BARSHEARS
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vale

MAINTENANCE MANUAL AND GENERAL OPERATION PROCEDURES

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FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN SEVERE PERSONAL INJURY

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FORWARD

The main purpose of this manual is to provide information regarding the operation, servicing, and maintenance of the standard line of ***Vale*** tools and power units. This manual therefore, should be directed into the hands of your service or maintenance department. The manual details general maintenance procedures for this hydraulic equipment that also apply too most specially designed ***Vale*** hydraulic tools. It also includes supplemental information (i.e., safety notices, drawings, supporting component service literature, etc.), regarding specific tools or power units. You will find that your ***Vale*** Tools are of a simple and rugged construction requiring very little maintenance. When the need for service does become necessary, apply good mechanical principles, handle parts carefully, and be sure they are clean and not marred or nicked when assembled. When ordering spare parts, order by number and description, so as to minimize errors in filling orders. If you should require more information or service assistance, call your local representative or the factory direct where your calls or letters will receive prompt attention.

TOOL DESCRIPTION AND OPERATION

The standard ***Vale*** hydraulic tools feature a well proven, simple design. They are equipped with a single hose supplying hydraulic fluid to the tool to stroke the ram forward, and a spring to return the ram back. The fluid is usually directed to the tool by means of a control valve on the power unit that is actuated by a trigger switch when it is desired to cycle the tool and make a cut.

In operation, the bar shear is designed to have a piece of stock placed between the blades, with the fixed blade just touching the metal to be cut. Care must be taken at this point to ensure the material is fully between the blades to avoid a partial or tip cut which could damage a blade. Then, while support personnel stand clear, the operator activates the trigger switch. When the switch is actuated, fluid flows from the power unit through the hose to the cutting tool. The tool is thereby allowed to stroke and build pressure for cutting. After the material is cut, the trigger should be released allowing the ram to return the blade to its full open position. If the trigger is held activated after the work is completed, the pump will continue to hold the blades together until the switch is released. This could cause the motor to stall and it is recommended that the operator release the trigger immediately upon completing the cut.

The operation of a rod straightener or bender is similar, but instead of having blades, it is equipped with a ram set, a wearable component. It is designed to have a piece of stock placed in the opening of the C-frame against the fixed portion, with the bent part where it will be pushed by the ram. Then, while support personnel stand clear, the operator activates the trigger switch. When the switch is actuated, fluid flows from the power unit through the hose to the tool. The tool is thereby allowed to stroke and build pressure for straightening. After the ram reaches the end of its stroke, the trigger should be released allowing the ram to return to its full open position. If the trigger is held activated after the work is completed, the pump will continue to hold the ram extended until the switch is released. This could cause the motor to stall and it is recommended that the operator release the trigger immediately upon straightening the bar.

INSTALLATION

Vale equipment should be installed in your work area with the following considerations for location:

•Proximity to the work area - Minimum hose or pipe runs will assure proper operational tool cycle requirements. Long pressure lines will slow down the tool cycle due to the need of pressurizing and de pressurizing the connected tool and power units. NOTE: The longer the hose or pipe runs, the greater number of fittings (elbows, tees, etc.) the longer the cycle time. It is also recommended that the hose lengths in excess of 30 feet NOT be used unless approved by the factory. Limit the flexible hose installation to that length which will adequately insure tool maneuverability within the limits of the work area.

•Protect the pressure runs from physical damage. Connecting hose or pipe should not be subjected to the physical abuse of trucking, vehicle, abrading of dragging on rough flooring, sharp objects, etc. For most severe applications and/or additional safety from hose burst, it is recommended that the use of ***Vale*** safety hose coverings be employed.

•Tool weight - Because of the tool weight, (with the exception of the model V-10 bar shear) an overhead balancer or hoist should be used to lift the tool. If a ***Vale*** Tool Cart was not ordered with the tool, accommodations should be made for lifting. The use of a ***Vale*** Tool Balancer, mounted to an overhead structural member capable of withstanding the additional weight, is recommended. Consult the factory for the appropriate Tool Balancer size recommendation.

•Accessibility to the power unit is of prime importance to insure adequate routine observation and availability to maintenance personnel for periodic checking

•Protect the equipment from extremes of temperatures. Exposure to extremely low temperatures will cause difficulty with the pump and tool daily start up. Hydraulic fluid will become more viscous and stiff. Flow into the pump or through valving and hoses will be retarded until the fluid has built up some frictional heat. The use of a heat exchanger may be required for cooling hydraulic fluid if ambient temperatures exceed 110° F or 43° C. Consult the factory for recommendations.
•Ensure the power unit reservoir is filled with hydraulic fluid compatible with the seals in the tool and power unit.

CAUTION: When fire resistant fluids are to be used, it will be necessary to order units equipped with seals compatible with these fluids.

NOTE: The use of synthetic fire resistant fluids (phosphate esters) will also tend to retard the return speed of the tool since these fluids tend to be more viscous than mineral based fluids. Consult the factory for recommendations if fire resistant fluids are to be used.

START-UP PROCEDURE

1. Check to see that power unit reservoir is filled with the appropriate type of hydraulic fluid.
2. Connect the ***Vale*** tool to the power unit.
3. Check to see that the blades (or ram set) are tightly secured in the C-frame and ram.
4. Check components for damage or leaks.
5. Check to see that the power unit's relief valve is set to 4500 PSI.

CAUTION: Never adjust pressure over 5,000 P.S.I. or damage to system components may occur.

6. The power unit can now be turned on.

•When connecting hoses to the power unit or tool, avoid over tightening of fittings. Refer to flow circuit diagrams for flow patterns and connection points for various control methods and valve components available. Start the power unit and allow oil to circulate freely. Operate tool at intermittent interval to purge lines, cylinders, etc., of air before operating the tool in working cycle.

•When first connected, the tool will seem sluggish and slow to begin its cutting strike. A delay will be noticed between the time the trigger is activated and the ram begins to move. This is caused by air trapped in the hose between the power unit and the tool. Under normal operation the air will eventually work it way back to the reservoir, it does however, cause the tool to cycle more slowly until the air is finally purged from the system. If this delay is found to be objectionable for the time it occurs, the air can be bled by following the instructions below.

Bleeding the Tool

CAUTION: Never advance the ram to its extreme position during this procedure as this could cause a maximum pressure build up which could cause a high pressure stream of oil to be expelled from the fitting.

1. *The fitting connecting the hose to the tool must be loosened enough to allow air to escape.*
2. *This is accomplished by cracking the fitting loose and cycling the tool until a thin stream of oil escapes from the fitting.*
3. *It will be noted that the oil is a milky white color and usually contains visible air bubbles. •The tool should be actuated so that the ram extends part way and then is returned.*
4. *Continue this procedure until the oil stream becomes clear and free from air bubbles.*

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8. *Continue this procedure until the oil stream becomes clear and free from air bubbles.*

Cold Weather Operation

When a pump unit is used with the temperature near freezing, the ram of the tool may be slow in returning due to the sluggishness of the oil. If it is essential that the tool be operated under these extreme conditions, the following steps may be taken:

1. Check to make sure the spring is in good condition
2. Keep the hose reasonably free from kinks and bends and eliminate as many fittings as possible, especially those fittings which change the direction of the oil flow (i.e., elbows, tees, etc.).
3. Start pump in advance of operation to permit the warm up period.
4. An oil with lower viscosity rating may be used (consult factory for recommendations).

NOTE: Remember that ram return times are directly proportioned to the amount of force necessary to force the oil back through the hose to tank. For example, a 25-foot hose will permit the return of the oil back to the pump reservoir more easily than a 50-foot hose due the increase in wall frictional area.

HYDRAULIC FLUIDS

The hydraulic fluid in your ***Vale*** Tool has to fulfill two duties; transfer and lubrication. It is therefore **extremely important** that the proper fluid is selected for optimum performance of the tool.

In the selection of fluids the viscosity temperature characteristics must be taken into consideration. Preferably, fluids with low change in viscosity with temperature change should be used; also a fluid with good shear strength and lubrication quality be means of HD or EP additives is recommended. To keep pressure drop low in outside cold weather installations, especially thin fluids, ISO viscosity group 36 should be used. Fluids for year-round outside use or in non-heated buildings, ISO viscosity group 46 is usually adequate.

The thick fluids, such as viscosity group 68 are used mostly in closed rooms and building where ambient temperatures are extremely high. Since the life and efficiency of fluids at high temperatures decrease, maximum temperature should not exceed 80 degrees C or 175 degrees F.

If it becomes necessary, because of hazardous locations, to employ the use of fire retardant fluids, phosphate ester fluids should be considered.

NOTE: When fire resistant fluids are to be used, it will be necessary to order units equipped with seals compatible with these fluids.

FIRE RESISTANT FLUIDS WITH WATER ADDITIVES ARE NOT RECOMMENDED.

FLUID RECOMMENDATIONS

Petroleum Based Fluids:

Vale recommends the use of a good grade of general purpose, detergent, hydraulic fluid be used in your power unit. Use Amoco AW 32, Gulf Harmony 32 or equivalent for cold weather applications: Amoco AW 46, Gulf Harmony 46 or equivalent for most applications: and Amoco AW 68, Gulf Harmony 68 or equivalent for high temperature applications.

Fire Resistant Fluids:

If fire resistant fluids are desired, ***Vale*** recommends the use of phosphate ester type fluids. Use E.F. Houghton Houghto-Safe 1115 or equivalent for cold weather applications; Houghto-Safe 1120 or Monsanto Chemical 10-E20 ELT, or 50 E or other equivalent for most applications; Houghto-Safe 1130 or equivalent for high temperature applications.

FIRE RESISTANT FLUIDS ARE FOR USE WITH *VITON SEALS* AND *O-RINGS* ONLY! CONSULT FACTORY BEFORE USING.

Petroleum Based Fluids:

Application	Viscosity SUS @ 100° F.	ISO Viscosity Group/Grade Identification
Continuously Cold Ambient Temperatures (Consult Factory)	150	32
Most all Applications	200	46
Continuously High Ambient Temperatures (Consult Factory)	300	68

When ambient temperatures vary greatly, ***Vale*** recommends the use of a heating element or heat exchange depending on the oil being used and the temperature variations. For almost every application viscosity group 46 should be used. If temperatures will be in either extreme or vary greatly, consult with your local oil distributor, engineering department or factory directly.

NOTE: When fire resistant fluids are used, it will be necessary to order tools and power units equipped with seals compatible with these fluids. (Refer to the *Vale* Catalog for information on ordering.) Note that the use of phosphate ester fluids will cause the return stroke to be slower than normal

FLUID FILTERING

Many of the parts in ***Vale*** units have precision finished surfaces working together. Contamination such as acid, water, grit etc. in the hydraulic fluid will cause trouble and the need for repairs. Handle all fluid in clean containers, and filter the fluid to be used to at least 25 micron before using. The power unit should have a filtering system to keep the fluid at an acceptable contamination level. The dirt removal rate must be equal to or exceed the ingestion rate which depends on running conditions, ambient conditions, breather effectiveness, seal conditions, etc. And although a filter will protect the ***Vale*** tool and pump from foreign particles in the fluid medium, it is still recommended that for long life and optimum performance, the fluid used be filtered to at least 25 micron before being put into the power unit reservoir.

BLADES

The application of blade design for cutting metals of different metallurgy, the different hardness, different sizes at different temperatures is difficult to say the least. Added to this, is the possibility that during the cut, the tool may not be held perpendicular to the cutting plane or the material to be cut, or the cut is done with the tip of the blades only: and then you have one of the most severe applications for cutting steel. Blade life therefore cannot be predicted nor can it be guaranteed, because of the difficulty in monitoring the usage of the tool. Blade breakage may occur if the tool is not handled properly. It is highly recommended that for optimum performance, the operators of this tool are instructed as to the proper and safe methods of tool operation.

For safe tool operation and to avoid premature blade failure, it is essential that the following simple rules be followed.

- *Wear safety glasses when using this tool.*
- *Before inspecting, removing, or changing the blades the power unit must be shut off and locked.*

WARNING: SHUT OFF AND LOCK OUT ALL ELECTRICAL POWER AND TAG OUT ELECTRICAL BOX.

- *Never lift or carry the tool by placing fingers between the cutting blades.*

WARNING: NEVER PUT ANY PART OF YOUR BODY INTO OR NEAR MOVING MACHINERY.

- *Never cut materials that are too hard, (above R/C 42).*
- *Before actuating the tool, be sure that the material is in a plane perpendicular to the stroke of the ram so as not to impart any side load to the blades.*

TOOL SEALING SYSTEM

The sealing system utilized in the construction of all ***Vale*** tools is unique, designed for ease of maintenance and long life, and consists of the following components.

Piston Seal:

The piston seal consists of four components. They are as follows:

1. **Sealing ring**: The sealing ring is the main component and is made from a tough, wear-resistant material. The sealing ring protects the O-ring and is the device which comes in contact with the thin film of oil on the cylinder wall. As the sealing ring "wears in," it matches the sides of the cylinder wall, thereby greatly enhancing its sealing characteristics and reducing frictional drag considerably. NOTE: Until tools "wear in," the rams return speed is usually slower than normal.

2. **Back-up** or **anti-extrusion rings** are required to prevent the O-ring from extruding between the piston and the cylinder wall. These rings are made of a modern elastomeric material that are also are a part of the dynamic sealing system. There are two (2) back-up rings in the sealing system. They are assembled on each side of the sealing ring.

3. **O-ring**: This ring is part of the seal over which the sealing ring is loaded. This preloading of the O-ring is necessary for sealing under near zero pressure when the pump is circulating oil under no load conditions. When the system goes under pressure, the O-ring is forced into the corners of the sealing groove in the piston. It is captively retained from extruding through clearances however, by the sealing and back-up rings.

4. **Wear ring**: The wear ring, although not a true sealing component, is essential nevertheless in allowing the sealing systems to operate properly. The wear ring is a non-metallic bearing and is responsible for holding the piston perfectly concentric with the cylinder wall. It also prevents metal to metal contact between the piston and the cylinder. Still another important function of the wear ring is that it acts as a wiper for the cylinder pushing any foreign particles ahead of it, thereby protecting the walls of the cylinder which comes in contact with the sealing system.

Cap Seal:

The cap seal consists of two components. They are as follows:

1. **O-ring**: This ring seals the opening in the cylinder pressure end. When the system goes under pressure, the O-ring is forced into the corners of the sealing groove in the cylinder cap. It is captively retained from extruding through clearances however, by the anti-extrusion rings.

2. **Anti-extrusion ring:** Two of these are required to prevent the O-ring from extruding between the cylinder cap and the cylinder wall.

Scraper Ring:

The scraper ring is used to keep dirt and other debris from accumulating on the ram and getting into the bore which could damage to the ram bushing. It is made of a copper-based alloy with a scraping edge free of nicks and burrs. It applies tension equally about the circumference of the ram and works with a rotary action to ensure that greater than 99 % of all accumulation is removed.

TOOL ATTACHMENTS

Hoses

The ***Vale*** Hi-Pressure hoses are supplied in 3/8", 1/2" and 3/4" inside diameters. The inside diameter selected depends upon the tool cycle requirements and power unit selection. Standard ***Vale*** power units and tools are fitted with compatible sized fitting to receive the applicable hose ends. Hose lines are stocked in lengths suitable for most applications. We **DO NOT** recommend hose lengths in excess of 30 feet unless approved by the factory as the internal fluid friction of long lengths influences the effectiveness of the tool return spring force to return the cylinder fluid to the reservoir in optimum time. The pressure rating of the standard 3/8", 1/2" and 3/4" diameter ***Vale*** hose is 5000 P.S.I. working and 20,000 P.S.I. burst pressure.

Switch Handle

The ***Vale*** switch handle, if supplied, attaches to the rear of the tool to provide a place to hold the tool safely.

WARNING: NEVER PUT ANY PART OF YOUR BODY INTO OR NEAR MOVING MACHINERY.

It is equipped with an integral switch used to activate the hydraulic power unit. The casting is connected to an electrical ground through the conductor cord, which is equipped with a twist-lock connector.

MAINTENANCE

Daily:

•Inspect blades for damage. At the first sign of any cracks, replace the blade immediately. Be sure to disconnect power before attempting to change a blade.

WARNING: SHUT OFF AND LOCK OUT ALL ELECTRICAL POWER AND TAG OUT ELECTRICAL BOX.

•The blades should be maintained in a sharpened condition at all times. Under operating conditions, it will be noted that the cutting edges will dull. By observation of the quality of the cutting operation or of the blade edges themselves, it can be determined how frequently the blades should be renewed.

•The blades on a square cut tool it should be noted have four cutting edges each. They may be changed by either flipping or rotating each blade to end up with fresh cutting edges.

Monthly:

- *Check oil level in reservoir, if necessary, add oil to bring up to level indicated by sight gauge.*
- *Inspect the system for hydraulic fluid leaks*

Overhauling the Hydraulic Cylinder

Procedure for Disassembly

When a tool needs to be repaired, due to seal, piston or cylinder damage, approximately one gallon of oil should be pumped out of the hose, into a bucket, and discarded to remove any foreign material which may be in the hose. This procedure will reduce the possibility that the rebuilt tool will damaged from foreign material which might remain in the hose. A gallon of new oil should be added to the power unit to replace the discarded oil.
To facilitate ease of disassembly and reassembly, it is recommended that the tool be clamped in a vise across the lower parts of the "C" frame and that the cylinder be tilted upward at approximately a 15 degree angle. A clean working area should be prepared so that parts can be placed in an orderly fashion when disassembled. It is recommended that the use of the standard ***Vale*** Tool Kit be employed. If a standard tool kit is not in your possession, you will require the following tools, a 16-oz. machinist hammer and a set of Allen wrenches. Refer to tool assembly drawing.

CAUTION: You MUST follow in Sequence! Tool piston is under HIGH INTERNAL SPRING PRESSURE.

NOTE: The disassembly procedures are the same for all *Vale* tools and rod straighteners with one minor exception. The model V-10 bar shear does not have a bolted-on end cap design. The end cap and cylinder are one integral part and therefore the V-10 also utilizes only one seal, the piston seal.

1. *Place "C" frame in vise and point cylinder cap upward at a 15-degree angle.*
2. *Remove the roll pins which retain the blades/ram set in the tool.*
   - *To remove the blades on a pinch cut tool, select the proper size drift punch and drive out the roll pins which retain the blade (or ram set).*

     NOTE: It is essential that the proper size drift punch be selected for driving out the blade retaining pins.
   - *To remove the blades on a square cut type tool, select an Allen wrench of the proper size and remove the socket head cap screws which hold the blades in place. Note that by either flipping or rotating, each blade has four cutting edges.*
3. *The blades can now be removed. If the blades cannot be easily removed by hand because of dirt or rust:*
   - *The blade in the C-frame can be driven out with a drift punch through the access hole in the back of the C-frame.*
   - *The blade in the ram can be pried out by means of a small pry bar placed between the blade shoulder and the end of the ram.*
4. *Remove the switch handle along with the nipple adapter by unscrewing the nipple adapter from the end cap.*

CAUTION: DO NOT USE THE SWITCH HANDLE AS A WRENCH OR LEVER IN ORDER TO LOOSEN THE NIPPLE ADAPTER.

The nipple adapter is made from one (1) inch hexagonal stock and can be removed easily with an adjustable crescent wrench or an open end wrench.

5. *Remove two (2) screws from the cylinder cap 180 degrees apart.*

CAUTION: HIGH INTERNAL SPRING PRESSURE!

6. Insert assembly studs with fine thread in cylinder until the assembly studs bottom out.
7. Place washer and coarse thread nuts over studs and tighten against cylinder cap.
8. Remove remaining cylinder cap bolts.
9. Evenly loosen nuts on assembly studs until all spring pressure is gone.
10. Remove cylinder cap. By hand, screw the nipple adapter (with switch handle removed) back onto the end of the cylinder cap. This will allow a means of applying a pulling force against the cap to aid in its removal. If the end cannot be removed by pulling, a 1/4 inch diameter rod approximately 12 inches long can be inserted in the access hole in the end of the C-frame and pushed forward until it comes in contact with the bottom of the blade pocket in the ram. By tapping lightly on the end of the rod while pulling on the nipple adapter, it should be possible to remove the cylinder cap.
11. Remove ram, piston and spring. The same procedure (utilizing the rod and tapping lightly) can be used to remove the ram.
12 Remove the cylinder. Removal of the cylinder is accomplished, first, by removing the set screw(s) which locks the cylinder from turning (See tool assembly drawing for location), and then simply unscrew the cylinder from the "C" frame. If the cylinder is beyond "hand tight" it may be necessary to employ the use of a strap wrench.
13. Removal of the ram bushing may now be accomplished with the aid of and arbor press utilizing a rod through the access hole in the back of the C-frame blade pocket.
14. Reverse procedure for assembly.
15. Tighten cylinder cap bolts using a cris-cross pattern to the torque specified in the Cylinder Cap Torque Chart.

REPLACEMENT OF SCRAPER RING AND BUSHING

Assuming, that the procedure for removal of the bushing has been followed as outlined in the procedure of disassembly of the ***Vale*** tool, clean the "C" frame in degreasing solvent and wipe clean. Check for nicks or burrs which could hinder assembly of the bushing. Clamp the "C" frame in an upright position under an arbor press and adjust so that the top surface of the "C" frame is perpendicular in two planes to the ram on the arbor press. Place the bushing and scraper ring in the bore and adjust for squareness. Bring the ram of the arbor press down until contact is made with the bushing and with light pressure make sure the bushing has stayed in line with the bore. Press the bushing into its bore until the top of the bushing is flush with the top of the bushing bore.

REPLACEMENT OF MAIN SEAL AND WEAR RING

After disassembly procedures have been followed for removal of the ram, wash the ram clean with a degreasing solvent and inspect for nicks or dents - ESPECIALLY on the pressure face of the piston groove. See tool assembly drawing. Install the sealing ring first. Tilt the sealing ring at approximately 20 degrees to the back face of the piston and insert into the sealing groove. DO NOT force the sealing ring, or try to stretch it over the piston as damage will occur. Use the same procedure to install the O-ring. Next, install the front back-up ring (the ring closest to the cutting blade). Push the sealing ring against the back-up ring and work the O-ring under the back-up ring. DO NOT use a sharp or metal object for this purpose. This procedure can be accomplished by hand. Lastly, place the second back-up ring opposite the first, so that the sealing and O-ring are sandwiched between the two.

Vale STANDARD TOOLS CYLINDER CAP TORQUE VALUES

All cylinder cap bolts should be torqued to the values as shown in chart below, and should be checked periodically for proper torque.

Use End Cap Bolt Torque Values:

	Inch Pounds	Foot Pounds	Kilogram Meter	Newton Meter
V-10 Rod Straightener	600	50	7	68
V-15 Shear	600	50	7	68
V-15 S.C. Shear	600	50	7	68
V-25 Rod Straightener	1440	120	17	160
V-35 Shear	1440	120	17	160
V-35 S.C. Shear	1440	120	17	160
V-70 Shear	1440	120	17	160
V-70 S.C. Shear	1440	120	17	160
V-90 Shear	2640	220	31	300
V-135 Shear	2640	220	31	300
V-250 Shear	1440	120	17	160
V-350 Shear	1440	120	17	160
V-700 Shear	1440	120	17	160
V-900 Shear	2640	220	17	160
V-1350 Shear	2640	220	17	160

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RELEASE 8.3
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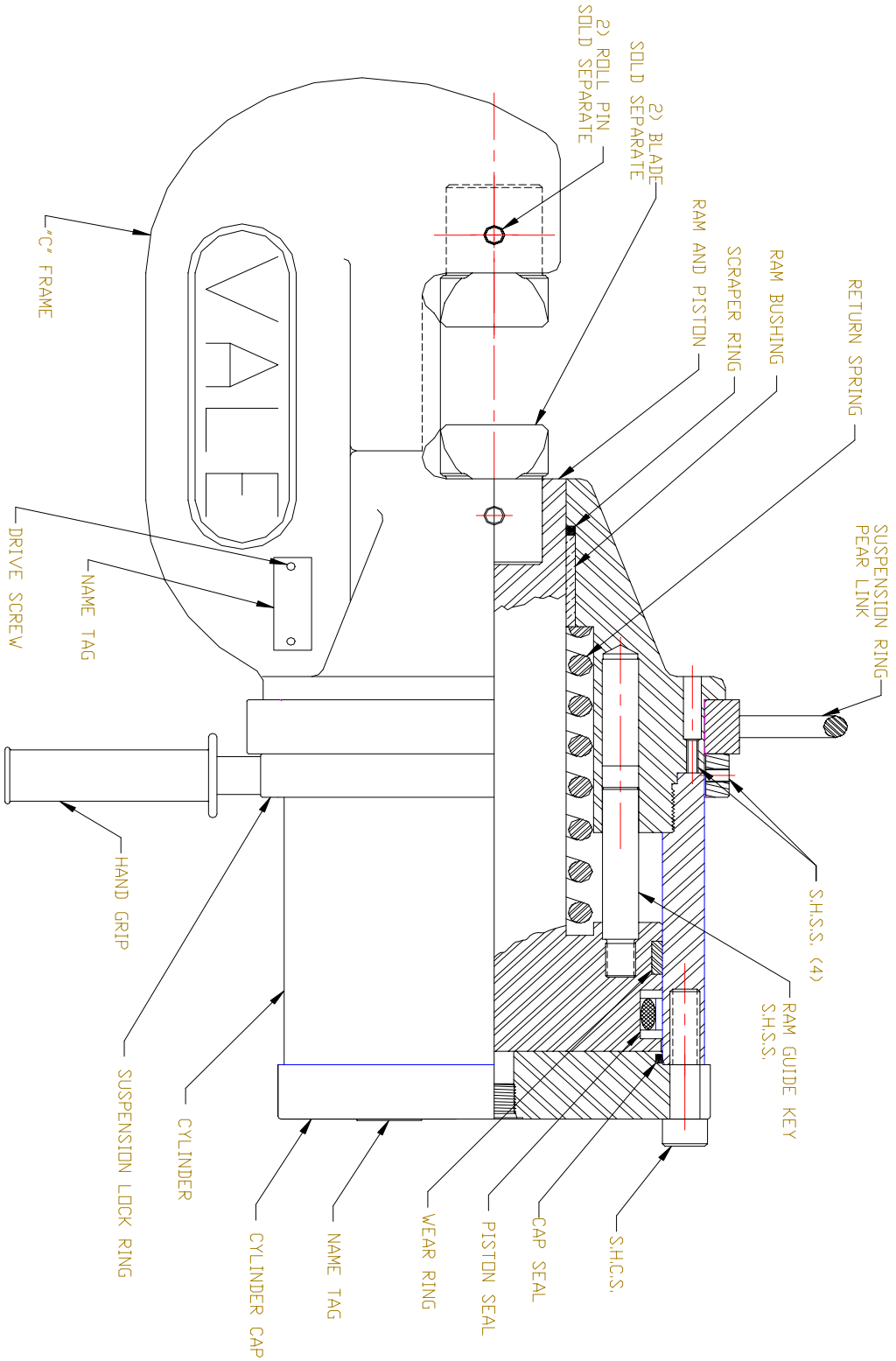

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GENERAL PART NUMBER INFORMATION

	V-10 R.S. D-1506	V-15 D-1507	V-15S.C. D-1685	V-25 R.S. D-1542	V-35 D-1508
Blade	**A-1500**	**A-1502**	**A-3059**	**A-1754/5**	**A-1502**
Roll pin	**A-1539**	**A-1539**	**A-1704**	**A-1594**	**A-1539**
Ram & Piston	**C-1543**	**C-1522**	**C-1897**	**C-1516**	**C-1531**
Scraper ring	**A-1601**	**A-1601**	**N/A**	**A-1588**	**A-1601**
Ram bushing	**A-1604**	**A-1604**	**A-3060**	**A-1586**	**A-1626**
Return spring	**A-1645**	**A-1591**	**A-1591**	**A-1589**	**A-1631**
Susp. ring	**A-1648**	**A-1537**	**A-1537**	**C-1517**	**A-1549**
S.H.S.S.	**A-1608**	**A-1593**	**A-1593**	**A-1595**	**A-1593**
Ram guide key	**N/A**	**A-1538**	**A-3065**	**N/A**	**A-1627**
S.H.C.S.	**A-1603**	**A-1603**	**A-1603**	**A-1697**	**A-1593**
Cap seal	**A-1644**	**A-1600**	**A-1600**	**A-1598**	**A-1630**
Piston seal	**A-2420**	**A-1540**	**A-1540**	**A-1597**	**A-1629**
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Cylinder	**C-1544**	**C-1523**	**C-1896**	**C-1514**	**C-1529**
Susp. lock ring	**A-1647**	**A-1536**	**A-1536**	**A-1592**	**A-1623**
Hand grip	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Serial # tag	**A-2066**	**A-2066**	**A-2066**	**A-2066**	**A-2066**
Drive screw	**A-1690**	**A-1690**	**A-1690**	**A-1690**	**A-1690**
“C” frame	**C-1547**	**C-1521**	**D-1697**	**C-1606**	**C-1532**

NOTE! Use in conjunction with Typical Tool Layout Illustration, Page 15

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GENERAL PART NUMBER INFORMATION

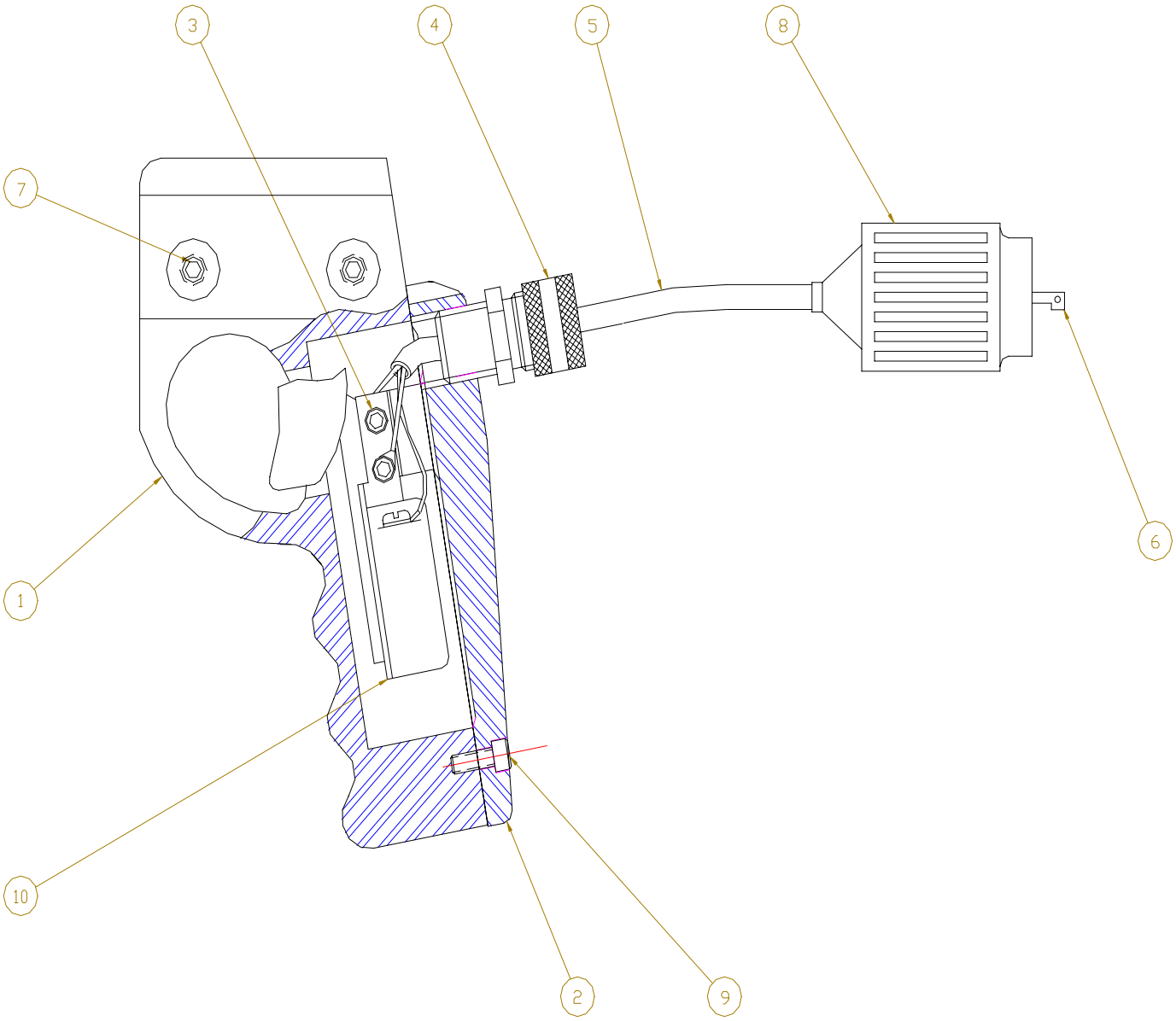
	V-35 S.C. D-1580	V-70 D-1509	V-70 S.C. D-1652	V-90 D-1570	V-135 D-1708
Blade	**A-1760**	**A-1503**	**A-2549/2731**	**A-1501**	**A-3716**
Roll pin	**A-1674**	**A-1594**	**N/A**	**A-1733**	**A-1938**
Ram & Piston	**C-1609**	**C-1535**	**C-1819**	**C-1605**	**C-2021**
Scraper ring	**N/A**	**A-1641**	**A-1703**	**A-1745**	**A-3751**
Ram bushing	**A-1761**	**A-1640**	**A-2550**	**A-1746**	**A-3752**
Return spring	**A-1589**	**A-1639**	**A-1700**	**A-1700**	**A-3717**
Susp. ring	**C-1549**	**C-1550**	**A-1550**	**A-1937**	**A-3715**
S.H.S.S.	**A-1593**	**A-1593**	**A-1593**	**A-1593**	**A-1593**
Ram guide key	**A-1760**	**A-1638**	**A-1590**	**A-1742**	**A-3714**
S.H.C.S.	**A-1595**	**A-1595**	**A-1595**	**A-1632**	**A-1891**
Cap seal	**A-1630**	**A-1637**	**A-1637**	**A-1739**	**A-3713**
Piston seal	**A-1629**	**A-1635**	**A-1635**	**A-1740**	**A-3712**
Wear ring	**A-1628**	**A-1636**	**A-1636**	**A-1741**	**A-3711**
Warning Label	**A-1617**	**A-1617**	**A-1617**	**A-1617**	**A-1617**
Cylinder cap	**C-1530**	**C-1690**	**C-1690**	**C-1599**	**C-2023**
Cylinder	**C-1608**	**C-1689**	**C-1818**	**C-1600**	**C-2020**
Susp. lock ring	**A-1623**	**A-1634**	**A-1634**	**C-1601**	**C-2022**
Hand grip	**N/A**	**N/A**	**N/A**	**A-1607**	**A-1607**
Serial # tag	**A-2066**	**A-2066**	**A-2066**	**A-2066**	**A-2066**
Drive screw	**A-1690**	**A-1690**	**A-1690**	**A-1690**	**A-1690**
“C” frame	**C-1610**	**D-1533**	**D-1653**	**D-1561**	**D-1706**

NOTE! Use in conjunction with Typical Tool Layout Illustration, Page 15

GENERAL PART NUMBER INFORMATION

	V-250 D-1510	V-350 D-1511	V-700 D-1512	V-900 D-1600	V-1350 D-1811
Blade	**A-1731**	**A-1505**	**A-1506**	**A-1920**	**A-1920**
Roll pin	**A-1594**	**A-1656**	**A-1733**	**A-1938**	**A-1938**
Ram & Piston	**C-1516**	**C-1562**	**C-1582**	**C-1684**	**C-2142**
Scraper ring	**A-1588**	**A-1610**	**A-1703**	**A-1936**	**A-1936**
Ram bushing	**A-1586**	**A-1605**	**A-1701**	**A-1911**	**A-1911**
Return spring	**A-1589**	**A-1611**	**A-1700**	**A-1912**	**A-1912**
Susp. ring	**C-1517**	**C-1549**	**C-1550**	**A-1937**	**A-1937**
S.H.S.S.	**A-1593**	**A-1593**	**A-1593**	**A-1593**	**A-1593**
Ram guide key	**A-1590**	**A-1606**	**A-1702**	**A-1935**	**A-1935**
S.H.C.S.	**A-1595**	**A-1595**	**A-1595**	**A-1697**	**A-1891**
Cap seal	**A-1598**	**A-1630**	**A-1637**	**A-1739**	**A-3713**
Piston seal	**A-1597**	**A-1629**	**A-1635**	**A-1740**	**A-3712**
Wear ring	**A-1596**	**A-1628**	**A-1636**	**A-1741**	**A-3711**
Warning Label	**A-1617**	**A-1617**	**A-1617**	**A-1617**	**A-1617**
Cylinder cap	**C-1515**	**C-1530**	**C-1690**	**C-1599**	**C-2023**
Cylinder	**C-1514**	**C-1524**	**C-1691**	**C-1683**	**C-2141**
Susp. lock ring	**A-1592**	**C-1563**	**C-1589**	**C-1601**	**C-1601**
Hand grip	**A-1607**	**A-1607**	**A-1607**	**A-1607**	**A-1607**
Serial # tag	**A-2066**	**A-2066**	**A-2066**	**A-2066**	**A-2066**
Drive screw	**A-1690**	**A-1690**	**A-1690**	**A-1690**	**A-1690**
“C” frame	**C-1513**	**D-1548**	**D-1554**	**D-1598**	**D-1814**

NOTE! Use in conjunction with Typical Tool Layout Illustration, Page 15



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SWITCH HANDLE PART NUMBER INFORMATION

DET.	PART #	DESCRIPTION	QTY
1	C-1518	SWITCH HANDLE	1
2	C-1519	SWITCH HANDLE CAP	1
3	A-1619	8-32 x ¼ NYLOK S.H.C.S.	2
4	A-1693	THREADED CORD TERMINATOR	1
5	A-1614	CONDUCTOR CORD	--
6	A-1612	MALE CONNECTOR	1
7	A-1542	5/16-18 x ½ NYLOK S.H.S.S.	2
8	A-1613	CONNECTOR CAP	1
9	A-1618	10-24 x ½ S.H.C.S.	4
10	A-1587	TRIGGER SWITCH	1

NOTE! Use in conjunction with Switch Handle Layout Illustration, Page 19

Revision Notes

Version Number	Description	Date
8.2	Initail issue of updated manual	6/99
8.3	Parts list page 16 updated. V-15SC shear Blade part number changed to A-3059.	9/99

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