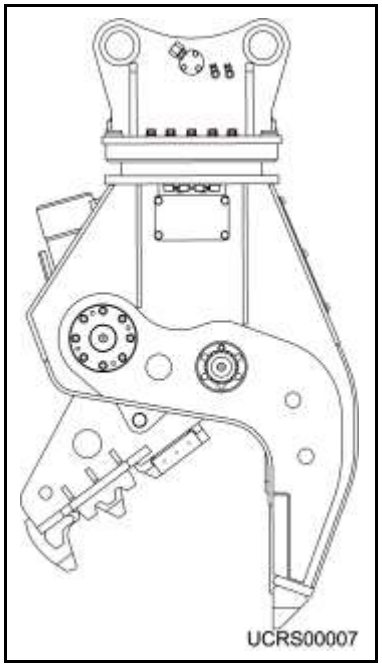
U and G-SERIES SECONDARY CONCRETE CRUSHERS

MODELS U21J, U21JR, U31J, U31JR U45J, U45JR, G7, G18J, G26J, G30JR

OPERATION AND MAINTENANCE MANUAL



"Use Genuine NPK Parts"

NPK ...attachments; designed, built and backed by NPK.

7550 Independence Drive
Walton Hills, OH 44146-5541
Phone (440) 232-7900
Fax (440) 232-6294

CONTENTS

SAFETY

Safety notices in NPK Instruction Manuals follow ISO and ANSI standards for safety warnings:

DANGER DANGER (red) notices indicate an imminently hazardous situation which, if not avoided, **will result in death or serious injury**.

WARNING WARNING (orange) notices indicate a potentially hazardous situation which, if not avoided, **could result in death or serious injury.**

CAUTION CAUTION (yellow) notices indicate a potentially hazardous situation, which, if not avoided, **may result in minor or moderate injury.**

ATTENTION ATTENTION (blue) notices in NPK Instruction Manuals are an NPK standard to alert the reader to situations which, if not avoided, **could result in equipment damage.**

WARNING – FALLING OR FLYING DEBRIS decals are included with each NPK CONCRETE CRUSHER. The decal must be installed in the cab, visible to the operator. WARNING - STAY CLEAR decals are installed on all NPK CONCRETE CRUSHERS. Keep them clean and visible. NPK will provide decals free of charge as needed.

WARNING

FALLING OR FLYING DEBRIS decal is included with each NPK CONCRETE CRUSHER. The decal (part number H100-7210) must be installed in the cab, visible to the operator.

WARNING

STAY CLEAR decal (part number H100-7200) is installed on all NPK CONCRETE CRUSHERS, Shears, and Material Processors. Keep them clean and visible. NPK will provide decals free of charge as needed.

SAFETY

⚠ WARNING

OPERATION

1. Operator personnel must read and understand the ***NPK INSTRUCTION MANUAL*** to prevent serious or fatal injury.
2. ***FLYING OR FALLING DEBRIS CAN CAUSE SERIOUS OR FATAL INJURY.*** Keep personnel and bystanders clear of the CONCRETE CRUSHER while in operation.
3. Do not operate CONCRETE CRUSHER without an impact resistant shield between the CONCRETE CRUSHER and operator. Operate with extreme caution near walls or columns that may collapse and near concrete and debris that may fall.
4. Operate the CONCRETE CRUSHER from the operator's seat only.
5. Use two people whenever operator visibility is limited, one to operate the CONCRETE CRUSHER, the other to guide operations.
6. ***Do not*** leave a load suspended in air.
7. ***Do not*** pass a load over people, vehicles, etc.
8. ***Do not*** operate the CONCRETE CRUSHER within reach of power lines.
9. ***Do not*** climb, sit, or ride on the CONCRETE CRUSHER.

Warning Decal for Cab Installation

⚠ CAUTION

10. Match the CONCRETE CRUSHER size to excavator according to NPK recommendations. The excavator must be stable during CONCRETE CRUSHER operation and during transport. See CARRIER COMPATIBILITY section of the NPK instruction manual.
11. ***Do not*** operate without inspection (access) covers in place.
12. Be especially cautious around hydraulic lines. Hydraulic oil can be extremely **HOT!** ***Avoid skin contact with hydraulic oil. It can cause severe burns!***
13. **Protect hands and body from hydraulic fluids under pressure**. Escaping high pressure fluid can penetrate the skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting any lines. Search for leaks with a piece of cardboard, or other object. If an accident occurs, see a doctor immediately! Hydraulic fluid injected into the skin must be surgically removed within a few hours or gangrene may result.
14. The pressure generated by the power intensifier on the CONCRETE CRUSHER exceeds 10,000 psi (690 bar), which is higher than commonly encountered on hydraulic equipment. To avoid bodily harm and/or injury when conducting inspection checks, use gauges, hoses and fittings rated at 15,000 psi (1035 bar). For parts replacement, use only genuine NPK replacement parts. Contact NPK Service Department at (440) 232-7900.
15. When removing or installing mounting pins, beware of flying metal chips.

SAFETY

MAINTENANCE

⚠ CAUTION

1. Use only NPK supplied replacement parts. NPK specifically disclaims any responsibility for bodily injury or CONCRETE CRUSHER damage that results from the use of parts not sold or approved by NPK.

2. Use extreme caution in handling. A fully assembled CONCRETE CRUSHER can weigh up to 5 tons (4-1/2 tonnes). Sub-assemblies range in weight from hundreds to thousands of pounds. To avoid bodily harm, use lifting and securing mechanisms of adequate capacity to support loads. Seek the aid of an assistant as much as possible, and always when handling heavier sub-assemblies.

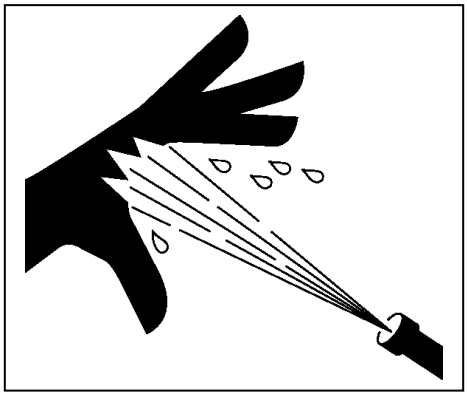
3. Use extreme caution when changing jaw sets, particularly in the field. Employ lifting and securing mechanisms of adequate capacity to support the jaw sets. *At least two people are required to change a jaw set safely in the field.*

4. Wear safety glasses and protective clothing when working on the CONCRETE CRUSHER. Wear thermal-protective gloves when handling heated parts.

5. Prevent exposure to hazardous fumes. Remove all paint, grease, and oil before heating, cutting, or welding on the CONCRETE CRUSHER.

6. Be especially cautious around hydraulic lines. Hydraulic oil can be extremely **HOT!** ***Avoid skin contact with hydraulic oil. It can cause severe burns!***

7. **Protect hands and body from hydraulic fluids under pressure.** Escaping fluid under pressure can penetrate the skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting any lines. Search for leaks with a piece of cardboard, or other object. ***If an accident occurs, see a doctor immediately! Hydraulic fluid injected into the skin must be surgically removed within a few hours or gangrene may result!***



8. The pressure generated by the power intensifier on the CONCRETE CRUSHER exceeds ***10,000 psi (690 bar)***, which is higher than commonly encountered on hydraulic equipment. To avoid bodily harm and/or injury when conducting inspection checks, use gauges, hoses and fittings rated at 15,000 psi (1035 bar). For parts replacement, use only genuine NPK replacement parts. Contact NPK Service Department at (440) 232-7900.

9. When removing or installing mounting pins, beware of flying metal chips.

SAFETY

MAINTENANCE

STANDARD PRACTICES

ATTENTION

Maintenance of and repairs to the CONCRETE CRUSHER should be performed by an experienced service technician, thoroughly familiar with all standard practices and procedures, and most importantly, all safety precautions. The following is a review of common standard practices to be followed when working with hydraulic equipment and is not meant to be all-inclusive. Rather, this review is presented as a reminder as to some of the unique characteristics of hydraulic equipment.

- The prevention of foreign contaminant damage is critical when working with hydraulic equipment. Protect exposed holes and parts to guard against entry of foreign contaminants. Thoroughly clean the work area.

- Mark the location and position of mating parts as an aid to re-assembly. Mark corresponding parts uniquely to reflect their relationship, including proper location, position, orientation, and/or alignment.

DO:

- During assembly, observe all markings made during disassembly, and all corresponding features of mating parts to ensure proper location, position, orientation, and alignment.

- During disassembly of a sub-assembly, place removed components on a clean, dry surface, in proper relative position as an aid in re-assembly.

- Always inspect threaded areas on components. Repair or replace as required.

- Use care to avoid scratches, nicks, dents, or other damage to machined surfaces of mating components.

- When securing a component, always tighten cap screws gradually in an opposing pattern, applying the specified torque.

- Grease can be used to temporarily hold a part in place while the abutting part is placed into position.

- Always use common sense and exercise standard safety precautions when working with all tools and equipment required to maintain, repair, or troubleshoot the CONCRETE CRUSHER.

INTRODUCTION

Thank you for your purchase of an NPK attachment. NPK prides itself in the design and manufacture of high-quality attachments. The quality workmanship and materials, which go into all our attachments, will provide maximum service life. With proper care, and use, your NPK attachment should provide you with many years of productive service.

The purpose of this manual is to provide you with information and instructions required to properly operate and maintain the CONCRETE CRUSHER. This will result in maximum ATTACHMENT reliability and productivity.

Read this manual thoroughly before attempting to operate, remove, disassemble, repair, or troubleshoot the CONCRETE CRUSHER or any of its components. For additional information or help with any problem encountered, please contact your authorized NPK dealer.

Follow all the safety precautions contained in this manual. **Failure to follow safety precautions can result in death, personal injury, injury to others and property damage.**

Use replacement parts sold by NPK only. NPK is not responsible for failures resulting from alterations not approved by NPK or substitution of parts not sold by NPK.

EXCAVATOR COMPATIBILITY

These carrier weight ranges are intended as a guideline only. Other factors, such as stick length, counterweights, undercarriage, etc., must be taken into consideration.

⚠ CAUTION

Mounting a CONCRETE CRUSHER that is too heavy for the carrier can be dangerous and damage the carrier. Verify carrier stability with the CONCRETE CRUSHER before transport or operation.

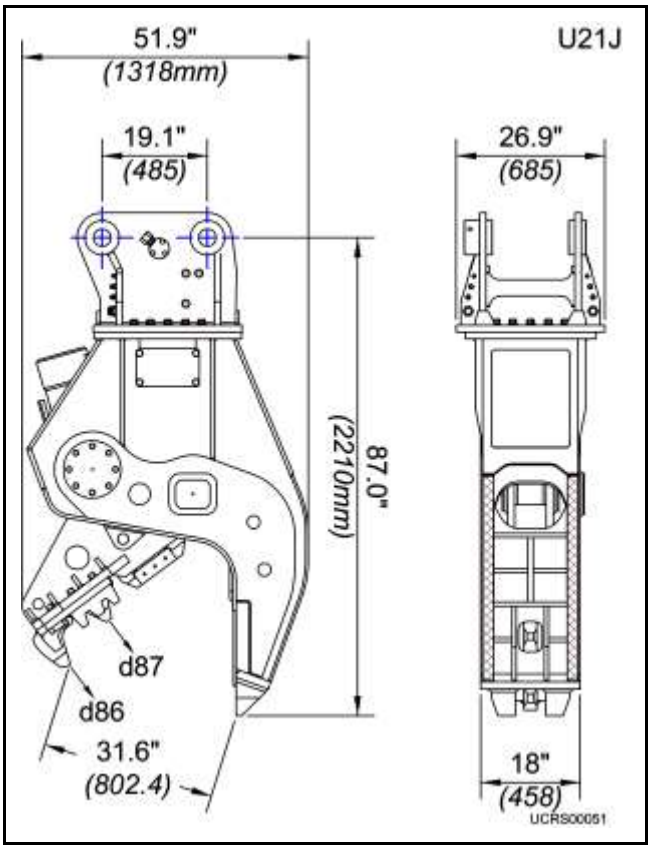
Mounting a CONCRETE CRUSHER that is too small for the carrier can damage the CONCRETE CRUSHER and void warranties. Please consult NPK Service or Engineering for specific detailed information.

CRUSHER MODEL	RECOMMENDED CARRIER WEIGHT RANGE 3rd member mounting	
	US ton	(*Metric ton*)
U21J	21 - 31	(*19 - 28*)
U21JR	21 - 31	(*19 - 28*)
U31J	31 - 53	(*28 - 48*)
U31JR	31 - 53	(*28 - 48*)
U45J	45 - 55	(*41 - 50*)
U45JR	45 - 55	(*41 - 50*)
G7	6.6 - 11	(*6 - 10*)
G18J	20 - 25	(*18 - 23*)
G26J	25 - 35	(*23 - 32*)
G30JR	35 - 50	(*32 - 45*)

Specifications subject to change without notice.

MODEL SPECIFICATIONS

U21J SECONDARY CONCRETE CRUSHER



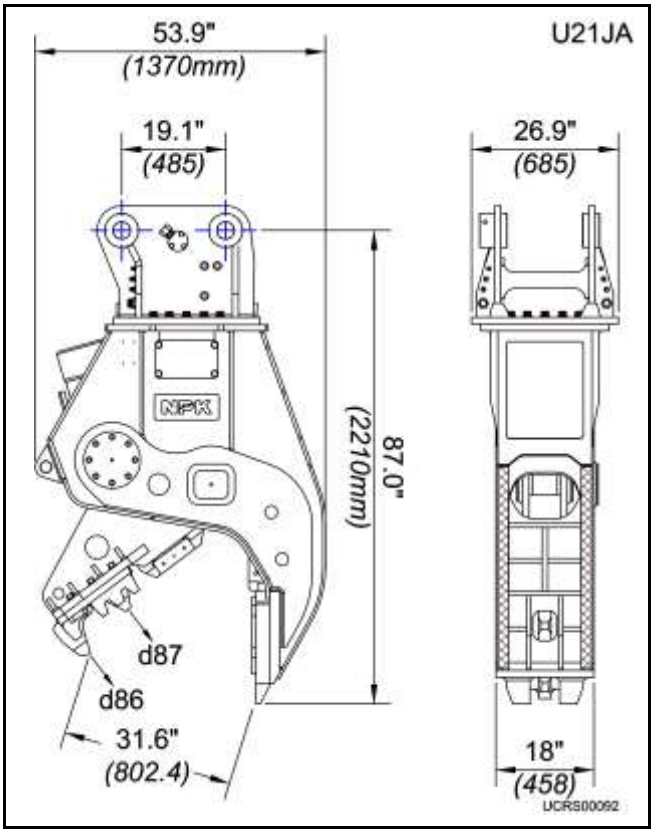
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U21J	4,800	(*2,180*)	31.6	(*802.4*)	26-53	(*98-200*)	1.2	1.6

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U21J	3,771	(*260*)	73	(*66*)	100	(*90*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

U21JA SECONDARY CONCRETE CRUSHER



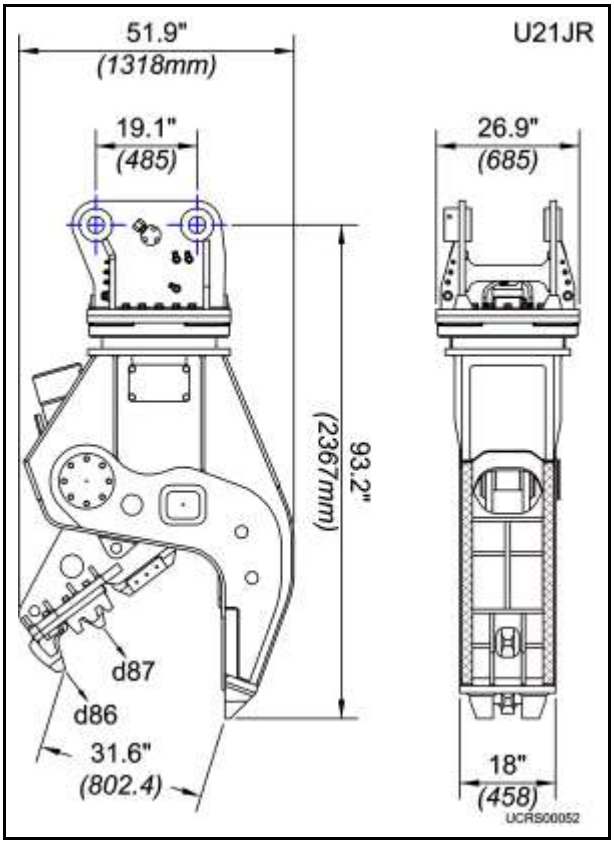
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U21JA	4,800	(*2,180*)	31.6	(*802.4*)	26-53	(*98-200*)	1.2	1.6

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U21JA	3,771	(*260*)	73	(*66*)	100	(*90*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

U21JR SECONDARY CONCRETE CRUSHER



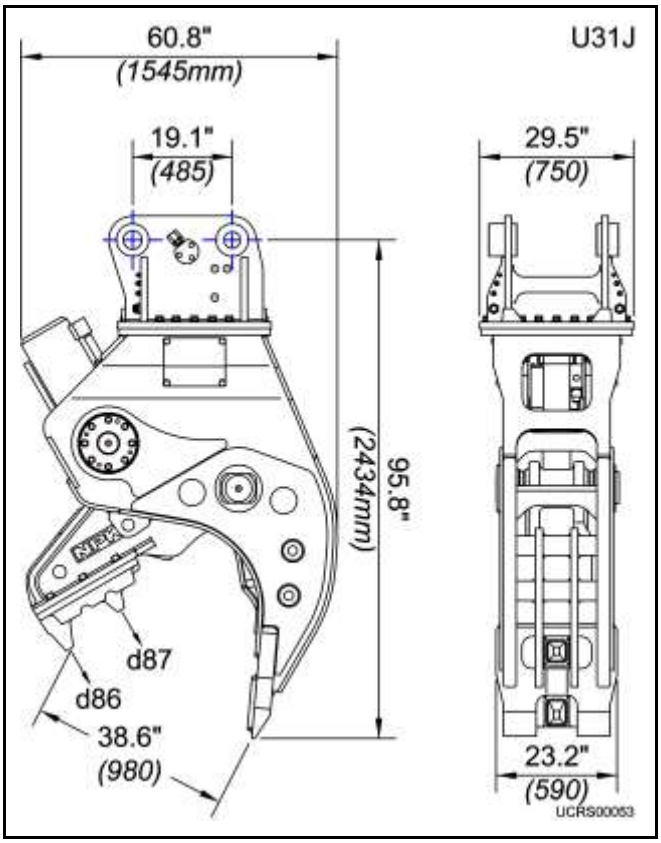
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U21JR	5,650	(*2,560*)	31.6	(*802.4*)	26-53	(*98-200*)	1.2	1.6

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U21JR	3,771	(*260*)	73	(*66*)	100	(*90*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

U31J SECONDARY CONCRETE CRUSHER



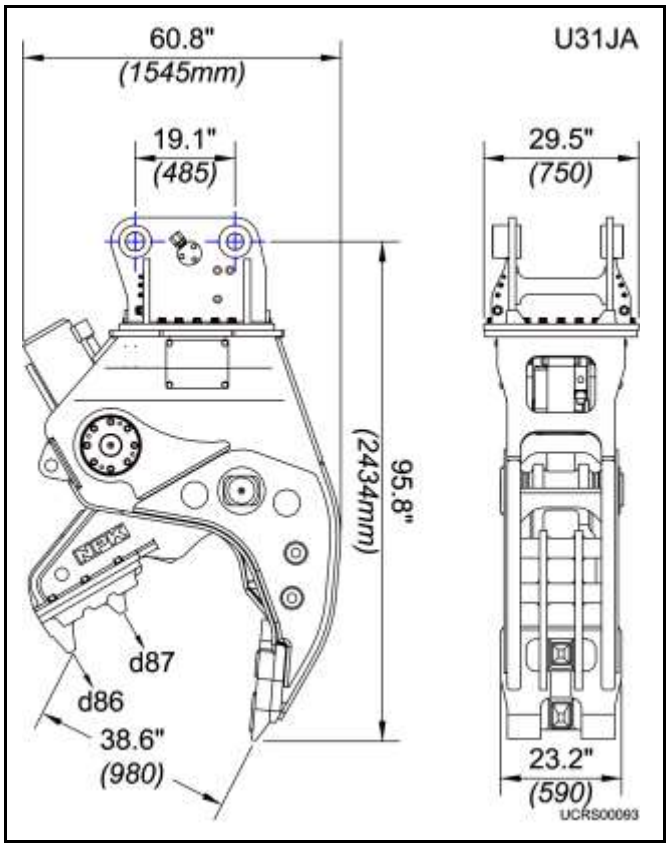
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U31J	6,250	*(2,840)*	38.6	(*980*)	26-66	(*98-250*)	2.4	2.9

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U31J	4,061	(*280*)	130	(*118*)	173	(*157*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

U31JA SECONDARY CONCRETE CRUSHER



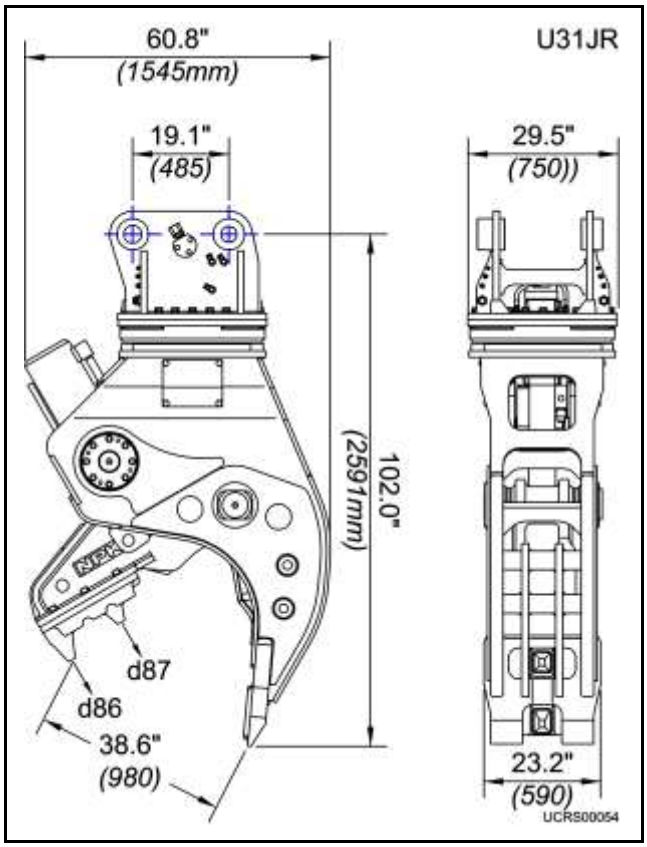
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U31JA	6,250	*(2,840)*	38.6	(*980*)	26-66	(*98-250*)	2.4	2.9

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U31JA	4,061	(*280*)	130	(*118*)	173	(*157*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

U31JR SECONDARY CONCRETE CRUSHER



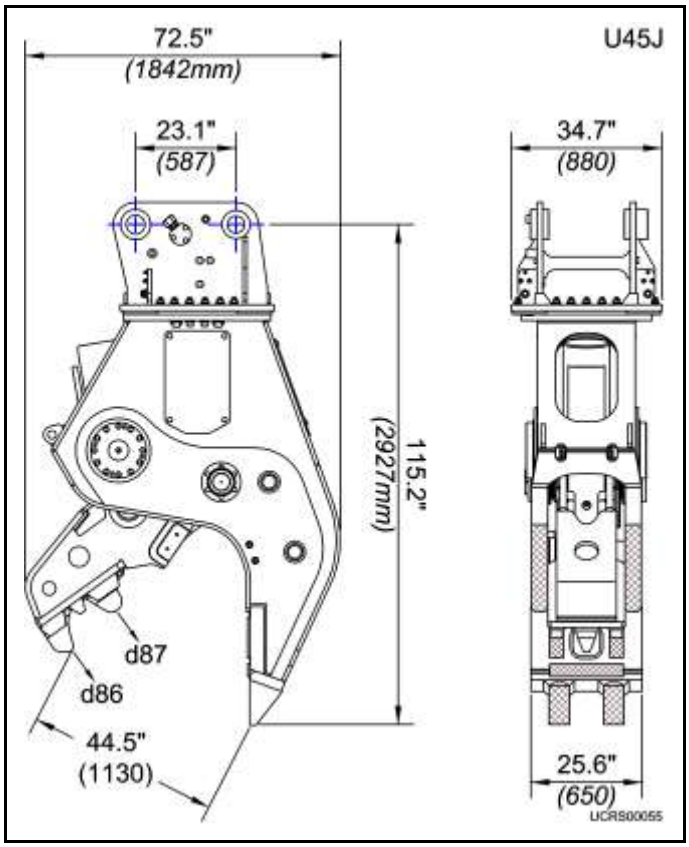
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U31JR	7,300	*(3,310)*	38.6	(*980*)	26-66	(*98-250*)	2.4	2.9

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U31JR	4,061	(*280*)	130	(*118*)	173	(*157*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

U45J SECONDARY CONCRETE CRUSHER



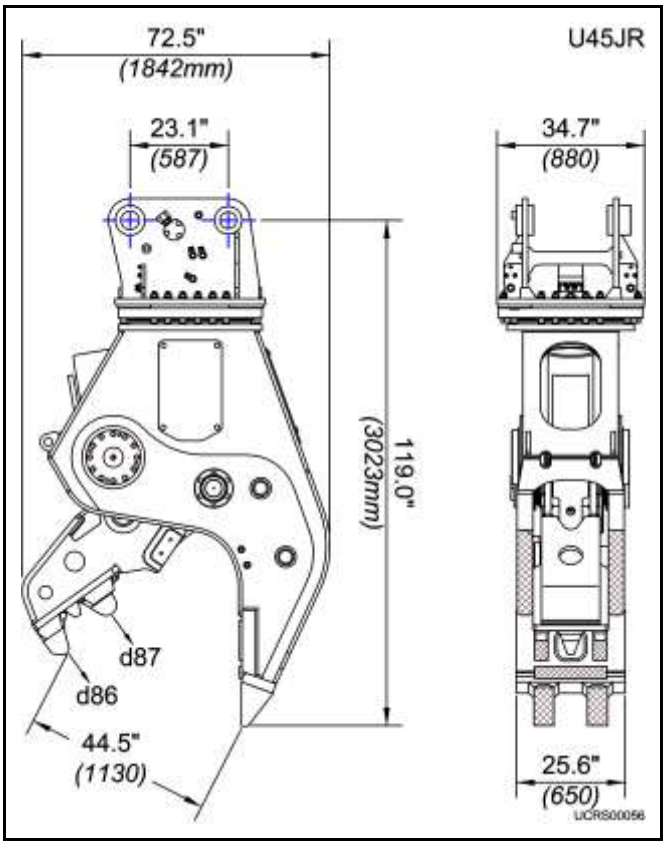
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U45J	9,400	*(4,260)*	44.5	(*1130*)	46-73	(*175-275*)	2.4	3.0

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U45J	4,350	(*300*)	142	(*129*)	195	(*177*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

U45JR SECONDARY CONCRETE CRUSHER



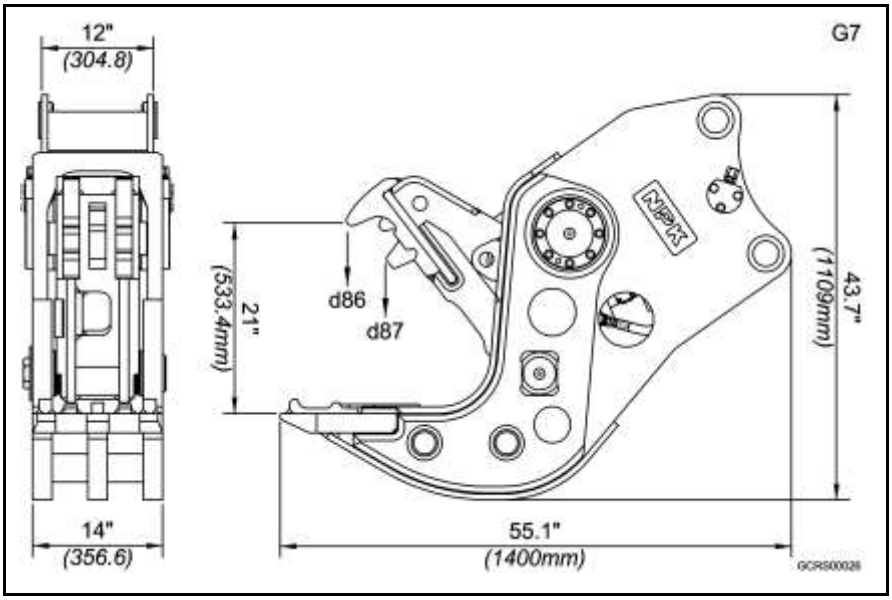
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
U45JR	9,920	(*4,500*)	44.5	(*1130*)	46-73	(*175-275*)	2.4	3.0

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
U45JR	4,350	(*300*)	142	(*129*)	195	(*177*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

G7 SECONDARY CONCRETE CRUSHER



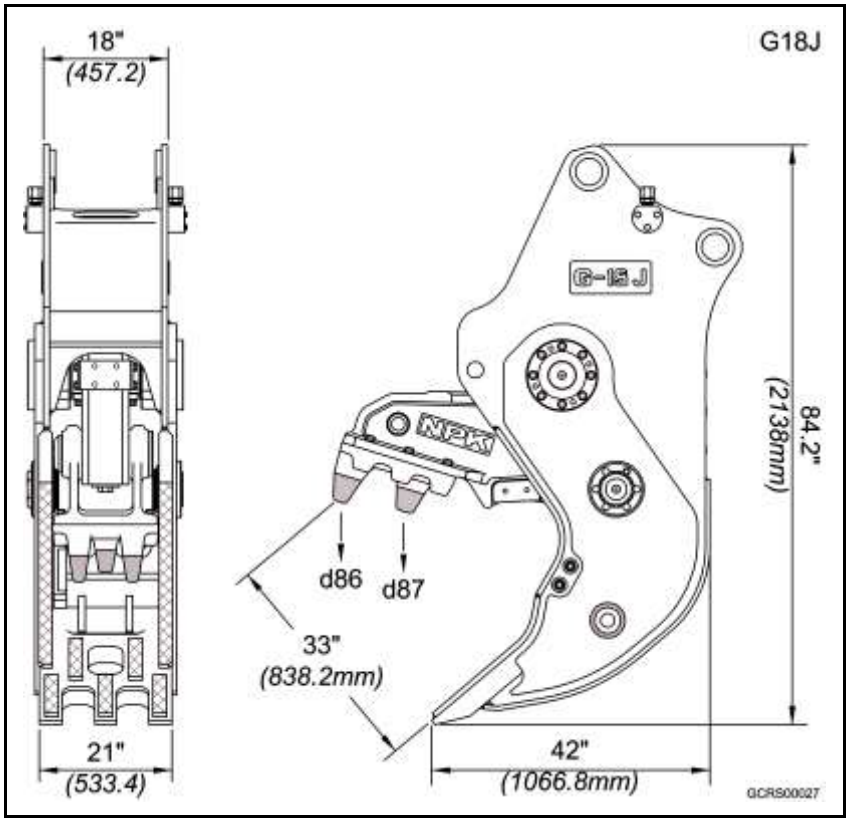
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
G7	1,650	(*750*)	21	(*533.4*)	13-21	(*49-80*)	0.9	1.8

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
G7	3,000	(*206*)	39	(*35*)	52	(*47*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

G18J SECONDARY CONCRETE CRUSHER



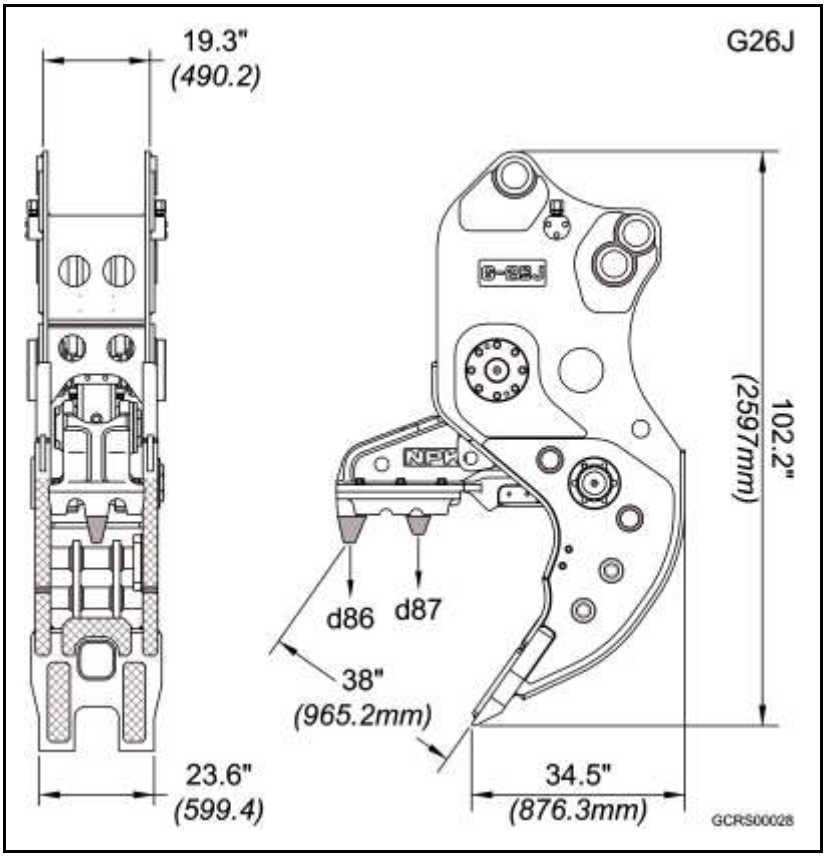
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
G18J	4,400	(*2,000*)	33	(*838.2*)	26-52	(*98-197*)	1.8	2.1

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
G18J	3,700	(*255*)	72	(*65*)	93	(*84*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

G26J SECONDARY CONCRETE CRUSHER



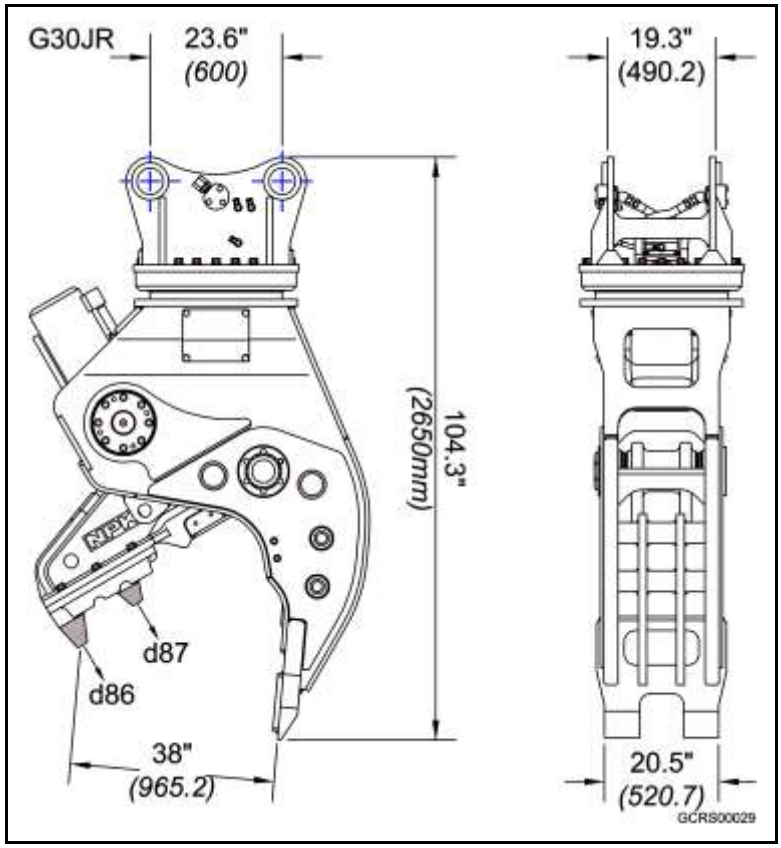
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
G26J	6,050	(*2,745*)	36	(*965.2*)	26-66	(*98-250*)	1.8	3.2

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
G26J	4,000	(*275*)	109	(*99*)	150	(*136*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

MODEL SPECIFICATIONS

G30JR SECONDARY CONCRETE CRUSHER



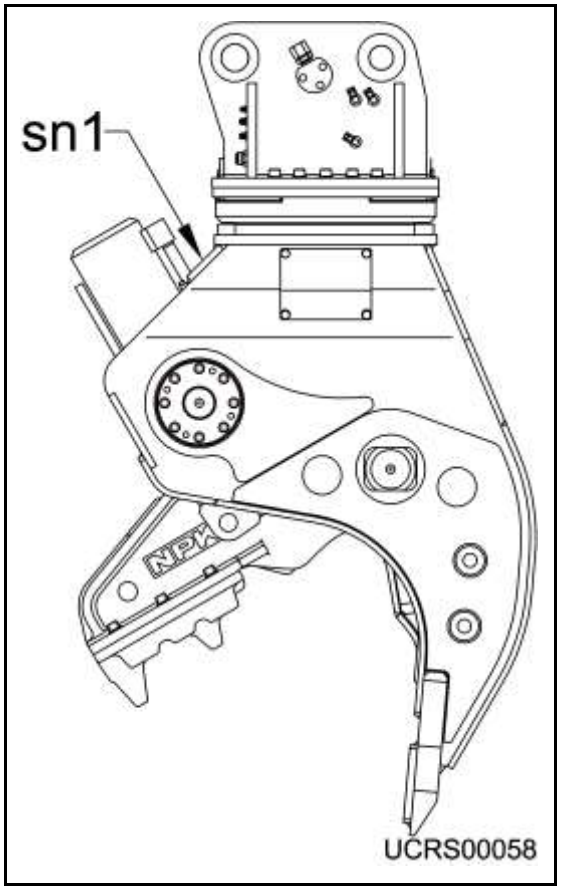
MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time (seconds)	
	lb.	(*kg*)	in.	(*mm*)	gpm	(*lpm*)	open	close
G30JR	7,000	(*3,175*)	36	(*965.2*)	26-66	(*98-250*)	1.8	3.2

MODEL	Maximum Operating Pressure		Crushing Force at d86		Crushing Force at d87	
	psi	(*bar*)	US Ton	(*Metric Ton*)	US Ton	(*Metric Ton*)
G30JR	4,000	(*275*)	109	(*99*)	150	(*136*)

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi (*69 bar*).
*Maximum operating pressure is determined by reliefs in the crusher.

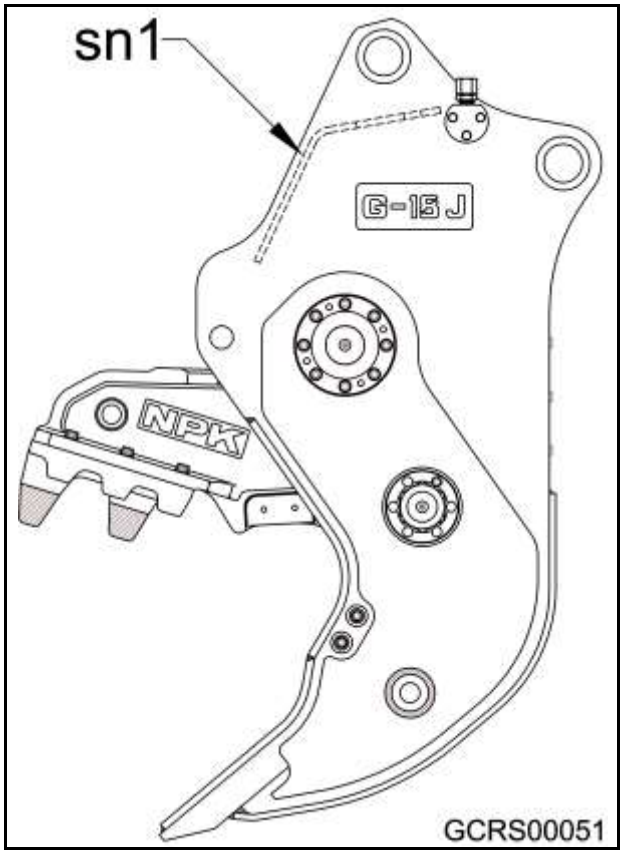
SERIAL NUMBER LOCATION

U21J/JR, U31J/JR, U45J/JR



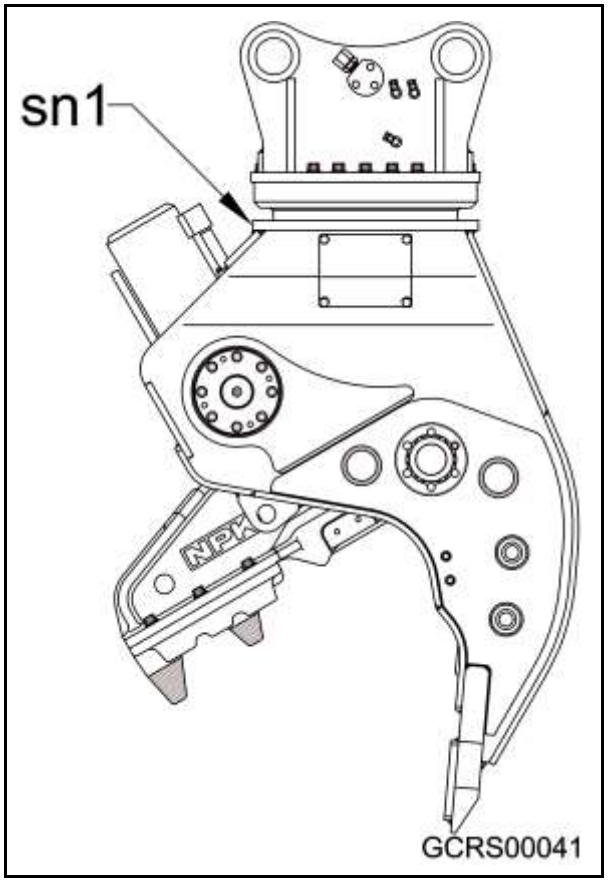
SERIAL NUMBER LOCATION

G7, G18J, G26J



SERIAL NUMBER LOCATION

G30JR

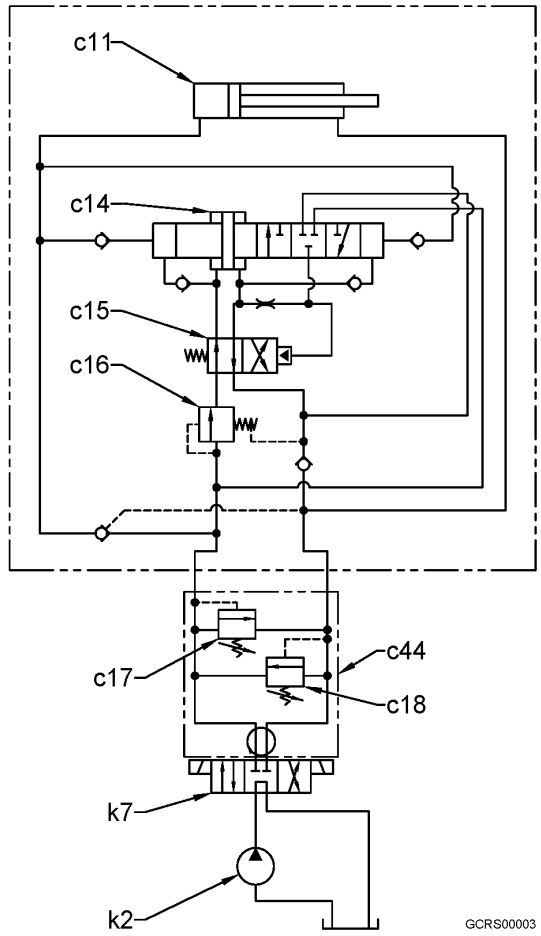


CRUSHER BOOSTER & CYLINDER

INTRODUCTION

The hydraulic cylinder used on the NPK Crushers is equipped with a hydraulic booster. To close the jaws of the crusher, hydraulic oil from the carrier is directed to the base end of the cylinder, which extends the cylinder rod. Under no load, no boost is applied, and this results in a rapid cycle time as compared to large, non-boosted cylinders.

When a load (*material to be crushed*) is encountered, pressure builds and shifts the sequence valve of the booster. This directs oil into the booster section, which intensifies the pressure well beyond the system operating pressure of the excavator. The compact NPK Boosted Cylinder System provides a working force equal to far larger un-boosted cylinders, which are working at excavator system pressure. Because the NPK boosted cylinders are smaller, they require less oil for full stroke as compared to large diameter cylinders. This reduces cycle time for the NPK Crusher. To open the jaws of the NPK Crusher, oil is directed to the rod end of the cylinder. This retracts the rod and pulls the jaw open. No boost is provided in the jaw open mode.



c11	Jaw Cylinder
c14	Booster Piston
c15	Main Valve Assembly
c16	Sequence Valve Cartridge
c17	Relief Valve (close)
c18	Relief Valve (open)
c44	Swivel Manifold
k2	Carrier Hydraulic Pump
k7	Carrier Control Valve

CRUSHER BOOSTER & CYLINDER

STRUCTURE OF THE BOOSTED CYLINDER

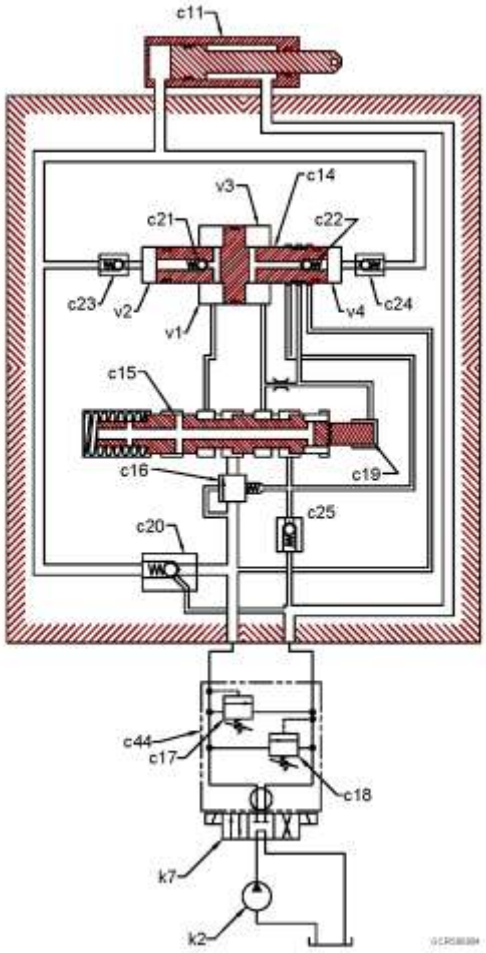


Fig. 1

As shown in Fig. 1, the booster cylinder consists of:

c11	Jaw Cylinder
c14	Booster Piston
c15	Main Valve Assembly
c16	Sequence Valve Cartridge
c17	Relief Valve (close)
c18	Relief Valve (open)
c19	Plunger
c20	Pilot Check Valve Assembly
c21	Check Valve 1 - booster piston inner "B"
c22	Check Valve 2 - booster piston inner "A"
c23	Check Valve 3 - booster sleeve "B"
c24	Check Valve 4 - booster sleeve "A"
c25	Check Valve 5 - Return
c44	Swivel Manifold
k2	Carrier Hydraulic Pump
k7	Carrier Control Valve
v1	Oil Chamber - 1
v2	Oil Chamber - 2
v3	Oil Chamber - 3
v4	Oil Chamber - 4

For a complete breakdown of parts in the booster cylinder assembly, see the parts manual for each unit by serial number.

CRUSHER BOOSTER & CYLINDER

OPERATING PRINCIPLE

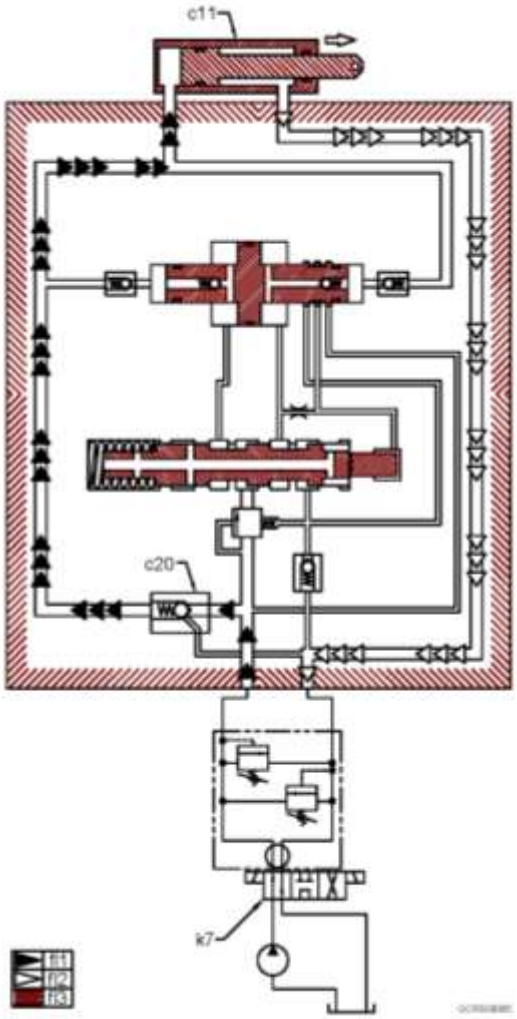


Fig. 2

CYLINDER EXTEND (NO LOAD)

c11	Jaw Cylinder
c20	Pilot Check Valve Assembly
k7	Carrier Control Valve
fl1	High Pressure Hydraulic Flow
fl2	Low Pressure Hydraulic Flow
fl3	Intensified Hydraulic Flow

When the cylinder (c11) is extended (*jaw close*) and no load (*material to be crushed*) is encountered, oil is directed from the carrier control valve (k7) to the base end of the cylinder by way of the pilot check valve (c20) in the booster assembly. When there is no load condition, hydraulic pressure is low, and no boosted pressure is required.

CRUSHER BOOSTER & CYLINDER

OPERATING PRINCIPLE

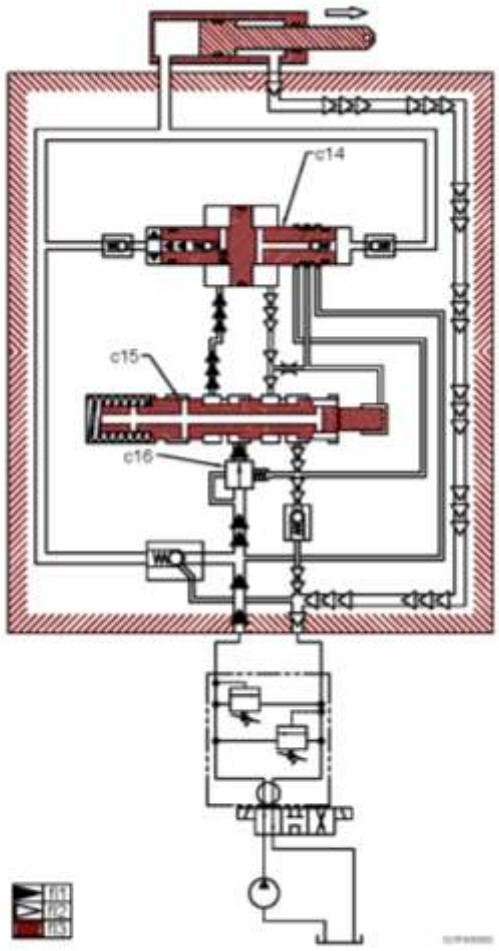


Fig. 3

BOOSTER ACTUATION

c14	Booster Piston
c15	Main valve Assembly
c16	Sequence Valve Cartridge
fl1	High pressure Hydraulic Flow
fl2	Low Pressure Hydraulic Flow
fl3	Intensified Hydraulic Flow

When a load (*material to be crushed*) is encountered on jaw close, the hydraulic pressure in the booster unit starts to rise. When the hydraulic pressure reaches a pre-set value, the sequence valve (c16) shifts and directs oil through the control valve (c15) of the booster, then to the booster piston (c14). This starts the boosting process. The booster piston is double ended and provides boost in each direction of booster piston travel.

CRUSHER BOOSTER & CYLINDER

OPERATING PRINCIPLE

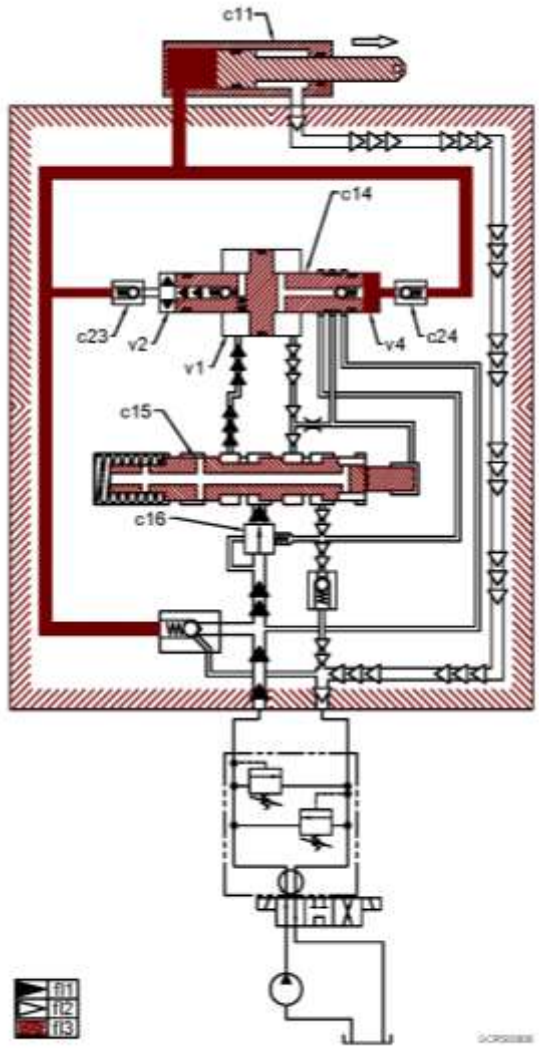


Fig. 4

FORWARD PISTON STROKE

c11	Jaw Cylinder
c14	Booster Piston
c15	Main Valve Assembly
c16	Sequence Valve Cartridge
c23	Check Valve 3 - booster sleeve "B"
c24	Check Valve 4 - booster sleeve "A"
v1	Oil Chamber - 1
v2	Oil Chamber - 2
v4	Oil Chamber - 4
fl1	High Pressure Hydraulic Oil
fl2	Low Pressure Hydraulic Oil
fl3	Intensified Hydraulic Oil

The hydraulic oil that has passed through the sequence valve (c16) and booster valve (c15), flows into rear oil chambers v1 and v2 of the booster piston (c14) and strokes it toward oil chamber v4. Because the area of the booster piston in oil chamber v1 is greater than the area in chamber v4, the pressure in oil chamber v4 is intensified. The higher-pressure oil is pushed through check valve (c24) to the base end of the cylinder (c11) and closes check valve (c23).

CRUSHER BOOSTER & CYLINDER

OPERATING PRINCIPLE

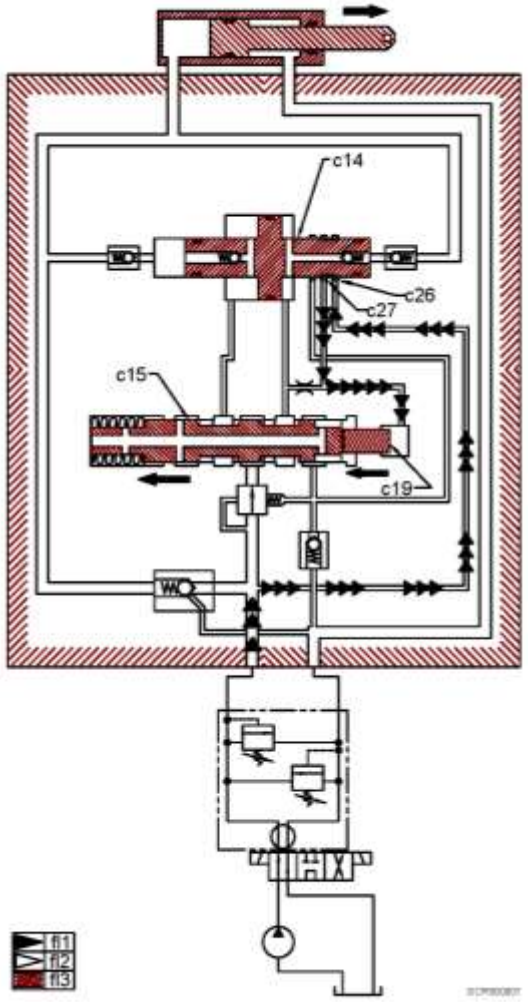


Fig. 5

MAIN VALVE REVERSE SHIFT

c14	Booster Piston
c15	Main Valve Assembly
c19	Plunger
c26	Port C1 Piston
c27	Port C2 Piston
fl1	High Pressure Hydraulic Flow
fl2	Low Pressure Hydraulic Flow
fl3	Intensified Hydraulic Flow

When the booster piston (c14) reaches its full stroke, oil entering port “C1” (c26) transfers to port “C2” (c27) of the piston. Oil is also sent to the plunger (c19) end of the main valve assembly (c15). This shifts the valve as shown in **Fig. 5**.

CRUSHER BOOSTER & CYLINDER

OPERATING PRINCIPLE

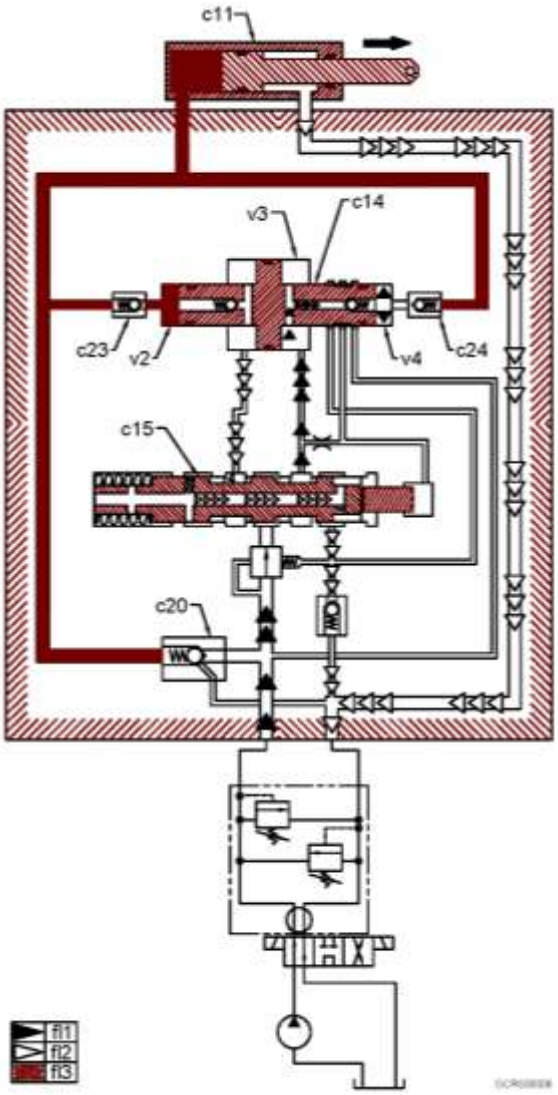


Fig. 6

REVERSE PISTON STROKE

c11	Jaw Cylinder
c14	Booster Piston
c15	Main Valve Assembly
c20	Pilot Check Valve Assembly
c23	Check Valve 3 - booster sleeve "B"
c24	Check Valve 4 - booster sleeve "A"
v2	Oil Chamber - 2
v3	Oil Chamber - 3
v4	Oil Chamber - 4
fl1	High Pressure Hydraulic Flow
fl2	Low Pressure Hydraulic Flow
fl3	Intensified Hydraulic Flow

When the main valve assembly (c15) has been shifted, oil is directed through the main valve assembly to oil chambers (v3) and (v4) of the booster piston (c14). This strokes the booster piston toward oil chamber (v2). The oil in chamber (v2) is intensified and sent through check valve 3 (c23) to the base end of the cylinder (c11). Pilot check valve (c20) and check valve 4 (c24) are also closed at this time.

CRUSHER BOOSTER & CYLINDER

OPERATING PRINCIPLE

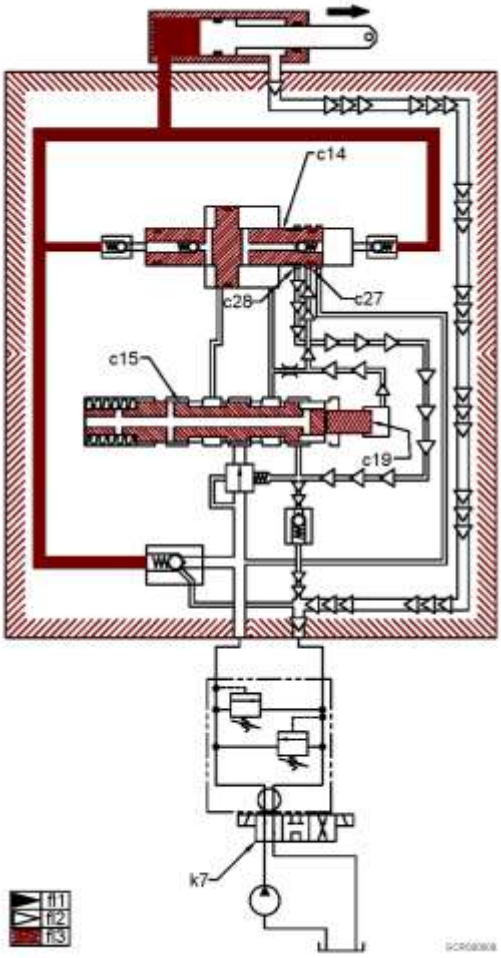


Fig. 7

VALVE SHIFT TO FORWARD STROKE

c14	Booster Piston
c15	Main Valve Assembly
c19	Plunger
c27	Port C2 Piston
c28	Port C3 Piston
k7	Carrier Control Valve
fl1	High Pressure Hydraulic Flow
fl2	Low Pressure Hydraulic Flow
fl3	Intensified Hydraulic Flow

When the booster piston (c14) reaches full reverse stroke, oil drains out of the plunger (c19) end of the main control valve (c15) through ports C2 (c27) and C3 (c28) of the booster piston. The main control valve spring moves the main control valve spool toward the plunger. This places the main control valve in position to direct oil to the booster piston to start the next forward piston stroke. These forward and reverse piston strokes will continue as long as the excavator's control valve (k7) is shifted to send hydraulic flow to the booster and cylinder and that there is sufficient resistance (load) to keep the booster active.

CRUSHER BOOSTER & CYLINDER

OPERATING PRINCIPLE

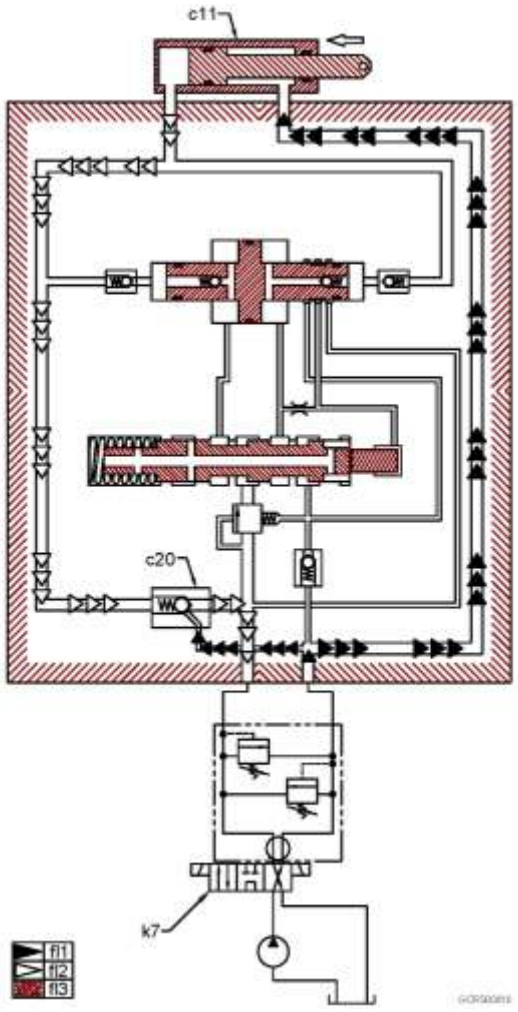


Fig. 8

CYLINDER RETRACT (JAW OPEN)

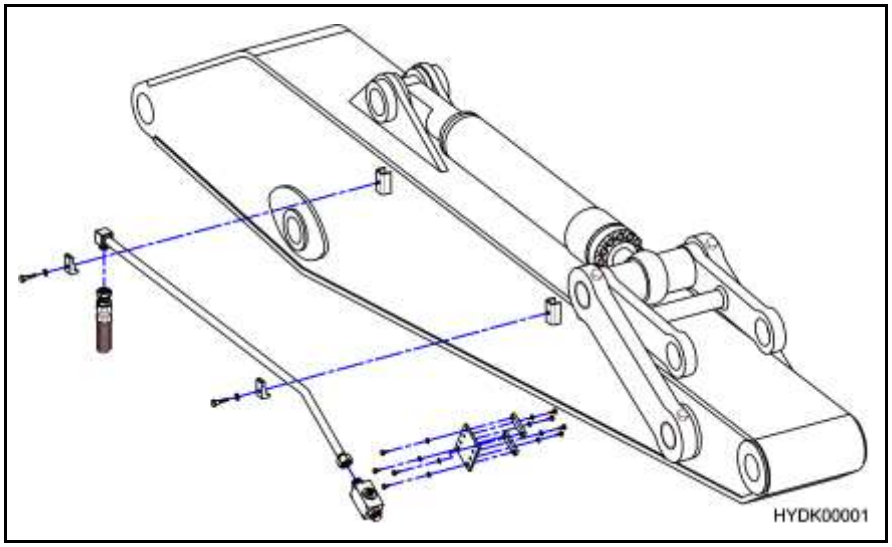
c11	Jaw Cylinder
c20	Pilot check valve assembly
k7	Carrier Control Valve
fl1	High Pressure Hydraulic Flow
fl2	Low Pressure Hydraulic Flow
fl3	Intensified Hydraulic Flow

When the crusher jaw is opened, oil from the excavator's control valve (k7) is directed through the booster to the rod end of the cylinder (c11). A pilot signal from this flow is sent to open the pilot check valve assembly (c20) which allows oil to be pushed out of the base end of the cylinder as the cylinder rod retracts. *There is no boost actuation on the jaw open cycle.*

HYDRAULIC INSTALLATION

HYDRAULIC KITS

Hydraulic Installation Kits are available for virtually all compatible backhoe loaders, excavators, and skid steers. Complete parts and instructions for the hydraulic installation of the NPK Crusher, including valves, electrical or manual controls, hoses and fittings, boom and stick piping and clamps are provided.

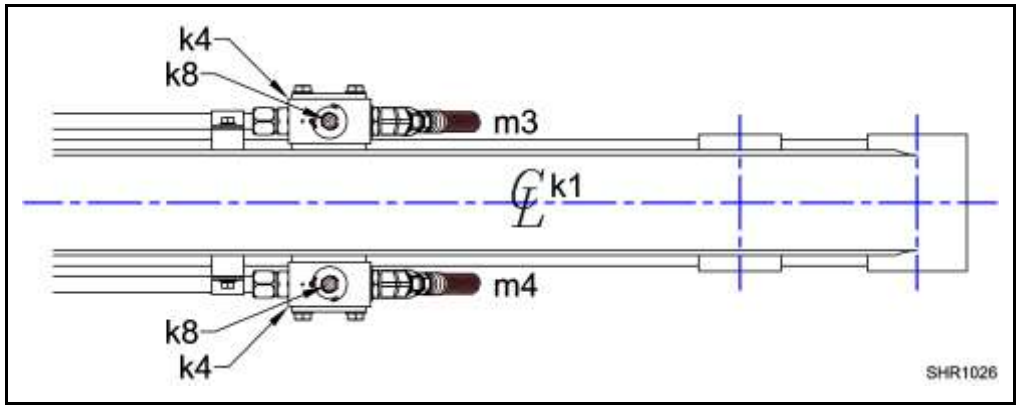


Combination kits that can be used for hydraulic hammer or compactor/driver operation are available.

See your NPK dealer for details or call NPK direct at (440) 232-7900.

FLOW DIRECTION

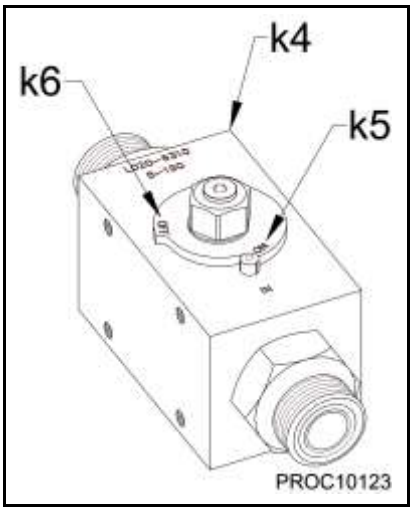
The hydraulic flow to close (m3) the Crusher jaws should be on the left side of the carrier (looking from the operator's seat) and to open (m4) the jaws is on the right.



HYDRAULIC INSTALLATION

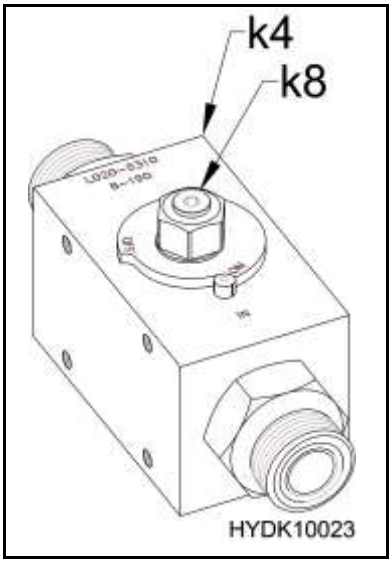
SHUT-OFF VALVES

Most hydraulic installation kits use two shut-off valves (k4) on the stick (k1) of the carrier. Each shut-off valve has an **"ON"** (k5) and an **"OFF"** (k6) position. Make sure both shut-off valves are in the "ON" position before operating your attachment.



TEST PORT LOCATIONS

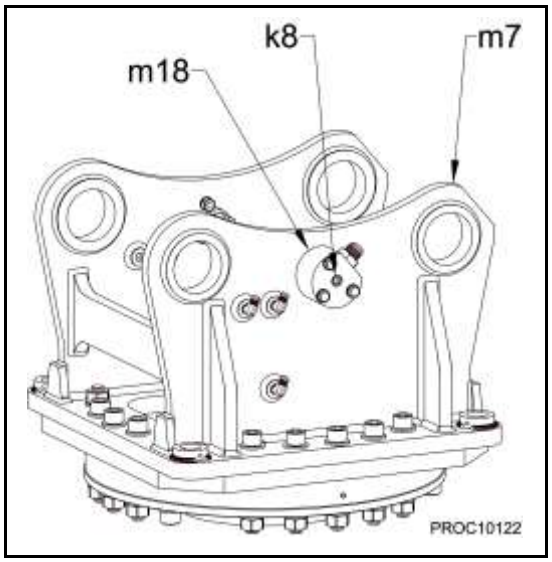
A. Some hydraulic installation kits have pressure test (gauge) ports (k8) in both shut-off valves (k4).



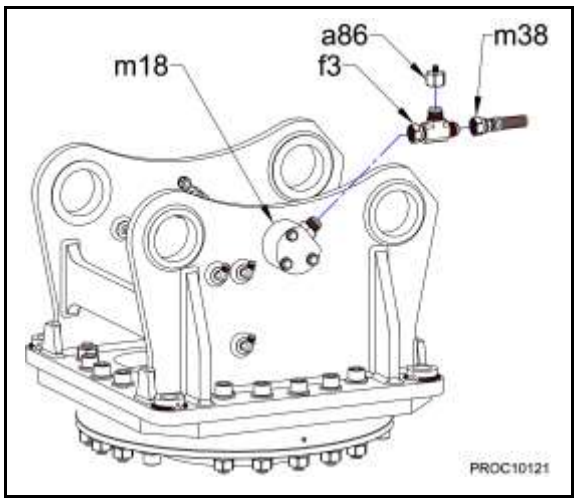
HYDRAULIC INSTALLATION

TEST PORT LOCATIONS

B. NPK also provides pressure test (gauge) ports (k8) in both the pressure and return joint fittings (m18) located on the attachment top bracket (m7).



C. For older units without pressure test ports in the top bracket or for units mounted on a carrier without and NPK Hydraulic Installation Kit, it is suggested that you use a correctly sized JIC swivel run tee (f3) and a reducer fitting (a86) between the whip hose (m38) and the joint fitting (m18).



HYDRAULIC INSTALLATION

PREVENTION OF CONTAMINATION

ATTENTION

1. Neglect of the hydraulic oil will cause many problems in all of the hydraulic components, including the attachment. Care should be taken to check for contamination of the oil and to change the oil if contamination is found. ***Routine oil sampling is recommended once per month.***

   ❖When the hydraulic oil shows low viscosity and bubbles, this indicates that the oil is deteriorated. If the oil is dark brown and gives off an offensive odor, it is severely deteriorated. ***Change the oil immediately!***
   ❖When the oil is clouded, or the oil filter becomes clogged, it indicates that the oil is contaminated. ***Change the oil immediately!***
   ❖To change the contaminated hydraulic oil, drain the hydraulic system as completely as possible. Try to minimize the amount of old oil that will be mixed with the new oil.
   NOTE: It is suggested to change the oil in the system with all of the cylinders retracted.

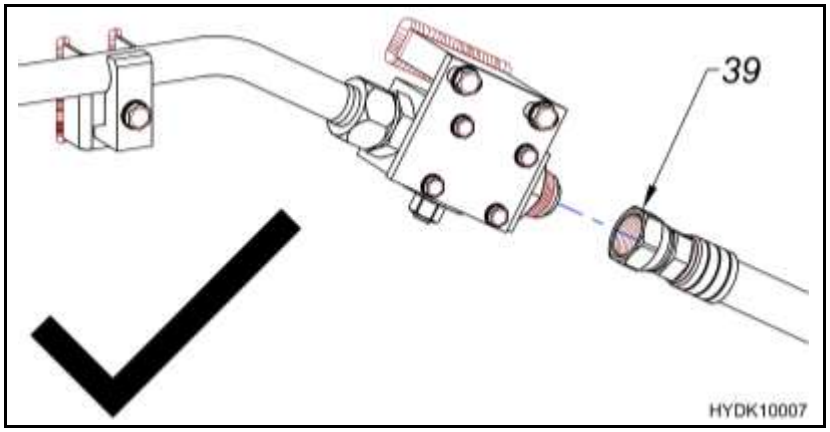
NOTE: *If a catastrophic failure has occurred and the system is found to have metal mixed with the hydraulic oil, a complete disassembly and clean out must be done to* ***ALL*** *hydraulic components and attachments.* ***ALL*** *of the hydraulic lines must be flushed.*

2. Do not allow any contaminants to mix with the hydraulic oil. Take special care in preventing contamination from entering the hydraulic system through the hose or tube connection when installing or removing the attachment. Always have caps and plugs ready.
3. Low oil level will cause heat buildup, resulting in deterioration of the hydraulic oil. Also, it may cause pump cavitation due to air mixing with the oil, leading to damage to the attachment or the carrier components. Keep the oil at the proper level at all times.
4. Do not use the hammer at an operating temperature higher than 180°F *(80°C)*. The proper operating oil temperature range is between 120°F *(50°C)* and 180°F *(80°C)*. Since contaminated cooler fins cause reduced efficiency of the cooler, keep them clean at all times. The use of a heat gun is the best way to evaluate if the cooler is working properly.
5. Water in the hydraulic oil will lead to damage of the attachment and the carrier. Drain off water and foreign matter from the hydraulic tank at specified intervals. When out of service, the attachment should be stored indoors.

HYDRAULIC INSTALLATION

HYDRAULIC QUICK DISCONNECTS

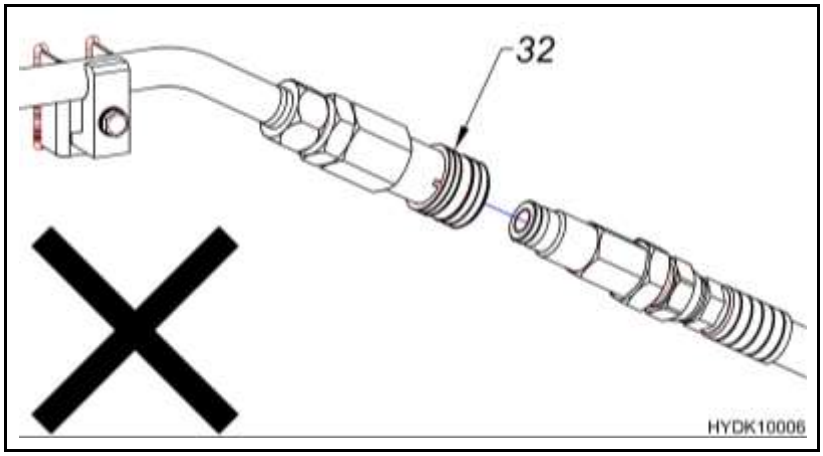
NPK prefers the use of a straight JIC connection (*39*) when installing its crusher onto a carrier.



NOTE: *Care should be given when removing the crusher to make sure that the hoses are plugged, and the tube ends are capped to prevent contamination from entering the hydraulic system.*

NPK recommends against the use of non-NPK hydraulic quick disconnects on fluid circuits operating NPK products, including the crusher, for the following reasons:

1. The hydraulic pulsations caused by the crusher can cause internal pieces of the non-NPK quick disconnect (*32*) to disintegrate. These pieces can migrate into the crusher, causing damage to the unit. That damage is not covered by NPK's warranty.

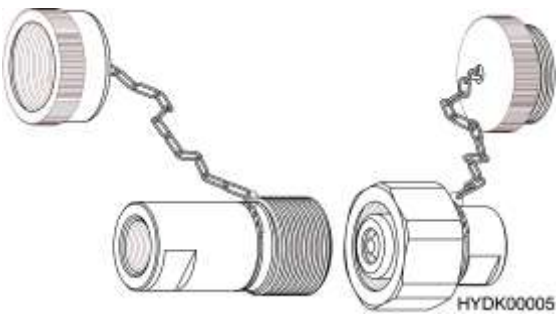
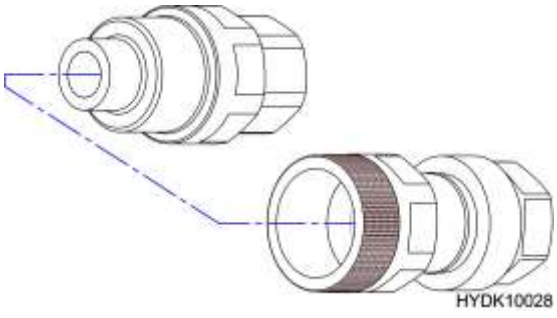


HYDRAULIC INSTALLATION

HYDRAULIC QUICK DISCONNECTS

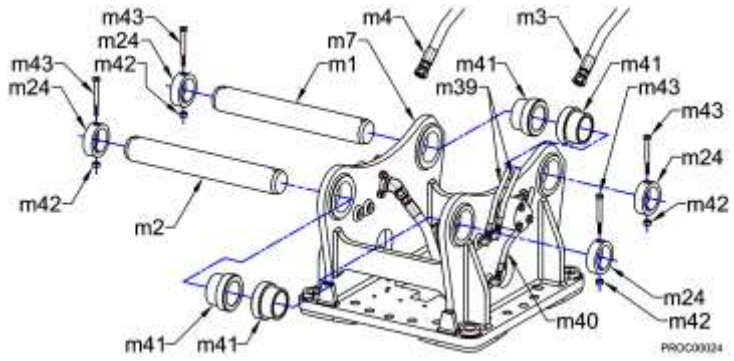
2. Contamination can enter the hydraulic system if the quick disconnect ends are not kept clean. The quick disconnects should be capped to keep them clean. If this is not done, contamination in the quick disconnect will be flushed into the hydraulic system, causing internal damage to the crusher.
3. Most quick disconnects create a restriction in the hydraulic circuit. NPK Crushers are not pressure sensitive, but the restrictions cause unnecessary heating of the oil. Also, the pressure required to operate the crusher, plus the restriction of the quick disconnects may push an older, lower pressure carrier to the limit of its hydraulic system. This would interfere with the proper operation of the crusher. However, the NPK approved quick disconnects are properly sized so that the crusher operation is not affected.

NPK has approved quick disconnects. Contact your NPK dealer or NPK direct at (440) 232-7900 for proper sizing of approved NPK quick disconnects for your unit.

	
ROFLEX COUPLING	**STUCCI COUPLING**

MOUNTING INSTALLATION

NPK Mounting Installation Kits include the parts required to adapt the NPK “U” and “G” Series Secondary Concrete Crushers to the stick of an excavator. The kits include all necessary boom pins, bushings, spacers, etc.

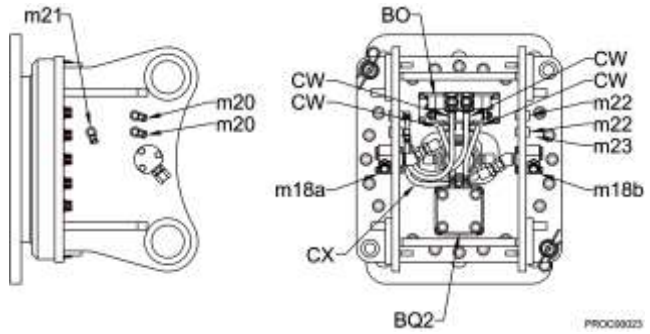


m1	Stick Pin
m2	Link Pin
m3	Main Whip Hose (jaw close)
m4	Main Whip Hose (jaw open)
m7	Top Bracket
m24	Boom Pin Collar
m39	Rotation Whip Hose
m40	Motor Drain Whip hose
m41	Boom Pin Bushing
m42	Stover Nut
m43	Hex head Cap Screw

NOTE: *NPK Mounting Kits using loose fit bushings to adapt the pins to the top bracket are not compatible for use with quick attaches or pin grabbers.*

“U” AND “G” SERIES ROTATING TOP BRACKET

The “U” and “G” Series rotating style top bracket is ported for right or left side hose access for rotation and motor case drain line connections.

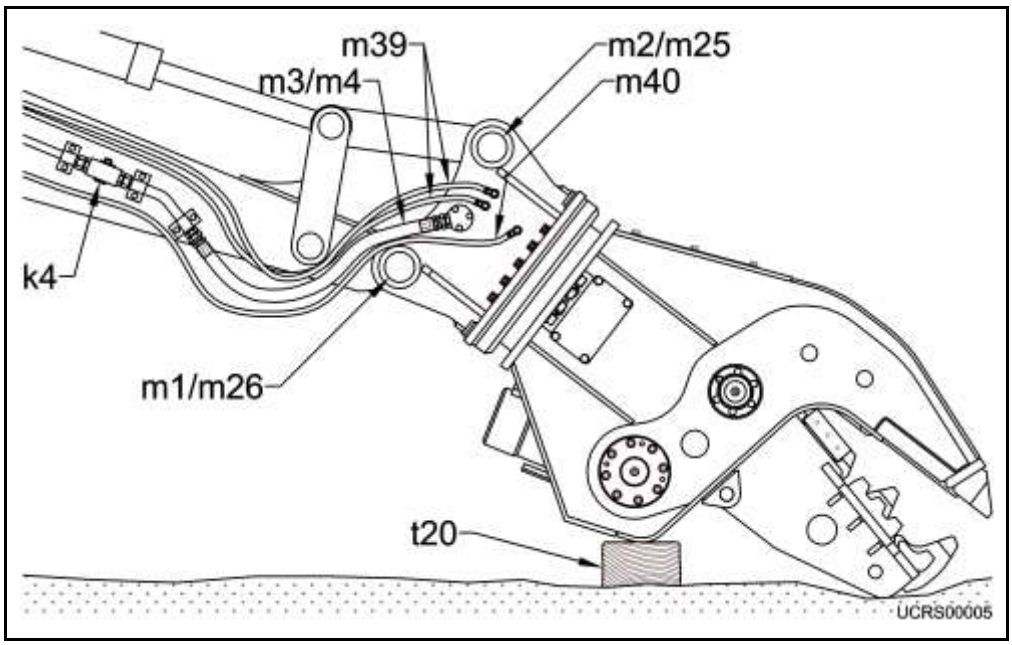


ITEM	DESCRIPTION
BO	Holding Valve
BQ2	Rotation Motor
CW	Rotation Hose
CX	Motor Drain Line
m18a	Main Connection (*close*)- #20 JIC male
m18b	Main Connection (*open*)- #20 JIC male
m20	Rotation Connections- #8 JIC male
m21	Motor Drain Connection- #6 JIC male
m22	Optional Rotation Ports
m23	Optional Drain Port

MOUNTING INSTALLATION

MOUNTING TO THE CARRIER

1. Position the crusher horizontal on a wood block (t20) as shown.
2. Align the stick pin bore (m26). Install stick pin (m1).
3. Align the link pin bore (m25). Install the link pin (m2).
4. Clean away any dirt found on the hose connections and connect the whip hoses (m3 and m4).
5. Connect the rotation whip hoses (m39) and hydraulic motor case drain whip hose (m40).
6. Open the shut off valves (k4).



ATTENTION

The hydraulic lines must be handled carefully to prevent contamination from entering the crusher or the carrier hydraulic system.

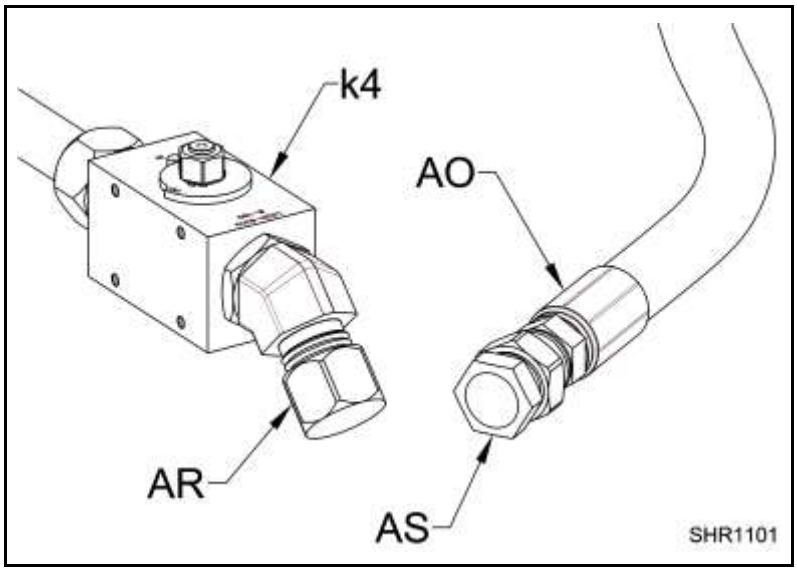
MOUNTING INSTALLATION

REMOVAL FROM THE CARRIER

1. Retract the cylinder to open the jaws fully.
2. Shut off the carrier's engine and relieve all hydraulic pressure.
3. Close the shut off valves.
4. Disconnect the hydraulic hoses before laying the crusher down. Install metal plugs in the hydraulic hoses and metal caps on the stick tubes to keep out contamination.
5. Position the crusher horizontal on a wood block (t20), as shown in **"MOUNTING TO THE CARRIER"**.

STORAGE OF THE CRUSHER

1. Make sure all whip hoses (AO) that connect the crusher to the carrier are plugged (AS), all hose connections are capped (AR), and turn shut off valves (k4) to the **"OFF"** position.



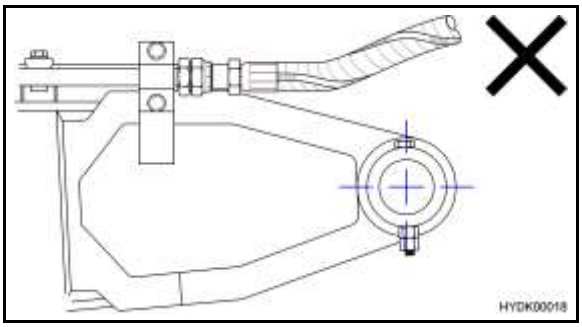
2. Grease all lubrication points; see the **"GENERAL MAINTENANCE"** section under **"LUBRICATION POINTS"**.
3. If the unit is stored outdoors, retract the cylinder and cover with a waterproof tarp.

HOSE INSTALLATION

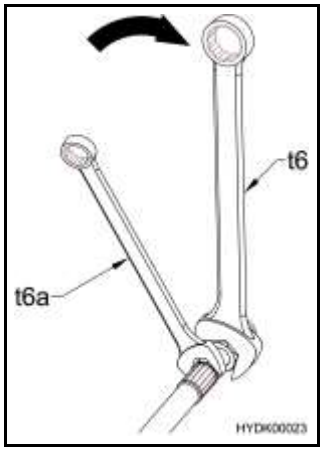
WHIP HOSE INSTALLATION TIPS

1. Connect larger diameter hoses first. Larger hoses are more difficult to bend and maneuver, while the smaller lines are usually more flexible and easier to install.

2. Do not twist the hose during installation. Pressure applied to a twisted hose can result in premature hose failure or loose connections.



3. Attach both ends of the hose to their connection points. Let the hose find its natural position, then tighten both ends of the hose, using a wrench (t6) and backup wrench (t6a).



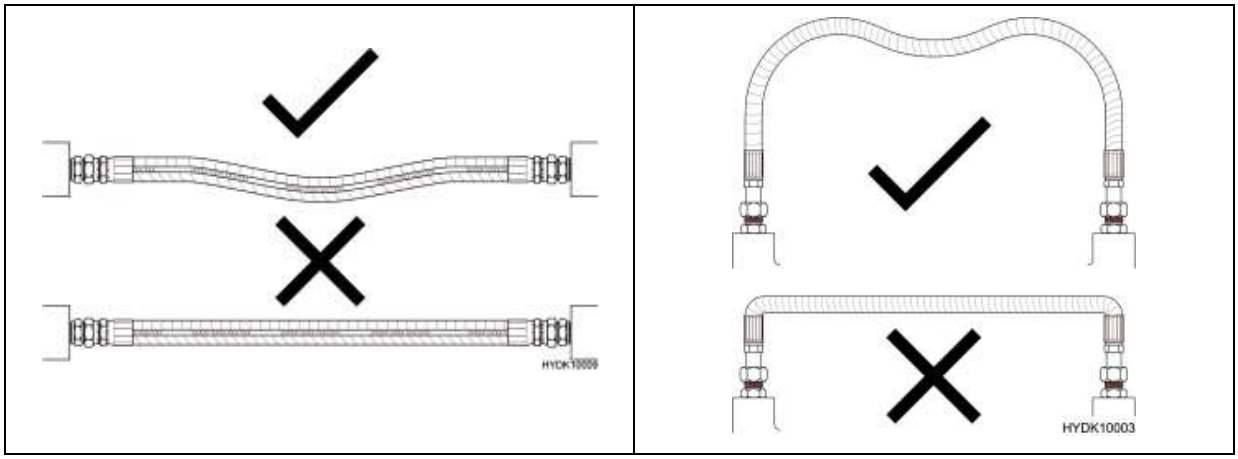
4. Torque hose to specifications.

NOMINAL HOSE SIZE	THREAD SIZE	TORQUE	
		ft. lbs.	*(Nm)*
1/2"	3/4 - 10	39	*(52)*
3/4"	1-1/16 - 12	88	*(119)*
1"	1-5/16 - 12	113	*(153)*
1-1/4"	1-5/8 - 12	133	*(180)*

HOSE INSTALLATION

WHIP HOSE INSTALLATION TIPS

5. All hoses change in length slightly when pressure is applied. Hoses must have enough slack to relieve stressing the connections.



6. Make sure the hose being installed is routed with the proper bend radius to prevent kinking, flow restrictions, or hose failures at the hose connection.

HOSE SIZE	MINIMUM BEND RADIUS	
	in	***(mm)***
1/2"	7	*(177.8)*
3/4"	9.5	*(241.3)*
1"	12	*(304.8)*
1-1/4"	16.5	*(419.1)*

7. Hoses should be used within the following ranges of temperature.

	TEMPERATURE RANGE	
	°F	***(°C)***
HYDRAULIC FLUID	14 to 176	*(-10 to +80)*
ATMOSPHERIC	14 to 122	*(-10 to +50)*

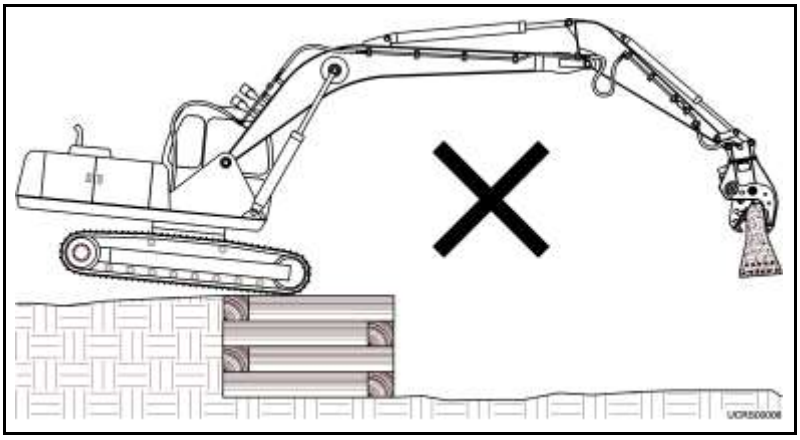
OPERATING INSTRUCTIONS

Before operating the NPK Crusher, be sure to read the safety information and perform the daily and weekly maintenance as specified in this manual.

⚠ WARNING

DO NOT OPERATE THE CRUSHER WITHOUT DEMOLITION GUARDS IN PLACE!

⚠ CAUTION

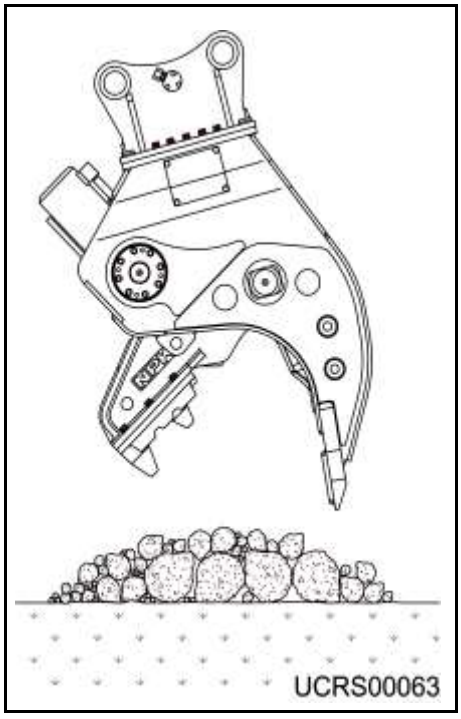


DO NOT LIFT OR LOAD BEYOND THE CAPACITY OF THE CRUSHER OR THE CARRIER.

OPERATING INSTRUCTIONS

USE THE CRUSHER ONLY FOR THE APPLICATION FOR WHICH IT IS INTENDED:

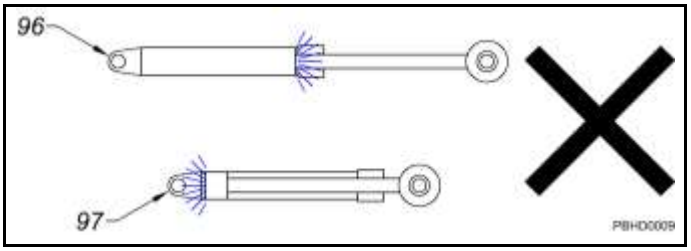
- NPK “U” and “G” Series Crushers are designed for the downsizing of concrete, the separation of concrete and rebar and some primary demolition.



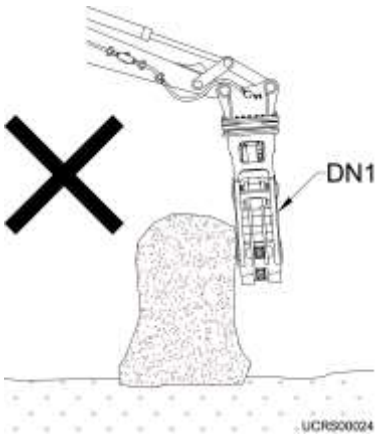
OPERATING TECHNIQUES AND PRECAUTIONS

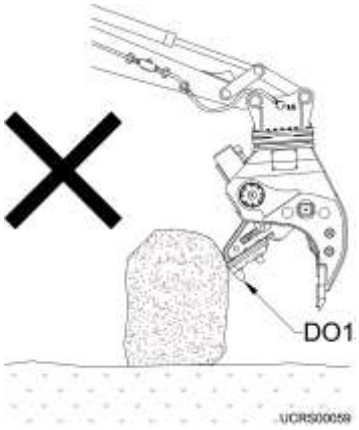
ATTENTION

1. **Do not** use the NPK Crusher with the excavator cylinders fully extended or retracted.



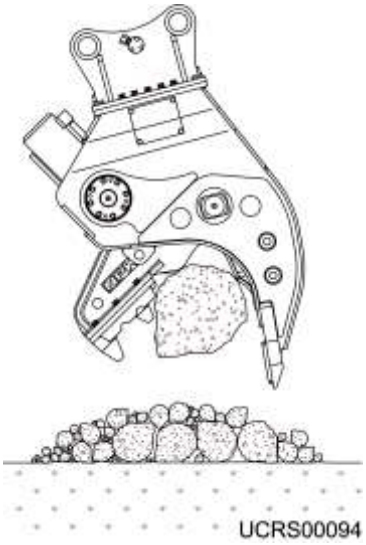
2. **Do not** strike the material with the crusher main body (DN1) or outer surface of the jaw set (DO1). Do not push, pull, or scrape material with the crusher.





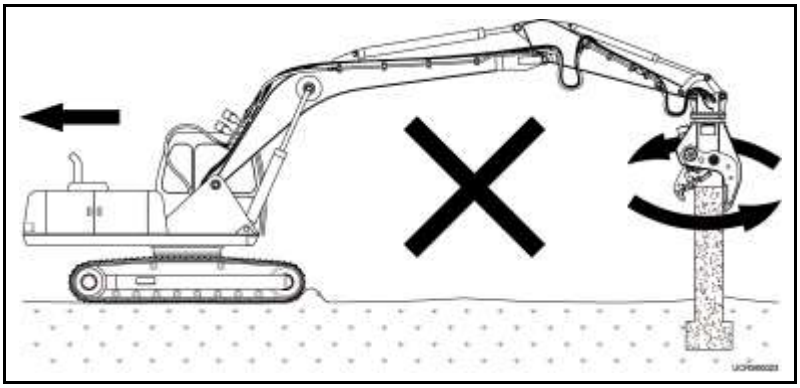
3. For most efficient operation, open the jaw only wide enough to grasp the material. Grasp the material to be crushed as deep into the throat of the crusher as possible. Do not force the material into the jaw.

If you have any questions on operating the NPK Crusher, please contact your local NPK dealer or call the NPK Service Department at (440) 232-7900.

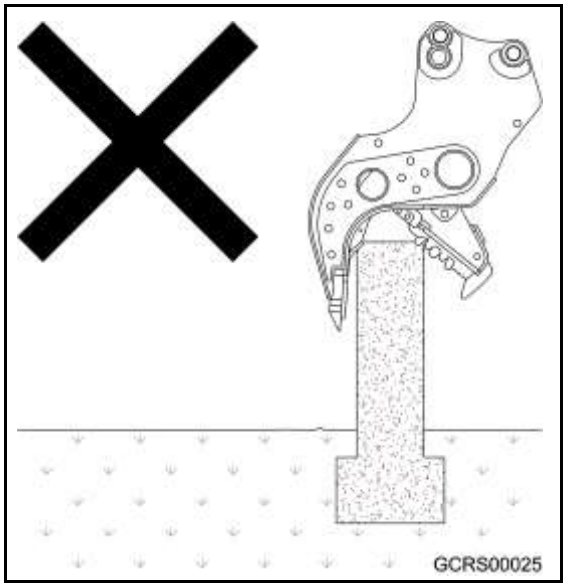


OPERATING TECHNIQUES AND PRECAUTIONS

4. **Do not** pry, twist, or pull with the excavator. Allow the hydraulic crushing forces of the crusher jaw to do the work. If the material does not crush completely at first, open the jaws and close again in a chewing action. The excavator is used as a way of positioning and supplying hydraulic power to the crusher.

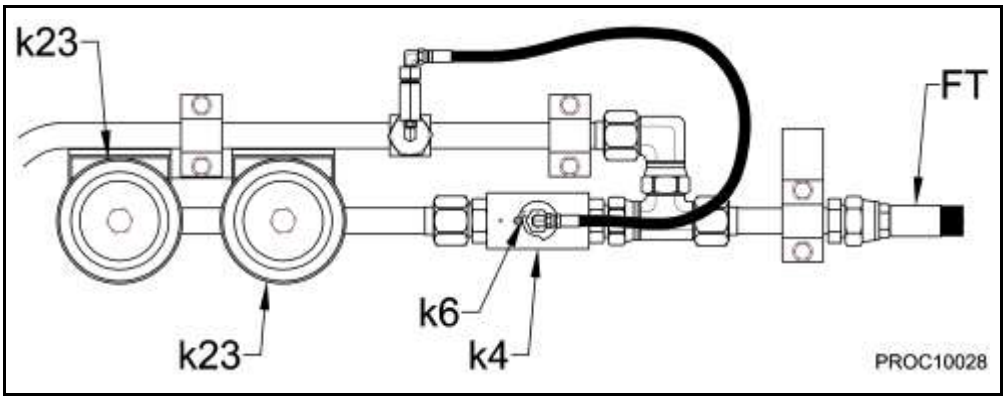


5. **Do not** use the rebar cutters to cut rod over 1-1/4” in diameter.
6. **Do not** use the “U” or “G” Series non-rotating crushers to crush fixed structures.

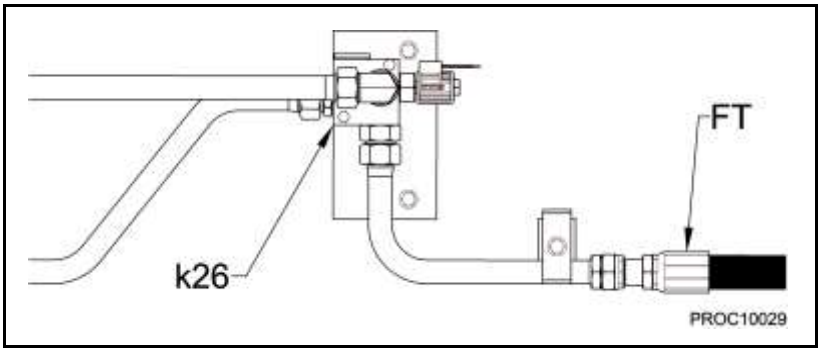


OPERATING TECHNIQUES AND PRECAUTIONS

7. **Do not** operate the crusher on an excavator with an NPK combination Hydraulic Hammer/Crusher hydraulic installation kit without first isolating the line mounted accumulators (k23).



   a. The shut-off valve (k4) in the return line (FT) must be in the **"OFF"** (k6) position for use with the processor.
   b. On some later NPK Hydraulic Installation Kits, the isolation feature is done automatically through the use of an accumulator isolation valve (k26). Consult with NPK at (440) 232-7900, if you are unsure of what your carrier is equipped with.



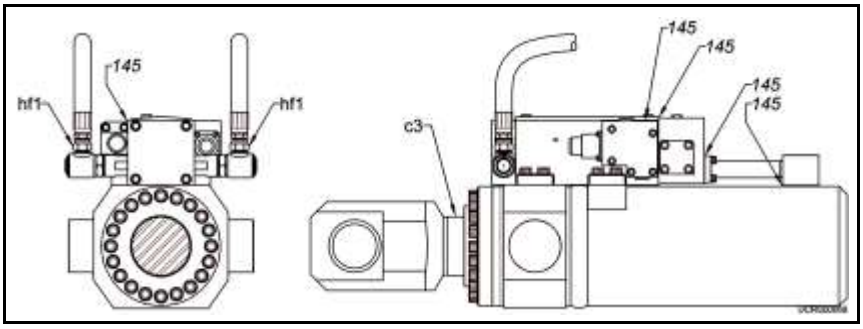
GENERAL MAINTENANCE

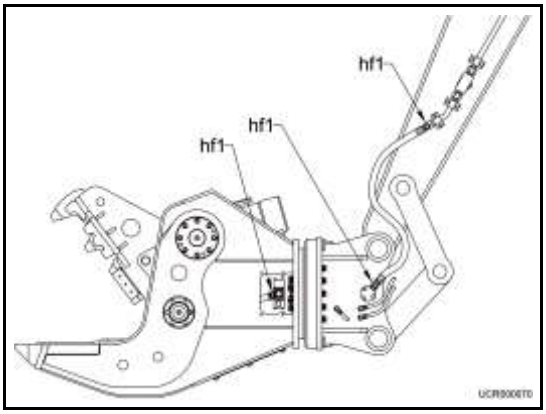
REFER TO IMPORTANT SAFETY INFORMATION SECTION

DAILY INSPECTION AND MAINTENANCE

The functions the crusher performs are demanding and in tough environments. Therefore, it is extremely important that the following maintenance and inspection procedures be performed daily.

- Grease all lubrication points! Use EP2 or equivalent grease. For lubrication points, see **"GENERAL MAINTENANCE"**, **"LUBRICATION POINTS".**
- Check for oil leaks at the cylinder piston rod (c3), the machined surfaces (*145*) and at all of the crusher's hose and fitting connections (hf1).

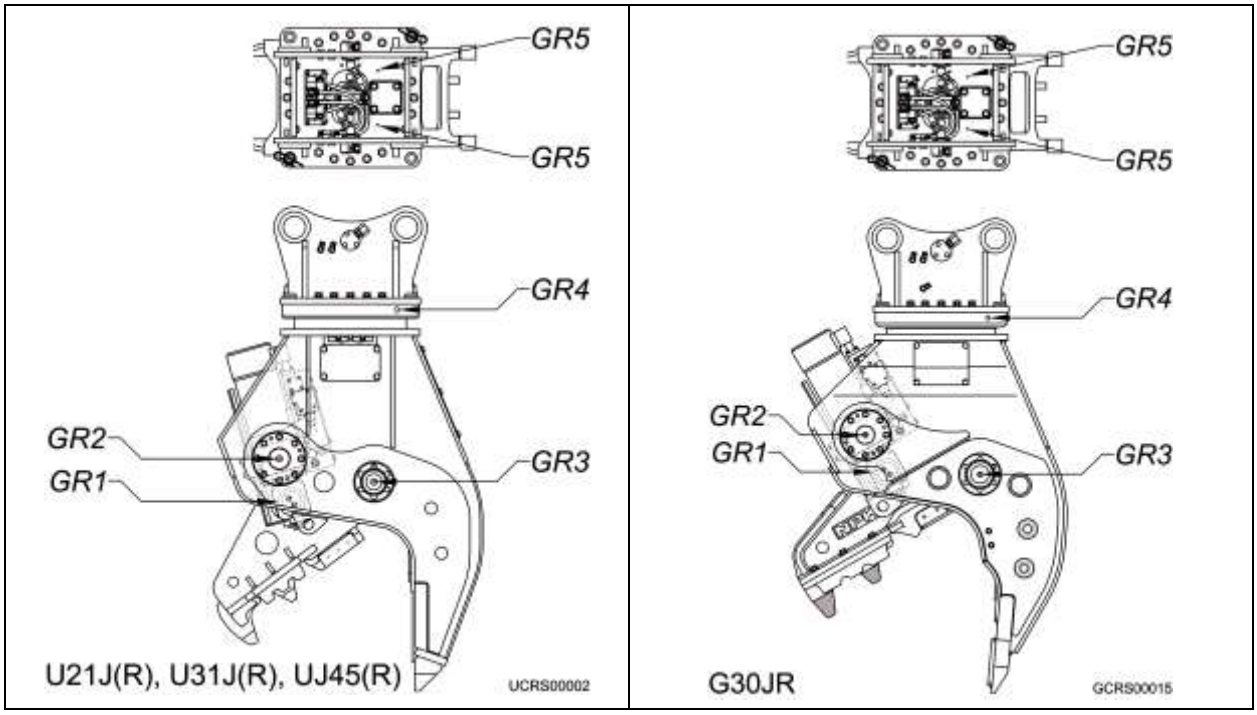




- Inspect the hydraulic hoses for wear, damage, or oil leakage.
- Inspect for loose, broken, and missing fasteners. Replace and/or retighten to torque specifications as required. See the **"FASTENER TORQUE"** section of this manual. Call the **NPK** Service Department at (440) 232-7900, if there are any questions regarding torque.
- Check the moveable jaw and main frame for cracks. See the **"FRAME CRACK AND JAW REPAIR"** section of this manual or contact **NPK** at (440) 232-7900 for repair procedure.
- Check the condition of the cutting blades; see **"CUTTER BLADE MAINTENANCE"**.

GENERAL MAINTENANCE

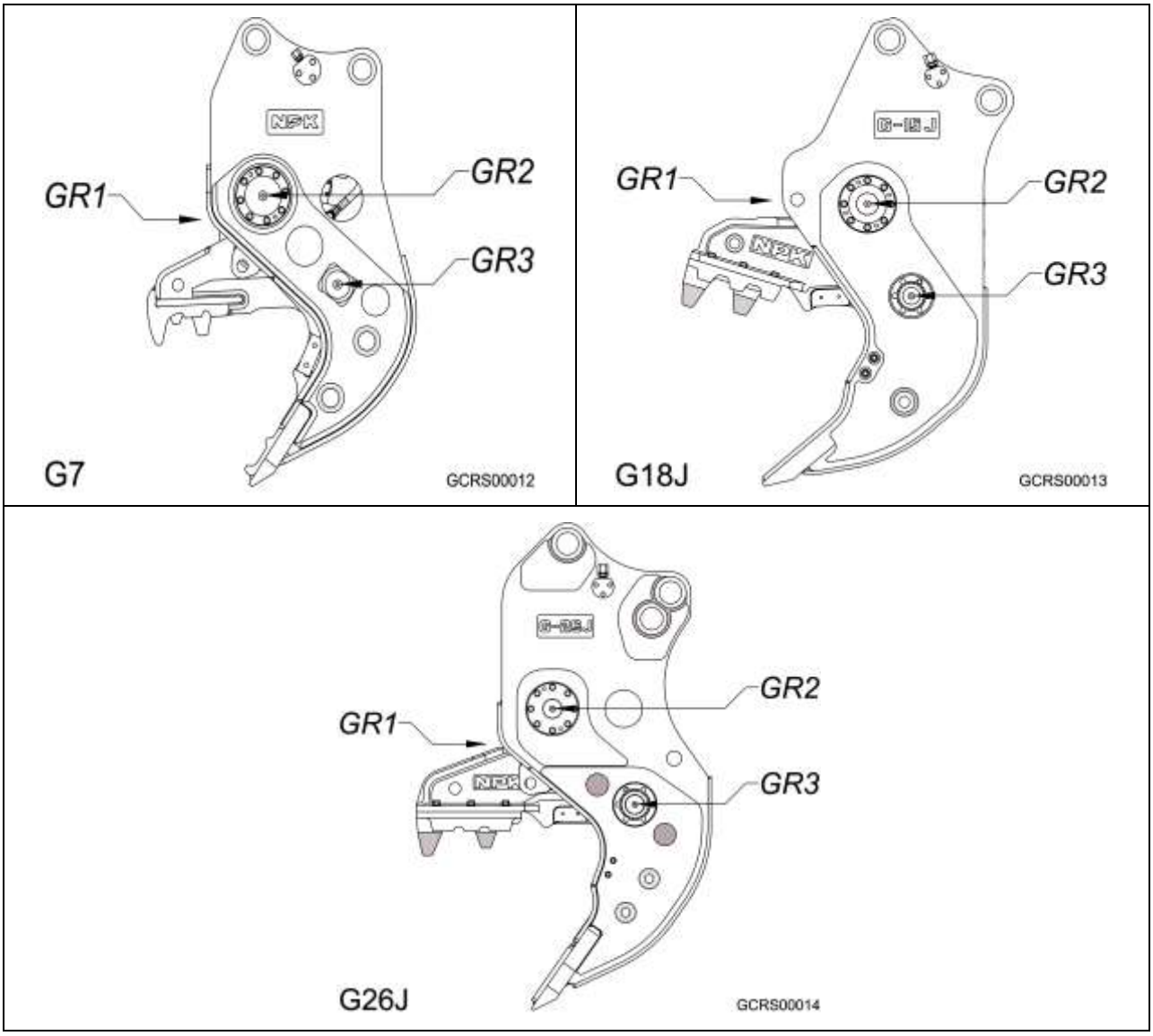
LUBRICATION POINTS
U21J(R), U31J(R), U45J(R), G30JR



GR1	CYLINDER ROD PIN	One lubrication point located at the jaw attachment end.	10 strokes from a grease gun every 4 hours.
GR2	CYLINDER PIVOT PIN	One lubrication point per side located at the cylinder trunnion flanges.	10 strokes from a grease gun once per shift.
GR3	JAW PIVOT PIN	One lubrication point on each end of the main pivot pin.	15 strokes from a grease gun per fitting per shift.
GR4	SLEWING RING/PINION TEETH	Two lubrication points 180° apart.	5 strokes from a grease gun per fitting per shift *(if equipped)*.
GR5	MOTOR PINION	One Lubrication point on each side of the hydraulic motor located on the top bracket.	5 strokes from a grease gun per fitting per shift *(if equipped)*.

GENERAL MAINTENANCE

LUBRICATION POINTS
G7, G18J, G26J

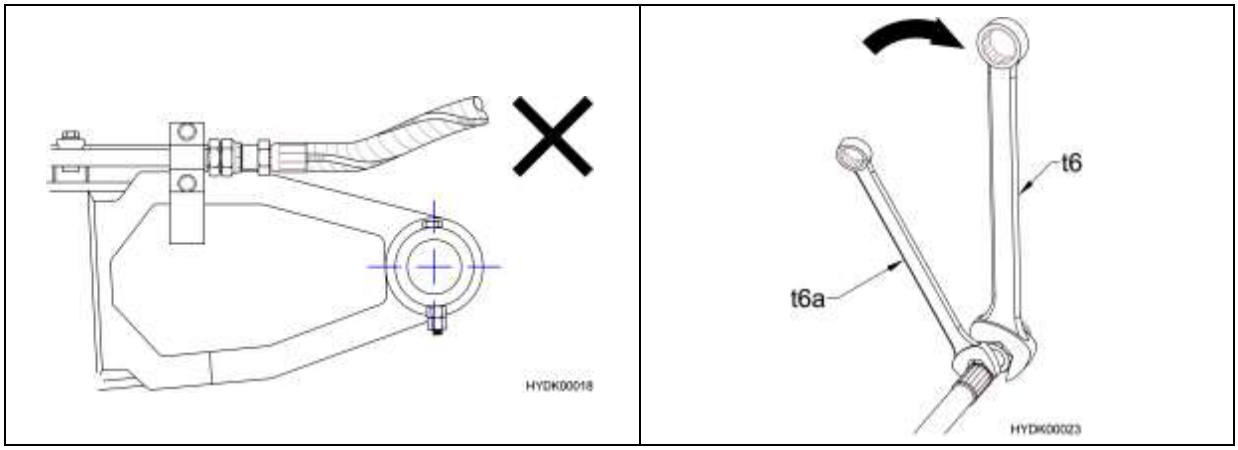


GR1	CYLINDER ROD PIN	One lubrication point located at the jaw attachment end.	10 strokes from grease gun per shift.
GR2	CYLINDER PIVOT PIN	One lubrication point per side located at the cylinder trunnion flanges.	10 strokes from a grease gun once per shift.
GR3	JAW PIVOT PIN	One lubrication point on each end of the main pivot pin.	15 strokes from a grease gun per fitting per shift.

GENERAL MAINTENANCE

HOSE INSTALLATION TIPS

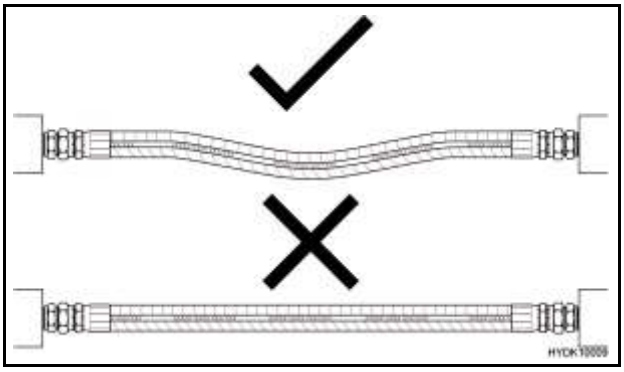
1. Connect larger diameter hoses first. Larger hoses are more difficult to bend and maneuver, while smaller lines are usually more flexible and easier to install.
2. Do not twist the hose during installation. Pressure applied to a twisted hose can result in premature hose failure or loose connections. Attach both ends of the hose to their connection points. Let the hose find its natural position, then tighten both ends using a wrench (t6) and backup wrench (t6a).



3. Torque hose to specifications, see **"HOSE TORQUE SPECIFICATIONS"**.

NOMINAL HOSE SIZE	THREAD SIZE	TORQUE	
		ft. lbs.	*(Nm)*
1/2"	3/4-16	109	*(80)*
3/4"	1-1/16-12	245	*(180)*
1"	1-5/16-12	272	*(200)*
1-1/4"	1-5/8-12	250	*(250)*

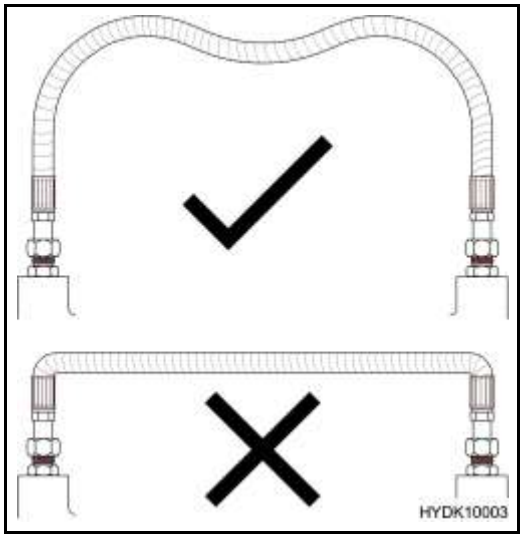
4. All hoses change in length slightly when pressure is applied. Hoses must have enough slack to relieve stressing the connections.



GENERAL MAINTENANCE

HOSE INSTALLATION TIPS

5. Make sure the hose being installed is routed with the proper bend radius to prevent kinking, flow restrictions, or hose failures at the hose connection.



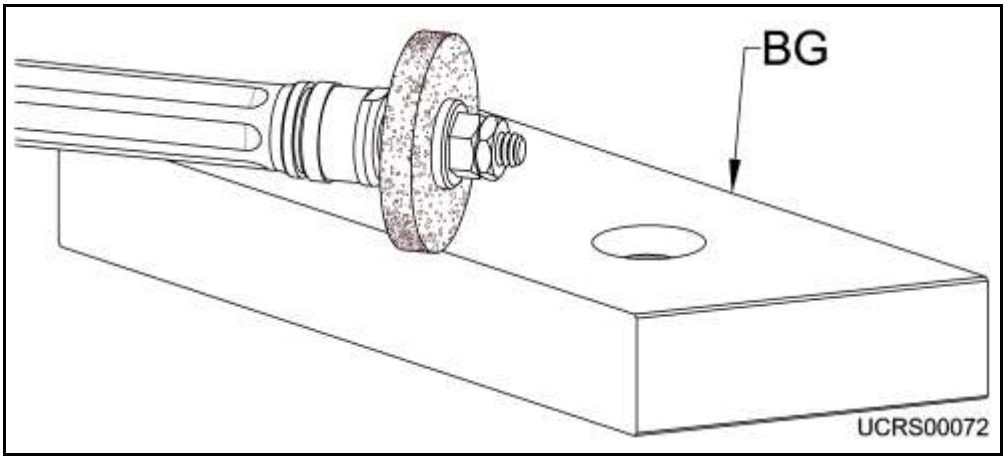
6. Hoses should be used within the following ranges of temperature.

	TEMPERATURE RANGE	
	ºF	***ºC***
HYDRAULIC FLUID	14 to 176	*(-10 to +80)*
ATMOSPHERIC	14 to 122	*(-10 to +50)*

GENERAL MAINTENANCE

CUTTER BLADE MAINTENANCE

When cutter blades become damaged or rounded due to abrasion, grind the rounded areas of the blades (BG) to a sharp 90° edge.



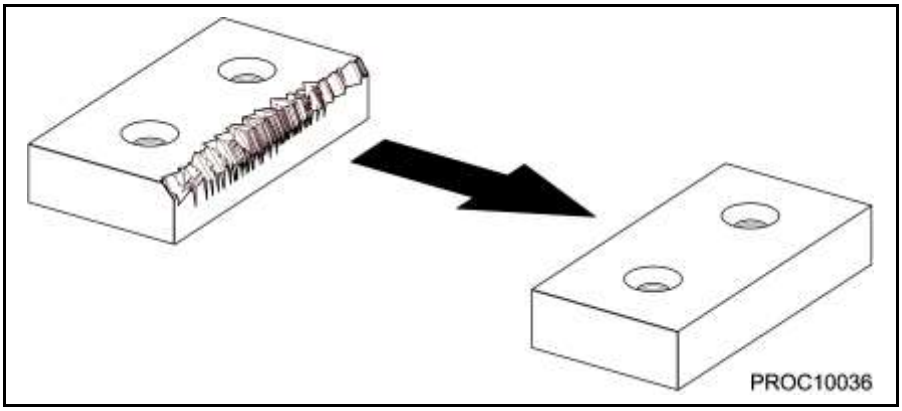
⚠ WARNING

Use care in handling to avoid bodily harm.

⚠ CAUTION

Do not *over grind the blades to the point that the surface becomes blue or discolored. This will make the blades brittle.*

Cutter blades can be flipped four times to increase service life. Replace the cutter blade if it is cracked, chipped, or worn beyond repair.

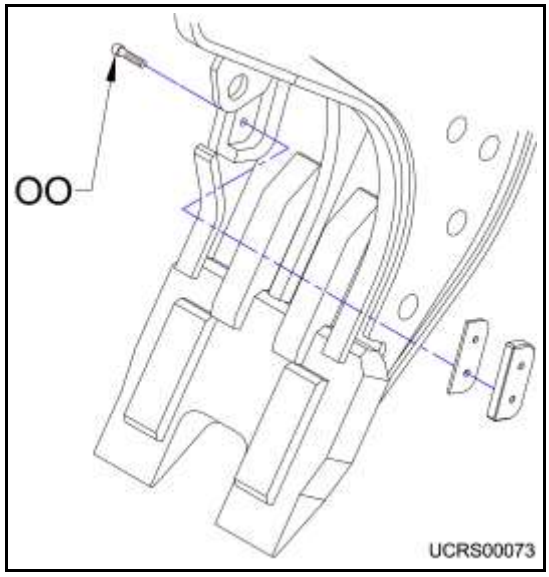


GENERAL MAINTENANCE

CUTTER BLADE MAINTENANCE

DO NOT WELD CUTTER BLADES!

Torque the cutter blade bolts (OO) to specification; see the **"FASTENER TORQUE"** section of this manual.



BLADE-TO-BLADE CLEARANCE

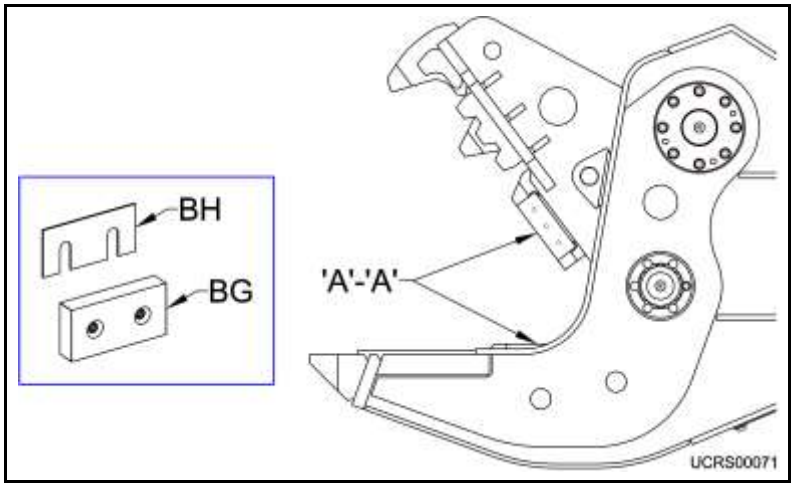


Fig. 1

A blade-to-blade ('A'-'A') clearance of .010" to .040" (*0.25 to 1.00 mm*) should be maintained for optimum performance. Install shims (BH) under blade (BG) as necessary, see **Fig. 1**.

GENERAL MAINTENANCE

SHIM KITS

MODEL	NPK SHIM KIT PART NUMBER
U21J, U21JR	U2100-1063
U31J, U31JR	S1850-7000
U45J, U45JR	1615250
G7	1609371
G18J	S1850-7000
G26J	S1850-7000
G30JR	S1850-7000

JAW INSPECTION AND MAINTENANCE

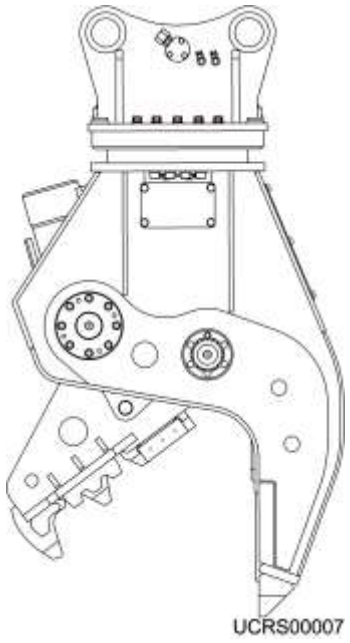
WEEKLY INSPECTION

ATTENTION

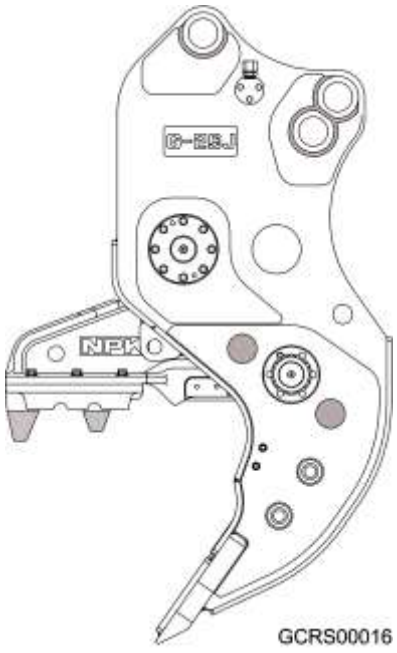
Inspect the jaw teeth for wear. Hard face worn areas as needed. The jaw teeth can be cut off and replaced when worn beyond rebuild limits. On some models, a replaceable tooth plate is available. Working with excessively worn jaws will reduce working efficiency.

MINIMUM DISTANCE BETWEEN FIXED AND MOVEABLE JAW

The distance between the fixed and moveable jaw must be maintained on U and G Series Crushers so that the crusher cylinder will not reach full stroke and become bottomed during operation.



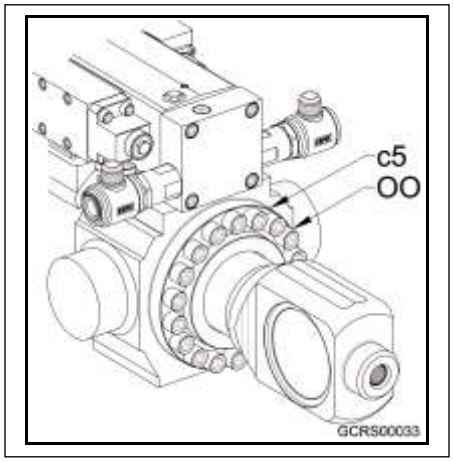
U SERIES



G SERIES

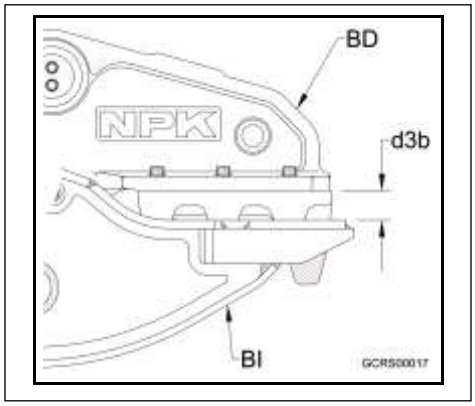
JAW INSPECTION AND MAINTENANCE

WEEKLY INSPECTION



If the cylinder reaches full stroke and becomes bottomed out, damage to the cylinder head cap (c5) and retaining cap screws (OO) can occur.

When the jaw teeth on moveable (BD) and fixed (BI) jaws become worn, allowing the gap to become less than the minimum (d3a) shown in **TABLE 1**, the teeth must be replaced or builtup by welding to reach the standard dimension (d3b) shown in **TABLE 2**.



See **TEETH BUILDUP** OR **TEETH REPLACEMENT**

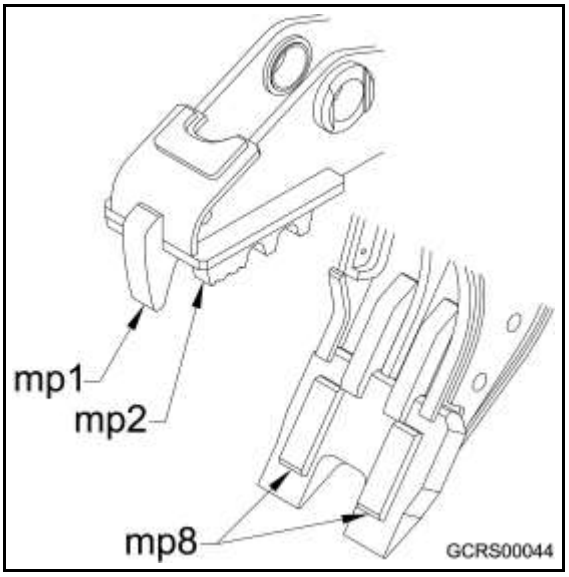
TABLE 1		
CRUSHER MODEL	d3a - DIMENSION Minimum Gap	
	in.	*(mm)*
U21J	4-15/16"	*(124)*
U21JR	4-15/16"	*(124)*
U31J	3-15/16"	*(100)*
U31JR	3-15/16"	*(100)*
U45J	5-15/16"	*(135)*
U45JR	5-15/16"	*(135)*
G7	2-9/16"	*(65)*
G18J	2-3/4"	*(70)*
G26J	3-15/16"	*(100)*
G30JR	3-15/16"	*(100)*

TABLE 2		
CRUSHER MODEL	d3b - DIMENSION Approx. Std. Gap	
	in.	*(mm)*
U21J	5-1/2"	*(140)*
U21JR	5-1/2"	*(140)*
U31J	5"	*(127)*
U31JR	5"	*(127)*
U45J	5-3/4"	*(145)*
U45JR	5-3/4"	*(145)*
G7	3"	*(77)*
G18J	3-15/16"	*(100)*
G26J	5"	*(127)*
G30JR	5"	*(127)*

JAW INSPECTION AND MAINTENANCE

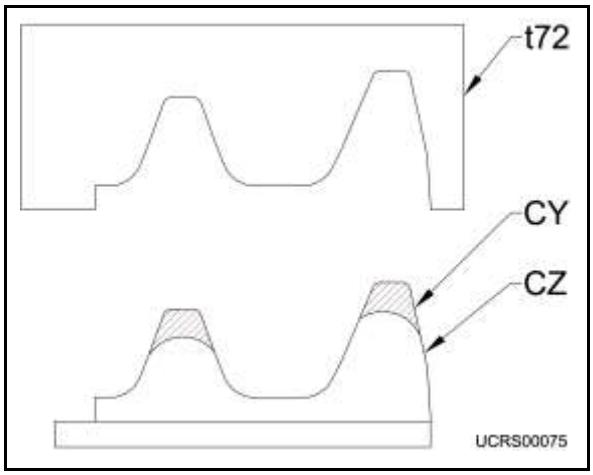
TEETH MAINTENANCE and REPLACEMENT

The U and G Series Crushers have three types of jaw teeth. The large tooth (mp1) and small teeth (mp2) are found on the moveable jaw and the flat teeth (mp8) are found on the main frame. Both types can be built up by hard facing or cut off and replaced when worn beyond NPK specification.



MOVEABLE JAW BUILDUP and HARDFACING

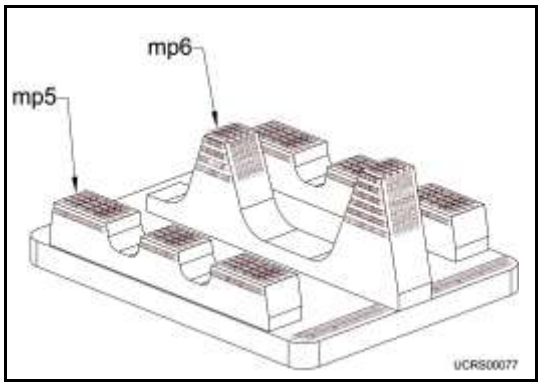
For buildup and hard facing, use NPK templates (t72) to check teeth so that they are to the original profile. Contact NPK for the correct templates for each model. Then, refer to **JAW and TOOTH REBUILD PROCEDURE.**



CY – NEW PROFILE, CZ – WORN PROFILE

JAW INSPECTION AND MAINTENANCE

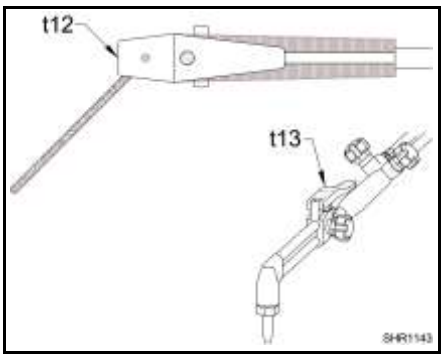
MOVEABLE JAWS: Wear on the small outside side teeth (mp5) determines when the cylinders are approaching full extension. The large center teeth (mp6) are for crushing purposes only.



TEETH REPLACEMENT

Following is the procedure for teeth replacement:

1. Remove worn teeth by carbon arc (t12) or acetylene cutting torch (t13).

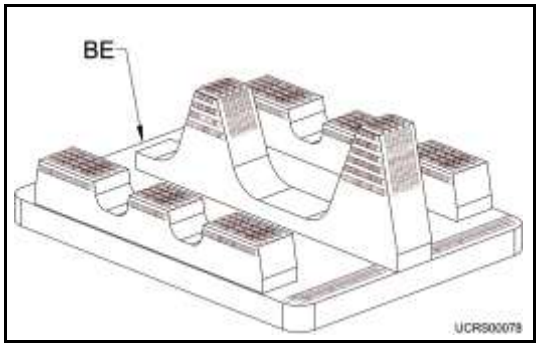


2. Prepare surface for new teeth.
3. Place new teeth into proper location.
4. Heat dry welding rod to 300°F+ *(150°C+)*.
5. Pre-heat weld area to 300°F - 400°F *(150°C - 200°C)*.
6. For joining, stringer beads are best. For buildup, weaving is acceptable. Use one of the following rods (or wire equivalent) or equal: Airco Austex 361, Cronatron 7770, Eutectic 3205, Hobart Smooth Arc MC, McKay Chrome-mang, Stoody 2110.
7. Hardface rod for tooth and structure wear surfaces. Pre-heat as in Step number 5. Use two passes maximum for hard facing. Use one of the following rods (or wire equivalent) or equal: Airco Hardcraft CR-70, Cronatron 7350, Eutectic Eutectrode N70, Hobart Smooth Arc 16 McKay Hardalloy 40 Tic, Stoody 19, 21, or 77.
8. Adjust weld current to rod manufacturer's specification.
9. Peen each layer.
10. Cool slowly. Cover weld in cold environments.

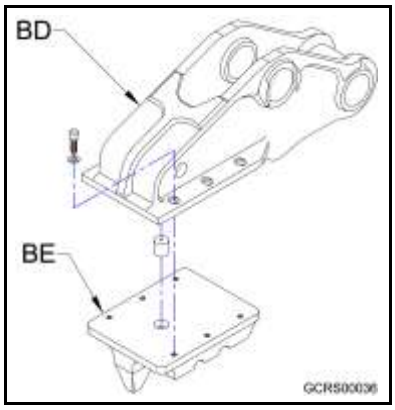
JAW INSPECTION AND MAINTENANCE

REPLACEABLE TOOTH PLATES – MOVEABLE JAWS

Another alternative is to replace the entire bolt on plates (BE).

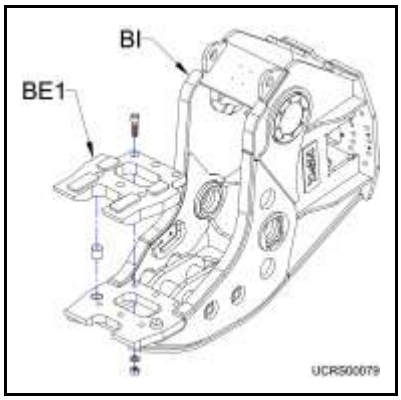


The male jaw (BD) tooth plate (BE) is replaceable on all U21J, U21JR, U31J, U31JR, U45J, U45JR, G18J, G26J, and G30JR models. Call NPK for part numbers at 440-232-7900.



REPLACEABLE TOOTH PLATES – MAIN FRAME

The main frame (BI) tooth plate (BE1) is replaceable on all U21JA and U31JA models. Contact NPK for part numbers.



JAW INSPECTION AND MAINTENANCE

JAW AND TOOTH REBUILD PROCEDURE: ALL MODELS

Due to the abrasive nature of the material being crushed, jaw wear will occur on the U and G Series Crushers. The jaws must be built up with hard face weld when the clearance between the tip of the jaws in the closed position is worn to the extent that the material can no longer be crushed efficiently.

To ensure maximum crushing performance, this rebuild procedure comprised of three steps, should be followed:

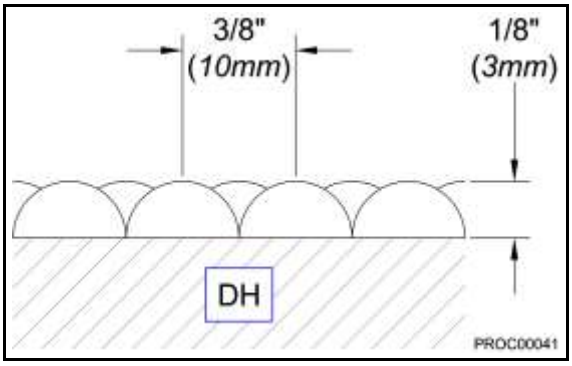
1. Surface Preparation.
2. Underlayment Weld.
3. Hard Face Weld.

1. SURFACE PREPARATION

Grind the entire worn area until it is smooth and clean. Remove all paint, grease, oil, dirt and old hard facing material before welding.

2. UNDERLAYMENT

Underlayment weld is necessary to build up the base material (DH) to match the original jaw or tooth profile before hard facing. You cannot hard face over old hard facing.



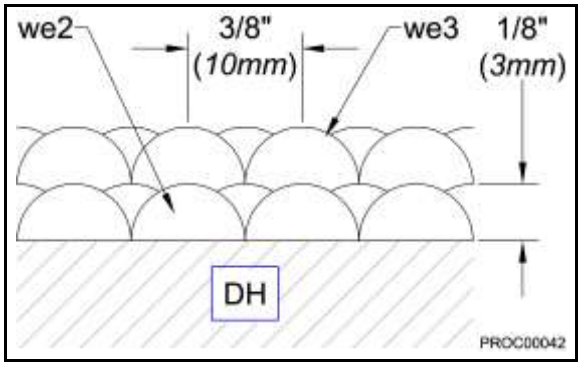
- Welding rod: Airco Austex 361, Cronatron 7770, Eutectic 3205, Postalloy 205, Stoody 2110 or equal. In Canada: NCH Canada Inc. Hi-Pact #194 or equal.
- Dry welding rod at 300°F+ *(150°C+)*.
- Pre-heat the jaw area to 300° - 400°F *(150° - 200°C)* and maintain this temperature during the welding operation. It is very important to maintain this temperature in cold environments.
- Adjust weld current to rod manufacturer's specifications.
- Peen each layer.
- Cool slowly. Cover weld in cold environments.

JAW INSPECTION AND MAINTENANCE

JAW AND TOOTH REBUILD PROCEDURE: ALL MODELS

3. HARD FACE

Hard face (we3) can only be applied over base material (DH) or underlayment weld (we2). **NEVER HARD FACE OVER EXISTING HARD FACE!**



Welding Rod: Airco Tubecraft 1A, Cronatron 7355, Eutectic N6006, Postalloy 214, Stoody 31 or equal. In Canada: NCH Canada Inc. Wear-X #176 or equal.

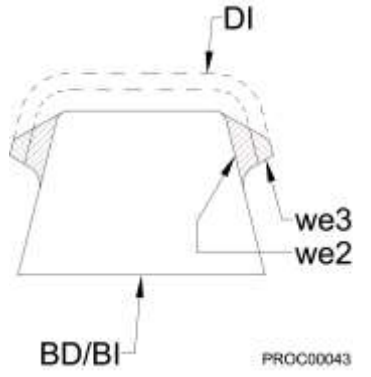
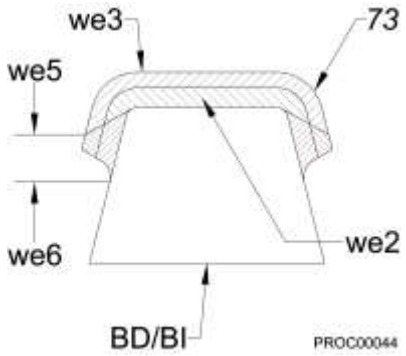
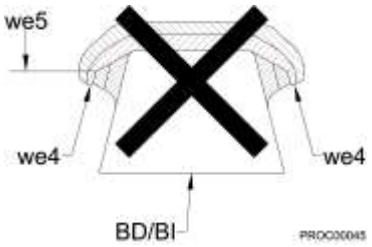
- Dry welding rod at 300°F+ *(150°C+)*.
- Pre-heat the jaw weld area to 350°F *(177°C)* and maintain this temperature during welding operation. It is very important to maintain this temperature in cold environments.
- Adjust weld current to rod manufacturer's specifications.
- Peen each layer. Do not exceed 2 – 3 layers of hard face.
- Cool slowly. Cover weld in cold environments.

JAW INSPECTION AND MAINTENANCE

JAW AND TOOTH REBUILD PROCEDURE: ALL MODELS

DO NOT WELD OVER OLD HARD FACING!

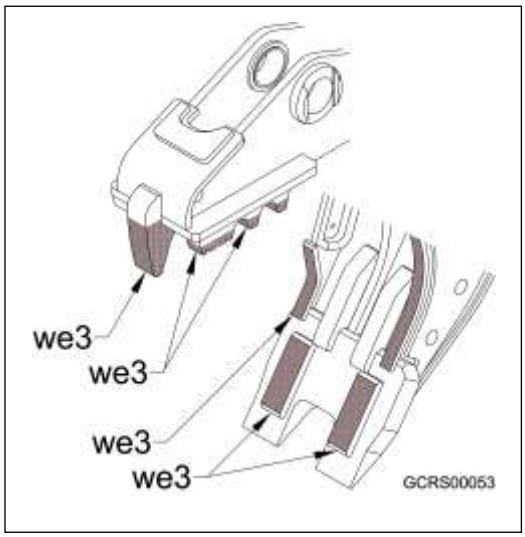
Remove all old hard facing before applying new underlay weld.

1. BEFORE WELD	2. AFTER WELD	
		
CORRECT **BD/BI** MALE OR FEMALE CRUSHER JAW **DI** WORN AREA **we2** UNDERLAYMENT **we3** HARDFACE	**CORRECT** **BD/BI** MALE OR FEMALE CRUSHER JAW **we2** UNDERLAYMENT **we3** HARDFACE **we5** END OF NEW WELD **we6** OLD WELD ***73*** FINISH GRIND TO BLEND	**INCORRECT** **BD/BI** MALE OR FEMALE CRUSHER JAW **we4** OVERFLOW **we5** END OF NEW WELD

JAW CONTACT AREAS

MAIN FRAME and MOVEABLE JAW CONTACT AREAS

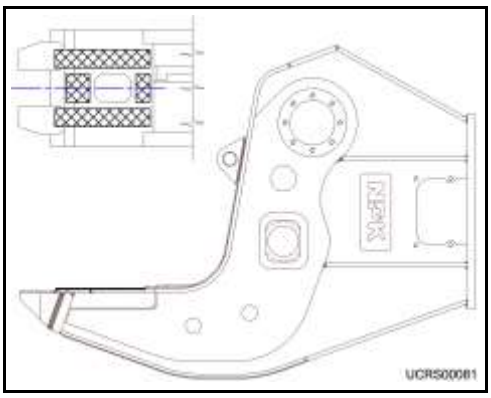
In contact areas of jaws, hard facing (we3) may be added to increase the wear life of these surfaces for hard facing instructions, see the **JAW and TOOTH REBUILD PROCEDURE**.



MAIN FRAME REWORK GUIDE

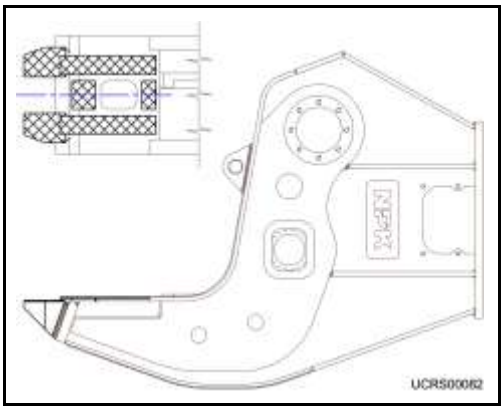
Consult with the NPK Service Department at 440-232-7900 to determine which rework procedure is required.

U21J-5206 (U21J), U31J-5200 (U31J), and U45J-5202 (U45J) are the procedures to be followed for normal main frame rework.



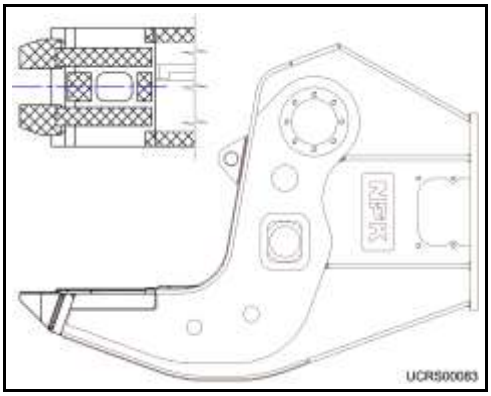
NORMAL WEAR

U21J-5207 (U21J), U31J-5201 (U31J), and U45J-5201 (U45J) are the procedures to be followed for excessive main frame rework.



EXCESSIVE WEAR

U21J-5208 (U21J), U3150-9000 (U31J), and U45J-5200A (U45J) are the procedures to be followed for extreme main frame rework.

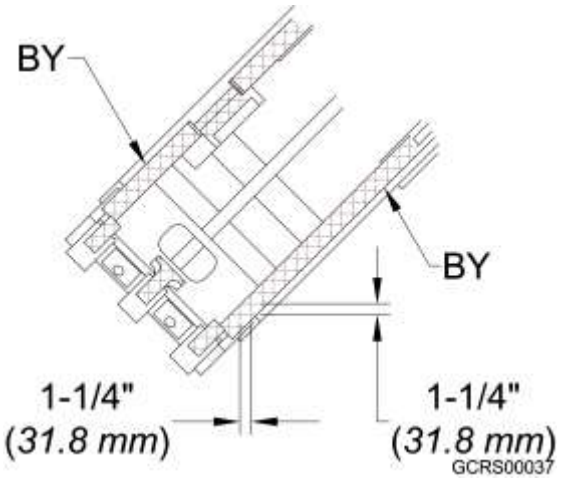


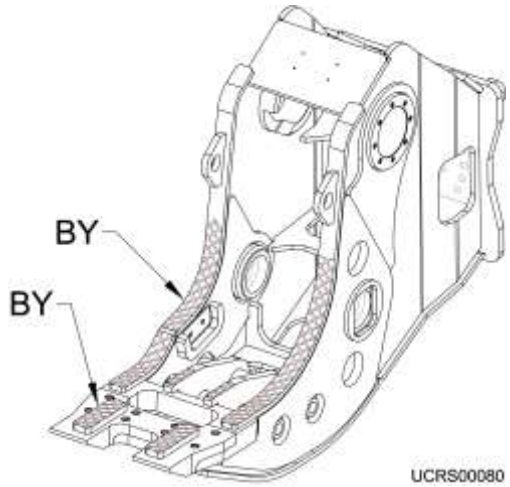
EXTREME WEAR

FRAME MAINTENANCE – REPAIR OF MAIN FRAME

Inspect frame for cracks periodically. Crushing is an abusive operation and eventually frame cracking may occur. If the attachment has been overstressed due to improper operation or has been used for many hours of operation, the steel components may develop fatigue cracks. If cracking is found in any of the steel components of the processor, photos of the crack or cracks must be emailed to NPK immediately so that the crack can be evaluated, and a repair option recommended.

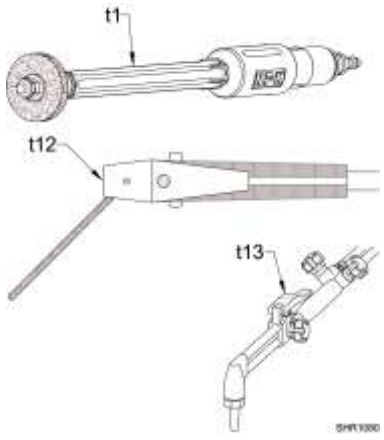
Use a crosshatch (BY) pattern on wear areas of the crusher as shown. Refer to the **TEETH REPLACEMENT** section for hard face rods and procedure.





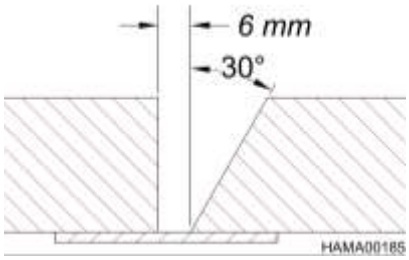
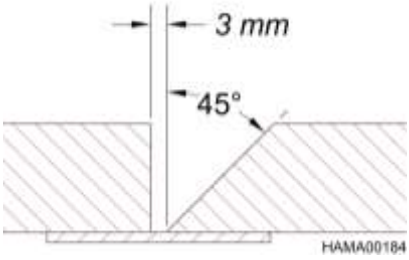
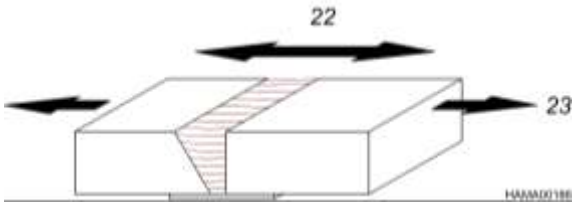
ROUTE WELD REPAIR

1. Gouge any cracks 100% using an air or electric handheld grinder (t1), carbon arc (t12) or torch (t13).



FRAME MAINTENANCE – REPAIR OF MAIN FRAME

ROUTE WELD REPAIR

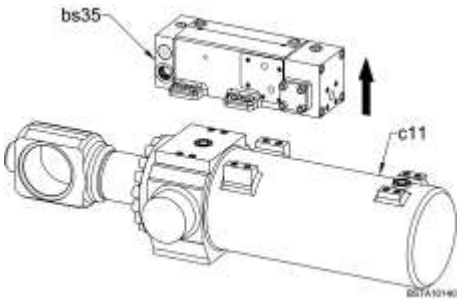
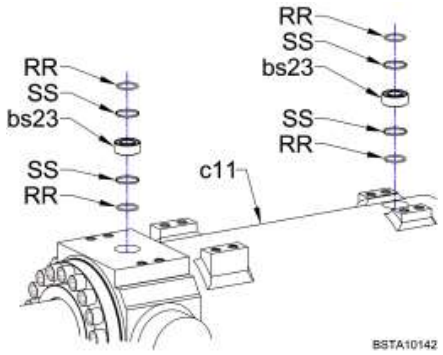
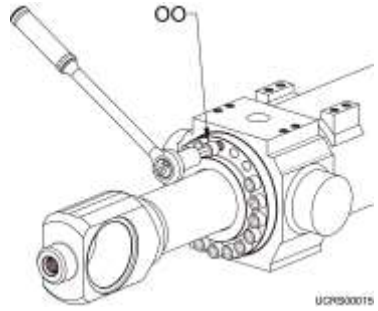
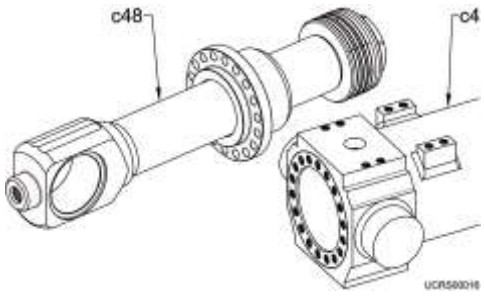
2a. Grind gouged area to a 30° angle on each side to the full depth of the gouged area for plate sizes up to 3/4" (*19 mm*) thick.	
2b. Grind gouged area to a 45° angle on each side to the full depth of the gouged area for plate sizes over 3/4" (*19 mm*) thick.	
3. If the crack is completely through the plate, grind the bevel in halfway from both sides. Remove all slag and grinding residue.	
4. Consult the **JAW and TOOTH REBUILD PROCEDURE, HARD FACE** section for pre-heat and welding instructions.	
5. Peen or stress relieve after each pass. Maintain pre-heat.	
6. After welding, grind area flush.	
	**22** DIRECTION OF GRINDING **23** DIRECTION OF PRINCIPLE STRESS
7. Allow area to cool slowly (eight hours minimum). Cover with a heat blanket or other suitable insulation. **FAILURE TO DO SO MAY CAUSE CRYSTALLIZATION OF THE WELD AND SUBSEQUENT BREAKAGE.**	

NOTE: NPK Construction Equipment has developed this repair procedure based on known information about structure and material. This, however, does not imply that repairs made using this procedure are guaranteed to be successful. NPK, therefore, cannot warranty this procedure. There is **NO** warranty regarding this repair either expressed or implied.

INSPECTION AND MAINTENANCE

BOOSTER CYLINDER

DISASSEMBLY

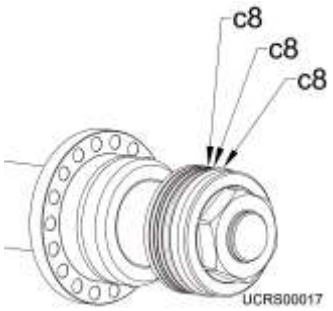
1. Remove the Booster Assembly (bs35) from the cylinder (c11). **NOTE: See the Booster Manual (B000-9600) for Booster maintenance.**	
2. Remove the spacers (bs23), o-rings (RR), and backup rings (SS) from the cylinder assembly (c11).	
3. Remove the cylinder end cap socket head cap screws (OO).	
4. Remove the cylinder rod assembly (c48) from the cylinder housing (c4).	

INSPECTION AND MAINTENANCE

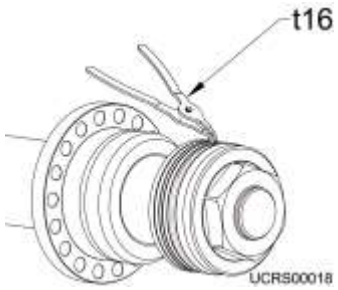
BOOSTER CYLINDER

DISASSEMBLY

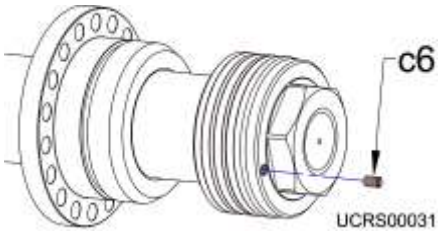
5. Check the piston rings (c8). The rings should be free in their grooves. If the rings are found to be stuck in their grooves, use a die grinder with a soft polishing stone (preferably NPK polishing wheel p/n 25026030) and polish the rings until they spring out of their grooves. If a ring is broken, it must be replaced.



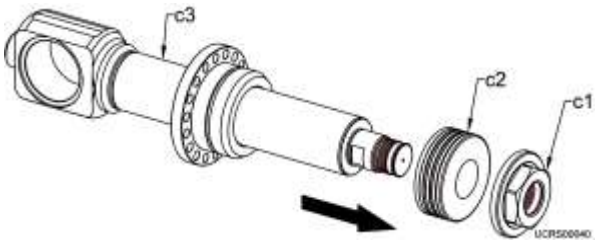
6. Using a ring expander (t16), remove all the piston rings.

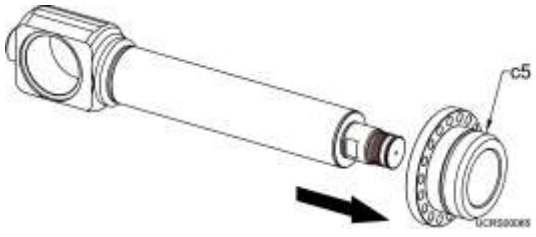


7. If used, lightly heat the rod nut set screw (c6) to loosen any thread adhesive that is present. Remove the rod nut set screw.



8. Unscrew the rod nut (c1) and remove the piston (c2) from the cylinder rod (c3). Remove the cylinder end cap (c5).

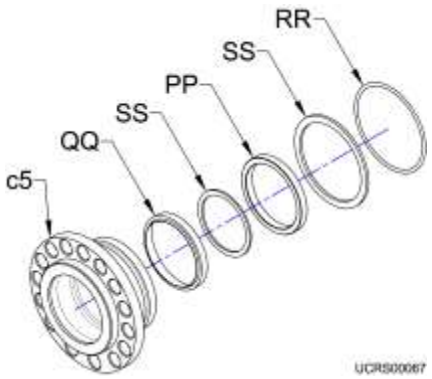
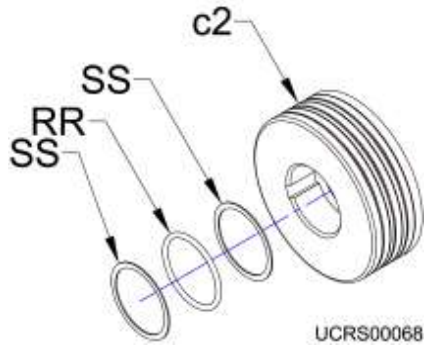




INSPECTION AND MAINTENANCE

BOOSTER CYLINDER

DISASSEMBLY

9. Remove the dirt seal (QQ), rod seal (PP), o-ring (RR), and backup rings (SS) from the cylinder end cap (c5) and discard.	
10. Remove the o-ring (RR) and backup rings (SS) from the inside of the piston (c2) and discard.	

INSPECTION AND MAINTENANCE

CYLINDER COMPONENTS

INSPECTING AND CLEANING

⚠ CAUTION

The prevention of foreign contaminant damage is critical when working with hydraulic equipment. Keep the work area clean. Using masking tape, cover all exposed holes and parts which may allow entry of foreign contaminants. Habitually clean the work area by wiping with a lint-free cloth.

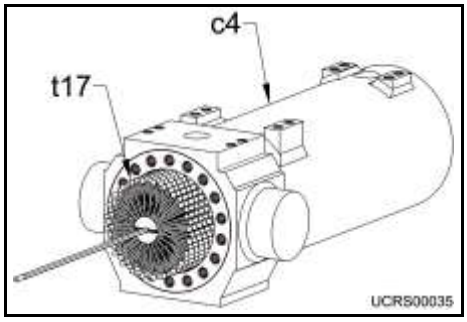
Mating surfaces are machined to a smooth surface. Use care to avoid scratches, nicks, dents, or other damage to machined surfaces. If damaged, the component must be repaired or replaced as required.

1. Inspect the heads and threads of all fasteners and plugs and corresponding threaded bores for damage. Repair or replace as required.
2. Inspect all components, particularly machined surfaces, including all hydraulic ports, for evidence of scratches, scoring, nicks, dents, wear, deformity, or other damage. Particularly close attention should be given to o-ring grooves and counter bores. Repair or replace as required.
3. Inspect drained and residual hydraulic fluid for evidence of contamination. If contaminated, inspect all components, seal, etc., to determine the cause.
4. Inspect the cylinder housing (c4) bore. If there is heavy scoring, contact the NPK Service Department for additional instructions at 440-232-7900.

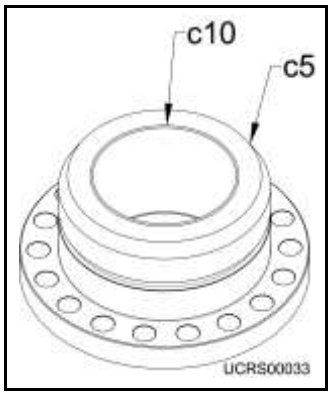
⚠ CAUTION

ONLY HONE (t17) IF NECESSARY!

USE BALL HONE ONLY!



5. Inspect the bronze guide (c10) found in the cylinder end cap (c5) for damage or excessive wear.

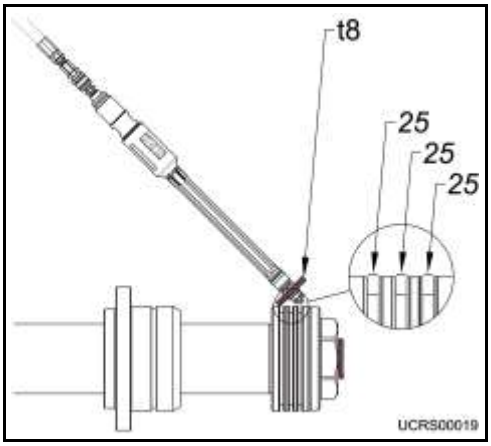


INSPECTION AND MAINTENANCE

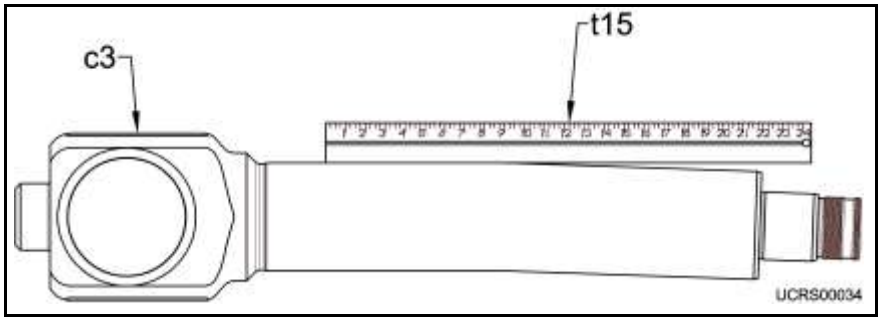
CYLINDER COMPONENTS

INSPECTING AND CLEANING

6. Using a die grinder with a soft polishing stone (t8), preferably NPK polishing wheel p/n 25026030, polish the leading edges of the piston ring grooves (*25*) to remove damage to the piston and allow free movement of the piston rings.



7. Using a straight edge (t15), check the cylinder rod (c3) for straightness.



NOTE: ***The cylinder rod is a forged, high strength part. It is not possible to repair the rod. If the rod is bent or damaged, it must be replaced.***

8. Clean all parts with a degreaser solvent using a Scotchbrite® or equivalent cleaning pad.

⚠WARNING

Compressed air can cause injury or death! Limit air pressure to a maximum of 30 psi (*2 bars*). Protect your eyes with safety glasses! Do not direct compressed air current at exposed skin! Do not direct compressed air current at other people within the work area!

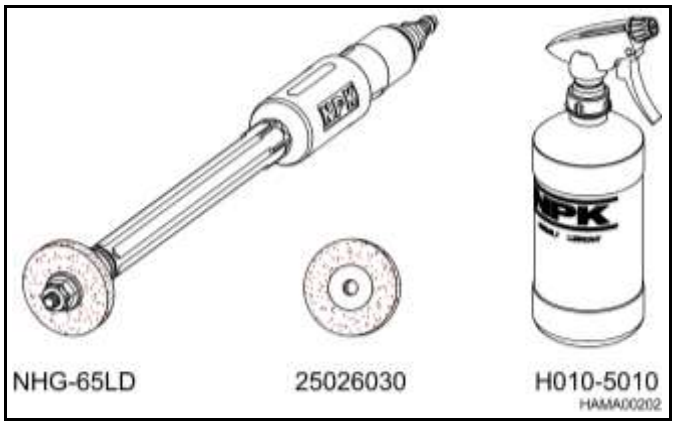
INSPECTION AND MAINTENANCE

CYLINDER COMPONENTS

INSPECTING AND CLEANING

9. Remove all thread sealant from threads using an appropriate thread sealant solvent. Remove old thread sealant residue with a maximum of 30 psi (*2 bars*) of compressed air.

REPAIR TOOLS AND EQUIPMENT



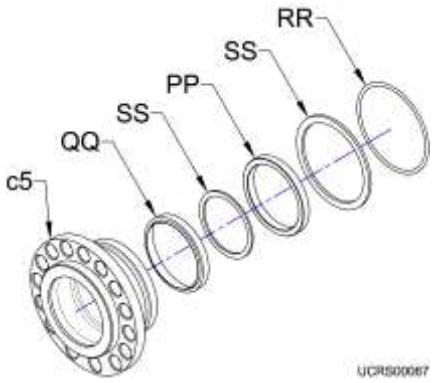
Air or electric handheld grinder (NPK model NHG-65LD recommended)
Polishing wheel for grinder (NPK p/n 25026030)
NPK Assembly Lube (p/n H010-5010)
Emery cloth (200 grit)
Cleaning solvent

INSPECTION AND MAINTENANCE

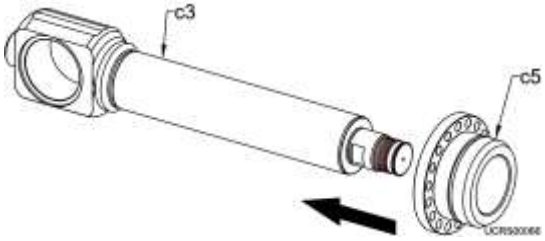
CYLINDER COMPONENTS

ASSEMBLY

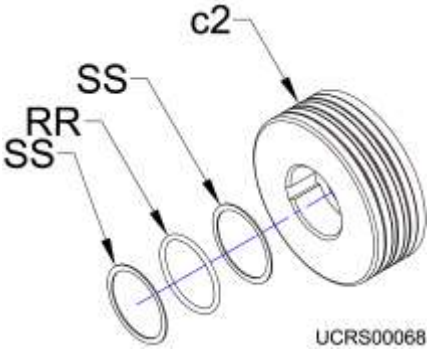
1. Install dirt seal (QQ), backup ring (SS), and piston seal (PP) into the seal grooves on the inner side of the cylinder end cap (c5). Install the o-ring and backup ring into the outer groove.



2. Apply hydraulic oil or NPK Assembly Lube (p/n H010-5010) to the inner surface coating the previously installed dirt seal, backup ring, and piston seal. Install the cylinder end cap (c5) onto the cylinder rod (c3).



3. Install the o-ring (RR) and backup rings (SS) into the piston (c2). Apply a light coat of hydraulic oil or NPK Assembly Lube to the o-ring and backup rings after installation.

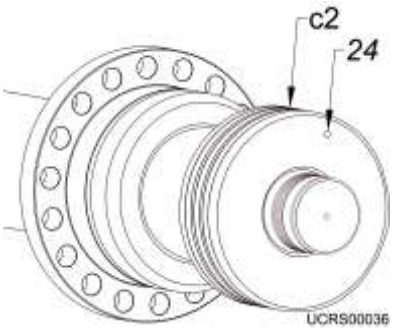


INSPECTION AND MAINTENANCE

CYLINDER COMPONENTS

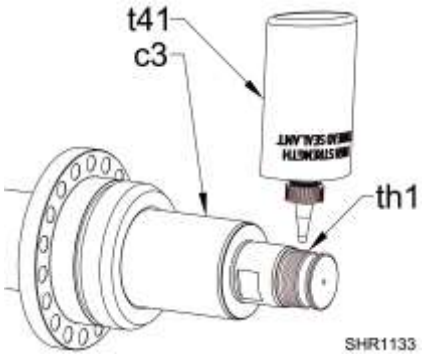
ASSEMBLY

4. Install the piston (c2), with the dimple (*24*) facing away from the rod eye, onto the cylinder rod.

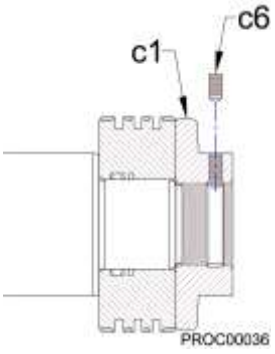


5. Apply high strength thread adhesive (t41) to the clean dry threads (th1) of the cylinder rod (c3).

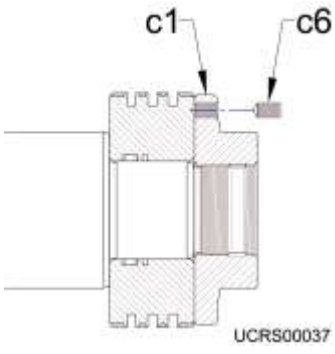
NOTE: ***New style cylinder rod nuts (without set screws) have a nylon patch and do not require thread adhesive.***



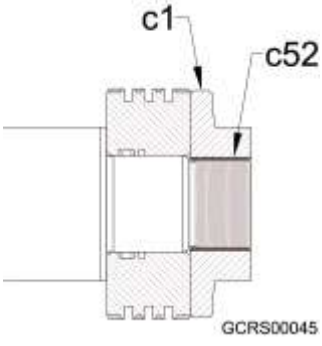
6. There are three styles of piston lock nuts (c1). Lock nut set screw (c6) location changes. Style “A” shows the early factory style. Style “B” shows the current factory style. Style “C” shows the replacement style. Style “C” uses a nylon patch (c52) instead of a set screw.



Style “A”



Style “B”



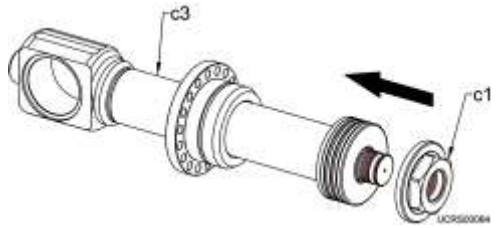
Style “C”

INSPECTION AND MAINTENANCE

CYLINDER COMPONENTS

ASSEMBLY

7. Thread cylinder rod nut (c1) onto the cylinder rod (c3) and torque to the listed value below.



MODEL	THREAD SIZE	TORQUE ft. lb.	TORQUE (*Nm*)	SOCKET SIZE	ROD NUT PART NUMBER STYLE "A"	STYLE "B"	STYLE "C"
U21J	M65 x 3.0	3,250	(*4,400*)	90 mm	16032575	16084717	X
U21JR	M65 x 3.0	3,250	(*4,400*)	90 mm	16032575	16084717	X
U31J	M70 x 3.0	4,100	(*5,500*)	120 mm	16039992	16084683	G180-1000
U31JR	M70 x 3.0	4,100	(*5,500*)	120 mm	16039992	16084683	G180-1000
U45J	M70 x 3.0	4,100	(*5,500*)	140 mm	X	16064537	X
U45JR	M70 x 3.0	4,100	(*5,500*)	140 mm	X	16064537	X
G7	M45 x 1.5	1,500	(*2,000*)	70 mm	16043050	X	X
G18J	M65 x 3.0	3,250	(*4,400*)	100 mm	16053903	X	S2250-4500
G26J	M70 x 3.0	4,100	(*5,500*)	120 mm	16039992	X	G180-1000
G30JR	M70 x 3.0	4,100	(*5,500*)	120 mm	16039992	X	G180-1000

8. Install the set screw. If the original factory lock nuts are to be re-used, a dimple must be drilled into the piston rod (Style “A” type) or the piston (Style “B” type) using the existing threaded hole as a guide. The maximum depth of the hole should not exceed 1/64th inch (*0.5 mm*). Apply a small amount of medium strength thread adhesive to the set screw before installing. If the lock nut is replaced (Style “C” type), the replacement will have a nylon patch and will not require a set screw.

9. Using a ring expander (t16), install the piston rings with the splits in the piston rings opposing each other.

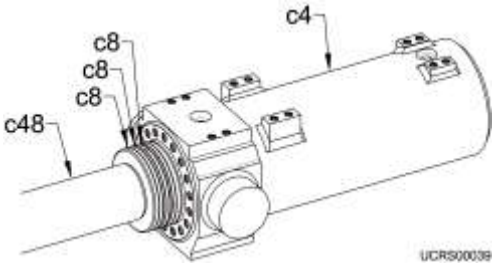
INSPECTION AND MAINTENANCE

CYLINDER COMPONENTS

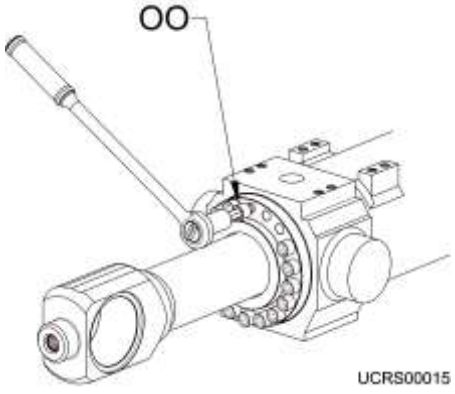
ASSEMBLY

10. Apply hydraulic oil or NPK Assembly Lube to the inner surface of the cylinder housing and to the outside diameter of the piston and piston rings.

11. Install the cylinder rod assembly (c48) slowly into the cylinder housing (c4) taking care not to damage the piston rings (c8).



12. Install the cylinder end cap socket head cap screws (OO) and torque to the value listed below.

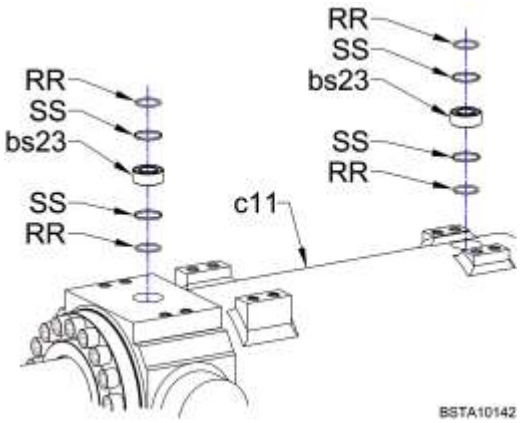
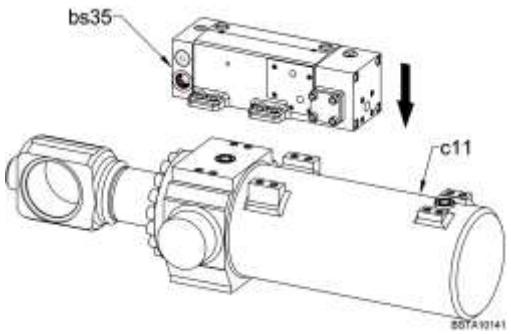


MODEL	BOLT SIZE	TORQUE ft. lb.	TORQUE (*Nm*)
U21J	M18-2.5	260	(*350*)
U21JR	M18-2.5	260	(*350*)
U31J	M20-2.5	365	(*500*)
U31JR	M20-2.5	365	(*500*)
U45J	M20-2.5	365	(*500*)
U45JR	M20-2.5	365	(*500*)
G7	M16-2	190	(*255*)
G18J	M18-2.5	260	(*350*)
G26J	M20-2.5	365	(*500*)
G30JR	M20-2.5	365	(*500*)

INSPECTION AND MAINTENANCE

CYLINDER COMPONENTS

ASSEMBLY

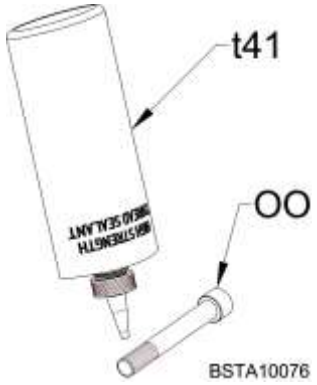
13. Apply a light coat of oil or NPK Assembly Lube to four new backup rings (SS), four new o-rings (RR) and the two spacers (bs23), then install in the corresponding counter bores of the main cylinder assembly (c11).	
14. Apply a light coat of oil or NPK Assembly Lube to the mating surfaces of the booster main body.	
15. With the aid of an assistant, carefully orient and align the eight-mounting flange fastening holes of the booster assembly (bs35) with the corresponding eight threaded bores of the cylinder assembly (c11). If necessary, install two eyebolts in the threaded bores on top of the booster assembly. Lift and move the booster assembly using a hoist.	

INSPECTION AND MAINTENANCE

CYLINDER COMPONENTS

ASSEMBLY

16. Apply high-strength thread sealant (t41) to the clean, dry threads of the eight previously removed cap screws (OO).



17. Secure the main booster assembly to the cylinder housing using the eight cap screws and washers. Tighten the cap screws in an opposing pattern. Torque to value listed to the right.

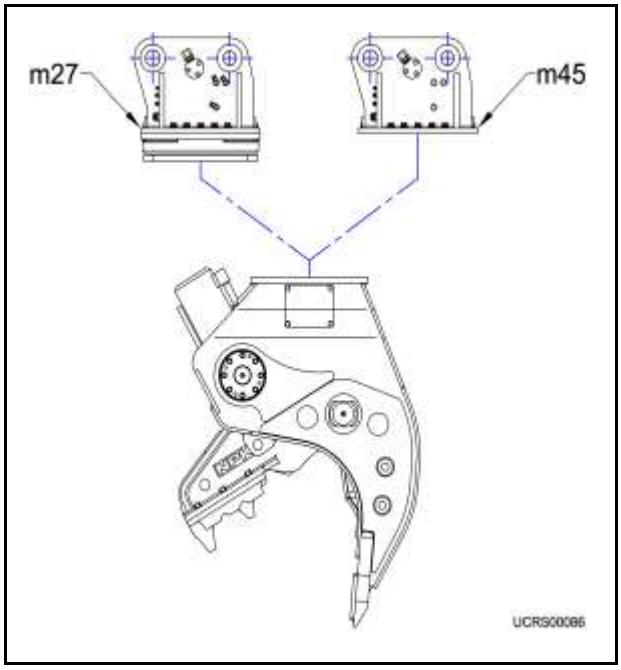
MODEL	BOLT SIZE	TORQUE	
		ft. lb.	(*Nm*)
U21J	M16-2	225	(*300*)
U21JR	M16-2	225	(*300*)
U31J	M16-2	225	(*300*)
U31JR	M16-2	225	(*300*)
U45J	M18-2.5	260	(*350*)
U45JR	M18-2.5	260	(*350*)
G7	M14-2	145	(*200*)
G18J	M16-2	225	(*300*)
G26J	M16-2	225	(*300*)
G30JR	M16-2	225	(*300*)

TOP BRACKET CONVERSION

CONVERSION PACKAGES OFFERED FOR "U" SERIES CRUSHERS

⚠ WARNING

A. Safe handling procedures must be followed to avoid personal injury.
B. Lifting and securing mechanisms must be of adequate capacity to safely support the particular crusher.



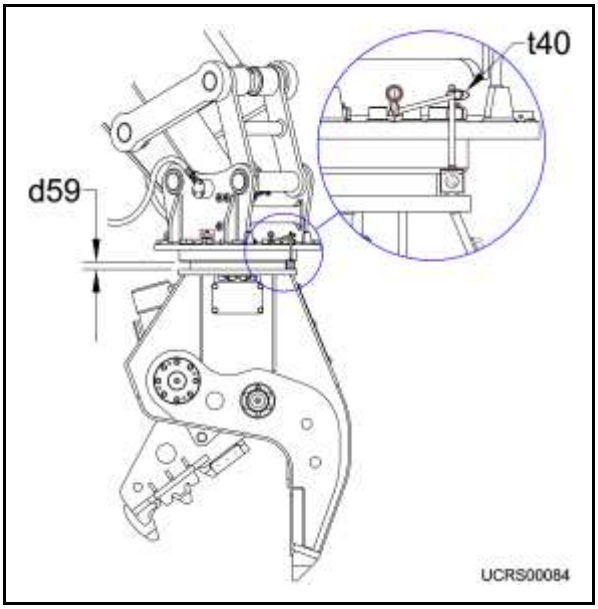
m27	Swivel Top
m45	Fixed Top

CRUSHER MODEL	PART NUMBER	FUNCTION	NOTES
U21	U2100-9510	FIXED TO ROTATION TYPE	
U21	U2100-9500	ROTATION TO FIXED TYPE	*crusher code number 322701 and earlier*
U21	U2100-9501	ROTATION TO FIXED TYPE	*crusher code number 322704 and newer*
U31	U3100-9510	FIXED TO ROTATION TYPE	
U31	U3100-9500	ROTATION TO FIXED TYPE	*crusher code number 322501 and earlier*
U31	U3100-9501	ROTATION TO FIXED TYPE	*crusher code number 322502 and newer*
U45	U4500-9500	ROTATION TO FIXED TYPE	

SLEWING RING INSPECTION AND MAINTENANCE

MEASURING MAXIMUM AXIAL MOVEMENT

1. While the unit is attached to the carrier, position the crusher in a vertical position as shown.
2. Lock the base of a dial indicator (t40) onto the lower frame of the crusher. Indicate the other end of the dial onto the top bracket face as shown. Using the excavator, slightly rock the crusher back and forth using slight stick movement. Note the movement shown on the dial. Take this reading (d59) in four places. If your readings are greater than shown, please contact the NPK Service Department at (440) 232-7900.



MODEL	NEW MAXIMUM	
	in	*(mm)*
U21JR (U21JRA)	<.010	*(<0.25)*
U31JR (U31JRA)	<.010	*(<0.25)*
U45JR	<.010	*(<0.25)*
G30JR	<.010	*(<0.25)*

MODEL	MAXIMUM ALLOWABLE WEAR	
	in	*(mm)*
U21JR (U21JRA)	0.138	*(3.50)*
U31JR (U31JRA)	0.138	*(3.50)*
U45JR	0.138	*(3.50)*
G30JR	0.138	*(3.50)*

SLEWING RING INSPECTION AND MAINTENANCE

ROTATION BEARING OUTER DIRT SEAL REPLACEMENT

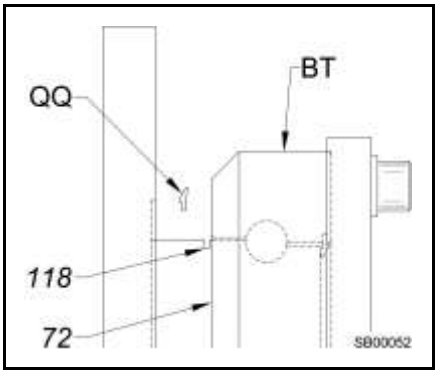
Additional items needed:

High strength adhesive
Brake clean/solvent

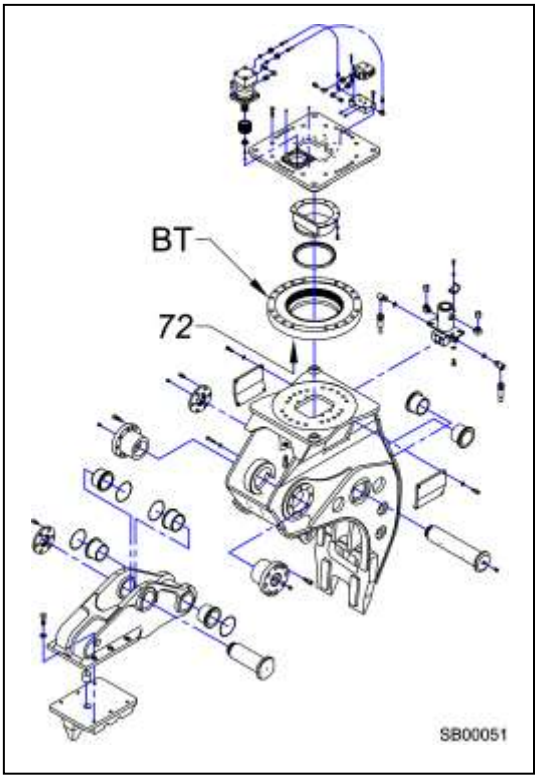
⚠ CAUTION

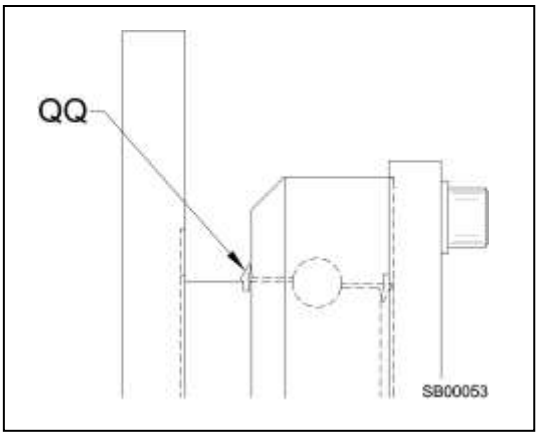
MODEL	SLEWING RING PART NUMBER	DIRT SEAL PART NUMBER
U21JR	25309660	25309273
U31JR	25309680	25309353
U45JR	25309840	25309843

1. Remove old seal (QQ) from the bottom side *(72)* of the slewing ring (BT).



2. Thoroughly clean oil, grease and dirt from the seal groove *(118)* and surrounding areas.
3. Clean seal groove with brake clean/solvent and allow time to dry completely.
4. Apply a small amount of high strength adhesive into the groove and install one end of the seal. ***Take care not to get adhesive on the lower lip of the seal.***
5. Insert seal into the groove and work around the slewing ring applying a small amount of adhesive every 12 in. *(300 mm)*. ***Take care not to stretch the seal as it is being installed around the slewing ring.***
6. Cut excess seal material as you get back around to the other end so the seal will butt against itself tightly. Apply adhesive to the groove and end of the seal to make it one continuous ring.





CRUSHER RELIEF LOCATIONS

U21J, U21JR, U31J, U31JR, U45J, U45JR, G30JR

Relief valve cartridges (c17/c18) for the “U” Series and the G30JR are located on the swivel manifold on rotating units (see **Fig. 1**) and below the joint assembly on fixed units (see **Fig. 2**). The relief cartridges are accessed through the same inspection plates on all models shown above.

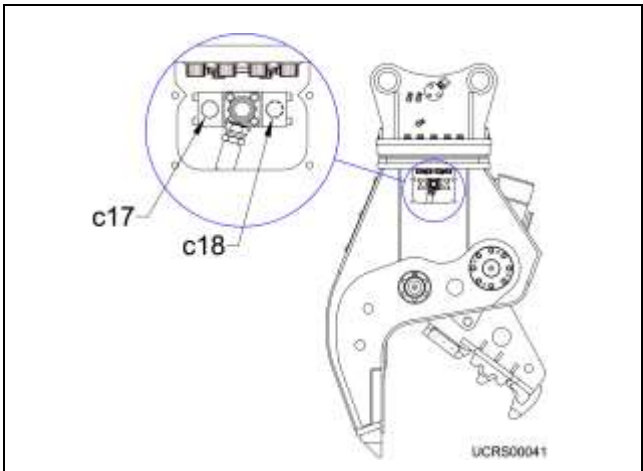


Fig. 1

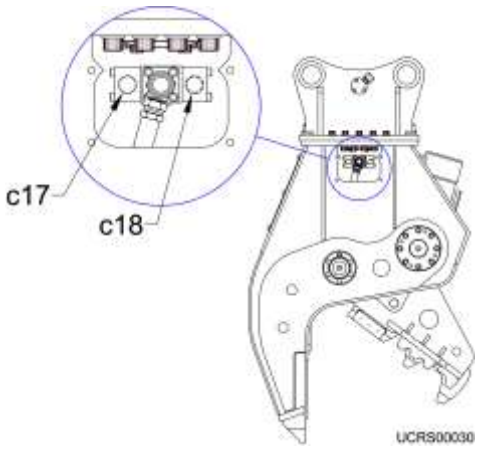


Fig. 2

G7, G18J, G26J

Relief valve cartridges (c17) for the G7, G18J AND G26J Crushers are mounted on the cylinder boosters (see Fig. 3). Cylinder assembly (c11).

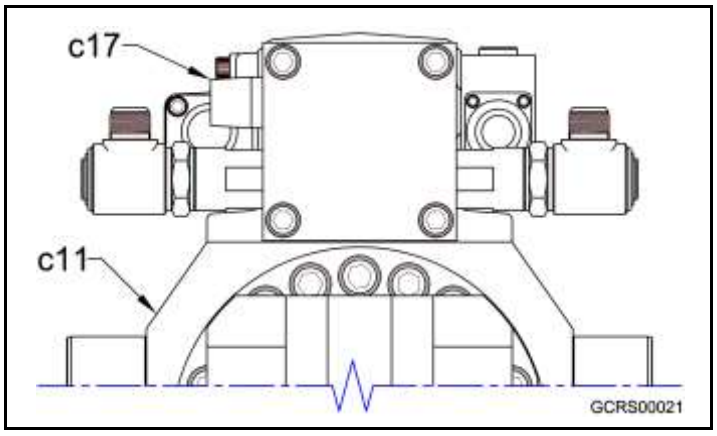


Fig. 3

CRUSHER RELIEF LOCATIONS

G7, G18J, G26J

Before attempting to adjust the relief pressures of an NPK crusher, the carrier circuit relief setting must be checked. The circuit relief setting must be at least 200 psi *(14 bar)* above the crusher relief (operating) pressure. The test ports on the NPK shut-off valves provided with NPK hydraulic kits are used for checking the carrier relief settings and to test and set the crusher relief cartridges. If not using an NPK hydraulic kit, a similar provision must be made to check pressures. Refer to the **"HYDRAULIC INSTALLATION"** section of this manual or call the NPK Service Department at (440) 232-7900.

MODEL	MINIMUM CARRIER RELIEF SETTING		CRUSHER RELIEF SETTING		REQUIRED OIL FLOW	
	psi	*(bar)*	psi	*(bar)*	gpm	*(l/m)*
U21J/U21JR	3,971	*(274)*	3,771	*(260)*	26 - 53	*(98 - 200)*
U31J/U31JR	4,261	*(294)*	4,061	*(280)*	26 - 66	*(98 - 250)*
U45J/U45JR	4,550	*(314)*	4,350	*(300)*	46 - 73	*(175 - 275)*
G7	3,200	*(220)*	3,000	*(206)*	13 - 21	*(49 - 80)*
G18J	3,900	*(269)*	3,700	*(255)*	26 - 52	*(98 - 197)*
G26J/G30JR	4,200	*(290)*	4,000	*(275)*	26 - 66	*(98 - 250)*

SWIVEL MANIFOLD MAINTENANCE

SWIVEL MANIFOLD ASSEMBLY

The swivel manifold assembly is located between the top bracket, which is pinned to the carrier, and the crusher frame that rotates. Hydraulic oil for both the open and close operations of the crusher pass through this manifold. The swivel manifold assembly consists of two main parts, the **"Spindle Case"** (BZ), which contains the oil seals, and the **"Spindle"** (CA), which rotates with the crusher frame (see **Fig. 1**).

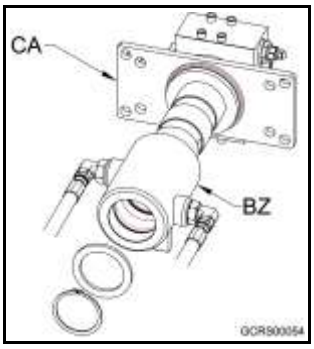


Fig. 1

LEAKAGE OF THE SEALS

External leakage or internal bypassing of hydraulic fluid will require the replacement of the seals in the swivel assembly. For external leakage, please review the seal replacement procedure in the **"REPLACEMENT OF THE SEALS IN THE SWIVEL"** section of this manual. If internal leakage is suspected, please proceed to the **"TESTING THE SWIVEL SEALS FOR INTERNAL LEAKAGE"** in the next section.

TESTING THE SWIVEL SEALS FOR INTERNAL LEAKAGE

If internal leakage is suspected, before disassembling the swivel assembly, the relief valve pressure settings should be checked. Internal leakage will most likely prevent the unit from reaching its relief settings in both the open and close functions. The relief valve cartridges are located in blocks (bs24) mounted to the swivel manifold assembly near the two hose connections (see Fig. 2). Access to these is through the upper side access plates of the crusher main frame (see **"CRUSHER RELIEF LOCATIONS"**). The relief valve setting adjustment screws (va1) are located beneath plastic caps (FN). **NOTE:** *Before attempting to adjust the relief setting, check that the relief valve cartridges have not loosened in their blocks.*

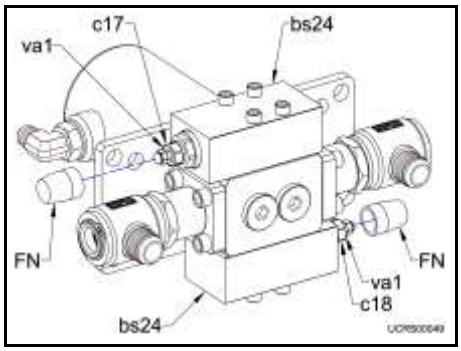


Fig. 2

SWIVEL MANIFOLD MAINTENANCE

TESTING THE SWIVEL SEALS FOR INTERNAL LEAKAGE

TEST PROCEDURE

Install 0 to 5,000 psi *(0 to 350 bar)* gauges in the NPK stop valves (located on the stick of the carrier) or in gauge ports in the open and close circuits located near the end of the stick *(for carriers without an NPK hydraulic kit)*. Close the jaw and keep the function activated, then read the pressure indicated on the gauge. Compare the pressure reached with the specifications for your model crusher. Repeat the check while opening the jaws and read the pressure indicated. If the proper relief pressure cannot be reached and the booster slows or stops, disassemble the swivel to check for failed seals. **NOTE:** *If the relief pressure cannot be reached with the jaw closed and the intensifier booster is clicking rapidly, the relief valves are not the problem and the intensifier booster should be checked.*

REPLACEMENT OF THE SEALS IN THE SWIVEL

Tools needed:

19 and 22 mm open end wrenches
41 and 46 mm open end wrenches
External snap ring pliers

⚠ CAUTION

The jaws of the crusher should be closed, and the frame supported or the shipping pins (t80), as shown in **Fig. 3**, installed to prevent rotation during repair.

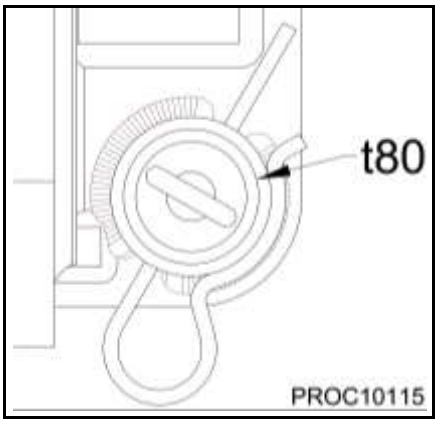


Fig. 3

SWIVEL MANIFOLD MAINTENANCE

REPLACEMENT OF THE SEALS IN THE SWIVEL

STEP 1 (Fig. 4)

Disconnect the rotation hoses (m39) at the counterbalance valve (BO). Remove the rotation motor hoses and motor fittings (f1) from the hydraulic motor. Disconnect the cylinder hoses (AO) at the side plates of the top bracket. Do not remove the cylinder hoses and fittings from the **"Spindle Case"** (BZ), they will be used to help lift it off the **"Spindle"** (CA). **Do not** disturb the elbow fittings (f4) in the **"Spindle Case"**.

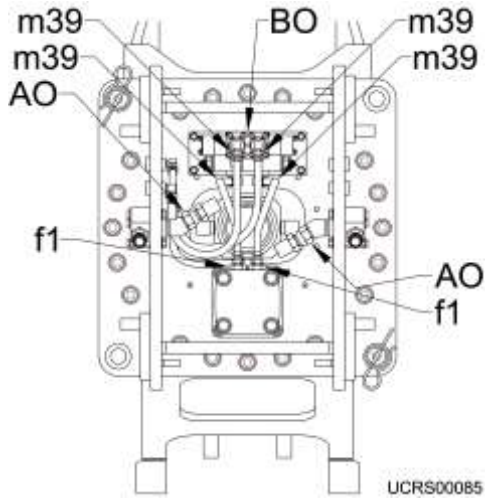


Fig. 4

STEP 2 (Fig. 5)

Remove the snap ring (AJ) and washer (U) from the top of the swivel assembly. Pull the **"Spindle Case"** off of the **"Spindle"** *(the cylinder hoses can be used for this)*.

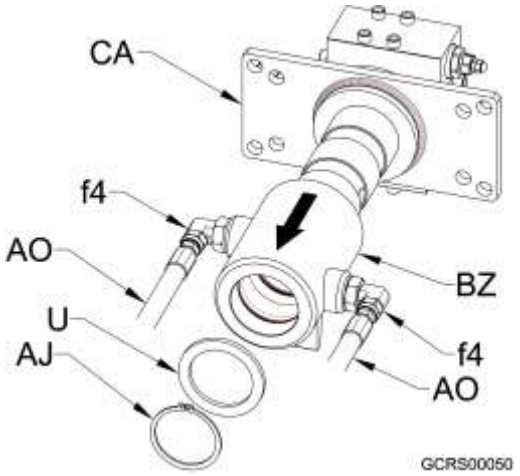


Fig. 5

STEP 3 (Fig. 6)

Inspection:

Visually inspect the sealing surfaces *(120)* of the **"Spindle"** (CA) for damage, which may hamper the ability of the o-rings to seal. Polishing the surface may clean up light scratching. Heavy scratching or galling may indicate rotator bearing play.

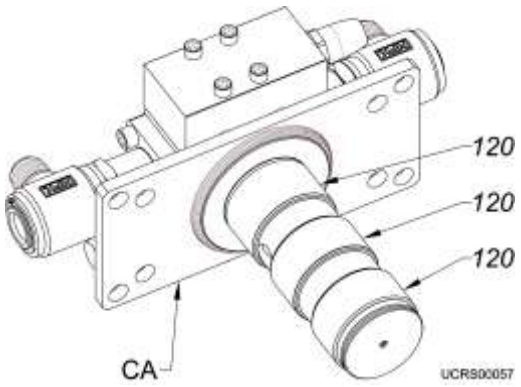


Fig. 6

SWIVEL MANIFOLD MAINTENANCE

REPLACEMENT OF THE SEALS IN THE SWIVEL

STEP 4 (Fig. 7)

Seal removal and replacement:

Sealing is accomplished with a combination of o-rings and back-up rings, which ride against the **"Spindle"**. Remove the o-rings and back-up rings with a seal pick (note the order of placement). Check the grooves *(118)* in the **"Spindle Case"** (BZ) for burrs or scoring damage. Light grinding or polishing may be required.

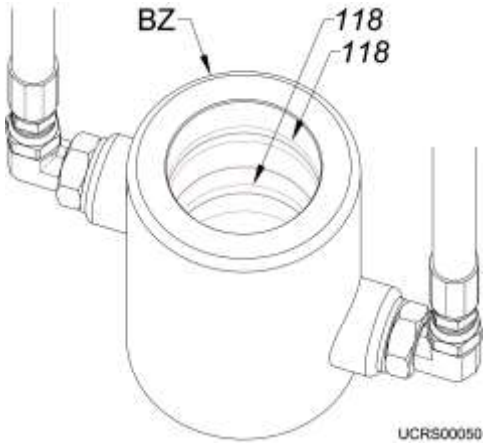


Fig. 7

STEP 5 (Fig. 8)

Lubricate the o-rings (RR) and back-up rings (SS) with grease. Install the back-up rings first, taking care not to crimp or fold them. Install the o-ring. Refer to the illustration for o-ring and back-up ring placement.

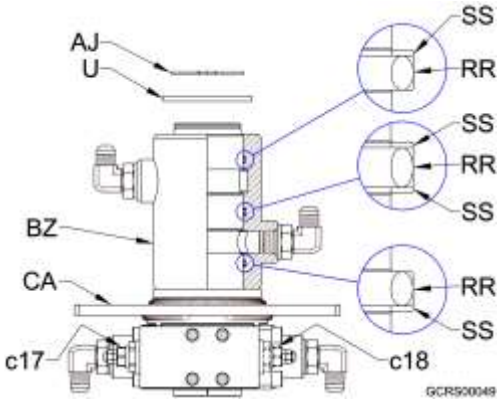


Fig. 8

Spray the **"Spindle"** (CA) with NPK assembly lube (P/N H010-5010). Install the hoses onto the **"Spindle Case"** (BZ). Slide the **"Spindle Case"** over the **"Spindle"**, which includes the relief valve cartridges (c17/c18). Install the washer (U) and snap ring (AJ). Reconnect the cylinder hoses to the top bracket, install the fittings into the hydraulic motor and install the hydraulic motor hoses.

FASTENER TORQUE SPECIFICATIONS

These torque charts are to be used with the specific “U” or “G” Series Crusher parts manual for the unit being paired.

All fasteners will be used with lube or medium strength thread adhesive. Bolts must have their threads wire brushed or cleaned with a thread die, then cleaned with solvent and finally cleaned with compressed air. Threaded holes must be cleaned with a thread tap, solvent and also with compressed air.

Use a common chassis or wheel bearing grease on fasteners listed as lubed. Grease the threads of the bolt and the contact surface under the bolt head. Grease the contact surface of nuts.

Use a few drops of medium strength thread adhesive on the threads of fasteners listed as torqued with adhesive.

Do not use anti-seize compound on any fasteners, unless otherwise noted.

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - MAIN FRAME ASSEMBLY

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE
			ft. lb.	*(Nm)*	OR LUBED
CYLINDER ROD END	**U21J/JR**	M16	260	*(350)*	LUBED
PIVOT PIN KEEPER	**U31J/JR**	M16	260	*(350)*	LUBED
	U45J/JR	M18	330	*(450)*	LUBED
CYLINDER PIVOT	**U21J/JR**	M18	330	*(450)*	LUBED
FLANGE	**U31J/JR**	M20	480	*(650)*	LUBED
	U45J/JR	M20	480	*(650)*	LUBED
JAW PIVOT PIN NUT	**U21J/JR**	M16	260	*(350)*	LUBED
	U31J/JR	M16	260	*(350)*	LUBED
	U45J/JR	M16	260	*(350)*	LUBED
CUTTING BLADE	**U21J/JR**	M14	150	*(200)*	LUBED
	U31J/JR	M16	260	*(350)*	LUBED
	U45J/JR	M16	260	*(350)*	LUBED
TOOTH PLATE	**U21J/JR**	M20	480	*(650)*	ADHESIVE
MOVEABLE JAW	**U31J/JR**	M24	775	*(1050)*	ADHESIVE
	U45J/JR	M24	775	*(1050)*	ADHESIVE
TOOTH PLATE	**U21JA**	M24	775	*(1051)*	ADHESIVE
FIXED JAW	**U31JA**	M30	1350	*(1830)*	ADHESIVE
COVER PLATE	**U21J/JR**	M16	260	*(350)*	LUBED
	U31J/JR	M16	260	*(350)*	LUBED
	U45J/JR	M16	260	*(350)*	LUBED
JOINT FITTING	**U21J/JR**	M12	65	*(90)*	LUBED
	U31J/JR	M12	65	*(90)*	LUBED
	U45J/JR	M12	65	*(90)*	LUBED
JOINT ASSEMBLY	**U21J**	M16	205	*(280)*	ADHESIVE
	U31J	M16	260	*(350)*	ADHESIVE
	U45J	M16	260	*(350)*	ADHESIVE
SPINDLE BLOCK	**U21J**	M10	45	*(60)*	LUBED
	U31J	M10	45	*(60)*	LUBED
	U45J	M10	45	*(60)*	LUBED
FLANGE ADAPTER	**U31J**	M12	80	*(105)*	LUBED

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - MAIN FRAME ASSEMBLY

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE
			ft. lb.	*(Nm)*	OR LUBED
CYLINDER ROD END	**G7**	M16	190	*(255)*	LUBED
PIVOT PIN KEEPER	**G18J**	M16	260	*(350)*	LUBED
	G26J	M16	260	*(350)*	LUBED
	G30JR	M16	260	*(350)*	LUBED
CYLINDER PIVOT	**G7**	M14	120	*(165)*	LUBED
FLANGE	**G18J**	M18	260	*(350)*	LUBED
	G26J	M20	480	*(650)*	LUBED
	G30JR	M20	480	*(650)*	LUBED
JAW PIVOT PIN NUT	**G7**	M12	80	*(105)*	LUBED
	G18J	M16	260	*(350)*	LUBED
	G26J	M16	260	*(350)*	LUBED
	G30JR	M16	260	*(350)*	LUBED
CUTTING BLADE	**G7**	M14	120	*(165)*	LUBED
	G18J	M16	260	*(350)*	LUBED
	G26J	M16	260	*(350)*	LUBED
	G30JR	M16	260	*(350)*	LUBED
TOOTH PLATE	**G18J**	M20	480	*(650)*	ADHESIVE
MOVEABLE JAW	**G26J**	M24	640	*(950)*	ADHESIVE
	G30JR	M24	640	*(950)*	ADHESIVE
COVER PLATE	**G18J**	M16	260	*(350)*	LUBED
	G26J	M16	260	*(350)*	LUBED
	G30JR	M16	260	*(350)*	LUBED
JOINT FITTING	**G7**	M12	65	*(90)*	LUBED
	G18J	M16	190	*(255)*	LUBED
	G26J	M12	65	*(90)*	LUBED
	G30JR	M12	65	*(90)*	LUBED

NOTE: *"G" crushers that have a "J" in the model designation have tooth plates that bolt to the moveable jaw.*

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - CYLINDER ASSEMBLY

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE
			ft. lb.	*(Nm)*	OR LUBED
CYLINDER END CAP	**U21J/JR**	M18	260	*(350)*	LUBED
	U31J/JR	M20	365	*(500)*	LUBED
	U45J/JR	M20	365	*(500)*	LUBED
CYLINDER ROD NUT	**U21J/JR**	M45	1400	*(1900)*	ADHESIVE
	U31J/JR	M65	3200	*(4400)*	ADHESIVE
	U45J/JR	M65	3200	*(4400)*	ADHESIVE
CYLINDER GUARD	**U21J/JR**	M24	640	*(870)*	ADHESIVE
	U31J/JR	M30	400	*(550)*	ADHESIVE
	U45J/JR	M30	400	*(550)*	ADHESIVE
GUARD HOLDER	**U21J/JR**	M10	45	*(60)*	ADHESIVE
PLATE - TOP	**U31J/JR**	M10	45	*(60)*	ADHESIVE
	U45J/JR	M12	80	*(105)*	ADHESIVE
GUARD HOLDER	**U21J/JR**	M16	205	*(280)*	ADHESIVE
PLATE - SIDE	**U31J/JR**	M16	260	*(280)*	ADHESIVE
	U45J/JR	M20	405	*(350)*	ADHESIVE
BOOSTER	**U21J/JR**	M16	225	*(300)*	ADHESIVE
ASSEMBLY	**U31J/JR**	M16	225	*(300)*	ADHESIVE
	U45J/JR	M18	260	*(350)*	ADHESIVE
BLOCK	**U21J/JR**	M12	93	*(125)*	ADHESIVE
	U31J/JR	M12	93	*(125)*	ADHESIVE
	U45J/JR	M12	93	*(125)*	ADHESIVE
CONNECTOR PIPE	**U31J/JR**	M12	93	*(125)*	ADHESIVE
	U45J/JR	M12	93	*(125)*	ADHESIVE

NOTE: *For booster assembly bolt torques see **B000-9600C** booster manual.*

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - CYLINDER ASSEMBLY

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE
			ft. lb.	*(Nm)*	OR LUBED
CYLINDER END CAP	**G7**	M16	190	*(255)*	LUBED
(See NOTE$_1$)	**G18J**	M18	260	*(350)*	LUBED
	G18J	M20	365	*(500)*	LUBED
	G26J	M18	260	*(350)*	LUBED
	G26J	M20	365	*(500)*	LUBED
	G26J	M22	400	*(550)*	LUBED
	G30JR	M20	365	*(500)*	LUBED
CYLINDER ROD NUT	**G7**	M45	1400	*(1900)*	ADHESIVE
	G18J	M65	3200	*(4400)*	ADHESIVE
	G26J	M70	4100	*(5500)*	ADHESIVE
	G30JR	M70	4100	*(5500)*	ADHESIVE
CYLINDER GUARD	**G7**	M12	93	*(125)*	ADHESIVE
	G18J	M30	400	*(550)*	ADHESIVE
	G26J	M30	400	*(550)*	ADHESIVE
	G30JR	M30	400	*(550)*	ADHESIVE
GUARD HOLDER	**G18J**	M10	45	*(61)*	ADHESIVE
PLATE - TOP	**G26J**	M10	45	*(61)*	ADHESIVE
	G30JR	M10	45	*(61)*	ADHESIVE
GUARD HOLDER	**G18J**	M16	205	*(280)*	ADHESIVE
PLATE - SIDE	**G26J**	M16	190	*(255)*	ADHESIVE
	G30JR	M16	260	*(350)*	ADHESIVE
SPACER PLATE	**G7**	M10	45	*(61)*	ADHESIVE
BRACKET - SIDE	**G7**	M12	93	*(125)*	ADHESIVE
BRACKET - BOTTOM	**G7**	M10	45	*(61)*	ADHESIVE
BOOSTER	**G7**	M14	145	*(200)*	ADHESIVE
ASSEMBLY	**G18J**	M16	225	*(300)*	ADHESIVE
(See NOTE$_2$)	**G26J**	M16	225	*(300)*	ADHESIVE
	G30JR	M16	225	*(300)*	ADHESIVE
BLOCK	**G18J**	M12	93	*(125)*	ADHESIVE
	G26J	M12	93	*(125)*	ADHESIVE
	G30JR	M12	93	*(125)*	ADHESIVE
CONNECTOR PIPE	**G18J**	M12	93	*(125)*	ADHESIVE
	G26J	M12	93	*(125)*	ADHESIVE
	G30JR	M12	93	*(125)*	ADHESIVE

NOTE$_1$: *Measure cylinder end cap bolt sizes on G18J and G26J units. Several different bolt sizes have been used.*

NOTE$_2$: *For booster assembly bolt torques, see **B000-9600C** booster manual.*

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - ROTATION COMPONENTS

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE
			ft. lb.	*(Nm)*	OR LUBED
SLEWING RING ASSEMBLY TO FRAME	**U21JR**	M24	700	*(950)*	LUBED
	U31JR	M24	775	*(1050)*	LUBED
	U45JR	M24	775	*(1050)*	LUBED
		M27	1035	*(1400)*	LUBED
TOP PLATE TO SLEWING RING	**U21JR**	M16	260	*(350)*	ADHESIVE
	U31JR	M16	260	*(350)*	ADHESIVE
	U45JR	M16	260	*(350)*	ADHESIVE
SLEWING RING COVER	**U21JR**	M12	93	*(125)*	ADHESIVE
	U31JR	M12	93	*(125)*	ADHESIVE
	U45JR	M10	45	*(60)*	ADHESIVE
ROTATION MOTOR	**U21JR**	M16	260	*(350)*	ADHESIVE
	U31JR	M16	260	*(350)*	ADHESIVE
	U45JR	M16	260	*(350)*	ADHESIVE
MOTOR PINION GEAR	**U21JR**	M12	93	*(125)*	ADHESIVE
	U31JR	M12	93	*(125)*	ADHESIVE
	U45JR	M12	93	*(125)*	ADHESIVE
COUNTERBALANCE VALVE	**U21JR**	M12	95	*(130)*	LUBED
	U31JR	M12	95	*(130)*	LUBED
	U45JR	M12	95	*(130)*	LUBED
COUNTERBALANCE VALVE PLATE	**U21JR**	M12	95	*(130)*	LUBED
	U31JR	M12	95	*(130)*	LUBED
	U45JR	M12	95	*(130)*	LUBED
ROTARY JOINT ASSEMBLY	**U21JR**	M16	205	*(280)*	ADHESIVE
	U31JR	M16	260	*(350)*	ADHESIVE
	U45JR	M16	260	*(350)*	ADHESIVE
SPINDLE BLOCK	**U21JR**	M10	45	*(60)*	LUBED
	U31JR	M10	45	*(60)*	LUBED
	U45JR	M10	45	*(60)*	LUBED
FLANGE ADAPTOR	**U31JR**	M12	80	*(105)*	LUBED
LOCK PLATE	**U21JR**	M12	93	*(125)*	ADHESIVE
	U31JR	M12	93	*(125)*	ADHESIVE
	U45JR	M12	93	*(125)*	ADHESIVE

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - G30JR ROTATION COMPONENTS

BOLT LOCATION	BOLT SIZE	BOLT TORQUE		ADHESIVE
		ft. lb.	*(Nm)*	OR LUBED
SLEWING RING ASSEMBLY TO FRAME	M24	700	*(950)*	LUBED
SLEWING RING COVER	M12	93	*(125)*	ADHESIVE
ROTATION MOTOR	M16	260	*(350)*	ADHESIVE
MOTOR PINION GEAR	M12	93	*(125)*	ADHESIVE
COUNTERBALANCE VALVE	M12	95	*(130)*	LUBED
COUNTERBALANCE VALVE PLATE	M12	95	*(130)*	LUBED
ROTARY JOINT ASSEMBLY	M16	260	*(350)*	ADHESIVE
SPINDLE BLOCK	M10	45	*(60)*	LUBED
FLANGE ADAPTOR	M12	80	*(105)*	LUBED
LOCK PLATE	M12	93	*(125)*	ADHESIVE

HOSE TORQUE SPECIFICATIONS

JIC ENDS

NOMINAL SIZE	FITTING DASH SIZE	THREAD SIZE	NUMBER OF FLATS FROM FINGER TIGHT	TORQUE	
				ft. lb.	*(Nm)*
1/2"	-8	3/4-16	1	36 - 39	*(49 - 53)*
3/4"	-12	1-1/16-12	1	79 - 88	*(107 - 119)*
1"	-16	1-5/16-12	1	108 - 113	*(146 - 153)*
1-1/4"	-20	1-5/8-12	1	127 - 133	*(172 - 180)*

ORFS ENDS

NOMINAL SIZE	FITTING DASH SIZE	THREAD SIZE	NUMBER OF FLATS FROM FINGER TIGHT	TORQUE	
				ft. lb.	*(Nm)*
1/2"	-8	13/16-16	1.25 - 1.75	32 - 35	*(43 - 48)*
3/4"	-12	1-3/16-12	1.25 - 1.75	65 - 70	*(88 - 95)*
1"	-16	1-7/16-12	1.25 - 1.75	92 - 100	*(125 - 136)*
1-1/4"	-20	1-11/16-12	1.25 - 1.75	125 - 140	*(170 - 190)*

TROUBLESHOOTING

DETERMINE THE TYPE OF PROBLEM

Performance problems are classified as **"LOSS OF POWER"** or **"LOSS OF CYCLE SPEED"** *(assuming the problem is not due to misapplication)*.

1. **LOSS OF POWER**
   NPK CRUSHER jaw crushing forces are determined by the operating pressure setting and NPK pressure intensifier performance.
2. **LOSS OF CYCLE SPEED**
   NPK CRUSHER cycle speed is determined by oil flow to the unit. The hydraulic installation circuit for the CRUSHER must be set to provide the correct flow.

DETERMINE THE CAUSE OF THE PROBLEM

Technical problems are caused by either the NPK CRUSHER or the carrier's hydraulic system *(hydraulic installation kit for the CRUSHER)*. Checking the hydraulic pressure and flow will determine if the problem is in the CRUSHER or the carrier. If the pressure and flow to the Crusher are correct, the problem is in the CRUSHER.

LOSS OF POWER

Loss of power can be caused by a low carrier relief valve setting or by a low CRUSHER relief valve setting. Verify the correct relief valve settings of the carrier and the CRUSHER. (See **"CRUSHER SEQUENCE, RELIEF VALVE AND CARRIER RELIEF VALVE SETTINGS"** on page 102.)

If the relief valve pressures are to specification, proceed to the **"INTENSIFIER CHECKS"** troubleshooting chart on page 104 and the **"PRESSURE INTENSIFIER OPERATION"** section on page 106.

TROUBLESHOOTING

TROUBLESHOOTING GUIDE FOR LOW POWER RELIEF VALVE CHECKS

RELIEF VALVE CHECKS

PROBLEM	CAUSE	CHECK	REMEDY
Operating Pressure is less than the pressure setting specified for Crusher model number. (See **"MODEL SPECIFICATIONS"**)	Carrier hydraulic circuit relief valve.	Measure the carrier circuit relief valve with the pressure to close shut-off valve in the **"OFF"** position	Adjust or replace the carrier circuit relief valve. The setting for the relief valve must be 200 psi *(14 bar)*, minimum, above the Crusher operating pressure.
	Crusher relief valves	Measure the relief valves with the shut-off valves on the carrier in the **"ON"** position. Check pressure with the jaws fully open and fully closed.	Setting should be per Crusher specification.
		Check relief cartridges for tightness.	Tighten the relief valve cartridges.
		Check relief cartridges for mis-adjustment.	Reset to Crusher specification. If unable to adjust, replace the cartridge.
		Check the o-rings and backup rings of the relief valve cartridges.	Replace the o-rings and backup rings of both relief valve cartridges.
	Pilot check valve assemblies.	Inspect the booster inlet pilot check valves for damage.	Replace the inlet pilot check valve assemblies if necessary.
	Swivel manifold assembly	Check the seals between the open and close passages in the swivel manifold assembly.	Replace the seals in the swivel manifold assembly.
		Check the land areas for the seals in the swivel manifold assembly.	Repair the land area or replace the spindle.

TROUBLESHOOTING

TROUBLESHOOTING GUIDE FOR LOW POWER RELIEF VALVE CHECKS

LOW POWER CHECKS

PROBLEM	CAUSE	CHECK	REMEDY
Operating pressure is per Crusher specification (See **MODEL SPECIFICATIONS"**), *but the intensifier does not click.*	Booster sequence valve cartridge.	Observe sequence valve operation. (See **"PRESSURE INTENSIFIER SEQUENCE AND RELIEF VALVE ACTUATION"**)	Replace the sequence valve cartridge. (**NOTE:** *The sequence valve cartridge is not adjustable*.)
		Check the o-rings and backup rings of the sequence valve cartridge.	Replace the o-rings and backup rings of the sequence valve cartridge.
	Booster control valve assembly.	Dis-assemble the main valve and inspect the spring, plungers and for free movement of the spool.	Polish or replace as necessary.
	Booster assembly	Dis-assemble the main valve and inspect the piston assembly, seals, poppets, and seats.	Polish or replace as necessary.

TROUBLESHOOTING

MEASURING OPERATING PRESSURES

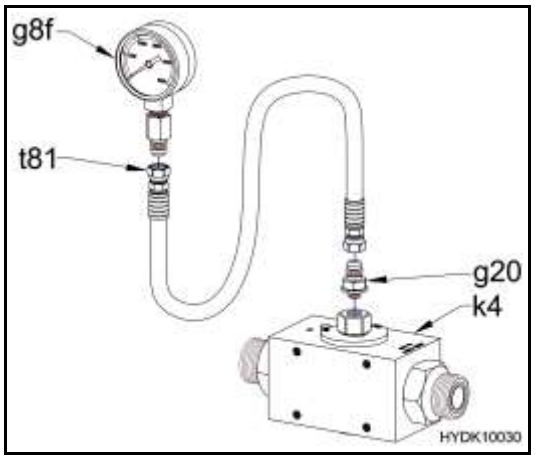
Tools and equipment required:

(For carriers with an NPK hydraulic installation kit installed).

Pressure gauge (g8f): 5000 psi *(350 bar)*.

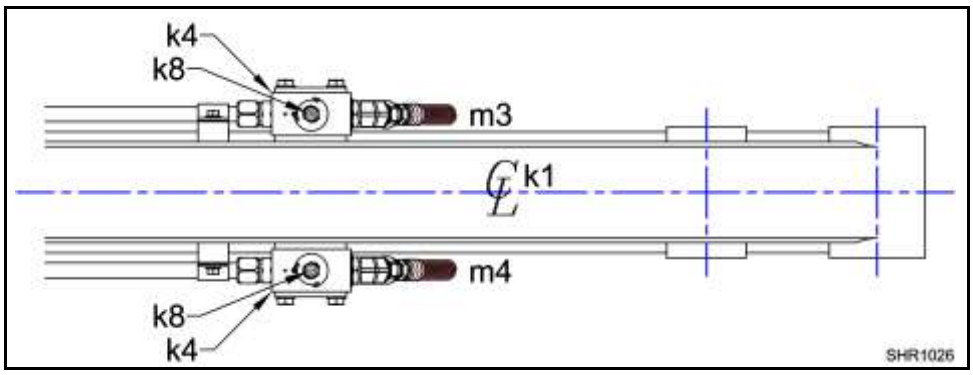
Test port adapter (g20): to fit #4 SAE female port in NPK shut-off valve (k4).

Test hose (t81): 5000 psi *(350 bar)* rated



RELIEF VALVE CHECKING AND SETTING PROCEDURE

NPK Hydraulic Installation Kits provide shut-off valves (k4) with test ports (k8) in both the jaw open (m4) and close lines (m3). Install pressure test hoses in both test ports.



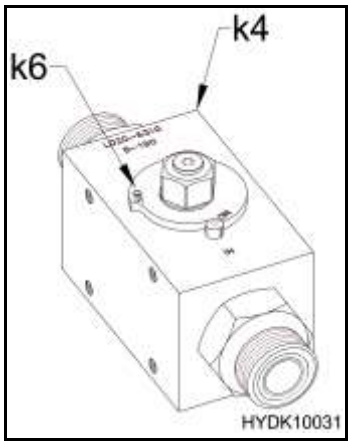
TROUBLESHOOTING

1. CARRIER CIRCUIT RELIEF VALVE CHECK

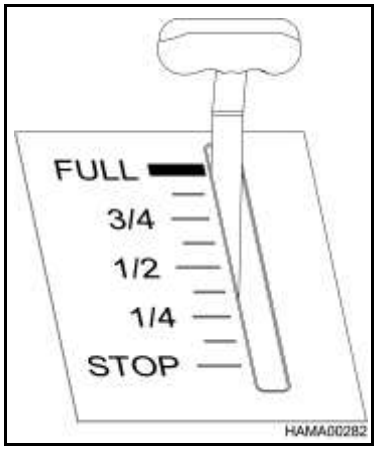
Verify that the hydraulic system of the carrier meets the requirements of the CRUSHER.

A. Install a 0 – 5000 psi *(350 bar)* pressure gauge (g8f) in the #4 SAE test ports in each of the shut-off valves at the end of the stick.

B. Turn the shut-off valve (k4) in the close circuit to the **"OFF"** position (k6).



C. Start the carrier. Set the throttle to the **"FULL"** position. Actuate the hydraulic circuit to close the jaws.



D. The pressure reading should be at least 200 psi *(14 bar)* above the CRUSHER operating pressure.

Note: If the excavator relief setting is less than 200 psi *(14 bar)* above the CRUSHER operating pressure, reset the excavator accordingly. (See specifications).

2. CRUSHER RELIEF VALVE

After the CRUSHER hydraulic circuit has been verified, check the CRUSHER relief valve settings for both open and close.

A. With a 0 – 5000 psi *(350 bar)* gauge installed in both the open and close side of the stick, open the shut-off valves.

B. Start the carrier. Set the throttle at full RPM and close the jaws completely and hold for 10 seconds. Check the psi *(bar)* reading on the gauge and compare to the specified CRUSHER relief valve setting. If it is not the same, reset the CRUSHER relief valve accordingly.

C. The booster will start to click. Depending on oil temperature, the booster will continue to click slowly compensating internal leaking in the main cylinder. This is normal.

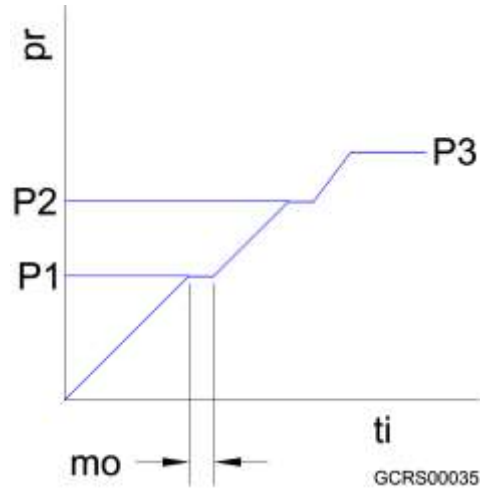
D. If the intensifier is clicking rapidly, pressure may not reach the relief valve setting due to severe intensifier or cylinder leakage.

E. Open the CRUSHER jaws to the fully open position and hold for 10 seconds. Check the pressure reading on the gauge and compare to the specified CRUSHER relief valve setting. If it is not the same, reset the CRUSHER relief valve accordingly.

PRESSURE INTENSIFIER SEQUENCE VALVE AND RELIEF VALVE ACTUATION

Close the jaws without material in them. When the jaw cylinders are fully stroked, the load pressure (pr) rises until it reaches the sequence valve setting (P1). The oil is then diverted to the pressure intensifier. The load pressure momentarily (mo) levels off for one to two seconds (ti) at the sequence valve pressure setting then rises to the CRUSHER relief valve setting (P2). The carrier relief valve (P3) acts only as a safety relief and must be set 200 psi *(14 bar)* above the CRUSHER relief setting.

NOTE: ***Do not*** *adjust sequence valve cartridge (factory preset).*



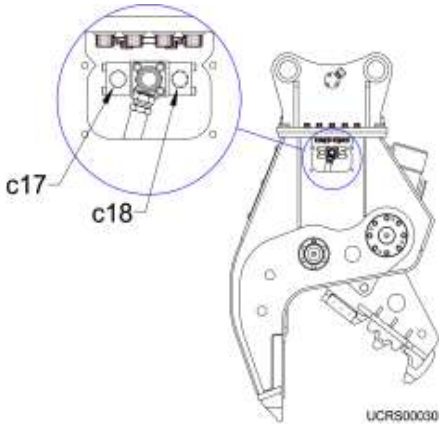
P1	SEQUENCE VALVE SETTING
P2	CRUSHER RELIEF VALVE SETTING
P3	CARRIER RELIEF VALVE SETTING
pr	pressure (psi/bar)
mo	momentarily
ti	time (1 - 2 seconds)

TROUBLESHOOTING

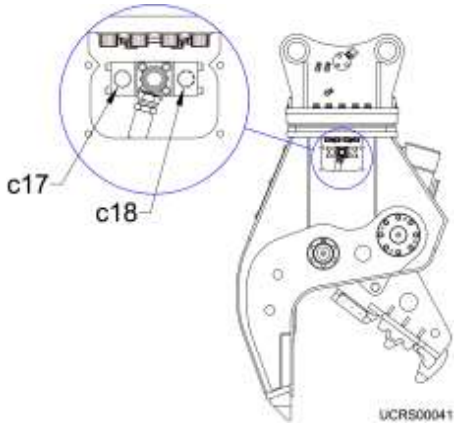
CRUSHER SEQUENCE, RELIEF VALVE AND CARRIER RELIEF VALVE SETTINGS

MODEL	SERIAL NO.	P1 CRUSHER SEQUENCE VALVE SETTING		P2 CRUSHER RELIEF VALVE SETTING		P3 MINIMUM CARRIER RELIEF VALVE SETTING	
		psi	*(bar)*	psi	*(bar)*	psi	*(bar)*
U21J/JR	ALL	2,990	*(210)*	3,771	*(260)*	4,000	*(275)*
U31J/JR	ALL	2,990	*(210)*	4,061	*(280)*	4,250	*(295)*
U45J/JR	ALL	2,990	*(210)*	4,350	*(300)*	4,480	*(315)*
G7	ALL	1,420	*(100)*	3,000	*(207)*	3,200	*(225)*
G18J	ALL	2,990	*(210)*	3,700	*(255)*	3,900	*(270)*
G26J	up to 39569	2,600	*(180)*	3,600	*(248)*	3,850	*(265)*
	40780 and above	3,000	*(211)*	4,000	*(276)*	4,200	*(290)*
G30JR	ALL	2,990	*(210)*	4,000	*(276)*	4,200	*(290)*

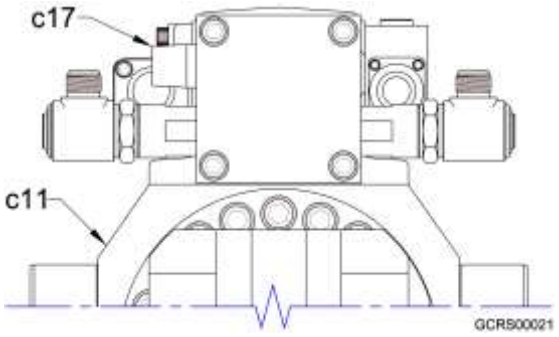
RELIEF VALVE LOCATION



“J” Units



“JR” Units

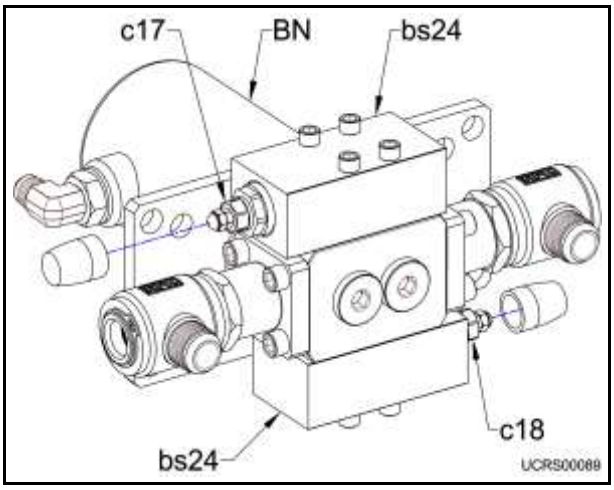


G7, G18J, G26J Units

TROUBLESHOOTING

RELIEF VALVE LOCATION

The CRUSHER relief valve cartridges, close (c17) and open (c18) are located in the relief blocks (bs24) that are bolted to the rotary joint assembly (BN).



TROUBLESHOOTING

INTENSIFIER CHECKS *(unit does not click)*

INTENSIFIER CHECKS

PROBLEM	CAUSE	CHECK	REMEDY
Intensifier does not click	CRUSHER relief valves	Check relief cartridges for tightness.	Tighten the relief valve cartridges.
		Check relief cartridges for mis-adjustment.	Reset to 3,625 psi (*250 bar*). If unable to adjust, replace the cartridge.
		Check the o-rings and backup rings of the relief valve cartridges.	Replace the o-rings and backup rings of both relief valve cartridges.
	Booster sequence valve cartridge.	Observe sequence valve operation. (See **"PRESSURE INTENSIFIER SEQUENCE AND RELIEF VALVE ACTUATION"**)	Replace the sequence valve cartridge. (**NOTE:** *The sequence valve cartridge is not adjustable*.)
		Check the o-rings and backup rings of the sequence valve cartridge.	Replace the o-rings and backup rings of the sequence valve cartridge.
	Booster control valve assembly.	Dis-assemble the main valve and inspect the spring, plungers and for free movement of the spool.	Polish or replace as necessary.
	Booster assembly	Check poppets and seats.	Replace poppets and seats as necessary.
		Check all o-rings and backup rings.	Replace all o-rings and backup rings.

TROUBLESHOOTING

INTENSIFIER CHECKS *(unit clicks – does not slow down)*

INTENSIFIER CHECKS

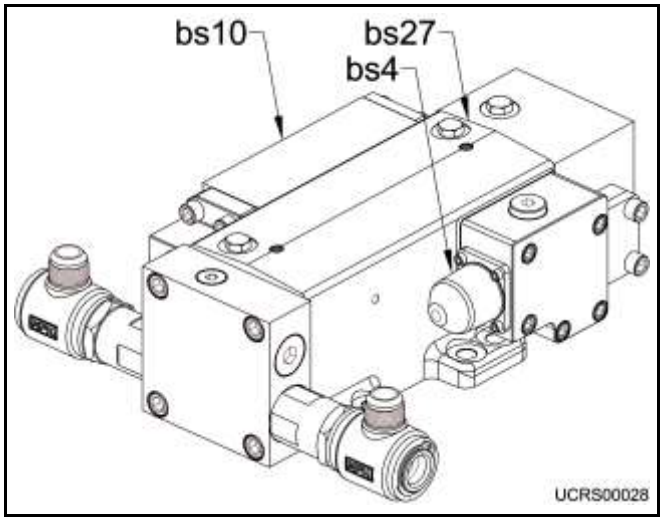
PROBLEM	CAUSE	CHECK	REMEDY
Intensifier clicks but does not slow down	CRUSHER relief valves	Check relief cartridges for tightness.	Tighten the relief valve cartridges.
	Main valve orifice. (**NOTE:** *Not found in most **"D"** style boosters.*)	Check the orifice, o-rings and backup rings.	Clean the orifice and replace the o-rings and backup rings. (See Service Bulletin **SB04-4**)
	Pilot check valve assemblies.	Inspect the booster inlet pilot check valve assemblies for damaged seats.	Replace the inlet pilot check valve assemblies.
	Booster assembly	Check poppets and seats.	Replace poppets and seats as necessary.
		Check all o-rings and backup rings.	Replace all o-rings and backup rings.
	Main cylinder assemblies	Check main cylinder piston rings for by-passing oil.	Replace piston rings.
		Check for damaged seals.	Reseal cylinders

TROUBLESHOOTING

PRESSURE INTENSIFIER OPERATION

NPK's exclusive pressure intensifier system is used in NPK CRUSHERs to boost cylinder pressure to increase the jaw closing forces. When the intensifier is working properly, a rapid clicking sound will be heard, indicating that the pressure intensifier is being actuated as the jaws begin to close against resistance. As the jaws grasp tighter onto the material, the clicking will begin to slow down. This slowing will continue until the material is either cut/crushed or the CRUSHER meets full resistance. At full resistance, the clicking will slow dramatically or sometimes stop completely.

PRESSURE INTENSIFIER (BOOSTER)



The control valve (bs10), sequence valve (bs4) and booster assembly (bs27) make up the pressure intensifier assembly.

RAPID CONTINUOUS CLICKING IS HEARD AND THE MATERIAL IS NOT BEING CRUSHED/SHEARED AS EXPECTED

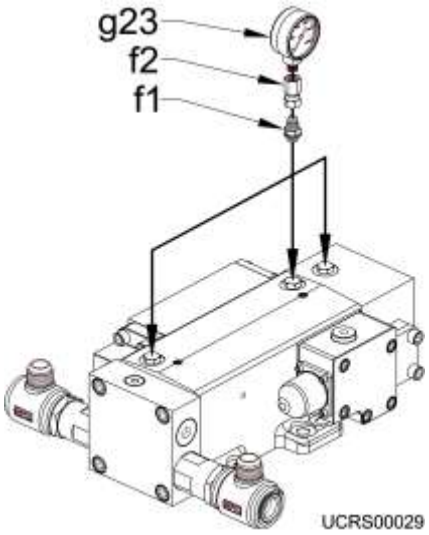
This indicates that the problem is not a relief or sequence valve setting, but it is in the intensifier or the cylinder of the CRUSHER. This requires further investigation by a mechanic/technician, see **"INTENSIFIER CHECKS"** *(clicks – does not slow down)* section on page 105.

TROUBLESHOOTING

CHECKING BOOSTED PRESSURE

WARNING ***EXTREMELY HIGH-PRESSURE OIL!***

NPK gauge assembly, **P/N L017-8000** is available to directly check the boosted pressure on all CRUSHERS. The pressure intensifier's have three test ports as shown.



L017-8000 GAUGE ASSEMBLY		
g23	L017-4020	gauge: 0 - 15,000 psi (*0 - 1000 bar*)
f1	L007-6630	female swivel adapter
f2	K023-6690	male adapter

PROCEDURE:

1. Remove a plug from one of the test ports and install the male adapter (f2). Choose the port that will give you the best gauge clearance and viewing.
2. Install the gauge (g23) into the swivel adapter (f1). (Use thread sealant).
3. Install the gauge and swivel adapter onto the male adapter. *(No thread sealant required.)*
4. Close the jaw all the way. Pressure will rise to the point where intensification starts (P1 on page 101). Then it will go up to the full boosted pressure of approximately 12,000 psi *(800 bar)*. When the clicking of the booster slows, it is at full intensification, click…click…click…etc., is normal. If the clicking continues rapidly and will not slow down, there may be a problem with the intensifier or CRUSHER cylinder assemblies.
5. Open the jaws all the way. You will now read the relief setting of the jaw open circuit. Note that the intensifier only works on jaw close. Jaw open sees the CRUSHER's or the carrier's relief valve pressure setting, whichever is lower.

NOTE: *IF ADDITIONAL ASSISTANCE IS REQUIRED, CALL THE NPK SERVICE DEPARTMENT AT (440) 232-7900.*

TROUBLESHOOTING

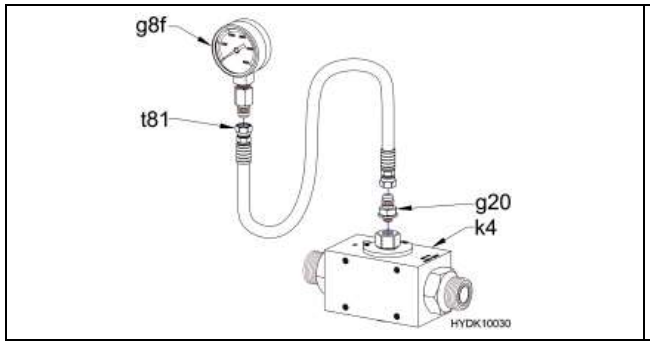
SLOW CYCLE SPEED

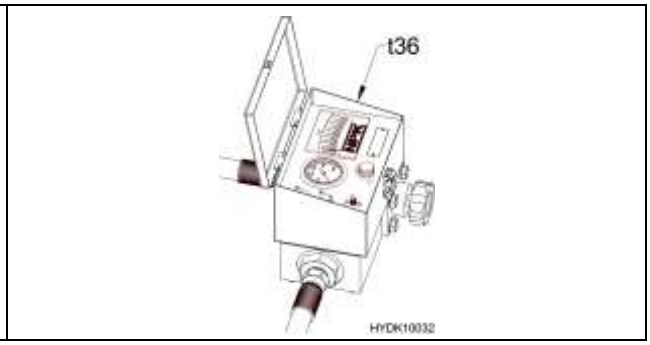
The specified cycle times of the CRUSHER are controlled by the flow provided by the hydraulic circuit of the carrier. The published cycle times of the CRUSHER are a direct result of the maximum published oil flow; see the **"MODEL SPECIFICATIONS"** section of this instruction manual.

NOTE: *If the jaws will not open or close, be sure the open and close shut-off valves are in the* **"ON"** *position.*

Tools and equipment required:

(For carriers with an NPK hydraulic installation kit installed.)





Pressure gauge (g8f): 5000 psi *(350 bar)*.

Test port adapter (g20): to fit #4 SAE female port in NPK shut-off valve (k4).

Test hose (t81): 5000 psi *(350 bar)* rated.

Loading type hydraulic flow meter (t36): 100 gpm *(380 l/m)* hydraulic flow capacity.

TEST PROCEDURE

Install a pressure gauge into the test port of the jaw close circuit *(left shut-off valve as seen from the operator's position)*. Fully stroke the CRUSHER cylinders. Measure the attachment operating pressure.

SLOW CYLINDER SPEED

PROBLEM	CAUSE	CHECK	REMEDY
Slow cylinder speed. Operating pressure is per Crusher specification (See **MODEL SPECIFICATIONS"**), *but the intensifier does not click*.	Carrier flow setting is set too low.	Check flow output of Crusher hydraulic circuit at 1000 psi (*69 bar*).	Adjust carrier flow output to meet NPK specifications.
			Repair or replace the carrier's pump.
	Crusher cylinder.	Check Crusher cylinder piston rings.	Replace if damaged or worn.

TROUBLESHOOTING

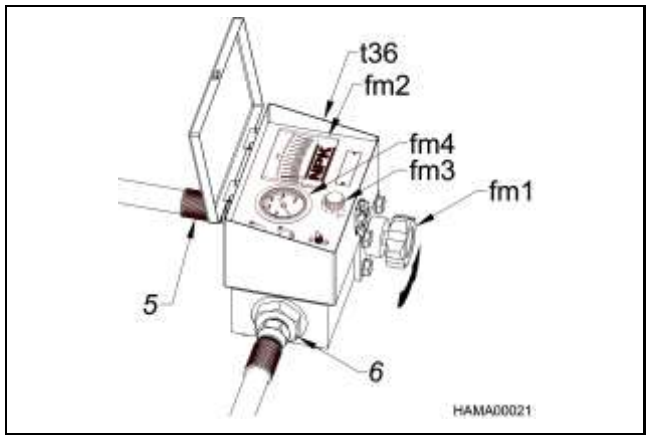
TEST PROCEDURE

SLOW CYLINDER SPEED

PROBLEM	CAUSE	CHECK	REMEDY
Operating Pressure is less than the pressure setting specified for Crusher model number. (See **"MODEL SPECIFICATIONS"**)	Carrier hydraulic circuit relief valve.	Measure the carrier circuit relief valve with the pressure to close shut-off valve in the **"OFF"** position	Adjust or replace the carrier circuit relief valve. The setting for the relief valve must be 200 psi (*14 bar*), minimum, above the Crusher operating pressure.
	Crusher relief valves	Measure the relief valves with the shut-off valves on the carrier in the **"ON"** position. Check pressure with the jaws fully open and fully closed.	Setting should be per Crusher specification.
		Check relief cartridges for tightness.	Tighten the relief valve cartridges.
		Check relief cartridges for mis-adjustment.	Reset to Crusher specification. If unable to adjust, replace the cartridge.
		Check the o-rings and backup rings of the relief valve cartridges.	Replace the o-rings and backup rings of both relief valve cartridges.
	Booster sequence valve cartridge.	Observe sequence valve operation. (See **"PRESSURE INTENSIFIER SEQUENCE AND RELIEF VALVE ACTUATION"**)	Replace the sequence valve cartridge. (**NOTE:** *The sequence valve cartridge is not adjustable*.)
		Check the o-rings and backup rings of the sequence valve cartridge.	Replace the o-rings and backup rings of the sequence valve cartridge.

TROUBLESHOOTING

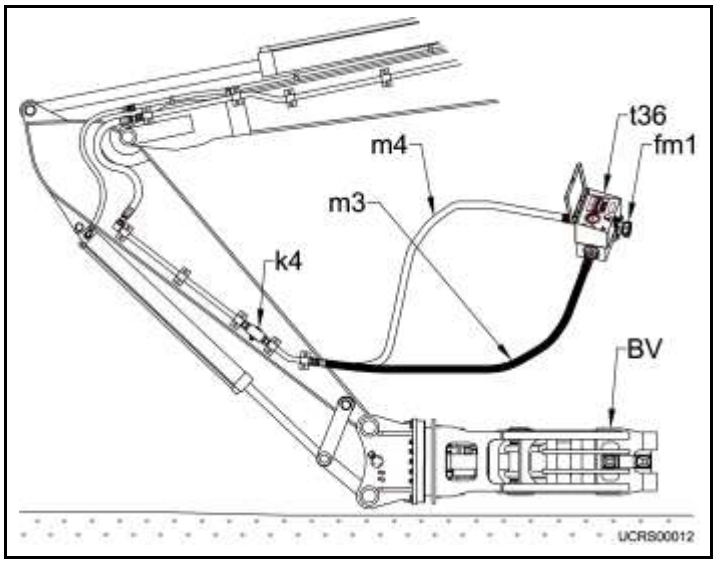
CHECKING THE HYDRAULIC FLOW AT RATED PRESSURE



(Typical loading type flow meter)

5	out port
6	in port
fm1	load valve
fm2	flow/temperature display
fm3	flow/temperature switch
fm4	pressure gauge

1. **Installation of the loading type flow meter.**
   Install the flow meter (t36) between the CRUSHER close (m3) and open lines (m4) as shown. Typically, the jaw close line is on the left and the jaw open is on the right of the CRUSHER *(looking from the operator's seat)*.



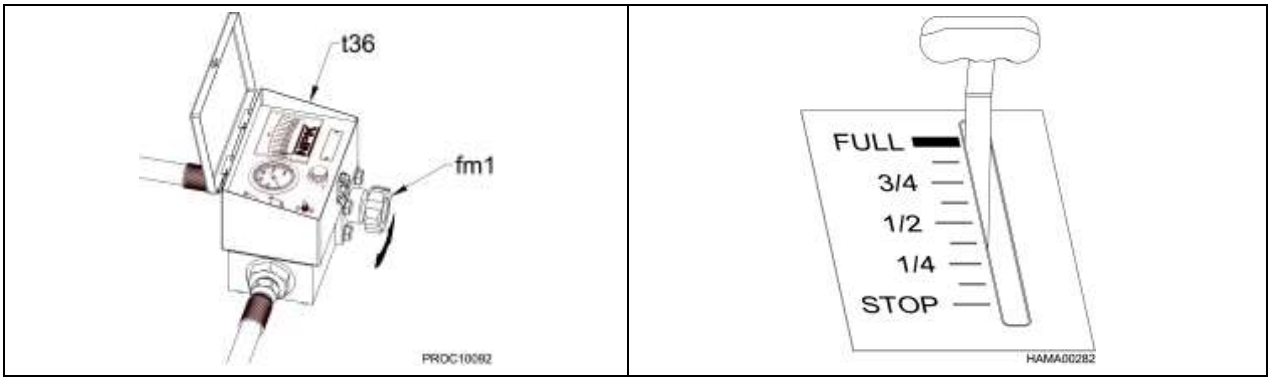
2. **Determine the return line pressure** *(pressure drop)*.
   Open both shut-off valves (k4) and energize the CRUSHER close switch. Measure the pressure on the flow meter gauge (fm2) with the load valve (fm1) in the fully open position.

TROUBLESHOOTING

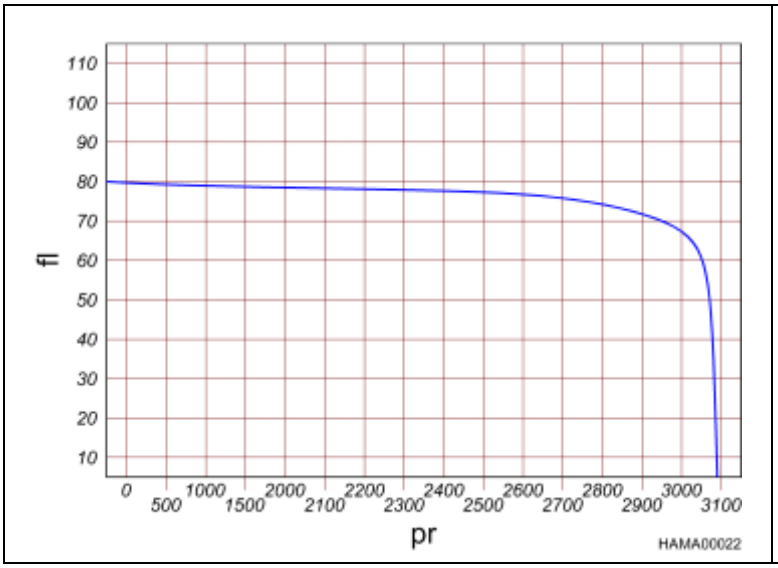
CHECKING THE HYDRAULIC FLOW AT RATED PRESSURE

3. Determine the circuit relief valve pressure and oil flow.

NOTE: *First, warm the carrier's hydraulic system to operating temperature.* Measure the flow and pressure with the loading flow meter (t36). Adjust the load valve (f1) to zero restriction *(fully open)*. Set the engine throttle to the maximum *(full)* position. Energize CRUSHER to close switch.



Slowly turn the loading valve knob (fm1) clockwise and record the pressure and flow at regular pressure intervals (pr) on graph paper. Record pressure on one axis of the graph and flow (fl) on the other. This is the circuit flow chart. Refer to the **"MODEL SPECIFICATIONS"** section of this manual for the correct flow at 1000 psi (70 bar).



fl	FLOW (gpm)
pr	PRESSURE (psi)

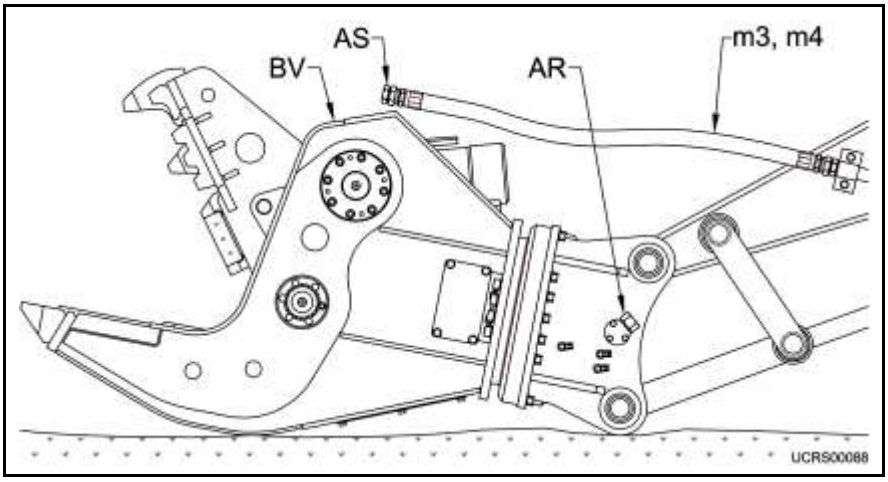
TROUBLESHOOTING

JAW DRIFT

- Some jaw drift may be experienced depending on the CRUSHER's position.
- Acceptable drift may occur over a number of minutes.
- Rapid drift may indicate a problem with the CRUSHER's cylinder, booster, or swivel manifold. The problem could also be in the carrier's hydraulic circuit.

TO DETERMINE IF THE JAW DRIFT IS WITH THE CRUSHER OR THE CARRIER

1. Remove the hoses (m3 and m4) from the joint fittings on the outside of the CRUSHER's frame and close the shut-off valves on the carrier.
2. Cap (AR) the joint fittings and plug (AS) the hoses. Fitting size is 20 JIC.



- **IF THE JAW DRIFTS:** The problem is in the cylinder, intensifier pilot checks or internal leakage in the swivel manifold of the CRUSHER (BV).
- **IF NO DRIFT OCCURS:** The problem is in the carrier's main control valve. Contact your carrier dealer.
  NOTE: *Drift due to the main control valve internal leakage may be inherent to the carrier and not repairable.*

TROUBLESHOOTING

ROTATION

The rotation speed is a direct result of the amount of flow (gpm – lpm) supplied by the rotation hydraulic circuit of the carrier. The chart below lists the recommended rotation speed and approximate flow required for your CRUSHER.

MODEL	ROTATION SPEED	APPROXIMATE FLOW		CARRIER RELIEF VALVE SETTING	
	rpm	**gpm**	***(lpm)***	**psi**	***(bar)***
U21JR	6.5 - 10	2.5 - 4	*(10 - 15)*	3,000	*(205)*
U31JR	6.5 - 10	2.5 - 4	*(10 - 15)*	3,000	*(205)*
U45JR	6 - 9	5 - 8	*(20 - 30)*	3,000	*(205)*
G30JR	6 - 9	2.5 - 4	*(10 - 15)*	3,000	*(205)*

Adjust the rotation flow so that the rpm is within the guidelines shown for the model number you have.

Flows are checked at a normal operating pressure of 1000 psi *(70 bar)*. The relief listed in the above chart is only necessary to protect the rotation supply componentry.

NOTE: ***The rotation motor drain line is to be routed straight to tank. Maximum back pressure must NOT exceed 150 psi (10 bar).***

TROUBLESHOOTING

ROTATION

⚠ CAUTION

Excessive rotation speed will result in damage to the hydraulic motor, pinion gear, and slewing ring.

ROTATION

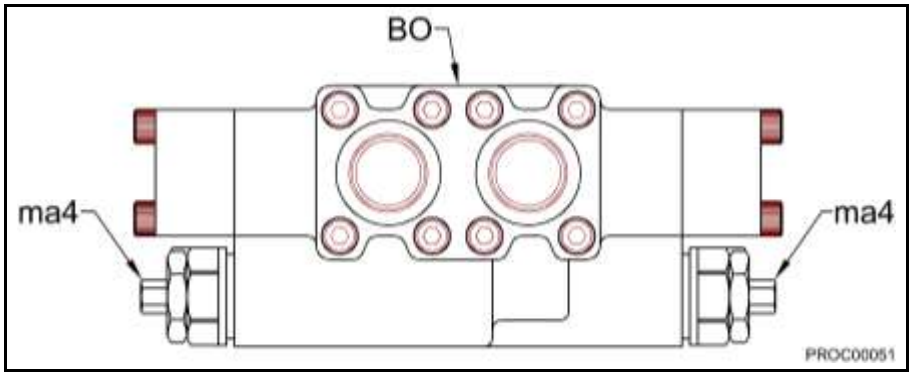
PROBLEM	CAUSE	CHECK	REMEDY
Unit will not rotate.	Low or no flow	Check hydraulic flow. (See *CRUSHER rotation flow specifications*.)	Adjust rotation hydraulic circuit flow setting.
	Pressure setting of CRUSHER rotation counterbalance valves.	Check counterbalance valve pressure settings for both directions.	adjust counterbalance valve pressure settings.
			Replace counterbalance valve.
	Broken pinion gear or hydraulic motor shaft.	Check pinion gear and hydraulic motor shaft.	Replace pinion gear or hydraulic motor.
Unit will not hold position.	Pressure setting of CRUSHER rotation counterbalance valves.	Check counterbalance valve pressure settings for both directions.	Adjust counterbalance valve pressure settings.
			Replace counterbalance valve.
	Broken pinion gear or hydraulic motor shaft.	Check pinion gear and hydraulic motor shaft.	Replace pinion gear or hydraulic motor.

TROUBLESHOOTING

ROTATION

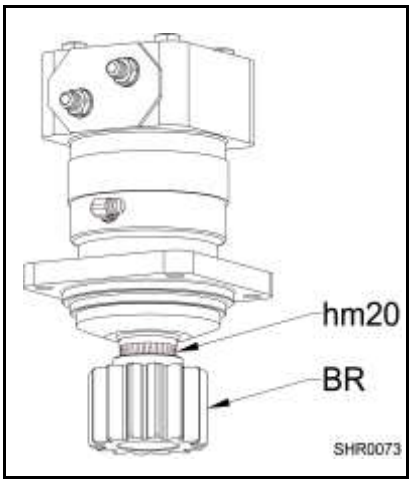
IF THE UNIT WILL NOT ROTATE

1. Check the rotation circuit hydraulic flow per the chart above.
   a. If the flow is within specification, install gauges into the rotation hydraulic circuit hose lines.
   b. Position the attachment so it will not rotate.
   c. Attempt to rotate the unit in both directions. Each gauge should read 2000 psi *(138 bar)*.
   d. If 2000 psi (138 bar) is not achieved, adjust the cross-port relief valve cartridges (ma4) on the counterbalance valve (BO).



   e. If adjustment is not possible, call the NPK Service Department at (440) 232-7900.

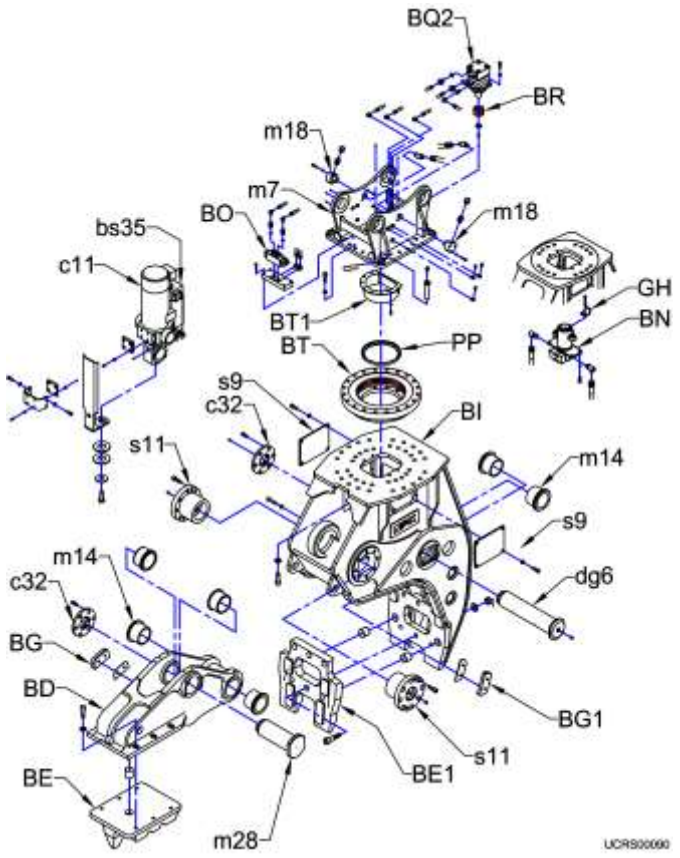
2. Check motor shaft and pinion gear.



UNIT WILL NOT HOLD POSITION

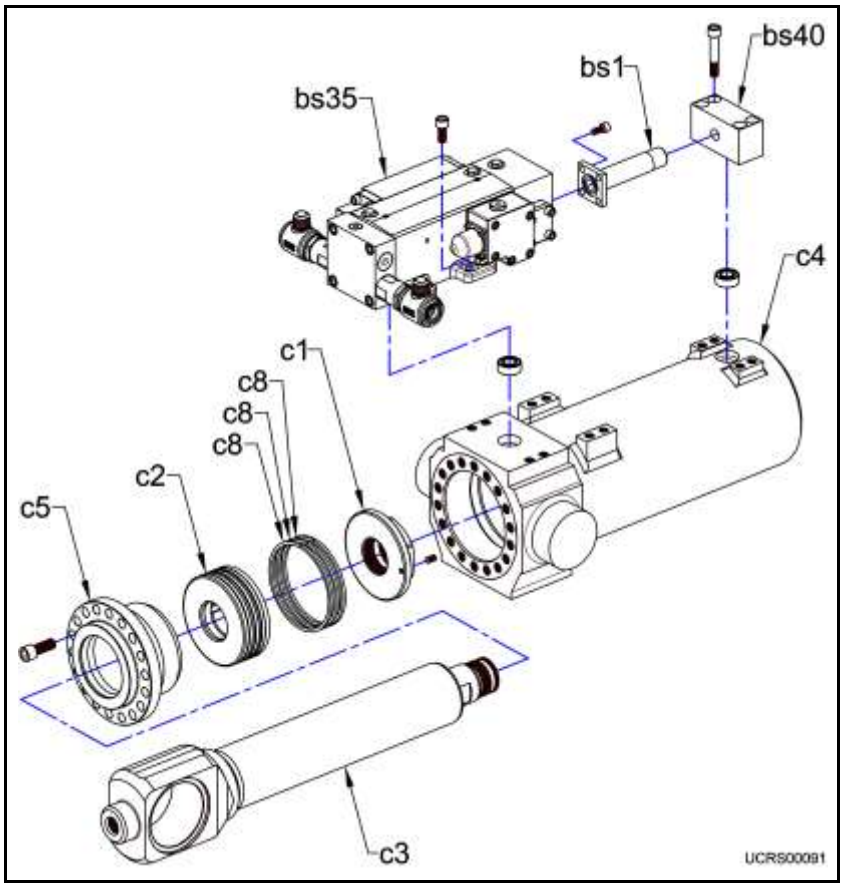
Follow steps 1a through 1e above.

KEYWORDS FOR COMMON CRUSHER COMPONENTS



BD	MALE JAW
BE	TOOTH PLATE (male jaw)
BE1	TOOTH PLATE (main frame)
BG	PRIMARY BLADE
BG1	SECONDARY BLADE
BI	MAIN FRAME
BN	ROTARY JOINT ASSEMBLY
BO	ROTATION VALVE
BQ2	HYDRAULIC MOTOR
BR	PINION GEAR
bs35	BOOSTER ASSEMBLY
BT	SLEWING RING
BT1	SLEWING RING COVER
c11	CYLINDER ASSEMBLY
c32	PIVOT PIN NUT
dg6	ARM PIN
GH	STOP PLATE
m 7	TOP BRACKET
m14	BUSHING
m18	JOINT FITTING
m28	CYLINDER ROD PIN
PP	SEAL
s 9	COVER PLATE
s11	FLANGE

KEYWORDS FOR COMMON CRUSHER CYLINDER COMPONENTS



bs1	CONNECTOR PIPE
bs35	BOOSTER ASSEMBLY
bs40	BLOCK
c1	CYLINDER ROD NUT
c2	PISTON
c3	CYLINDER ROD
c4	CYLINDER MAIN BARREL
c5	CYLINDER END CAP
c8	PISTON RING

WARRANTY STATEMENTS

"Use Genuine NPK Parts" 10/18

NPK WARRANTY

BOOM MOUNTED MATERIAL PROCESSORS, CONCRETE CRUSHERS, AND SHEARS

APPLICATION FOR WARRANTY MUST BE MADE WITHIN 30 WORKING DAYS OF FAILURE / REPAIR.

BASE WARRANTY (6 months or 600 hours)

NPK CONSTRUCTION EQUIPMENT, INC. ("NPK") warrants that Boom Mounted Material Processors, Concrete Crushers, and Shears sold by NPK will be free from defects in material or workmanship for a period of six (6) months or 600 operating hours, whichever occurs first, starting from the date of delivery to the first user.

THIS WARRANTY DOES NOT APPLY TO:

- HYDRAULIC and MOUNTING INSTALLATION KIT PARTS, HOSES, or REPLACEMENT PARTS, which are covered by other warranties.

NPK RESPONSIBILITY

NPK will, at its option, repair or replace with a new or reconditioned part, any warranted part that fails by reason of defective material or workmanship, free of charge delivered at a place of business of an NPK Dealer. Note: Parts replaced under warranty become the property of NPK.

During the six (6) month or 600 hour BASE WARRANTY period, NPK will pay the cost of labor at 75% of the posted shop rate that is necessary to install any repaired or replacement part during normal working hours. Overtime rates and travel expenses will not be reimbursed.

USER RESPONSIBILITY

- ***Photos must accompany all warranties submitted to NPK. These photos can be 35mm, polaroid, or digital.***
- The installer, user, operator, repairer, assumes responsibility to read, understand and comply with NPK's written INSTALLATION, OPERATOR, SERVICE and WELDING INSTRUCTIONS.
- Returning Warranty Registration to NPK at the time of installation.
- All costs associated with transporting the boom mounted material processor, concrete crusher, or shear or equipment to which the boom mounted material processor, concrete crusher, or shear is installed, to an authorized NPK Dealer or other authorized location. NPK is not responsible for any expense incurred in field repair.
- Supplying a hydraulic oil sample from the carrier machine upon request by NPK.

THESE WARRANTIES DO NOT COVER FAILURES RESULTING FROM:

- Installation, alteration, operation, maintenance, repair or storage which NPK judges improper.
- Not performing DAILY VISUAL INSPECTIONS as specified in the NPK MANUALS.
- Exceeding the steel cutter wear limit.
- Failures resulting from jaw / tooth wear that is beyond the limits as specified in the NPK Service or Instruction Manuals.
- Not following the NPK recommended welding procedure.
- Operation after discovery of defective or worn parts.
- Unreasonable delay in making a repair after being notified of a potential product problem.

THESE WARRANTIES SPECIFICALLY EXCLUDE:

- Installations not approved by NPK.
- Hardface welding to build up wear surfaces.
- Replacement due to wear, e.g. crusher jaws and steel cutter.
- Repairs by other than an authorized NPK Dealer.
- Any attachment or alteration to the crusher jaws.
- Use of parts not sold by NPK. **THE USE OF "WILL FIT" PARTS WILL VOID ALL NPK WARRANTIES.**
- Labor charges that are deemed excessive by NPK.
- Parts shipping charges in excess of those which are usual and customary. (Air freight, unless pre-approved, will not be covered.)
- Duties, brokerage fees, and local taxes.

WARRANTY REPAIRS DO NOT EXTEND THE STANDARD WARRANTY PERIOD.

LIMITATIONS AND EXCLUSIONS

Violation of any federal, provincial, state or local laws, ordinances, rules or regulations, or removal or alteration of product serial numbers void NPK's written product warranties. ***Application for warranty must be made within 30 days of failure / repair.***

THIS PRODUCT MUST BE USED IN A SAFE AND LAWFUL MANNER IN COMPLIANCE WITH APPLICABLE OSHA REGULATIONS.

The written product warranties made by NPK set forth NPK's only obligations with respect to any claims of failure, defects or deficiencies in products sold by NPK. **NPK MAKES NO OTHER WARRANTIES OR REPRESENTATIONS WHATSOEVER, EXPRESS OR IMPLIED, OF THE QUALITY, PERFORMANCE, DURABILITY, MATERIALS, WORKMANSHIP, SUITABILITY, CONDITION, DESIGN OR UTILITY OF PRODUCTS SOLD BY NPK, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, ALL SUCH OTHER WARRANTIES AND REPRESENTATIONS BEING HEREBY EXPRESSLY EXCLUDED. NPK SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, COSTS, LOSSES OR LIABILITIES ON ACCOUNT OF DELAY OR DOWNTIME.**

DISCLAIMER REGARDING OTHER REPRESENTATIONS OR WARRANTIES

No person is authorized to grant any other warranties or to assume any other liability on NPK's behalf unless made or assumed in writing by an officer of NPK. No person is authorized to grant any warranties or to assume any liabilities on the seller's behalf unless made or assumed in writing by the seller.

Internet: www.npkce.com
As used in this warranty the term NPK means NPK CONSTRUCTION EQUIPMENT, INC., WALTON HILLS, OHIO, U.S.A.

WARRANTY STATEMENTS

"Use Genuine NPK Parts" 6/08

NPK WARRANTY REPLACEMENT PARTS

APPLICATION FOR WARRANTY MUST BE MADE WITHIN 30 WORKING DAYS OF FAILURE / REPAIR.

REPLACEMENT PARTS WARRANTY (90 days)

NPK CONSTRUCTION EQUIPMENT, INC. ("NPK") warrants that new Replacement Parts sold by NPK will be free from defects in material or workmanship for a period of ninety (90) days, starting from the date of installation. NPK Replacement Parts Warranty ***does not*** cover labor or travel expenses. Note: Unexpired New Product Warranty has priority over Replacement Parts Warranty.

THIS WARRANTY DOES NOT APPLY TO:

- Wear items such as upper and lower tool bushings, impact ring, retaining bars and pins.
- Tools (covered under separate Tool Warranty).

NPK RESPONSIBILITY

NPK will, at its option, repair or replace with a new or reconditioned part, any warranted part that fails by reason of defective material or workmanship, free of charge delivered at a place of business of an NPK Dealer. Note: Parts replaced under warranty become the property of NPK.

USER RESPONSIBILITY

- ***Photos must accompany all warranties submitted to NPK. These photos can be 35mm, polaroid, or digital.***
- The installer, user, operator, repairer, assumes responsibility to read, understand and comply with NPK's written INSTALLATION, OPERATOR and SERVICE INSTRUCTIONS.
- All labor costs.
- Any expense incurred by field repair.
- Supplying a hydraulic oil sample from the carrier machine upon request by NPK.

THESE WARRANTIES DO NOT COVER FAILURES RESULTING FROM:

- Installation, alteration, operation, maintenance, repair or storage which NPK judges improper.
- Not performing DAILY VISUAL INSPECTIONS and/or RETIGHTENING of fasteners after initial 20 operating hours after repair.
- Exceeding the tool and/or tool bushing wear limit.
- Underwater operation.
- Operation after discovery of defective or worn parts.
- Unreasonable delay in making a repair after being notified of a potential product problem.

THESE WARRANTIES SPECIFICALLY EXCLUDE:

- Installations not approved by NPK.
- Replacement due to normal wear.
- Use of parts not sold by NPK. **THE USE OF "WILL FIT" PARTS WILL VOID ALL NPK WARRANTIES.**
- Parts shipping charges in excess of those which are usual and customary. (Air freight, unless pre-approved, will not be covered.)
- Duties, brokerage fees, and local taxes.

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DISCLAIMER REGARDING OTHER REPRESENTATIONS OR WARRANTIES

No person is authorized to grant any other warranties or to assume any other liability on NPK's behalf unless made or assumed in writing by an officer of NPK. No person is authorized to grant any warranties or to assume any liabilities on the seller's behalf unless made or assumed in writing by the seller.

Internet: www.npkce.com

As used in this warranty the term NPK means NPK CONSTRUCTION EQUIPMENT, INC., WALTON HILLS, OHIO, U.S.A.

NOTES

NPK SECONDARY CONCRETE CRUSHER

MODEL NUMBER _____

SERIAL NUMBER _____

NPK INSTALLATION KIT NUMBER _____

EXCAVATOR MANUFACTURER	
MODEL NUMBER	
SERIES	
SERIAL NUMBER	

DATE OF INSTALLATION _____

DATE OF 20 HOUR INSPECTION _____ WARRANTY REGISTRATION SENT ❑

SERVICE RECORD

	DATE

NPK
7550 INDEPENDENCE DRIVE WALTON HILLS, OHIO 44146
PHONE: 440-232-7900 FAX: 440-232-6294

