SPX OTC
SPX Corporation
655 Eisenhower Drive
Owatonna, MN 55060-0995 USA
Phone: (507) 455-7000
Tech. Services: (800) 533-6127
Fax: (800) 955-8329
Order Entry: (800) 533-6127
Fax: (800) 283-8665
International Sales: (507) 455-7290
Fax: (507) 455-7063

Form No. 102755

Operating Instructions and Parts List for:

4088
4089

HYDRAULIC CYLINDERS

All cylinders are marked with maximum pressure setting

SAFETY EXPLANATIONS

Two safety symbols are used to identify any action or lack of action that can cause personal injury. Your reading and understanding of these safety symbols is very important.

DANGER - Danger is used only when your action or lack or action will cause serious human injury or death.

WARNING - Warning is used to describe any action or lack of action where a serious injury can occur.

IMPORTANT - Important is used when action or lack of action can cause equipment failure, either immediate or over a long period of time.

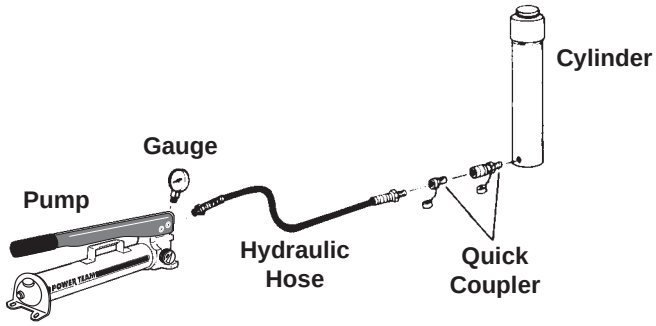
WARNING: It is the operator's responsibility to read and understand the following safety statements,

- **Only qualified operators should install, operate, adjust, maintain, clean, repair, or transport this machinery.**
- **These components are designed for general use in normal environments. These components are not specifically designed for lifting and moving people, agri-food machinery, certain types of mobile machinery or special work environments such as: explosive, flammable or corrosive. Only the user can decide the suitability of this machinery in these conditions or extreme environments. OTC will supply information necessary to help make these decisions.**

SINGLE-ACTING HYDRAULIC SYSTEMS

A basic single-acting hydraulic system consists of a manual or power pump that moves the hydraulic fluid, a hydraulic hose that carries the fluid, and a cylinder or ram that the fluid moves to do a job.

TYPICAL INSTALLATION



Since the single-acting cylinders have only one hose going to the cylinder, the cylinder can only apply force to extend its rod. The return stroke is accomplished by gravity or spring force.

Litho in USA

SAFETY PRECAUTIONS

DANGER

- **When extending a cylinder or ram under load, always insure that the coupler(s) or port thread(s) has (have) not been damaged or do(es) not come in contact with any rigid obstruction. If this condition does occur, the coupler's attaching threads may become stripped or pulled from the cylinder or ram resulting in the instantaneous release of high pressure hydraulic fluid, flying objects, and loss of the load. All of these possible results could cause serious injury or death.**
- **Avoid off-center loads which could damage the cylinder or ram and/or cause loss of the load, possibly causing serious injury or death.**
- **Control the load at all times. Do not drop the load. Especially on locking collar cylinders or rams because the threads may shear and cause loss of the load.**
- **Properly rated adapters must be installed and used correctly for each application.**
- **Cylinders with weep hole stroke limiters will expel high pressure oil through the bleed hole to the atmosphere if extended beyond the visual maximum stroke indication. If this occurs, seals must be replaced.**

WARNING

- **All WARNING statements must be carefully observed to help prevent personal injury.**

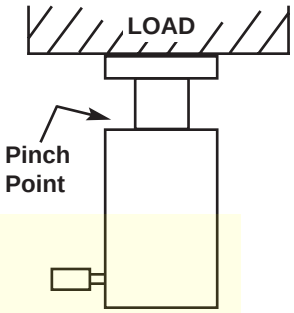
Hydraulic Hoses and Fluid Transmission Lines

- **Before operating the pump, all hose connections must be tightened with the proper tools. Do not overtighten. Connections should only be tightened securely and leak-free. Overtightening can cause premature thread failure or high pressure fittings to split at pressures lower than their rated capacities.**
- **Should a hydraulic hose ever rupture, burst, or need to be disconnected, immediately shut off the pump and release all pressure. Never attempt to grasp a leaking pressurized hose with your hands. The force of escaping hydraulic fluid could cause serious injury.**
- **Do not subject the hose to potential hazard such as fire, sharp surfaces, extreme heat or cold, or heavy impact. Do not allow the hose to kink, twist, curl, crush, cut, or bend so tightly that the fluid flow within the hose is blocked or reduced. Periodically inspect the hose for wear, because any of these conditions can damage the hose and possibly result in personal injury.**
- **Do not use the hose to move attached equipment. Stress can damage the hose and possibly cause personal injury.**
- **Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive materials such as creosote-impregnated objects and some paints. Hose deterioration due to corrosive materials can result in personal injury. Consult the manufacturer before painting a hose. Never paint a coupler.**

SAFETY PRECAUTIONS (CONTINUED)

Cylinder

- Use only approved accessories and approved hydraulic fluid. Hoses, seals and all components used in a system must be compatible with the hydraulic fluid used.
- Do not exceed the rated capacities of the cylinders. Excess pressure can result in personal injury.
- Inspect each cylinder and coupler before each use to prevent unsafe conditions from developing.
- Do not use cylinders if they are damaged, altered or in poor condition.
- Do not use cylinders with bent or damaged couplers or damaged port threads.
- Under certain conditions, the use of an extension with a hydraulic cylinder may not be advisable and could present a dangerous condition.
- Avoid pinch points or crush points that can be created by the load or parts of the cylinder.



- If this component is used to lift or lower loads, be certain that the load is under operator control at all times and that others are clear of the load. Do not drop the load.
- As the load is lifted, use blocking and cribbing to guard against a falling load.
- To help prevent personal injury, do not allow personnel to go under or work on a load before it is properly cribbed or blocked. All personnel must be clear of the load before lowering.
- Never use extreme heat to disassemble a hydraulic cylinder or ram. Metal fatigue and/or seal damage will result and can lead to unsafe operating conditions.
- The guide cannot cover every hazard or situation so always do the job with SAFETY FIRST.

IMPORTANT:

- Keep the cylinder clean at all times.
- When the cylinder is not in use, keep the piston rod fully retracted and upside down.
- Use an approved, high-grade pipe thread sealant to seal all hydraulic connections. Teflon tape can be used if only one layer of tape is used and it is applied carefully (two threads back) to prevent the tape from being pinched by the coupler and broken off inside the pipe end. Any loose pieces of tape could travel through the system and obstruct the flow of fluid or cause jamming of precision-fit parts.
- Always use protective covers on disconnected quick couplers.
- When mounting cylinders or rams using the internal piston rod threads, collar threads, threaded tie rods or base mounting holes, the threads must be fully engaged. Always use SAE grade 8 or better fasteners when attaching components to cylinders or rams and tighten securely.
- Limiting the stroke on spring return cylinders will prolong spring life.

INTRODUCTION

These instructions are written to help you, the user, more effectively use and maintain your hydraulic cylinders. If any questions, please call your nearest OTC facility.

Some of the information included in these instructions was selected from A.N.S.I. B30.1 and applies to the construction, installation, operation, inspection and maintenance of hydraulic cylinders. It is strongly recommended that you read A.N.S.I. B30.1 to answer any questions not covered in these instructions. The complete A.N.S.I. B30.1 standard which contains additional information can be obtained at a nominal cost from the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th, New York, New York 10017.

An inspection checklist (Form No. 105503) is available on request from your nearest OTC facility.

SYSTEM EVALUATION

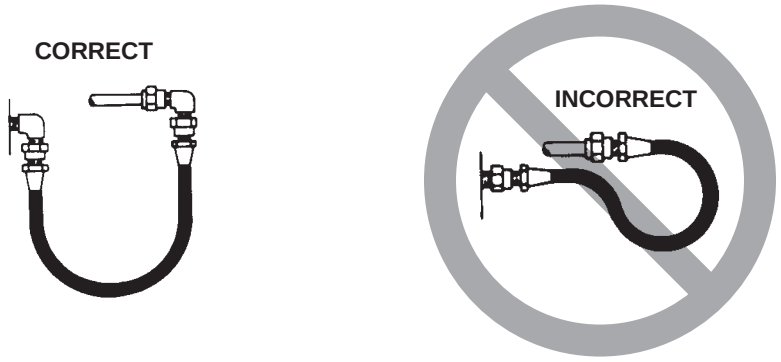
Your cylinder, hose(s), couplings and pump all must be rated for the same maximum operating pressure, correctly connected and compatible with the hydraulic fluid used. An improperly matched system can cause the system to fail and possibly cause serious injury. If you are in doubt, consult your nearest OTC facility.

SET-UP

HYDRAULIC CONNECTIONS

Remove the thread protectors or dust covers from the hydraulic ports if applicable. Clean the areas around the fluid ports of the pump and cylinder. Inspect all threads and fittings for signs of wear or damage, and replace as needed. Clean all hose ends, couplers and union ends. Connect all hose assemblies to the pump and cylinder. Use an approved, high-grade pipe sealant to seal all hydraulic connections. Tighten securely and leak-free but do not overtighten.

Hydraulic lines and fittings can act as restrictors as the cylinder or ram retracts. The restricting or slowing of the fluid flow causes back pressure that slows the cylinder's or ram's return. Return speed also varies because of the application, condition of the cylinder or ram, inside diameter of hose or fitting, length of the hose, and the temperature and viscosity of the hydraulic fluid.

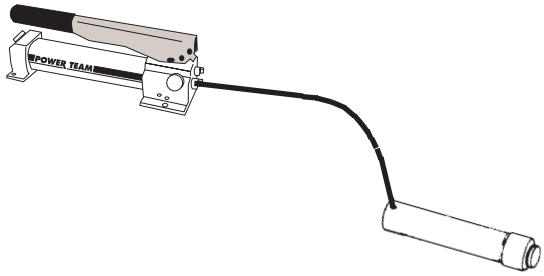


SET UP (CONTINUED)

BLEEDING THE SYSTEM

After all connections are made, the hydraulic system must be bled of any trapped air. Refer to the diagram below.

With no load on the system and the pump vented and positioned higher than the cylinder or ram, cycle the system several times. If you are in doubt about venting your pump, read the operating instructions for your pump. Check the reservoir for possible low fluid level and fill to proper level with approved, compatible hydraulic fluid as necessary.



IMPORTANT: Some spring return cylinders or rams have a cavity in the rod which forms an air pocket. This type of cylinder or ram should be bled when positioned upside down or lying on its side with the port facing upward.

INSPECTION

Before each use, visually inspect for the following items:

1. Cracked or damaged cylinder
2. Excessive wear, bending, damage, or insufficient thread engagement
3. Leaking hydraulic fluid
4. Scored or damaged piston rod
5. Improperly functioning swivel heads and caps
6. Loose bolts
7. Damaged or improperly assembled accessory equipment
8. Modified, welded, or altered equipment
9. Bent or damaged couplers or port threads

Preventive Maintenance (yearly or sooner, if the cylinder or ram condition suggests damage) - Visual examination by the operator or other designated personnel with a dated and signed equipment record.

MAINTENANCE

- **Always use clean, approved hydraulic fluid and change as needed.**
- **Any exposed threads (male or female) must be cleaned and lubricated regularly, and protected from damage.**
- **If a cylinder or ram has been exposed to rain, snow, sand, grit-laden air, or any corrosive environment it must be cleaned, lubricated, and protected immediately after exposure.**

PERIODIC CLEANING

A routine should be established to keep the hydraulic system as free from dirt as possible. All unused couplers must be sealed with dust covers. All hose connections must be free of dirt and grime. Any equipment attached to the cylinder must be kept clean. Use only OTC hydraulic fluid and change as recommended or sooner if the fluid becomes contaminated (never exceed 300 hours).

MAINTENANCE (CONTINUED)

STORAGE

Single-acting and Center Hole Cylinders

Single-acting and center hole cylinders and rams should be stored in a vertical position with the rod end down in a ***dry***, well-protected area where they will not be exposed to corrosive vapors, dust or other harmful elements.

When a single-acting cylinder or ram has not been used for a period of three (3) months it should be connected to a pump and be fully extended and then retracted. This cycle will lubricate the cylinder walls thereby reducing the potential for rust formation on the cylinder walls.

TROUBLESHOOTING GUIDE

IMPORTANT:

- **The following troubleshooting and repair procedures should be performed by qualified personnel familiar with this equipment. Use the proper equipment when troubleshooting!**

NOTE:

- **All the following statements may not apply to your particular model of cylinder or ram. Use the guide as a general reference for troubleshooting.**

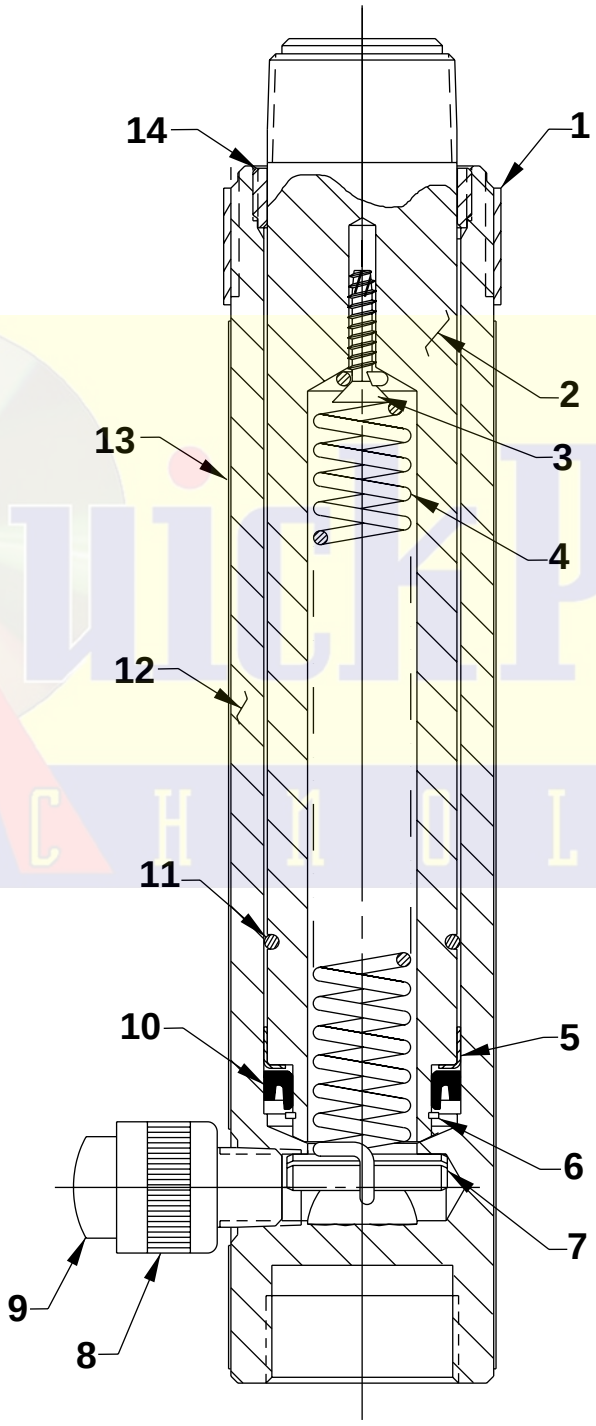
PROBLEM	CAUSE	SOLUTION
Erratic action	1. Air in system or pump cavitation	1. Add fluid, bleed air and check for leaks
	2. Internal leakage in double-acting cylinders or external leakage in single-acting cylinders	2. Replace worn packings. Check for excessive contamination or wear. Replace contaminated fluid as necessary.
	3. Cylinder sticking or binding	3. Check for dirt or leaks. Check for bent, misaligned, worn parts or defective packings.
Cylinder/Ram does not move	1. Loose couplers	1. Tighten couplers
	2. Faulty coupler	2. Verify that female coupler is not locked up (ball wedged into seat). Replace both female and male couplers.
	3. Improper pump valve position	3. Close release valve or shift to new position
	4. Low or no hydraulic fluid in pump reservoir	4. Fill and bleed the system
	5. Air-locked pump	5. Prime pump per pump operating instructions
	6. Pump not operating	6. Check pump's operating instructions
	7. Load is above the capacity of the system	7. Use the correct equipment
	8. Fluid leaks out of rod end relief valve (double-acting cylinders only)	8. Make sure all couplers are fully coupled. Contact your nearest Authorized Hydraulic Service Center.

TROUBLESHOOTING GUIDE (CONTINUED)

PROBLEM	CAUSE	SOLUTION
Cylinder/Ram extends only partially	1. Pump reservoir is low on hydraulic fluid 2. Load is above the capacity of the system 3. Cylinder piston rod binding	1. Fill and bleed the system 2. Use the correct equipment 3. Check for dirt or leaks. Check for bent, misaligned, worn parts or defective packings.
Cylinder/Ram moves slower than normal	1. Loose connection or coupler 2. Restricted hydraulic line or fitting 3. Pump not working correctly 4. Cylinder seals leaking	1. Tighten 2. Clean and replace if damaged 3. Check pump operating instructions 4. Replace worn seals. Check for excessive contamination or wear
Cylinder/Ram moves but does not maintain pressure	1. Leaky connection 2. Cylinder seals leaking 3. Pump or valve malfunctioning	1. Clean, reseal with thread sealant and tighten connection 2. Replace worn seals. Check for excessive contamination or wear. Replace contaminated fluid as necessary. 3. Check pump or valve operating instructions
Cylinder/Ram leaks hydraulic fluid	1. Worn or damaged seals 2. Loose connections 3. Rod end relief valve has activated (double-acting cylinders only)	1. Replace worn seals. Check for excessive contamination or wear. Replace contaminated fluid as necessary. 2. Clean, reseal with thread sealant and tighten connection 3. Make sure all couplers are fully coupled. a. *If relief valve is still leaking,* do not attempt to service this component. Contact your nearest Authorized Hydraulic Service Center.
Cylinder/Ram will not retract or retracts slower than normal	1. Pump release valve closed 2. Loose couplers 3. Blocked hydraulic lines 4. Weak or broken retraction springs 5. Cylinder damaged internally 6. Pump reservoir too full	1. Open pump release valve 2. Tighten couplers 3. Clean and flush 4. Send to service center for repair 5. Send to service center for repair 6. Drain hydraulic fluid to correct level

PARTS LIST

SINGLE-ACTING, SPRING RETURN
HYDRAULIC CYLINDER
Maximum Capacity: 10 Ton At 8,950 PSI



QuickParts TECHNOLOGY

Item No.	Part No.	No. Req'd	Description
1	**252346**	1	Thread Protector
2	**421425**	1	Piston Rod (For 4088)
	421380	1	Piston Rod (For 4089)
3	**252345**	1	Cap Screw (1/4-20 UNC X 1" Lg.)
4	**252417**	1	Extension Spring (For 4088)
	252342	1	Extension Spring (For 4089)
5	**252341**	1	Bushing
6	**16076**	1	Retaining Ring
7	**11538**	1	Roll Pin (5/16 dia. X 1-3/8 Lg.)
8	**25599**	1	Coupler
9	**9800**	1	Protective Cap
10	**16067**	1	U-cup
11	**252399**	1	Retaining Ring
12	**421424**	1	Cylinder Body (For 4088)
	421378	1	Cylinder Body (For 4089)
13	**501455**	1	Complete Coverage Decal (For 4088)
	501456	1	Complete Coverage Decal (For 4089)
14	**351354**	1	Retainer Nut

PartsTech TECHNOLOGY

Note: Shaded areas reflect last revision(s) made to this form.

No-Hassle Warranty

The Merit-series bottle jacks and the Cobra-series automotive hydraulic rams are warranted against defects in materials and workmanship under the 90-day No-Hassle replacement warranty.

In addition, OTC will, at its option, repair or replace these products for one year from date of purchase by the end user. This warranty is expressly limited to the original retail purchaser of the product for use in the ordinary course of the buyer's business.

This warranty does not cover any product or part that has been abused, worn out, contaminated, rusted, heated, ground, or otherwise altered, damaged due to side loading, used for a purpose other than for which it was intended, or used in a manner inconsistent with any instructions regarding its use.

To qualify for warranty consideration within the 90-day No-Hassle period, return the OTC product, freight prepaid, to your local distributor, along with a proof of purchase. If these terms and conditions are met, a warranty replacement will be granted.

All warranty requests after the 90-day period, and within one year from date of purchase, should be sent freight prepaid, with a proof of purchase and a full description of the defect, to your local OTC authorized hydraulic service center. If any product or part manufactured by OTC is found to be defective by OTC or its service network, in its sole judgment, OTC will, at its option, either repair or replace such defective product or part, and return it via best ground transportation, freight prepaid.

THIS SHALL BE THE EXCLUSIVE REMEDY AVAILABLE FOR ANY DEFECTS IN THE PRODUCTS OR PARTS MANUFACTURED AND SOLD BY OTC, OR FOR DAMAGES RESULTING FROM ANY OTHER CAUSE WHATSOEVER, INCLUDING, WITHOUT LIMITATION, OTC'S NEGLIGENCE. OTC SHALL NOT, IN ANY EVENT, BE LIABLE TO ANY BUYER FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND, WHETHER FOR DEFECTIVE OR NON-CONFORMING GOODS, NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR FOR ANY OTHER REASON.

THIS WARRANTY IS EXCLUSIVE OF THE MERIT-SERIES BOTTLE JACKS AND COBRA-SERIES HYDRAULIC RAMS, AND OTC MAKES NO OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, WITH RESPECT TO THESE PRODUCTS MANUFACTURED OR SOLD BY IT, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER MATTER. No agent, employee, or representative of OTC has any authority to bind OTC to any affirmation, representation, or warranty concerning OTC products or parts, except as stated herein.

The purpose of this exclusive remedy shall be to provide the buyer with repair or replacement of products or parts, manufactured or distributed by OTC, found to be defective in materials or workmanship, or negligently manufactured. This exclusive remedy shall not be deemed to have failed its essential purpose so long as OTC is willing and able to repair or replace said defective products or parts in the prescribed manner.

Terms and conditions of the No-Hassle Warranty are subject to change without notice.

Out-of-warranty items can be returned to your local OTC authorized hydraulic service center. There is a charge to repair out-of-warranty items.