KELLY TILLAGE SYSTEM HYDRAULIC SEQUENCE VALVES

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Kelly Tillage welcomes feedback. Should you have any difficulties that you wish to raise, suggestions for improvement or modifications that you feel would enhance our products we look forward to hearing from you.

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KELLY TILLAGE SYSTEM
HYDRAULIC SEQUENCE VALVES

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SEQUENCE VALVE OVERVIEW

Hydraulic flow setting on tractor must be set to 20% - Max flow 8 gallons per minute

The sequencing valve manifold incorporated in Kelly Tillage Diamond Series Chain Harrow provides simple and reliable operation. The manifold is pressure sensitive, once set right it will give many years of trouble free service. If operating conditions change it may be necessary to make adjustments to various valves. This section should help you trouble shoot any problems and make the appropriate adjustments. At the beginning of the section are the factory settings, should you need to start again.

Like all hydraulic components the main enemy is contamination. Care should be taken at all times to prevent contamination entering the hydraulic circuit. Self-cleaning line filters are fit- ted to the tractor hoses on the pressure section of the manifold.

The valve manifold controls the folding and unfolding of the Diamond Chain Harrow. One or Two pairs of hoses connect the valve manifold to the tractor. One pair operates the tail and module circuit. The other pair fold and unfold the wings. Only newer models have the second pair for the tail. A third pair of hoses operate the tongue cylinder.

Oil is directed to the first stage of a fold or unfold sequence. When the cylinders reach the end of their stroke and pressure mounts, a sequence valve is triggered allowing oil to flow to the next stage. The sequence valves automatically reset themselves when system pressure allows.

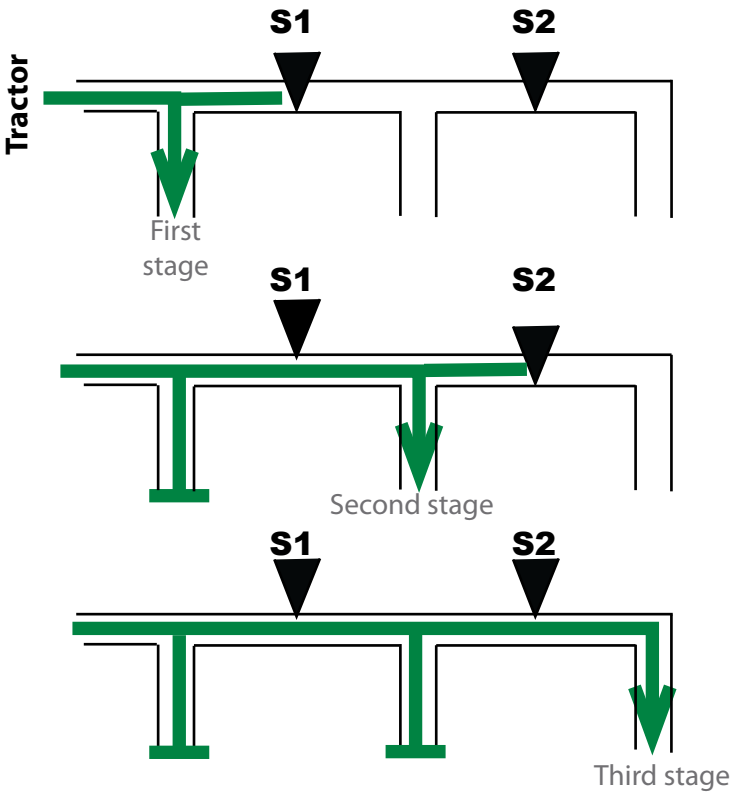
The valve manifold incorporates over-center or counterbalance valves as a safety measure. These O/C valves prevent the tail or wings from falling in the event that one of the tractor hoses should fail, manage smooth folding and hold the wings straight out in their working position. The newest type manifolds incorporate pressure control valves to prevent damage to the machine in case things go wrong when folding.

Note. The valve manifold has a maximum flow capacity of 8 Gallons (US) per minute (30Lpm).

For the purposes of this instruction view all directions as though standing behind the machine looking forward.

SEQUENCE VALVE MANIFOLD - FLOW CHART

FOLD



Step 1 -Raise Tail and Modules fully.

Step 2 -Raise wings until folded

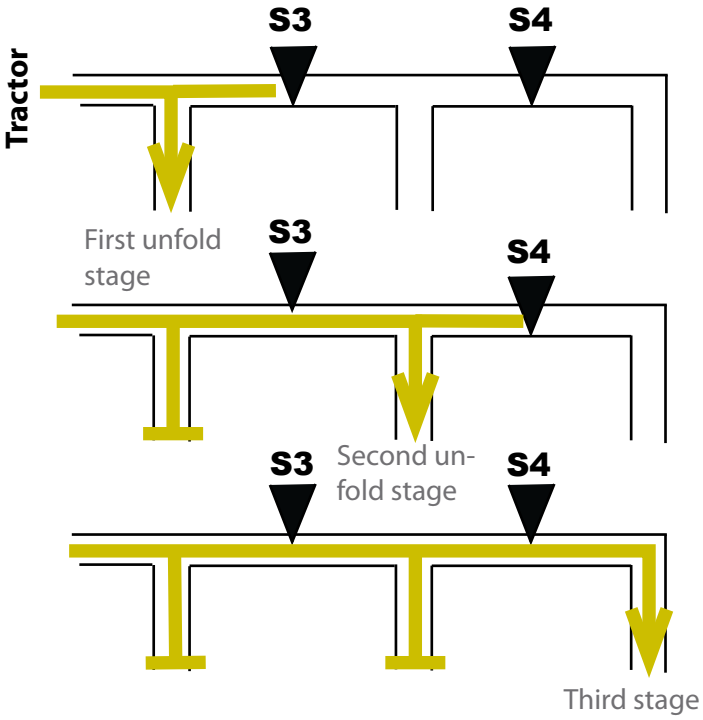
Stage 1
S1 closed S2 closed
Oil is flowing to main wing cylinders

Stage 2
S1 open, S2 closed.
Oil is flowing to left outer wing

Stage 3
S1 & S2 open.
Oil is flowing to right outer wing

Step 3 -Raise front tongue assembly fully

UNFOLD



Step 1 -Lower front tongue assembly to working position.

Step 2 -Unfold wings fully

Stage 1
S3 closed.
Oil is flowing to right outer wing

Stage 2
S3 open, S4 closed.
Oil is flowing to left outer wing

Stage 3
S3 open, S4 open.
Oil is flowing to main wings, modules and tails

Step 3 -Lower Tail and Modules fully.

EXPLANATION OF VALVE FUNCTION

Main wing fold circuit

E Flow controller to increase or decrease oil flow for extending (unfolding) wing fold cylinders

R Flow controller to increase or decrease oil flow for retracting (folding) wing fold cylinders

PR Pressure reducing valve to protect right wings when folding

PL Pressure reducing valve to protect left wings when folding

S1 Sequence valve that remains closed until main cylinders are closed. (inner wings fold vertical) It then opens to allow left outer wing to fold.

S2 Sequence valve that remains closed until left outer wing is folded. Then opens to allow right outer wing to fold.

S3 Sequence valve that remains closed until right outer wing unfolds to vertical. It then opens to al low left outer wing to unfold.

S4 Sequence valve that remains closed until left outer wing unfolds to vertical. It then opens to allow main wing cylinders to extend and unfold both main wings to working position.

L1 Over Centre valve that holds main wings in position if tractor hose fails. Prevents wings falling.

L3 Over Centre valve that holds the right wings out straight when working.

L4 Over Centre valve that holds the left wings out straight when working.

C1 Check valve for return oil from right outer wing unfold. Can seem like S2 problem

C2 Check valve for return oil from left outer wing fold. Can seem like S3 problem

C3 Check vale for return oil from left outer wing unfold. Can seem like S1 problem

C4 C5 Check valve for return oil from main wing cylinder folding. Can seem like S4 problem

Note - Check valves are located on back face of some manifolds. Not all valves are installed in all manifold models.

Tail & Module circuit

L2 Over Centre valve that holds tail in raised or partially raised position

L5 Over Centre valve that holds the two centre module chains up for transport & storage.

Factory setting: Table for sequence valve manifolds.

Valve number	Factory setting - turns counter clockwise from bottoming out	To increase pressure - turn :	To decrease pressure - turn :
PR	6 1/8	Clockwise	Counter clockwise
PL	6 1/8	Clockwise	Counter clockwise
S1	2 1/2	Clockwise	Counter clockwise
S2	3 1/8	Clockwise	Counter clockwise
S3	3 1/8	Clockwise	Counter clockwise
S4	2 3/4	Clockwise	Counter clockwise
L1	1/2	Counter clockwise	Clockwise
L2	1 3/4	Counter clockwise	Clockwise
L3	1 1/2	Counter clockwise	Clockwise
L4	1 1/2	Counter clockwise	Clockwise
L5	1 3/4	Counter clockwise	Clockwise

Valve number	Factory setting - turns counter clockwise from bottoming out	To increase flow - turn :	To decrease flow - turn :
E	5	Counter clockwise increases flow. One turn is 4 gpm	Clockwise reduces flow. One turn is 4 gpm
R	5	Counter clockwise increases flow. One turn is 4 gpm	Clockwise reduces flow. One turn is 4 gpm

These settings are true or a very good starting point for all valves regardless of manifold model. Note that not all valves are installed in older models' manifolds.

HF111938-16, V12 - split circuit

Adjusting Sequence Valve (HF111938-16, V12 - split circuit)

Fits the 9m, 40, 12m, 4012, 45, 46, 60, 62, 62HDX and 80' Kelly Tillage System.

Valve block model # is on the left end of the valve block, toward the front.
Internal filters located on left and right ends and underside of valve block.

Make sure tail hoses are on TR1 and TE1.

1) Slow down the flow of the tractor hydraulics to 20% or about 8-10gpm.
2) It may be necessary to remove extra weight such as mud build-up on disc

Identify if the problem is on the folding or unfolding sequence.
Unfolding= extend and Folding= retract

Folding problems
This valve block is split into two circuits. One set of hoses controls the raising and lowering of the tail and modules independent from the wing fold.
Raise the tail first. Then loosen the jam nut on the sequence valve cartridges S1 and S2. Increase valve pressure settings by screwing in S1 and S2 (clockwise) until they bottom out. Activate the folding circuit with the tractor control valve. The main wings will raise/fold. The left and right outer wings will not fold. Screw out S1 (counter clock-wise) until the left outer wing folds then give it another ½ turn. Next, the right outer wing will not fold. Screw out S2 (counter clockwise) until the right outer wing folds then give it another ½ turn.

Unfolding problems
Before unfolding, check to make sure the discs are not caught on the M brackets or other carrier arms. Loosen the jam nut on the sequence valve cartridges S3 and S4. Screw in S3 and S4 (clockwise) until they bottom out. Now activate the unfolding circuit with the tractor control valve. The right outer wing will unfold and nothing else with move. Screw out S3 (counter clock-wise) until the left outer wing unfolds then give it another ½ turn. Next, the main wings will not unfold. Screw out S4 (counter clock-wise) until the main wings unfold, then give it another ½ turn.
Since the valve block is split into two parts, you will need to now activate the tail circuit to lower the tail and modules.
When multiple tractors are to be used, set valves to the tractor that has the lowest pressure (most times the oldest tractor).

If the above adjustments have been made and there are still problems, you may want to look at the other check valves and over/center valves.
Bottom out the valves (clockwise) and then back out (counter-clockwise):

Over/Center valves

L1 – 1 ¾ turns out; controls main wings from free fall

L2 – 1 ¾ turns out; controls tail, holds it up for storage and transport

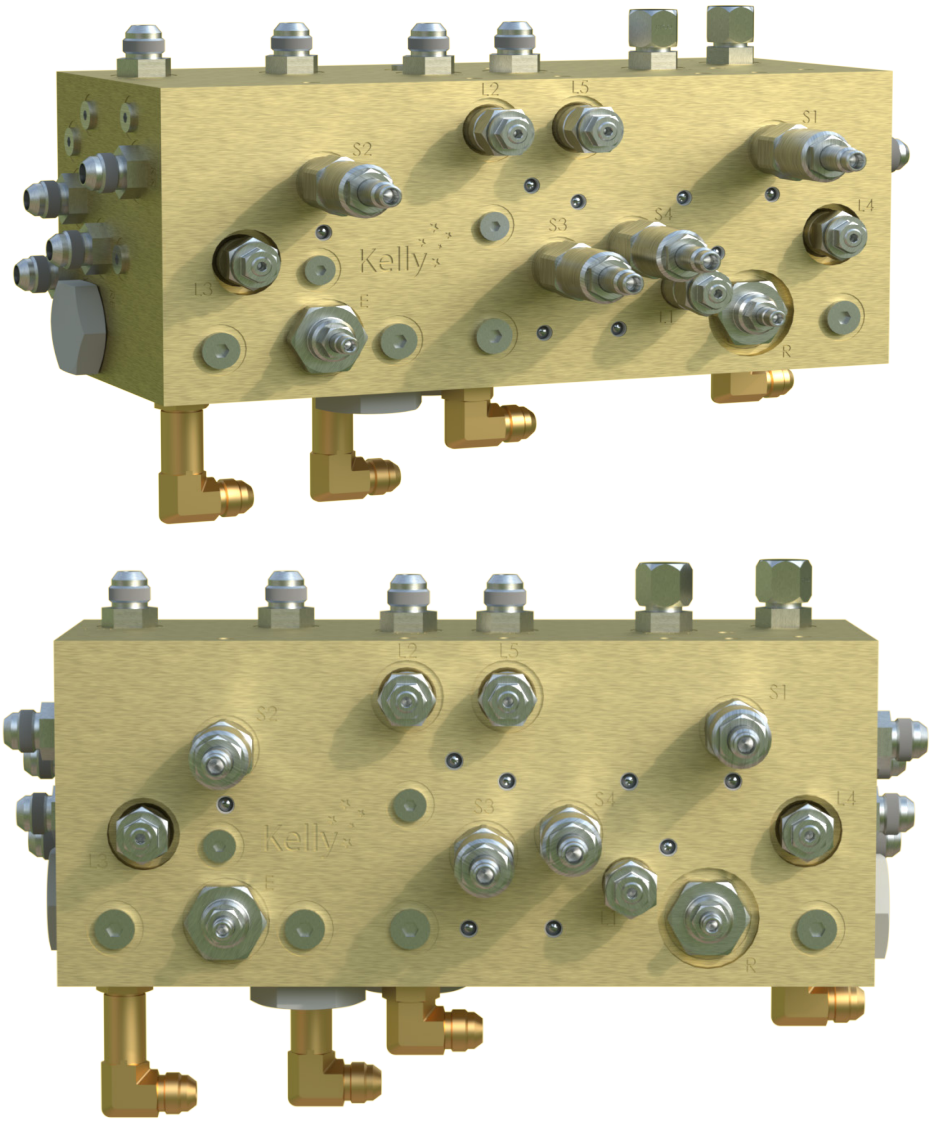
L3 – 1 ¾ turns out; controls lock up on RH outer wing

L4 – 1 ½ turns out; controls lock up on LH outer wing

L5 – 1 ½ turns out; controls modules, holds them up for storage and transport

If a check valve is open due to contamination, the symptom will be as though the corresponding sequence valve is open.

C1 - is the check valve to bypass around S2 (right outer wing) on the folding circuit
C2 - is the check valve to bypass around S3 (left outer wing) on the unfolding circuit
C3 - is the check valve to bypass around S1 (left outer wing) on the folding circuit
C4 - is the check valve to bypass around S4 (main wing) on the unfolding circuit



111938

290509, V10 split circuit

Adjusting Sequence Valve (290509, v10 split circuit) for the 40, 45, 50, 60, 62, 65 Kelly Diamond Harrow

Valve block model # is on the top of the valve block, toward the back.
L5 has a counterbalance valve installed.

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Make sure tail hoses are on TR1 and TE1

1) Slow down the flow of the tractor hydraulics to 20% or about 8-10 gpm.
2) It may be necessary to remove extra weight such as mud buildup on discs.

Identify if the problem is on the folding or unfolding sequence. Unfolding= extend and Folding= retract

Folding problems
This valve block is split into two circuits. One set of hoses controls the raising and lowering of the tail and modules independent from the wing fold.
Raise the tail first. Now loosen the jam nut on the sequence valve cartridges S1 and S2. Increase valve pressure settings by screwing in S1 and S2 (clockwise) until they bottom out. Activate the folding circuit with the tractor control valve. The main wings will raise/fold. The left and right outer wings will not fold. Screw out S1 (counter clock-wise) until the left outer wing folds then give it another ½ turn. Next, the right outer wing will not fold. Screw out S2 (counter clock-wise) until the right outer wing folds then give it another ½ turn.

Unfolding problems
Before unfolding, check to make sure the discs are not caught on the M brackets or other carrier arms. Loosen the jam nut on the sequence valve cartridges S3 and S4. Screw in S3 and S4 (clockwise) until they bottom out. Now activate the unfolding circuit with the tractor control valve. The right outer wing will unfold and nothing else with move. Screw out S3 (counter clock-wise) until the left outer wing unfolds then give it another ½ turn. Next, the main wings will not unfold. Screw out S4 (counter clock-wise) until the main wings unfold, then give it another ½ turn.
Since the valve block is split into two parts, you will need to now activate the tail circuit to lower the tail and modules.
When multiple tractors are to be used, set valves to the tractor that has the lowest pressure (most times the oldest tractor).

If the above adjustments have been made and there are still problems, you may want to look at the other check valves and over/center valves.
Bottom out the valves (clockwise) and then back out (counter-clockwise):

Over/Center valves

L1 – 1 ¾ turns out; controls main wings from free fall

L2 – 1 ¾ turns out; controls tail to go down last and up first L3 – 1 ¾ turns out; controls lock up on RH outer wing

L4 – 1 ½ turns out; controls lock up on LH outer wing

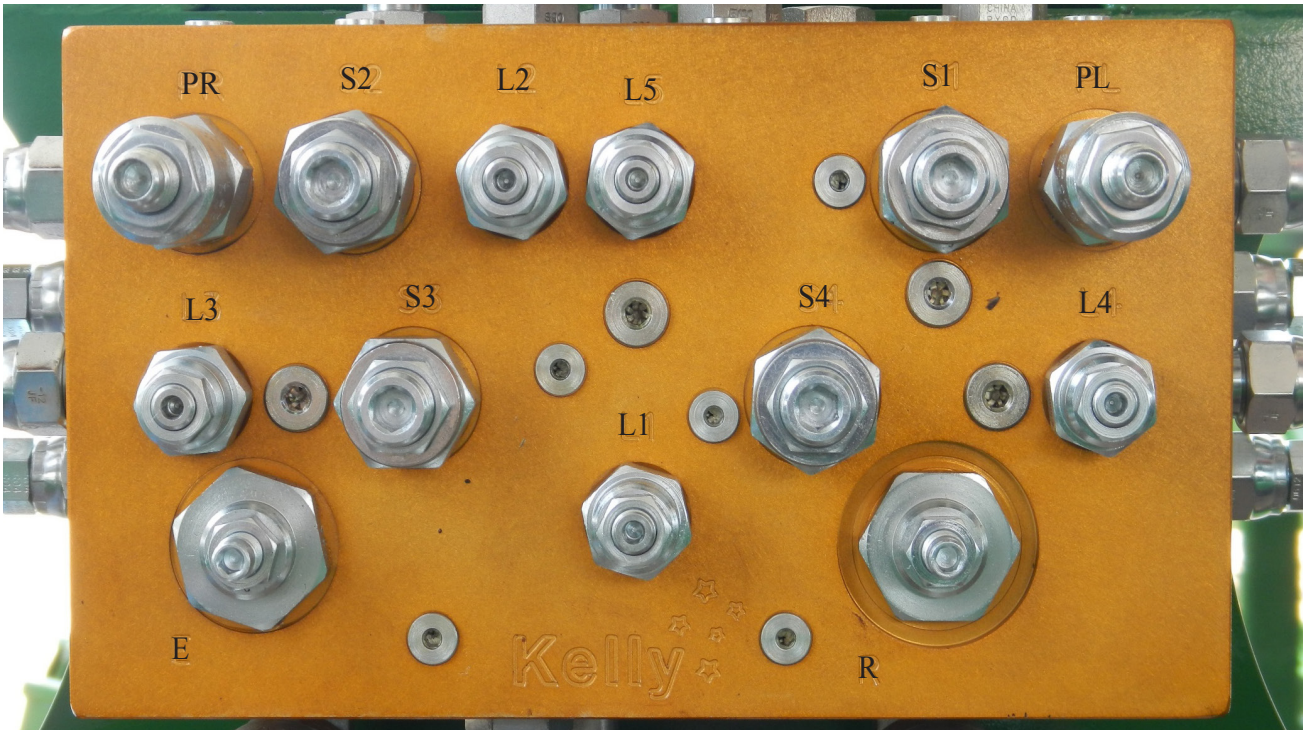
L1 & L2 are related…if you over do one it will affect the other one.

If a check valve is open due to contamination, the symptom will be as though the corresponding sequence valve is open.

C1- is the check valve to bypass around S3 (left outer wing) on the unfolding circuit C2- is the check valve to bypass around S2 (right outer wing) on the folding circuit C3- is the check valve to bypass around S1 (left outer wing) on the folding circuit

C4- is the check around the flow control (full flow in the folding circuit) located on back of block

C5- is the check valve to bypass around S4 (main wing) on the unfolding circuit



290509

290430, V9 split circuit

Adjusting Sequence Valve (290430, v9 split circuit) for the 40', 45', 50', 60', 62, 65' Kelly Diamond harrow

Valve block model # is on the top of the valve block, toward the back. Make sure L5 has a cavity plug in it.
Make sure tail hoses are on TR1 and TE1

1) Slow down the flow of the tractor hydraulics to 20% or about 8-10 gpm.
2) It may be necessary to remove extra weight such as mud buildup on discs.

Identify if the problem is on the **folding or unfolding** sequence.
Unfolding= extend and Folding= retract

Folding problems

This valve block is split into two circuits. One set of hoses controls the raising and lowering of the tail and modules independent from the wing fold.
Raise the tail first. Now loosen the jam nut on the sequence valve cartridges S1 and S2. Increase valve pres-sure settings by screwing in S1 and S2 (clockwise) until they bottom out. Activate the folding circuit with the tractor control valve. The main wings will raise/fold. The left and right outer wings will not fold. Screw out S1 (counter clock-wise) until the left outer wing folds then give it another ½ turn. Next, the right outer wing will not fold. Screw out S2 (counter clock-wise) until the right outer wing folds then give it another ½ turn.

Unfolding problems

Before unfolding, check to make sure the discs are not caught on the M brackets or other carrier arms. Loosen the jam nut on the sequence valve cartridges S3 and S4. Screw in S3 and S4 (clockwise) until they bottom out. Now activate the unfolding circuit with the tractor control valve. The right outer wing will unfold and nothing else with move. Screw out S3 (counter clock-wise) until the left outer wing unfolds then give it another ½ turn. Next, the main wings will not unfold. Screw out S4 (counter clock-wise) until the main wings unfold, then give it another ½ turn.
Since the valve block is split into two parts, you will need to now activate the tail circuit to lower the tail and modules.

When multiple tractors are to be used, set valves to the tractor that has the lowest pressure (most times the oldest tractor).

If the above adjustments have been made and there are still problems, you may want to look at the other check valves and over/center valves.

Bottom out the valves (clockwise) and then back out (counter-clockwise):

Over/Center valves

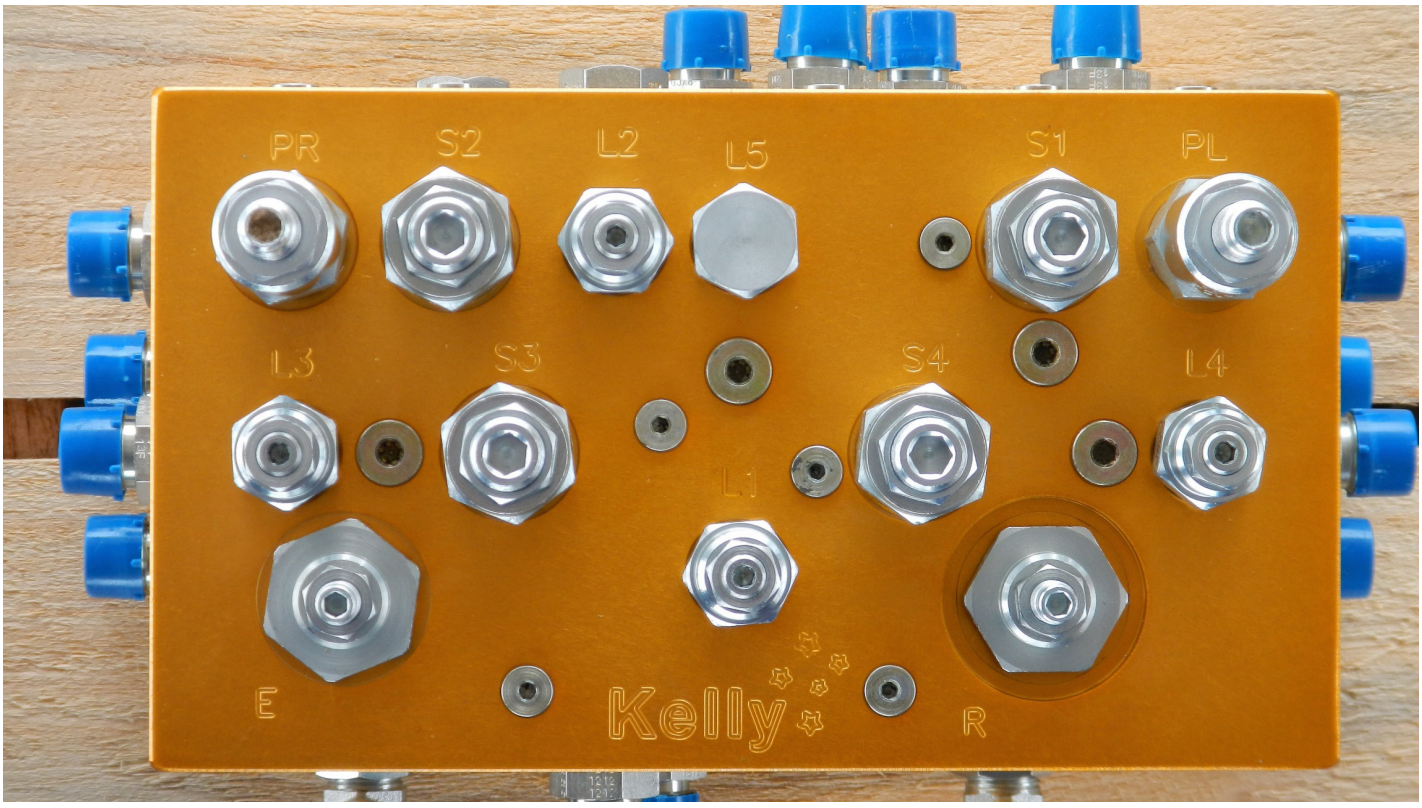
L1 – 1 ¾ turns out; controls main wings from free fall

L2 – 1 ¾ turns out; controls tail to go down last and up first
L3 – 1 ¾ turns out; controls lock up on RH outer wing
L4 – 1 ½ turns out; controls lock up on LH outer wing

L1 & L2 are related…if you over do one it will affect the other one.

If a check valve is open due to contamination, the symptom will be as though the corresponding sequence valve is open.

C1- is the check valve to bypass around S3 (left outer wing) on the unfolding circuit
C2- is the check valve to bypass around S2 (right outer wing) on the folding circuit
C3- is the check valve to bypass around S1 (left outer wing) on the folding circuit
C4- is the check around the flow control (full flow in the folding circuit) located on back of block
C5- is the check valve to bypass around S4 (main wing) on the unfolding circuit



290430

290380, V8 split circuit

Adjusting Sequence Valve (290380, v8 split circuit) for the 40', 45', 50', 60', 62, 65' Kelly Diamond harrow

1) Slow down the flow of the tractor hydraulics to 20% or about 8-10 gpm.
2) It may be necessary to remove extra weight such as mud buildup on discs.

Identify if the problem is on the folding or unfolding sequence.
Unfolding= extend and Folding= retract

Folding problems

This valve block is split into two circuits. One set of hoses controls the raising and lowering of the tail and modules independent from the wing fold.

Raise the tail first. Now loosen the jam nut on the sequence valve cartridges S1 and S2. Increase valve pressure settings by screwing in S1 and S2 (clockwise) until they bottom out. Activate the folding circuit with the tractor control valve. The main wings will raise/fold. The left and right outer wings will not fold. Screw out S1 (counter clock-wise) until the left outer wing folds then give it another ½ turn. Next, the right outer wing will not fold. Screw out S2 (counter clock-wise) until the right outer wing folds then give it another ½ turn.

Unfolding problems

Before unfolding, check to make sure the discs are not caught on the M brackets or other carrier arms.

Loosen the jam nut on the sequence valve cartridges S3 and S4. Screw in S3 and S4 (clockwise) until they bottom out. Now activate the unfolding circuit with the tractor control valve. The right outer wing will unfold and nothing else with move. Screw out S3 (counter clock-wise) until the left outer wing unfolds then give it another ½ turn. Next, the main wings will not unfold. Screw out S4 (counter clock-wise) until the main wings unfold, then give it another ½ turn.

Since the valve block is split into two parts, you will need to now activate the tail circuit to lower the tail and modules.

When multiple tractors are to be used, set valves to the tractor that has the lowest pressure (most times the oldest tractor).

If the above adjustments have been made and there are still problems, you may want to look at the other check valves and over/center valves.

Bottom out the valves (clockwise) and then back out (counter-clockwise):

Over/Center valves

L1 – 1 ¾ turns out; controls main wings from free fall

L2 – 1 ¾ turns out; controls tail to go down last and up first

L3 – 1 ¾ turns out; controls lock up on RH outer wing

L4 – 1 ½ turns out; controls lock up on LH outer wing

L1 & L2 are related…if you over do one it will affect the other one.

If a check valve is open due to contamination, the symptom will be as though the corresponding sequence valve is open.

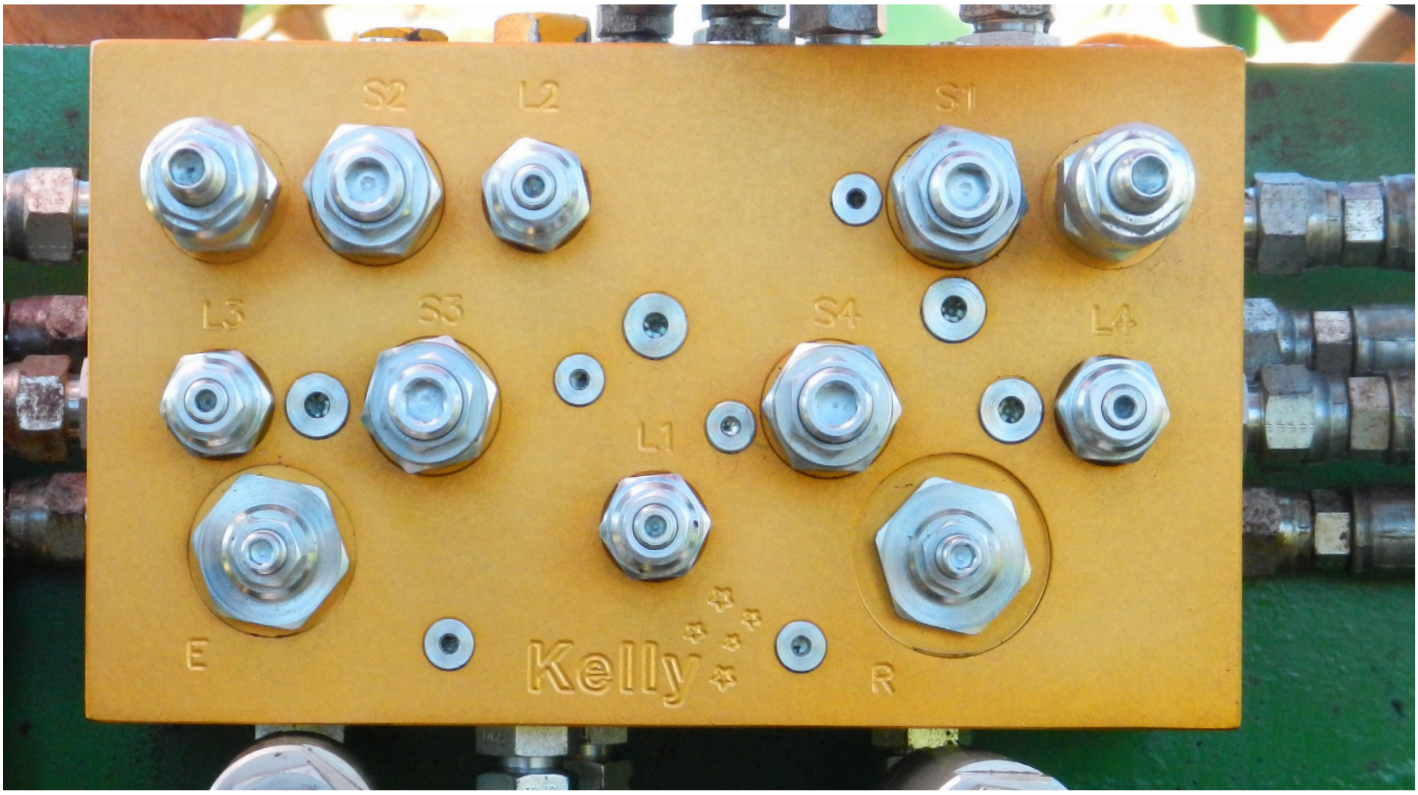
C1- is the check valve to bypass around S3 (left outer wing) on the unfolding circuit

C2- is the check valve to bypass around S2 (right outer wing) on the folding circuit

C3- is the check valve to bypass around S1 (left outer wing) on the folding circuit

C4- is the check around the flow control (full flow in the folding circuit) located on back of block

C5- is the check valve to bypass around S4 (main wing) on the unfolding circuit



290380

290179, V7 split circuit

Adjusting Sequence Valve (290179, v7 split circuit) for the 40', 45', 50', 60', 62, 65' Kelly Diamond harrow

Has 4 sequence valves in a line and an ST valve.

1) Slow down the flow of the tractor hydraulics to 20% or about 8-10 gpm.
2) It may be necessary to remove extra weight such as mud buildup on discs.

Identify if the problem is on the **folding or unfolding** sequence.
Unfolding= extend and Folding= retract

Folding problems

This valve block has a sequence valve ST to control the tail raising function. The sequence operates as ST then S1 then S2

Loosen the jam nut on the sequence valve cartridges - ST, S1 and S2. Increase valve pressure settings by screwing in ST, S1 and S2 (clockwise) until they bottom out. Activate the folding circuit with the tractor control valve.

The Tail and modules will raise up. Nothing else will move. Screw out ST (counter clock-wise) until the main wings raise/fold. The left and right outer wings will not fold. Screw out S1 (counter clock-wise) until the left outer wing folds then give it another ½ turn. Next, the right outer wing will not fold. Screw out S2 (counter clock-wise) until the right outer wing folds then give it another ½ turn.

Unfolding problems

Before unfolding, check to make sure the discs are not caught on the M brackets or other carrier arms.

Loosen the jam nut on the sequence valve cartridges S3 and S4. Screw in S3 and S4 (clockwise) until they bottom out. Now activate the unfolding circuit with the tractor control valve. The right outer wing will unfold and nothing else with move. Screw out S3 (counter clock-wise) until the left outer wing unfolds then give it another ½ turn. Next, the main wings will not unfold. Screw out S4 (counter clock-wise) until the main wings unfold, then give it another ½ turn.
The tail and modules should follow last of all. Increase pressure on L2 if tail comes down too soon. (counter-clockwise to increase pressure)

When multiple tractors are to be used, set valves to the tractor that has the lowest pressure (most times the oldest tractor).

If the above adjustments have been made and there are still problems, you may want to look at the other check valves and over/center valves.

Bottom out the valves (clockwise) and then back out (counter-clockwise):

Over/Center valves

L1 – 1 ¾ turns out; controls main wings from free fall

L2 – 1 ¾ turns out; controls tail to go down last

L3 – 1 ¾ turns out; controls lock up on RH outer wing

L4 – 1 ½ turns out; controls lock up on LH outer wing

L1 & L2 are related…if you over do one it will affect the other one.

If a check valve is open due to contamination, the symptom will be as though the corresponding sequence valve is open.

C1- is the check valve to bypass around S3 (left outer wing) on the unfolding circuit

C2- is the check valve to bypass around S2 (right outer wing) on the folding circuit

C3- is the check valve to bypass around S1 (left outer wing) on the folding circuit

C4- is the check around the flow control (full flow in the folding circuit) located on back of block

C5- is the check valve to bypass around S4 (main wing) on the unfolding circuit

290179

228712, V6

Adjusting Sequence Valve (228712, v6) for the 40', 45', 50', 60', 62, 65' Kelly Diamond harrow

1) Slow down the flow of the tractor hydraulics to 20% or about 8-10 gpm.
2) It may be necessary to remove extra weight such as mud buildup on discs.

Identify if the problem is on the folding or unfolding sequence.
Unfolding= extend and Folding= retract

Folding problems

Loosen the jam nut on the sequence valve cartridges S1 and S2. With a 5 mm Allen wrench, increase valve pressure settings by screwing in S1 and S2 (clockwise) until they bottom out. Activate the folding circuit with the tractor control valve. The tail, modules and the main wings will raise/fold. The left and right outer wings will not fold. Screw out S1 (counter clock-wise) until the left outer wing folds then give it another ½ turn. Next, the right outer wing will not fold. Screw out S2 (counter clock-wise) until the right outer wing folds then give it another ½ turn.

Unfolding problems

Before unfolding, check to make sure the discs are not caught on the M brackets or other carrier arms. Loosen the jam nut on the sequence valve cartridges S3 and S4. Screw in S3 and S4 (clockwise) until the 5mm Allen screw bottoms out. Now activate the unfolding circuit with the tractor control valve. The right outer wing will unfold and nothing else with move. Screw out S3 (counter clock-wise) until the left outer wing unfolds then give it another ½ turn. Next, the main wings, modules and tail will not unfold. Screw out S4 (counter clock-wise) until the main wings, modules and tail unfolds then give it another ½ turn.

When multiple tractors are to be used, set valves to the tractor that has the lowest pressure (most times the oldest tractor).

If the above adjustments have been made and there are still problems, you may want to look at the other check valves and over/center valves to reset them to factory settings.

Bottom out the valves (clockwise) and then back out (counter-clockwise):

Sequence valves

S1 – about 5 turns out

S2 – about 5 ½ turns out
first S3 – about 5 ¼ turns out
S4 – about 4 turns out

Over/Center valves

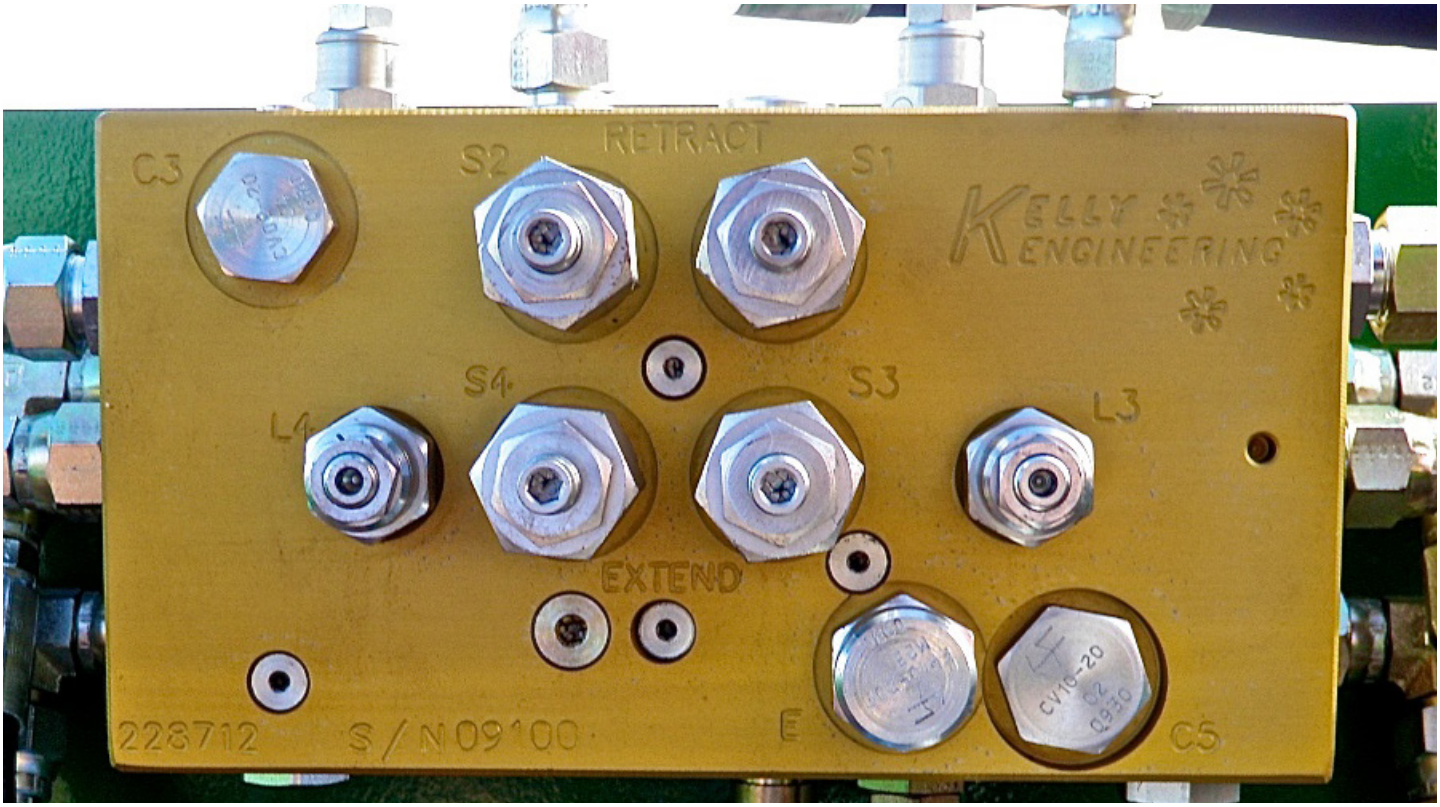
L1 – 1 ¾ turns out; controls main wings from free fall

L2 – 1 ¾ turns out; controls tail to go down last and up
L3 – 1 ¾ turns out; controls lock up on RH outer wing
L4 – 1 ½ turns out; controls lock up on LH outer wing

L1 & L2 are related…if you over do one it will affect the other one.

If a check valve is open due to contamination, the symptom will be as though the corresponding sequence valve is open.

C1- is the check valve to bypass around S3 (left outer wing) on the unfolding circuit
C2- is the check valve to bypass around S2 (right outer wing) on the folding circuit
C3- is the check valve to bypass around S1 (left outer wing) on the folding circuit
C4- is the check around the flow control (full flow in the folding circuit) located on back of block
C5- is the check valve to bypass around S4 (main wing) on the unfolding circuit



228712

MODEL 30

Sequence valve adjustment.

If attempts have been made to adjust valves without the knowledge of proper valve operations and settings, it may be best to return to the factory settings.

Bottom out the valves (clockwise) and then back out (counter-clockwise):

Left wing Over/Center (L O/C)	**1 ¾ turns out**
Right wing Over/Center (R O/C)	**1 ¾ turns out**
Tail Over/Center (T O/C1 & 2)	**2 ¼ turns out**

To further fine tune valve settings, do the following:

1) Slow down the flow of the tractor hydraulics to 20-25% or about 10 gpm.
2) It may be necessary to remove extra weight such as mud buildup on discs.

Identify if the problem is on the folding or unfolding sequence.

Folding issue

The tail and modules should come up first. If there is a plug in the S1 port, then move on to the Unfolding instructions (see figure 1). If the valve block is equipped with a sequence cartridge in the S1 port (figure 2) then loosen the jam nut on the sequence valve cartridges. With a 5 mm Allen wrench, screw in ST (clock- wise) until it bottoms out. (S1 is only used to control the folding circuit while the T O/C over/center valve is used to control the tail while unfolding.) Activate the folding circuit with the tractor control valve. The tail will raise/fold. The wings will not raise/fold. Screw out S1 (counter clock-wise) until the wings start to fold then give it another ½ turn.

In newer models Figure 3, the tail circuit is independent of the wings, ie there are two pairs of hoses con-necting the valve body to the tractor remotes.
The Tail and Module OC valves hold those items in position, either fully or partially raised.

Unfolding issue

The tail should go down last.
If the tail does not go down last then loosen the jam nut on the T O/C over/center valve cartridges. Set this valve at or about 2 ¼ turns out.
O/C valves are turned clockwise to decrease pressure and counter clockwise to increase pressure. This is backwards to how it seems like it should be.

On newer models it doesn't matter in which order the tail or modules come down, so long as this is after the wings are unfolded fully via the wing fold circuit. If tail or modules creep down during storage, increase the pressure (screw the valve counterclockwise 1/2 turn)

Figure 1

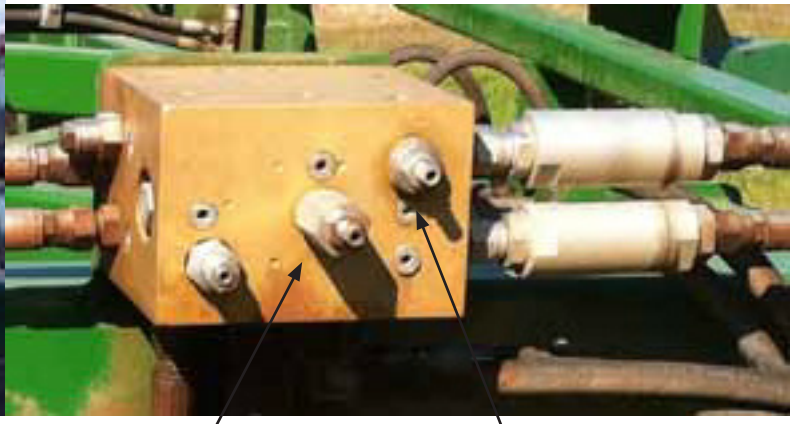


Figure 2

LO/C

TAIL SEQUENCE VALVE

R O/C

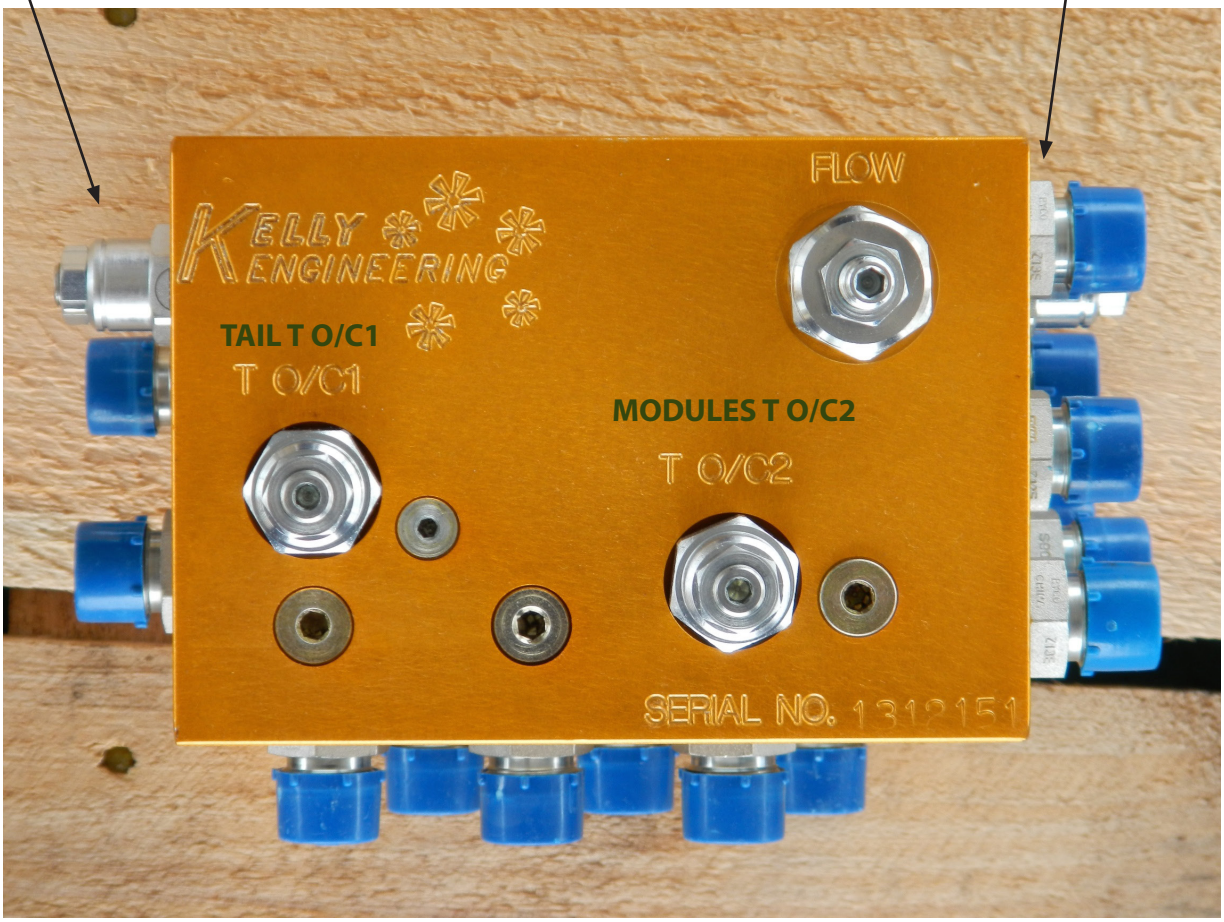


Figure 3

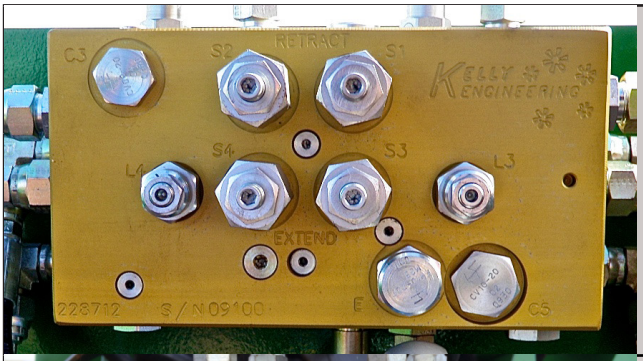
SEQUENCE VALVE MANIFOLD VERSION TABLE

Part No.	Version	Machine	Start	Sequence Valve	Qty	Pressure Relief	Qty	Over Centre	Qty	Comment
288253	5	40,45,50,60,	Mar-05	BO4C3H-Z-N-587	4			E2B-O4O-Z-N	4	BO4C3H-Z-N-587 is interchangeable with 505095
288712	6	40,45,50,60	Jan- 07	505095	4			CBA-LHN	4	Pilot activated sequence valves
288712P	6	40,45,50,60	Sept-12	505095	4			CBA-LHN	3	Pilot activated
								CBCL-LJN	1	sequence valves
288712R	6	40,45,50,60	Nov-12	505095	4			CBA-LHN	3	Pilot activated
								CBCL-LJN	1	sequence valves
290179	7	40,45,50,60	Nov-12	PS10-36A-0-N-30	5			CBA-LHN	3	Hydraforce sequence valves.
								CBCL-LJN	1	Unique cavity configuration. There are 124 of these units in circulation. The majority in the US.
290380	8	40,45,50,60	Aug-13	PSVP-10-N-S-0-30	4	PR10-36A-	2	CBCA-LHN	1	Standard sequence valves.
						0-N-30		CBCL-LJN	1	
								CBCG-LJN	2	
290430	9	40,45,50,60	Aug -13	PSVP-10-NS-0-30	4	PR10-36A-	2	CBCA-LHN	1	Standard sequence valves.
						0-N-30		CBCL-LJN	1	
								CBCG-LJN	2	
290509	10	40,45,50,60	Aug -13	PSVP-10-NS-0-30	4	PR1036A-0-N-30	2	CBCA-LHN	2	Standard sequence valves.
						0-N-30		CBCL-LJN	1	
								CBCG-LJN	2	
289848		30	June -11	511013	1			CBCA-LHN	3	Standard Sequence valve fitted.
290421		30	Oct -13					CBCA-LHN	4	
HF111938-16	12	9m, 12m, 40, 45, 46, 60, 62HDX, 80	Oct -17	0341-PS10-3801A-0-N-30	4			0341-4170740-D19003	1	4 internal filter elements PN: 0343-4170912
								0341-4170740-D21003	1	
								0341-4170740-D21005	1	
								0341-4170740-D33002	1	
								0341-417092A-M21003	1	

Notes

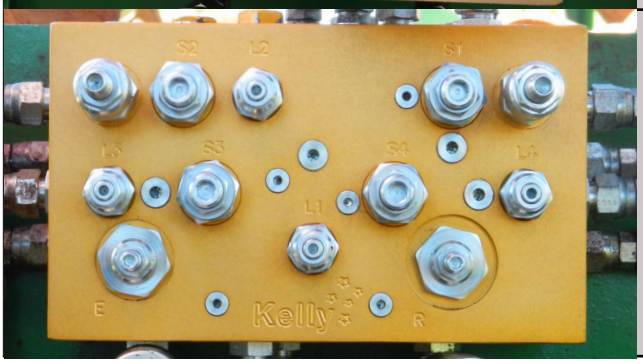
505095	Kick down sequence cartridge - replaces Bo4C3H-Z-N. Hydraforce equivalent is KS10-S3201A-0-N-30.
511013	Replaced with cavity plug VC10-S3.
PS10-36A-0-N-30	Unique cavity configuration. The only sequence valve that is not interchangeable with all others.
PSVP-10-N-S-0-30	Standard sequence valve that can be retrofitted to all previous manifolds except version 7.

SEQUENCE MANIFOLD IDENTIFIER for Models 40, 45, 46, 50, 60CT, 62HDX, 65



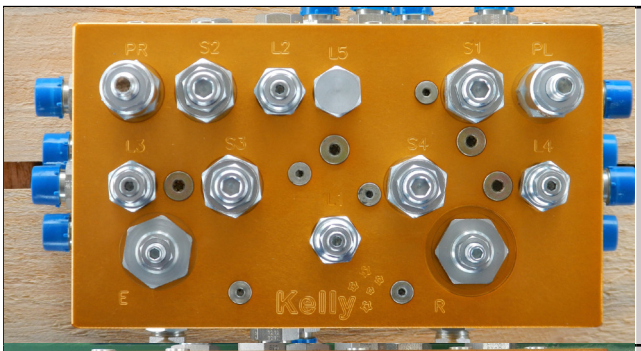
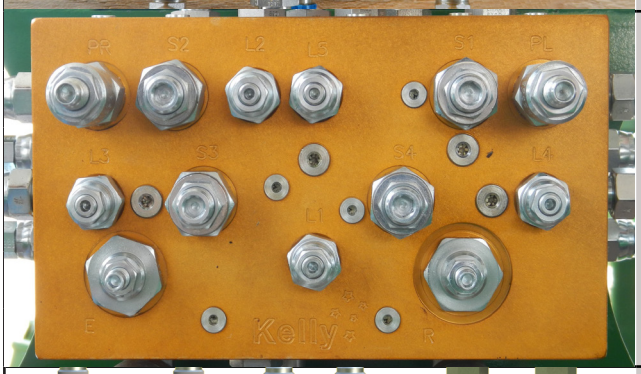
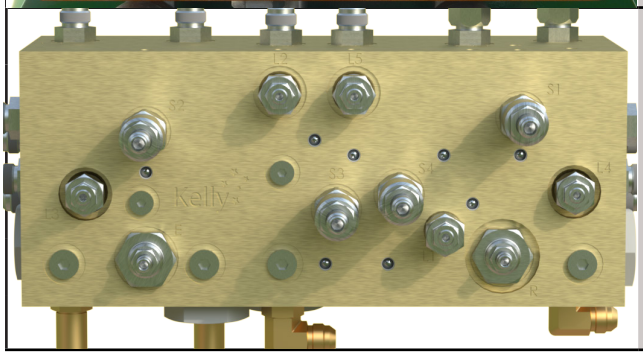
Manifold Part #	**228712**
Version	6
Features	Aluminium and gold anodized. 2 in-put hoses on bottom. 2 ports on top.
Flow Control	fixed
Model number location	Front, top right

Manifold Part #	**290179**
Version	7
Features	4 sequence valves across top of front. ST valve. 2 input hoses. 6 ports on top. TR & TE 123 common porting.
Flow Control	E & R Adjustable
Model number location	Underside, rear left corner.



Manifold Part #	**290380**
Version	8
Features	4 input hoses on bottom. PR & PL reduc-ing valves installed. Tail hoses TE1 TR1, Module hoses ME1,2 MR1,2
Flow Control	E & R adjustable
Model number location	Top surface

SEQUENCE MANIFOLD IDENTIFIER for Models 40, 45, 46, 50, 60CT, 62HDX, 65

	**Manifold Part #**	**290430**
	Version	9
	Features	PR & PL reducing valves installed. 4 input hoses. L5 port with plug. Tail hoses TE1 TR1, Module hoses ME1,2 MR1,2
	Flow Control	E & R Adjustable
	Model number location	Top surface
	**Manifold Part #**	**290509**
	Version	10
	Features	4 input hoses on bottom. PR & PL reduc-ing valves. L5 with OC valve. Tail hoses TE1 TR1, Module hoses ME1,2 MR1,2
	Flow Control	E & R adjustable
	Model number location	Top surface
	**Manifold Part #**	**HF 111938-16**
	Version	12
	Features	4 input hoses, Tail hoses TE1 TR1, Module hoses ME1,2 MR1,2, 4 internal filter elements
	Flow Control	E & R adjustable
	Model number location	Left hand front edge

TROUBLE SHOOTING

Dual Function

Manifolds from version 8, 9 and 10 have the ability to allow independent raising and lowering of the tail section. This means that when crossing roadways or waterways the front and rear can be quickly raised to lift the chains clear of the ground. This allows you to back into corners of fields and improves turning on end rows. The new functionality requires 3 pairs of tractor remotes to operate. It will be possible to operate the machine successfully on a tractor with only two circuits after some minor alterations to hose connections and routing.

Unfolding

During unfolding the following sequence must be observed.

1. Lower front tongue assembly to working height
2. Unfold wings fully until main cylinder pins centre in their slots.
3. Lower tail and modules fully.

When unfolding the wings, oil travels directly to the right hand outer wing cylinders until they are fully extended. Oil then opens S3 and flows to the left hand outer wing cylinders. When these are fully extended, oil pressure opens S4 and flows to the center cylinders pushing the extended wings to the ground. There is an over-center valve, L1, that protects the main wings from falling and controls their decent.

RIGHT WING WON'T RISE FROM FOLDED POSITION

If the pressure required to raise the right wing is greater than tractor pressure, then oil will not flow. This may occur if chain is full of mud or other matter increasing the weight of the chain. It may also occur on tractors with lower than original hydraulic oil pressure.

If the pressure setting of S3 is too low, it can open before lifting the top wing. Oil will then try to raise the second wing, which is trapped and cannot move. The main cylinders will try to force the wings apart.

Disc chain may be caught on one of the saddles or supports, especially on the tail, preventing the wing from lifting. Usually you will see the top wing raise a little then stop if this is the case.

Oil may bypass a cylinder piston seal if the seal or piston have failed. You will hear oil flowing in one cylinder and that cylinder should warm up compared to the remaining cylinders.

Check-valves C4 or C5 may be held open by contamination allowing oil to flow to left wing or main cylinders.

Solution

Clean chains of mud and debris.
Check the disc chain for areas it might be caught and make adjustments to support brackets or folding procedure.
Increase the pressure setting on S3 by 1/2 turn clockwise. (repeat if required) Remove Check-valve C4 or C5 and inspect.
If oil is flowing through the manifold but no movement is occurring, then it is possible that a piston seal has failed. Sequentially isolate cylinders until culprit is identified. (Fold wings to transport position before removing cylinders, DEATH or INJURY could result.)
Check that tractor hydraulic oil pressure is adequate (2200psi / 151Bar).

RIGHT WING RISES BUT LEFT WING WON'T RISE

If the pressure required to raise the left wing is greater than tractor pressure, then oil will not flow. This may occur if chain is full of mud or other matter increasing the weight of the chain. It may also occur on tractors with lower than original hydraulic oil pressure. Left wing is longer than right wing and may require more pressure to lift.

If the pressure setting of S3 is too high, then oil will stall and left wing will not raise.

Disc chain may be caught on one of the saddles or supports, especially on the rear "M" bracket mounts, preventing the wing from lifting.

Oil may bypass a cylinder piston seal if the seal or piston have failed. You will hear oil flowing in one cylinder and that cylinder should warm up compared to the remaining cylinders.

A check-valve may be stuck open allowing oil to bypass.

Solution

Clean chains of mud and debris.
Check the disc chain for areas it might be caught and make adjustments to support brackets or folding procedure.
Decrease the pressure setting on S3 by 1/2 turn clockwise. (repeat if required)
Remove and inspect check-valve C4. Clear any contamination and reinstall.
If oil is flowing through the manifold but no movement is occurring, then it is possible that a piston seal has failed. Sequentially isolate cylinders until culprit is identified. (Fold wings to transport position before removing cylinders, DEATH or INJURY could result.)
Check that tractor hydraulic oil pressure is adequate (2200psi / 151Bar).

CENTER CYLINDERS EXTEND BEFORE OUTER WINGS ARE BOTH STRAIGHT (VERTICAL)

If the pressure required to raise the right wing is greater than that set by S3 then oil will flow past S3 to the left wing. As the right wing rests on top of the left wing and neither can move then oil is also forced past S4 to the main wing cylinders causing them to extend while the outer wings are still folded. As the main wings unfold and the weight is transferred from the outer wings then the oil will flow to the outer wing cylinders allowing the wings to straighten. Do not allow this to continue as the cylinder pins will shear and the wings will fall uncontrolled.

The same symptom will occur if check valve C4 is held open by contamination.

As above, mud or debris in the chain will change the load and operating pressure required to lift the outer wings.

Solution

If chains are clean, then increase the pressure setting on S3. (right wing will raise) Increase pressure setting on S4 (left wing will raise)
Remove and inspect Check valve C4. Clear any foreign material from around ball & seat area.

BOTH WINGS STAND VERTICAL THEN STOP

Once the outer wings have stood vertical oil pressure opens S4 and allows flow to the main wing cylinders. An overcentre valve, L1 prevents the wings from falling and controls their decent to working position.

Solution

Lower pressure setting on S4, screw centre counterclockwise 1/2 turn, check, repeat if needed.
L1 overcentre valve may be set too high, preventing return oil flowing to tank. Reduce pressure setting on L1 by turning CLOCKWISE 1 turn.
Check that hydraulic flow on the tractor is not set to very low or off.
Check tractor hydraulic pressure (should exceed 2200 psi -151 Bar).
Call service technician. Test for oil flow. If flow is present isolate cylinders one at a time to ensure integrity of cylinder piston seal. (Fold wings to transport position before removing cylinders, DEATH or INJURY could result.).

NO MOVEMENT AT ALL

Solution

See first point. Check and if necessary clean chains of mud or debris.
Check that hose tips are correctly engaged in tractor breakaway sockets.
Check that any taps or electronic transport locks are open on the tractor.
Check that hydraulic flow on the tractor is not set to very low or off.
Check tractor hydraulic pressure (should exceed 2200 psi -151 Bar).
Call service technician. Test for oil flow. If flow is present isolate cylinders one at a time to ensure integrity of cylinder piston seal.

SEQUENCE WAS WORKING BUT HAS BECOME ERRATIC

The sequence valve manifold has an oil flow capacity of 8 gallons (US) per minute (30Lpm).
At this flow the sequence cartridges are able to cope with the flow of oil and operate at their correct settings. If the flow rate is set too high, pressure in the manifold builds up and may unseat the sequence valves prematurely or in an unpredictable manner.

Solution

Set tractor hydraulic remote oil flows to slow (20%).
Engage tractor hydraulic lever slowly.
Reduce flow by screwing flow control valve E counterclockwise 2 turns.

Folding

The fold sequence is as follows.
1. Raise tail and modules
2. Raise wings until fully folded
3. Raise tongue assembly to transport height.

During folding, oil travels directly to the main wing cylinders. When these are all closed oil then opens S1 allowing oil to flow to the left outer wing cylinders. When these cylinders close oil pressure opens S2 to fold the right outer wing.

NO MOVEMENT AT ALL

The main cylinders are the first to receive oil from tractor and should lift the wings. Failure to operate as ex-pected could indicate excess mud in the discs. If the tail has not been raised it is possible that the wings will not lift up as the chain tension prevents them from rising.

Solution

Clean mud from the discs.

Raise the tail section fully prior to folding the wings.

BOTH MAIN WINGS STAND VERTICAL THEN LEFT WING WON'T FOLD.

Oil flows straight from tractor to the main cylinders. Once raised oil must then force S1 open to allow flow to the left outer wing. If S1 is set too high, then oil flow will stall and the left outer wing will not fold.

Over centre valve L4 is used to hold the left wing straight during operation. If L4 is set at too high a pressure the left wing will not fold. L4 is a pilot operated valve and requires correct system pressure to function.

A pressure control valve, PL (7.2) is used to protect the frame in the event that wings collide when folding. If the pressure setting on PL is too low, then there will be insufficient pilot pressure to operate L4 valve. Before adjusting L4 ensure that PL is set correctly.

Solution

Reduce the pressure setting on S1 by screwing counterclockwise 1/2 turn. (repeat as required.)
Increase pressure setting on PL (7.2) by screwing clockwise 2 turns.
Reduce pressure setting on L4 by screwing CLOCKWISE 1 turn.

LEFT HAND OUTER WING FOLDS BEFORE BOTH INNER WINGS ARE VERTICAL

If the pressure required to raise the wings to vertical is greater than the pressure setting on S1 then oil will pass S1 and cause the left hand outer wing cylinders to retract. This may occur if there is excessive load such as mud or debris or on occasions where the chains may have become blocked and buried.

The same symptom can be seen if check-valve C3 is held open by contamination.

Solution

Check and clean if necessary any mud or debris from chains. Do not attempt to fold the machine if the chains are buried during a blockage. Clear away the soil from the chains first.
If the chains are clean but problem persists it may be necessary to adjust S1. Increase the pressure setting by screwing clockwise 1/2 turn.
Remove and clean C3 Check-valve.

RIGHT HAND OUTER WING FOLDS BEFORE BOTH INNER WINGS ARE VERTICAL

In the normal folding process, the Left wing must fold before the Right wing. Even if both S1 and S2 have pressure settings that are too low, then both wings will move together. For the Right outer wing to move first then Check-valve C1 must be open.

Solution

Remove and clean C1 check-valve.

MAIN WINGS FOLD, LEFT OUTER WING FOLDS THEN RIGHT OUTER WING STANDS VERTICAL.

Oil is forced to the Left outer wing cylinders which cause the left wing to fold down. Once these cylinders are closed oil pressure increases and opens S2 allowing oil to flow to the right hand outer wing cylinders. If S2 is set too high the oil flow can stall after left outer wing is folded.

Over centre valve L3 is used to hold the right wing straight during operation. If pressure setting on L3 is too high the left wing will not fold. L3 is a pilot operated valve and requires correct system pressure to function.

A pressure control valve, PR is used to protect the frame in the event that wings collide when folding. If the pressure setting on PR is too low, then there will be insufficient pilot pressure to operate L3 valve. Before adjusting L3 ensure that PL is set correctly.

Solution

Reduce the pressure setting on S2 by screwing counterclockwise 1/2 turn. (repeat as required.)
Increase pressure setting on PR by screwing clockwise 2 turns.
Reduce pressure setting on L3 by screwing CLOCKWISE 1 turn.

OUTER WINGS COLLIDE WHEN FOLDING.

If you witness the two outer wings coming together when folding, you must immediately stop and reverse the operation. Unfold the wings to vertical then recommence slowly. The individual wings should fold in sequence. If they both continue to fold together then oil must be passing S2 prematurely. For this to happen S2 has pressure set too low.

Solution

Increase the pressure setting on S2 by screwing clockwise 1/2 turn. (repeat as required.)

LEFT OUTER WING STANDS VERTICAL AND RIGHT OUTER WING FOLDS OVER

The main wings stand vertical then the left wing does not move but the right hand outer wing folds over then all movement stops. This can occur when the L4 overcentre valve that holds the wing straight during operation in the field, will not release and allow the wing to fold. L4 could be contaminated but would usually stick open. L4 could have failed but this is rare. PL may be set at a pressure too low to activate the pilot release on L4.

Solution

Increase the pressure setting on PL by screwing it clockwise 2 turns.
Decrease the pressure setting on L4 by screwing it CLOCKWISE 1/2 turn.

SEQUENCE WAS WORKING FINE BUT HAS BECOME ERRATIC

The sequence valve manifold has an oil flow capacity of 8 gallons (US) per minute. (30Lpm).
At this flow the sequence cartridges are able to cope with the flow of oil and operate at their correct settings. If the flow rate is set too high, pressure in the manifold builds up and may unseat the sequence valves prematurely or in an unpredictable manner.

Occasionally foreign material may lodge in one of the check valves. This will allow oil to flow in a seemingly illogical manner. Symptoms suggest valve adjustments however the logical adjustments have no effect.

Solution

Set tractor hydraulic remote oil flows to slow (20%).
Engage tractor hydraulic lever slowly.
Reduce flow by screwing flow control valve R counterclockwise 2 turns.

NO MOVEMENT AT ALL

Solution

Check that hose tips are correctly engaged in tractor breakaway sockets.
Check that any shut off valves or electronic transport locks are open on the tractor.
Check that hydraulic flow on the tractor is not set to very low or off.
Check tractor hydraulic pressure (should exceed 2200psi - 151 Bar).
Call service technician. Test for oil flow. If flow is present isolate cylinders one at a time to ensure integrity of cylinder piston seal.

WORKING

Wings "sag" in middle while working.

Both sets of wings are locked straight in working position by the L4 and L3 over centre valves. If the pressure setting on these valves is too low the wings may not be effectively locked.

Solution

Left wing sagging, increase the pressure setting on L4 by screwing it COUNTERCLOCKWISE 1/2 turn.
Right wing sagging, increase the pressure setting on L3 by screwing it COUNTERCLOCKWISE 1/2 turn.

CONTACT DETAILS

IF THESE ADJUSTMENTS DO NOT SOLVE THE PROBLEM

Contact your service agent for assistance. There may be a fault with one of the cartridges.
The valve manifolds are tested at factory and again prior to shipping. The assembling agent will also have ensured the correct operation prior to delivery. Very rarely, but occasionally valves do fail. The usual cause is ingress of contaminant.

You may also contact Kelly Tillage for technical advice and assistance.

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