the main disassembly is complete.

CARRIER DISASSEMBLY

1. Locate roll pin(3G) which holds planet shaft (3E) in the carrier housing(3A).
2. Drive the roll pin(3G) down into planet shaft (3E) until it bottoms against the carrier housing. If the roll pin is not completely driven into the planet shaft, damage to the carrier could occur when the shaft is removed.
3. Remove planet shaft(3E) from carrier housing (3A). The two thrust washers(3B) and planet gear(3F) will slide off.
4. Place planet shaft(3E) in a vice and drive roll pin(3G) out through the roll pin hole.
5. Remove the needle rollers(3C) and spacer(3D) from inside planet gear(3F).
6. Repeat steps 1-5 to remove the two remaining planet gears.
7. At this point the carrier disassembly is complete.

CARRIER SUB-ASSEMBLY

1. Apply grease to the inside of one planet gear (3F).
2. Line one half of planet gear(3F) with 16 needle rollers(3C).
3. Place one spacer(3D) inside planet gear(3F) so that it rests on top of the needle rollers(3C).
4. Line the remaining half of planet gear(3F) with 16 needle rollers(3C).
5. Stand carrier housing(3A) in an upright position.
6. Insert a planet shaft(3E) into one of the planet shaft holes which also has a roll pin hole on carrier housing(3A). The end of the planet shaft that does not have the roll pin hole should be inserted into the carrier housing first.
7. Place one thrust washer(3B) onto the end of planet shaft(3E) which has been inserted through the planet shaft hole. Notice that the thrust washer has a tang on it. The tang should point straight down so as to fit within the space in the raised inside edge of the planet shaft hole.
8. Following the thrust washer, place planet gear (3F), with needle rollers, onto planet shaft (3E).
9. Following the planet gear, place one more thrust washer(3B) onto planet shaft(3E).
10. Now insert planet shaft(3E) through the opposite planet shaft hole on carrier housing (3A) and use an alignment punch or similar tool to align the roll pin holes on the carrier housing(3A) and planet shaft(3E).
11. Drive roll pin(3G) down into the aligned roll pin holes.
12. Repeat the procedure in steps 1-11 for the installation of the two remaining planet gears (3F).
13. At this point the carrier sub-assembly is complete.

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