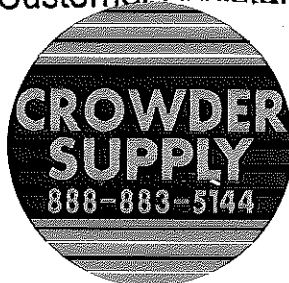


Drill Doctor's Handbook
for the maintenance of
Mid-Western Rock Drills

A HANDBOOK OF ESTABLISHED PRACTICES AND
PRACTICAL SUGGESTIONS FOR MAINTENANCE AND
REPAIR OF MID-WESTERN MODEL 83 ROCK DRILLS

For Customer Assistance Call:



Warranty

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INTRODUCTION

This Handbook is intended for the use of service personnel whose job is to care for and repair Mid-Western Jackleg, Sinker or Stoper Rock Drills.

Modern rock drills are precision machines, manufactured to very close tolerances that are subjected to a great deal of hard service and abuse by those who operate them.

In spite of our best efforts to make a drill that will run forever, rock drills can and do wear out and break down. We hope the information provided in this handbook will help with the task of maintaining Mid-Western drills at their operating best.

Suggestions to drillers

Many of the troubles which arise from faulty operation can be eliminated or minimized if certain precautions are observed in the care and handling of rock drills:

- Never** pound on stuck steel. Nothing is accomplished and you may damage the drill and bit.
- Never** retract the steel at full throttle. This may cause damage to pistons and side rods.
- Never** strike the drill with tools. You may dent the cylinder or cause other damage.
- Never** try to turn the drill in the hole when the steel is stuck. Pawls will break if drill is turned in opposite direction from normal rotation.
- Never** try to repair the drill on the job. Take it to the repair shop.
- Never** drag a drill along the ground, as this will allow dirt and foreign matter to enter the drill through exhaust ports and other openings. This will cause malfunction and possible failure.
- Always** blow out air supply hose and flush out water hose before connection to drill. This rids the lines of dirt and rust.
- Always** be sure drill is well lubricated. Adjust line oiler so steel shank always shows oil film yet does not cause fogging.
- Always** keep side rods tight and at equal tension.
- Always** keep drill aligned with drill steel and hole. Hold drill firmly and apply even pressure with both hands.
- Always** protect drill when blasting.

TYPICAL PROPERTIES OF ROCKDRILL LUBRICANTS ¹

VISCOSITY FOR AIR TEMPERATURES	ISO VISCOSITY GRADE ²	FLASH POINT (MINIMUM) ³		POUR POINT ⁴		PIN WEAR TEST FILM STRENGTH (PSI) ⁵	STEAM EMULSION NUMBER ⁶
		F	C	F	C		
Below 20F (7C)	32	360	182	-55	-48	300,000	1200+
20F to 40F (-7C to 4C)	68	405	207	-30	-34	300,000	1200+
40F to 80F (4C to 27C)	100	420	216	-10	-23	300,000	1200+
80F to 110F (27C to 43C)	150	445	229	-5	-21	300,000	1200+
Above 110F (43C)	220	470	243	5	-15	300,000	1200+

- (1) Rockdrill oils used in air line oilers should adhere to metallic surfaces under conditions which exist in a rockdrill.
- (2) Viscosity is a measure of oil's resistance to change due to temperature fluctuations. The higher the number, the less its viscosity changes.
- (3) Flash point is the minimum temperature at which sufficient liquid is vaporized to create a mixture of fuel and air that will burn if ignited, and is only of an instant's duration.
- (4) Pour point is the lowest temperature to which an oil can be chilled and still be poured from a container.
- (5) The film strength and lubricity is a measure of the load an oil will sustain between two metal surfaces without scoring.
- (6) Steam emulsion number is a measure of the life of an emulsion developed between volumes of oil and water under certain standard conditions. A high number (1200+) indicates good lubrication in the presence of water and also prevents foaming in the oiler.

<u>PROBLEM</u>	<u>REASON</u>	<u>REPAIR PROCEDURE</u>
Drill will not start.	Airline or hose blocked.	Clear blockage.
	Piston stuck - air blowing from exhaust ports.	Cylinder damaged - broken piston - main valve stuck. Rotation jammed, fronthead siezed
	Piston stuck - no air blowing.	Cylinder damaged. Rotation jammed - fronthead seized.
	Water leaking from exhausts	High pressure water backing up into drill. Check D83N40X Gland Assembly.
	Frozen muffler or exhaust ports.	Install moisture trap in air line. Check water tube.
Erratic or sluggish operation.	Damaged or tight front cylinder washer liner.	Hone or ream liner to proper size.
	Rockdrill oil too heavy for temperature.	Change grade of oil.
	Too much oil.	Check oiler and set properly.
	Not enough or no oil. Machine heating up.	Check oiler and set properly. Check oiler hose length - not over 12' from drill.
		Check oiler - fill - clean or reset as required.
	Dirt in machine.	Disassemble - clean - check for damage. Use clean oil and containers. Protect drill when blasting or moving.
	Main valve sticking.	Check for burrs or nicks and clean.

PROBLEM**REASON****REPAIR PROCEDURE**

Drill lacks power
but sounds good.

Broken or damaged parts,
pawls, pawl springs.

Make certain all parts are clean, undamaged
and operating freely.

Short or long shank on drill
steel.

Check steel.

Worn or broken piston.

Replace.

Plugged hose or air leakage.

Clean and tighten.

Low air pressure.

Check air lines and valves.
Min - 80 PSI.

Lack of oil.

Front end cylinder will be warm - check
oiler.

Loss of front end cushion.

Worn piston or front cylinder washer liner.

Cylinder damaged.

Repair.

Worn Chuck Liner.

Replace.

Damaged chuck or fronthead.

Repair or replace.

Slow drill speed.

Low air pressure.

Should be 80 PSI or higher.

Plugged air screen or airline.

Clean.

Low water pressure
or volume

Check water valve - water tube - drill steel -
water lines.

Improper alignment in hole.

Keep drill steel centered in the hole.

<u>PROBLEM</u>	<u>REASON</u>	<u>REPAIR PROCEDURE</u>
Slow rotation no rotation	Bent drill steel.	Change steel - return for repair.
	Pawis - rifle bar - rifle nut - piston - chuck nut worn.	Replace worn parts.
	Damage or lack of lubrication to front end of drill.	Check for oil and damage.
	Machine not assembled properly	Check for proper assembly - tighten side rods properly - Tighten alternately and evenly (MIN. 140 FT/LB. torque).
Bit mudding in hole - cuttings not being removed.	Plugged steel. Plugged water tube.	Clear obstruction.
	Low water pressure.	Check water lines - water screen, etc. Water pressure should be at least 70 psi.
	High water pressure.	Water pressure should be at least 15psi lower than air pressure.
	Water tube hole too small.	At high drilling speeds (35"/min) it may be necessary to use water tubes with orifice larger than the S63F27B standard of .067" - S63F27BSPC water tube has orifice size of .092"
Drill muffler freezing.	Excessive moisture in air.	Drain air line - install moisture traps.
	Broken water tube.	Replace broken tube Replace- 729B - water tube seal.

PROBLEM**REASON****REPAIR PROCEDURE**

Drill overheats.

Lack of oil.

Fill oiler - check oiler for faulty operation.

Insufficient push on airleg allowing machine to bounce.

Adjust feed pressure.
Check for wear on feedleg cups & seals

Improper oil.

Do not operate machines on full throttle when pulling steel or at any time for more than a few seconds.

Change oil. Engine oil is no good for a rockdrill and its use will damage the drill.

Fogging.

Broken water tube.

Replace.

Excessive moisture in air supply.

Blow air lines. Install moisture traps.

Too much oil.

Check oiler.

Water leaking around water tube.

Change 729B water tube seal.

Piston chipped or broken.

Worn drill steel.

Check drill shanks - reface all crowned, worn, bevelled or chipped steel.

Poorly refaced piston.

Reface piston so that the axis of the piston is exactly at right angles to the striking face.

Worn chuck liner.

Replace. Use chuck gauge.

PROBLEM**REASON****REPAIR PROCEDURE**

Bronze cuttings in
drill

Lack of oil.

Check oiler - use only high quality rockdrill
oil.

Rough or damaged rifle bar.

Replace or use fine grindstone to smooth parts.

Rough or damaged piston.

Replace or use fine grindstone to smooth parts.

Excessive wear of
parts.

Faulty lubrication.

Replace necessary parts. Check grade of oil
and oiler for proper operation.

Dirt in drill.

Check Stoppers for front end blow. Plug or
cover all openings of drill when blasting or
when storing drill.

"Blow out" air and water lines.

Cut-off or split
water tubes.

Plugged, damaged or
mushroomed shanks
on drill steel.

Replace or refurbish drill steel.

Chuck liner - worn
beyond acceptable limits.

Replace.

Chuck liner breaking

Worn chucks or chuck
Liner.

Replace chuck - breakage is a result of
expansion of the chuck bore caused by
improper alignment when pressing insert in.
One should carefully check chucks
before replacing insert.

PARTS PART NUMBER AND
DESCRIPTION

IDENTIFICATION OF PROBLEM AND SOLUTION

1S83F9 Piston

The striking face of a Piston should be flat so as to present the largest possible striking surface to the drill steel. When wearing occurs, reface (up to 1mm 0.040" max.).

This grinding is critical and should be flat, smooth and square to the longitudinal axis of the Piston. Care must be taken to have adequate cooling during grinding. Chamfer the Water Tube hole to prevent chipping and peening which will cut off Water Tubes. Restore the radius on the end of the splines to prevent damage to the Chuck Nut and Front Cylinder Liner.

Replace Piston when 0.004" wear of the Piston Head occurs. (2.996" on 3" Piston) or if splines are worn to one-half the original width. Check Rifle Nut thread for damage. Internal Bore should be clean. Check for nicks and scratches and remove with fine hand stone. "Scoring" of the Piston is most often caused by a dented Cylinder but it can also be caused by "dieseling". Dieseling occurs when a drill with too much oil in the air is run on cushion (Piston not striking steel). Solution is to adjust Airline Oiler for less oil feed and to keep proper feed on the leg, or push on a Sinkers. Check Piston for discoloration or cracking in splines due to lack of lubrication.

PARTS PART NUMBER AND
DESCRIPTION

IDENTIFICATION OF PROBLEM AND SOLUTION

S83F2528 Rifle Nut

Rotation 1 in 28. This refers to the Piston making one complete rotation for twenty-eight inches of travel. Check that nut is seated properly in Piston. Lack of lubrication is the major cause of Rifle Nut failure. Check for discoloration of Nut and Rifle Bar to pinpoint the problem. Replacement should be made when splines are worn to 1/2 the original width. A good system for removing and installing Rifle Nuts is to weld a Chuck to a work bench, with a Chuck Nut in place, and with a plate welded over the Chuck Nut to prevent movement. Weld a Rifle Bar to a Handle (drill Rod for example) and use this to tighten the Rifle Nut in a Piston. For Rifle Nut removal, a good sharp blow with an #8 hammer will loosen the Nut unless the thread of the Piston is damaged. Rifle Nuts have a left-hand thread.

S83F16 Valve

Valve must fit freely both in the Valve Chest and on the Valve Plug, but must still maintain an air seal. Replace when a sloppy fit is apparent. If necessary, sharp edges or corners may be smoothed off using extra fine emery cloth.

S83F3335 Ratchet Ring

Check teeth for wear - when rounded so that Pawls slip - replace. Check for tightness in Cylinder. Always install Ratchet Ring with Main Valve Assembly for proper alignment and to prevent damage to Cylinder.

S5511C Pawl Spring

Replace when broken or "set" is gone. Check for proper action when installed.

PARTS PART NUMBER AND
DESCRIPTION

IDENTIFICATION OF PROBLEM AND SOLUTION

R9111A Reversible Pawl

Replace or reface when wear exceeds 1mm (1/32") Pawls can be ground up to 1mm (1/32") to restore original profile. Check for proper operation when installed in Rifle Bar.

S83F2628 Rifle Bar

Rotation 1 in 28.

Replace when splines are worn to one-half original size. Check that Lubrication Holes to Pawls Springs and Plungers are open. Check for signs of lack of lubrication - discoloration - heat checks - cracking. Check that Pawls, Springs and Plungers are free to operate. Misalignment between Cylinder internal parts can be detected when installing the Rifle Bar. Misalignment is apparent when the Rifle Bar is tight to install. The problem can usually be solved by removing the Rifle Bar, rotating one Spline and again positioning in place. This step should be repeated until the Rifle Bar drops freely into place. Such a condition normally occurs when all parts are new and tolerances are close. All sharp edges should be smoothed off with a hand stone or fine emery cloth. Clean out Water Tube Bore. On rare occasions with worn drills the Rifle Bar Head will jam between the Valve Chest and the Backhead. The Rifle Bar rotates between these two surfaces so some wear is normal. Grinding a slight amount from the Head of the Rifle Bar will solve the problem.

PARTS PART NUMBER AND
DESCRIPTION

IDENTIFICATION OF PROBLEM AND SOLUTION

Chuck Liner
Collared - Hex
1041277 = 7/8"
1041285 = 1"

Never hammer Liners into Chuck - use a press and proper tools to avoid breakage.

Liner must be a tight fit in Chuck to prevent breakage (up to 15 ton press fit on installation) - Liners are very hard but brittle and must be well supported.

A worn tool can split liners.

S63F7N Chuck Nut

Replace when wear exceeds one-half the original spline width.

Valve Plug

Make certain all holes and ports are clear. If necessary remove sharp edges or corners with extra fine emery cloth. Plug should fit snugly into Valve Chest.

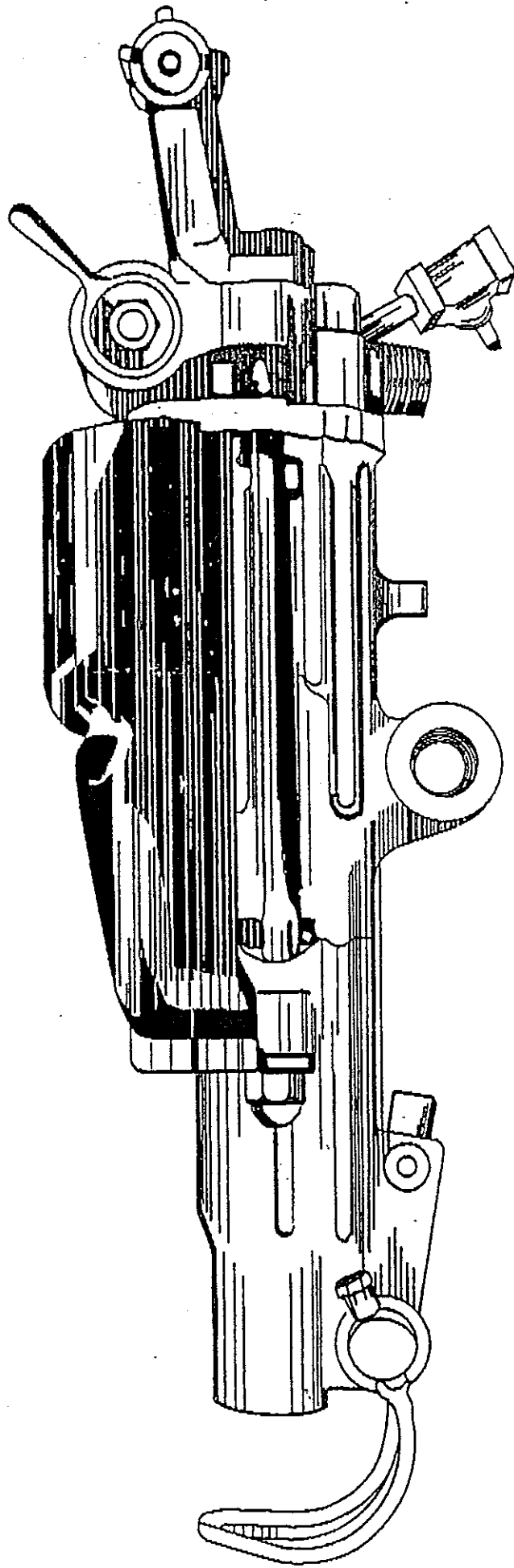
Valve should fit freely on the Plug but not be loose enough to allow air leakage. Complete Assembly should be a close fit in the Drill Cylinder to prevent air leakage between ports.

S83F3 Side Rod

Replace when worn or broken. Torque Rods to 90-100 FT/LB Torque. Always assemble drill with either two new or two used Side Rods - never use a new and a used Side Rod on the same drill.

MW

MID-WESTERN MACHINERY COMPANY, INC.
MANUFACTURERS OF ROCK DRILL REPLACEMENT PARTS



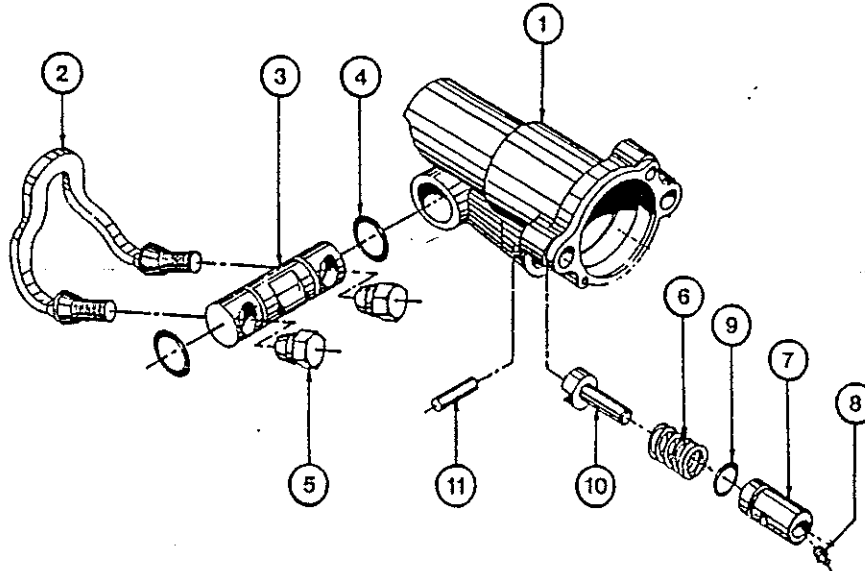
S83F FEED LEG DRILL



S83F BASIC MODULE 1056025

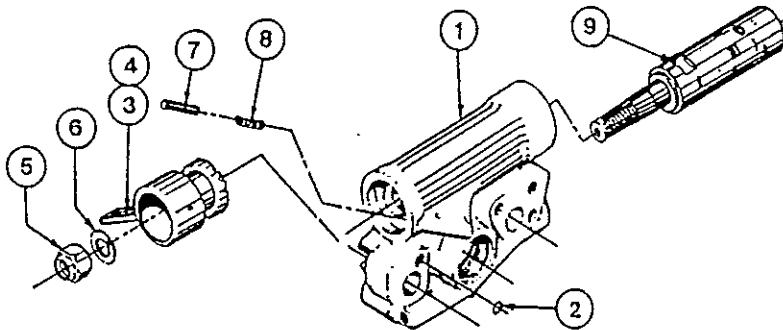
- 4 1/4" COLLARED CHUCK LINER ● AUTOMATIC WET GLAND
- TRUNNION TYPE STEEL PULLER ● POLYURETHANE MUFFLER

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1	S83F1T	Cylinder	22	1739A	Tube Washer
2	S83F1B	Cylinder Bushing Assembly - includes Liner (S53F1L)	23	S63F27B	Water Tube - 1/16" Orifice
3	S53F1L	Liner	24	D83N40X	Automatic Wet Gland Assembly - See Page 6
4	1S83F9	Hammer	25	S63F7N	Chuck Driver Nut
5	S83F2528	Rifle Nut	26	S58F7DA	Chuck Driver
6	S83F15B	Valve Plug	27	1040906	Chuck End - See Page 4 for internal parts
7	S83F16	Automatic Valve	28	1057381	Front Muffler Bracket
8	S83F15	Valve Chest	29	1057726	Rear Muffler Bracket
9	S83F15D	Valve Chest Pin	30	1057795	Muffler Assembly - includes items 30, 31 and 32
10	S83F2628	Rifle Bar	31	1057796	Muffler
11	711C	Pawl Spring - 4 required	32	1057797	Liner
12	711B	Plunger - 4 required	33	1057799	Seal - not shown
13	R9111A	Pawl - 4 required		S583N	Side Rod Nut - 2 required
14	S83F3335	Ratchet Ring			
15	S83F2X	Backhead Assembly - See Page 4	34	1057778	7/8" Liner Module - includes Chuck Liner and Steel Puller
16	S83F112ABX	D-Handle Assembly - See Page 5	35	1041277	7/8" Hex. Chuck Liner
17	1053440	Throttle Handle		S53F36A	7/8" Hex. Steel Puller
18	S48F13X	Water Connection Assembly - See Page 6		1057779	1" Liner Module - includes Chuck Liner and Steel Puller
19	RB83147X	Air Connection Assembly - See Page 6	34	1041285	1" Hex. Chuck Liner
20	S83F3	Side Rod - 2 required	35	S53F36B	1" Hex. Steel Puller
21	729B	Tube Gasket			



REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1	1040906	Chuck End	6	S58F36N	Spring
2	S53F36A	Steel Puller - 7/8" Hex	7	1053971	Retainer Assembly — Includes next 2 parts
2	S53F36B	Steel Puller - 1" Hex	8	Z1	Grease Filling
		Note - Steel Pullers are included with Liner Modules - see page 3.	9	ORP210B	O Ring
3	S53F36TA	Trunnion Assembly — Includes ORP214B O Ring	10	1057632	Detent
4	ORP214B	O Ring - 2 required	11	1053943	Pin
5	S53F36N	Lock Nut - 2 required			

BACKHEAD ASSEMBLY



S83F2X BACKHEAD ASSEMBLY

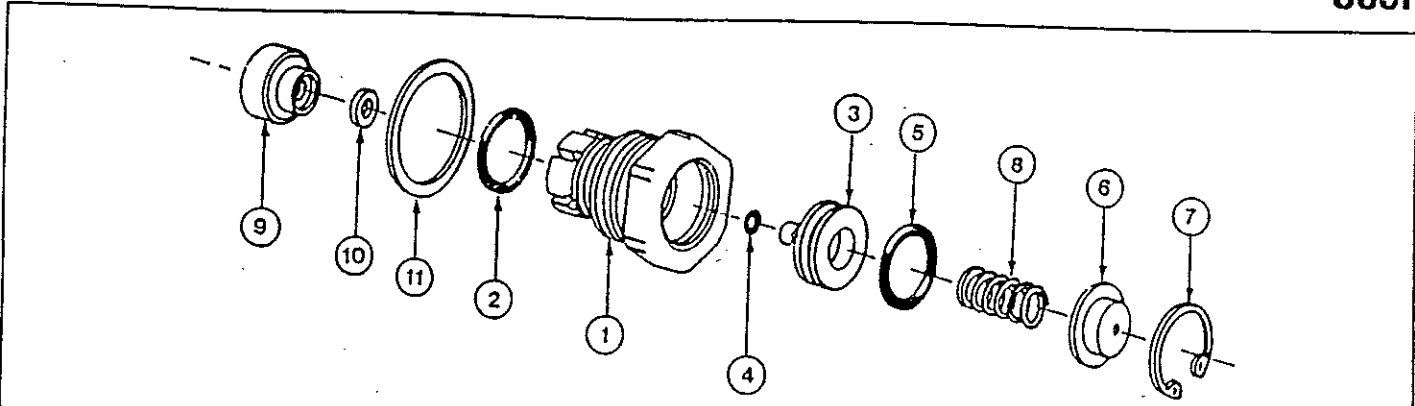
REF. NO.	PART NO.	DESCRIPTION
1	S63F2	Backhead Assembly - Includes OR6 O Ring
2	OR6	O Ring - 4 required
3	S58F12E	Throttle Handle Assembly - Includes S58F12K Key
4	S58F12K	Key
5	S48F12N	Nut
6	WP31	Lock Washer
7	72A	Detent
8	72ES	Spring
9	S83F12B	Throttle Valve

**S83F112ABX
BASIC MODULE**

REF. NO.	PART NO.	DESCRIPTION
	S83F112ABX	Handle Assembly - consists of the following parts:
1	S83F112AB	D-Handle Asm. - consists of Pin and O Rings
2	S83F113	Pin
3	ORP116A	O Ring - 2 required
4	S83F116C	Control Valve
5	S83F117	Spring
6	PP2A	Pipe Plug

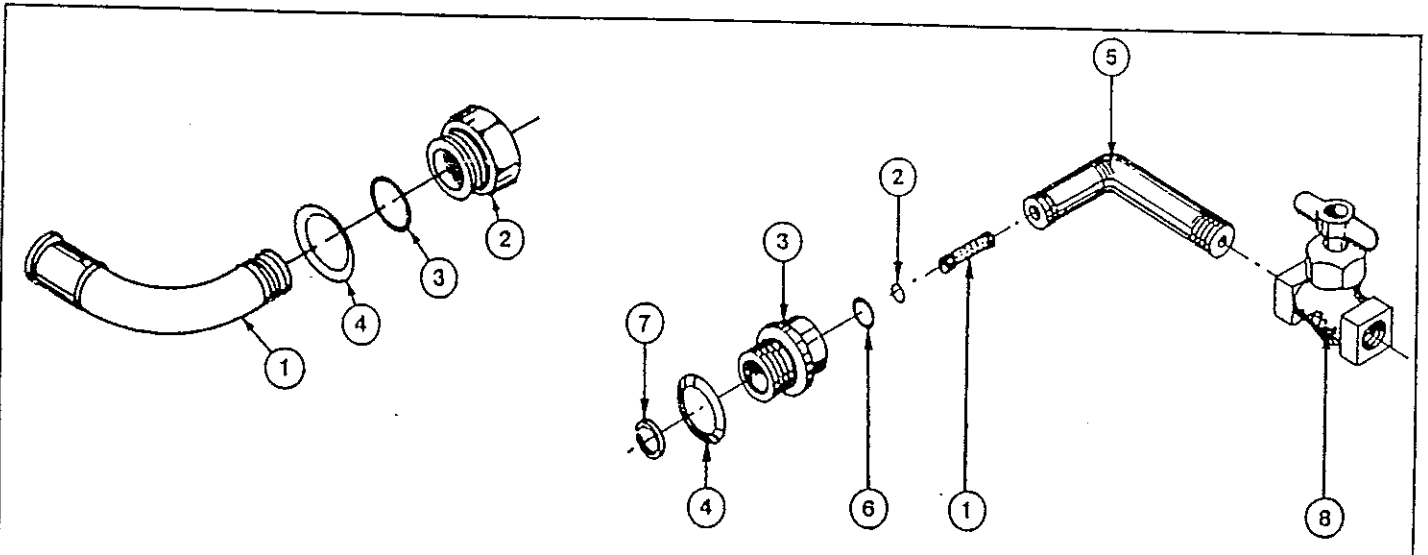
D HANDLE ASSEMBLIES

NON-POWER RETRACT MODULE 1056027			POWER RETRACT MODULE 1056026		
<p>See page 2 for location.</p>					
REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
36	S63F121	D-Handle	1.	S83F118B	Control Valve Asm. - includes O Rings (ref. no. 2,3 and 4)
37	1S83F715	Seal - Open	2	OR9	O Ring
38	1S83F715A	Seal - Solid	3	CL5324P	O Ring
			4	OR7	O Ring
			5	S83F119B	Spring
			6	S83F120	Retainer
			7	ERP6	Pin
					See page 2 for location.
			36	S83F114	D-Handle Asm.
			37	1S83F715	Seal (open) - 2 required Use one open seal in place of solid seal (1S83F715A), item 38.



REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1	1056697	Gland Assembly - includes OR18 O Ring	6	D83N42	Cap
2	OR18	O Ring	7	TRR5	Retaining Ring
3	D83N41	Poppet Valve Assembly - includes OR3 and OR18 O Rings	8	D83N43	Spring
4	OR3	O Ring	9	D83N44	Retainer
5	OR18	O Ring	10	D83N45	Valve Seat
			11	D8340	Washer

AIR AND WATER CONNECTIONS



RB83147X AIR CONNECTION

S48F13X WATER CONNECTION

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1	1031946	Air Tube	1	S4813S	Screen Assembly
2	RB83146	Swivel Spud Asm. - Includes O Ring	2	OR5	O-Ring
3	OR21	O Ring	3	S4813E	Swivel Spud
4	D73H146W	Washer	4	S481W	Washer
			5	S48F13T	Watcon Tube Assembly - Includes O-Ring
			6	OR10	O-Ring
			7	D9313R	Retainer Ring
			8	760	Valve

MW-S83F ENGINEERING AND DRILL SPECIFICATIONS

DRILL MODEL SERIES	BORE DIAMETER	STROKE	AIR HOSE I.D.	WATER HOSE	STEEL SIZE	MACHINE LENGTH	HAMMER WEIGHT WITH RIFLE NUT	MACHINE WEIGHT LESS SWIVEL
MW-S83F	3"	2.5"	1"	1/2"	1"	27-1/4"	5 LBS.	72 LBS.
MW-S83FM	3"	2.5"	1"	1/2"	1"	27-1/4"	5 LBS.	72 LBS.

DRILL MODEL SERIES	PSI	ENERGY PER BLOW LB/FT	BLOW FREQUENCY BLOWS/MINUTE	FOOT-POUND-BLOWS PER MINUTE	AIR CONSUMPTION AT SEA LEVEL		
					DRILL CFM	BLOWING	
						ORIFICE	CFM
MW-S83F	80	59.6	2256	134460	183	7/32"	45
	90	69.2	2302	159300	208	7/32"	53
	100	84.8	2418	205000	233	7/32"	62
MW-S83FM	80	51.9	2268	117700	179	7/32"	45
	90	60.1	2387	143460	205	7/32"	53
	100	65.8	2454	161500	229	7/32"	62

AIR CONSUMPTION FACTORS:

2000 ft. = Sea Level x 1.065
 4000 ft. = Sea Level x 1.136
 6000 ft. = Sea Level x 1.213

Specifications subject to change without notice



MID-WESTERN MACHINERY COMPANY, INC.

MW-S83F ENGINEERING AND DRILL SPECIFICATIONS

VARIABLES WHICH AFFECT DRILL PERFORMANCE

- Type of ROCK or GROUND
- Hole Size
- DULL Bits
- Feed Pressure
- Type of drilling OPERATION
- CONDITION of equipment and lubrication

CAUTION - Where applicable, Total Energy values and Drill CFM figures are measured using 1" Hex Drill rod direct striking Shanks. Small Shanks and Tappet construction will result in lower values.

*Blowing – Caution – The blowing CFM values listed are maximum quantities of air that can be passed through the Tube. Drilling conditions rarely require extra air capacity for blowing.

Specifications subject to change without notice



MID-WESTERN MACHINERY COMPANY, INC.