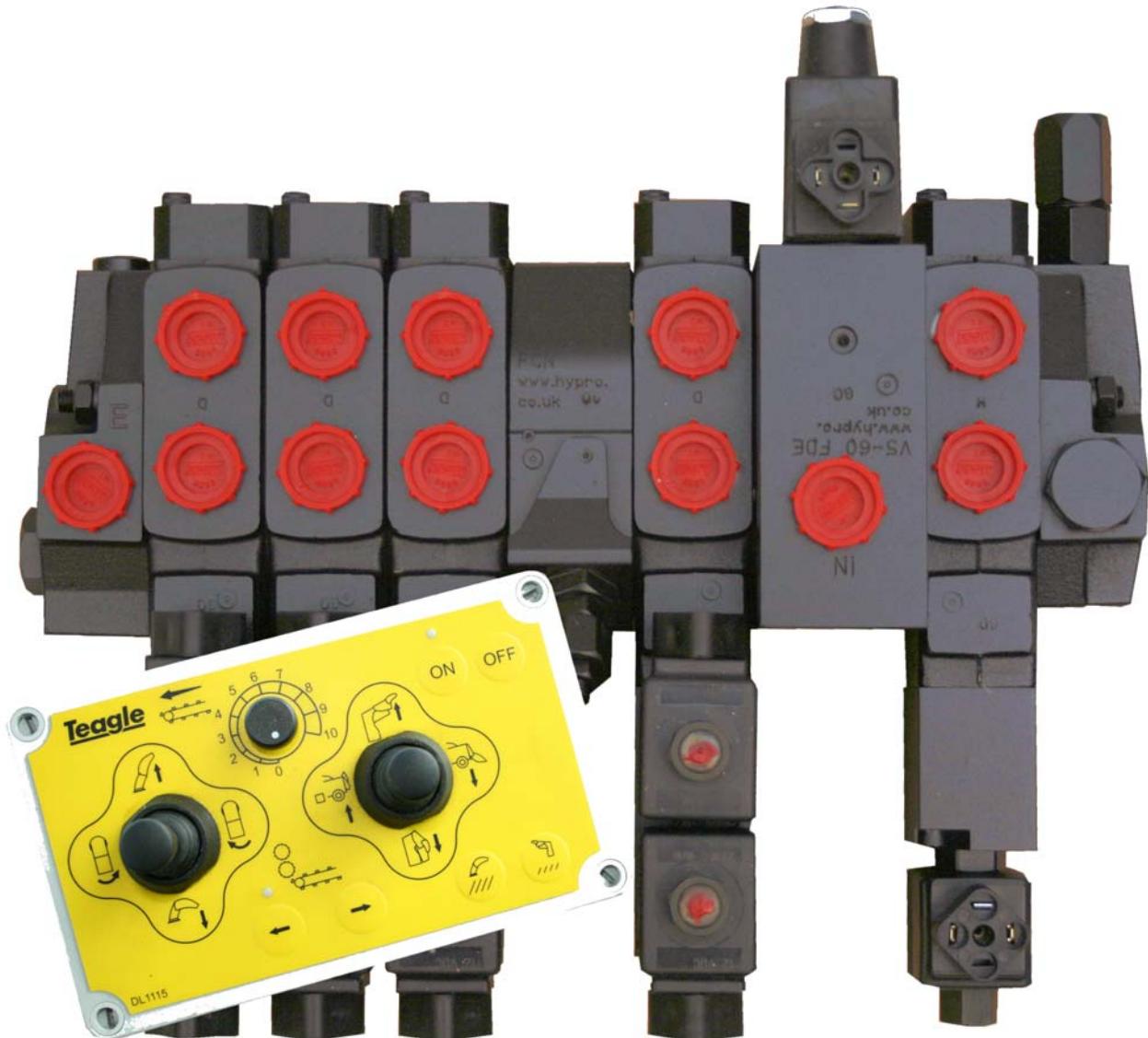




808, 8080, 9090, 1005 & 1010  
Valve & Electronic System Details

## Instruction Book & Parts List



Issue 11/08

Tomahawk 808S From Serial No. 2000

Tomahawk 8080 From Serial No. 3800

Tomahawk 9090 From Serial No. 1600

Tomahawk 1005 From Serial No. 1501

Tomahawk 1010 From Serial No. 3501

# SAFETY FIRST!

- 1. READ THE INSTRUCTION BOOK THOROUGHLY** before attempting to operate or carry out any maintenance on the machine. If you do not understand any part of this manual, ask your dealer for assistance.
- 2. ALWAYS CARRY OUT SAFE MAINTENANCE.** Never clean, adjust or maintain the machine unless the engine has been stopped, the machine come to rest, the PTO disengaged and the key removed.
- 3. NEVER WORK UNDER A MACHINE RAISED ON THE 3-POINT LINKAGE** unless it is securely supported.
- 4. NEVER OPERATE THE MACHINE WITH ANY PARTS OR GUARDS MISSING.** Check that all guards including the PTO shaft guards are in good condition and in place before operating the machine.
- 5. SECURE THE PTO GUARD BY MEANS OF CHECK CHAINS** to suitable points on the tractor and machine to prevent the shield from rotating.
- 6. NEVER PUT YOUR HAND OVER A HYDRAULIC LEAK** Oil under pressure may enter the blood stream.
- 7. BEFORE DISCONNECTING HYDRAULIC HOSES** **ALWAYS LOWER THE HYDRAULIC RAMS** for safety as this prevents residual pressure in the hoses.
- 8. OPERATE SAFELY.** Before starting work, check that there are no persons or animals in the immediate vicinity of the machine or tractor. Always maintain full control of the tractor and machine. Ensure that you know how to stop the tractor and machine quickly in case of emergency.
- 9. NEVER STAND BETWEEN THE MACHINE AND THE TRACTOR WHEELS.**
- 10. DO NOT WEAR LOOSE OR RAGGED CLOTHING**
- 11. BEWARE OF DUST.** Under dusty conditions, keep the cab windows and doors closed. The use of a dust mask conforming to EN149 is strongly recommended.
- 12. BEWARE OF HIGH NOISE LEVELS.** Some tractor/implement combinations give noise levels in excess of 90dB at the operator's ear. Under such circumstances, ear defenders should be worn. Keep cab windows and doors closed to reduce noise level.

Throughout this handbook, the term 'tractor' is used to refer to the power source used to drive the machine. It does not necessarily refer to a conventional agricultural tractor.

## HEALTH AND SAFETY AT WORK

Our equipment is designed so as to conform with current Health & Safety Regulations and therefore poses no significant hazard to health when properly used. Nevertheless, in the interests of all concerned, it is essential that equipment of our manufacture is used in accordance with the instructions that are supplied or are available from our Technical Staff.

Legislation requires that all operators are instructed in the safe operation, cleaning and maintenance of equipment and machines. This handbook forms part of that instruction and it must be read and understood before fitting the machine onto the tractor or attempting to use it.

Your supplier is responsible for carrying out any necessary pre-delivery inspection, fitting the machine onto the tractor and test running. The supplier must also give instruction in the safe use, maintenance and adjustment of the machine.

In the interests of safety, please ensure that the instructions referred to above are brought to the attention of all your employees who are to use the equipment. We recommend that the use of this equipment is restricted to capable trained operatives. Persons under the age of sixteen should not operate the machine and should be kept away from where it is being used.

## WARRANTY

The standard warranty is for 12 calendar months against faulty materials and workmanship. Components supplied as part of the original machine, but manufactured by another company, e.g. PTO shafts, wheels etc., are subject to the original manufacturer's conditions and warranty.

Where repairs are carried out under warranty:-

- a) Claims for the fitting of non original parts will not be considered unless prior agreement has been obtained.
- b) The repairer must be advised that the work is to be the subject of a warranty claim beforehand.

- c) Any claim must be submitted within four weeks of the repair.
- d) The damaged parts must be retained for inspection and returned carriage paid if required.

The right to withdraw warranty is reserved if:-

- a) Non-original parts are fitted.
- b) The machine has been abused, badly maintained or used for purposes other than that for which it was designed.

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# SECTION 1. INSTALLATION INFORMATION

## SAFETY FIRST - READ THE INFORMATION AT THE FRONT OF THIS BOOK

### 1.1 TRACTOR VALVE CONNECTION

The hydraulic valve block requires an oil supply from a double/single acting valve with an unrestricted return and must be completely independent of the 3-point linkage. The supply to the valve should be at least 50 litres/min for correct operation but must not exceed 60 litres/min.

#### **IMPORTANT - Closed Centre Hydraulic System**

Where the machine is to be operated on a tractor with closed centre hydraulics, a large volume of oil will be passing through the valve and motors when the bed chain is in use. This may require the tractor to be fitted with a free flow "3<sup>rd</sup> Line Return" to return oil from the machine's hydraulic return hose to the tractor. This will ensure correct operation of the machine and protect the tractor's hydraulic system from being damaged. The latest design of solenoid valve (see section 10.9 page 26 for details) can be modified to permit normal use on tractors fitted with a closed centre hydraulic system. If in doubt contact your local relevant tractor dealer for advice.

**IMPORTANT-** Oil must flow through the valve in the correct direction and an identifying tag has been attached to the pressure line to assist in the correct connection to the tractor spool valve pressure port. Failure to observe this requirement may result in the valve seals failing.

### 1.2 CABLE CONTROL INSTALLATION

The control lever mounting bracket should be fitted inside the cab so that the levers are conveniently situated for the operator. It should be remembered that structural members of the cab must not be drilled or welded and thus some modification of the mounting bracket may be required. Place the cable control unit in the cab and slot into the control lever mounting bracket. Route the cables outside the cab clear of any rear linkage components and PTO shaft.

### 1.3 ELECTRONIC CONTROL INSTALLATION

The electric control box mounting bracket should be fitted inside the cab at either side of the operator so that the controls are conveniently situated. It is necessary to reverse the control box on its mounting plate if the mounting bracket is to be fitted to the left of the operator. To reverse the mounting plate carefully remove the lid of the control box to reveal the heads of the mounting bolts, unbolt the box and refit reversed then replace the lid making sure the seal is correctly positioned. It should be remembered that structural members of the cab must not be drilled or welded and thus some modification of the mounting bracket may be required. Place the electric control unit in the cab and slot into the control box mounting bracket.

Provided with the controls, is a supply cable for direct connection to the tractor battery. **The controls have been designed to be supplied through this cable and WARRANTY SHALL BE INVALIDATED if this cable is modified.** When fitting to the tractor, make sure that the brown cable (positive) is fitted to the positive terminal of the battery. Failure to connect the wires correctly will cause the in-line 7.5 amp protective fuse to blow. The fuse will continue to blow until the power supply cables are connected correctly to the battery terminals. **UNDER NO CIRCUMSTANCES SHOULD A FUSE WITH A HIGHER RATING THAN 7.5 AMPS BE FITTED.**

When fitting the cable, make sure it is routed away from high temperature and moving engine components. Avoid sharp edges that would damage the cable, particularly when passing the cable through a bulkhead. Position the two pin socket in a suitable position within the cab.

Once the control box has been positioned, route the machine cable into the cab making sure it is kept away from the rear wheels and any pinch points between the PTO shaft and link arms. Where possible, route into the cab through cable entry points on the tractor, allowing the rear window to be kept closed during use. Plug the cable connector into the socket on the box and secure by engaging the locking clip.

### 1.4 ELECTRONIC CONTROL BOX STORAGE

When the machine is not being used, the control box should be **stored in a dry location** with the connector cover closed safely away from the machine to prevent the possibility of water ingress which may damage the electronics. The plug on the end of the machine cable should be kept clean and stored safe from damage.

### 1.5 ELECTRONIC CONTROL MAINTENANCE

Teagle Machinery Ltd should be contacted immediately if any problem is found with any aspect of the electronic controls during the warranty period. The correct course of action shall be advised by a member of the manufacturer's Technical Staff. **Failure to comply with this request shall INVALIDATE THE WARRANTY.** Before maintaining any part of the electronic controls and wires, disconnect the 12v supply as failure to do so may result in damage to electronic components.

## NOTES

## **SECTION 2. CABLE CONTROL HYDRAULIC VALVE TROUBLE SHOOTING**

**2.1 Loss of operation of any service. Also operation of bed chain in 1 direction only may occur. Failure may be sudden or deteriorate slowly over a few days.**

### **Cause**

Series plug (adjacent to item 10 Section 3.2) has failed/come out of position resulting in oil flowing back to tank which stops the other slices operating.

### **Solution**

Replace blanking plug and valve body if damaged.

**2.2 Bed chain no longer operates or operates only very slowly at tractor engine PTO speed.**

**Failure may be sudden or intermittent.**

### Possible causes

There are 3 possible causes; the first one is the most likely to be the problem.

- a) Dirt or contamination in the Bypass Valve in the flow control slice does not allow it to close resulting in the oil dumping to tank starving any oil flow to the motor.
- b) Dirt or contamination in the Pressure Relief Valve in the flow control slice does not allow it to close resulting in the oil dumping to tank starving any oil flow to the motor.
- c) Failure of the hydraulic motor.

### **Solution**

Remove Bypass Valve or Pressure Relief Valve from the Flow Control Slice, inspect for contamination, clean and replace.

With reference to Section 3.2, remove the bypass valve by unscrewing the cap adjacent to item 15, remove bonded seal (15) and the spring below. Using long nose pliers remove the spool and bypass valve body complete with 'O' rings. Clean and rebuild.

With reference to Section 3.2, remove the pressure relief valve by unscrewing the complete valve from the slice and inspect the seat for contamination, clean and replace.

**2.3 Bed chain speed control stops working on full or part bed chain speed**

### **Possible causes**

Flow control spool jammed open by contamination.

### **Solution**

Remove the valve guard from the front of the machine. Slip the rubber shield from around the flow control cam mechanism up. Undo the 3 grub screws retaining the aluminium adapter body to the top of the valve. Unscrew the flow control spool from the valve body Remove contamination and reassemble making sure the adapter body is fully seated before securing with grub screws.

**2.4 Oil leaks from between the interface seals between the slices of the valve.**

### **Possible causes**

This is caused by the failure of O rings between the slices of the valve and can be caused by several things.

- a) Oil flow in the wrong direction has been passed through the valve block. If a ram is operated in this state sufficient pressure can be generated within the valve block to separate the valve slices causing the O-rings to extrude.
- b) The valve has been pressurised with the return hose not connected to the tractor.
- c) Damage to the return hose quick release fitting does not allow full flow of oil back to tank.
- d) The tractor spool valve does not have a free flow return and is generating back pressure within the valve block.
- e) Excessive oil flow has caused the oil seal in the main gallery to be extruded from its recess.
- f) Studs holding the valve chest together are not tightened sufficiently.

**Solution**

- 1) Identify direction of flow from the tractor and make sure it is directed to the inlet port of the valve. Fitting of a check valve to the outlet port can prevent reverse flow if the machine is connected incorrectly on a regular basis.
- 2) Check the quick release coupling of the return hose is connected correctly.
- 3) Check the operation and condition of the quick release couplings.
- 4) Install a free flow return connection to the tractor.
- 5) Reduce the flow of hydraulic oil to the valve (60 litres max).
- 6) Check torque of studs holding valve block together (13 Nm, 10 lb ft).

**Oil leaks from the interface between the flow control slice and the adjacent double acting slice due to the O ring in the Oval recess being missing (O ring 20 in diagram A).**

**Solution**

On a valve manufactured before 2005 where the seals are being replaced between the flow control slice and the adjacent double acting slice it may be necessary to fit an additional retaining collar to prevent the O ring from being extruded - Contact Teagle Machinery Ltd for details

**2.6 Oil leak from the cap at the bottom of a valve slice.****Possible causes**

Incorrectly fitted seals or seal failure.

**Solution**

Replace the seals. Remove the cable form the valve slice causing the problem. Unscrew the cap from the bottom of the valve taking care not to lose any springs and detent balls. Remove the spool. Fit the new slip ring to the spool sliding it down to the bottom of the spool and fitting the O ring outside the slip ring. Insert the spool back into the valve body making sure the O ring remains outside the slip ring. Reassemble the cable back onto the spool and refit the cap at the bottom of the valve.

**IMPORTANT** - To ensure correct and reliable operation, OEM components including O rings must be fitted during any overhaul of the valve, failure to do so may lead to repeated failures as specific high quality grade O rings are used to seal the valve.

Remove the hoses from the valve block then remove the valve complete with cables and mounting plate from the machine. Take the mounting plate off the valve and thoroughly clean the valve and cable adapters of dirt and debris before stripping the valve.

To split the valve to replace interface seals undo the long studs through the valve and separate between slices at the appropriate location as indicated by the position of the leak.

Replace the damaged seals end reassemble the valve. The studs should be tightened to the figure in Table 1.

It may be preferable to remove the cables before attempting to split the valve. To remove the standard cables undo the lock nut on the cable above the adapter body and unscrew it from the thread an the end of the cable. Remove the 2 socket head cap screws retaining the adapter to the valve body and unscrew it until the cross pin can be removed from the end of the spool.

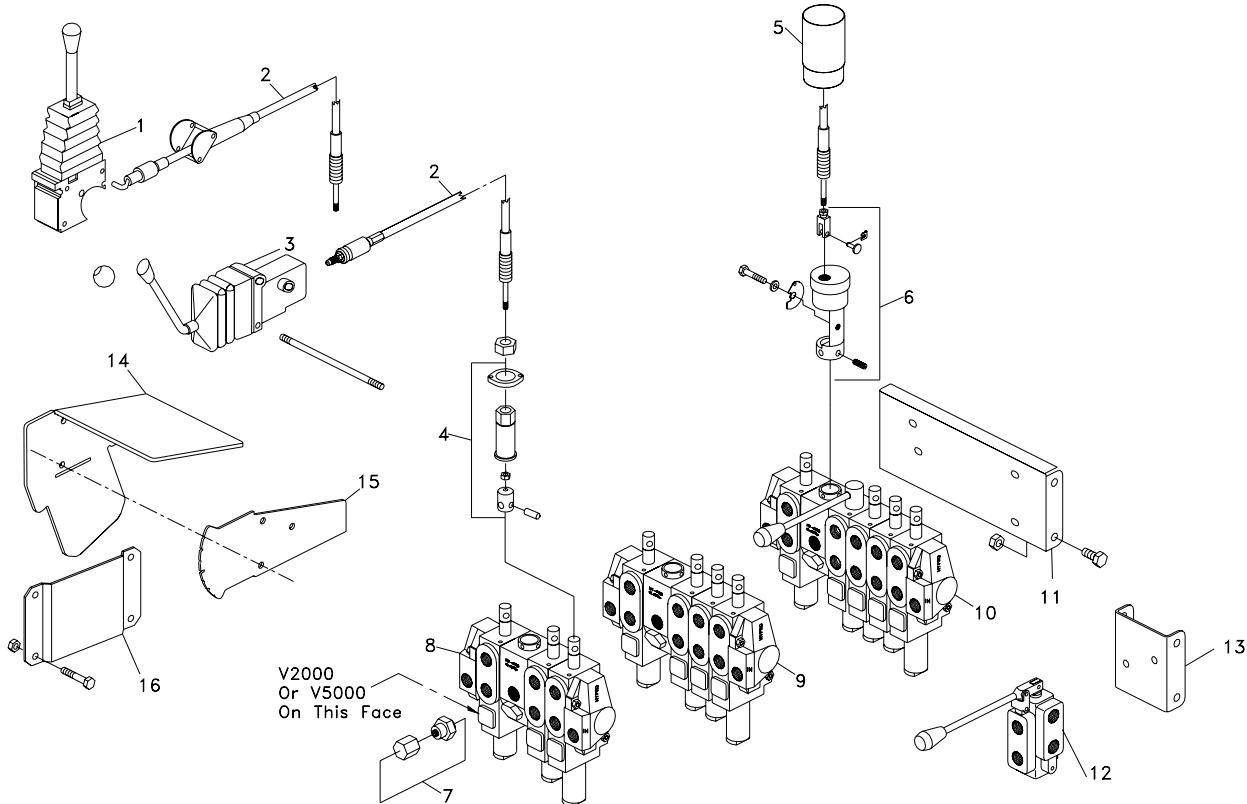
To remove the adapter from the flow control slice slip the rubber shield from around the flow control cam mechanism. Undo the 3 grub screws retaining the aluminium adapter body to the top of the valve and remove the cable.

	Torque setting (Nm)	Torque setting (lb ft)
Studs through valve	13	10
End cap unions (Inlet/Outlet) 1/2" BSP	70-75	52-55
Slice port unions 1/2" BSP	70-75	52-55

Table 1. Cable control valve torque settings

## SECTION 3. CABLE VALVE PARTS LIST

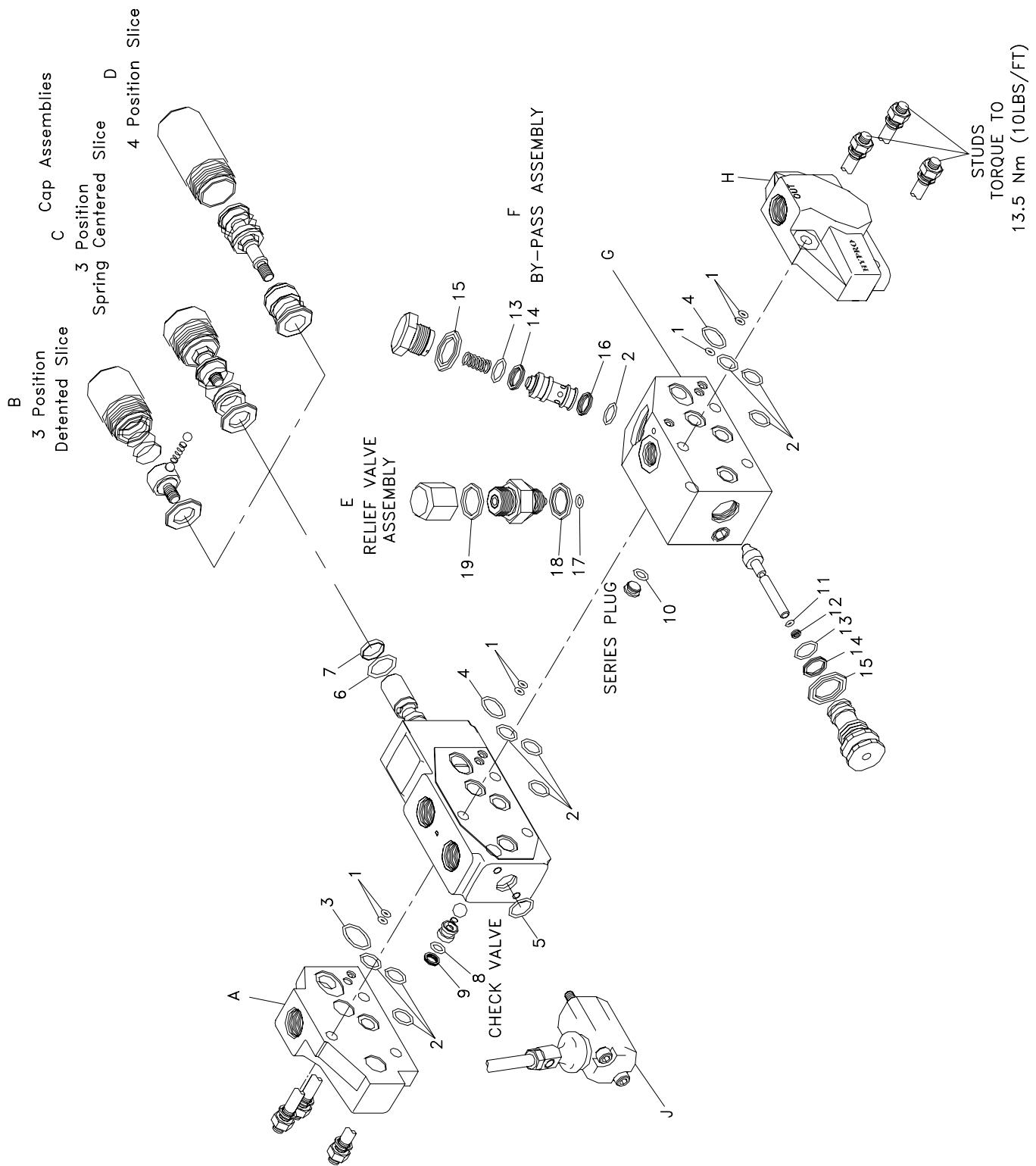
### 3.1 CABLE CONTROLS



Ref	Description	TMC Black	RDB Red	RH Chute	Swivel Chute	Twin Chute
	Valve complete items 1 to 8	HYD5060	HYD5060	1	--	--
	Valve complete items 1 to 7 & 9	HYD5067	HYD5067	--	1	--
	Valve complete items 1 to 7 & 10	HYD5084	HYD5084	--	--	1
	Cable complete c/w actuator & valve adapter kit items 1, 2 & 4.	HYD5073	HYD5180	3	4	4
	Cable complete c/w actuator & flow Control adapter kit 1, 2, 5 & 6.	HYD5074	HYD5181	1	1	1
1	Actuator – standard	HYD5065	-----	3	4	4
	Actuator - TMC Flow control	HYD5066	-----	1	1	1
2	Cable 3.5 meters long	HYD5076	HYD5185	4	5	5
3	Actuator – RDB	-----	HYD5184	4	5	5
	Bent Handle	-----	HYD5182	4	5	5
	Plain nut M10	-----	FAS2303	4	5	5
	Standard knob	HYD5176	HYD5166	3	4	4
	Round +/- knob	HYD5165	HYD5165	1	1	1
	Actuator boot	-----	HYD5183	4	5	5
4	Adapter kit – valve end	HYD5079	HYD5186	3	4	4
5	Rubber sleeve	HYD5068	HYD5068	1	1	1
6	Adapter kit – flow control end	HYD5069	HYD5069	1	1	1
7	Relief valve kit – valve block	HYD5070	HYD5070	1	1	1

Ref	Description	TMC Black	RDB Red	Standard	Swivel	Twin Chute
8	T8080 valve block	HYD5077	HYD5077	1	--	--
	Valve c/w cables	HYD5060	HYD5060	1	--	--
	Setscrew M8 x 16	FAS2625P	FAS2625P	4	--	--
	Washer M8	FAS2343P	FAS2343P	4	--	--
9	T8080S valve block	HYD5080	HYD5080	--	1	--
	Valve c/w cables	HYD5067	HYD5067	--	1	--
	Setscrew M8 x 16	FAS2625P	FAS2625P	--	4	--
	Washer M8	FAS2343P	FAS2343P	--	4	--
10	T8080TC valve block	HYD5086	HYD5086	--	--	1
	Valve c/w cables	HYD5084	HYD5084	--	--	1
	Seal kit complete	HYD5078	HYD5078	--	--	1
	Setscrew M8 x 16	FAS2625P	FAS2625P	--	--	4
	Washer M8	FAS2343P	FAS2343P	--	--	4
11	Valve mount	SC3012	SC3012	1	1	1
	Setscrew M10 x 20	FAS2652P	FAS2652P	4	4	4
	Locknut M10	FAS2333	FAS2333	4	4	4
12	Divertor valve	HYD5085	HYD5085	--	--	1
	Bolt M6 x 70	FAS9614P	FAS9614P	--	--	2
	Washer M6	FAS2342P	FAS2342P	--	--	4
	Locknut M6	FAS2331	FAS2331	--	--	2
13	Hand valve mounting	SC3461	SC3461	--	--	1
	Setscrew M10 x 20	FAS2652P	FAS2652P	--	--	4
	Lock nut M10	FAS2333	FAS2333	--	--	4
14	Cable actuator mount - T8080	SC3064	SC3717	1	--	--
	Cable actuator mount - T8080S/TC	SC3209	SC3717	--	1	1
	Stud M6 x 195	FAS9157P	-----	3	--	--
	Stud M6 x 235	FAS9158P	-----	--	3	3
	Locknut M6	FAS2330	-----	6	6	6
	Stud M8 x 202	-----	FAS9159P	3	--	--
	Stud M8 x 240	-----	FAS9160P	--	3	3
	Locknut M8	-----	FAS2332	6	6	6
15	Cable protector - T8080	SC3290	-----	1	--	--
	Cable protector - T8080S/TC	SC3292	-----	--	1	1
	Decal plate - T8080	-----	SC3718	1	--	--
	Decal plate - T8080S/TC	-----	SC3719	--	1	1
16	Mounting bracket - all models	DC0459	DC0459	1	1	1
	Bolt M8 x 30	FAS2027P	FAS2027P	4	4	4
	Locknut M8	FAS2332	FAS2332	4	4	4

## 3.2 CABLE CONTROL VALVE PARTS & SEALS



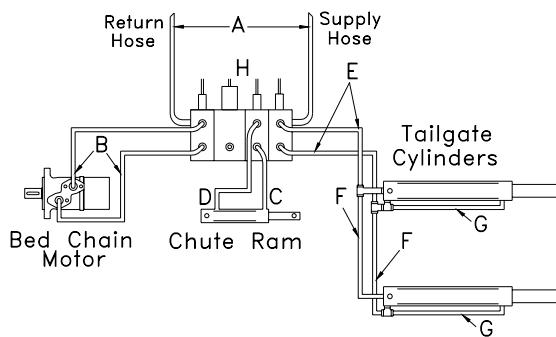
Ref	Description	Part No.	Standard chute	Swivel chute	Twin chute				
A	Inlet Cover	HYD5098	1	1	1				
B	Double acting slice – detent (bed forward/reverse)	HYD5097	1	1	1				
C	Double acting slice – spring return	HYD5090	1	2	3				
D	4 position slice (tailgate)	HYD5089	1	1	1				
E	Relief valve assembly	HYD5070	1	1	1				
F	By-pass valve assembly	HYD5163	1	1	1				
G	Flow control slice	HYD5091	1	1	1				
H	Outlet Cover	HYD5099	1	1	1				
J	Manual Handle	HYD5191	-	-	1				
	Complete valve seal kit	--	HYD5169	HYD5170	HYD5171				
	Interface seal kit	HYD5081	5	6	7				
	Spool & check valve seal kit	HYD5082	4	5	6				
	Flow control valve seal kit	HYD5161	1	1	1				
Ref	Description	A Inlet cover	B slice detent	C slice spring	D slice 4 position	E Relief valve	F By-pass valve	G Flow control	H Outlet cover

'O' ring with internal diameter of 3.69 mm and a material diameter of 1.78mm is specified by 3.69 x 1.78  
Anti extrusion ring with internal diameter of 7.29 mm and a material thickness of 1.40mm is specified by 7.29 x 1.40

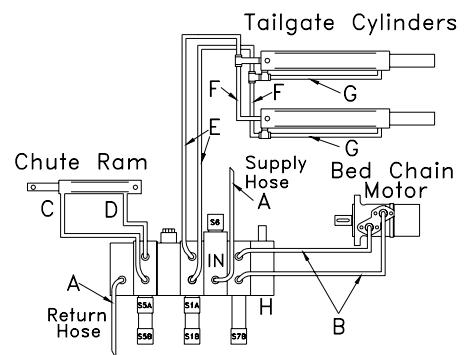
1	'O' ring 3.69 x 1.78	2	2	2	2	--	--	3	--
2	'O' ring 12.42 x 1.78	3	3	3	3	--	1	3	--
3	'O' ring 15.60 x 1.78	1	--	--	--	--	--	--	--
4	'O' ring 15.60 x 1.78	--	1	1	1	--	--	1	--
5	'O' ring (Viton) 15.60 x 1.78	--	1	1	1	--	--	--	--
6	'O' ring 15.54 x 2.62	--	1	1	1	--	--	--	--
7	Slip ring PTFE	--	1	1	1	--	--	--	--
8	'O' ring 7.66 x 1.78	--	1	1	1	--	--	--	--
9	Anti Extrusion ring 7.29 x 1.40	--	1	1	1	--	--	--	--
10	'O' ring 7.1 x 1.6	--	--	--	--	--	--	1	--
11	'O' ring 2.90 x 1.78	--	--	--	--	--	--	1	--
12	Anti Extrusion ring 2.54 x 1.40	--	--	--	--	--	--	1	--
13	'O' ring 14.00 x 1.78	--	--	--	--	--	1	1	--
14	Anti Extrusion ring 13.64 x 1.40	--	--	--	--	--	1	1	--
15	Bonded seal	--	--	--	--	--	1	1	--
16	Anti Extrusion ring 12.07 x 1.40	--	--	--	--	--	1	--	--
17	'O' ring 6.07 x 1.78	--	--	--	--	1	--	--	--
18	Bonded seal	--	--	--	--	1	--	--	--
19	Copper washer	--	--	--	--	1	--	--	--

## SECTION 4. HYDRAULIC HOSES PARTS LIST

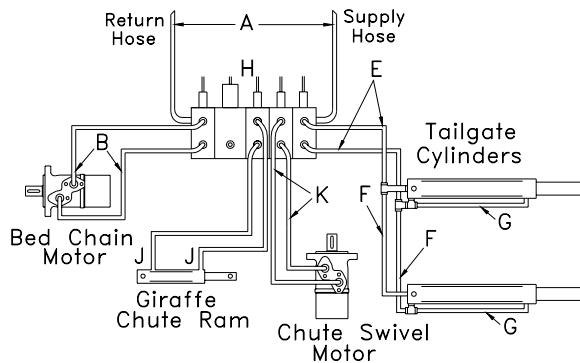
Right Hand Chute Cable Valve



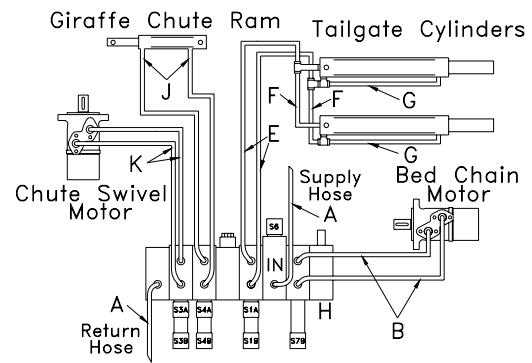
Right Hand Chute Solenoid Valve



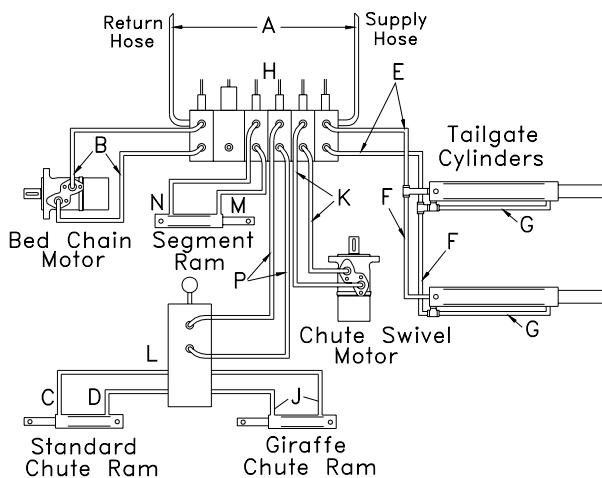
Swivel Chute Cable Valve



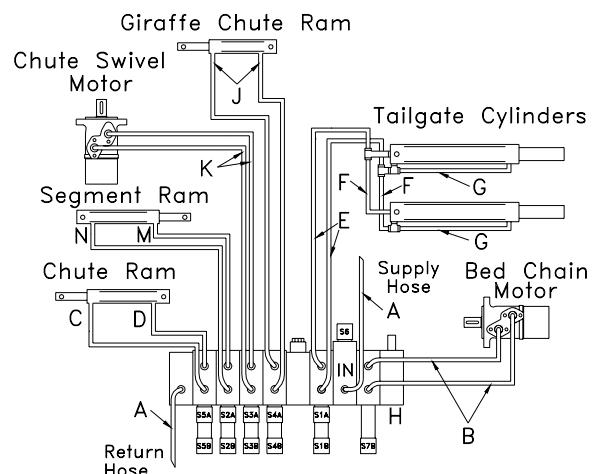
Sloping Chute Solenoid Valve



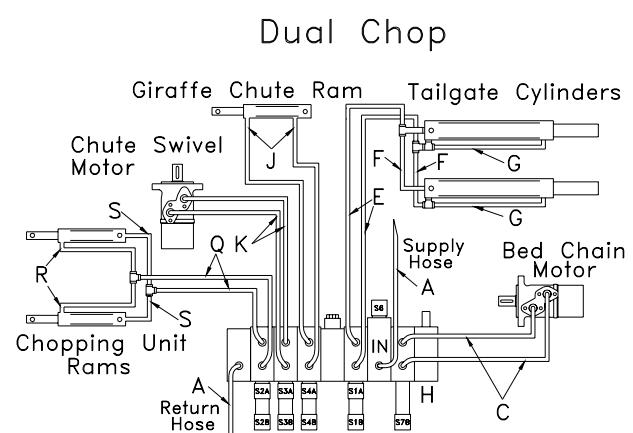
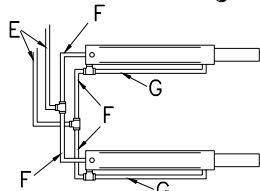
Twin Chute Cable Valve



Twin Chute Solenoid Valve



T808 Tailgate Cylinder Arrangement



Ref	Description	808	8080	9090	Q'ty	Associated Components	Part No.	Q'ty
A	Valve supply hose	HYD2228	HYD2228	HYD2228	2	Bonded seal ½ BSP Male coupling	HYD4204 HYD1901	2 2
B	Bed motor hose	HYD2117	HYD2117	HYD2122	2			
C	Chute ram hose - outer	HYD2043	HYD2043	HYD2043	1			
D	Chute ram hose - inner	HYD2046	HYD2046	HYD2046	1			
E	Valve to 'T' piece	HYD2196	HYD2058		2	1/4" BSP T piece M/M/F	HYD1930	2
			HYD2056		2	1/4" BSP T piece M/M/M	HYD1921	2
F	Tailgate ram front hose		HYD2059	HYD2059	2			
		HYD2060			4			
G	Tailgate ram rear hose	HYD2062	HYD2061	HYD2061	2	1/4" BSP T piece M/M/F	HYD1930	2
J	Giraffe chute ram hose	HYD2047	HYD2047	HYD2047	2			
K	Swivel motor 1/4" hose	HYD2063	HYD2063	HYD2063	2	Bonded seal 1/2" BSP 1/2-1/4 BSP M/M union	HYD4204 HYD1114	2 2
	Swivel motor 3/8" hose	HYD2132	HYD2132	HYD2132	2	3/8 x 3/8 M/M union Bonded seal 3/8 BSP One way restrictor 1/2x 3/8 BSP M/M union Bonded seal 1/2 BSP	HYD1012 HYD4204 HYD1755 HYD1115 HYD4204	2 4 2 2 2
L	Divertor valve	HYD5085	HYD5085	HYD5085	1	1/2 x 1/4 BSP M/M unions 1/2 x 3/8 BSP M/M unions Bonded seal 1/2 BSP	HYD1114 HYD1115 HYD4204	4 2 6
M	Seg. ram hose – inner	HYD5085	HYD5085	HYD5085	1			
N	Seg. ram hose – outer	HYD2048	HYD2048	HYD2048	1			
P	Divertor valve hose	HYD2048	HYD2048	HYD2048	2			
Q	Valve to 'T' piece	HYD2064	HYD2064	----	2	1/4" BSP T piece M/M/M	HYD1921	2
R	Chop unit side hose	HYD2065	HYD2065	----	2	1/4" BSP M/F 90° Elbow	HYD1760	2
S	Chop unit rear hose	HYD2066	HYD2066	----	2			
NOT SHOWN								
	Strap non re-useable	FAS9051	FAS9051	FAS9051	10			
<b>CABLE CONTROL VALVES</b>								
H	RH valve only	HYD5077	HYD5077	HYD5077	1	1/2 x 1/2 BSP M/M union	HYD1013	2
	RH valve c/w cables	HYD5060	HYD5060	HYD5060	1	1/2 x 1/4 BSP M/M union	HYD1114	2
						1/2 x 3/8 BSP M/M union	HYD1115	4
						Bonded seal 1/2 BSP	HYD4204	8
	SC valve only	HYD5080	HYD5080	HYD5080	1	1/2 x 1/2 BSP M/M union	HYD1013	2
	SC valve c/w cables	HYD5067	HYD5067	HYD5067	1	1/2 x 1/4 BSP M/M union	HYD1114	2
						1/2 x 3/8 BSP M/M union	HYD1115	6
						Bonded seal 1/2 BSP	HYD4204	10
	TC valve only	HYD5086	HYD5086	HYD5086	1	1/2 x 1/2 BSP M/M union	HYD1013	2
	TC valve c/w cables	HYD5084	HYD5084	HYD5084	1	1/2 x 1/4 BSP M/M union	HYD1114	2
						1/2 x 3/8 BSP M/M union	HYD1115	8
						Bonded seal 1/2 BSP	HYD4204	12

## SECTION 5. ELECTRONIC CONTROL IDENTIFICATION

This manual covers the current and previous versions of the electronic control system which can be identified from figures 5.2 and 5.3 below. It is important to correctly identify the control system before diagnosing problems or ordering parts as parts of individual systems are not interchangeable. As a guide the current design of controls were fitted to machines after the serial numbers shown in Table 5.1 below.

Machine Type	808	8080	9090
RH	2520	4290	1770
S/SC	2495	4271	1770
DC/TC	2519	4287	1770

**Table 5.1** Last Machines Fitted With Previous Style Controls

**NOTE:** All current design control desks have a serial number on the base of the control desk which can be identified through the aperture of the steel mounting plate. Please quote the serial number when entering into any correspondence with Teagle Machinery Ltd.

For information on earlier versions of the electronic control system not identifiable from either Figures 5.1 or 5.2 below please contact Teagle Machinery Ltd to obtain the appropriate manual.

Control Box



Junction Box



DL1115      Large Flat Buttons      Chop Length Symbols

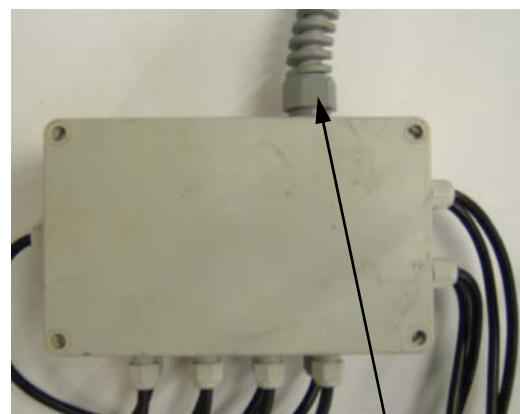
Grey Cable Enters Side

**Figure 5.2 Current Design - Large Raised Buttons**

Control Box



Junction Box



Small Domed Buttons

Chute Symbols Only

Grey Cable Enters Top

**Figure 5.3 Previous Design - Small Domed Buttons**

## SECTION 6. CONTROL BOX FUNCTIONS

### 6.1 INSTRUCTIONS FOR USE

The Functions of the controls are indicated in Figure 6.1 below

### 6.2 BED CHAIN/FORWARD REVERSE

(Raised Button Model - Small Domed Buttons)

The bed chain can be operated in the forward direction by pressing the forward button on the box. In order to reverse the bed chain once in the forward direction, press and hold the reverse button, once released the bed chain will automatically default to forward. To stop the bed chain press the forward button.

(Raised Button Model - Large Flat Buttons DL1115)

The bed chain can be operated in the forward direction by pressing the forward button on the box. To reverse the bed chain press and hold the reverse button while the bed chain is at rest or operating in the forward direction. Once the reverse button is released the bed chain will return to rest. The bed chain can be stopped from moving in the forward direction by pressing either of the two directional buttons.

### 6.3 OVERLOAD PROTECTION

Along with the in-line fuse (7.5 amp), the electronic controls also have a built-in overload (short circuit) protector. When the fuse fails the red LED on the fuse holder will illuminate. When the protection device activates due to an overload, the control box will not operate and the LED will flash. In order to reset the device, the control box must be turned off and then turned back on again. If the control box will not turn back on then there is a permanent short circuit present. In this case the when the control box is switched on the green light on the box will turn on briefly and then go off. The short circuit will have to be detected and rectified before the control box will operate correctly.

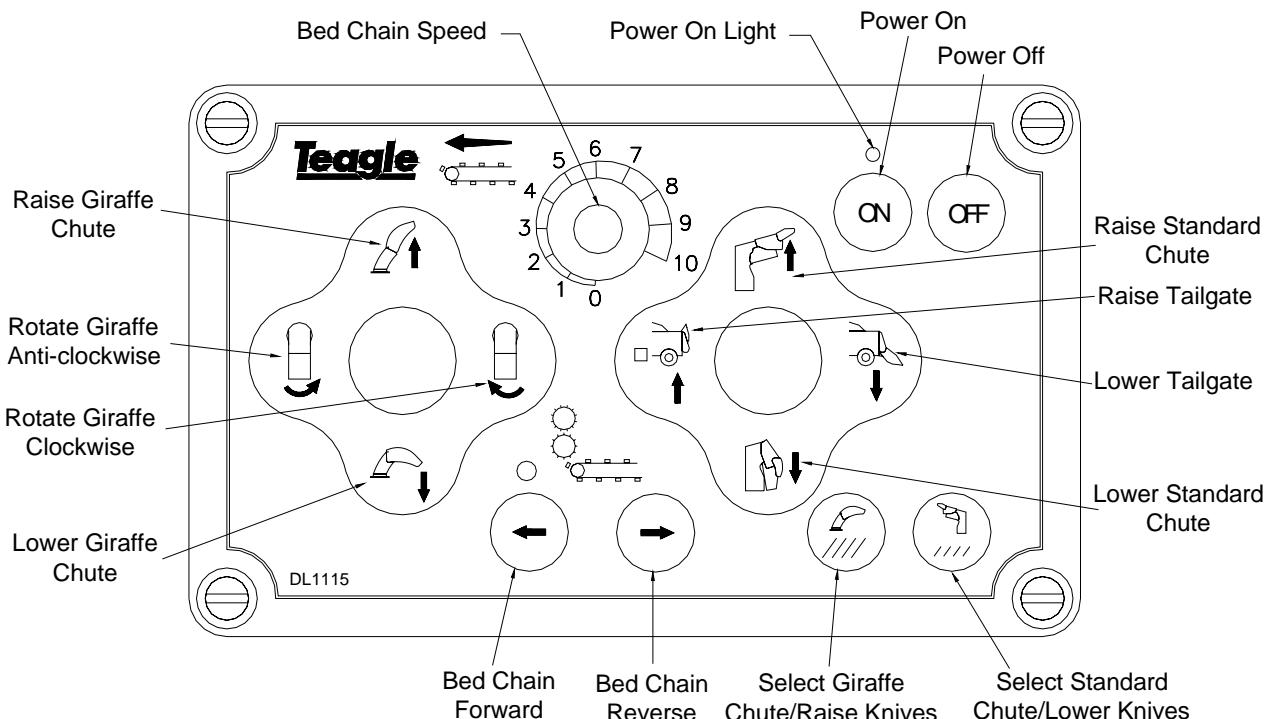
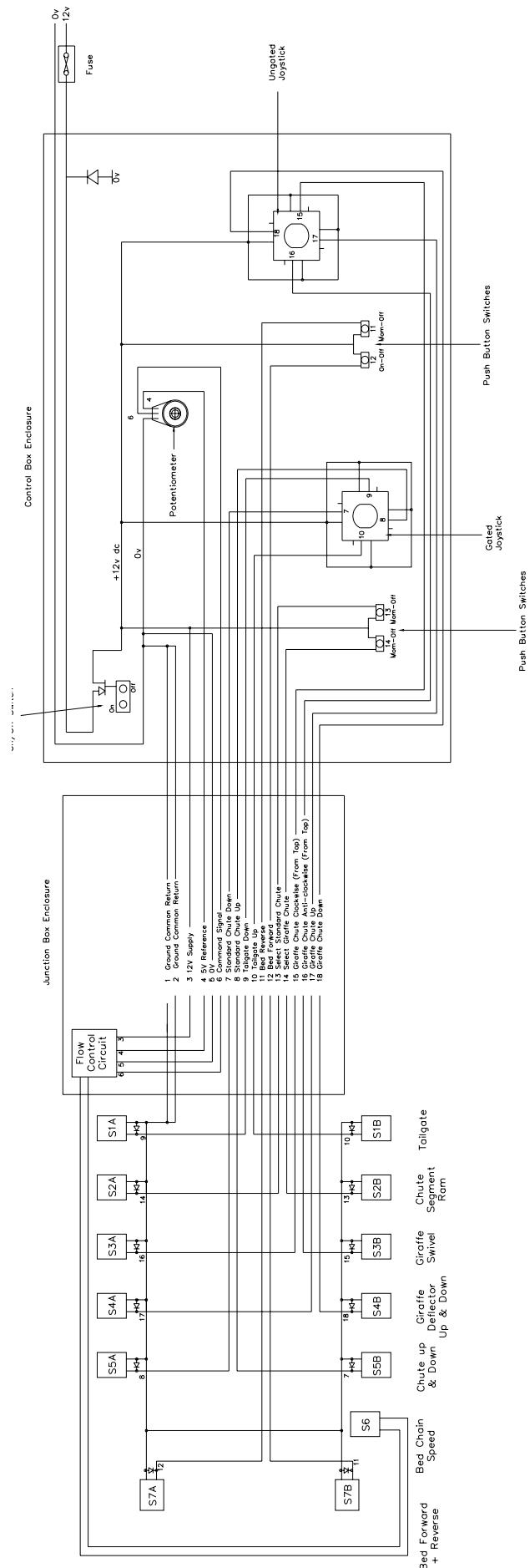


Figure 6.1 Control Functions

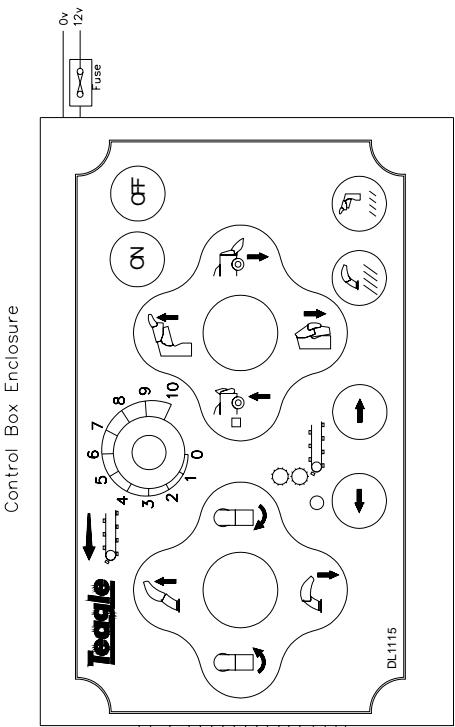
# SECTION 7. CIRCUIT DIAGRAMS

## 7.1 SMALL DOMED BUTTONS

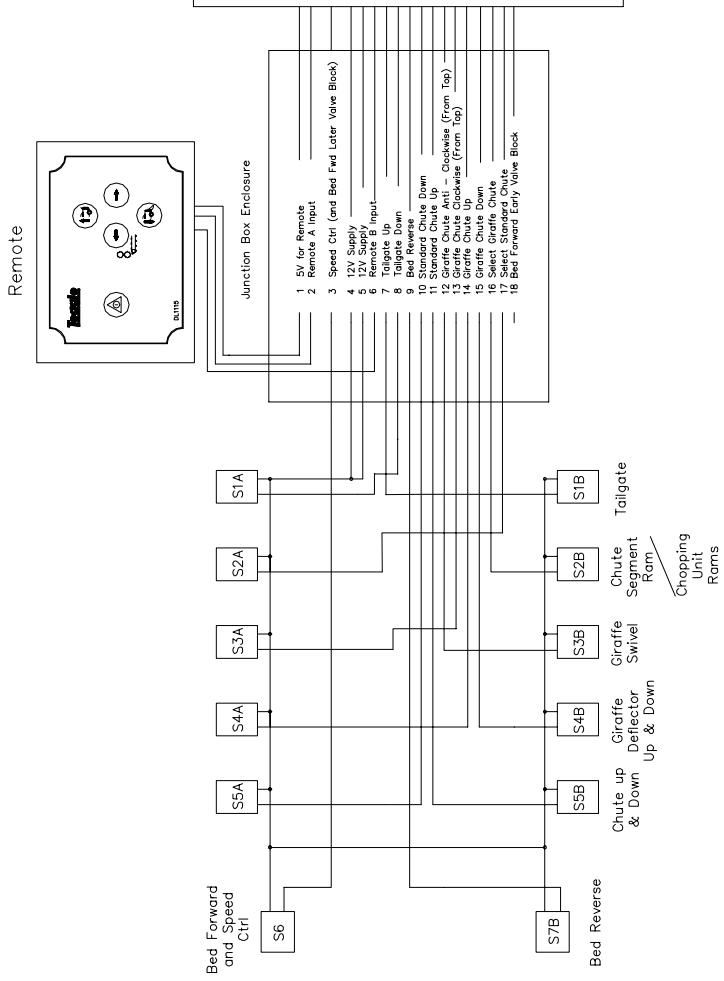
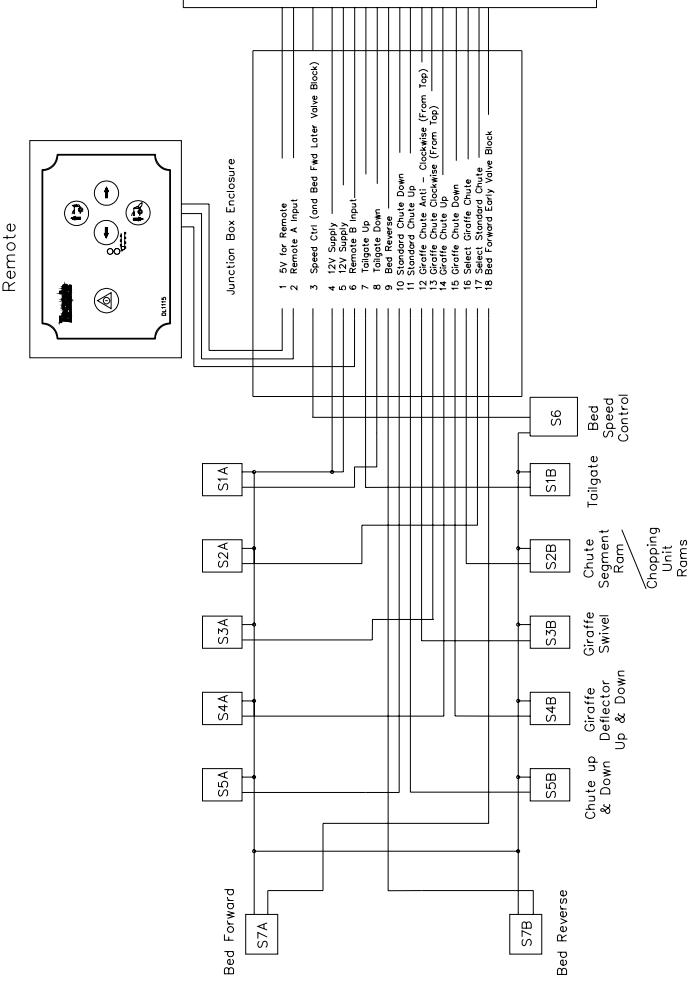
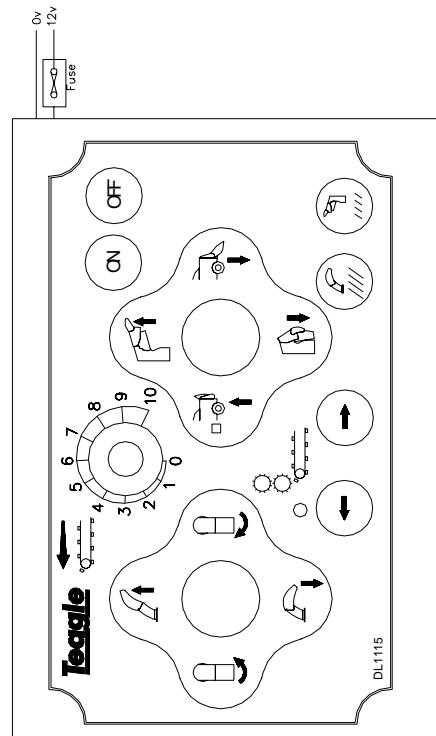


## 7.2 LARGE RAISED FLAT BUTTONS

**AS FITTED TO VALVE WITH INDEPENDENT  
SPEED CONTROL SLICE**



**AS FITTED TO VALVE WITH COMBINED  
SPEED CONTROL/FORWARD SLICE**



## **SECTION 8. SOLENOID VALVE AND CONTROLS TROUBLE SHOOTING**

### **8.1 No valve functions at all.**

#### **Possible causes**

- a) No oil flowing to valve
- b) No power to the electric circuits.
- c) Current overload protection operating.
- d) Low voltage supply to control box - on light flashes
- e) Low voltage to solenoid coils.

#### **Solution**

- a) Check hydraulic oil level on tractor & make sure oil being supplied to valve chest.
- b) Check whether the fuse has blown indicated by the illumination of the red LED on the fuse holder, replace fuse with new 7.5 Amp fuse. If a current overload has occurred and the on LED is flashing, the overload protection device needs to be reset by switching the control box off and on.
- c) If there is a short circuit present within the electric controls then the current overload device will operate. It will be necessary to trace the fault before the controls will operate again.
- d) Check the voltage supply to the unit is greater than 11V, if voltage is lower than 11V, ON/OFF switch will fail to operate.
- e) Check voltage at coils is greater than 75% of coil rating (i.e. greater than 9v for a 12v solenoid coil).

### **8.2 Bed chain fails to operate in both directions. All other valve functions operate normally.**

#### **Possible causes**

- a) Bed chain mechanically jammed in machine or drive to bed chain failed.
- b) Hydraulic Motor failed or seized.
- c) Failure of the wiring to the circuit board, the connections to the potentiometer within the control box or poor connections in the connector between the control box and machine cable.
- d) Pilot orifice blocked in manifold of solenoid slice controlling bed chain forward and reverse.

#### **Solution**

- a) Check Bed chain and drive mechanically intact and working correctly.
- b) Attach hoses directly to motor and run directly from tractor to prove motor failure.
- c) Check all wiring for mechanical damage. Follow procedure in Section 9.3 to solve problem.
- d) Remove solenoid manifold and clean.

### **8.3 Bed chain speed control fails but floor chain keeps moving. All other valve functions remain working.**

#### **Possible causes**

Spool of the proportional flow control slice jammed open or held open by contamination.

#### **Solution**

- a) Eliminate electronic controls by removing the coil from the proportional slice, if bed chain stops then the problem is electrical not mechanical.
- b) Remove the spool and check for contamination (Section 9.2). Remove contamination and check spool is free to move.

### **8.4 One function suddenly fails in both directions of operation.**

#### **Possible causes**

- a) Pilot orifice in manifold blocked.
- b) Damage to circuit board

#### **Solution**

- a) Remove manifold and clean (Section 9.5)
- b) Check junction box circuit board for burnt out circuits caused by a short circuit. Replace if damaged.

## **8.5 One function suddenly fails in one direction of operation only (either permanently on or off).**

### **Possible causes**

- a) Switch/joystick in control box has failed.
- b) Electric circuit to coil has failed.
- c) Damage to circuit board
- d) Coil failed.
- e) Pilot orifice blocked
- f) Pilot Cartridge Stuck

### **Solution**

- a) Check switch/joystick is working, contact Teagle Machinery Ltd if repair is necessary
- b) Check multipin connector at back of control box, replace damaged pin(s).
- c) Check circuit board for burnt out circuits caused by short circuit. Replace if damaged.
- d) Check coil is working and replace if faulty. (Section 9.1)
- e) Clean pilot orifice (see section 9.5)
- f) Remove cartridge (item 7 Section 10.1) and check spool moves freely within cartridge. Replace cartridge if unable to get it moving freely again.

## **8.6 Bed chain no longer operates or operates erratically with poor speed control. Failure may be sudden or intermittent.**

### **Possible causes**

- a) Bed directional function has failed
- b) Failure of the proportional cartridge coil
- c) Malfunction of the proportional cartridge
- d) Failure of the speed control circuit
- e) Motor failure
- f) Dirt or contamination in the proportional cartridge preventing its movement
- g) Dirt or contamination in the Bypass Valve in the flow control slice does not allow it to close resulting in the oil dumping to tank starving any oil flow to the motor.
- h) Dirt or contamination in the Pressure Relief Valve in the flow control slice does not allow it to close resulting in the oil dumping to tank starving any oil flow to the motor.
- i) Dirt or contamination in the Pressurising Valve in the outlet cap does not allow it to close resulting in the oil dumping to tank starving any oil flow to the motor.

### **Solution**

- a) Diagnose as per Section 8.5 above
- b) Check coil for correct operation. (Section 9.1)
- c) Apply 12V directly to proportional coil,
  - 1. If bed runs at full speed the cartridge is operating correctly, refer to Section 9.3 for electrical diagnostics
  - 2. If no change is detected, the cartridge may be mechanically jammed by contamination, refer to Section 9.2 for removal and repair of cartridge.
- d) Check circuit for correct operation. (Section 9.3)
- e) Attach hoses directly to motor, replace if faulty.
- f) Remove proportional cartridge and clean, replace if damaged in any way. (Section 9.2)
- g) Remove bypass valve from the flow control slice, inspect for contamination, clean and replace. (Section 9.6)
- h) Remove pressure relief valve from the flow control slice, inspect for contamination, clean and replace. (Section 9.6)
- i) Remove pressurising valve from the outlet cap from the end of the valve chest, inspect for contamination, clean and replace. (Section 9.8)

## **SECTION 9. SOLENOID VALVE AND CONTROLS REPAIR AND ADJUSTMENT**

### **9.1 Checking coils for correct operation**

Without the tractor engine running it is usually possible to hear the click of cartridge valves moving when the switches are operated.

Remove the coil from the cartridge valve by unscrewing the retaining nut being careful not to lose the 'O' ring behind the nut. With the switch on the control box operated, the magnetic effect of the coil should be detectable on a screwdriver placed inside the coil.

If the magnetic effect cannot be detected try a different coil attached to the same lead or alternatively check for a switched current on the lead with a multimeter. If there is no switched electrical current at the coil connector it may be a fault in the wiring, switch or connector on the cab control box which can only be traced with the aid of a multimeter/test lamp.

### **9.2 Removal of the proportional cartridge**

Remove the coil from the proportional cartridge valve by unscrewing the retaining nut being careful not to lose the 'O' ring behind the nut.

Removal of the cartridge is best effected with the use of tool HYD5336 which allows the cartridge to be removed by a 1" AF deep socket. Where the tool HYD5336 is not available then adjacent components may have to be removed to obtain access with a 9/16" AF open ended spanner.

Reattach the proportional coil to the cartridge and operate through the bed chain speed control range. A variable opening of the cartridge should be noted.

### **9.3 Diagnosing bed chain electronic circuit for faults**

Diagnostics can only be achieved with the use of a multimeter capable of measuring a variable voltage in the range 0-12v.

#### **9.3a Small domed button controls**

As the potentiometer speed control on the control box is varied from stop to full flow it should be possible to measure the following voltages on the connector in the middle of the junction box circuit board, cable labelled 3 (12v), 4 (5v), 5 (0v) & 6 (variable 0 to 5v). If only the variable voltage has failed then the potentiometer in the cab control box may have a faulty connection or has failed. Check for good connections, if none are apparent refer the control box to Teagle Machinery Ltd for repair.

Measure the varying voltage at the connector to the coil with a multimeter, a variation of 6v in a range from 4v to 10v should be measured. If the above satisfactory readings cannot be obtained then one of the two following faults has occurred:

1. Bed chain max and min values need adjustment usually indicated by a variable voltage outside the given range.
2. Flow control circuit board failed - Replace junction box circuit board. (Section 9.4)

#### **9.3b Large flat button controls**

Measure the varying voltage at the connector to the coil, a variation of 6v in a range from 4v to 10v should be measured. If the above satisfactory readings cannot be obtained then one of the two following faults has occurred:

1. Bed chain max and min values need adjustment usually indicated by a variable voltage outside the given range.
2. Control box potentiometer or circuit board has failed - refer the control box to Teagle Machinery Ltd for repair.

<sup>3</sup> Note: Control boxes are available on an exchange basis to prevent any unnecessary down time.

### **9.4 Replacing junction box circuit board**

Remove the circuit board in the junction box by releasing all of the wires from the electrical connector blocks noting the positions of the solenoid wires. Unscrew the circuit board retaining screws and remove the circuit board. Refit the new circuit board ensuring that all wires are returned to their original positions and adjust the I Min and I Max settings (Section 9.11) to ensure correct bed chain speed variation.

## **9.5 Removal of manifold to clean pilot orifice**

With reference to Section 10.1, firstly disconnect the 2 electrical connectors from the coils. With a 5mm Allen Key remove the 2 socket head cap screws retaining the manifold assembly onto the valve body.

The pilot orifice (item 6) can now be inspected for contamination and cleaned.

Refit the O rings in the correct position. Assemble the manifold back onto the valve. The 2 socket head cap screws should be refitted with a thread locking liquid applied to the thread and tightened to a torque of 20.3 Nm (15 lbft).

## **9.6 Removal of pressure relief valve and bypass valve from flow control slice**

With reference to Section 10.2, remove the bypass valve unscrew cap (6) and remove along with the bonded seal (9) and spring (7). Using long nose pliers remove the spool (4) and bypass valve body complete with "O" rings. Clean and rebuild.

To remove the Pressure Relief Valve unscrew the complete valve from the slice and inspect the seat for contamination, clean and replace.

## **9.7 Adjusting the pressure relief valve.**

To check the relief valve setting place an in line pressure gauge in the supply hose to the valve. Remove both hoses from the bed chain hydraulic motor and blank both hose ends. ( 3/8" BSP blanking plug for the hose fitting). Start the tractor and operate the bed chain with the bed chain speed control in its mid position. The pressure shown on the gauge should be 120 bar. The pressure setting should remain the same throughout the whole range of bed chain speed.

To adjust the bed chain pressure remove the cap (item 21 Section 10.2) over the relief valve. To increase the bed chain pressure setting, turn the grub screw (item 20) clockwise until the desired setting is achieved. Replace the cap.

## **9.8 Pressurising valve maintenance.**

To check the operation of the pressurizing valve. Unscrew the valve assembly form the Outlet Cap (item 2 Section 10.5) and check the ball is seated correctly and free to move.

## **9.9 Leaks – seal replacement**

Remove the hoses and electrical connections from the valve. Remove the valve on its mounting plate from the machine. Take the mounting plate off the valve and thoroughly clean the valve of dirt and debris before stripping the valve.

To split the valve to replace interface seals undo the long studs through the valve and separate individual slices. Replace the damaged seals and reassemble the valve. Fitting of O rings not obtained from manufacturer may lead to repeated failures as specific high quality grade O rings are used to seal the valve

The studs should be tightened to a torque of 13.5 Nm (10 lb ft).

## **9.10 Specific torque settings**

	Torque Setting (Nm)	Torque Setting (lb ft)
Long studs through valve	13.5	10
Closure plate socket head cap screws	13.5	10
Manifold socket head cap screws	20.3	15
Cartridge valve assemblies	27.1	20
End cap unions (Inlet/Outlet) 1/2" BSP	70-75	52-55
Slice port unions	70-75	52-55

**Table 9.10 Torque Settings**

## 9.11 Adjusting bed chain speed range

Adjusting the speed range should only be required when any aspect of the bed chain speed control whether hydraulic or electronic has been replaced.

### SAFETY FIRST

With both cases below, the machine must be attached to a tractor with the hydraulics running and so great care must be taken to ensure a safe working environment under these circumstances.

#### 9.11a Small domed button controls

Remove the valve guard and junction box cover.

To get the bed chain to stop when the potentiometer on the control box is set to 0. Set the potentiometer to 1 on the control box and adjust the I Min setting on the machine junction box circuit board (Figure 9.11) until the floor chain is just moving. Turning this adjustment anticlockwise will slow the bed chain speed down. Once set, turning the cab control to 0 should stop the bed chain.

In setting the minimum speed the maximum speed of the bed chain may have been reduced. Turn the cab control to 10 and adjust the I Max setting until maximum floor speed is achieved. Turning clockwise will increase the bed chain maximum speed.

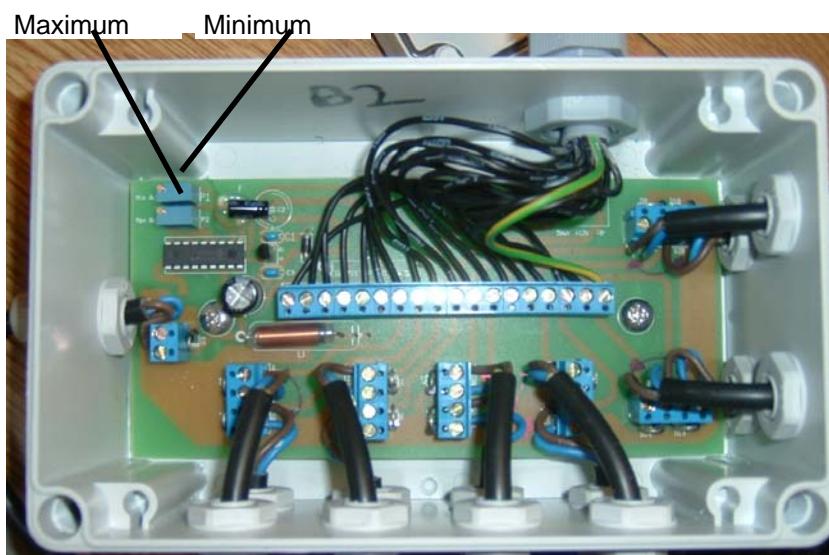


Figure 9.11 Junction box circuit board

#### 9.11b Large raised flat button controls

The speed adjustment on this type of control box can be done from the control panel by following the instructions below. Neither the control box or junction box needs to be opened.

1. With the control box off and with reference to figure 6.1 hold the bed chain forward, raise knives, and ON buttons together for 8 seconds until both LED's are ON. Set up mode will now be shown by the ON LED and Bed Chain LED flashing alternately.
2. Set bed chain speed control dial to 0.5, reduce bed chain speed until stopped by using raise knives button or if bed chain is already stopped increase bed chain speed until just moving using lower knives button.
3. Set bed chain speed control dial to 10, increase bed chain speed to max using lower knives button or if bed chain is already at maximum speed use raise knives button to find the point at which the bed chain just starts to decrease in speed.
4. Switch the control desk off to save these settings.
5. Switch the control box on and test for correct operation.

#### 9.12 Indicating max/min supplied voltage during service (large raised flat button controllers only).

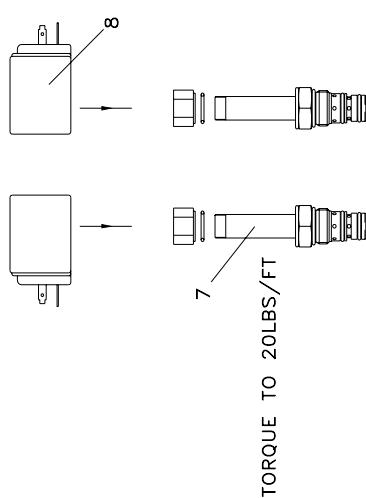
1. Hold bed chain forward, Off and On buttons for approx 14 seconds until both LED's ON.
2. Turn the bed chain speed dial to maximum for minimum voltage which will be indicated by the bed chain forward LED, one flash per volt under voltage, which is repeated.
3. Turn bed chain speed dial to minimum for maximum voltage which will be indicated by the bed chain forward LED, one flash per volt over voltage, which is repeated.
4. Turn off to revert to normal.

# SECTION 10. SOLENOID VALVE AND CONTROLS PARTS LIST

## 10.1 DOUBLE ACTING SLICE

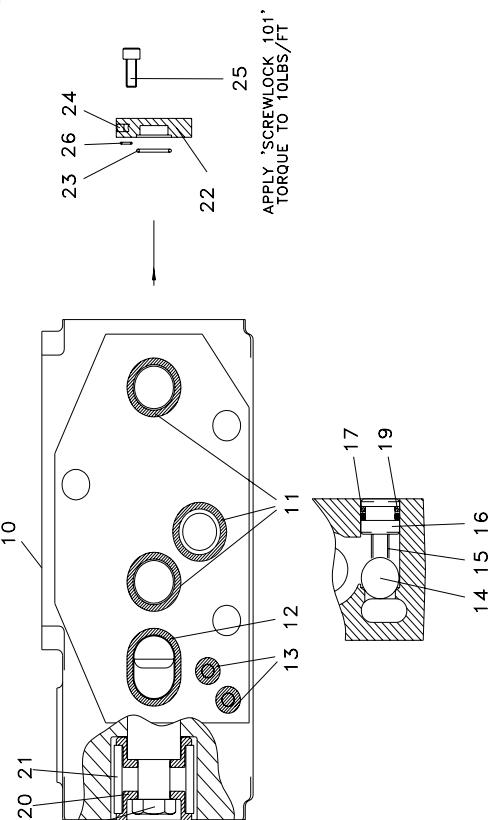
ITEM	PART NUMBER	DESCRIPTION	QTY
1		M6x90 SKT HD CAP SCREW	2
2	HYD5168	PILOT MANIFOLD	1
3		ø4mm AVSEAL PLUG	6
4		'O' RING	1
5		'O' RING	3
6		RESTRICTOR	1
7	HYD5313	SOLENOID CARTRIDGE	2
8	HYD5179	12V, 24W COIL (DIN 43650)	2
9		DOUBLE ACTING SPOOL	1
10		Slice Body 1" PORTS	1
11		'O' RING	3
12		'O' RING	1
13		'O' RING	2
14			1

ITEM	PART NUMBER	DESCRIPTION	QTY
1		M6x90 SKT HD CAP SCREW	2
2	HYD5168	PILOT MANIFOLD	1
3		ø4mm AVSEAL PLUG	6
4		'O' RING	1
5		RESTRICTOR	1
6		SOLENOID CARTRIDGE	2
7	HYD5179	12V, 24W COIL (DIN 43650)	2
8		DOUBLE ACTING SPOOL	1
9		Slice Body 1" PORTS	1
10		'O' RING	3
11		'O' RING	1
12		'O' RING	2
13			1



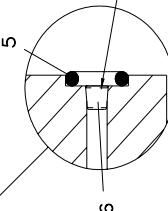
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APPLY 'THREADLOCKER 243'



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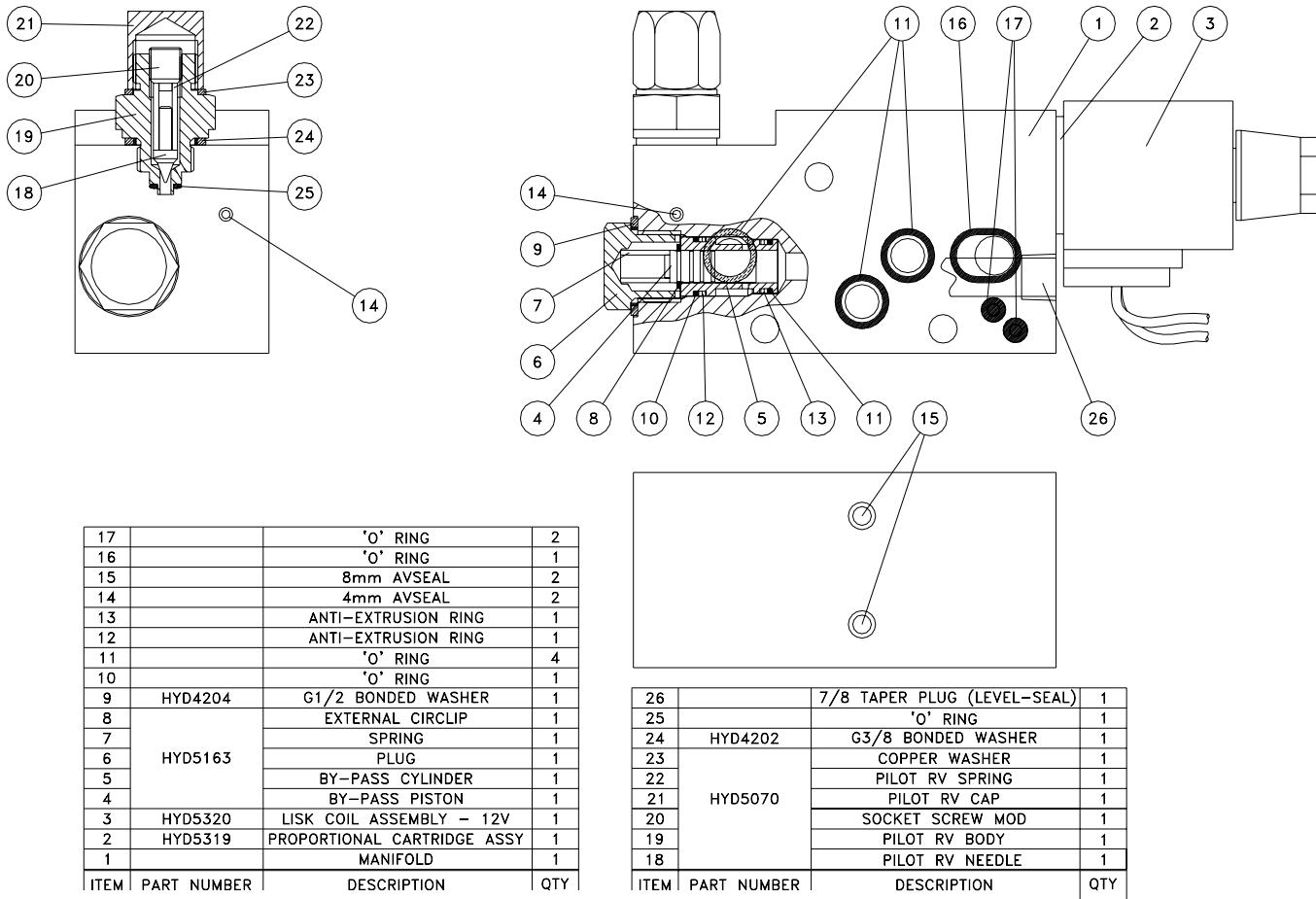
NOTE:  
ITEM 9 MUST BE FITTED  
FLUSH WITH BOTTOM  
OF COUNTERBORE



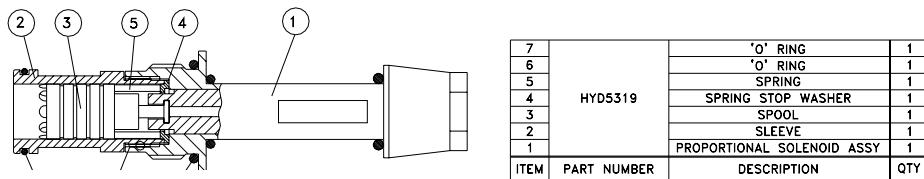
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APPLY 'SCREWLOCK 101'  
TORQUE TO 15LBS/FT

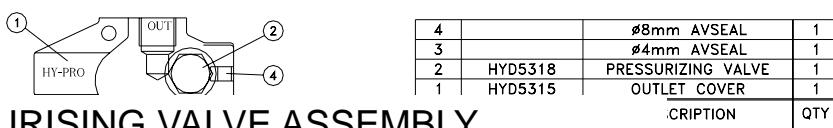
## 10.2 PROPORTIONAL SOLENOID SLICE (INDEPENDENT BED CONTROL)



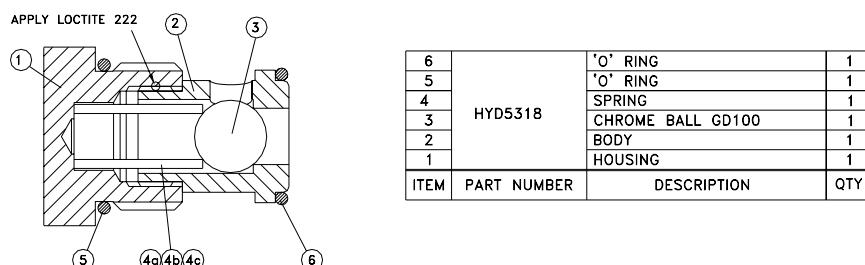
## 10.3 PROPORTIONAL SOLENOID CARTRIDGE



## 10.4 OUTLET END CAP



## 10.5 PRESSURISING VALVE ASSEMBLY



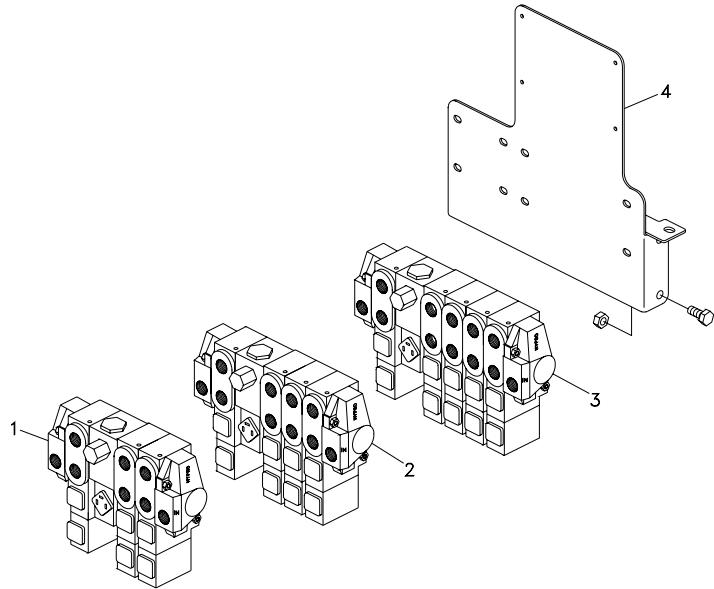
## 10.6 SOLENOID VALVE PARTS INDEPENDENT BED SPEED CONTROL SLICE

Ref	Description	Part No.	RH	SC	TC/DC
A	Inlet Cover	HYD5098	1	1	1
B	Double acting slice – spring return	HYD5192	3	4	6
C	Relief valve assembly	HYD5070	1	1	1
D	Flow control slice	HYD5314	1	1	1
E	Outlet Cover	HYD5315	1	1	1
	Complete valve seal kit	--	HYD5172	HYD5173	HYD5174
	Valve slice seal kit	HYD5316	5	6	9
	Flow control valve seal kit	HYD5317	1	1	1

## 10.7 SOLENOID VALVE PARTS COMBINED SPEED CONTROL/FORWARD SLICE

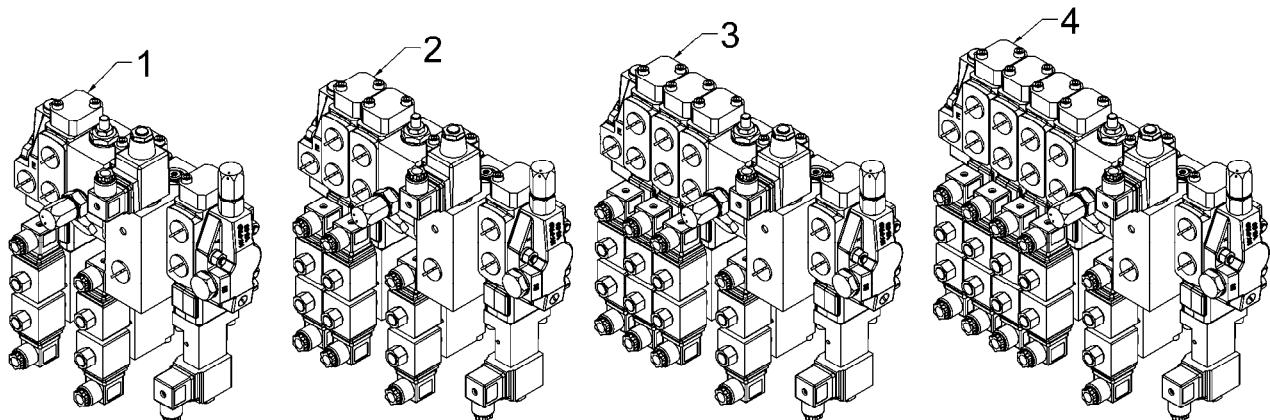
Ref	Description	Part No.	RH	SC	DC	TC
A	Cover (Bed control end)	HYD5406	1	1	1	1
B	Relief valve assembly	HYD5407	1	1	1	1
C	Double acting slice – spring return	HYD5192	2	3	4	5
D	Flow control slice	HYD5404	1	1	1	1
E	Bed reverse slice	HYD5405	1	1	1	1
F	Outlet Cover	HYD5315	1	1	1	1
G	Flow dividing slice	HYD5198	1	1	1	1
	Complete valve seal kit	HYD5174	1	1	1	1
	Valve slice seal kit	HYD5316	2	3	4	5
	Reverse slice seal kit	HYD5408	1	1	1	1
	Flow control slice seal kit	HYD5409	1	1	1	1

## 10.8 SOLENOID VALVE INDEPENDENT BED SPEED CONTROL



Ref	Description	Part No.	RH Chute	SC Chute	TC/DC
1	Electric Valve	HYD5094	1	--	--
2	Electric Valve	HYD5095	--	1	--
3	Electric Valve	HYD5096	--	--	1
4	Valve mount bracket	SC3539	1	1	1
	Setscrew M8 x 16	FAS2625P	--	--	4
	Washer M8	FAS2343P	--	--	4

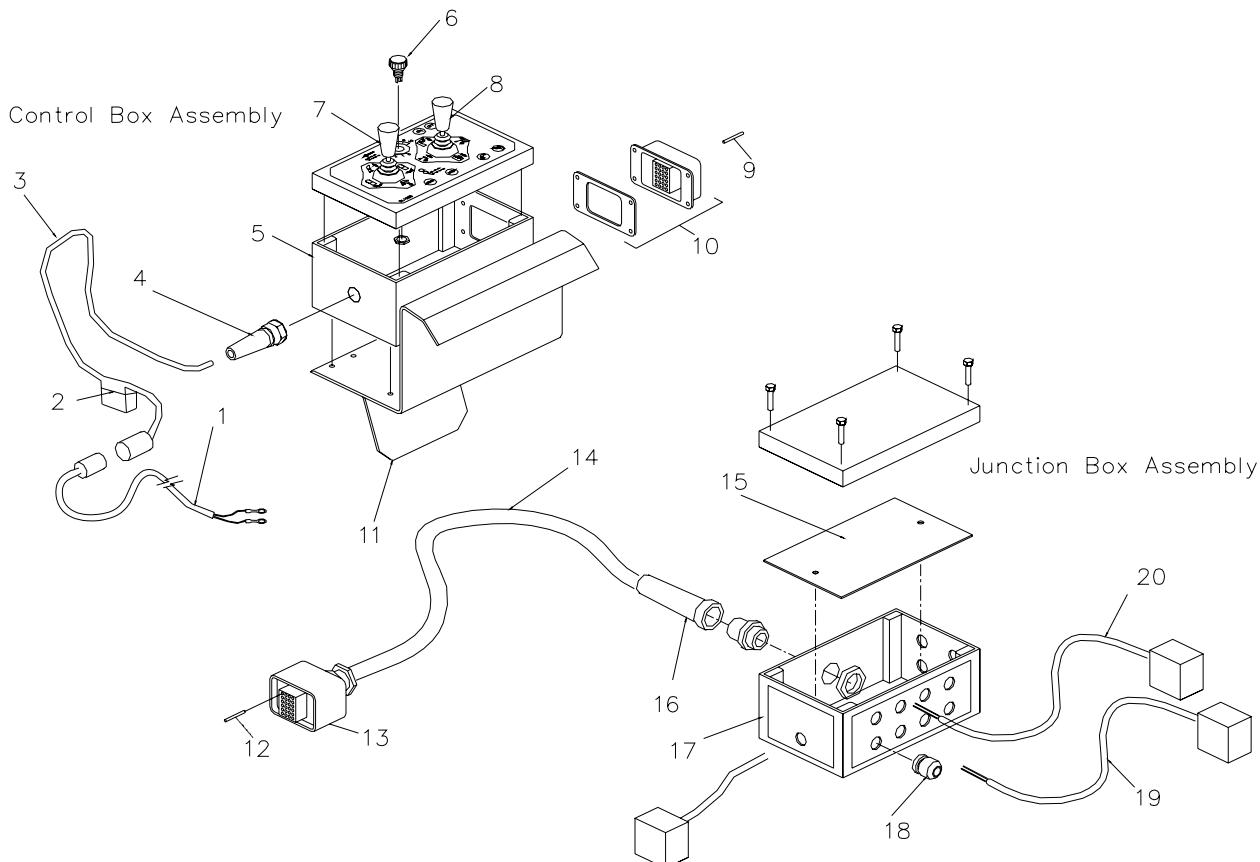
## 10.9 SOLENOID VALVE COMBINED BED FORWARD/SPEED CONTROL



Ref	Description	Part No.
1	Valve RH	HYD5400
2	Valve SC	HYD5401
3	Valve DC	HYD5402
4	Valve TC	HYD5403

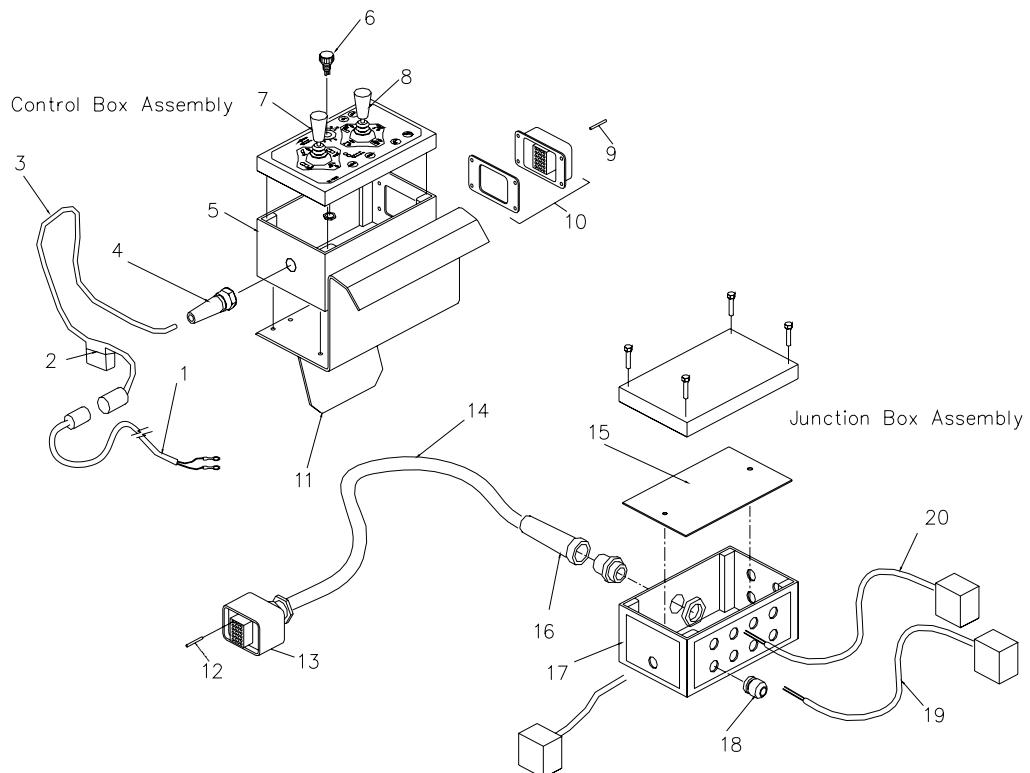
Note: Valve mounting plate and fasteners are as for solenoid valve with independent speed control.

## 10.10 ELECTRONIC CONTROLS - SMALL DOMED BUTTONS



Ref	Description	Standard Chute	Swivel Chute	Dual Chop & TC	Q'ty	Associated Components	Part No.	Q'ty
	<b>Control Box Assembly</b>							
1	Battery to cab cable	SC3546	SC3540	SC3540	1			
2	7.5 A fuse	SC3529	SC3529	SC3529	1			
3	Power cable	SC3503	SC3503	SC3503	1			
4	Cable gland	SC3504	SC3504	SC3504	1			
5	Enclosure	SC3506	SC3506	SC3506	1			
	Base	SC3506A	SC3506A	SC3506A	1			
	Lid	SC3506D	SC3506C	SC3506B	1			
6	Potentiometer	SC3513	SC3513	SC3513	1			
7/8	Joystick	SC3510	SC3510	SC3510	1	Micro-switches	SC3566	4
9	Male crimp contacts	SC3516	SC3516	SC3516	18			
10	Control box socket	SC3515	SC3515	SC3515	1	M4 x 16 Pan Head M4 Locknut	FAS2430S	4
11	Support Bracket	SC3538	SC3538	SC3538	1	M4 x 16 Pan Head M4 Locknut	FAS2430S	4
	<b>Junction Box Assembly</b>							
12	Crimp contacts	SC3557	SC3556	SC3542	1			
13	Cable socket	SC3519	SC3519	SC3519	18			
14	18 Core cable assy (4m)	SC3518	SC3518	SC3518	1			
	18 Core cable assy (5m)	SC3522	SC3522	SC3522	1			
15	PCB (Domed Controls)	SC3592	SC3592	SC3592	1			
16	Cable gland	SC3524	SC3524	SC3524	1	M4 x 3/8 Pan Head	FAS2431	2
17	Enclosure	SC3525	SC3525	SC3525	1	M4 x 16 Pan Head M4 Locknut	FAS2430S	4
18	Sealing Gland.	SC3537	--	--	7			
		--	SC3537	--	9			
		--	--	SC3537	13			
19	Solenoid cable - long.	SC3548	SC3548	SC3548	2			
20	Solenoid cable - short.	SC3547	--	--	5			
		--	SC3547	--	7			
		--	--	SC3547	11			

## 10.11 ELECTRONIC CONTROLS - LARGE RAISED FLAT BUTTONS



Ref	Description	Standard Chute	Swivel Chute	Dual Chop & TC	Q'ty	Associated Components	Part No.	Q'ty
	<b>Control Box Assembly</b>							
1	Battery to cab cable	SC3580	SC3579	SC3579	1			
2	7.5 A fuse	SC3529	SC3529	SC3529	1			
3	Power cable	SC3503	SC3503	SC3503	1			
4	Cable gland	SC3504	SC3504	SC3504	1			
5	Enclosure	SC3506	SC3506	SC3506	1			
	Base	SC3506A	SC3506A	SC3506A	1			
	Lid	SC3506D	SC3506C	SC3506B	1			
6	Potentiometer	SC3513	SC3513	SC3513	1			
7/8	Joystick	SC3510	SC3510	SC3510	1	Micro-switches	SC3566	4
9	Male crimp contacts	SC3516	SC3516	SC3516	18			
10	Control box socket	SC3515	SC3515	SC3515	1	M4 x 16 Pan Head M4 Locknut	FAS2430S	4
						M4 x 16 Pan Head M4 Locknut	FAS2329S	4
11	Support Bracket	SC3538	SC3538	SC3538	1		FAS2430S	4
							FAS2329S	4
	<b>Junction Box Assembly</b>							
12	Crimp contacts	SC3583	SC3582	SC3581	1			
13	Cable socket	SC3519	SC3519	SC3519	18			
14	18 Core cable assy 4m	SC3522	SC3522	SC3522	1	(Standard)		
	18 Core cable assy 5m	SC3592	SC3592	SC3592	1	(Optional)		
	18 Core cable assy 7m	SC3594	SC3594	SC3594	1	(Optional)		
15	PCB (Large Controls)	SC3575	SC3575	SC3575	1	M4 x 3/8 Pan Head	FAS2431	2
16	Cable gland	SC3524	SC3524	SC3524	1			
17	Enclosure	SC3525	SC3525	SC3525	1	M4 x 16 Pan Head M4 Locknut	FAS2430S	4
							FAS2329S	4
18	Sealing Gland.	SC3537	--	--	7			
		--	SC3537	--	9			
		--	--	SC3537	13			
19	Solenoid cable - long.	SC3548	SC3548	SC3548	2	Connector screw	SC3585	2
20	Solenoid cable - short.	SC3547	SC3547	SC3547	5-11	Connector screw	SC3585	5-11