

OPERATION AND MAINTENANCE INSTRUCTIONS

PB60, PB60S, PB85 AND PB85S PAVING BREAKERS

**Refer All Communications To The
Nearest Address Listed On The Back Cover**

INGERSOLL-RAND[®]
DRILLING EQUIPMENT

Rock Drill Division
Roanoke, VA 24019

INGERSOLL-RAND

51085363

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CONSTRUCTION AND DRILLING EQUIPMENT SOLD BY DISTRIBUTORS

Warranty

Ingersoll-Rand, through its distributor, warrants that each item of equipment manufactured by it and delivered hereunder to the initial user to be free of defects in material and workmanship for a period of three (3) months from initial operation or six (6) months from the date of shipment to the initial user, whichever first occurs.

With respect to the following types of equipment, the warranty period enumerated will apply in lieu of the foregoing warranty period.

- A. Drill Mountings—The earlier of six (6) months from initial operation or nine (9) months from date of shipment to the initial user.
- B. Portable Compressors—The earlier of twelve (12) months from shipment to, or the accumulation of 2,000 hours of service by the initial user.
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Ingersoll-Rand, its supplier(s) and its distributors shall in no event be liable to the user, any successors in inter-

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The DANGERS, CAUTIONS, and NOTES used throughout the text of this instruction book are defined as follows:

- DANGER** - A specific procedure or practice that must be strictly followed, or a specific condition that must be met, to prevent possible bodily injury.
- CAUTION** - A specific procedure or practice that must be strictly followed, or a specific condition that must be met, to prevent damage to the equipment.
- NOTE** - Important supplemental information.

SAFETY PRECAUTIONS

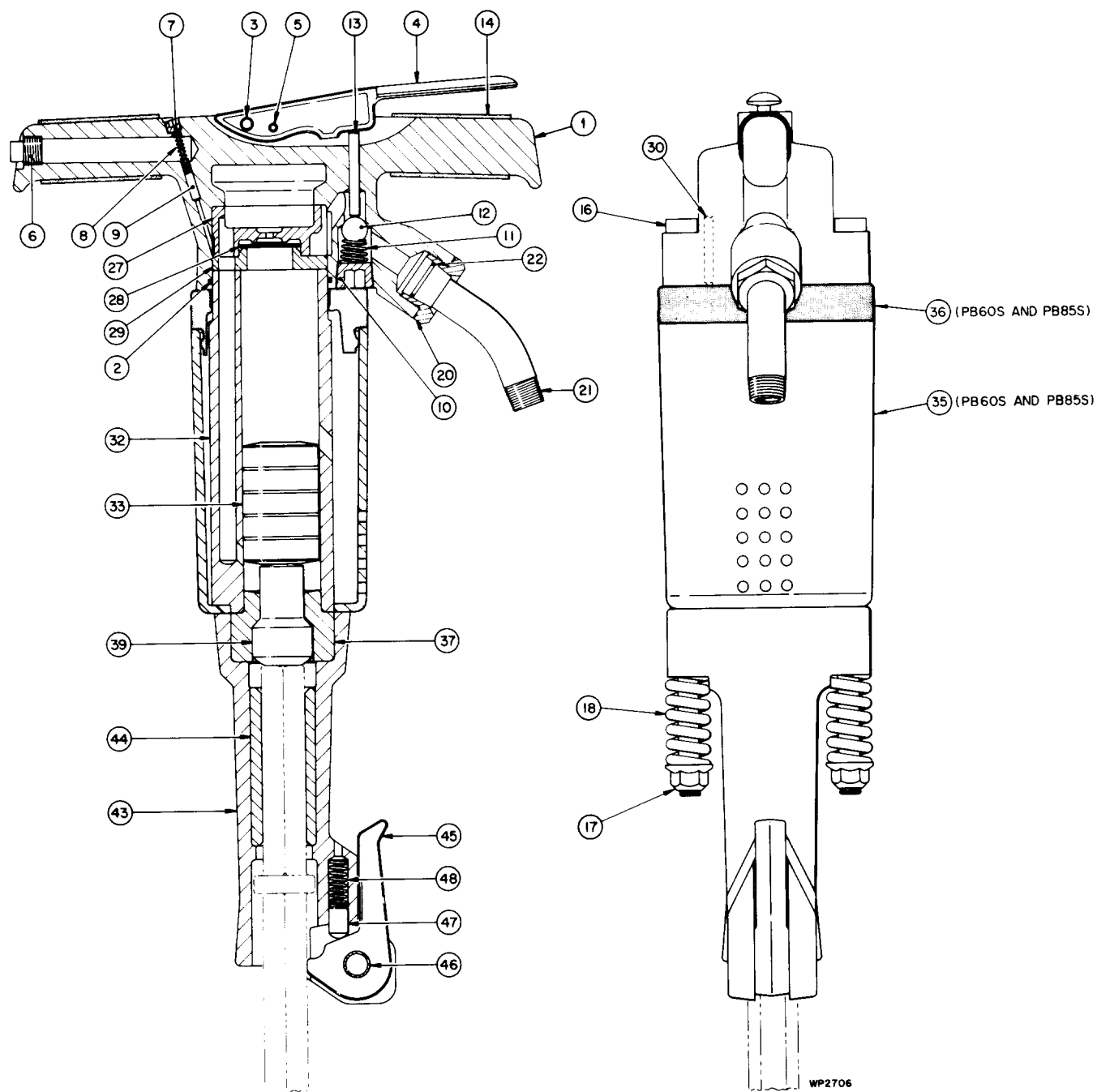
(DANGERS)

The Safety Precautions listed below are intended to alert the operators and maintenance personnel to the possible physical dangers inherent in the various phases of operating and maintaining equipment of this kind.

All operators and maintenance personnel must read and thoroughly understand this manual before attempting to operate or perform maintenance on the drill. Also, "SAFETY FIRST" must always be the primary consideration of all personnel while operating or maintaining the drill under normal or unusual conditions.

Since these Safety Precautions cannot cover every possible situation, everyone is expected to exercise good judgement and common sense while operating, servicing, or working near the drill.

1. WEAR SAFETY SHOES, SAFETY GLASSES, EAR PROTECTORS, AND A HARD HAT WHILE OPERATING THE BREAKER.
2. PROLONGED EXPOSURE TO EXCESSIVE NOISE LEVELS WITHOUT THE USE OF PROPER EAR PROTECTION CAN RESULT IN PERMANENT HEARING LOSS.
3. DO NOT INDULGE IN HORSEPLAY. DISTRACTIONS CAN CAUSE ACCIDENTS.
4. KEEP YOUR HANDS OFF THE THROTTLE LEVER UNTIL IT IS TIME TO START BREAKER OPERATION.
5. MAINTAIN A STEADY BALANCE AT ALL TIMES.
6. NEVER PUT YOUR FACE CLOSE TO THE BREAKER.
7. NEVER REST THE BREAKER ON YOUR FOOT.
8. NEVER POINT THE BREAKER AT ANYONE.
9. NEVER START THE BREAKER WHEN IT IS LYING ON THE GROUND.
10. COMPRESSED AIR IS DANGEROUS. NEVER POINT AN AIR HOSE AT YOURSELF OR CO-WORKERS. NEVER BLOW YOUR CLOTHES FREE OF DUST WITH COMPRESSED AIR.
11. BE SURE ALL HOSE CONNECTIONS ARE TIGHT. A LOOSE HOSE NOT ONLY CAUSES LEAKS, IT MAY COME COMPLETELY OFF THE BREAKER, WHIP AROUND, AND INJURE THE OPERATOR AND OTHERS IN THE AREA. ATTACH SAFETY CABLES TO ALL HOSES TO PREVENT INJURY IF A HOSE IS ACCIDENTLY BROKEN.
12. NEVER DISCONNECT A PRESSURIZED AIR HOSE. BEFORE DISCONNECTING A HOSE, SHUT-OFF THE AIR AT THE COMPRESSOR AND BLEED THE BREAKER.
13. DO NOT OPERATE THE BREAKER WITHOUT A BREAKER TOOL LOCKED IN THE FRONTHEAD. HOLD THE TOOL FIRMLY AGAINST THE WORK.
14. ALWAYS KEEP BOTH HANDS ON THE HANDLE WHILE OPERATING THE BREAKER.
15. THE OPERATOR MUST SPREAD HIS LEGS AND FEET CLEAR OF THE BREAKER TOOL TO PREVENT INJURY IF THE TOOL BREAKS. IF A TOOL BREAKS, THE BREAKER (WITH PIECE OF BROKEN TOOL PROJECTING FROM FRONTHEAD) WILL SUDDENLY DROP TO THE GROUND.
16. DO NOT "RIDE" THE BREAKER WITH ONE LEG OVER THE HANDLE. THE OPERATOR CAN BE INJURED IF THE TOOL BREAKS WHILE HE IS RIDING THE BREAKER.
17. KNOW WHAT IS UNDERNEATH THE MATERIAL YOU ARE ABOUT TO BREAK. BE ALERT FOR ANY BURIED WATER, GAS, SEWER, TELEPHONE, OR ELECTRIC LINES.
18. IF YOU HIT SOMETHING, SHUT-OFF THE BREAKER IMMEDIATELY AND FIND OUT WHAT IT IS. USE A SHOVEL, NOT THE BREAKER, TO UNCOVER THE OBJECT - CAREFULLY.
19. WHEN USING ANY SOLVENT TO CLEAN PARTS, MAKE SURE THAT IT MEETS CURRENT SAFETY AND HEALTH STANDARDS AND THAT IT IS USED IN AN AREA THAT IS ADEQUATELY VENTILATED.



- | | | |
|------------------------|-----------------------|-----------------------------------|
| 1. Handle | 13. Throttle Plunger | 32. Cylinder |
| 2. O-Ring | 14. Handle Grip | 33. Piston |
| 3. Pin | 16. Assembly Rod | 35. Muffler (PB60S and PB85S) |
| 4. Throttle Lever | 17. Locknut | 36. Muffler Cap (PB60S and PB85S) |
| 5. Stop Pin | 18. Spring | 37. Front Washer |
| 6. Oil Reservoir Plug | 20. Cap | 39. Anvil Block |
| 7. Oil Metering Plug | 21. Air Connection | 43. Fronthead |
| 8. Oil Metering Spring | 22. O-Ring | 44. Bushing |
| 9. Oil Metering Pin | 27. Valve Chest | 45. Steel Retainer Lever |
| 10. Throttle Plug | 28. Valve | 46. Retainer Pin |
| 11. Throttle Spring | 29. Valve Chest Cover | 47. Retainer Plunger |
| 12. Ball Valve | 30. Locating Pin | 48. Retainer Spring |

Figure 1-1. PB60, PB60S, PB85 and PB85S
Paving Breakers (Sectional View)

SECTION I

DESCRIPTION AND SPECIFICATIONS

1-1 GENERAL DESCRIPTION

1-1.1 PB60 AND PB60S DESCRIPTION

The PB60 and PB60S Paving Breakers are high-quality, medium-weight tools recommended for general paving breaker work. They are especially suited to horizontal work (such as tearing down brick and concrete walls), tearing up concrete, digging trenches, and general demolition work in mines and quarries.

The PB60 and PB60S Paving Breakers are identical in construction except that the PB60S is fitted with an integral muffler that reduces the noise level of the breaker and extends its application possibilities. All descriptions and specifications pertaining to the PB60 will apply to the PB60S except where noted.

Refer to PS-5500.13 for Parts List of the PB60 and PB60S Paving Breakers.

1-1.2 PB85 and PB85S DESCRIPTION

The PB85 and PB85S Paving Breakers are high-quality tools designed for the majority of heavy-duty demolition jobs. They are especially suited to tearing up concrete, asphalt, or stone paving in road construction jobs; tearing down walls foundations, and floors in general construction and maintenance work; breaking up large rocks

and boulders in mines and quarries; and general demolition work in any industry.

The PB85 and PB85S Paving Breakers are identical in construction except that the PB85S is fitted with an integral muffler that reduces the noise level of the breaker and extends its application possibilities. All descriptions and specifications pertaining to the PB85 will apply to the PB85S except where noted.

The PB85 and PB85S can be equipped with spike driver fronthead parts specially designed for driving spikes on railway maintenance jobs.

Refer to PS-5500.16 for Parts List of the PB85 and PB85S Paving Breakers and Spike Drivers.

1-1.3 STANDARD EQUIPMENT

Each standard Paving Breaker is a complete unit ready to be put into service with proper lubrication. There are no extra parts or special fittings required.

The standard Paving Breakers have a fronthead bushing for a 32 mm hex. x 152 mm lg (1-1/4 in. hex. x 6 in. lg) paving breaker shank.

1-1.4 OPTIONAL FRONTHEAD BUSHING

When specially ordered, the Paving Breakers can be equipped with an optional fronthead bushing for 29 mm hex. x 152 mm lg (1-1/8 in. hex. x 6 in. lg) paving breaker shank.

1-2 SPECIFICATIONS

1-2.1 PB60 AND PB60S SPECIFICATIONS

Table 1-1. PB60 and PB60S General Specifications

	METRIC	U.S.
Net Weight (PB60)	28.6 kg	63 lb
Net Weight (PB60S)	29 kg	64 lb
Overall Length (less tool)	668 mm	26.312 in.
Bore of Cylinder	56 mm	2.204 in.
Working Stroke	124 mm	4.875 in.
**Size of Standard Paving Breaker		
Shank (Solid Hex. with Collar)	32 mm hex. x 152 mm lg (1-1/4 in. hex. x 6 in. lg)	
**Size of Optional Paving Breaker		
Shank (Solid Hex. with Collar)	29 mm hex. x 152 mm lg (1-1/8 in. hex. x 6 in. lg)	
Size of Air Inlet	3/4 in. NPT Male Pipe	
Size of Air Hose Recommended	19.1 mm	3/4 in.
Air Consumption (at 621 kPa [90 psi])	1.94 m ³ /min	69 ft ³ /min

**NOTE: The paving breaker shank size depends on the size of the replaceable fronthead bushing.

Table 1-2. PB60 and PB60S Shipping Information

	METRIC	U.S.
Net Weight (PB60)	28.6 kg	63 lb
Net Weight (PB60S)	29 kg	64 lb
Shipping Weight (PB60)(boxed for export or domestic shipment)	29.5 kg	65 lb
Shipping Weight (PB60S)(boxed for export or domestic shipment)	30 kg	66 lb
Cubic Contents (boxed for export or domestic shipment)	0.087 m ³	3-1 ft ³

1-2.2 PB85 and PB85S SPECIFICATIONS

Table 1-3. PB85 and PB85S General Specifications

	PAVING BREAKERS		SPIKE DRIVERS	
	Metric	(U.S.)	Metric	(U.S.)
Net Weight (PB85)	37 kg	(82 lb)	34 kg	(75 lb)
Net Weight (PB85S)	37.6 kg	(83 kg)	34.5 kg	(76 lb)
Overall Length (less tool).....	702 mm	(27.625 in.)	665 mm	(26.2 in.)
Bore of Cylinder	63.5 mm	(2.5 in.)	63.5 mm	(2.5 in.)
Working Stroke	161 mm	(6.312 in.)	161 mm	(6.312 in.)
**Size of Standard Paving Breaker Shank (Solid Hex. with Collar) ..	32 mm hex. x 152 mm lg (1-1/4 in. hex. x 6 in. lg)			
**Size of Optional Paving Breaker Shank (Solid Hex. with Collar) ..	29 mm hex. x 152 mm lg (1-1/8 in. hex. x 6 in. lg)			
Size of Air Inlet	3/4 in. NPT Male Pipe		3/4 in. NPT Male Pipe	
Size of Air Hose Recommended	19.1 mm	(3/4 in.)	19.1 mm	(3/4 in.)
Air Consumption (at 621 kPa [90 psi])	2.02 m ³ /min.	(72 ft ³ /min.)	See Note Below	

NOTE: The air consumption of the Spike Drivers is 2.02 m³/min. (72 ft³/min.) actual at 621 kPa (90 psi). However, its operation is intermittent with approximately five seconds required to drive a spike. Therefore, the air consumption can be figured to be 0.17 m³ (6 ft³) of free air per spike.

**NOTE: The Paving Breaker Shank Size depends on the size of the replaceable fronthead bushing.

Table 1-4. PB85 and PB85S Shipping Information

	PAVING BREAKERS		SPIKE DRIVERS	
	Metric	(U.S.)	Metric	(U.S.)
Net Weight (PB85)	37 kg	(82 lb)	34 kg	(75 lb)
Net Weight (PB85S)	37.6 kg	(83 lb)	34.5 kg	(76 lb)
Shipping Weight (PB85) (boxed for export or domestic shipment)	38.1 kg	(84 lb)	35 kg	(77 lb)
Shipping Weight (PB85S) (boxed for export or domestic shipment)	38.5 kg	(85 lb)	35.4 kg	(78 lb)
Cubic Contents (boxed for export or domestic shipment)	0.087 m ³	(3-1 ft ³)	0.087 m ³	(3-1 ft ³)

SECTION II

OPERATION

2-1 AIR REQUIREMENTS

An air compressor of sufficient capacity is needed to provide the necessary volume of air at the most efficient operating pressure to ensure effective and economical operation of the breaker. Refer to Specifications (paragraph 1-2) for air requirements of the breaker.

2-1.1 AIR PRESSURE AND VOLUME

Low or inadequate air pressure at the breaker is costly and wasteful, and an insufficient volume of air will not allow it to operate efficiently.

Air pressures of 483 to 827 kPa (70 to 120 psi) are recommended for maximum performance. These figures represent air pressures at the breaker and not at the compressor. There is always a certain amount of pressure drop between the compressor and the breaker; only the pressure and volume at the tool is effective in doing work. If the hose is relatively short and in good condition, the pressure drop between the compressor (or air receiver) and the breaker should not exceed 15 percent of the initial pressure.

2-1.2 AIR HOSE AND FITTINGS

Quality hose designed especially for rock drill service should be used. It should be constructed with an outer covering that resists abrasive wear, an oil-resistant inner tube and should be able to withstand the heat of the compressed air. It should have a working pressure safety factor of at least 4 to 1 in relation to burst.

The hose fittings should be kept as tight as possible and should be in good condition. Elimination of leakage involves making the air system tight and then keeping it tight. Air losses through bad connections and worn hose can often reach 10 to 20 percent of the total air compressed. Refer to Specifications (paragraph 1-2) for the size of air hose required.

2-2 BEFORE OPERATION

1. Determine the method of lubrication to be used. Refer to paragraph 3-1.

2. Fill the oil reservoir with rock drill oil conforming to the physical and chemical properties listed in Table 3-1.

3. Blow out the main air supply hose to get rid

of moisture, rubber particles, and dirt.

DANGER

COMPRESSED AIR IS DANGEROUS. WHEN BLOWING OUT AN AIR HOSE, HOLD IT FIRMLY AND POINT IT AWAY FROM PERSONNEL AND EQUIPMENT. NEVER BLOW YOUR CLOTHES FREE OF DUST WITH COMPRESSED AIR.

4. When using new air hose, blow lubricated air through the hose to completely coat the inside with oil. This may take 10 to 15 minutes.

5. Pour 0.12 liter (1/2 cup) of rock drill oil into the hose before connecting it to the breaker.

6. An air line filter can be installed in the main air supply line to keep dirt from entering the breaker. Filters are an accessory item and must be specially ordered.

7. Connect the leader hose to the air connection on the breaker.

DANGER

BE SURE ALL HOSE CONNECTIONS ARE TIGHT. A LOOSE HOSE NOT ONLY CAUSES LEAKS, BUT MAY COME COMPLETELY OFF THE BREAKER, WHIP AROUND, AND INJURE PERSONNEL IN THE AREA. ATTACH SAFETY CABLES TO ALL HOSES TO PREVENT INJURY IF A HOSE IS ACCIDENTLY BROKEN.

8. Open the steel retainer by pushing the lever down with your foot.

9. Insert the shank end of the paving-breaker tool in the fronthead, and swing the retaining lever up to lock the tool in the breaker. Refer to Specifications (paragraph 1-2) for the correct paving breaker shank size.

CAUTION

MAKE SURE THE TOOL IS THE CORRECT SIZE FOR THE FRONTHEAD: EITHER 29 MM HEX. (1-1/8 IN. HEX.) OR 32 MM HEX. (1-1/4 IN. HEX.). DON'T USE A PAVING BREAKER TOOL THAT IS DULL; IT WON'T DO AN EFFECTIVE JOB AND WILL CAUSE UNNECESSARY WEAR TO THE BREAKER.

10. Check the tightness of the assembly rods:

a. PB60 and PB60S - Tighten the assembly rod nuts until the assembly rod springs are compressed to 60 mm (2.36 in.).

b. PB85 and PB85S - Tighten the assembly rod nuts until the assembly rod springs are compressed to 68 mm (2.68 in.).

2-3 CONTROLS

The Paving Breaker is controlled by a self-closing, lever-operated, throttle valve that is built into the t-handle.

When air pressure is directed to the breaker, the throttle lever will be in the raised, or off, position. The breaker will not start until the lever is depressed. The lever will return to the off position when it is released.

2-4 OPERATION

CAUTION

DO NOT OPERATE THE BREAKER WITHOUT A BREAKER TOOL IN THE FRONTHEAD. HOLD THE TOOL FIRMLY AGAINST THE WORK.

DANGERS

1. KNOW WHAT IS UNDERNEATH THE MATERIAL YOU ARE ABOUT TO BREAK. BE ALERT FOR ANY EXISTING WATER, GAS, ELECTRICITY, SEWER, OR TELEPHONE LINES.
2. ALWAYS KEEP BOTH HANDS ON THE HANDLE WHILE OPERATING THE BREAKER.
3. THE OPERATOR MUST SPREAD HIS LEGS AND FEET CLEAR OF THE BREAKER TOOL TO PREVENT INJURY IF THE TOOL BREAKS. WHEN A TOOL BREAKS, THE BREAKER (WITH A PIECE OF BROKEN TOOL PROJECTING FROM THE FRONTHEAD) WILL SUDDENLY DROP TO THE GROUND.

1. Grip the breaker handle with both hands. Depress the throttle valve lever with the palm of the hand, and apply a firm steady pressure to the t-handle. The correct amount of pressure for maximum efficiency can be gained only by experience, but generally the correct pressure is usually recognizable by the rhythmic sound of the exhaust and maximum breaking action. Insufficient pressure will cause the breaker to "bounce," while too much pressure will slow down the breaking action. Do

not "ride" the breaker with one leg over the handle.

CAUTION

RIDING THE BREAKER HANDLE CREATES EXCESSIVE PRESSURE ON ONE SIDE OF THE BREAKER, THROWING IT OUT OF ALIGNMENT AND CAUSING UNNECESSARY WEAR ON INTERNAL PARTS.

DANGER

THE OPERATOR CAN BE SERIOUSLY INJURED IF THE TOOL BREAKS WHILE HE IS RIDING THE BREAKER WITH ONE LEG OVER THE HANDLE.

2. Almost immediately after starting the breaker, check for the presence of oil at the exhaust port and on the paving breaker tool. This is the only assurance that oil is traveling all the way through the breaker. When checking the breaker for proper lubrication, always put the tool against the work.

3. Release the throttle-valve lever to shut the breaker off.

4. Periodically check the two assembly rods. (Refer to paragraph 2-2, step 10).

5. If exhaust freeze-up occurs, add anti-freeze lubricant directly through the air inlet connection. Use "KILLFROST" anti-freeze lubricant or equivalent.

2-5 OPERATIONAL TIPS

To ensure maximum operating efficiency, observe the following suggestions:

- a. Never strike the breaker with tools.
- b. Never attempt major maintenance of the breaker on the job; take it to a repair shop.
- c. Never drag the breaker along the ground; the air ports and other openings will scoop up dirt.
- d. Always blow out the air supply hose before connecting it to the breaker. This rids the line of dirt.
- e. Always be sure the breaker is well lubricated. Adjust the air line lubricator so that the paving breaker tool always shows an oil film. There should be a fine mist of oil coming out of the exhaust port.
- f. Always keep Rock Drill Oil in a sealed container so that it doesn't get contaminated with dust or dirt.
- g. Do not operate the breaker when the tool is

not against the work.

h. In extremely cold weather, keep paving breaker tools wrapped in burlap or cloth until just before you use them. At 0°F (-17.8°C) a hardened-steel tool loses about 80% of its normal shock resistance.

i. Always keep plastic caps or plugs in all ports when the breaker is not in service.

j. Work to the predetermined line (boundary) and grade (depth). Cut straight and cut neatly. To get the exact grade, use a tape or ruler.

k. In certain applications, such as a pipe job where the grade is critical, it pays to over-excavate. If you try to excavate exactly to grade, even a small piece of rock sticking up will throw the pipe off grade. To avoid this problem, excavate a little deeper than grade, then fill and compact to the correct grade. This is easier than having to come back and break out more rock.

l. Always score a sidewalk or portion of a slab before breaking it. This is usually done with a concrete saw, but if it has not been, use the breaker to score the job along the designated line to ensure a clean break. When cutting asphalt, cut all the way through the asphalt with each cut, as well as all the way around the perimeter of the area, before you break the asphalt out.

m. When excavating to a critical line for installation of a service, square the sides of the excavation as you work down. Otherwise, you'll either under-cut or over-cut.

n. When making an excavation to work in, it's better to make a "bell-hole" to provide ample working room.

o. Always break any material to the point of "give". This is accomplished by making sure you're breaking the concrete or rock, not just cracking it; otherwise, you're not working to the point of give. Always clear away the rubble as you're breaking the concrete, rock, or asphalt. Uncleared rubble blocks your point of give.

p. Always take the right sized "bite" with the paving breaker. When starting to work the breaker in a material, experiment to find the right sized bite for breaking that material efficiently.

1. If you take bites that are too big, it will be necessary to pry with the breaker tool. This could break the tool or damage the breaker. The paving breaker is not designed for prying; it's designed for breaking. Always use a pick to pry material free.

2. If you take bites that are too small, you'll be working too slowly, and you'll have to pick up and move the breaker more than necessary.

SECTION III

MAINTENANCE

3-1 LUBRICATION

3-1.1 METHODS OF LUBRICATION

Proper lubrication is the most important single factor responsible for the service life of the pneumatic breaker. A breaker can be severely damaged during the first few minutes of operation if it is not properly lubricated.

The lubrication method depends on the actual operating conditions and customer preference.

a. The oil reservoir built into the handle will provide proper lubrication. It must be checked every two hours and refilled as necessary.

b. For intermittent operation with an air-supply hose no longer than 15 m (49 ft), a compressor-mounted lubricator may be used.

c. For continuous operation during an eight-hour shift, an Ingersoll-Rand IRO-16F Air Line Lubricator, or other constant-feed air line lubricator, should be installed in the air-supply line about 3.5 m (11.5 ft) from the breaker. The IRO-16F Lubricator has a capacity of 0.47 Liters (1 U.S. pint) and will be furnished when it is specially ordered. To adjust an air line lubricator initially:

1. Turn the lubricator needle valve clockwise until it is completely closed, and then turn the valve counter-clockwise about 3/4 of a turn off its seat.

2. Almost immediately after starting the breaker, check for presence of oil at the exhaust ports and on the paving breaker tool. When checking the breaker for proper lubrication, always put the tool against the work.

3. Fine-tune the lubricator needle valve to provide a light film of oil on the paving breaker tool and a fine oil mist coming from the exhaust ports. If there is blue smoke coming from the ex-

haust port or oil running down the tool, the breaker is getting too much oil. Adjust the lubricator for proper rate of feed.

Regardless of the method of lubrication, the lubricating oil reservoir must be serviced with the correct grade of rock drill oil as frequently as is necessary to prevent any possibility of the breaker running dry.

The supply of lubricant in the handle reservoir should be checked every two hours of operating time.

The oil level in the air line lubricator should be checked at the beginning of each eight-hour shift and once during the shift.

Every effort must be made to avoid oil contamination from dirt or other impurities. Oil should be kept in covered containers and stored in an area that is relatively dust free.

Before filling the air line lubricator, the area around the filler plug should be wiped clean.

3-1.2 LUBRICATING OIL SPECIFICATIONS

Rock Drill Oil formulated specifically for pneumatic tools is available. This oil possesses certain characteristics that prolong the service life of the breaker and provide protection against rust and corrosion when the tool is stored.

It is recommended that oils of this class be used in the oil reservoir in order to obtain maximum performance of the tool. Table 3-1 lists the specifications of this oil.

In addition to meeting the specifications in Table 3-1, the Rock Drill Oil must perform satisfactorily in the breaker. The responsibility for meeting these specifications, the quality of the product, and its performance in service must necessarily rest with the oil supplier.

Table 3-1. Rock Drill Lubricating Oil Specifications

The Rock Drill Oil used in the air line lubricator must be a well refined petroleum lubricating oil. It must be suitably compounded to provide the specified consistency and film strength, and be further compounded to provide the specified steam emulsion number. The latter is required to provide a satisfactory lubricant for such drills where water or wet air is encountered. The oil must also be substantially non-corrosive to steel and bronze, and contain little or no sulphur.

Characteristics	Method	Below 20°F (-6.7°C) Light	20 to 90°F (-6.7 to 32.2°C) Medium	Above 90°F (32.2°C) Heavy
Viscosity:				
SUS at 100°F (37.8°C)	ASTM-D2161	175 Min.	450 Min.	750 Min.
SUS at 210°F (98.9°C)	ASTM-D2161	46 Min.	65 Min.	85 Min.
cSt at 40°C	ASTM-D445	37 Min.	105 Min.	160 Min.
cSt at 100°C	ASTM-D445	6 Min.	11 Min.	16 Min.
Flash Point, °F (°C) Min.	ASTM-D92	370 (188)	400 (204)	450 (232)
Pour Point, °F (°C) Max.	ASTM-D97	-10 (-23)	-10 (-23)	0 (-18)
Viscosity Index, Min.	ASTM-D2270	90	90	90
Steam Emulsion No., Min.	ASTM-1935-65	1200	1200	1200
Consistency		Stringy	Stringy	Stringy
Falex Load Test				
lbs (Min.)	ASTM-D2670	2000	2000	2000
Timken E.P. Test				
lbs (Min.)	ASTM-D2782	30	30	30

The composition of the "film strength" additive is not specified. The additive must be suitable for use with both steel and bronze, and be substantially non-corrosive to both metals. Except for consistency, all tests must be conducted in accordance with the standard method (latest edition) of the American Society for Testing Materials.

3-2 TROUBLE SHOOTING

The operating troubles outlined in Table 3-2 must not be construed as an indication of the op-

erating difficulties to be expected. If the paving breaker is operated and serviced properly, the only troubles that will develop will be due to normal wear associated with long hard service.

Table 3-2. Troubleshooting Chart

TROUBLE	PROBABLE CAUSE	REMEDY
Breaker will not start.	1. Plugged exhaust port or air passages caused by dirt or hose particles. 2. Stuck valve due to gummy oil or incorrect assembly. 3. Frozen piston due to improper lubrication. 4. Assembly rods unevenly tightened causing binding.	1. Dismantle breaker (Para. 3-3) and clean out all ports and air passages. Keep the air hose in top notch condition; never use a soft deteriorated hose. 2. Remove valve chest parts (Para. 3-3) from the breaker. Clean parts. Never use dirty oil nor oil that does not conform to the recommended specifications (Para. 3-1). Refer to para. 3-3.5 (14) for correct valve assembly procedures. 3. Dismantle breaker (Para. 3-3) to remove piston. Repair piston by placing in a high speed lathe and dressing with fine emery cloth. Never run breaker without the proper lubricating oil in the lubricating oil reservoir. 4. Keep the assembly rods tight at all times. Tighten the PB60 and PB60S assembly rod nuts until the assembly rod springs are compressed to 60 mm (2.36 in.). Tighten the PB85 and PB85S assembly rod nuts until the assembly rod springs are compressed to 68 mm (2.68 in.).
Breaker loses power rapidly.	1. Restriction in air supply line. 2. Air supply line too long. 3. Diameter of air supply too small.	1. Never allow the air supply to kink or make sharp bends. 2. As a general rule keep the air supply line under 15 m (49 ft). 3. A 19.1 mm (3/4 in.) diameter air supply is recommended for the breaker.
Breaker lacks power.	1. Low air supply pressure. 2. Running on fronthead cushion. 3. Plugged air passages. 4. Lack of lubricating oil.	1. The air supply pressure at the tool should be 483 to 827 kPa (70 to 120 psi). 2. Keep shank fed-up to the work. Always maintain a constant pressure when operating the breaker. 3. Dismantle the breaker (Para. 3-3) and clean out all ports and passages. 4. Maintain the proper oil level in the lubricating oil reservoir (Para. 3-1). Steel shank must show a film of oil.
Overheating of the cylinder front washer on a new machine.	1. Breaker not properly broken in.	1. Stop operating the breaker and perform initial servicing (Para. 2.2). Never run a new breaker at full throttle until a proper break-in period has been completed. (Para. 3-4)
Overheating of breaker after break-in period.	1. Running on fronthead cushion. 2. Piston not hitting the shank because of short shank. 3. Pulling steel at full throttle. 4. Lack of lubrication or improper lubricating oil.	1. Keep shank fed-up to work. Always maintain constant pressure when operating the breaker. 2. Remove shank from breaker. Refer to Specifications (paragraph 1-2) for correct shank size. 3. When pulling steels always use minimum throttle. 4. Before operating the breaker make sure the lubricating oil reservoir is full of proper lubricant (Para. 3-1).
Erratic or sluggish operation.	1. Lubricating oil too heavy, slowing down valve action. 2. Gummy oil or dirt in operating parts.	1. Use only the recommended lubricating oil. (Para. 3-1). 2. Dismantle breaker (Para. 3-3) and clean out dirt and gummy residue. Service the breaker with clean oil. Protect the tool from dirt when idle.
Freezing at exhaust ports.	1. Excessive moisture in the air supply line. (Usually occurs in low ambient temperatures.)	1. Install moisture traps in the air supply line or add anti-freeze lubricant directly through the air inlet. Use "KILFROST" anti-freeze lubricant or equivalent.
Fogging	1. Excessive moisture in the air supply line. 2. Over lubrication.	1. Blow out air lines. If moisture traps are installed in the air supply line, drain the moisture. 2. Clean lubricating oil reservoir and adjust for proper rate of feed.

3-3 DISASSEMBLY, INSPECTION AND REASSEMBLY

3-3.1 PRELIMINARY DISASSEMBLY INSTRUCTIONS

1. Never attempt major maintenance of the breaker on the job; always send the breaker to a repair shop.
2. Clean the exterior of the breaker before disassembly.
3. Provide a clean work area for disassembling the breaker.
4. If necessary, use a rubber mallet to loosen the cylinder from the handle. Use a brass drift to remove the cylinder front washer.
5. Handle parts carefully. Hardened parts might chip or break if dropped on a hard surface.
6. Place small parts in a clean box to prevent loss.

3-3.2 DISASSEMBLY INSTRUCTIONS (Refer to Figures 1-1 and 3-1)

1. Mount the breaker in a vise with the front-head up.

CAUTION

POSITION THE BREAKER SO THAT THE VISE JAWS CLAMP THE BREAKER HANDLE. CLAMP THE BREAKER FIRMLY BUT DO NOT EXERT EXTREME PRESSURE. THE HANDLE CAN BE SQUEEZED OUT-OF-ROUND OR CRACKED IF THE VISE IS OVERTIGHTENED.

2. Unscrew the two assembly rod nuts (17), then remove the nuts and springs (18).
3. Lift the fronthead assembly off the breaker.

NOTE

Step number 4 applies only to Models PB60S and PB85S Paving Breakers.

4. Pull the muffler (35) off the breaker.
5. Pull the cylinder (32) upward to remove it from the handle (1). If the cylinder will not free easily from the handle, "rock" the cylinder from side to side as you pull upward. If rocking does not free the cylinder, strike it several times with a rubber mallet.
6. As the cylinder is being removed, the piston (33) will drop out onto the valve chest assembly. Remove the piston.
7. Tip the cylinder forward and remove the anvil

block (39) from the front of the cylinder.

8. The cylinder front washer (37) is held in the cylinder (32) by a friction-fit. Use a brass drift and a hammer to drive the washer out of the front of the cylinder.

NOTE

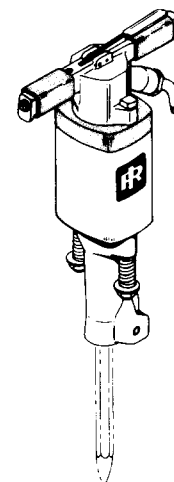
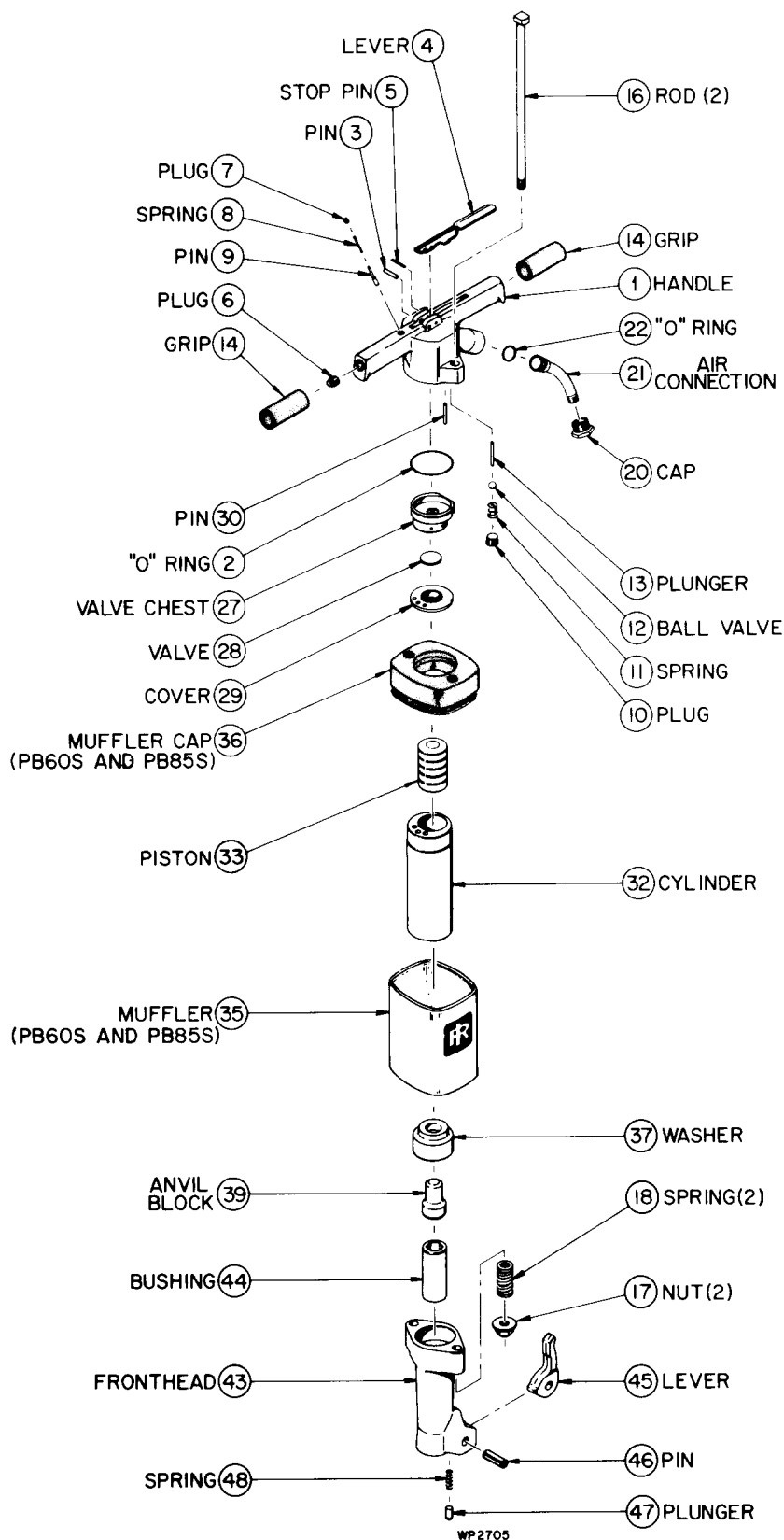
Step number 9 applies only to Models PB60S and PB85S Paving Breakers.

9. Remove the rubber muffler cap (36) from the cylinder (32).
10. Remove the O-Ring (2) from the handle (1).
11. Remove the assembly rods (16).
12. Remove the handle assembly from the vise and invert it to allow the valve chest (27), valve chest cover (29), disc valve (28) and locating pin (30) to fall out of the handle (1).
13. Place the handle (1) on a clean work bench.
14. Unscrew the pipe plug (10) with a 9/16 in. (14.3 mm) allen wrench. If an allen wrench of this size is unavailable, the hex. head of a 3/8 in. (9.5 mm) bolt along with vise grips will provide a suitable tool.
15. Remove the throttle spring (11) and ball valve (12) from the handle (1). Note the manner in which the spring (11) is installed; it is tapered and must be re-installed with the smaller diameter end against the ball valve.
16. Remove the throttle plunger (13) from the handle.
17. If it is necessary to remove the throttle valve lever (4), drive out the throttle valve pin (3) and throttle valve lever stop pin (5), then lift the lever out of the handle.

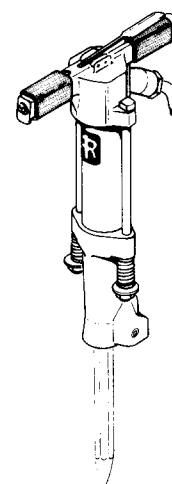
NOTE

Do not attempt to remove the oil metering parts (parts 7, 8, and 9) unless they are damaged and must be replaced.

18. If the oil metering parts must be removed, use a 3/16 in. (4.8 mm) allen wrench to remove the oil metering plug (7) from the handle (1). This will allow the oil metering spring (8) and pin (9) to drop out of the handle.
19. If necessary, remove the oil reservoir plug (6) from the handle (1).
20. Unscrew the air connection cap (20), then remove it along with the air connection (21) and o-ring (22).



PB60S AND PB85S



PB60 AND PB85

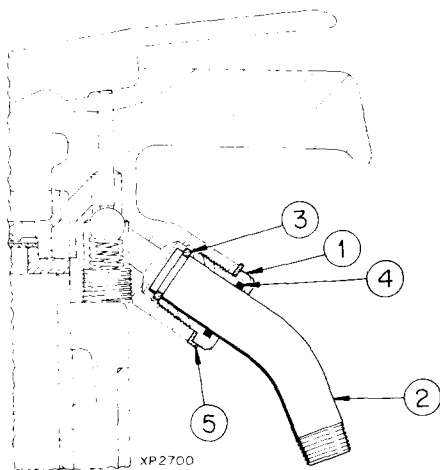
Figure 3-1. PB60, PB60S, PB85 and PB85S
Paving Breakers (Exploded View)

NOTE

Some of the earlier PB85 and PB85S Paving Breakers were equipped with a slightly different air connection assembly than the one shown in Figures 1-1 and 3-1. Refer to Figure 3-2 for an illustration of the older-style air connection assembly. To remove the older-style air connection assembly, bend back the tabs on the tab washer (5, figure 3-2) and unscrew the cap (1, figure 3-2) to remove the air connection assembly from the handle.

CAUTION

DO NOT ATTEMPT TO DISASSEMBLE THE INDIVIDUAL PARTS COMPRISING THE OLDER-STYLE AIR CONNECTION ASSEMBLY, SINCE THEY ARE NOT AVAILABLE ON AN INDIVIDUAL BASIS.



1. Swivel Connection Cap
2. Swivel Connection
3. Retaining Ring
4. O-Ring
5. Tab Washer

Figure 3-2. Older-Style Air Connection Assembly for PB85 and PB85S

21. If it is necessary to remove the steel retainer parts, drive out the roll pin (46), then remove the retainer lever (45), plunger (47), and spring (48).

22. If the fronthead bushing (44) must be removed from the fronthead (43), make a tool from an old moil steel:

- a. Cut off the tip of the moil.
- b. Leave about 6 in. (152 mm) of steel on each side of the moil collar.

c. The collar on the moil steel must be turned down to 1-1/2 in. (38.1 mm) diameter to permit the collar to rest on the bushing (44) and not on the lip within the fronthead (43).

23. Insert the fabricated tool in the front end of the fronthead (43), and, with a hydraulic press, drive out the fronthead bushing (44).

3-3.3 INSPECTION AND REPAIR OF PARTS

1. Clean disassembled parts in a suitable solvent.

DANGER

WHEN USING ANY SOLVENT TO CLEAN PARTS, MAKE SURE THAT IT MEETS CURRENT SAFETY AND HEALTH STANDARDS, AND THAT IT IS USED IN AN AREA THAT IS ADEQUATELY VENTILATED.

2. All of the ports in the handle, valve chest, valve chest cover, and cylinder must be examined, and all dust or dirt particles removed.

3. Check the disc valve for cracks or coining. If the valve is damaged, replace it.

4. The cylinder front washer must be checked for wear. Excessive wear leads to loss of cushion on the front end of the cylinder and invites breakage of the piston and other parts. Worn front washers should be replaced when a 0.007 in. (0.178 mm) feeler gauge can be inserted between the anvil block and the cylinder front washer.

5. Check the anvil block and piston to be sure that the faces are in good condition. If the striking face of the piston shows signs of wear, it should be reversed upon reassembly. If faces are cupped, they can be refaced by grinding. Care must be exercised when regrinding so that the re-finished surface is flat and square. Remove as little metal as possible. Do not burn metal when regrinding.

6. Replace the piston and/or cylinder when a 0.007 in. (0.178 mm) feeler gauge can be inserted between them. To determine whether the piston or cylinder is worn, install a new piston in the cylinder and check the clearance.

7. Check the flat wear faces of the handle, cylinder, cylinder front washer, and fronthead for uneven wear. If such wear occurs, it is usually due to uneven tension on the assembly rods. The damaged surfaces should be reground.

8. Check the throttle valve ball for wear, and make certain that the throttle valve plunger is free to slide in the handle.

9. When the throttle valve spring becomes fatigued, it should be replaced. The correct free length of the spring is 7/8 in. (22.2 mm).

3-3.4 PRELIMINARY REASSEMBLY INSTRUCTIONS

1. Keep hands and breaker parts free of dirt.

2. Wipe a film of clean oil over all working parts as they are assembled.

3. Do not allow dirt or chips from soft hammers to enter the breaker.

4. All parts, with the exception of pressed-in parts, should fit together easily and should not require excessive force. If force is required, the part is probably cocked or misaligned and should be removed and realigned.

3-3.5 REASSEMBLY INSTRUCTIONS (Refer to Figures 1-1 and 3-1)

1. If the fronthead bushing (44) was removed from the fronthead (43), an assembly tool should be made from an old moil steel to assist in re-assembling the bushing in the fronthead. Refer to paragraph 3-3.2, step 22, for instructions on fabricating this tool.

2. Using the fabricated assembly tool, press the fronthead bushing (44) into the back end (cylinder end) of the fronthead (43) until bottomed.

NOTE

Make sure the bushing (44) is aligned in the fronthead (43) so that chisel points, asphalt cutters, and other bladed tools will have the blade parallel to the breaker handle.

3. If they were removed, reassemble the steel retainer parts:

a. Insert the steel retainer spring (48) and plunger (47) (in order mentioned) in the fronthead (43).

b. Fit the steel retainer lever (45) to the fronthead (43), then secure with the lever pin (46).

4. Secure the handle (1) in a vise with soft jaws.

CAUTION

CLAMP THE HANDLE FIRMLY BUT CAREFULLY. THE HANDLE CAN BE CRACKED OR SQUEEZED OUT-OF-ROUND IF THE VISE IS OVER-TIGHTENED.

5. Install a new o-ring (22) on the air connection (21), place the connection in the tapered cap (20), then apply Loctite to the threads of the cap and screw it into the inlet boss in the handle.

NOTE

Some of the earlier PB85 and PB85S Paving Breakers were equipped with an older-style air connection assembly as shown in Figure 3-2. To re-install the older-style connection, slide the tab washer (5, figure 3-2) over the cap (1, figure 3-2), then apply Loctite to the threads of the connection cap and screw the air connection assembly (figure 3-2) into the handle. Be sure to bend back the tabs on the tab washer.

6. If it was removed, screw the oil reservoir plug (6) into the handle (1).

7. Install the oil metering pin (9), then the spring (8) in the ports in the handle. Apply Loctite to the threads of the oil metering plug (7), then screw it into the handle.

8. Position the throttle valve lever (4) in the handle (1), and drive in the throttle valve lever pin (3) and stop pin (5) to secure the lever in the handle.

9. Slide the two assembly rods (16) through their holes in the handle.

10. Turn the handle (1) in the vise to expose the interior. Support the assembly rods (16) so they will not drop out of the handle.

11. Install the throttle plunger (13), ball valve (12), and throttle spring (11) in the handle (1).

NOTE

The throttle spring (11) is tapered and must be installed with the smaller diameter against the ball (12) and the larger diameter against the plug (10).

12. Apply Loctite to the threads of the plug (10), then screw it into the handle to secure the throttle valve parts.

13. Install the locating pin (30) in the handle for the valve parts.

14. Install the valve chest (27), disc valve (28), and valve chest cover (29) (in order mentioned) in the handle. Make sure the locating pin grooves in the valve chest (27) and valve chest cover (29) align with the locating pin.

NOTE

Extreme care must be exercised to assure that the disc valve (28) is properly seated in the valve chest (27) when assembled with the valve chest cover (29). If necessary, apply a light coating of grease to the valve to hold it in position in the valve chest.

CAUTION

IF THE DISC VALVE (28) IS NOT SEATED PROPERLY AND IS COCKED BETWEEN THE VALVE CHEST (27) AND THE VALVE CHEST COVER (29) WHEN THE ASSEMBLY RODS ARE TIGHTENED, THE VALVE PARTS WILL BE PERMANENTLY DAMAGED, AND THE BREAKER WILL NOT RUN.

15. If removed, install a new "O" ring (2) in its groove in the handle (1).

NOTE

Step number 16 applies only to Models PB60S and PB85S Paving Breakers.

16. Apply a light coat of clean oil to the inside diameter of the muffler cap (36), then install it on the operating-port end of the cylinder (32).

17. Apply a light coat of clean oil to the cylinder front washer (37), then, with a brass drift, drive the washer into the front of the cylinder (32).

18. Check the bore of the cylinder to make sure it is clean. If necessary, use a clean rag to wipe out any dirt or chips.

19. Drop the piston (33) in the cylinder (32).

20. Fit the cylinder assembly to the handle making sure the locating pin groove in the cylin-

der aligns with the locating pin (30) in the handle.

21. Push the cylinder assembly into the handle bore until the cylinder (32) is seated against the valve chest cover (29).

22. Install the anvil block (39) in the cylinder front washer (37).

NOTE

Step number 23 applies only to Models PB60S and PB85S Paving Breakers.

23. Fit the muffler (35) to the muffler cap (36) and cylinder (32), making sure the assembly rod holes in the bottom of the muffler slide over the assembly rods (16), and that the muffler exhaust holes are on the air connection side of the breaker.

24. Align the assembly rod holes in the fronthead (43) with the assembly rods (16), and fit the fronthead assembly to the cylinder front washer (37).

NOTE

Make sure the steel retainer lever (45) is located on the air connection side of the breaker.

25. Hold the head of one assembly rod (16) flush against its lug on the handle (1), install the spring (18) on the assembly rod, then screw the nut (17) on the assembly rod-finger tight. Repeat this procedure for the remaining assembly rod.

26. Alternately tighten the assembly rod nuts (17) until the assembly rod springs (19) are compressed to:

- a. PB60 and PB60S - 60 mm (2.36 in.)
- b. PB85 and PB85S - 68 mm (2.68 in.)

3-4 PERFORMANCE TESTING

A reconditioned paving breaker should be tested before it is sent back to the job. Before connecting the air hose, check to see that the lubricator used with the breaker is filled with lubricating oil. Add a teaspoonful of lubricating oil directly into the air connection before attaching the leader hose for initial lubrication.

The paving breaker should start with less than 20 psi (138 kPa) air pressure and with the piston

reciprocating smoothly. Let the breaker run in slowly at reduced pressure long enough to see that it is in good working order. If the breaker stalls, turn off the air immediately. This indicates binding due to tight fits or perhaps unevenly tightened rods. Check rod tension first, then start the breaker again. After a short period of operation, a definite rhythm should develop and an even exhaust note will be heard. The breaker may become warm, but should not overheat. If erratic

operation continues or stalling persists, dismantle the tool and check for binding of parts.

After an initial period of low pressure operation, check the performance of a reconditioned breaker with that of a new one by comparing both under similar conditions and with normal air pressure. Once testing is completed, place plastic caps or plugs in all ports to keep out dirt until the breaker is put back in service.

NOTES

NOTES

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