Spearhead Machinery
Operator Instruction Manual For

TWIGA CLASSIC

5.00-6.50m cut width

Vegetation control reach arm mower

8999164EN v1.0

IMPORTANT
Verification Of Warranty Registration

Dealer Warranty Information & Registration Verification

It is imperative that the selling dealer registers this machine with Spearhead before delivery to the end user.

Failure to do so may affect the validity of the machine warranty.

To register machines go to the Spearhead Machinery Limited web site at:

https://my.spearheadmachinery.com/warranty/machine-registration/

Should you experience any problems registering a machine in this manner please contact the Spearhead Service Department on 01789 491867.

Confirm to the customer that the machine has been registered in the section below.

Registration Verification

Model Type:		**Twiga Classic**
Model Number:		**956**_____
Serial Numbers:	**Machine:**	**S**_____
	Cutting Implement:	**S**_____
	Other:	
Name Of Owner:		
Name Of Installing Dealer:		
Dealer Address:		
Dealer Signature:		
Date Of Delivery / Installation:		
Date Of Warranty Registration:		

IMPORTANT

At the point of transfer of ownership record the above information. Note the serial number of your machine and always quote it in any communication with us or your dealer. (The serial number plate is located on the machine mainframe.) This is particularly important when ordering spares. Remember to include all numbers and letters.

The information given throughout this manual is correct at the time of publication. However, in the course of constant development of Spearhead machines, changes in specification are inevitable. Should you find the information given in this book to be at variance with the machine in your possession, you are advised to contact the Spearhead Service department where up-to-date information will be provided.

The manual can contain standard and optional features and is not to be used as a machine specification. The machine has been tested and is considered safe if carefully used. Ensure your operator is properly trained in its use and maintenance.

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Twiga Classic Reach Arm Mower

This manual covers the Twiga Classic series of tractor mounted reach arm mowers which are available in 5.0m, 5.5m and 6.0m standard arm variants, 5.5m and 6.0m variable forward reach arm variants and a 6.5m telescopic arm variant. These machines are designed to be fitted on Category 2 tractors with a minimum horsepower of 80hp (60kW) and a minimum tractor weight starting from 2800kg (6173lbs). See the specific minimum tractor weight requirement of each specific reach arm model in Section 1.5.1.

All machines are all fitted with hydraulic rams which allow for the cutting attachment to be placed in infinite positions and allow the reach arm the ability to compactly fold making the machine legal for road transportation.

Twiga reach arm machines can be specified with various specifications of tractor fitting and control operating systems to suit the end user's specific requirements.

Twiga reach arm machines can be specified to work with a variety of different attachments which Spearhead Machinery can also provide as part of its product offering.

It is essential that the safety guards are always fitted during operation and that the machine is operated in line with the procedures and practices detailed in this manual.

IMPORTANT

This operator's manual should be regarded as part of the machine. Suppliers of both new and second-hand machines are advised to retain documentary evidence that this manual was provided with the machine.

This machine is designed solely for ground vegetation control and must not be used for any other purpose. Use in any other way is considered as contrary to the intended use. Compliance with, and strict adherence to, the conditions of operation, service, and repair, as specified by the manufacturer, also constitute essential elements of the intended use.

This machine should be operated, serviced, and repaired only by persons who are familiar with its characteristics and who are acquainted with the relevant safety procedures.

Accident prevention regulations, all other generally recognised regulations on safety and occupational medicine, and all road traffic regulations must always be observed.

Any arbitrary modifications carried out to this machine may relieve the manufacturer of liability for any resulting damage or injury.

It is potentially hazardous to fit or use any parts other than genuine **Spearhead** parts.

The company disclaims all liability for the consequences of such use which, in addition, voids the machine warranty.

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1 Machine Description

1.1 Intended Usage

1.1.1 Allowed Uses

The Twiga Classic reach arm range of machines are perfect for farmers, contractors and local authorities which when combined with one of Spearhead's wide range of cutting attachments makes a machine which is suitable to a wide range of applications with an excellent reach capability. Such applications include hedge cutting, verge mowing, tree branch cutting, ditch cleaning and weed brushing.

These machines are designed for use on level, undulating or inclined ground and for a duty cycle of 1000 hours per annum and it can be positioned to access up-bank or down-bank applications. The cutting capabilities of the machine are defined by the capabilities of the cutting attachment. See the attachment operators manuals for the capabilities of the attachment.

These machines can be mounted to agricultural tractors with a minimum of 80hp (60kW) and a minimum tractor weight starting of 3500kg (S55), 3750kg (VFR55 and S60), 4250kg (VFR60) and 4500kg (T65).

1.1.2 Improper Uses

DANGER! Spearhead declines any and all liability for damages caused by the machine to persons, animals or property, resulting from use in any other way than described in this manual, or due to damage caused by negligence or by not observing the instructions contained in this manual.

The machine, due to its typical construction, may also be suitable for uses other than from those foreseen by the manufacturer. For this reason Spearhead has selected, as non-exhaustive examples, a series of improper uses that can be reasonably foreseen, which are:

- Use the machine as a lifting crane.
- Fitting attachments with a mass greater than 500kg (1100lbs).

The uses listed above and those not specifically indicated in this manual, including reasonably foreseeable improper uses, are definitively prohibited.

Figure 1.1 Spearhead Twiga Classic Reach Arm
(Left-hand build S55 model shown)

1.2 General Arrangement

The layout and naming convention used throughout this manual for each of the machines are shown in the table below. The numbering and positioning of the relevant item can be found for the particular machine in Section 1.2.1 for the Twiga Classic standard arm variant (S55, S60), Section 1.2.2 for Twiga Classic variable forward reach arm variant (VFR55/VFR60) and Section 1.2.3 for the Twiga Classic telescopic reach arm variant (T65). Sections 1.2.1 to 1.2.3 illustrate the standard fitment Pilot control system.

Twiga Classic machines can be specified at manufacture to come with various control systems and machine options. It is important to examine the machine and the machine order to determine what features are fitted to the specific Twiga Classic machine being viewed. Further guidance to the various Twiga Classic machine options can be seen in Section 1.5.2.

Item No.	Description.
1	Oil Tank
2	Machine Stand
3	Slew Ram
4	Lift Ram
5	Dipper Ram
6	Head Ram
7	Tele Ram
8	Forward Reach Ram
9	LED Light
10	Slew Post
11	Lift Frame
12	Head Mount Bracket
13	Main Arm
14	Dipper Arm
15	A Frame
16	Documents Tube
17	Control Valve
18	Breakback Valve
19	Returns Filter
20	Stabiliser
21	Gearbox
22	Pump
23	Pilot Valve
24	Cable Rotor Valve

Item No.	Description.
25	Rotor Control Valve
26	Armrest
27	Telescopic Arm
28	Forward Reach Arm
29	Tank Level Gauge
30	Strainer Element
31	Over Centre Bracket
32	Top Link Cushion
33	Tractor Tongue
34	Tie Bar
35	Head Crowd Bracket
36	Head Crowd Link
37	Curved Link
38	Hose Carrier Plate
39	Top Link
40	Input PTO Driveshaft
41	Input PTO Shipping Bracket
42	VFR Knuckle
43	VFR Parallel Arm
44	Hose Guard
45	Control Box + Loom
46	Joystick Assembly
47	Input PTO Driveshaft

Table 1.1 – Twiga Classic Machine Components

1.2.1 Standard Arm Variants (S55, S60)

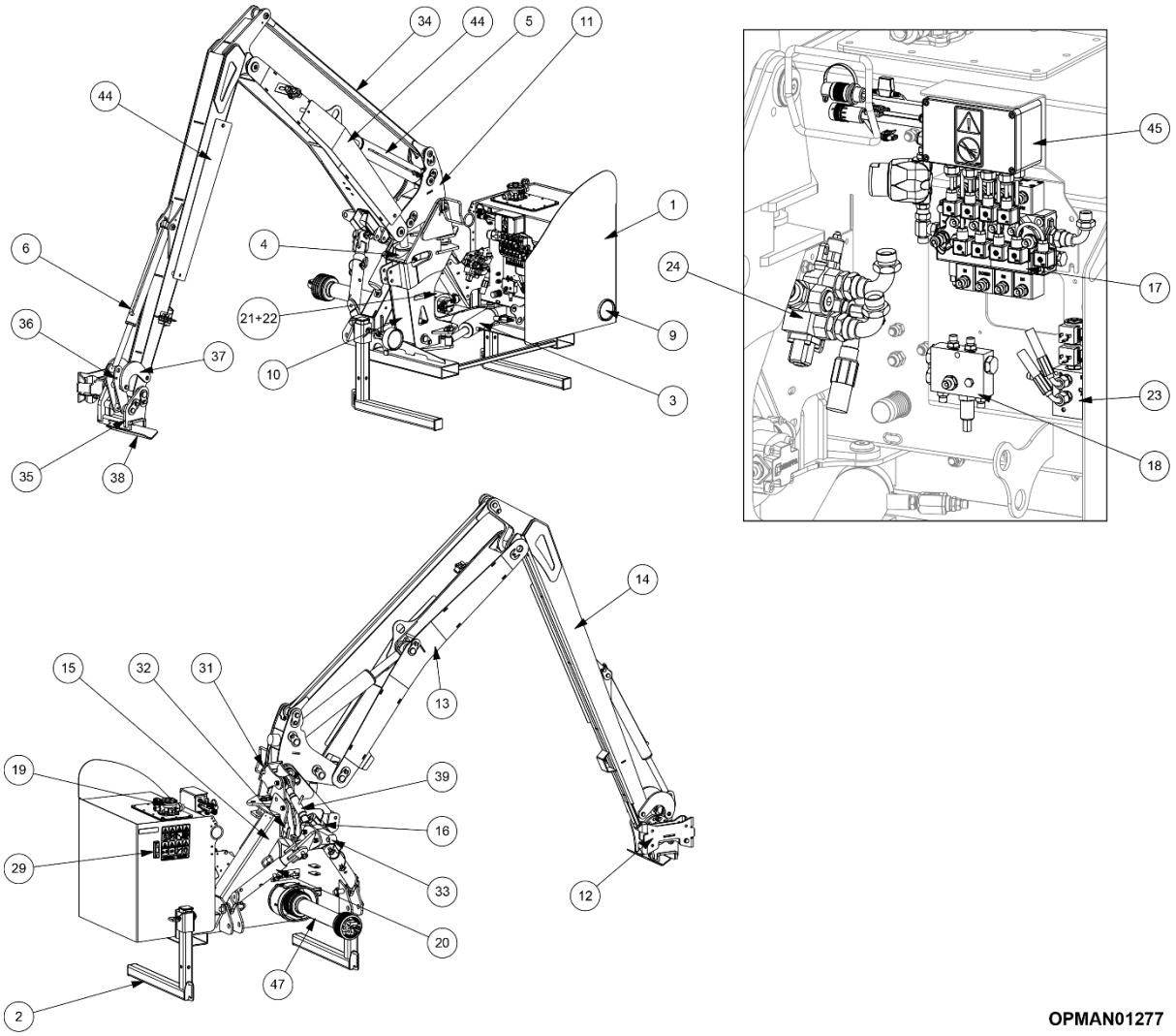


Figure 1.2 – Standard Arm Variants General Arrangement

(Left-hand build S55 model with pilot control system shown)

1.2.2 Variable Forward Reach Arm Variants (VFR55, VFR60)

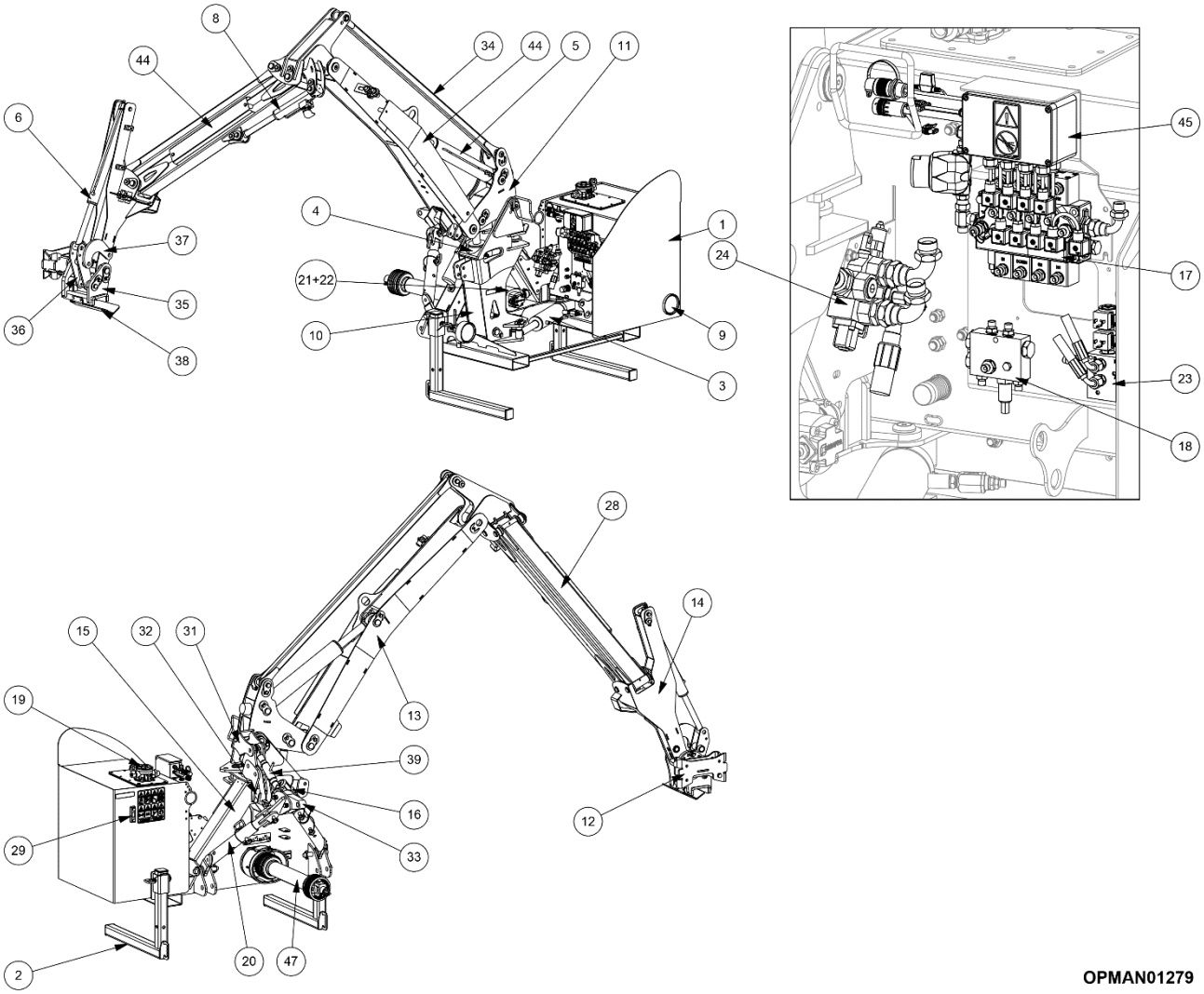


Figure 1.3 – Variable Forward Reach Arm Variants General Arrangement

(Left-hand build VFR55 model with pilot control system shown)

1.2.3 Telescopic Arm Variant (T65)

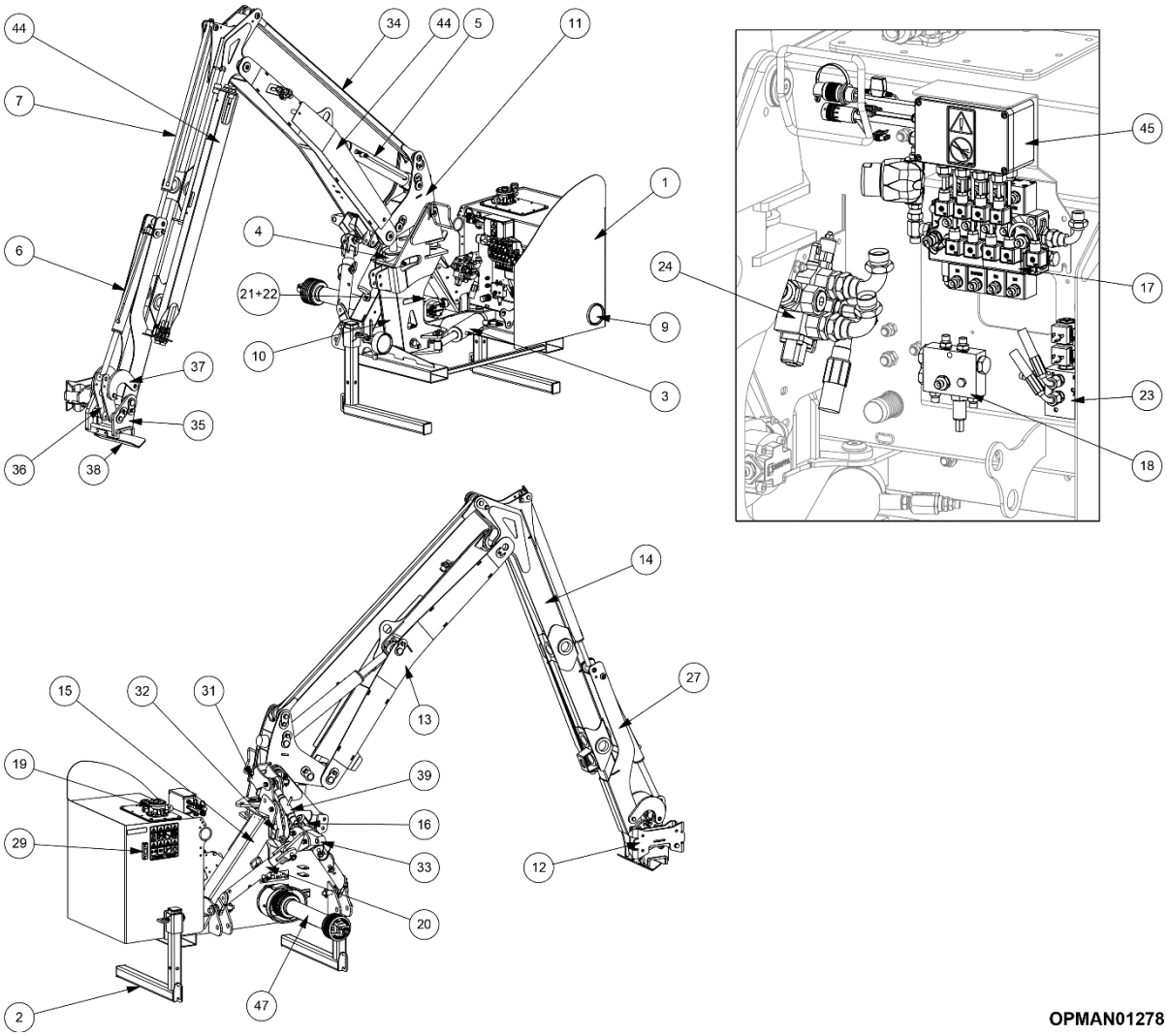


Figure 1.4 – Telescopic Arm Variant General Arrangement

(Left-hand build with Pilot control system shown)

1.3 Machine Identification

Each machine is equipped with a serial plate; see Figure 1.5 that includes the following data in this order:

1. UKCA Conformity Marking.
2. Machine Whole Goods Code (WGC).
3. Serial number of the machine.
4. Mass in kg.
5. Production Year (year of construction).
6. Design conformity standard.
7. Machine Product Group Code.
8. EU Authorised Representative QR scan code.
9. Manufacturer marking with name and address.
10. EAC Eurasian/Russian Conformity Marking.
11. EC European Conformity Marking.

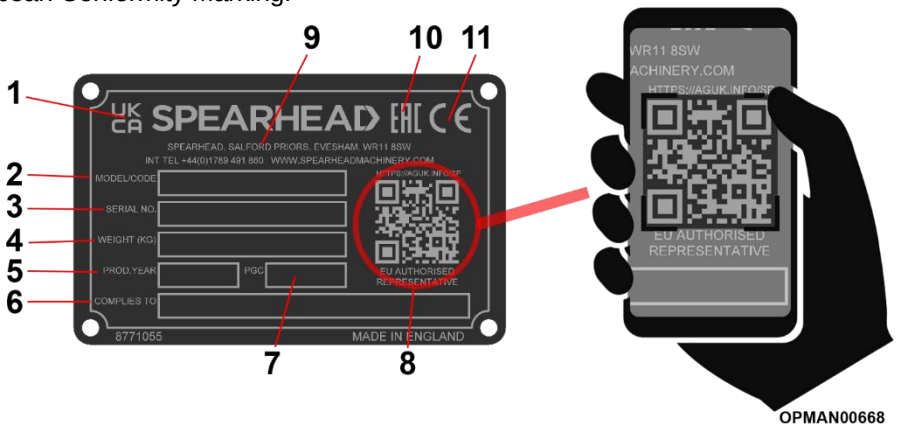


Figure 1.5 – Serial Plate

Data on the Spearhead manufacturer's plate should always be referred to when requesting assistance and/or requiring replacement spare parts.

This data can identify the machine and its characteristics and specification for its particular time of manufacture, certifying that it responds to current regulations. For this reason the plate should never therefore be removed nor be used for other purposes; if the machine is dismantled, it should be destroyed to prevent any form of abuse.

By utilising a smart phone and scanning the Authorised Representative QR scan code found on the right-hand side of the serial plate (ref 8, Figure 1.5) using a suitable QR scanning App, you can find details for Spearhead Machinery authorised representatives for its various territories.

The serial plate is located on the left-hand side of the A frame of the machine near the flip-over bracket; see Figure 1.6.

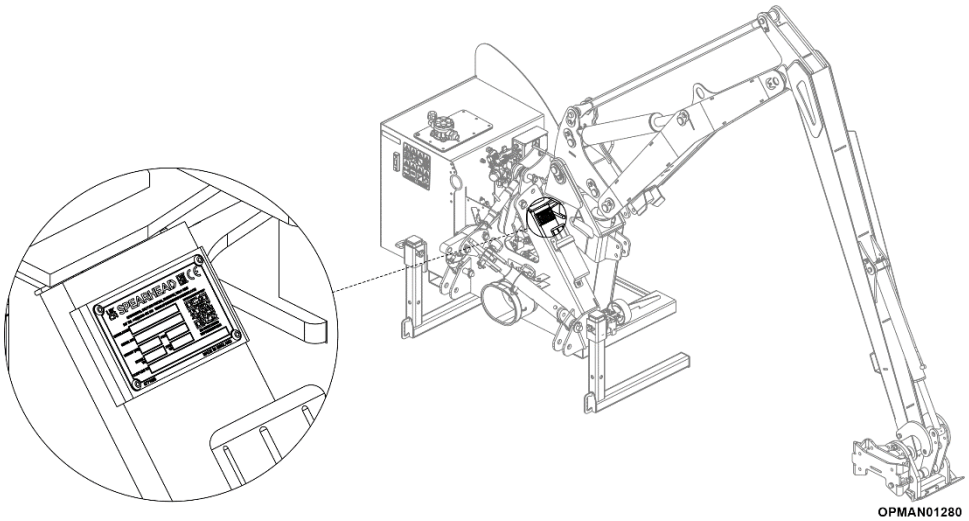


Figure 1.6 – Serial Plate Location
(Left-hand build S55 model shown)

1.4 Rotation Definitions & Conventions

This instruction manual refers to relative rotational directions. The terms clockwise and anti-clockwise are defined by looking down at the machine from above, with the tractor being at the front. To eliminate confusion the following definitions will be used throughout this operator's manual.

Additionally, other references to 'clockwise' and 'anti-clockwise' actions by the operator conform to international right-hand thread conventions for 'screw down' and 'un-screw' respectively.

This convention also extends to the definition of PTO drive rotation from the prime mover, see Figure 1.7.

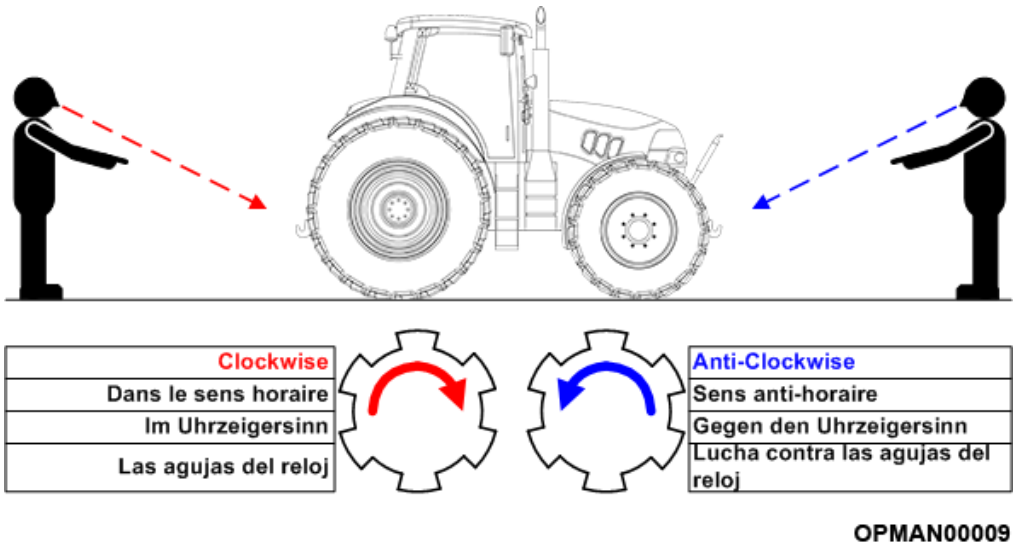


Figure 1.7 – Tractor PTO Shaft Rotation Definitions

1.5 Machine Specification

1.5.1 Standard Specification

	Twiga Classic		S55	VFR55	S60	VFR60	T65
Tractor	Recommended Minimum Tractor HP		80hp (60kW)				
	Minimum Tractor Weight		3500kg (7717lbs)	3750kg (8268lbs)	3750kg (8268lbs)	4000kg (8819lbs)	4250kg (9370lbs)
PTO	Speed		540RPM				
	Size		1” 3/8 6-spline				
Machine (1) (2)	Mass		1230kg (2712lbs)	1320kg (2911lbs)	1250kg (2756lbs)	1340kg (2955lbs)	1310kg (2889lbs)
	Hitch		Three-point linkage				
Dimensions	Working (ref Figure 1.8)	A	5.50m (18’)	5.50m (18’)	5.90m (19’ 4”)	5.90m (19’ 4”)	6.40m (21’)
		B	4.90m (16’ 1”)	5.00m (16’ 5”)	5.30m (17’ 5”)	5.40m (17’ 9”)	5.80m (19’)
		C	3.60m (11’ 10”)	3.70m (12’ 2”)	4.00m (13’ 1”)	4.10m (13’ 5”)	4.40m (14’ 5”)
		D	6.50m (21’ 4”)	6.50m (21’ 4”)	6.80m (22’ 4”)	7.00m (22’ 11”)	7.10m (23’ 3”)
		E	5.10m (16’ 9”)	5.10m (16’ 9”)	5.40m (17’ 9”)	5.50m (18’)	5.70m (18’ 8”)
		F	2.20m (7’ 3”)	2.30m (7’ 7”)	2.30m (7’ 7”)	2.30m (7’ 7”)	2.20m (7’ 3”)
		W	2.20m (7’ 3”)	2.30m (7’ 7”)	2.20m (7’ 3”)	2.30m (7’ 7”)	2.20m (7’ 3”)
		H	3.50m (11’ 6”)	3.30m (10’ 10”)	3.50m (11’ 6”)	3.40m (11’ 2”)	3.50m (11’ 6”)
		T	N/A				0.90m (2’ 11”)
		V	N/A	1.10m (3’ 7”)	N/A	1.10m (3’ 7”)	N/A
		R	N/A	0.90m (2’ 11”)	N/A	0.90m (2’ 11”)	N/A
	Transport (ref Figure 1.9)	A	2.81m (9’ 3”)	2.82m (9’ 3”)	2.98m (9’ 10”)	2.95m (9’ 9”)	2.96m (9’ 9”)
		B	1.38m (4’ 7”)	1.45m (4’ 10”)	1.38m (4’ 7”)	1.45m (4’ 10”)	1.41m (4’ 8”)
		C	1.97m (6’ 6”)	2.04m (6’ 9”)	1.98m (6’ 6”)	2.04m (6’ 9”)	2.01m (6’ 8”)
		D	0.79m (2’ 8”)	0.78m (2’ 7”)	0.91m (3’)	0.90m (3’)	0.78m (2’ 7”)
		E (3)	0.72m (2’ 5”)	0.72m (2’ 5”)	0.72m (2’ 5”)	0.72m (2’ 5”)	0.72m (2’ 5”)
		F	1.43m (4’ 9”)	1.60m (5’ 3”)	1.43m (4’ 9”)	1.60m (5’ 3”)	1.43m (4’ 9”)
		G	2.22m (7’ 4”)	2.39m (7’ 11”)	2.22m (7’ 4”)	2.39m (7’ 11”)	2.22m (7’ 4”)
Hydraulic System	System		Gear				
	Pump		Iron				
	Pump Arrangement		Twin				
	Drive Type		Fully Independent				
	Tank Capacity		190 litres (334 pints)				
	Horsepower		65hp (49kW)				
	Flow Rate		90l/min				

Table 1.2 – Twiga Classic S55/VFR55/S60/VFR60/T65 Standard Specification

Notes:

(1) Spearhead constantly reviews and improves product designs and reserve the right to change this information. Actual machines may vary from the above specification. Contact your Spearhead Sales representative if you have any queries.
(2) All dimensions are determined from computer models, so actual measurements may vary slightly.
(3) Dimensions are determined from a tractor computer model. Actual measurements will be dependent on the tractor in which the reach arm is going to be fitted.

The figure guide for working dimensions (Figure 1.8) is illustrated using a Twiga Classic T65 and Twiga Classic VFR55.

The figure guide for transport dimensions (Figure 1.9) is illustrated using a Twiga Classic S55.

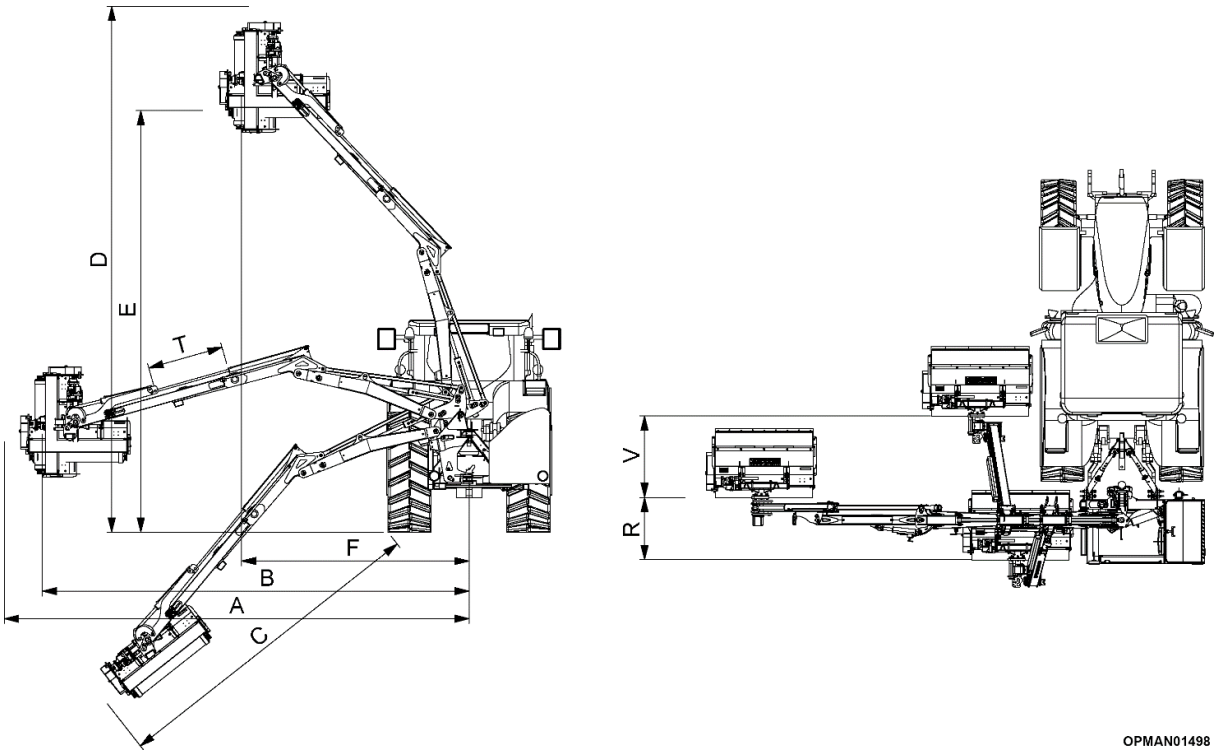


Figure 1.8 Working Dimensions
(Left-hand build reach arm shown)

NOTE: These illustrations for working and transport dimensions are illustrated for visual purposes only.

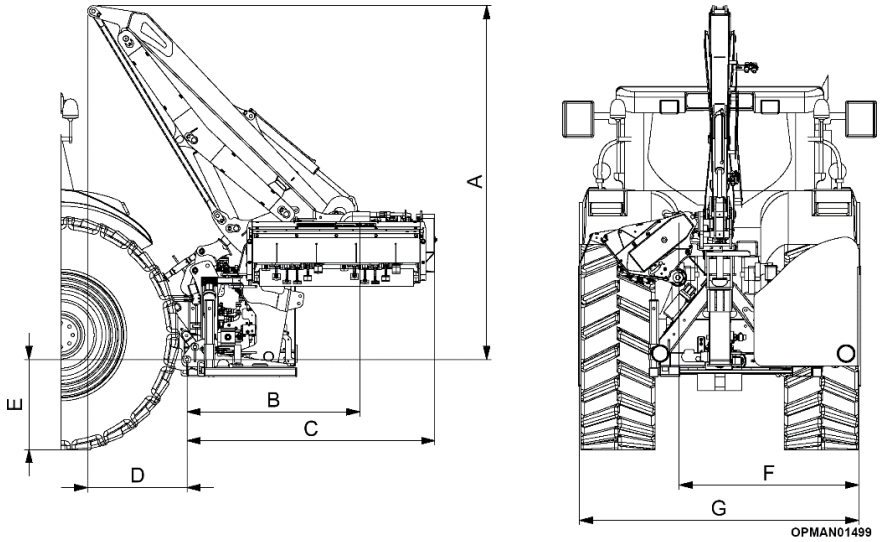
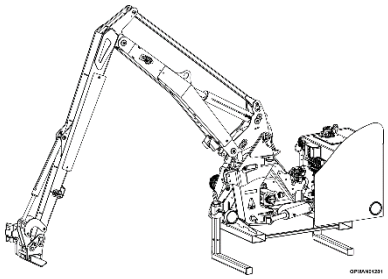
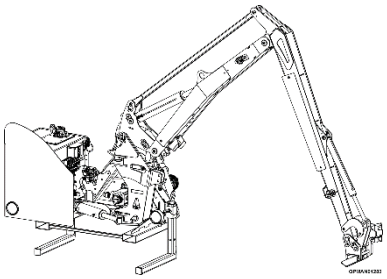
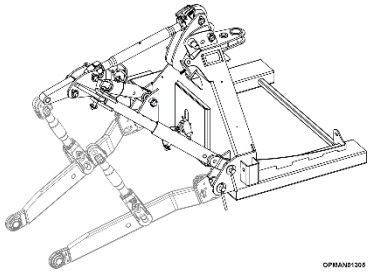
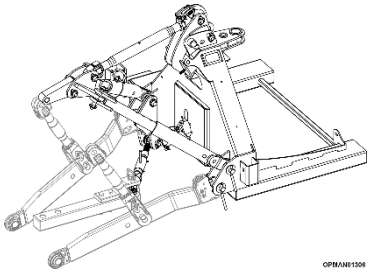
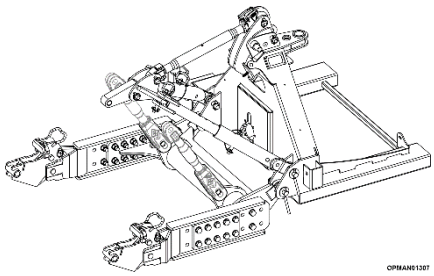


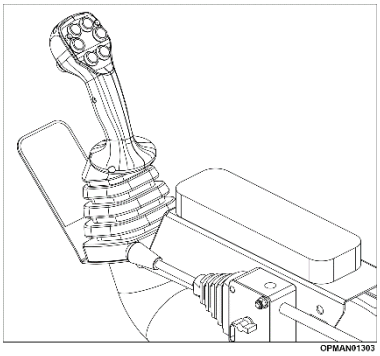
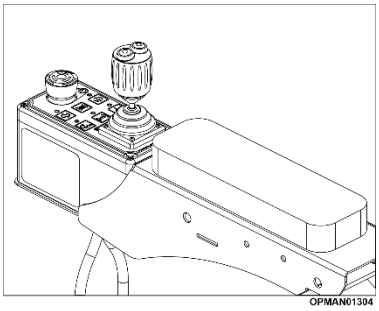
Figure 1.9 Transport Dimensions
(Left-hand build reach arm shown)

1.5.2 Machine Options

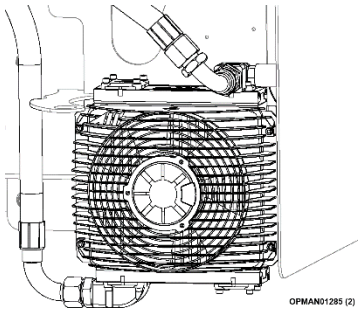
Twiga Classic machines can be ordered in a variety of different specifications to fit the particular user's requirements.

Option	Picture	
1.5.2.1 Build Configuration		
	Left-hand (S55 model shown)	Right-hand (S55 model shown)

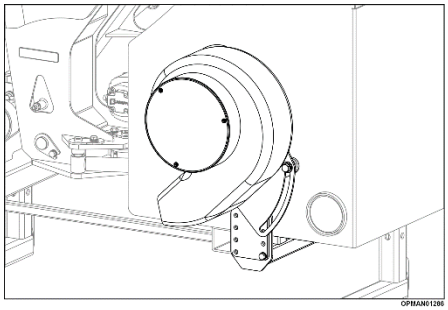
Option	Picture	
1.5.2.2 Machine Fitment		
	Three-point Standard	Four-point Option
		
	Subframe Option	

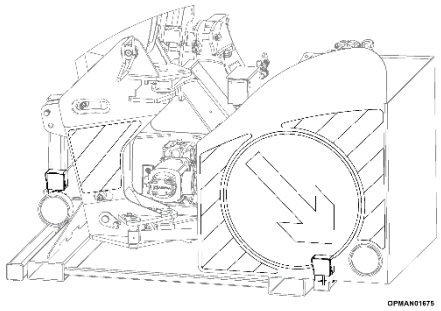
Option	Picture	
1.5.2.3 Controls System		
	Pilot	Minipilot
	Standard	Option

Option	Picture	
1.5.2.4 Oil		
	Grade 46	Biodegradable
	Option	Option

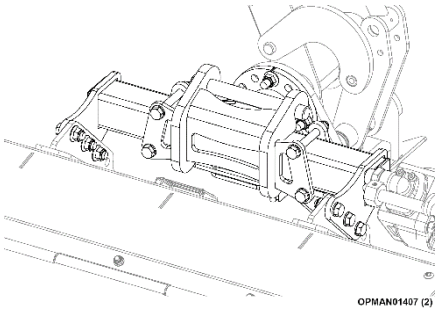
Option	Picture
1.5.2.5 Oil Cooler	

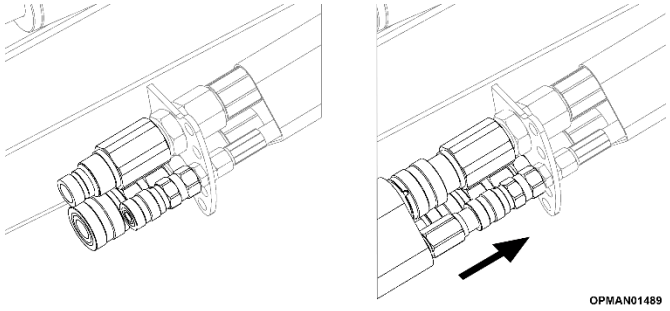
Option	Picture
1.5.2.6 Arm Float	

Option	Picture
1.5.2.7 Debris Blower	

Option	Picture
1.5.2.8 Highway Kit	

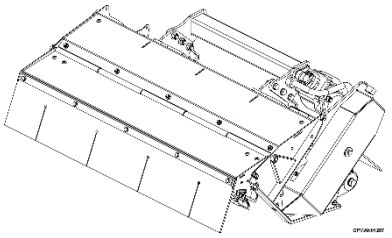
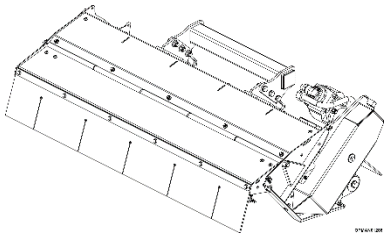
Option	Picture
1.5.2.9 Narrow Lane Bracket	

Option	Picture
1.5.2.10 Mechanical Quick Attachment	 (Powerdrive flail head shown)

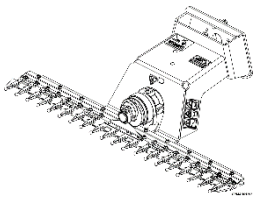
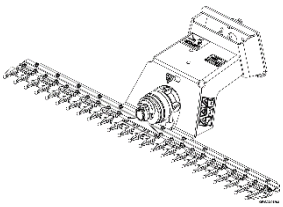
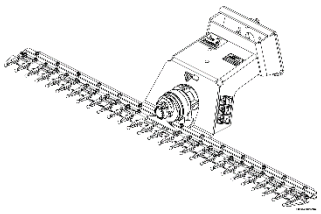
Option	Picture
1.5.2.11 Hydraulic Quick Attachment	

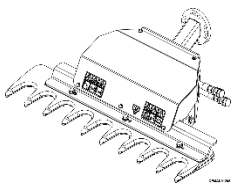
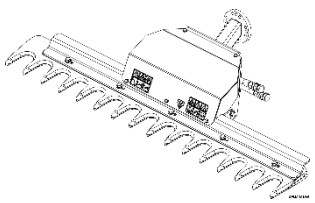
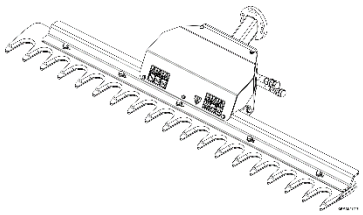
1.6 Compatible Attachment Options

1.6.1 Flail Heads

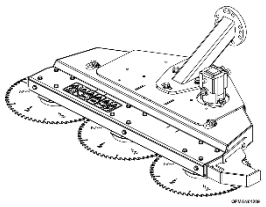
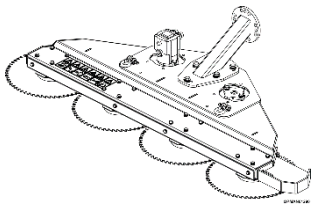
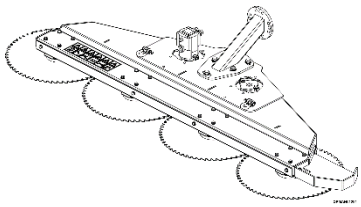
Option	Picture	
1.6.1.1 Powerdrive		
	1.2m	1.5m

1.6.2 Cutterbars

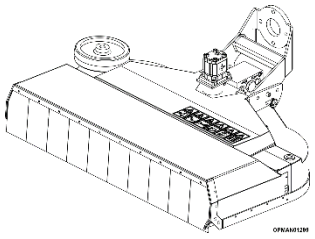
Option	Picture		
1.6.2.1 Standard Duty			
	SP15 (1.5m)	SP18 (1.8m)	SP21 (2.1m)

Option	Picture		
1.6.2.2 Heavy Duty			
	SP17 HD (1.7m)	SP23 HD (2.3m)	SP27 HD (2.7m)

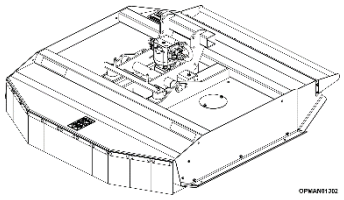
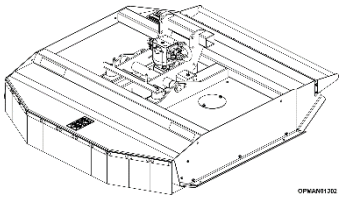
1.6.3 Sawblades

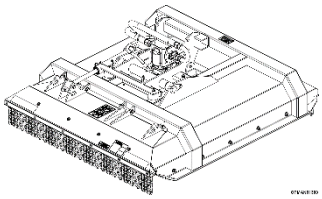
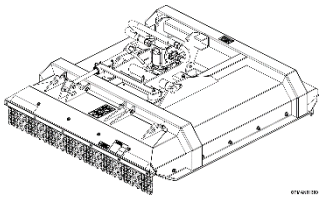
Option	Picture		
1.6.3.1 Sawblade			
	SP15 (1.5m)	SP20 (2.0m)	SP25 (2.5m)

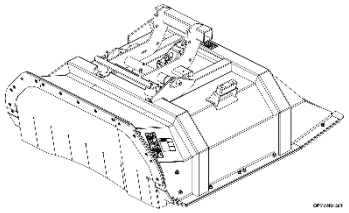
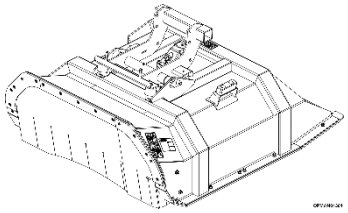
1.6.4 Finishing Head

Option	Picture
1.6.4.1 Fine Cut Rotary Head	
	SP13 (1.3m)

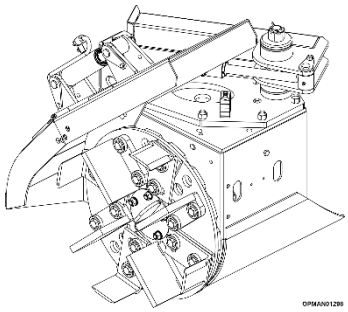
1.6.5 Rotary Heads

Option	Picture	
1.6.5.1 Medium Duty		
	SP12 MD (1.2m)	SP15 MD (1.5m)

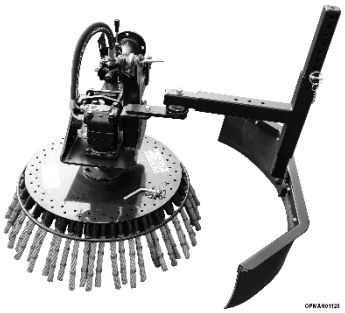
Option	Picture	
1.6.5.2 Heavy Duty		
	SP12 HD (1.2m)	SP15 HD (1.5m)

Option	Picture	
1.6.5.3 Super Heavy Duty		
	SP12 SHD (1.2m)	SP15 SHD (1.5m)

1.6.6 Ditch Cleaner

Option	Picture
1.6.6.1 Ditch Cleaner	

1.6.7 Weed Brush

Option	Picture
1.6.7.1 Weed Brush	

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2 Safety

2.1 Level Of Danger

The operator must read, understand and follow all of the Safety instructions. Serious injury or death may occur unless care is taken to follow the warnings and instructions provided. The level of safety is indicated in three levels and the following notation is used throughout this operator instruction book;

DANGER! Level 1; alerts for imminent death or critical injury.

WARNING! Level 2; warns of serious injury or possible death.

CAUTION! Level 3; indicates possible injury.

IMPORTANT: Special instruction related to either the machine, tractor or the working environment

NOTE: Special instruction related to either the machine, tractor or the working environment

2.2 Terminology

The indicated levels of danger refer to specific risk situation that may occur during machine use and may involve the same machine, the operator and any exposed persons. With the purpose of highlighting situations or operations that may result in risks, the meanings of terms used in this manual are indicated here:

- WORKING ZONE: Any area in and/or around a machine where the presence of an exposed person constitutes a risk to the health and safety of said person.
- BYSTANDER: A person fully or partly in a hazardous area.
- OPERATOR: The person or personnel in charge of the installation, the operation, the adjusting, the cleaning, the repairing and the moving of the machine.
- USER: the person, entity or company, who purchased or rented the machine and intends to use it according to the intended use foreseen by the manufacturer.
- SPECIALISED PERSONNEL: any person specifically trained and approved to carry out maintenance or repair interventions that require particular knowledge of the machine, its operation, the installed safety devices, intervention modes. It must be capable of recognising danger present on the actual machine, therefore avoiding at risk situations.
- RISK: a combination of the probability and seriousness of injury or damage to health which can arise in a dangerous situation.
- GUARD: a part of the machine that is used to specifically guarantee protection by way of a material barrier.
- PROTECTION DEVICE: a device that reduces risk (unlike the guard) either on its own or together with the guard.
- INTENDED USE: the use of the machine in accordance with the information provided in the operators manual.
- REASONABLE FORESEEABLE MISUSE: the use of the machine different to the information provided in the operator's instructions, which may be the result of readily predictable human behaviour.
- GENUINE SPEARHEAD DEALER/ AUTHORIZED TRACTOR DEALER: The Genuine Spearhead Dealer/ Authorized Tractor Dealer, legally authorised by the Manufacturer, is formed by specialised staff able to carry out all types of assistance, maintenance and repair work, even of a certain complexity, required to maintain the machine in perfect working order.

WARNING! Carefully read the guidance as stated in this manual relating to safe use. If the instructions described are not followed, a situation may arise which causes irreparable damage to the machine or property, or injury - even severe - to people or animals. Spearhead declines all responsibility for damage caused by not complying with the safety and injury prevention regulations described below. Spearhead also declines any responsibility for damage caused by improper use of the machine and/or as a result of modifications made without prior authorisation by the manufacturer.

2.3 Safe Use

DANGER! It is prohibited to use the machine in ways that are different from the indications contained in this operators manual.

Never operate the tractor or machinery until you have read and completely understood this manual, the tractor operator's manual and the attachment reach arm manual and each of the safety messages given and those displayed on the tractor or implement.

Safety is of upmost importance to the manufacturer and should be of the same level of importance for the operator/owner. Spearhead machines have been designed to ensure the greatest level of protection to operating personnel and bystanders. However, in practice implementing the safety as guided in this operator manual is up to **you**. Only **you** can prevent serious injury or death from unsafe practices.

2.3.1 Health and Safety Executive (HSE) Guide Sheets

It is important to take note of the health and safety guidance given by the Health and Safety Executive (HSE) with regards to safely operating agricultural machinery safely in addition to the safety guidance given in this reach arm operator's manual and the tractor and machine attachment operator's manuals.

Health and Safety Executive (HSE) – Power take-offs and power take-off drive shafts (guide sheet)
https://www.hse.gov.uk/pubns/ais40.pdf

Health and Safety Executive (HSE) – Safe use of agricultural mowers (guide sheet)
https://www.hse.gov.uk/pubns/ais25.pdf

Health and Safety Executive (HSE) – Safe use of rotary flail hedge cutters (guide sheet)
https://www.hse.gov.uk/pubns/ais21.pdf

Health and Safety Executive (HSE) – Working safely near overhead electricity power lines (guide sheet)
https://www.hse.gov.uk/pubns/ais8.pdf

Health and Safety Executive (HSE) – Working safely with agricultural machinery (guide sheet)
https://www.hse.gov.uk/pubns/INDG241.pdf

Health and Safety Executive (HSE) – Using tractors safely (guide sheet)
https://www.hse.gov.uk/pubns/indg185.pdf

2.3.2 Health and Safety Executive (HSE) Safe Stop Campaign

Spearhead Machinery endorses the “Safe Stop” campaign promoted by the Health and Safety Executive (HSE) to give guidance on how to safely prepare the machine and personnel and operate the machine and what to do in emergency cases.

The 'Safe Stop' campaign focusses on the importance of following the 'Safe Stop' procedure:

- Engage handbrake
- Controls in neutral
- Switch off engine
- Remove key

https://www.hse.gov.uk/agriculture/topics/machinery/safe-use-1.htm

Figure 2.1

2.3.3 Operators Manual

2.3.3.1 **IMPORTANT:** Read, understand and follow the safety messages stated throughout this section and the rest of this operator's manual. Serious injury or death may occur unless care is taken to follow the warnings.

2.3.3.2 **IMPORTANT:** Ensure the operator's manual is complete, readable, and easily accessed by the operator and accompanying personnel. If in doubt replace, by contacting your local Spearhead dealer or Spearhead Machinery directly.

2.3.3.3 **DANGER!** It is prohibited to use the machine in ways that are different from the indications contained in this operators manual.

2.3.3.4 **IMPORTANT:** Check the reach arm attachment for condition alongside the operator's manual requirements for use and its compatibility with the reach arm and tractor.

2.3.3.5 **IMPORTANT:** Read the input PTO driveshaft operator's manual before using the machine.

2.3.3.6 **IMPORTANT:** It is required that all operators and personnel carrying out maintenance on this machine familiarise themselves with the machine and this operator manual to ensure they are aware of the dangers of incorrect use or improper or incorrect repairs.

2.3.4 Personnel Preparation

2.3.4.1 **DANGER!** It is prohibited to use or have the machine used by personnel that are incompetent and not correctly trained in the use of the tractor and machine controls and who are in poor health and physical condition or under the use of drugs or alcohol.

2.3.4.2 **IMPORTANT:** Ensure that the operator is aware of the correct emergency stop procedure if the tractor and machine is required to stop suddenly.

2.3.4.3 **DANGER!** It is forbidden to drive the agricultural tractor attached to the machine or have it driven by personnel without an appropriate driving licence.

2.3.4.4 **IMPORTANT:** It is required that all operators and personnel carrying out maintenance on this machine familiarise themselves with the machine and this operator manual to ensure they are aware of the dangers of incorrect use or improper or incorrect repairs.

2.3.4.5 CAUTION**!** If the agricultural tractor has no closed cabin, the operator is required to use extra Personal Protection Equipment. Ear protectors are required and a dust mask if the working ground lifts a considerable amount of dust along with safety glasses. If your health is compromised during work or afterwards, stop immediately and seek professional medical advice immediately.

2.3.4.6 **DANGER!** Ensure you never smoke or have an open flame near the tractor or machine.

2.3.4.7 CAUTION**!** Personnel should take regular breaks during work to minimise fatigue and ensure alertness in work.

2.3.4.8 **IMPORTANT:** Personnel and operators should make themselves aware of local and national highway laws and regulations and contact the Department of Transport of your Local Highway Authority to obtain detailed information on the subject.

2.3.4.9 **IMPORTANT:** Personnel and operators should make themselves aware of local and national laws and regulations where they can and cannot carry out works with regards to wildlife and habitats.

2.3.4.10 **IMPORTANT:** Ensure a full risk assessment of the work site is conducted by a qualified body before beginning the works evaluating risks to the operator, machine, bystanders and other road users if applicable.

2.4 Personal Protective Equipment

2.4.1.1 CAUTION**!** It is mandatory to use suitable clothing, PPE for example.

2.4.1.2 CAUTION! Operators should be wearing sufficient personal protection equipment (PPE) to protect them from hearing, respiratory and impact damages.

When working in an unsealed cab or where windows and apertures are open to the environment, operators are advised to wear suitable eye and ear protection and a facemask (depending on conditions).

When handling cutting surfaces or hydraulic equipment, operators are advised to wear suitable gloves.

When clearing blockages and wire, or working with pressurised hydraulic components, operators are advised to wear suitable eye protection and suitable gloves.

Ensure maintenance personnel wear suitable PPE clothing when maintaining the machine to ensure a reduced risk of impact or skin injuries. Frequent or prolonged contact with hydraulic oil may cause dermatitis and other skin disorders including (more rarely) skin cancer when not wearing impenetrable gloves. Worn parts may have sharp edges.

Follow the guidance of the lubricant manufacturer with regards to handling oils, solvents, cleansers and other chemical agents.

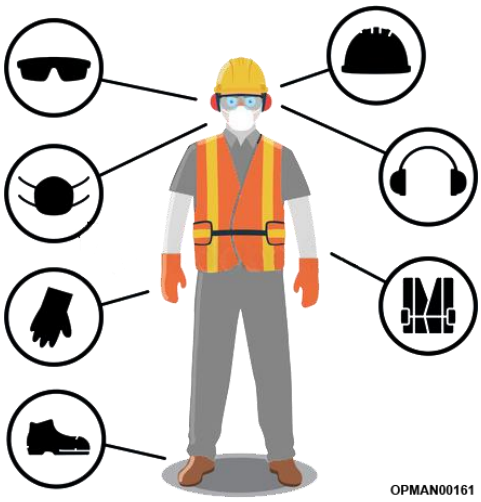


Figure 2.2

Ensure that non-baggy clothing is worn to reduce the chance of entanglement and snagging on components. Strictly avoid long or loose clothing that could be caught in any way by moving parts.

Wear suitable clothing and PPE to cater for the working environment. In some geographical locations, wildlife such as bees or insects or larger wildlife could impact the wellbeing of the operator, machine and other bystanders. Inspect the work location before commencing work.

2.5 Tractor And Machine Preparation

Tractor Preparation

2.5.1.1 **IMPORTANT:** Before starting, safety checks on tractor and machine must be carried out with regard to functionality, road safety and accident prevention rules.

2.5.1.2 CAUTION**!** Check that the agricultural tractor on which the machine is installed is of adequate power, weight and configuration, compatible with the model fitted and fitted with a seat belt.

The tractor should exceed the weight of the machine by at least 20%. For machine weights see Section 1.5.1.

2.5.1.3 CAUTION**!** Before proceeding to take the machine into the work area ensure that driving vision is not impaired by tractor, cab or implement for clear vision of ground hazards and bystanders while seated in the driver's seat.

Adjust rear view mirrors in order to see clearly the machine and all items behind.

2.5.1.4 CAUTION**!** Where a machine is used in conjunction with tractors not fitted with a glazed safety cab, a clear polycarbonate safety screen together with a mesh guard must be fitted to the tractor between the operator and the cutting unit. A polycarbonate safety screen must be used on cabs where windows are likely to be left open for ventilation purposes. It is essential that cab windows on the operating side, through which the machine is observed, are intact, clean and closed. Otherwise, a clear polycarbonate safety screen must be fitted where grass trimming operations are carried out.

2.5.1.5 CAUTION**!** If the agricultural tractor has no closed cabin, the tractor must be equipped with a "Rollover Protection Structure" (ROPS) which must always be locked in position.

2.5.1.6 **IMPORTANT:** Ensure the tractor is fitted with flashing warning beacons and Slow Moving Vehicle (SMV) sign if required. Check the local jurisdiction to determine what requirements are required to be switched on and shown when the machine is working.

2.5.1.7 **WARNING!** Ensure the supplied cab guard is correctly prepared and fitted to the tractor to protect the tractor glass and operator from ejected debris.

2.5.1.8 CAUTION**!** Ensure that the tractor destined to be used with the machine has a vertical escaping, bonnet mounted exhaust to reduce potential fire risk when the machine is in operation. If the tractor is equipped with a under frame exhaust seek a different tractor of use.

2.5.1.9 CAUTION**!** If two or more tractors/ machines are being used in close proximity in the working area, enclosed cabs must be used.

2.5.1.10 CAUTION**!** Do not mount the machine with trucks or other vehicles on the public highway.

2.5.1.11 **IMPORTANT:** Ensure that permissible axle loads are not exceeded.

2.5.1.12 **IMPORTANT:** Ensure that the correct fire extinguisher is carried inside the tractor at all times and is easily accessible.

Machine Fitting

2.5.1.13 **DANGER!** Ensure that the intermediate axle brackets, if fitted, are complete and correctly fitted and secure to the tractor.

2.5.1.14 **DANGER!** Ensure that the linkages or intermediate axle brackets are correctly engaged between the reach arm and tractor.

2.5.1.15 **IMPORTANT:** Ensure the reach arm mounting stabilisers are correctly fitted and adjusted to ensure the reach arm is secure, correctly compatible and fitted to the tractor.

2.5.1.16 **IMPORTANT:** Ensure the stabiliser top link fitted in between the stabiliser and mainframe to ensure the reach arm assembly is pitched correctly against the tractor.

2.5.1.17 **WARNING!** When moving the reach arm not fitted to the tractor ensure the machine is lifted or carried using suitable equipment in the correct position.

A suitable forklift truck through the designated forklift slots found on the mainframe of the machine.

A suitable lifting crane or telehandler through the designated lifting point found on the main arm of the machine using a suitable lifting strap or chain.

Machine General Inspection

2.5.1.18 CAUTION! Ensure that the tractor, reach arm and attachment are correctly inspected using their designated pre-delivery inspection (PDI) sheet before first use.

2.5.1.19 **IMPORTANT:** Check the reach arm attachment for condition alongside the operator's manual requirements for use and its compatibility with the reach arm and tractor.

2.5.1.20 **IMPORTANT:** Before returning the machine back to work ensure the machine has been thoroughly inspected and checked using the Machine Inspection Record; see Section 8.12.

Ensure that when the machine inspection is carried out that the machine is stationary and not running.

Where parts are broken, damaged and deemed not fit for use; replace with genuine Spearhead parts using the online Interactive Parts facility at:
https://my.spearheadmachinery.com/parts/public-interactive-parts-database/

You will require the machine serial number. Assistance to its location can be found in Section 1.3.

2.5.1.21 **WARNING!** Check all key components. Inspect and replace all damaged components with genuine Spearhead parts and ensure the machine is running correctly again before resuming cutting operations.

Input PTO Driveshaft

2.5.1.22 **IMPORTANT:** It is mandatory to use the type of input PTO driveshaft supplied with the machine by Spearhead and for the same type to be sourced again when a replacement is required.

2.5.1.23 **IMPORTANT:** Ensure that before first use the input PTO driveshaft is the correct item for the tractor in which the machine is intended to be attached to and is prepared and shortened to the correct length required following the guidance in the relevant section of the operators manual.

Spearhead does not accept returns on modified/prepared or used input PTO driveshafts, so please take extended time to ensure the item is correct and safe for the tractor application. See Section 3.3.

2.5.1.24 **IMPORTANT:** Do not use PTO adaptors on input PTO driveshafts. This can cause examples such as excessive vibration and driveline failures due to changes in the machines intended use. PTO adaptors also increase the exposed working length of the PTO driveshaft increasing the probability of entanglement with external objects. If the driveshaft is incorrect for the tractor; request another driveshaft from your local Spearhead dealer.

2.5.1.25 **WARNING!** Never connect the power takeoff unless the tractor engine is stopped.

2.5.1.26 **IMPORTANT:** Do not connect the machine to a tractor with a PTO directly connected to the tractor transmission.

2.5.1.27 **DANGER!** At all times ensure that the PTO driveshaft guard is in position, securely fitted, in good condition and that the tractor PTO driveshaft shield is fitted.

2.5.1.28 **IMPORTANT:** Replace any of the PTO driveshaft or coupling guards if any of the following are evident; cracks or damages or any part of the PTO driveshaft is exposed. Ensure the PTO driveshaft guard is not free to rotate, and the anti-rotation chains are securely fitted and effective before starting the PTO.

2.5.1.29 **IMPORTANT:** Make sure that the maximum number of revolutions of the PTO is set to the specific specification of the particular machine in question; 540 rpm, before powering it. Over-speeding a driveline may result in driveline components and attachment. If in any doubt, contact your local Spearhead dealer or Spearhead directly.

2.5.1.30 **IMPORTANT:** When operating the machine, the reach arm needs to be raised to a position where the input PTO driveshaft is working near horizontal.

Fasteners

2.5.1.31 **IMPORTANT:** Periodically (every 8 hours) verify that the screws and bolts are tightened and secure.

2.5.1.32 **IMPORTANT:** Ensure that the gearbox bolts are tight and to the correct torque settings.

2.5.1.33 **IMPORTANT:** Ensure that the hydraulic pump bolts are tight and to the correct torque settings.

Hydraulic Oil And Lubrication

2.5.1.34 **IMPORTANT:** Using the types of lubricating oils indicated by Spearhead and follow the recommended guidelines of the lubricant manufacturer. Check oil levels and grease points daily to ensure the longevity of your components on your machine following the maintenance section of this operators manual.

Follow the guidance of the lubricant manufacturer with regards to handling oils, solvents, cleansers and other chemical agents.

2.5.1.35 CAUTION**!** Check the machine daily for hydraulic system leaks. If any component in the system is faulty, replace the component before preceding to use the machine.

2.5.1.36 CAUTION**!** Ensure all hydraulic hoses, lines and connections are in good condition and tight before applying pressure.

2.5.1.37 CAUTION**!** Relieve hydraulic pressure before disconnecting lines or working on the system.

2.5.1.38 **IMPORTANT:** Hydraulic hoses should be correctly routed so they will not become snagged or pinched in use or when the machine is prepared for work from its transport position.

Utilise the reach arms various hose guides and guards.

2.5.1.39 **IMPORTANT:** Warm the hydraulic oil of the reach arm at idle speed before working at the correct 540rpm cutting speed. Forcing the reach arm to work at high rpm using cold oil will lead to cavitation and permanent damage to driveline and hydraulic components.

2.5.1.40 **IMPORTANT:** Do not change any factory-set hydraulic settings to avoid component or equipment failures.

Guarding

2.5.1.41 **DANGER!** Do not operate the reach arm and attachment with guards missing. Ensure that the correct guards are properly fitted to the machine and tractor at all times and that they are in good condition and function as they are intended to. If guards are missing; replace before using the machine.

2.5.1.42 **DANGER!** It is forbidden to alter, tamper with or bypass any of the components on the machine including the safety devices provided by the manufacturer. e.g., guarding.

Spearhead claims no responsibility to damages to operators, personnel or property by the factory fitted guards being not fitted or in poor repair.

Lighting

2.5.1.43 **IMPORTANT:** Before proceeding to take the machine onto the public highway ensure that all brake lights and indicators are working correctly.

2.5.1.44 **IMPORTANT:** If the machine is fitted with the optional “Highway Kit” ensure the LED lights are working correctly.

2.5.1.45 **IMPORTANT:** The reach arm and tractor should be clean and bright in colour to warn others of its presence and the works in which its carrying out.

Cleanliness

2.5.1.46 **WARNING!** It is forbidden to deposit items on the machine which can harm persons or animals, or damage property should they fall.

2.5.1.47 **IMPORTANT:** Before proceeding to take the machine onto the public highway ensure that the reach arm and attachment are clear of any cut material collected.

2.5.1.48 **IMPORTANT:** Before proceeding to take the machine onto the public highway ensure that the tractor tyres are clear of mud and dirt build up.

2.5.1.49 **IMPORTANT:** Check the machine to ensure all safety and instruction decals are in position as stated in Section 2.14.2. Replace any missing or damaged decal prior to proceeding to use the machine by sourcing from a local Spearhead dealer.

Controls

2.5.1.50 **WARNING!** Ensure that all functions work correctly on the joystick before starting the reach arm attachment and taking the machine onto the public highway.

2.5.1.51 **WARNING!** Ensure that the emergency stop function works correctly on the joystick in case of the sudden requirement for it to be used in work.

2.5.1.52 **WARNING!** Ensure that the joystick is correctly switched off and isolated to prevent accidental operation or movement machine when the machine is being transported out of use.

2.5.1.53 **IMPORTANT:** Do not modify or alter implement functions or components.

Transport To Work

2.5.1.54 **DANGER!** When transporting the machine on the road, ensure that the transport bracket is fitted correctly between the slew post and the main arm and locking pin is fitted in the slew post to ensure that the reach arm doesn’t move and potentially cause an accident with other road users in the event when being transported.

2.5.1.55 **DANGER!** When transporting the machine ensure the machine stands are raised, to ensure that there is sufficient ground clearance to protect the machine from bottoming out when travelling along uneven terrain, such as speed humps.

2.5.1.56 **IMPORTANT:** Ensure the reach arm is correctly closed up in a compact transport position against each of the bump stops found on the main arm and flip-over bracket before taking the machine onto the public highway. The reach arm should be positioned where it takes up the least amount of space and meets local height and width traffic regulations and will not hit the tractor when either stationary or being transported.

2.5.1.57 **IMPORTANT:** Ensure the reach arm flip over bracket is correctly placed for working and transport position.

2.5.1.58 **IMPORTANT:** Ensure the slew locking pin is removed before moving the reach arm from transport into working position.

The slew locking pin then need to be reinstated when returned to transport position.

2.5.1.59 **IMPORTANT:** Ensure that all rubber bump stops are not overly worn and compressed and protect the machine from damage due to vibration in work and transport.

Attachment

2.5.1.60 **WARNING!** Ensure the reach arm and attachment mounting interface is compatible and the fixing fasteners are secure before raising the attachment.

2.5.1.61 **IMPORTANT:** Ensure that the reach arm attachment is placed into its most compact position to ensure safety on the highway.

Handling

2.5.1.62 **IMPORTANT:** Before preceding to start work ensure that steering and braking give proper operation and are in good condition.

2.5.1.63 **IMPORTANT:** Perform performance tests on the tractor/ machine combination and how it will act/perform before taking the machine onto the public highway.

Braking tests in a safe environment are required to be carried out in order to gauge the characteristics of the tractor/machine combination and how it will act/perform in an emergency stop situation.

Determine before taking the tractor and machine onto the public highway of the maximum speed the vehicle can be driven safely. Determine the safe speed the machine can be turned remembering the sharper the corner, the larger the reduction in speed required in order to ensure the machine does not turn over. The machine should not travel faster than 20 mph (32 kmh) in any case.

2.6 Work Site Management & Risk Assessment

Figure 2.3

Risk Assessment

2.6.1.1 **IMPORTANT:** Ensure a full risk assessment of the work site is conducted by a qualified body before beginning the works evaluating risks to the operator, machine, bystanders and other road users if applicable.

Work Site Assessment

2.6.1.2 **IMPORTANT:** The destined work site to use the reach arm and attachment should be thoroughly checked and familiarised to assess the working area for hazards; removable and fixed.

Items should be assessed, removed or clearly marked (e.g. if too heavy to move) before cutting:

- Items and ground characteristics which could cause a reduction in the tractor and reach arms stability in operation.
- Items and ground characteristics which could cause a reduction in the tractors traction in operation.
- Items and ground characteristics which could cause a reduction in operator safety and ease of control in operation.
- Insufficient lighting.
- Foreign objects which could be picked up and then flung by the attachment damaging and causing risk to bystanders, operator, tractor or the nearby environment. Items seen on the surface and buried deeply in the material. For example rocks, tree stumps and manhole covers.
- Foreign objects which could be picked up and then damage the attachment or the reach arm; for example wire.
- Low level objects which could come into collision with the tractor and/or machine.
- Items which could create a fire risk

2.6.1.3 CAUTION**!** Ensure the environment where the machine is required to operate has adequate lighting. Insufficient or excessive lighting may pose a risk to the operator or bystanders. Ensure you have at least 90m (300 ft) clear visibility ahead of you to identify passers-by and potential risks and disturbances to yourself and/or tractor/machine and ensure you have sufficient time to adjust/stop.

2.6.1.4 **WARNING!** Inspect the work area for overhead or underground electrical power lines. Gas pipes, other cables and any other kind of structure which could be detrimental to the machine or create risk for operator/personnel/bystanders. These should be either removed, marked to keep away from or if preventative methods cannot be easily placed alternative methods of landscape maintenance should be considered.

If short buried utility lines are located; contact your local utility maintenance provider responsible for the work site and do not use the machine until the issue has been addressed and made safe.

2.6.1.5 **WARNING!** Inspect to see the raised reach arm will remain at 3 metres (10 ft) or greater distance from all power lines and overhead obstructions when carrying out the works.

2.6.1.6 **WARNING!** If working in overgrown or high grass inspect for, remove or mark potential hazards, mow at an **intermediate** height. Then repeat the process of inspection and hazard prevention and mow then at the required **finished** height. Increased work site observation will be required to maintain safety through the mowing operation.

This will also bring benefits to operations with reduced power requirements to cut, reduce wear and tear on the reach arm and attachment and give a better overall finish.

2.6.1.7 **WARNING!** Any hazardous objects that cannot be removed must be clearly marked and carefully avoided by the operator. Stop mowing immediately if the machine strikes a foreign object.

Many varied objects, such as wire, cable, rope, or chains, can become entangled in the cutting area of the attachment. These items can swing outside the confines of the safe cutting area of the attachment at greater velocities than the flails/blades. Such a situation is extremely hazardous and could result in serious injury or even death.

IMPORTANT: Repair all damage and make certain rotor or blade carrier is balanced before resuming mowing.

2.6.1.8 **WARNING!** Ensure that there are no fire sources present or near the destined working area of the machine. Do not drive into burning debris if it is present or if the area is freshly burnt out.

2.6.1.9 **IMPORTANT:** Ensure that before carrying out work procedures that the working zone is correctly prepared to warn bystanders and road users of the works being carried out and how they should act as a response by using correct signage.

2.6.1.10 **IMPORTANT:** Ensure that all warning signs are moved at the same speed as the works are being carried out.

2.6.1.11 **IMPORTANT:** Debris material must be collected or swept away from the working zone once the works have been carried out.

2.7 Machine At Work And Observation

2.7.1.1 **DANGER!** It is prohibited to use the machine in ways that are different from the indications contained in this operators manual.

Operator

2.7.1.2 **WARNING!** All operation related to the tractor and machine should always be carried out from the driver's seat with seat belt buckled whether working or transporting the machine on the public highway.

2.7.1.3 **WARNING!** It is forbidden to leave the driver's seat on the agricultural tractor with the combustion engine running when the machine is running. The machine should always be monitored from the cab of the tractor.

2.7.1.4 **WARNING!** Never approach the machine or leave the tractors seat until the attachment has completely stopped, and the tractor has been stopped using the "Safe Stop" procedure.

2.7.1.5 CAUTION**!** Personnel should take regular breaks during work to minimise fatigue and ensure alertness in work.

2.7.1.6 **DANGER!** Do not enter the working zone of the PTO driveshaft when the machine and tractor are running. It is dangerous to approach the rotating parts of the machine.

2.7.1.7 **IMPORTANT:** Operator should use the procedure used by the “Safe Stop” campaign promoted by the Health and Safety Executive (HSE) to give guidance on how to safely prepare the machine and personnel and operate the machine and what to do in emergency cases.

https://www.hse.gov.uk/agriculture/topics/machinery/safe-use-1.htm

Operator Using Machine

2.7.1.8 **WARNING!** Ensure that the reach arm attachment is less than one metre from the ground and horizontal before starting the attachment.

2.7.1.9 **IMPORTANT:** Warm the hydraulic oil of the reach arm at idle speed before working at the correct 540rpm cutting speed. Forcing the reach arm to work at high rpm using cold oil will lead to cavitation and permanent damage to driveline and hydraulic components.

2.7.1.10 **WARNING!** Keep the raised reach arm at 3 metres (10 ft) or greater distance from all power lines and overhead obstructions.

2.7.1.11 **DANGER!** It is forbidden to approach, stand close or touch the machine when the machine is operated. It is the operators responsibility to check before starting up the machine and during work that bystanders who may inadvertently get in the way of cut material being thrown are kept away from the tractor and machine. Machines are capable under adverse conditions of throwing objects great distances at high velocity. Stop the rotors until all bystanders are well clear (90 m/300 ft+).

2.7.1.12 **WARNING!** Never operate the machine with the rotor moving in folded transport position, even for short distances.

2.7.1.13 **WARNING!** If working in overgrown or high grass inspect for, remove or mark potential hazards, mow at an **intermediate** height. Then repeat the process of inspection and hazard prevention and mow then at the required **finished** height. Increased work site observation will be required to maintain safety through the mowing operation.

2.7.1.14 CAUTION**!** Driveline and hydraulic components can become very hot when in work. Ensure that these components are sufficiently cool before going anywhere near them.

2.7.1.15 CAUTION**!** Ensure that the machine and attachment are clear of excess debris. Driveline and hydraulic components can become hugely hot when in work and debris could cause risk of a fire hazard.

2.7.1.16 **WARNING!** Ensure that there are no fire sources present or near the destined working area of the machine. Do not drive into burning debris if it is present or if the area is freshly burnt out.

2.7.1.17 **IMPORTANT:** Ensure that the correct fire extinguisher is carried inside the tractor at all times and is easily accessible.

2.7.1.18 **WARNING!** Failure to have sufficient load over the front axle (20% +) or to drive at inappropriate speeds on undulating terrain may result in a loss of directional control.

2.7.1.19 **WARNING!** Pay special attention when working with the machine and do not allow the machine to touch fixed objects such as road drains, walls, shafts, curbs, guard rails, tracks etc. as these could break the machine and/or attachment which could cause debris to be thrown at very high speed from the machine. A fire hazard could be created in contacting objects as well. As a precaution raise the machine to ensure they do not collide when the machine is in work.

2.7.1.20 **WARNING!** Do not position the reach arm attachment with the reach arm in such a position where the cut material will get ejected towards the tractor, bystanders and road users.

The reach arm attachment should be positioned to minimise ejected material.

2.7.1.21 **IMPORTANT:** During work you may be required to adjust your mowing speed to compensate for changes and external factors such as overhead obstructions and debris/foreign objects with the fitted attachment.

2.7.1.22 **WARNING!** Keep your forward speed to a level appropriate to the operating conditions. High-speed manoeuvres are very dangerous, particularly on uneven ground where there is risk of overturning. Reduce speed in poor conditions.

2.7.1.23 **DANGER! Avoid wire**. It can be extremely dangerous if wire catches in the machine, and every care must be taken to ensure this will not happen. Inspect the working area before commencing.

2.7.1.24 **IMPORTANT:** Stop and do not use the machine when there is vibration or unusual mechanical noise coming from the machine, as this may cause breakage and extended serious damage. Find the cause of the vibration or noise and have it inspected by your local Spearhead dealer and do not use the machine until the cause is identified and eliminated.

2.7.1.25 **WARNING!** Check all key components. Inspect and replace all damaged components with genuine Spearhead parts and ensure the machine is running correctly again before resuming cutting operations.

2.7.1.26 **WARNING!** During work, if the tractor requires refuelling ensure the machine is stopped and the PTO is disengaged, and the tractor is stopped safely using the “Safe Stop” procedure.

2.7.1.27 CAUTION**!** Ensure on the reach arm attachment the rotors are turning in the right direction.

Twiga reach arm machines have a “rotor reverse” ability which allow for the cutting rotors of the attachment to be changed in direction using the reach arm controls.

2.7.1.28 **DANGER!** Do not reach into the machine whilst it is working.

2.7.1.29 **DANGER!** It is forbidden to approach, stand close or touch the machine when the machine is operated. It is the operators responsibility to check before starting up the machine and during work that bystanders who may inadvertently get in the way of the moving armset and attachment are kept away from the tractor and machine. Machines have many pinch and impact point dangers whilst the machine is in operation and being used.

2.7.1.30 **WARNING!** While the tractor is running all personnel should keep well clear of the area around the machine (90m/300 ft+) as there are numerous crushing, shearing, impact dangers caused by the machine operation.

2.7.1.31 **DANGER!** When lowering the machine ensure bystanders stay clear to avoid crushing.

2.7.1.32 **WARNING!** Never carry passengers in the tractor unless it is fitted with an approved seat and seat belt.

2.7.1.33 **WARNING!** Never carry passengers on the machine.

2.7.1.34 **IMPORTANT:** Ensure the tractor light beacon illuminates correctly when power supply is given to it.

2.7.1.35 **IMPORTANT:** The tractor and machine will respond different between working and transport position.

A machine in work due to its design will be constantly changing its operating characteristics due to the reach arm and attachment being moved into different positions and as a result changing

its mass characteristics. The operator is required to adjust their driving characteristics/speed in order to ensure safety to bystanders and other vehicles.

A machine in transport position will have a higher centre of gravity so will be more likely to become unstable at lower speeds. The operator is required to adjust their driving characteristics/speed in order to ensure safety to bystanders and other vehicles.

2.7.1.36 **IMPORTANT:** Use low speeds and smooth, gradual steering action in order to ensure safety to bystanders and other vehicles when on curves, hills, rough or uneven surfaces or wet roads.

2.7.1.37 **IMPORTANT:** Allow clearance for implement swing while turning.

2.8 Working With Overhead Power Lines (OHPL's)

2.8.1 Dangers With Reach Arms

Figure 2.4

There are significant dangers involved when working in the vicinity of Overhead Power Lines (OHPL's). Some Twiga reach arm machines are capable of reaches in excess of 8 metres (26') which well exceeds the lowest legal minimum height of 5.2 metres from the ground for 11,000 and 33,000 volt power lines; see Figure 2.5.

If a machine comes close or in contact with an OHPL, electricity will be conducted to the earth. This can cause a fire or explosion and electric shock or burns to anyone contacts the tractor or machine. An overhead wire does not need to come in contact with the machine to cause serious injury or death as electricity can jump, or arc across small gaps.

Spearhead Machinery has listed a non-exhaustive guide of basic safe reach arm operation near OHPL's throughout Section 2.8 which should be considered before creating a thorough procedure following the safe guidance and laws given and required by the local jurisdiction and country in which the works are to be carried out.

WARNING! Spearhead declines all responsibility for damage or harm caused during work operations to road users and bystanders due to not complying with the safety and injury prevention regulations required by the local jurisdiction of the country where the works are being carried near OHPL's. It is thoroughly the responsibility of the operator, user and accompanying personnel to ensure compliance is adhered to and not Spearhead Machinery.

Spearhead also declines any responsibility for damage caused by improper use of the machine and/or as a result of modifications made without prior authorisation by the manufacturer.

It is important to adhere to the health and safety guidance given by the Health and Safety Executive (HSE) and or alternative official governing bodies and the Distribution Network Operator (DNO) in the jurisdiction with

regards to safely operating the reach arm around OHPL's in addition to the safety guidance given in this reach arm operator's manual and the tractor and machine attachment operator's manuals.

Health and Safety Executive (HSE) – Working safely near overhead electricity power lines (guide sheet)
https://www.hse.gov.uk/pubns/ais8.pdf

Health and Safety Executive (HSE) – Avoiding danger from overhead power lines (guide sheet)
https://www.hse.gov.uk/pubns/gs6.pdf

DANGER! All operators must gain the correct safety information and be aware of the risks and dangers involved when working in the vicinity of Overhead Power Lines (OHPL's).

WARNING! Fatal electrocution can occur without contacting a power line. Due to the high electrical potential between the conductors and the ground, electricity can arc from the power line to any conducting item within range. Steel reach arm mowers are ideal conductors.

DANGER! Users and operators who work near OHPL's must carry out a thorough risk assessment and manage the risks whilst the works are being carried out.

WARNING! Good management, planning and consultation with interested parties before and during any work close to OHPL's will reduce the risk of accidents.

2.8.2 Height Of Powerlines And Equipment

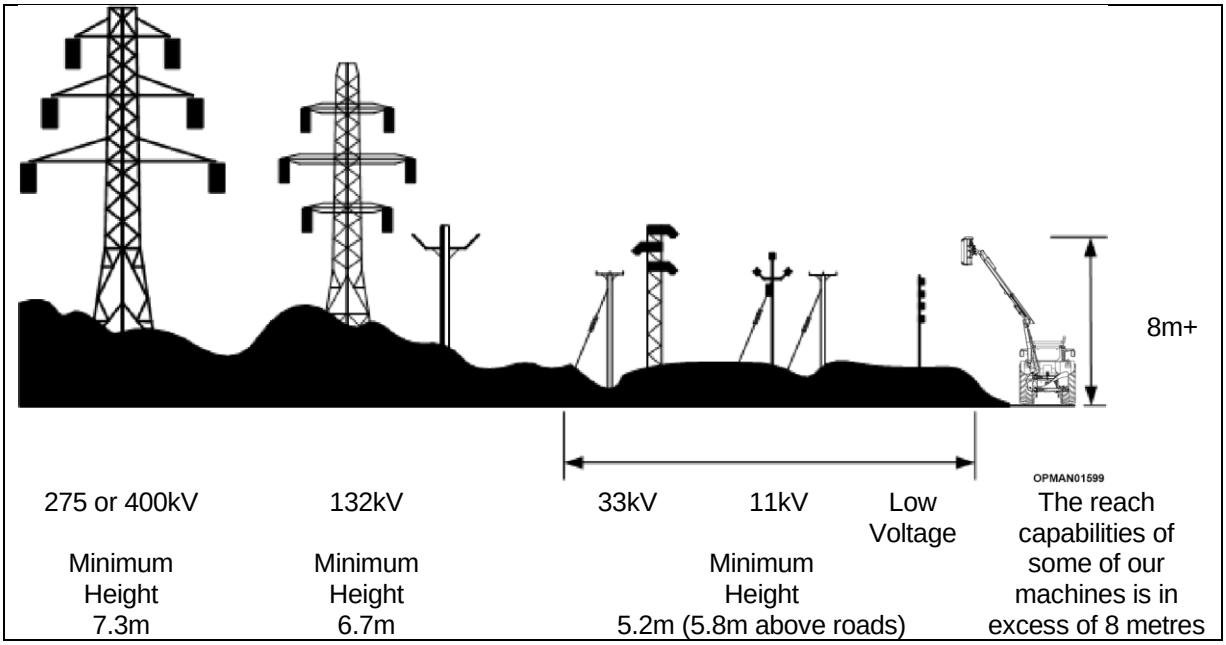


Figure 2.5
Minimum Heights For Overhead Powerlines

With reference to Figure 2.5, the height of the OHPL varies depending on the voltage being carried by it. All OHPL's must be a minimum height of 5.2m from the ground and the higher the voltage, the higher the OHPL is Some electrical equipment mounted on poles may be lower than 5.2m, such as transformers.

Spearhead's Twiga reach arm range of machines can be capable of reaches in excess of 8 metres (26') which well exceeds the lowest legal minimum height of 5.2 metres for OHPL's from the ground. Consider the overall height of other equipment in addition to the reach arm considering potential additional items fitted to the complete machine as well such as flashing beacons on the tractor cab. Consider the complete process of access to and from the work site and the work being carried out and the maximum height for the particular reach arm mounted on the tractor and folded in transport, see Section 1.5.

IMPORTANT: Always follow the guidance given by the local Distribution Network Operator (DNO) who will be able to advise you the correct working practice and ensure work safety.

The height above the ground to the OHPL should be pre-measured by a suitably trained person using non-contact measuring devices before carrying out the works. Inspect the ground contours of the work area as undulating terrain may effect the stability of the machine and reduce the distance of the machine from the OHPL's during work in certain locations.

IMPORTANT: Ensure that a thorough work site risk assessment is carried out to ensure the works are carried out safely in the vicinity of OHPL's.

IMPORTANT: If a machine comes into contact with an OHPL, it is important to that the user and operator know what action to take to reduce the risk of any personal injury.

DANGER! Users and operators who work near OHPL's must carry out a thorough risk assessment and manage the risks whilst the works are being carried out.

DANGER! Always maintain a minimum distance from OHPL's with the tractor and machine and ensure bystanders maintain suitable distance from the working area of the machine.

DANGER! Always assume the OHPL is live until the owner of the OHPL is confirmed it is dead.

DANGER! Users and operators must be aware of the correct safety procedures if a machine comes in contact with an OHPL.

WARNING! Fatal electrocution can occur without contacting a power line. Due to the high electrical potential between the conductors and the ground, electricity can arc from the power line to any conducting item within range. Steel reach arm mowers are ideal conductors.

2.8.3 Exclusion Zones

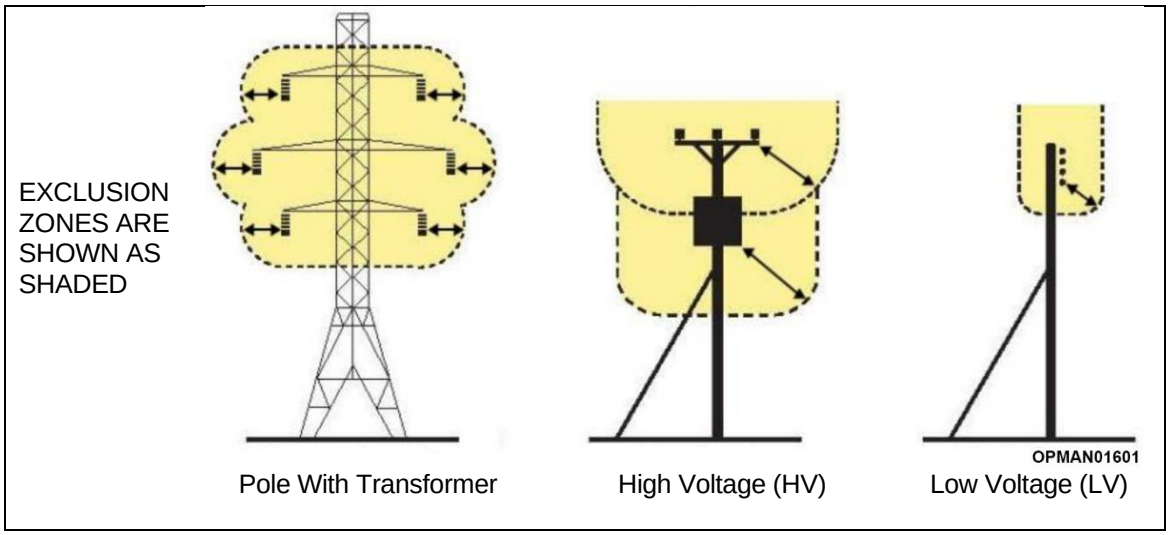


Figure 2.6
Exclusion Zone Definitions

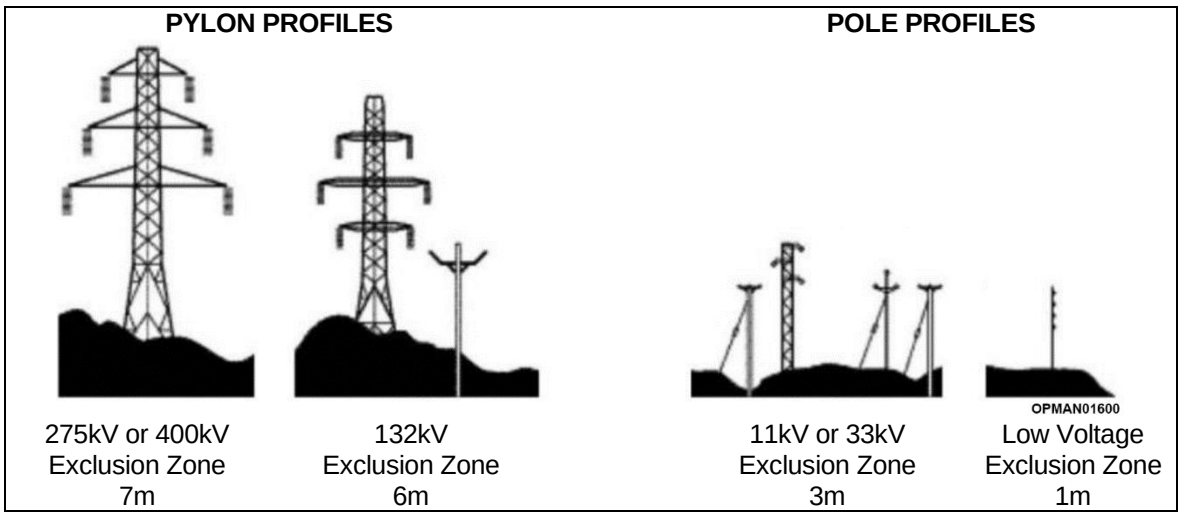


Figure 2.7
Minimum Exclusion Zones For Specific Overhead Powerlines

Risks can be reduced by maintaining a minimum horizontal distance of from an OHPL's.

With reference to Figure 2.7, the minimum safety distance or "Exclusion Zone" is 1m for low voltage OHPL's, with the distance increasing with OHPL's with greater voltages. Definitions as to where the measurements of distance are taken from are defined in Figure 2.6.

The safest procedure is always to not work around OHPL's with reach arm machines. However, if no alternative method can be used to cut inside the exclusion zone, it is important to contact the local Distribution Network Operator (DNO) who will be able to advise you the correct working practice and ensure work safety.

DANGER! Users and operators who work near OHPL's must carry out a thorough risk assessment and manage the risks whilst the works are being carried out.

DANGER! Always maintain a minimum distance from OHPL's with the tractor and machine and ensure bystanders maintain safe distance from the working area of the machine.

WARNING! Fatal electrocution can occur without contacting a power line. Due to the high electrical potential between the conductors and the ground, electricity can arc from the power line to any conducting item within range. Steel reach arm mowers are ideal conductors.

2.8.4 OHPL Risk Assessment

Figure 2.8

Before working near OHPL's, always assess the risks of the working environment by creating a work site risk assessment to maintain the safety of the machine, operator and bystanders.

Spearhead Machinery has listed a non-exhaustive guide of basic safe reach arm operation near OHPL's below which should be considered before creating a thorough procedure following the safe guidance and laws given and required by the local jurisdiction and country in which the works are to be carried out.

WARNING! Spearhead declines all responsibility for damage or harm caused during work operations to road users and bystanders due to not complying with the safety and injury prevention regulations required by the local jurisdiction of the country where the works are being carried near OHPL's. It is thoroughly the responsibility of the operator, user and accompanying personnel to ensure compliance is adhered to and not Spearhead Machinery.

Spearhead also declines any responsibility for damage caused by improper use of the machine and/or as a result of modifications made without prior authorisation by the manufacturer.

2.8.4.1 Follow the guidance of the health and safety guidance given by the Health and Safety Executive (HSE) and or alternative official governing bodies and the Distribution Network Operator (DNO) in the jurisdiction with regards to safely operating the reach arm around OHPL's.

2.8.4.2 Find out the maximum reach height for the particular reach arm mounted on the tractor in work position and transport position, see Section 1.5. and ensure that the reach arm and tractor remain a safe minimum distance from the OHPL meeting the safety requirements stated in Section 2.8.3.

2.8.4.3 Create a work site map marking out the following:

2.8.4.4 Find out the location and routes of all OHPL's within the work area.

2.8.4.5 Find out the operating voltage of all OHPL's within the work area.

2.8.4.6 Find out and mark the exclusion zone required from each the OHPL's, see Figure 2.7.

2.8.4.7 Ensure to supply the map to the operator carrying out the work.

2.8.4.8 Ensure to know about each OHPL in the working area and also who's responsible for the OHPL.

2.8.4.9 Consider how the location of OHPL's and the safety precautions required may influence traffic management methods for the works if the works are being out from the public highway.

2.8.4.10 Inspect the ground contours of the work area as undulating terrain may effect the stability of the machine and reduce the distance of the machine from the OHPL's in certain areas.

2.8.4.11 **IMPORTANT:** Know the risks of contacting OHPLs and the risk of arcing.

2.8.4.12 **DANGER!** Never attempt to operate the machine within an exclusion zone.

Always contact the local Distribution Network Operator (DNO) who will be able to advise you on the operating voltage, exclusion zones, the minimum safe working distance and any additional precautions required.

2.8.4.13 Ensure that contact details for the local DNO is displayed clearly inside the cab of the tractor in case of emergency.

2.8.4.14 **DANGER!** If the works are being carried out near a railway, do not begin work until local railway authority has been contacted if works are going to be inside their responsible areas or any works could cause risk to trains and the railway infrastructure.

2.8.4.15 **DANGER!** Never allow machinery to impede or overhang a railway outer boundary.

2.8.4.16 Consider if there are alternative methods of carrying out the works to avoid risk completely.

2.8.4.17 Work in daylight hours and at times of good visibility. Risks increase at dusk, in darkness or in poor visibility where it is harder to see OHPL's.

2.8.4.18 Always work with extreme caution and pre-plan work ahead to avoid high risk areas.

2.8.4.19 **WARNING!** If in doubt; do not work in the area – never risk the safety of operators, bystanders or road users.

2.8.4.20 **WARNING!** Never park the tractor and machine underneath a OHPL.

2.8.4.21 **IMPORTANT:** Ensure that all operators and users are supplied with the full risk assessment explaining all hazards, risks and precautions to follow including the safety procedure if an OHPL is contacted.

2.8.4.22 **IMPORTANT:**Ensure that the location of OHPLs in the working area are highlighted by displaying suitable hazard warning signs in prominent positions and supplementing them with appropriate text to warn the operator and bystanders of the overhead risks. An example is shown in Figure 2.8.

2.8.4.23 **DANGER!** Users and operators who work near OHPL's must carry out a thorough risk assessment and manage the risks whilst the works are being carried out.

2.8.4.24 **DANGER!** A risk assessment must be adaptively changed to changing conditions and working environments as the works are carried out.

2.8.5 Contacting An OHPL

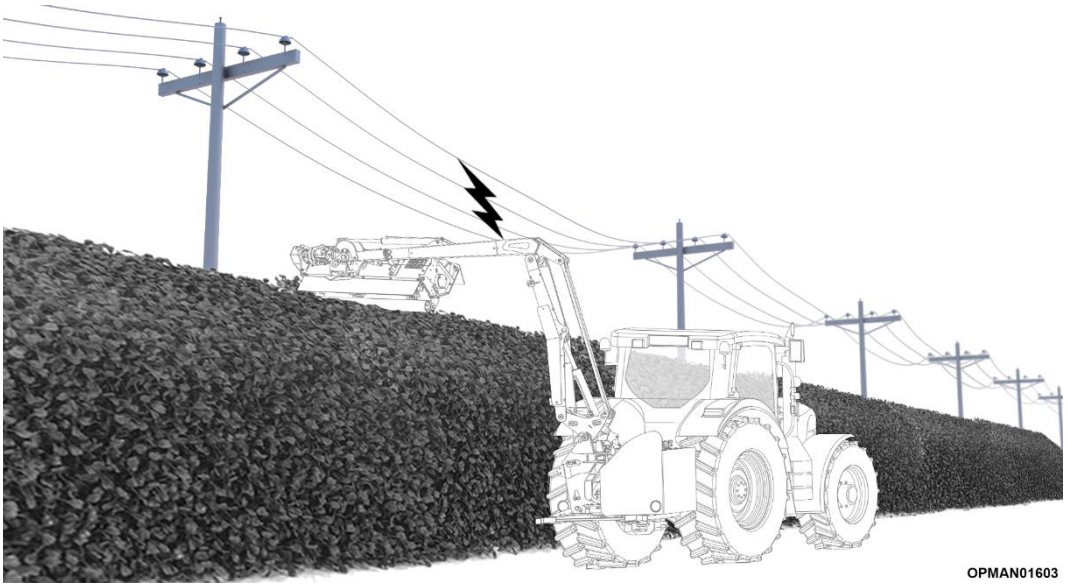


Figure 2.9 – Warning! Overhead Power Lines

DANGER! Follow the following procedure if the machine comes in contact with an Overhead Power Line (OHPL).

If for any reason the machine and reach arm come in contact with an OHPL:

2.8.5.1 Safely stop the reach arm and tractor as soon as possible.
2.8.5.2 Stay in the cab of the tractor and lower the reach arm in contact with the line or try to drive the machine clear if it is safe to do so. Ensure that the OHPL is not damaged in such a way that it could be brought down and causing further danger to others.
2.8.5.3 Inform the DNO immediately.
2.8.5.4 Electrocution is possible if anyone touches both the machine and the ground at the same time. If you need to get out jump
2.8.5.5 Ensure bystanders well clear so that no simultaneous contact is made between you, the machine and the ground. Do not touch any wires. Stay clear and warn others not to approach.
2.8.5.6 Get the DNO to disconnect the supply. Even if the line appears dead, do not touch it, or any part of the machine. Contact with the line may cause the power supply to trip out temporarily and it may be reconnected and re- energised automatically, without warning.
2.8.5.7 Ensure that bystanders are made aware of the incident and remain away from the machine for their wellbeing.
2.8.5.8 Never touch an overhead line that has been brought down by machinery, or has fallen, e.g. in a storm. Do not try to disentangle equipment, until you have received confirmation that the line has been de-energised and made safe.

DANGER! It is prohibited to use or have the machine used by an operator who is not properly trained in the use of the tractor and machine controls.

DANGER! Operators should be aware should read and fully understand the risk assessment produced by the user and organiser of the works when working round OHPL's.

DANGER! Users and operators should know of the correct, safe procedure to be used in case the tractor and machine come in contact with an OHPL and how to safely stop and leave the machine if it is safe to do so.

WARNING! Fatal electrocution can occur without contacting a power line. Due to the high electrical potential between the conductors and the ground, electricity can arc from the power line to any conducting item within range. Steel reach arm mowers are ideal conductors.

DANGER! Ensure that contact details for the local DNO is displayed clearly inside the cab of the tractor in case of emergency.

2.9 Working On The Highway - Lighting, Signage And Road Users

Figure 2.10

Hedge cutting and verge mowing applications come into contact with public bystanders and other road users and special accommodations and considerations must be placed on the operator, user and machine to ensure the wellbeing of all parties and for the works to be carried out causing as little disruption as possible.

2.9.1 Safety Warnings & Considerations

Spearhead Machinery has listed a non-exhaustive guide of basic hedge cutting and verge mowing work considerations which should be considered before creating a thorough procedure following the safe guidance and laws given and required by the local jurisdiction and country in which the works are to be carried out.

WARNING! Spearhead declines all responsibility for damage or harm caused during work operations to road users and bystanders due to not complying with the safety and injury prevention regulations required by the local jurisdiction of the country where the works are being carried. It is thoroughly the responsibility of the operator, user and accompanying personnel to ensure compliance is adhered to and not Spearhead Machinery.

Spearhead also declines any responsibility for damage caused by improper use of the machine and/or as a result of modifications made without prior authorisation by the manufacturer.

Legal

2.9.1.1 Ensure that all communication has been carried out with the correct local governing bodies in working locations which require prior consultation; for example highway closures and working in the vicinity of railways.

2.9.1.2 Ensure that all necessary licenses/permits, approvals and temporary traffic regulation orders/notices are adhered to and gained before commencing work. From this you will be able to determine the correct traffic control equipment required.

Risk Assessment

2.9.1.3 Ensure that a thorough work site risk assessment is carried out to ensure the correct signage, lighting and guarding is put in place for road users and bystanders. Re-evaluate the work assessment if circumstances change.

2.9.1.4 Check site regularly and before/after work to ensure all safety requirements are correct and intact. Increase inspection intervals in areas of high activity, vandalism is seen to be a problem, higher risk areas (e.g. pedestrian crossings) and in poor weather conditions.

Time Of The Works

2.9.1.5 Roadside maintenance should be carried out in such a way to cause minimum inconvenience to road users. If emergency or extended disruption or road diversions are required, ensure that the correct warnings are put in place prior to the works beginning to minimise road user disruption and for road users to make alternative arrangements.

Signage

2.9.1.6 Use signing, lighting and guarding to cover all risks in the working environment, not just to warn of the works being carried out.

2.9.1.7 Extra advanced signage should be at locations with limited visibility – on a bend, dips in the road or brow of a hill.

2.9.1.8 Signage should be placed for road users and bystanders from all potential directions.

2.9.1.9 Ensure that signage placed on public footpaths yet still allow full, safe public access of the footpath for pedestrians.

2.9.1.10 Ensure that if there are OHPLs in the working area, that they are highlighted by displaying suitable hazard warning signs in prominent positions.

2.9.1.11 Signage should be clean, clear and level and correctly positioned from the ground.

2.9.1.12 Signage should be secure to ensure it does not blow away or fall over.

2.9.1.13 Sufficient quantity of signage should be placed in the correct sequence and distances from the work site to the recognised local standards of the jurisdiction.

2.9.1.14 Consider how works on multi-carriageway may require the duplication of road signs for road users in different lanes.

2.9.1.15 If signage needs to be removed or moved ensure that the signs are replaced as soon as possible and whilst they are removed ensure that there are sufficient supporting personnel to make sure that pedestrians do not enter the working zone.

2.9.1.16 Use only recognised equipment produced to the correct standards.

Figure 2.11
Always Use Correct Standard Signage

Road Users

2.9.1.17 Inspect the work site to see if parked cars will affect the works.

2.9.1.18 Consider the proximity of fixed traffic lights and roundabouts in proximity to the works. Will stationary and waiting traffic due to the works potentially back up and cause congestion issues to these areas.

2.9.1.19 Consider the type of road traffic and quantity, this will affect traffic control required. Queue management strategy. Different levels of traffic will require different provisions.

2.9.1.20 Consider the period of the works and selection of the time of day. Large quantities of traffic may influence the works, for example during school time and early morning deliveries.

2.9.1.21 Consider whether the works will impede on cycle lanes and the quantity of bicycles using them.

2.9.1.22 Will the works restrict access and exit of premises, such as residential, businesses, shopping, schools and car parks.

2.9.1.23 Does the road allow for sufficient passing distance between the tractor and machine and other road users. Consider the overhang of the reach arm during work. Where this cannot be achieved, traffic management must be used.

2.9.1.24 Where a working zone which has a restricted width which cannot be accessed by some vehicles, an alternative route will be required agreed with the local highways authority.

2.9.1.25 Consider the speed limit required and speed reduction methods.

2.9.1.26 Consider the weather conditions and the influence it will make on the works.

2.9.1.27 Ensure that the machine is only ever at work in the working zone.

Railways

2.9.1.28 Do not begin work until local railway authority has been contacted if works are going to be inside their responsible areas. National rail and heritage railway authorities are responsible for certain portions of the road within the stop lines of their railway crossings.

2.9.1.29 Extreme care to ensure stationary traffic does not tailback onto railway crossings when the works are being carried out.

2.9.1.30 Never allow machinery to impede or overhang the railway outer boundary.

Overhead Power Lines (OHPL's)

2.9.1.31 Some Twiga reach arm machines are capable of reaches in excess of 8 metres (26') which well exceeds the lowest legal minimum height of 5 from the ground for high voltage power lines; see Section 2.8.2.

Find out the maximum reach height for the particular reach arm mounted on the tractor in work position and transport position, see Section 1.5. and ensure that the reach arm and tractor remain a safe minimum distance from the OHPL meeting the safety requirements stated in Section 2.8.3.

2.9.1.32 Follow the guidance of the health and safety guidance given by the Health and Safety Executive (HSE) and or alternative official governing bodies and the Distribution Network Operator (DNO) in the jurisdiction with regards to safely operating the reach arm around OHPL's.

2.9.1.33 See Section 2.8 for guidance on working near OHPL's.

2.9.1.34 Consider how the location of OHPL's may require additional safety precautions put in place for road users, public bystanders and railway infrastructure when carrying out the works.

2.9.1.35 Ensure that contact details for the local DNO is displayed clearly inside the cab of the tractor in case of emergency.

2.9.1.36 Consider if there are alternative methods of carrying out the works to avoid risk completely.

Tractor And Reach Arm Specification

2.9.1.37 Tractor and reach arm must be conspicuous. High visibility chevrons are strongly recommended and a requirement in some jurisdictions.

2.9.1.38 The tractor must have one or more amber warning beacons which can be seen from any direction.

2.9.1.39 Keep left/right sign(s) must be displayed for drivers approaching the works showing which side to pass the works attached to either the reach arm or the tractor. These signs must be covered when the machine is out of use in order to ensure that road users and pedestrians are not incorrectly directed.

Figure 2.12

Pedestrians

2.9.1.40 Consider whether bus stops will be affected by the works.
2.9.1.41 Consider whether pedestrian crossings will be affected by the works.
2.9.1.42 Consider the quantity of pedestrians which may be coming in the vicinity of the works in a similar way to road users. How will this vary during the day, due to work patterns, school hours and potential special events.
2.9.1.43 How will pedestrians interact with the potential increased quantity of traffic.
2.9.1.44 Will safe routes and footpaths be affected by the works. Will alternative routes be required. Consider what will be required at junctions and multi-carriageway roads.
2.9.1.45 Are these safe routes, footpaths and potential alternative routes accessible for disabled and pushchair access.
2.9.1.46 Ensure that pedestrians never impede on the working zone. There are a number of risks, for example, tripping on loose cut material or being struck by moving equipment or debris.
2.9.1.47 If any pedestrians or road users enter the working zone, stop the machine immediately and escort them back to the safe route.
2.9.1.48 If the works are to be carried out for an extended period or with high levels of disruption, provide information to affected residents and businesses in good time.

Lighting

2.9.1.49 Consider the time of day when the works are to be carried out.
2.9.1.50 Consider the lighting requirements of the tractor and machine.
2.9.1.51 Requirements of cones and warning lights.
2.9.1.52 Stop/Go boards are restricted to daytime use.
2.9.1.53 Signs placed closed to railway lines could be interpreted as signals.

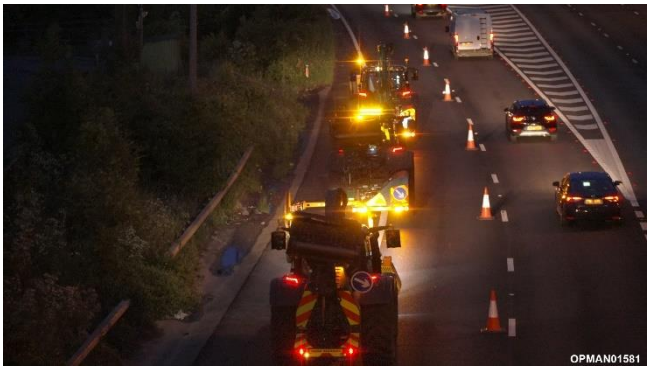


Figure 2.13

Other Safety Precautions

2.9.1.54 Always use the correct type of fire extinguisher which can be quickly accessed.
2.9.1.55 Consider the proximity of emergency services. Police, medical and fire.
2.9.1.56 Consider the communication methods with multiple personnel carrying out the works to ensure road user and pedestrians are remained safe, for example the use of two-way radios.

Unattended Works

2.9.1.57 If the work site is required to be left unattended, remove as many hazards as possible when they are not in use. Safely secure and immobilise all machinery so it cannot be tampered with or nothing can fall over/off.

2.10 Transporting The Machine

Tractor Preparation Before Transport

2.10.1.1 **IMPORTANT:** Before starting, safety checks on tractor and machine must be carried out with regard to functionality, road safety and accident prevention rules.

2.10.1.2 CAUTION**!** Check that the agricultural tractor on which the machine is installed is of adequate power, weight and configuration, compatible with the model fitted and fitted with a seat belt.

The tractor should exceed the weight of the machine by at least 20%. For machine weights see Section 1.5.

2.10.1.3 **IMPORTANT:** Before preceding to start work ensure that steering and braking give proper operation and are in good condition.

2.10.1.4 **WARNING!** Failure to have sufficient load over the front axle (20% +) or to drive at inappropriate speeds on undulating terrain may result in a loss of directional control.

2.10.1.5 CAUTION**!** If the agricultural tractor has no closed cabin, the tractor must be equipped with a “Rollover Protection Structure” (ROPS) which must always be locked in position.

2.10.1.6 **IMPORTANT:** The tractor independent brakes should be locked together and the differential lock should be disengaged.

Figure 2.14

2.10.1.7 **IMPORTANT:** Ensure the reach arm is raised sufficiently off the ground in order to give ground clearance over road obstacles, yet low enough to maintain on road stability and clear all low access areas to and from the work site at a safe margin. An example are railway bridges.

2.10.1.8 **IMPORTANT:** Ensure the 7 pin plug is fitted into the rear of the tractor to ensure that all brake lights, turning signals and any other optional lights work correctly on the machine.

2.10.1.9 **IMPORTANT:** Ensure that the tractor PTO is disengaged using the relevant tractor button/handle and the reach arm controls are switched off, to ensure there is no accidental operation of the machine in transport by the operator.

2.10.1.10 **IMPORTANT:** Make certain that the local jurisdiction legal safety requirement items are fitted. For example a “Slow Moving Vehicle” (SMV) sign is installed and tractor flashing warning lights. Check the local jurisdiction to determine whether the flashing warning beacons are required to be switched on when the machine is working.

2.10.1.11 **IMPORTANT:** Make sure all tractor and reach arm lighting are functioning correctly. Older tractors may not feature as many/bright lights as modern tractors. Consider upgrading the lights by consulting your authorized tractor dealer to ensure that the tractor and machine presence is seen.

2.10.1.12 **IMPORTANT:** It is of upmost importance that safety decals are kept clean and replaced if they are no longer legible, damaged or lost completely. Safety decals can be purchased readily from a local Spearhead dealer.

Operator

2.10.1.13 **CAUTION!** Before proceeding to take the machine into the work area ensure that driving vision is not impaired by tractor, cab or implement for clear vision of ground hazards and bystanders while seated in the driver's seat.

Adjust rear view mirrors in order to see clearly the machine and all items behind.

2.10.1.14 **IMPORTANT:** Ensure that permissible axle loads are not exceeded.

2.10.1.15 **WARNING!** All operation related to the tractor and machine should always be carried out from the driver's seat with seat belt buckled whether working or transporting the machine on the public highway.

2.10.1.16 **WARNING!** Never carry passengers in the tractor unless it is fitted with an approved seat and seat belt.

2.10.1.17 **WARNING!** Never carry passengers on the machine.

2.10.1.18 CAUTION**!** Personnel should take regular breaks during work to minimise fatigue and ensure alertness in work.

2.10.1.19 **IMPORTANT:** Operator should use the procedure used by the "Safe Stop" campaign promoted by the Health and Safety Executive (HSE) to give guidance on how to safely prepare the machine and personnel and operate the machine and what to do in emergency cases.

https://www.hse.gov.uk/agriculture/topics/machinery/safe-use-1.htm

Folding

2.10.1.20 **WARNING!** Ensure that the rotors have completely stopped before folding the machine between working and transport position.

2.10.1.21 **DANGER!** When the reach arm is folded for transport, the arm is placed close to the rear of the cab of the tractor. Inspect and judge to ensure that the arm remains at a safe distance when folded against the "flip over bracket" considering the movement of the arm whilst it is being transported by the tractor potentially on uneven terrain.

2.10.1.22 **IMPORTANT:** Ensure that the reach arm "flip over bracket" and slew locking pin are correctly positioned and fitted to secure the machine in position when being transported.

Transportation In Progress

2.10.1.23 **IMPORTANT:** Stop and do not use the machine when there is vibration or unusual mechanical noise coming from the machine, as this may cause breakage and extended serious damage. Find the cause of the vibration or noise and have it inspected by your local Spearhead dealer and do not use the machine until the cause is identified and eliminated.

2.10.1.24 **DANGER!** When transporting the machine do not engage the tractor PTO.

2.10.1.25 **WARNING!** Never operate the machine with the rotor moving in the transport position.

2.10.1.26 **IMPORTANT:** The tractor and machine will respond different between working and transport position.

A machine in work due to its design will be constantly changing its operating characteristics due to the reach arm and attachment being moved into different positions and as a result changing its mass characteristics. The operator is required to adjust their driving characteristics/speed in order to ensure safety to bystanders and other vehicles.

A machine in transport position will have a higher centre of gravity so will be more likely to become unstable at lower speeds. The operator is required to adjust their driving characteristics/speed in order to ensure safety to bystanders and other vehicles.

2.10.1.27 **IMPORTANT:** Use low speeds and smooth, gradual steering action in order to ensure safety to bystanders and other vehicles when on curves, hills, rough or uneven surfaces or wet roads.

2.10.1.28 **WARNING!** Before transporting the tractor and reach arm and attachment, determine the legal maximum transport speeds for the equipment conforming to local jurisdictions and comfortable transport speeds for the operator. Only increase speeds safely when conditions allow or the operator is comfortable to do so.

Transport the machine only at safe speeds which allow you to properly control the machine and at a maximum speed of 20 mph (32 kph). Drive for the conditions and reduce speed if required. Increasing speeds, operating down a hill or on wet or rain slick roads; increases stopping distances.

2.10.1.29 **IMPORTANT:** Allow clearance for implement swing while turning.

2.10.1.30 **IMPORTANT:** When driving on public roads respect other road users and obey the highway laws of the local jurisdiction.

2.10.1.31 **IMPORTANT:** When operating on public roads, have consideration for other road users. Pull to the side of the road occasionally to allow all following traffic to pass. Do not exceed the legal speed limit set in your local jurisdiction for agricultural tractors. Always stay alert when transporting the tractor and reach arm on public roads. Use caution and reduce speed if other vehicles or pedestrians are in the area.

2.10.1.32 **IMPORTANT:** Ensure the tractor is fitted with flashing warning beacons and they are switched on, if required. Contact the local jurisdiction authority for guidance on machine preparation.

2.10.1.33 CAUTION**!** Ensure that the machine and attachment are clear of excess debris. Driveline and hydraulic components can become hugely hot when in work and debris could cause risk of a fire hazard.

2.10.1.34 **WARNING!** Keep the raised reach arm at 3 metres (10 ft) or greater distance from all power lines and overhead obstructions.

2.11 Transporting The Machine On A Trailer

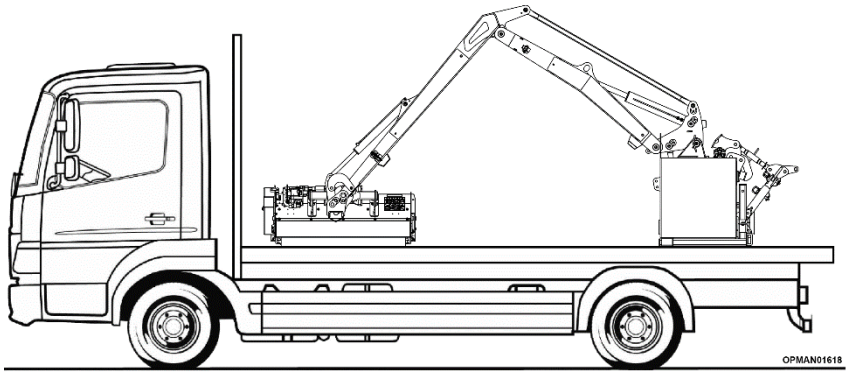


Figure 2.15
Transporting Machine On A Trailer

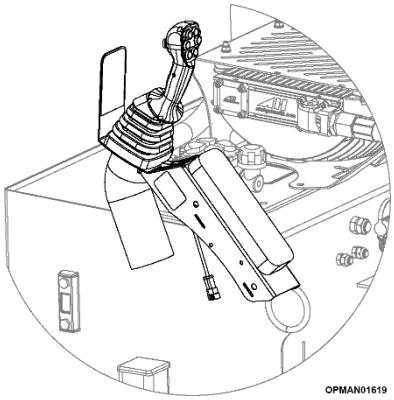


Figure 2.16
Joystick Mounting
(Pilot control system shown)

Before transporting a machine (potentially plus tractor), measure the height and width dimensions and gross weight of the complete loaded unit. Ensure that the load will be in compliance with the legal limits set for the areas that will be travelled through during transit.

Twiga reach arm machines can be positioned for transporting on a trailer in either transport or working position if the size of the trailer allows and the armset can be positioned to suit the trailer and road conditions.

2.11.1.1 **IMPORTANT:** Use adequately sized and rated trailers and equipment to transport the tractor and machine. Consult an authorized dealer to determine the proper equipment required. Using adequately sized chains, heavy duty straps, cables and/or binders, securely tie down the machine to ensure it does not fall over or move in transport.

Arrange the straps so that when tightened, the straps are pulling downward and against themselves. Carefully tighten the securing strap or other fasteners to apply maximum tension and to ensure that no machine components get damaged. Use extreme care when attaching and removing the securing devices as the extreme tension involved when released has the potential to inflict serious injury.

While hauling the tractor and implement, make occasional stops to check that the machine has not moved or shifted and that the securing devices have maintained tension. If during transport a hard braking, sharp turning or swerving action was performed, stop at the next safe location to inspect the security of the load.

The joystick controls can either be disconnected from the machine completely or mounted to the front of the oil tank, as shown in Figure 2.16. Ensure to cover the controls in a plastic bag to protect them from water damage.

2.12 Machine Storage

Moving Machine

2.12.1.1 **WARNING!** While the tractor is running all personnel should keep well clear of the area around the machine (90m/300 ft+) as there are numerous crushing, shearing, impact dangers caused by the machine operation.

2.12.1.2 **DANGER!** It is forbidden to approach, stand close or touch the machine when the machine is operated. It is the operators responsibility to check before starting up the machine and during work that bystanders who may inadvertently get in the way of the moving armset and attachment are kept away from the tractor and machine. Machines have many pinch and impact point dangers whilst the machine is in operation and being used.

2.12.1.3 **WARNING!** When moving the reach arm not fitted to the tractor ensure the machine is lifted or carried using suitable equipment in the correct position.

A suitable forklift truck through the designated forklift slots found on the mainframe of the machine.

A suitable lifting crane or telehandler through the designated lifting point found on the main arm of the machine using a suitable lifting strap or chain.

Hydraulics

2.12.1.4 **DANGER!** Lower the machine and attachment to the ground when not in use in order to protect personnel and bystanders from hydraulic or mechanical failure.

2.12.1.5 **DANGER!** When storing the machine, ensure that the transport bracket is fitted correctly between the slew post and the main arm to ensure that the reach arm does not move and potentially fall causing an accident or severe injury or death to personnel.

2.12.1.6 **DANGER!** When storing the machine in the folded transport position, ensure that the locking pin is fitted in the slew post to ensure that the reach arm does not move and potentially fall causing an accident or severe injury or death to personnel.

2.12.1.7 **WARNING!** It is mandatory to switch the combustion engine off and disengage PTO, ensure that the machine has completely stopped, and the tractor is stopped safely using the “Safe Stop” procedure. Only mount or dismount the tractor when machine/tractor are at standstill and stopped.

2.12.1.8 **WARNING!** Do not leave the reach arm attachment parked near a building, hay bale stack or similar to ensure the machine is not climbed upon or fallen onto.

2.12.1.9 CAUTION! Relieve hydraulic pressure before disconnecting hydraulic hoses connecting to the tractor, if fitted.

2.12.1.10 CAUTION**!** Disconnect all hydraulic and mechanical connections between the tractor and machine when not in use so it is not used inadvertently out of work.

2.12.1.11 **IMPORTANT:** Ensure to cap ends of the hydraulic hoses of the reach arm and attachment if they are disconnected from each other to prevent contamination and dirt. Contamination and dirt can cause failure in hydraulic components and premature wear.

2.12.1.12 CAUTION**!** Keep the disconnected hydraulic hoses and electrical connections from the reach arm and attachment off the floor when the reach arm, attachment and tractor are disconnected from each other to ensure not to cause a trip hazard.

Items Left On Machine/Left Machine

2.12.1.13 **WARNING!** It is forbidden to deposit items on the machine which can harm persons or animals, or damage property should they fall.

2.12.1.14 CAUTION! When the machine is not in use, use the machine stands to support the machine on a level ground to make sure the machine will not move or suddenly fall down. Ensure the stands are not overloaded with excess weight.

2.12.1.15 **IMPORTANT:** Store the machine in a safe place which is protected from the elements, to ensure its wellbeing and protection from damage to components for when the machine is to be recommissioned and used again.

2.12.1.16 **IMPORTANT:** Store the machine in a safe place which is protected from the elements when the work is completed to ensure its wellbeing and protection from damage to components.

2.12.1.17 CAUTION**!** Keep the disconnected input PTO driveshaft off the floor when the reach arm is not connected to the tractor to ensure not to cause a trip hazard.

2.12.1.18 **IMPORTANT:** Ensure the reach arm controls are protected from damage and weather when out of work. At the very least use a waterproof bag to cover the controls and protect them from water ingress and ideally keep them indoors protecting them from damage form the elements.

2.12.1.19 CAUTION**!** Keep the disconnected reach arm controls and accompanying wiring off the floor when the reach arm is not connected to the tractor to ensure not to cause a trip hazard.

2.13 Safe Maintenance

Personnel Preparation

2.13.1.1 **IMPORTANT:** It is required that all operators and personnel carrying out maintenance on this machine familiarise themselves with the machine and this operator manual to ensure they are aware of the dangers of incorrect use or improper or incorrect repairs.

2.13.1.2 **IMPORTANT:** Maintenance on the machine should be performed by only skilled and specialized personnel, in strict compliance with the instructions in this manual, and any worn or damaged parts should be replaced.

2.13.1.3 **IMPORTANT:** Always use genuine Spearhead parts when carrying out repairs and maintenance with thoughts to longevity and reliability of the machine and personnel safety.

2.13.1.4 CAUTION! Ensure maintenance personnel wear suitable PPE clothing when maintaining the machine to ensure a reduced risk of impact or skin injuries. Frequent or prolonged contact with hydraulic oil may cause dermatitis and other skin disorders including (more rarely) skin cancer when not wearing impenetrable gloves. Worn parts may have sharp edges.

Follow the guidance of the lubricant manufacturer with regards to handling oils, solvents, cleansers and other chemical agents.

2.13.1.5 **IMPORTANT:** Ensure that the correct suitable fire extinguisher is available at all times and is easily accessible.

Crushing & Impact

2.13.1.6 **DANGER!** When lowering the machine ensure bystanders stay clear to avoid crushing.

2.13.1.7 **WARNING!** While the tractor is running all personnel should keep well clear of the area around the machine as there are numerous crushing, shearing, impact dangers caused by the machine operation.

2.13.1.8 **DANGER!** Machines have many pinch and impact point dangers whilst the reach arm is being maintained. Be conscious of these dangers when conducting maintenance on the reach arm.

Lifting

2.13.1.9 **DANGER!** When required to work on the machine with any components or attachment raised, ensure that the machine is supported with fixed stands/supports to ensure that the machine doesn't suddenly drop and potentially crush maintenance personnel in the event of a mechanical or hydraulic failure, especially when working on the underside of the machine.

2.13.1.10 **WARNING!** When moving the reach arm not fitted to the tractor ensure the machine is lifted or carried using suitable equipment in the correct position.

A suitable forklift truck through the designated forklift slots found on the mainframe of the machine.

A suitable lifting crane or telehandler through the designated lifting point found on the main arm of the machine using a suitable lifting strap or chain.

2.13.1.11 **DANGER!** When conducting maintenance on the reach arm, many components are very heavy and unable to be carried by one personnel. Use additional personnel assistance and correct sufficient lifting gear to prevent accident and injury.

Working Environment

2.13.1.12 **DANGER!** Do not run the tractor engine inside. Only run the tractor in open outdoor spaces.

2.13.1.13 **DANGER!** Engine exhaust fumes and some of their constituents and certain vehicle components contain or emit chemicals known to the state of California to cause cancer, birth defects or other reproductive harm. See Section 8.12 with regards to Proposition 65.

2.13.1.14 **DANGER!** If the machine is required to be worked on ensure that the ground is level, sturdy and solid and that the machine is suitably chocked in order to ensure it doesn't move or fall.

2.13.1.15 CAUTION! If maintenance is required on the machine in a location which is high up and inaccessible from the ground; use a secure ladder or raised stands.

2.13.1.16 CAUTION! Ensure a good footing by standing on solid, flat surfaces when getting onto the machine to carry out work.

2.13.1.17 CAUTION! Never use the PTO or PTO guards as a step.

2.13.1.18 **DANGER!** When conducting maintenance on the reach arm do not overreach. Consider the consequences of examples such as spanner slippage and sudden breaking/loosening of fasteners. These example but not exhaustive situations could result in a fall or removal of skin from arms and hands.

If any case of injury is possible; rethink your approach.

Hydraulic

2.13.1.19 CAUTION**!** Keep hands and body away from pin holes and nozzles ejecting hydraulic fluid. Ingested or penetrated hydraulic fluid in the body can become gangrenous. Removal must be carried out professionally by a suitable Doctor.

2.13.1.20 CAUTION**!** When working with/checking the hydraulic system on the machine always wear safety glasses and impenetrable gloves. This also applies when working with gearboxes and gearbox oil. Use paper or cardboard to search for leaks and not hands or any other body parts.

2.13.1.21 CAUTION**!** Relieve hydraulic pressure before disconnecting lines or working on the system.

2.13.1.22 CAUTION**!** Before carrying out work on the system, place the reach arm into its most outstretched position with the head attachment on the floor. Once this has been completed and then suitable safety glasses and impenetrable gloves have been put on, the hydraulic hoses can be removed from various components of the machine. Gently loosen hydraulic hose connections at first as the system will need to be relieved of its pressure.

By placing the reach arm in its most outstretched position with the head attachment on the floor ensures the least amount of reactive movement with the hydraulic pressure being relieved from the system.

Ensure any other unrequired bystanders and specialised personnel are kept clear of the machine during this procedure.

2.13.1.23 CAUTION**!** Ensure all hydraulic hoses, lines and connections in good condition and tight before applying pressure.

2.13.1.24 **IMPORTANT:** Do not change any factory-set hydraulic settings to avoid component or equipment failures.

PTO Shaft & Guarding

2.13.1.25 **DANGER!** Disconnect the input PTO driveshaft of the machine from the tractor PTO before starting any maintenance or adjustment.

2.13.1.26 **IMPORTANT:** Always replace guards that have been removed for service or maintenance and ensure they are fit for use, give complete protection and work as intended. If not, replace them before proceeding to use the machine.

Modification

2.13.1.27 **IMPORTANT:** Do not modify or alter implement functions or components.

2.13.1.28 **DANGER!** Do not weld any important structural components. They may cause other component failures and accident and injury.

Heat

2.13.1.29 CAUTION**!** Components such as gearboxes and driveline components can become hugely hot when in work. Ensure that components are sufficiently cool before going anywhere near the machine for maintenance. As a precaution though wear gloves and safety glasses when servicing these potentially hot items or any other potentially hot item on the machine.

2.13.1.30 **WARNING!** It is forbidden to deposit items on the machine which can harm persons or damage property should they fall.

2.13.1.31 **WARNING!** It is mandatory to switch the combustion engine off and disengage PTO, ensure that the machine has completely stopped, and the tractor is stopped safely using the “Safe Stop” procedure. Only mount or dismount the tractor when machine/tractor are at standstill and stopped before engaging in maintenance operations.

Storage Afterwards

2.13.1.32 **IMPORTANT:** Comply with the laws in force in the country of installation on the use and disposal of products used for cleaning and performing maintenance on the machine, considering the recommendations of the manufacturer and local guidelines on the given products.

2.13.1.33 **IMPORTANT:** Store the machine in a safe place which is protected from the elements, when the work is completed to ensure its wellbeing and protection from damage to components.

2.13.1.34 **IMPORTANT:** Before returning the machine back to work ensure the machine has been thoroughly inspected and checked using the Machine Inspection Record; see Section 8.12.

Ensure that when the machine inspection is carried out that the machine is stationary and not running.

Where parts are broken, damaged and deemed not fit for use; replace with genuine Spearhead parts using the online Interactive Parts facility at:
https://my.spearheadmachinery.com/parts/public-interactive-parts-database/

You will require the machine serial number. Assistance to its location can be found in Section 1.5.

2.14 Safety & Operational Decals

Twiga reach arm machines are equipped with safety and operational decals warning about residual risks present on the machines that were not possible to eliminate. Some give guidance in how to best operate and care for the machine. Safety decals are yellow in colour and placed in strategic positions around each of the respective dangers. Operational decals are generally white in colour and are placed in locations close to the respective item required to be maintained. Section 2.14.1 specifies the meaning of each of the symbols contained in the decals and their particular positioning on the machine is stated in Section 2.14.2. The operator must memorise the meaning of these decals.

All decals should be kept clean and replaced immediately if they are fully/partially detached or damaged by purchasing them through a local Spearhead dealer.

2.14.1 Definitions

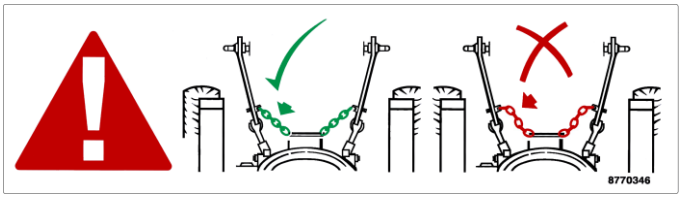
1

Figure 2.17 – 8770608 Safety Decal

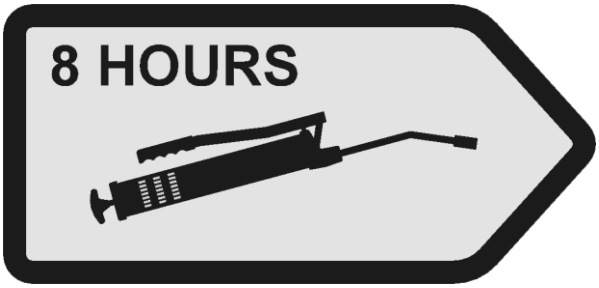
a	Warning: - Remove key, read instruction manual	The original machine operators manual should be read before using the machine giving guidance to operation and maintenance
b	Instruction: - Check the tightness of fasteners	The tightness of all fasteners around the machine should be checked at least once every 8 hours
c	Danger: - Keep clear of overhead power lines	Ensure you maintain a safe distance with the reach arm and attachment from overhead power lines. Where doubt exists contact your local power company for advice.
d	Danger: - Crushing hazard	Personnel should keep at distance from the machine when the machine is unsupported as of the risk of the wing and other items falling posing potential entrapment or crushing
e	Danger: - Flying debris	Personnel should keep at distance from the machine when the machine is operating due to the risk of items being flung from the machine
f	Danger: - Keep hands and body away from hydraulic fluid	Ingested or penetrated hydraulic fluid in the body can become gangrenous. Removal must be carried out professionally by a suitable Doctor.
g	Danger: - Pinch point hazard	Personnel should keep at distance from the machine when the machine is operating as of the risk of entrapment or crushing by components
h	Danger: - Wear ear protection	Personnel should wear hearing protection when in close proximity to the machine in operation to prevent permanent hearing damage
i	Instruction: - P65 cancer and reproductive harm	Operating, servicing and maintaining this equipment can expose you to chemicals which are known to the State of California to cause cancer and birth defects or other reproductive harm.

Table 2.1 – 8770608 Safety Decal Definitions

2.



3.



4.

Figure 2.18 – Other Safety & Instruction Decals

2	Warning/Instruction: - Keep chain tight	Ensure that the tractor lower linkage chains are kept tight during work to ensure minimal sway from the machine in use.
3	Instruction: - Grease every 8 hours	Placed and pointed towards components of the machine which should be greased at least once every 8 hours
4	Warning/Instruction: - PTO operating speed	Indication to the correct operating speed of the machine when in work. 540RPM

Table 2.2 – Other Safety & Instruction Decal Definitions

For the placement of these decals on each of these machines, please refer to Section 2.14.2.

2.14.2 Placement

Figure 2.19 states the particular positions safety and instruction decals are placed on each of the Twiga Classic reach arm models.

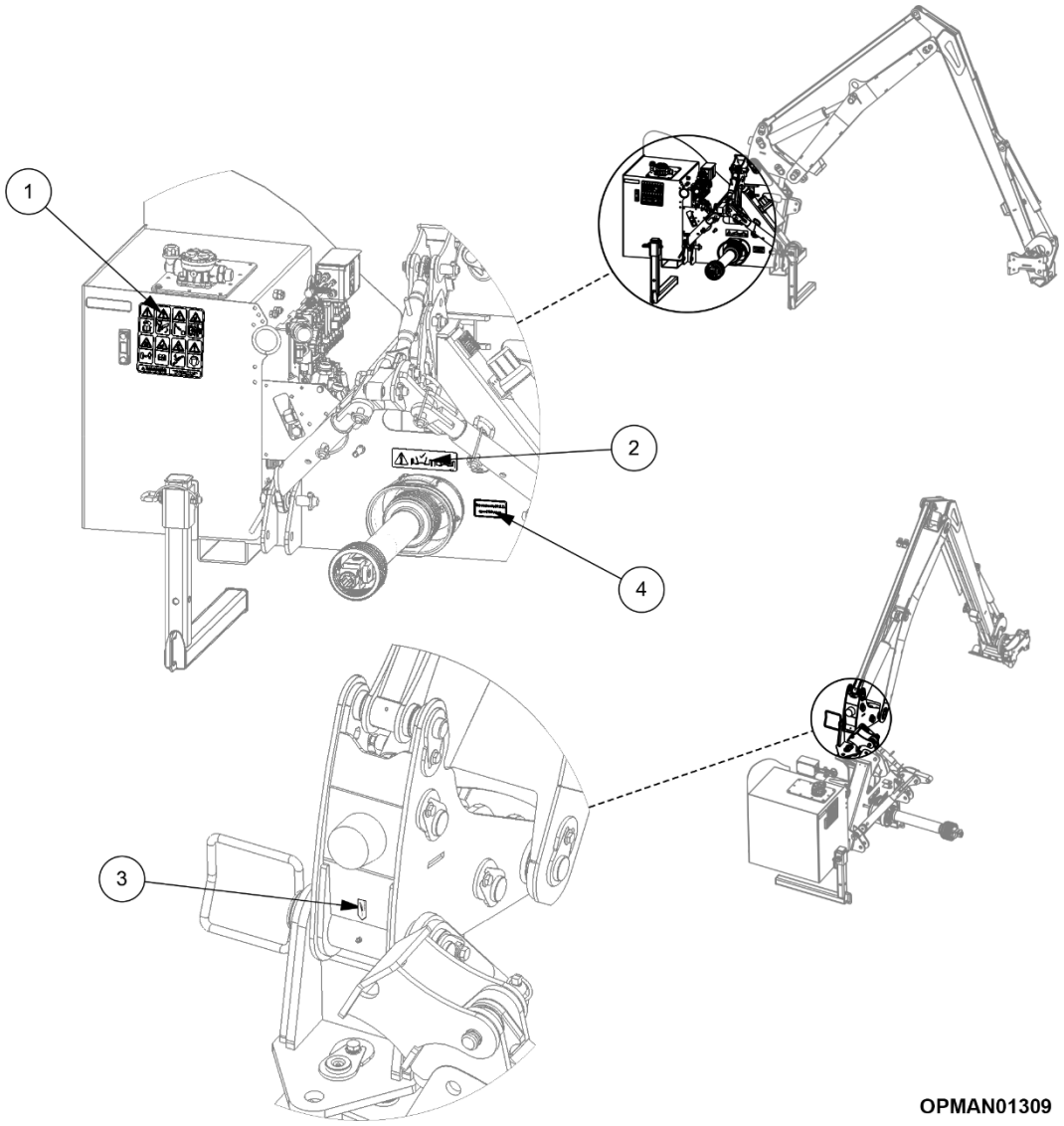


Figure 2.19 – Twiga Classic Safety & Instructional Decal Placement
(Left-hand build S55 model shown)

2.14.3 Replacement

It is of upmost importance that safety decals are kept clean and replaced if they are no longer legible, damaged or lost completely. Safety decals can be purchased readily from a local Spearhead dealer.

Spearhead safety decals have the replacement part number found in the bottom right of the decals.

For more extensive guidance on ordering spare parts and how to go about finding the correct part number; see Section 10.

2.15 Guards

DANGER! For safe operation it is essential that that all guards must be kept in position on the machine whenever the machine is running. Spearhead disclaim all responsibility for any damage or injury arising as a result of guards being removed, or other than in accordance with these instructions.

WARNING! Inspect guards twice daily or immediately if damage is suspected.

Always replace guards that have damage or wear which could impair their performance. Typical damage to inspect for is as follows;

Hose guards	Missing, distorted or with sharp outer edges.
PTO driveshaft + coupling guard	Cracked, missing portions revealing moving parts

Table 2.3 – Permanent Protection Guard Damages

2.15.1 Mandatory Guards

The General arrangement figure found in Section 1.2 and the list below show the mandatory guards required. These along with the danger decals and warning decals are necessary for safe cutting operations with this machine:

- PTO coupling guard
- PTO driveshaft guard
- Main arm guard
- Dipper arm guard
- Forward reach arm guard (Twiga Classic VFR55/60 only)

2.15.2 Cab Guard Kit

Spearhead Twiga reach arm machines come supplied with a cab guard kit which should be fitted to the tractors side window to protect it from ejected material from the cutting attachment.

The cab guard kit supplied is universal to allow it to be fitted to all cabbed tractors and requires modification to allow it to fit. The kit is supplied with a selection of components to allow it to fit to the tractors window safely and securely without causing damage. The contents of this kit are shown in Figure 2.20.

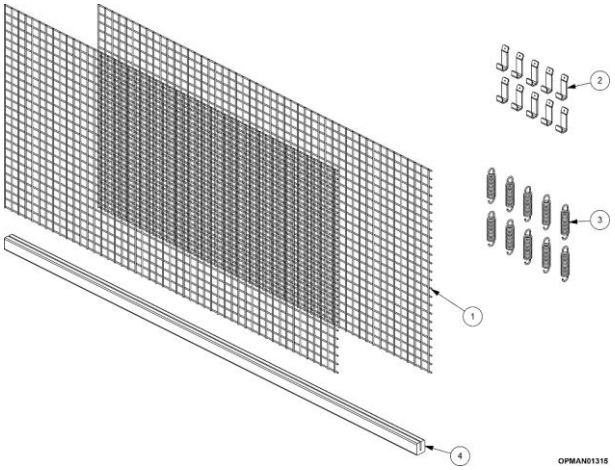


Figure 2.20 - Twiga Classic Universal Cab Guard Kit

Item No.	Description.	Qty.
1	Mesh Guard Panel	2
2	Hook	10
3	Spring	10
4	Foam Protection Strip	1

Table 2.4 - Twiga Classic Universal Cab Guard Kit Contents

For guidance on fitting the Spearhead cab guard kit, see Section 3.2.3.

2.15.3 Attachment Guards

Guarding on the reach arm attachment will vary depending on the type of attachment. It is important to inspect the specific reach arm attachment and its accompanying operators manual to gain full clarification to the guarding fitted to the machine.

Example guarding is:

- Belt guards
- Rubber protection guards
- Chain guards
- Blade guards
- Motor drive guards
- Skids

2.16 Sound

The air noise level created by the machine under operating conditions was detected using a sound level meter with integrator.

The measurements were carried out in accordance with ISO 1680-2 with the machine.
Tests performed under the conditions indicated by the standard produced the following results:

Machine	Tractor With Open Cab	Tractor With Closed Cab
Twiga Classic	TBC	TBC

Table 2.5 – Twiga Classic Sound Readings

2.17 The Machine & The Environment

Below are the minimum provisions to be followed in order to reduce the risk of environmental impact connected to the use of the machine:

- If the Country where the machine is used foresees specific sound emission limits, it is best to adapt to the provisions in these standards, if necessary, being supplied with suitable protective equipment (earplugs, muffs, etc.).
- **It is mandatory** to respect current legislation of the country where the machine is used, related to use and disposal of lubricants and products used for machine cleaning and maintenance, observing the recommendations of the manufacturer of those products.
- If replacing worn parts or during demolition, one must follow anti-pollution laws foreseen in the country where the machine is used.
- **It is prohibited** to pour products used for cleaning or polluting substances into the sewerage drain, on the ground, in watercourses, or into the environment.
- **It is mandatory** to collect products used for cleaning and polluting substances in appropriate containers, store them and deliver them to companies authorised for their disposal.

2.17.1 Disposal

When Spearhead equipment reaches the end of its economic working life it should be disposed of responsibly, either through an approved recycling centre or by compliance with all regulations in force in the destination territory.

In most instances Spearhead machines can be broken into its constituent parts with the use of basic workshop equipment. Table 2.5 contains a typical list of constituent materials, together with disposal guidelines.

When undertaking a machine breakdown, take care to ensure that heavy parts are always adequately supported to avoid injury.

To avoid environmental contamination, take containment precautions to retain control of liquids in order.

It is the owner's responsibility to ensure the machine is disposed of in accordance with all applicable regulations.

Material	Typically found in;	Disposal guideline
Steel	Structural components, fixed guards, fasteners and driveline	Can be dismantled and recycled. Take care when handling heavy and/or sharp objects
Aluminium	Pump and gearbox housings, serial number plates	Can be dismantled and recycled. Take care when handling heavy and/or sharp objects. Take appropriate actions for oil contaminated products
Copper	Wiring, electrical components	Can be recycled using appropriate recovery procedures.
Hydraulic oil	Tank, hydraulic components	Dispose of in accordance with all applicable regulations
Rubber	Hoses, flexible guards, seals, 'O' rings	Dispose of in accordance with all applicable regulations
Plastics	Clips, caps, cable ties, decals, filter housings, document holders, bushes, electrical components, plugs, connectors, wire insulation	Dispose of in accordance with all applicable regulations
Filter element	Filter housings	Dispose of in accordance with all applicable regulations
Cork / paper	Gaskets	Dispose of in accordance with all applicable regulations

Table 2.6 – Machine Breakdown Component Disposal

2.18 Proposition 65

Figure 2.21 – P65 Cancer And Reproductive Harm Decal

Operating, servicing and maintaining this equipment can expose you to chemicals including gasoline, diesel fuel, lubricants, petroleum products, engine exhaust, carbon monoxide, and phthalates, which are known to the State of California to cause cancer and birth defects or other reproductive harm.

To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves and wash your hands frequently when servicing your vehicle. Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

For more information go to www.P65Warnings.ca.gov.

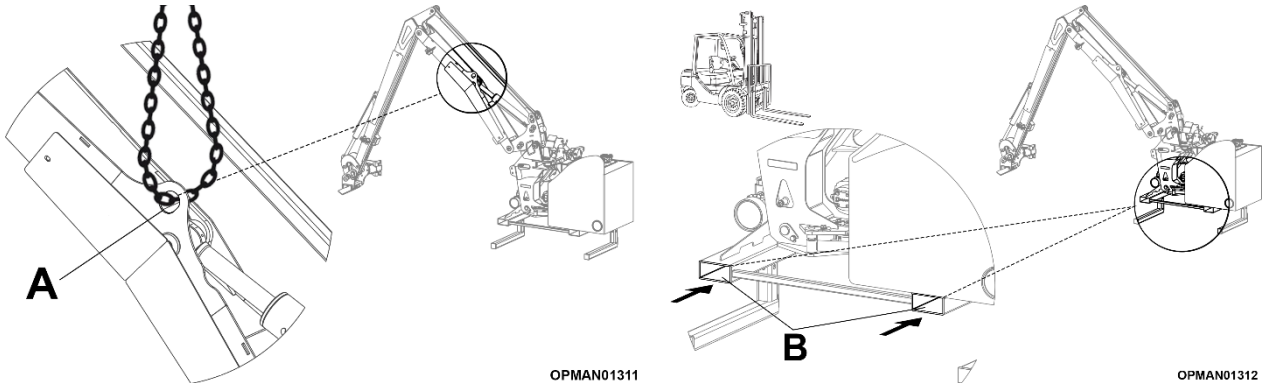
This website, operated by California's Office of Environmental Health Hazard Assessment, provides information about these chemicals and how individuals may be exposed to them.

3 Machine Preparation

3.1 Lifting The Machine

WARNING! Do not lift by drawbar or axle alone. Damage may occur which will invalidate warranty. Use recommended lifting point locations.

Twiga Classic machines should be lifted using a suitable lifting strap or chain through the designated lifting hole found on the main arm; as shown in Figure 3.1 (A). It could be alternatively lifted through the box section slots found on the A frame of the reach arm through use of a suitable forklift; as shown in Figure 3.1 (B).



Main Arm Lifting Point A Frame Forklift Points

Figure 3.1 Shipping Position – Twiga Classic
(Left-hand build S55 model shown)

Ensure that the machine is guided by personnel when positioning the machine to where it is required to be placed. This is to ensure that the machine and/or equipment/personnel do not get hit by the machine.

Ensure that wherever the machine is going to be positioned afterwards is sturdy and level, so that the machine does not end up becoming unstable and will potentially move or fall over.

Twiga reach arms should be left on a sturdy and level ground utilising the retractable storage stands. These are fixed to the front of the A frame of the machine, see Figure 3.2. These are removed by holding the handle near the base of the stand and then removing the linch pin and pin and lowering the stand. Refit the linch pin and pin into the upper hole once each of the holes are lined up correctly.

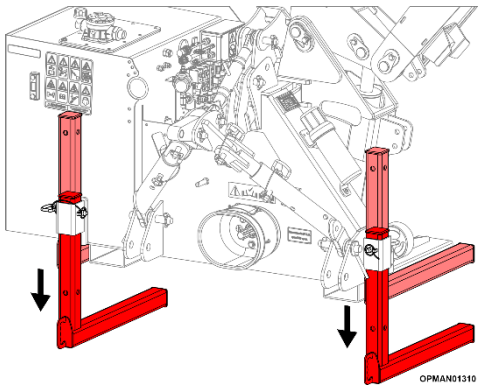


Figure 3.2 – Twiga Classic Storage Stands
(Left-hand build model shown)

3.2 Post-delivery/First Use Inspection

3.2.1 Tractor Inspection

It is important to read the tractor manufacturer's operators manual to ensure that a complete inspection to the manufacturer's recommendations is carried out on the tractor ensuring it is in correct working condition and has the correct safety measures in place for use. It is important before use to check the suitability of the tractor using the manufacturer's manual to ensure it meets the requirements to fit and operate correctly with the machine.

3.2.2 Machine Adjustment

The machine when received from Spearhead is virtually complete and components are set correctly, requiring minimum time to ready the machine for use. Spearhead machines are tested after manufacture.

It is important to assess the machine to ensure that it is of the correct specification ordered from Spearhead or local Spearhead dealer. Information with regards to the specification of the machine can be found on the machines serial plate. Guidance to the location of the serial plate can be found in Section 1.5.

Before use, it is important to inspect the machine following the guidance in this operators manual to ensure it is correctly set-up and is suitable for the attaching tractor using the inspection guidance sheet in Section 8.12.

3.2.3 Fitting The Cab Guard Kit

Spearhead Twiga reach arm machines come supplied with a cab guard kit which should be fitted to the tractors side window to protect it from ejected material from the cutting attachment.

The cab guard kit supplied is universal to allow it to be fitted to all cabbed tractors and requires modification to allow it to fit.

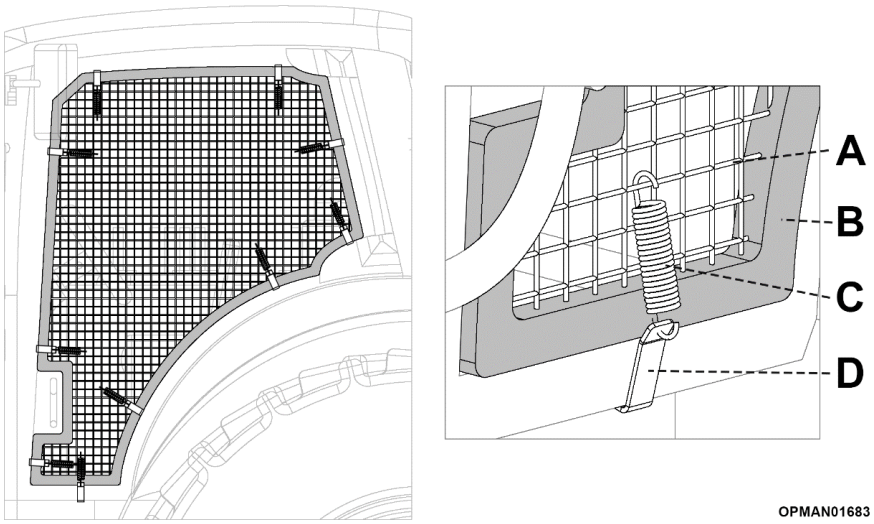


Figure 3.3

With reference to Figure 3.3, to fit the cab guard kit:

3.2.3.1 Trim the mesh guard panel(s) (A) to size to fit the size of the door/glass panel to ensure that it is fully covered.

3.2.3.2 Cut suitable lengths of foam protection strip (B) to cover the sharp edges of all the mesh panels to protect personnel and damage to the cab glass.

3.2.3.3 Loop each spring (C) through the small hole in the hook (D) and place a sufficient quantity of hooks in suitable places around the tractor door or window frame. Secure the springs to the mesh guard ensuring that they are fitted to make them pull taught.

NOTE: These illustrations are for visual purposes only. Variations and procedure of fitting will dependent on the specific tractor the kit is being fitted to.

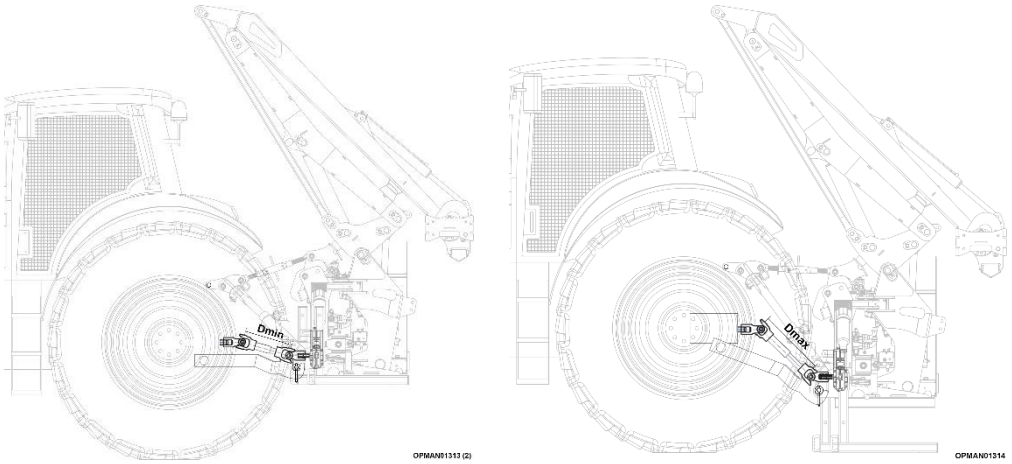
3.3 Input PTO Driveshaft

3.3.1 Input PTO Driveshaft Setup & Adjustment (first use)

The PTO of your machine will be delivered as it left the manufacturer, so will require to be shortened to give the correct effective length between the machine and the power take-off of the tractor.

In order to determine the correct length of the finished driveline, fit the reach arm to the tractor and raise the machine to a height where the input PTO driveshaft of the machine will run a close as possible to horizontal between the splined output shaft of the tractor and splined input shaft of the reach arm. Proceed to install the two uncoupled/unprotected semi-shafts to their respective tractor/ reach arm PTO's. For guidance on fitting input PTO driveshafts, see Section 3.3.5.

At this point, verify any interference of the outer tube with the yoke inner tube and establish how much the outer tube needs to be shortened.



Minimum (Dmin) Maximum (Dmax)

Figure 3.4 – Min/max Input PTO Driveshaft Overlap

The minimum distance "Dmin" (see Figure 3.4), occurs when the reach arm is raised into the working position when the input driveshaft is working horizontal between the tractor and reach arm. Verify that in the condition of maximum extension "Dmax", which occurs when the reach arm is lowered on the tractors three-point linkage to rest on the machine stands, the coupling between the two tubes is still sufficient.

The input PTO driveshaft should be shortened to ensure:

- At least 25mm (1") clearance at the shortest point (Dmin) between the end of the driveshaft and the universal joint
- At least 1/3 of the driveshafts length overlap engagement at the longest point (Dmax) between the two CV tube halves

Check and ensure that the driveshaft has been sufficiently maintained and prepared before proceeding to use using the machine following the guidance given in Section 8.2.3.

3.3.2 Bottoming Out Test

It is important to test whether the driveshaft has been sufficiently shortened to protect against “bottoming out” by:

3.3.2.1 Lower the machine to the ground on the machine stands using the tractors three-point linkage

3.3.2.2 Disconnect the input PTO driveshaft and fully compress the two halves of the driveshaft together

3.3.2.3 Placing a piece of coloured tape on the inner shield 5mm (3/16”) away from the end of the outer shield

3.3.2.4 Reattach the PTO driveshaft between the tractor and machine.

3.3.2.5 Raise the machine on the three-point linkage to the working height of the reach arm.

3.3.2.6 If at **any** point the outer shield end becomes any closer than 50mm (2”) away from the placed tape, then shorten the PTO driveshaft and then test again.

To effectively shorten and modify the input PTO driveshaft; see Section 3.3.4.

3.3.3 Engagement Test

It is important to test whether the driveshaft has been sufficiently shortened to make sure there is sufficient overlap and engagement between the CV tubes by:

3.3.3.1 With the input PTO driveshaft attached, lower the machine to the ground on the machine stands using the tractors three-point linkage, Dmax (see Figure 3.5).

3.3.3.2 Place a piece of coloured tape on the inner shield 5mm (3/16”) away from the end of the outer shield.

3.3.3.3 Disconnecting the input PTO driveshaft and split the two CV tube halves.

3.3.3.4 Measure the distance between the coloured tape and the end of the inner shield. This gives the amount of overlap between the CV tubes.

3.3.3.5 It is important that at least a 1/3 of the length of the inner shield is engaged with the outer shield.

If an input PTO driveshaft is too short then a new longer driveshaft should be fitted.

Please contact your local Spearhead dealer for guidance on purchasing a new/replacement input PTO driveshaft.

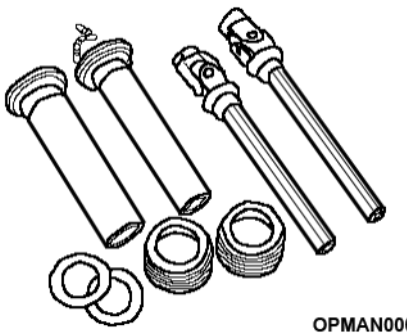
To effectively shorten and modify the input PTO driveshaft see Section 3.3.4.

3.3.4 Modifying & Shortening The Input PTO Driveshaft

Binacchi, the manufacturer of the PTO driveshaft which comes with all Twiga reach arm machines **does not recommend** modifications to its products. This is further supported by Spearhead.

NOTE: Binacchi and Spearhead declines all responsibility for damage and/or injury caused by modifying the power take-off driveshaft on Twiga reach arm machines in any other way than described in this manual. **If you are unsure of the procedure**, or need additional assistance, please **contact your local Spearhead dealer, qualified service centre or Spearhead**.

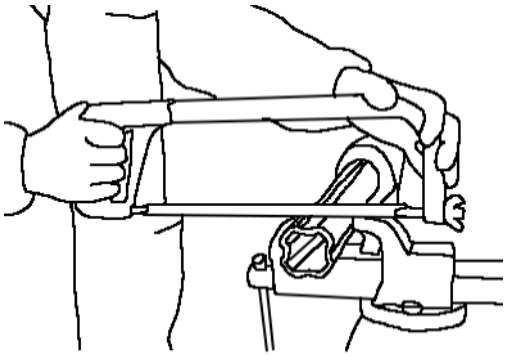
Proceed as follows to shorten the input PTO driveshaft:



OPMAN00067

Figure 3.5

3.3.4.1 Remove shielding.



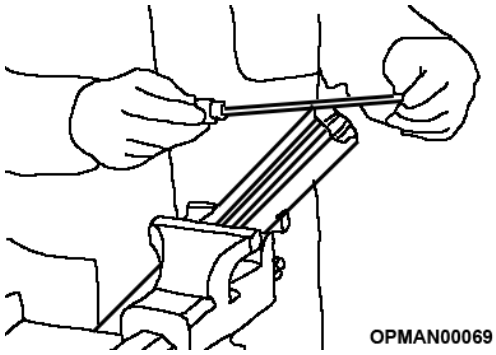
OPMAN00068

Figure 3.6

3.3.4.2 Shorten drive tubes by the required length. In normal conditions, telescopic tubes must always overlap **by at least a ½ of their length**. During manoeuvres, when the driveline is not rotating, the telescopic tubes must have a suitable overlap to maintain the tubes aligned and allow them to slide properly. See Section 3.3.3.

If the driveline has a single chain restraint system (splined inner tube), the tubes can be shortened by a limited amount (**normally no more than 70mm**) to avoid eliminating the splined ring connecting the two shield tubes.

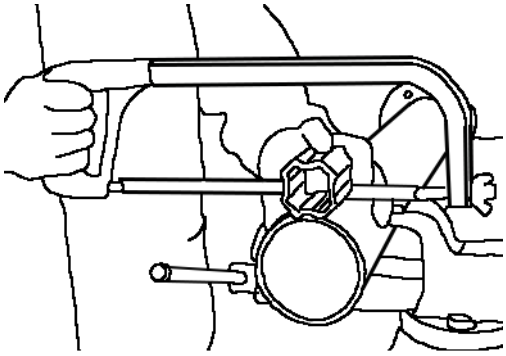
If the driveline is fitted with a greasing system incorporated in the inner drive tubes, the tubes can be shortened by a limited amount to avoid damage to the lubrication system. Carefully measure and shorten each drive tube equally.



OPMAN00069

Figure 3.7

3.3.4.3 Carefully deburr the ends of the tubes with a file and remove any chippings from the tubes.



OPMAN00070

Figure 3.8

3.3.4.4 Shorten shield tubes one at a time by cutting the same length that was cut from the drive tubes. If the driveline is equipped with Single Chain Restraint System, shortening the driveline will involve removal of the plastic ring which connects the shield tubes. If it is necessary to remove this collar, add a retaining chain to the tractor side of the driveline shield.

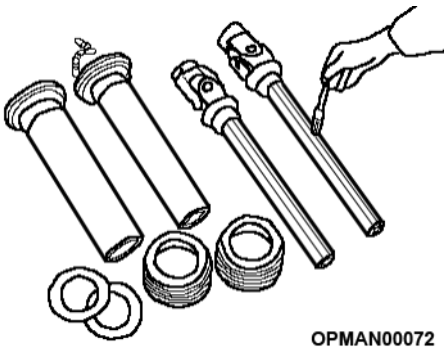


Figure 3.9

3.3.4.5 Grease the internal drive tube. Reassemble the shield on the driveshaft.

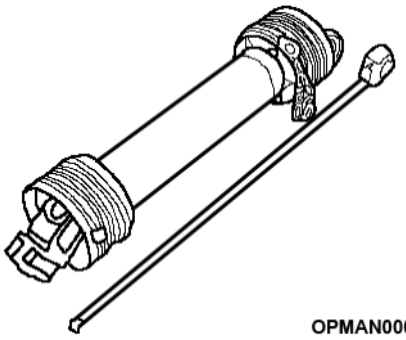


Figure 3.10

3.3.4.6 Check the length of the driveshaft at the minimum and maximum positions of the machine. See Figure 3.4 for guidance on Dmin/Dmax lengths.

If further adjustment is required; repeat the process.

3.3.5 Fitting The PTO Driveshaft

CAUTION! Many of the equipment components listed in this section used to carry out processes are heavy (25kg/60lbs+), and special lifting procedures are recommended to reduce potential user lifting injuries. Use mechanical lifting assistances, two people and other proper lifting techniques when connecting the input PTO shaft between the machine and tractor.

Fitting

The PTO driveshaft should be fitted between the reach arm and tractor once the reach arm has been securely mounted to the back of the tractor following the guidance in Section 3.4.

Make sure before proceeding to try to fit the input PTO shaft between the tractor and machine that the specification of the shaft is the correct speed, size and has the correct quantity of splines for the machine and the tractor can offer the machines required PTO speed.

Furthermore, ensure that it's been adjusted to the correct length for use between the machine and the given tractor as stated in Section 3.3.1.

DANGER! Do not use PTO adaptors to attach a non-matching implement driveline to a tractor PTO. Use of an adaptor can double the operating speed of the implement resulting in excessive vibration, thrown objects, blade/driveline failures due to changes in the machines design intended use. PTO adaptors also increase the exposed working length increasing the probability of entanglement with external objects. If the shaft is incorrect for the tractor; contact your local Spearhead dealer for assistance.

WARNING! When attaching the machine input shaft to the tractor power take-off, it is important that the connecting yoke spring activated taper pin moves freely and seats securely in the groove on the tractors output PTO shaft.

Push and pull the input shaft back and forth several times to ensure it is securely attached. An input shaft not attached correctly to the tractor PTO shaft could come loose and result in personal injury and damage to the machine.

Both the input shaft yoke and tractor PTO shaft must be dirt free and a light smearing of grease should be applied prior to attachment.

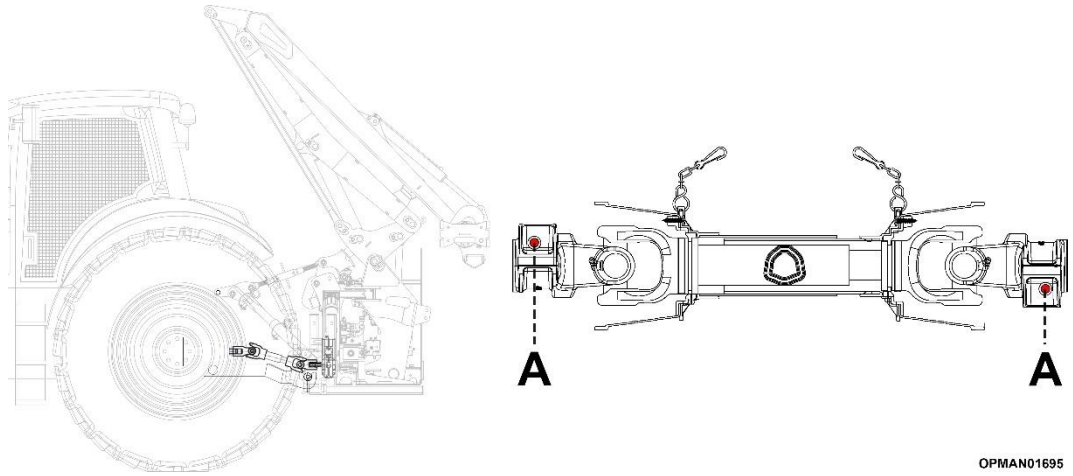
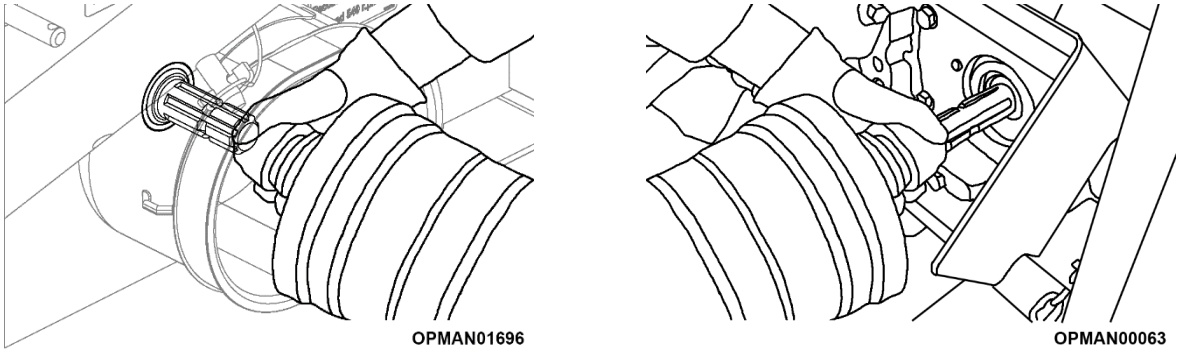


Figure 3.11 – Twiga Classic Input Shaft Fitting & Removal

Fitting



Reach Arm End Tractor End

Figure 3.12

Proceed as follows:

3.3.5.1 Starting on the reach arm end, press in the spring activated taper pin and slide the input PTO shaft onto the reach arm output gearbox spline shaft lining up the slot in the gearbox shaft with where the spring activated taper pin will be placed; see Figure 3.11 (A)/Figure 3.12.

It is best practice, when fitting the input shaft to wipe a small quantity of grease (NLGI #2 Molybdenum Disulphide) onto the splines to aid assembly and later removal.

3.3.5.2 Repeat the process on the tractor end, press in the spring activated taper pin and slide the input PTO shaft onto the tractor output PTO shaft lining up the slot in the output shaft with where the spring activated taper pin will be placed; see Figure 3.11 (A)/Figure 3.12.

It is best practice, when fitting the input shaft to wipe a small quantity of grease (NLGI #2 Molybdenum Disulphide) onto the splines to aid assembly and later removal.

3.3.5.3 To ensure that the input PTO shaft is secure, push and pull the shaft back and forth several times.

It is best practice, when fitting the input shaft to wipe a small quantity of grease (NLGI #2 Molybdenum Disulphide) onto the splines to aid assembly and later removal.

Removal

Removing the input shaft works in a reverse fashion from what is stated in the fitting section; by removing the shaft from the tractor end first. Ensure that the PTO is disengaged, tractor engine is stopped and the handbrake is applied before proceeding to remove the shaft.

It is best practice, when removing the input shaft, to wipe a small quantity of grease (NLGI #2 Molybdenum Disulphide) onto the splines of the exposed shaft end to prevent corrosion.

If the machine is not going to be used for an extended length of time the input shaft should be removed completely and stored indoors to maintain its condition.

3.4 Reach Arm – Fitting

3.4.1 Three-point Linkage

WARNING! Do not let anyone else to be around the reach arm whilst operating the tractor for fitting.

Spearhead Machinery endorses the “Safe Stop” campaign promoted by the Health and Safety Executive (HSE) to give guidance on how to safely prepare the machine and personnel and operate the machine and what to do in emergency cases.

NOTE this section is written and illustrated using a Twiga Classic S55 left-hand model. Right-hand model machines use exactly the same fitting procedure to connect the reach arm to the tractor.

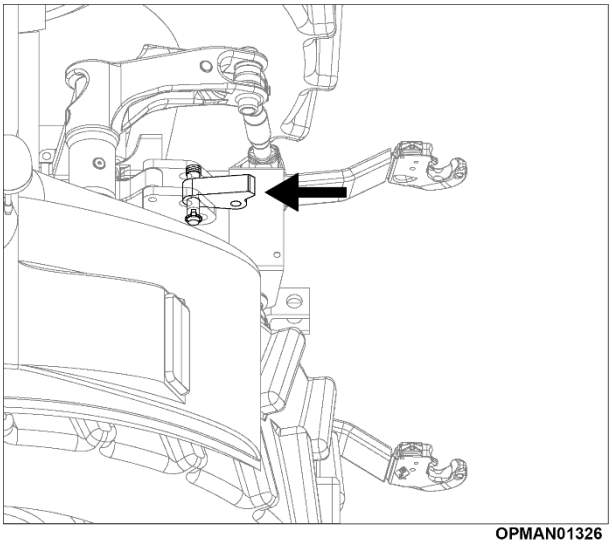


Figure 3.13

3.4.1.1 Remove the existing top link supplied with the tractor and replace it with the tongue supplied with the reach arm and refit the top link pin and linch pin.

Spearhead Machinery offers a selection of different reach arm tongue options to fit a wide range of different tractors as shown in Figure 3.14.

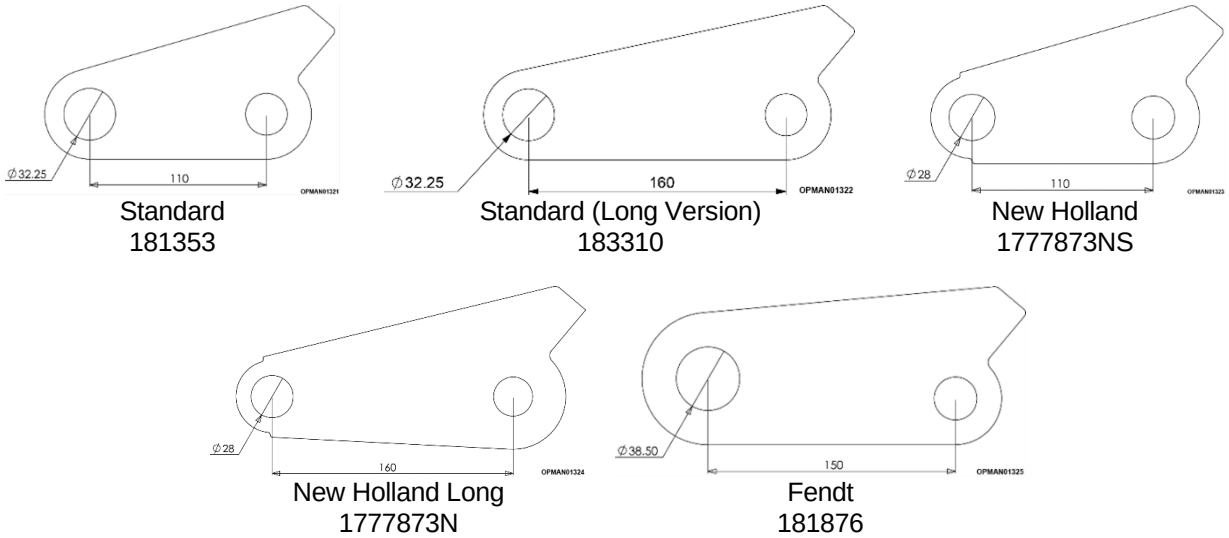
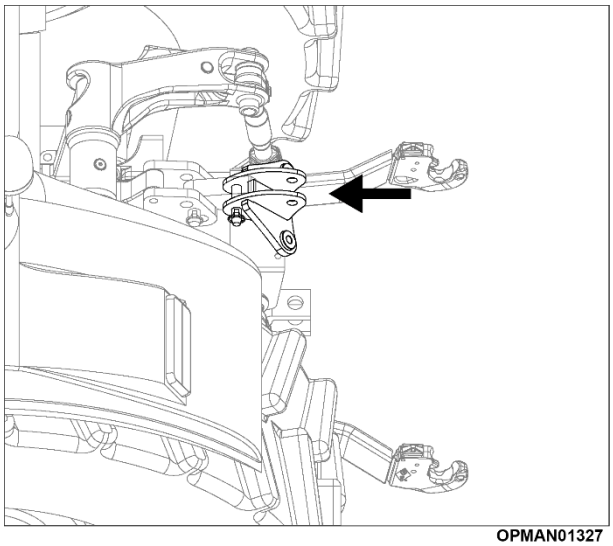


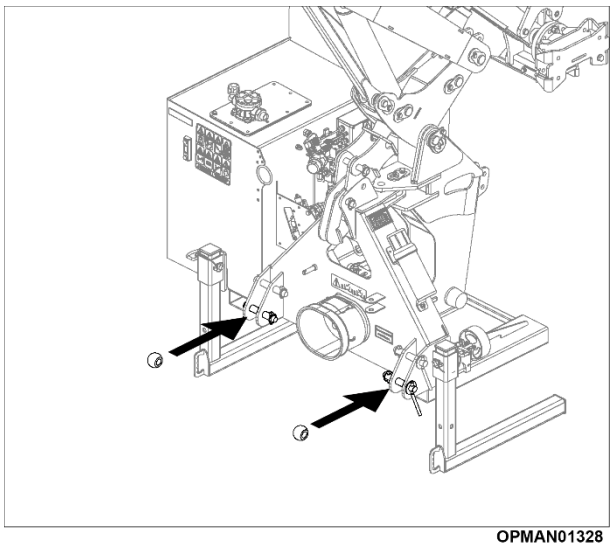
Figure 3.14 – Spearhead Machinery Tractor Tongue Options



OPMAN01327

Figure 3.15

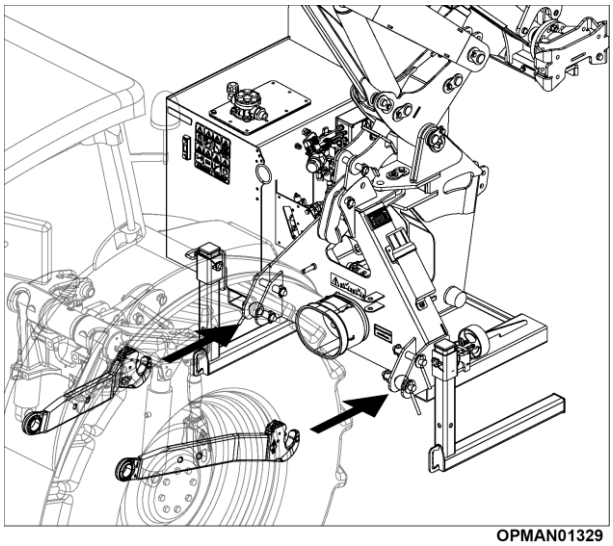
3.4.1.2 With the correct tongue fitted to the tractor, fit the stabiliser bracket “flying fish” using the supplied pin and linch pin.



OPMAN01328

Figure 3.16

3.4.1.3 Fit the balls to each of the lower link holes on the reach arm (not supplied with the reach arm).



OPMAN01329

Figure 3.17

3.4.1.4 Open the latches on the lower link arms of the tractor and gently reverse the tractor to the machine and fit the lower link arms to the balls fitted to the reach arm.

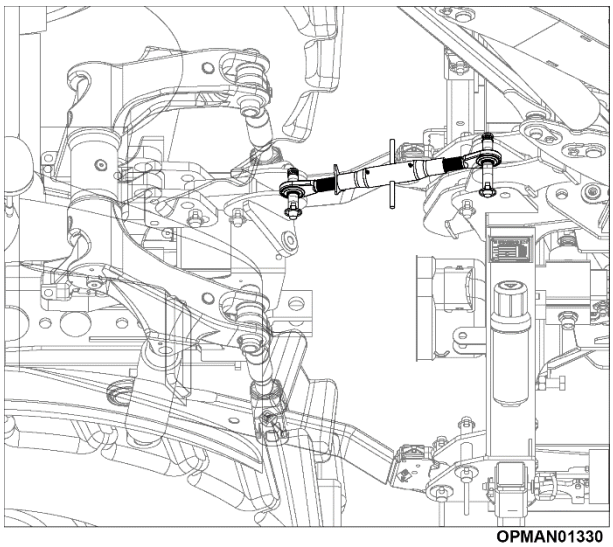
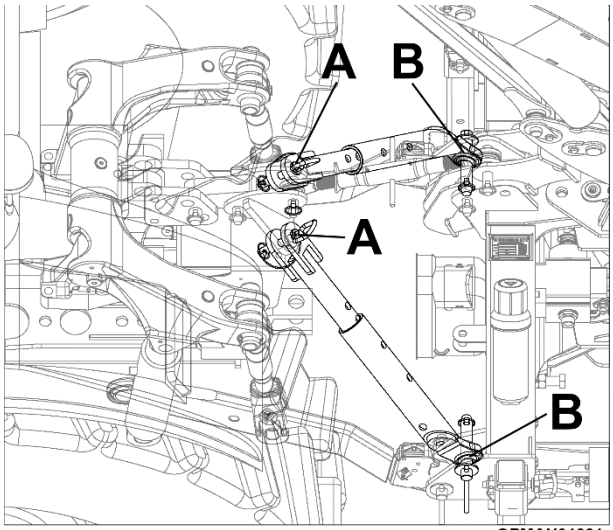

OPMAN01330

Figure 3.18

3.4.1.5 Fit the tractor adjustable top link in between the stabiliser bracket “flying fish” and the top link cushion on the main reach arm fabrication.



OPMAN01331

Figure 3.19

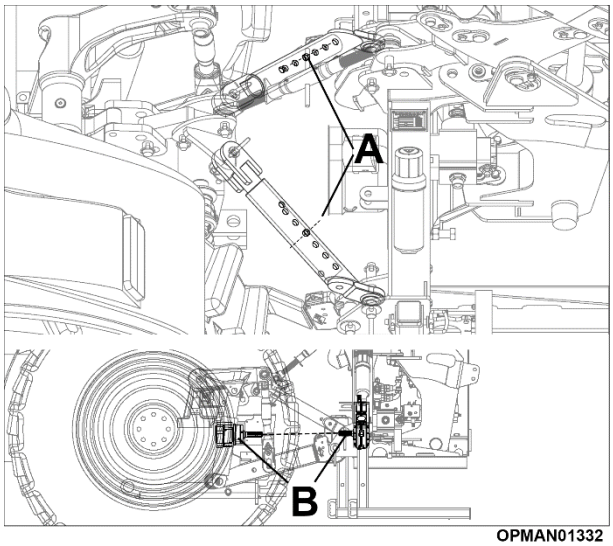
3.4.1.6 Slide a pair of outer and inner stabiliser tubes into each other.

Fit the inner tube clevis to the stabiliser bracket “flying fish” using the supplied pin and linch pin; see Figure 3.19 (A).

Fit the outer tube ball end to the upper hole found just above the lower link arm fitting holes of the reach arm mainframe using the supplied pin and linch pin; see Figure 3.19 (B).

IMPORTANT DO NOT fit the telescopic tube locking pins at this point.

3.4.1.7 Repeat the process for the other telescopic tube.



OPMAN01332

Figure 3.20

3.4.1.8 Start the tractor and gently raise the lower linkage of the tractor to initially allow the latches to engage and lock on the lower link balls.

3.4.1.9 Continue to raise the reach arm to a position where:

- A suitable hole is found where the locking pin can be fitted through the inner and outer stabiliser tubes; see Figure 3.20 (A).
- The splined output shaft of the tractor and splined input shaft of the reach arm are roughly horizontal to each other; see Figure 3.20 (B).

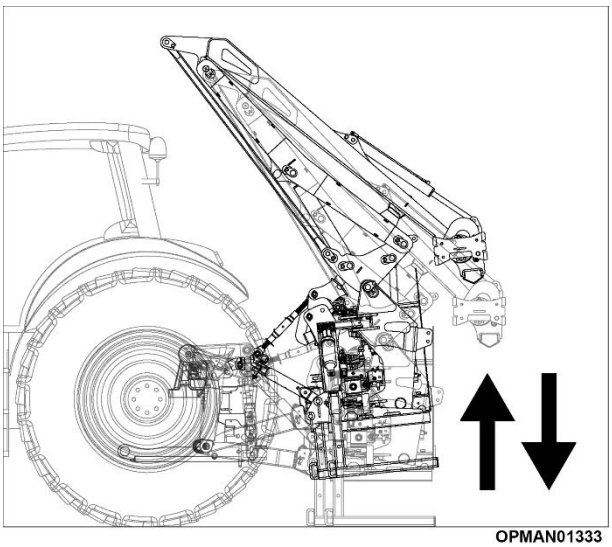
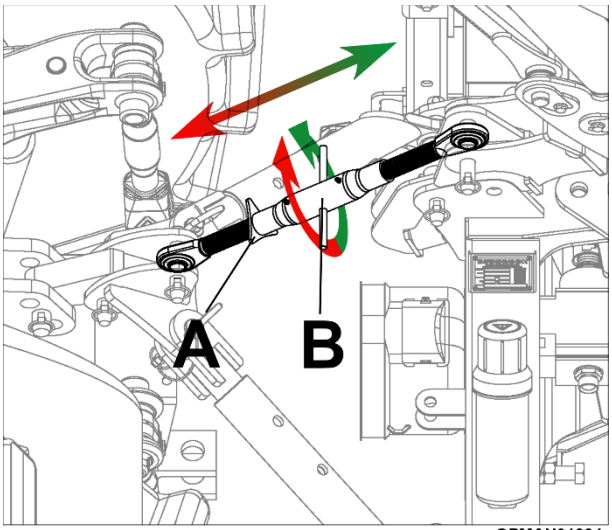

OPMAN01333

Figure 3.21

3.4.1.10 Leave the tractor and inspect the machine to see the machine is sitting horizontal and level. If the machine is not sitting horizontal lower the machine back to the floor and adjust the machine top link.



OPMAN01334

Figure 3.22

To adjust the top link:

3.4.1.11 Loosen the locking tab; see Figure 3.22 (A)

3.4.1.12 Turn the adjustable top link barrel in between the stabiliser bracket “flying fish” and the top link cushion on the main reach arm fabrication to ensure the reach arm assembly is sitting parallel with the floor; see Figure 3.22 (B).

If the machine when raised was pitched forwards (towards the tractor):

- Lengthen the top link to push the reach arm away from the tractor.

If the machine when raised was pitched backwards (away from the tractor):

- Shorten the top link to pull the reach arm closer to the tractor.

Enter the tractor and raise the reach arm again and inspect the angle of the reach arm and repeat the process again if necessary to ensure the machine is sitting level.

3.4.1.13 Tighten the locking tab; see Figure 3.22 (A)

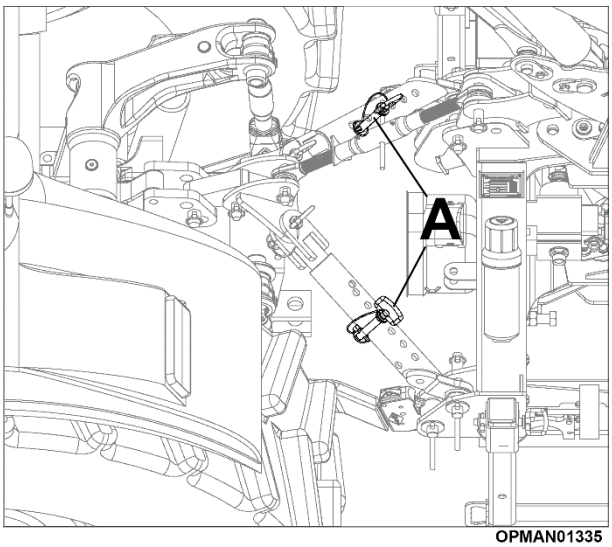


Figure 3.23

3.4.1.14 Stop the tractor and fit the locking pin and linch pin into the stabiliser tubes; see Figure 3.23 (A).

3.4.1.15 Start the tractor and lower the linkages of the tractor until the weight of the reach arm is placed on the stabilisers. Allow the machine to settle.

3.4.1.16 Stop the tractor and inspect the reach arm for a final time to see:

- the reach arm is not sitting excessively high.
- whether the splined output shaft of the tractor and splined input shaft of the reach arm are roughly horizontal to each other.

3.4.1.17 If adjustments are required to be made, return to the tractor and repeat the various processes by adjusting the stabilisers to the next upper/lower hole until a correct position is found.

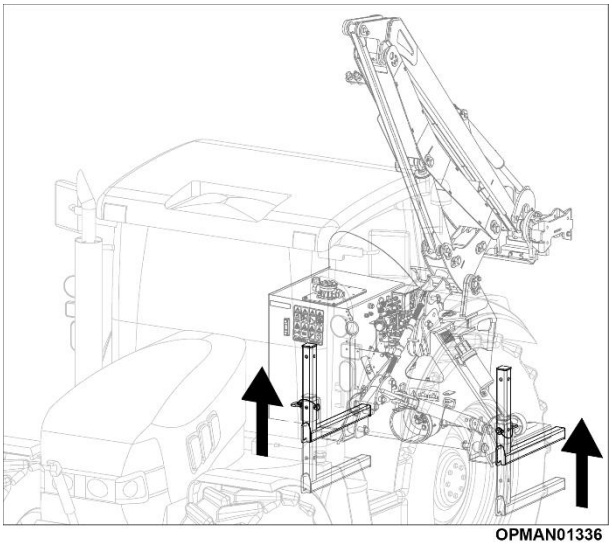


Figure 3.24

3.4.1.18 Raise the two machine stands found at the front of the mainframe of the machine.

3.4.1.19 Proceed to fit the input PTO driveshaft in between the tractor and reach arm.

3.4.2 Four-point Linkage

WARNING! Do not let anyone else to be around the reach arm whilst operating the tractor for fitting.

Spearhead Machinery endorses the “Safe Stop” campaign promoted by the Health and Safety Executive (HSE) to give guidance on how to safely prepare the machine and personnel and operate the machine and what to do in emergency cases.

NOTE this section is written and illustrated using a Twiga Classic S55 left-hand model. Right-hand model machines use exactly the same fitting procedure to connect the reach arm to the tractor.

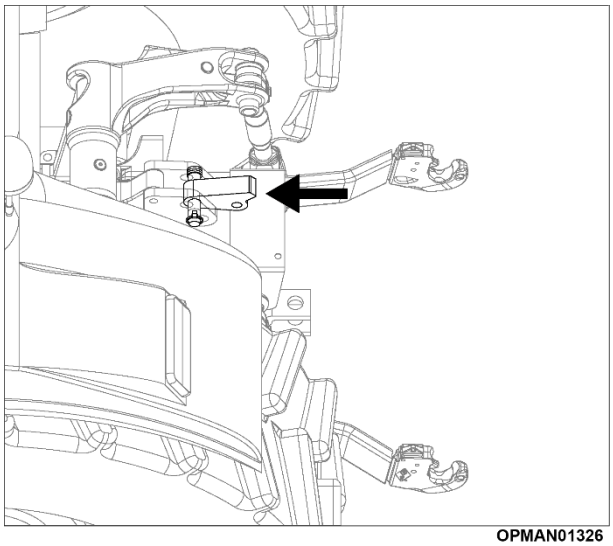


Figure 3.25

3.4.2.1 Remove the existing top link supplied with the tractor and replace it with the tongue supplied with the reach arm and refit the top link pin and linch pin.

Spearhead Machinery offers a selection of different reach arm tongue options to fit a wide range of different tractors as shown in Figure 3.26.

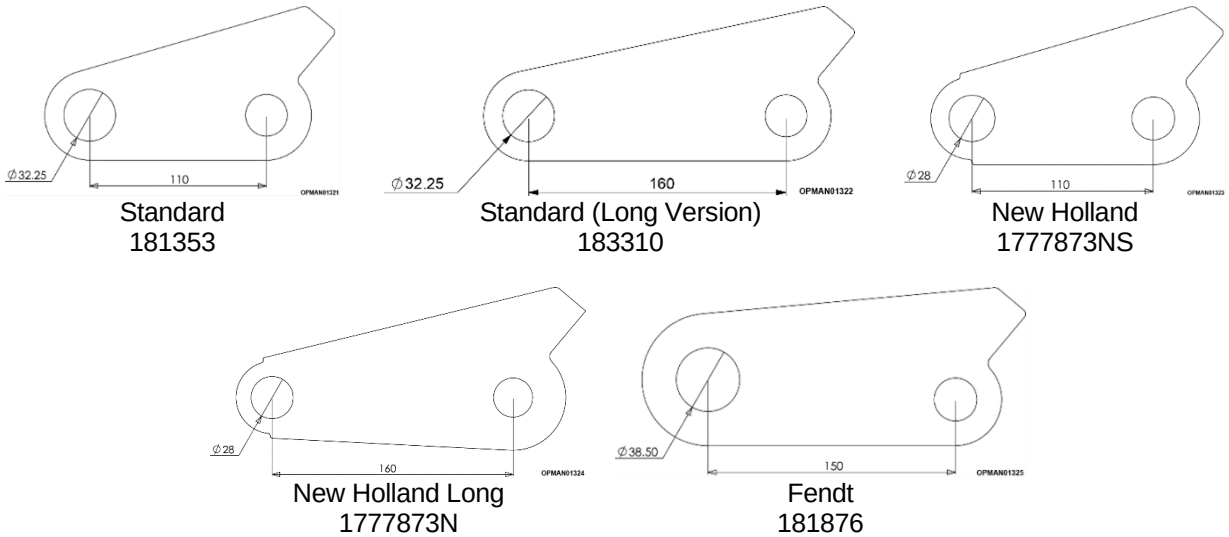
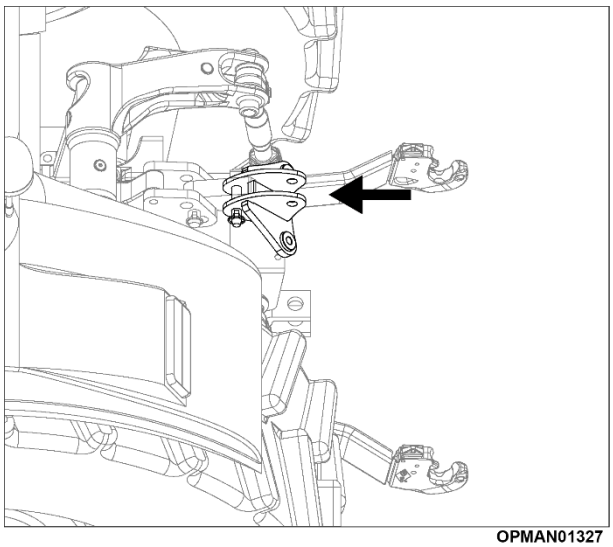


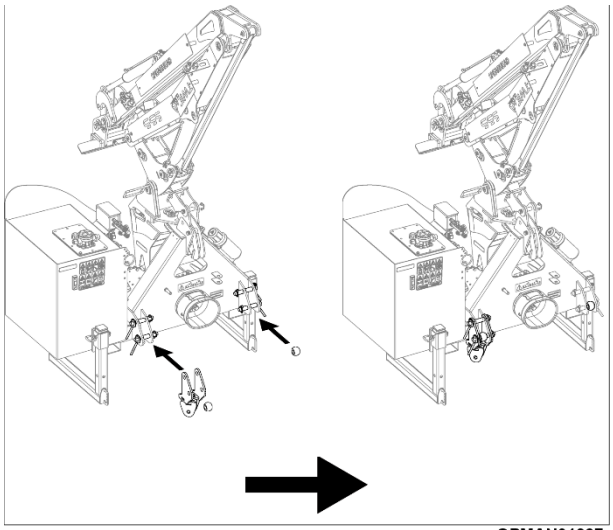
Figure 3.26 – Spearhead Machinery Tractor Tongue Options



OPMAN01327

Figure 3.27

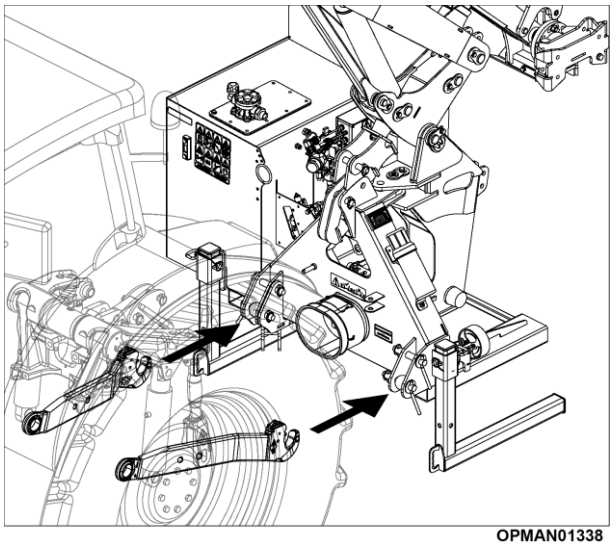
3.4.2.2 With the correct tongue fitted to the tractor, fit the stabiliser bracket “flying fish” using the supplied pin and linch pin.



OPMAN01337

Figure 3.28

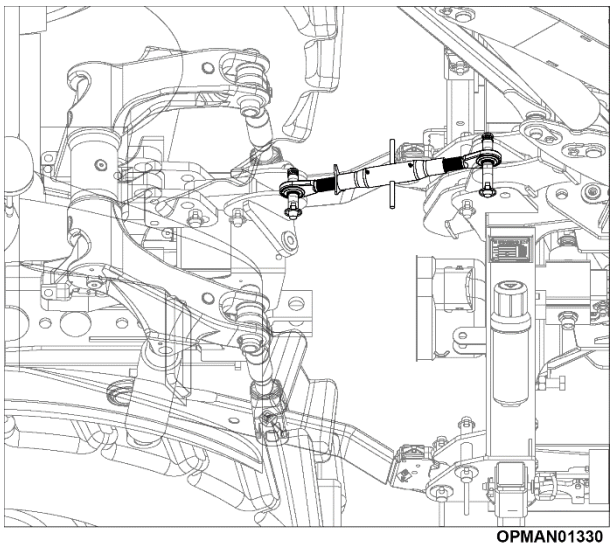
3.4.2.3 Using the linkage pins supplied with the machine, fit the lower stabiliser bracket and the balls to each of the lower link holes on the reach arm (not supplied with the reach arm).



OPMAN01338

Figure 3.29

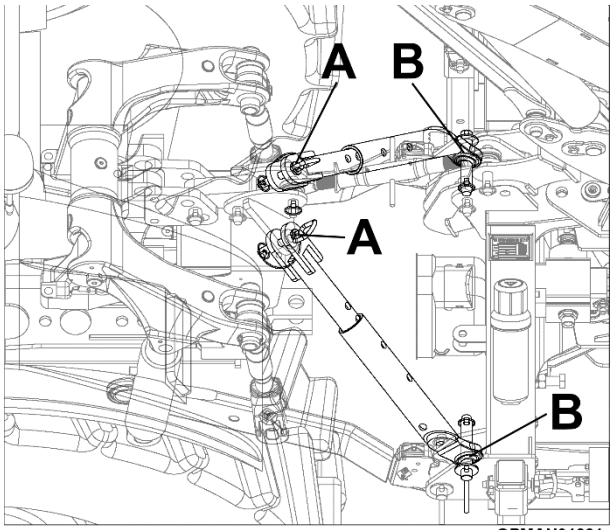
3.4.2.4 Open the latches on the lower link arms of the tractor and gently reverse the tractor to the machine and fit the lower link arms to the balls fitted to the reach arm.



OPMAN01330

Figure 3.30

3.4.2.5 Fit the tractor adjustable top link in between the stabiliser bracket “flying fish” and the top link cushion on the main reach arm fabrication.



OPMAN01331

Figure 3.31

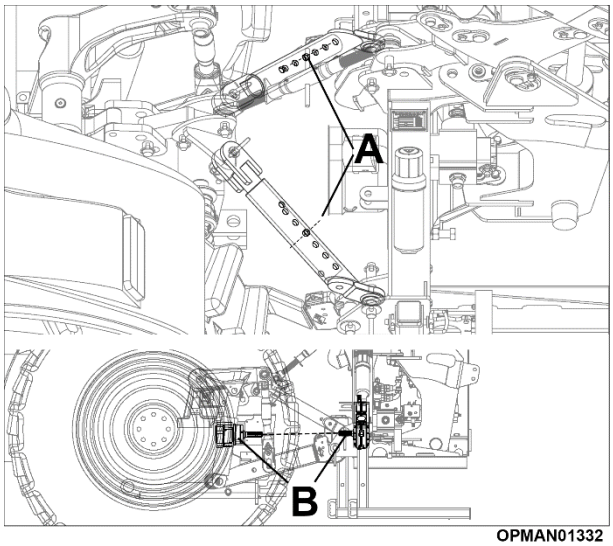
3.4.2.6 Slide a pair of outer and inner stabiliser tubes into each other.

Fit the inner tube clevis to the stabiliser bracket “flying fish” using the supplied pin and linch pin; see Figure 3.31 (A).

Fit the outer tube ball end to the upper hole found just above the lower link arm fitting holes of the reach arm mainframe using the supplied pin and linch pin; see Figure 3.31 (B).

IMPORTANT DO NOT fit the telescopic tube locking pins at this point.

3.4.2.7 Repeat the process for the other telescopic tube.



OPMAN01332

Figure 3.32

3.4.2.8 Start the tractor and gently raise the lower linkage of the tractor to initially allow the latches to engage and lock on the lower link balls.

3.4.2.9 Continue to raise the reach arm to a position where:

- A suitable hole is found where the locking pin can be fitted through the inner and outer stabiliser tubes; see Figure 3.32 (A).
- The splined output shaft of the tractor and splined input shaft of the reach arm are roughly horizontal to each other; see Figure 3.32 (B).

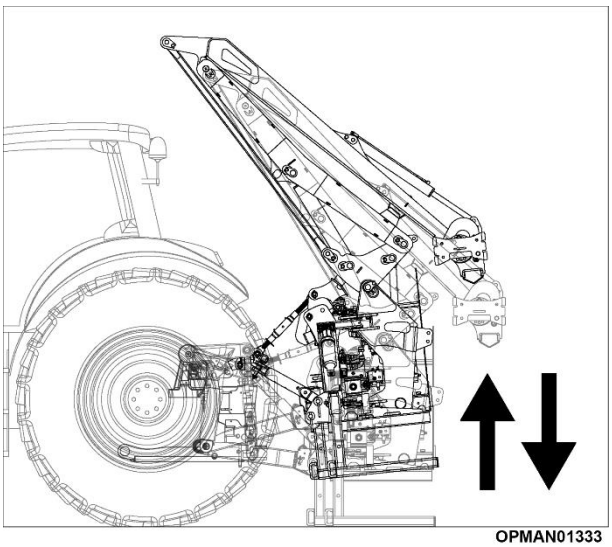
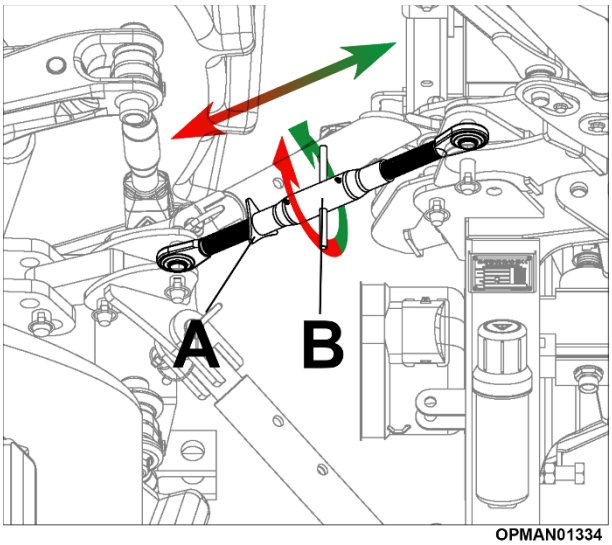

OPMAN01333

Figure 3.33

3.4.2.10 Leave the tractor and inspect the machine to see the machine is sitting horizontal and level. If the machine is not sitting horizontal lower the machine back to the floor and adjust the machine top link.



OPMAN01334

Figure 3.34

To adjust the top link:

3.4.2.11 Loosen the locking tab; see Figure 3.34 (A)

3.4.2.12 Turn the adjustable top link barrel in between the stabiliser bracket “flying fish” and the top link cushion on the main reach arm fabrication to ensure the reach arm assembly is sitting parallel with the floor; see Figure 3.34 (B).

If the machine when raised was pitched forwards (towards the tractor):

- Lengthen the top link to push the reach arm away from the tractor.

If the machine when raised was pitched backwards (away from the tractor):

- Shorten the top link to pull the reach arm closer to the tractor.

3.4.2.13 Enter the tractor and raise the reach arm again and inspect the angle of the reach arm and repeat the process again if necessary to ensure the machine is sitting level.

3.4.2.14 Tighten the locking tab; see Figure 3.34 (A)

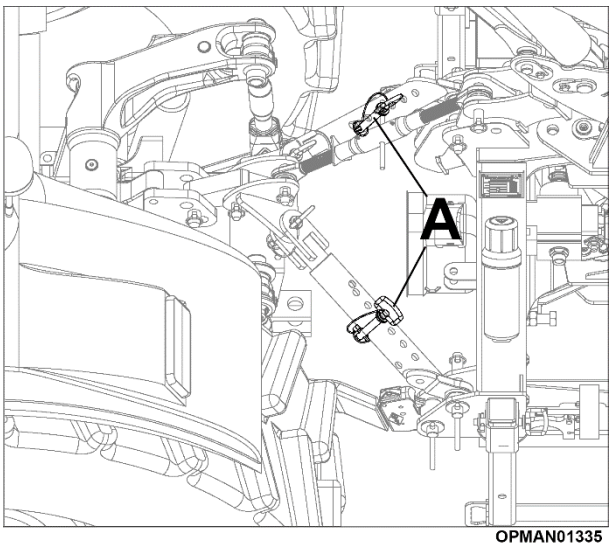


Figure 3.35

3.4.2.15 Stop the tractor and fit the locking pin and linch pin into the stabiliser tubes; see Figure 3.35 (A).

3.4.2.16 Start the tractor and lower the linkages of the tractor until the weight of the reach arm is placed on the stabilisers. Allow the machine to settle.

3.4.2.17 Stop the tractor and inspect the reach arm for a final time to see:

- the reach arm is not sitting excessively high.
- whether the splined output shaft of the tractor and splined input shaft of the reach arm are roughly horizontal to each other.

3.4.2.18 If adjustments are required to be made, return to the tractor and repeat the various processes by adjusting the stabilisers to the next upper/lower hole until a correct position is found.

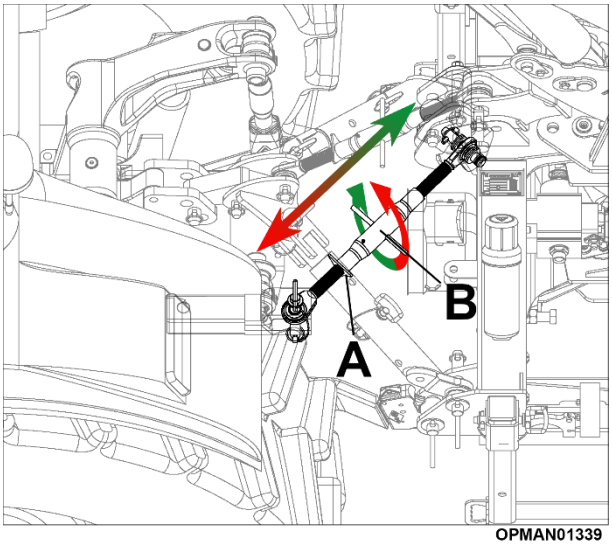


Figure 3.36

3.4.2.19 Fit the fourth linkage between the tractors drawbar and fourth linkage bracket on the reach arm.

Adjust the length of the fourth linkage by loosening the locking tab, see Figure 3.36 (A) and then turning the barrel to lengthen or shorten the linkage; see Figure 3.36 (B).

The fourth linkage should be tightened to take excessive play out between the tractor and the reach arm.

3.4.2.20 Tighten the locking tab; see Figure 3.36 (A).

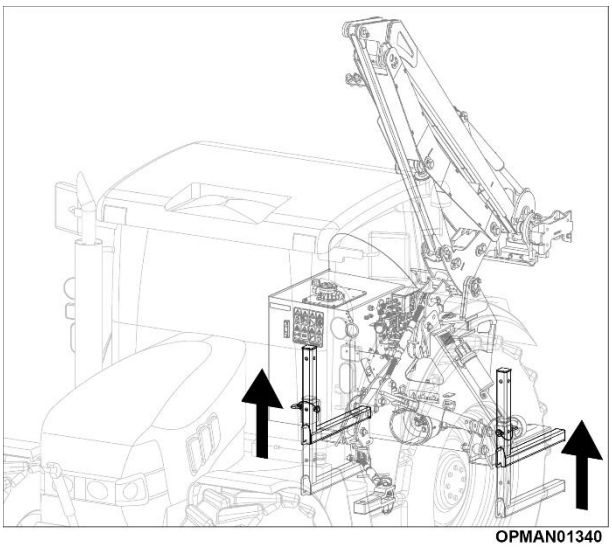


Figure 3.37

3.4.2.21 Raise the two machine stands found at the front of the mainframe of the machine.

3.4.2.22 Proceed to fit the input PTO driveshaft in between the tractor and reach arm.

3.4.3 Axle Brackets

WARNING! Do not let anyone else to be around the reach arm whilst operating the tractor for fitting.

Spearhead Machinery endorses the “Safe Stop” campaign promoted by the Health and Safety Executive (HSE) to give guidance on how to safely prepare the machine and personnel and operate the machine and what to do in emergency cases.

NOTE this section is written and illustrated using a Twiga Classic S55 left-hand model. Right-hand model machines use exactly the same fitting procedure to connect the reach arm to the tractor.

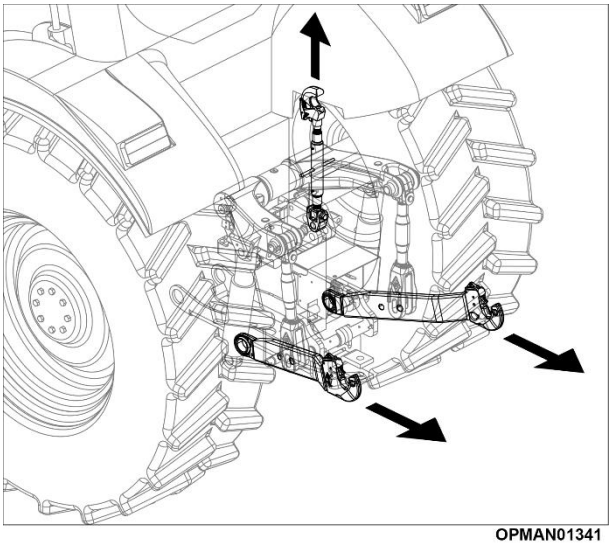
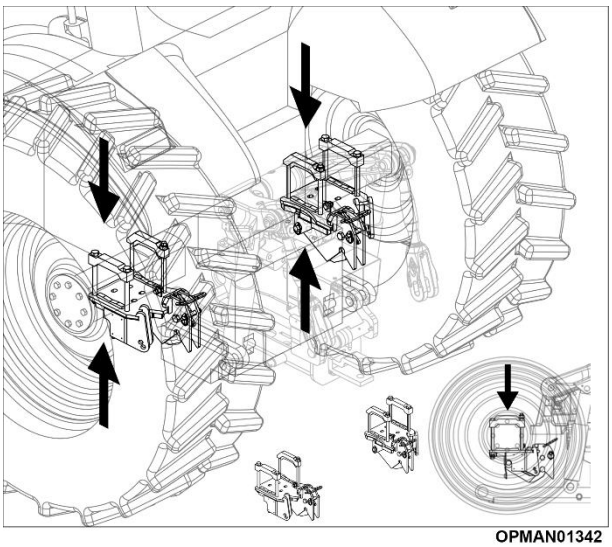


Figure 3.38

3.4.3.1 Detach the lower link arms from the drop links on the tractor.

Preferably remove the lower link arms completely from the tractor or if this is not possible raise the link arms out of the way.

3.4.3.2 Remove the adjustable top link on the tractor.



OPMAN01342

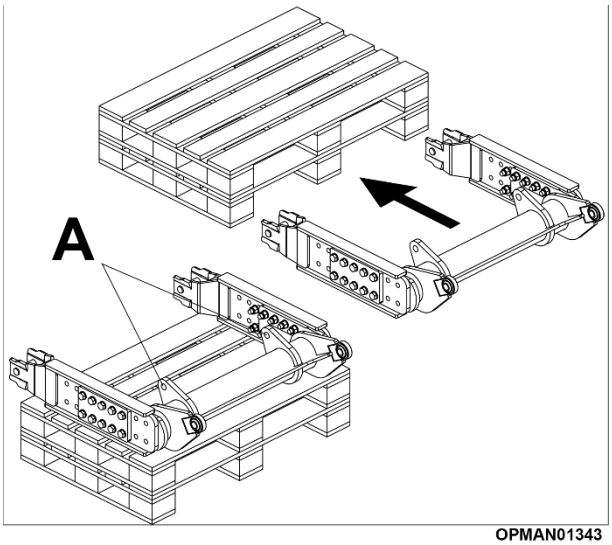
Figure 3.39

3.4.3.3 Fit the axle brackets to either side of the tractor axle.

Spearhead Machinery offers a wide range of different axle brackets to fit specific tractors. Ensure the axle brackets are the correct version for your tractor.

Axle brackets are handed. Thoroughly read the specific fitting instructions supplied with the axle bracket kit taking key importance on setting the correct working span width of the brackets.

This setting is either 1.00 metre (39 3/8”) or 1.10 metres (43 5/16”).

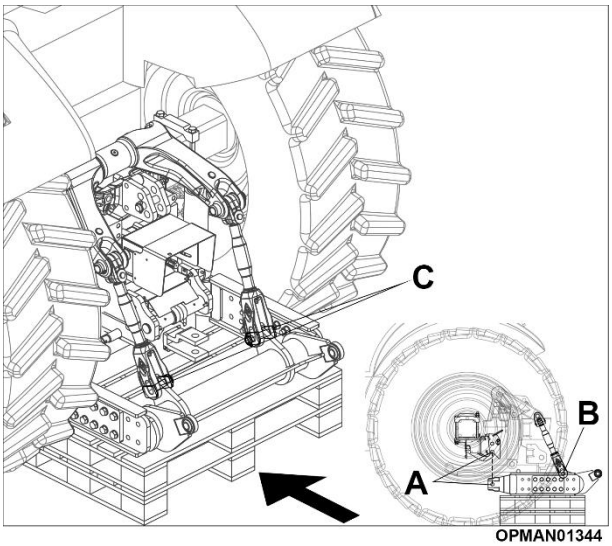


OPMAN01343

Figure 3.40

3.4.3.4 Inspect to see whether the tractor drop links will be able to be lowered enough to reach the mounting points on axle mount H frame; see Figure 3.40 (A).

If this is not possible, raise the axle mount H frame from the floor using suitable lifting gear onto a raised platform, for example onto a pallet.



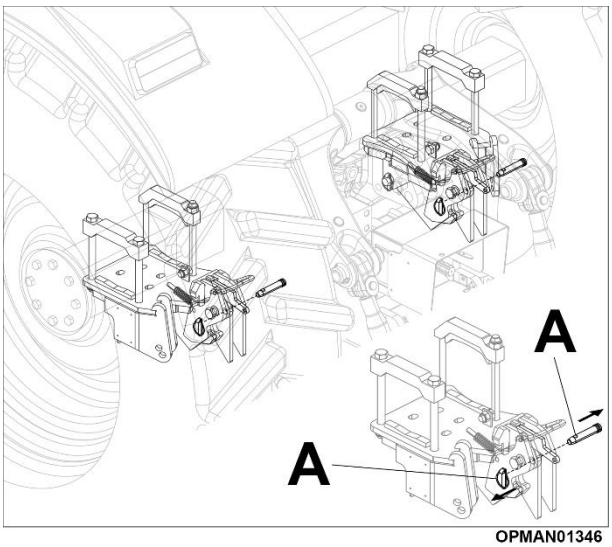
OPMAN01344

Figure 3.41

3.4.3.5 Place the axle mount H frame under the tractor and line up roughly the front axle mount linkage pins with the locking slots in the axle mount brackets; see Figure 3.41 (A).

3.4.3.6 Lower the tractor linkage to fit the tractor drop links to the fixing point on the axle mount H frame; see Figure 3.41 (B).

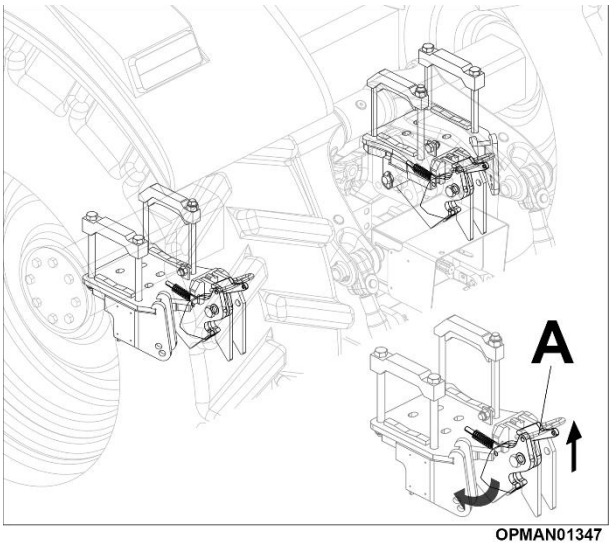
3.4.3.7 Fit the tractor pins and linch pins supplied with the tractor to secure the axle mount H frame to the tractor; see Figure 3.41 (C).



OPMAN01346

Figure 3.42

3.4.3.8 Remove the locking pin and linch pin from each axle mount assembly; see Figure 3.42 (A).



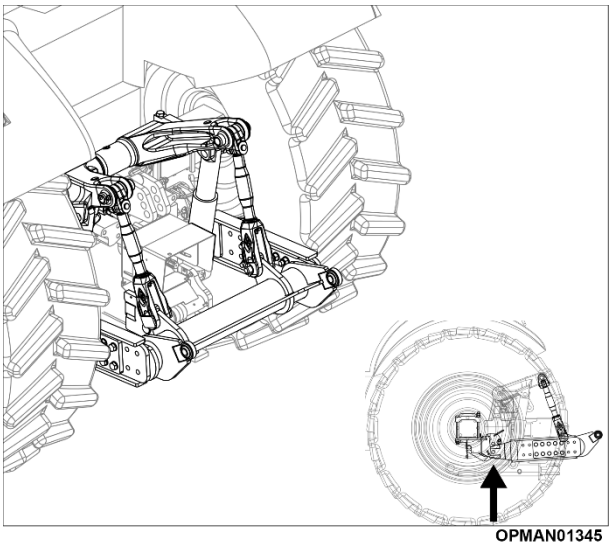
OPMAN01347

Figure 3.43

3.4.3.9 Raise and hold both of the axle linkage opening handles to expose the pin slot to become open and allow for the H frame to be fitted.

CAUTION! Use caution when opening and holding open the axle mount latches. Pinch point.

The axle mount latches are spring loaded shut.



OPMAN01345

Figure 3.44

3.4.3.10 Raise and rotate the front of the H frame to bring each of the front pins into the securing slot in each axle mounting.

You will require assistance personnel to carry out this procedure.

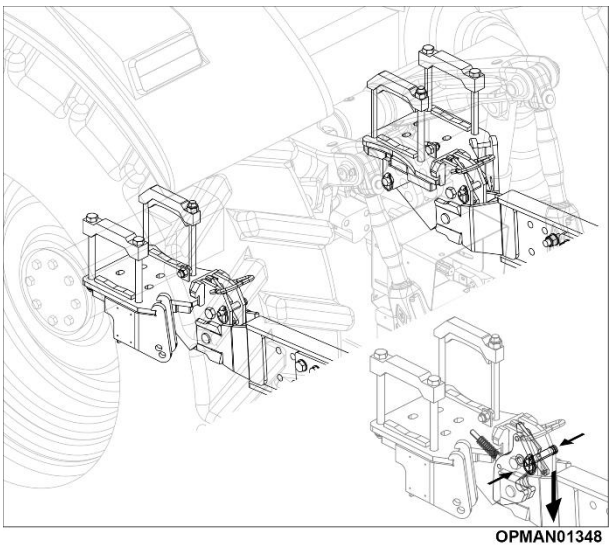


Figure 3.45

3.4.3.11 Release both of the spring loaded axle linkage opening handles to close off the pin slots to lock the front of the H frame to the axle mount brackets of the tractor.

CAUTION! Use caution when closing the axle mount latches. Pinch point.

The axle mount latches are spring loaded shut.

3.4.3.12 Refit the locking pin and linch pin to ensure the H frame remains permanently secure.

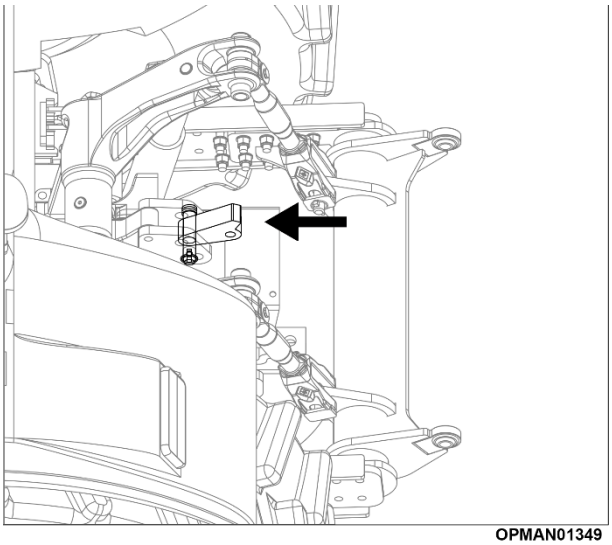


Figure 3.46

3.4.3.13 Remove the existing top link supplied with the tractor and replace it with the tongue supplied with reach arm and refit the top link pin and linch pin.

Spearhead Machinery offers a selection of different reach arm tongue options to fit a wide range of different tractors as shown in Figure 3.47

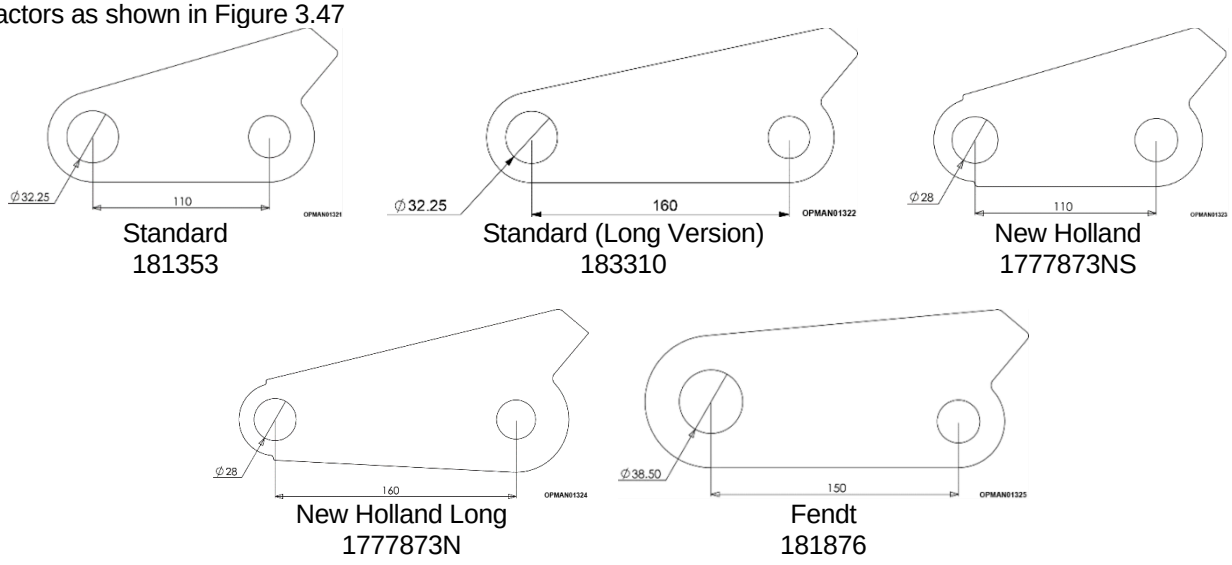
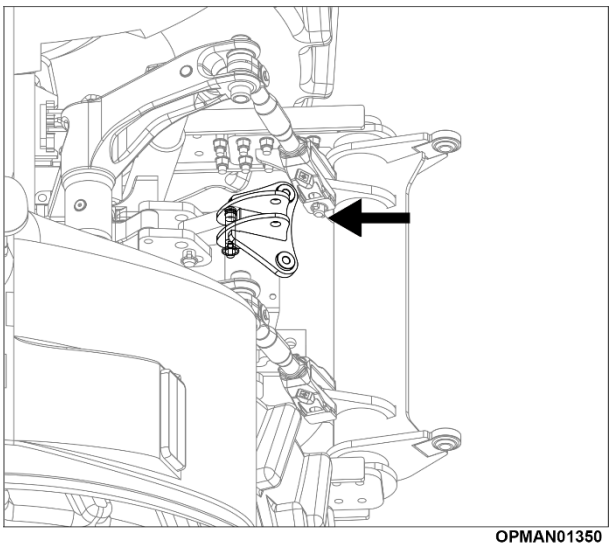


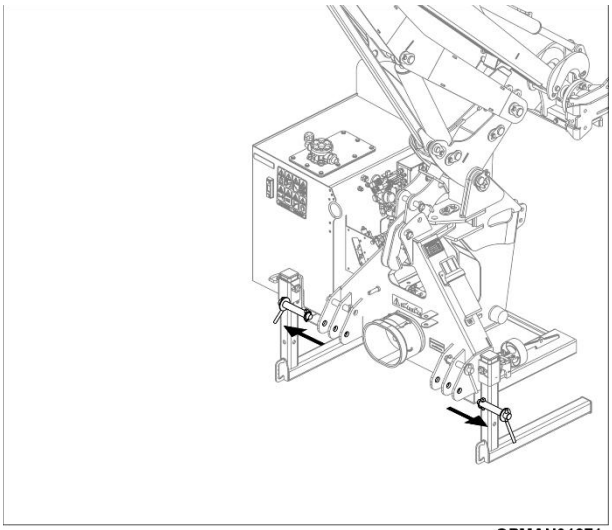
Figure 3.47 – Spearhead Machinery Tractor Tongue Options



OPMAN01350

Figure 3.48

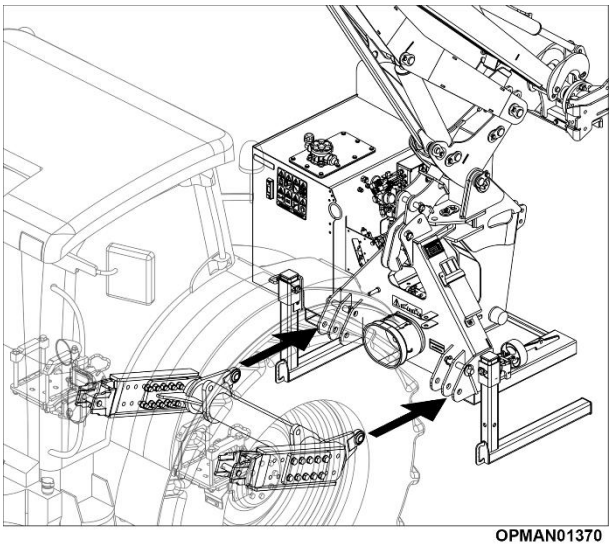
3.4.3.14 With the correct tongue fitted to the tractor, fit the stabiliser bracket “flying fish” using the supplied pin and linch pin.



OPMAN01371

Figure 3.49

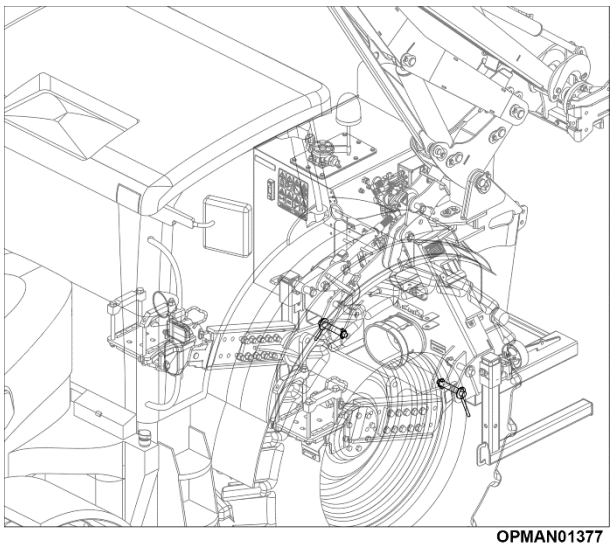
3.4.3.15 Remove the lower linkage pins and securing linch pins from the reach arm.



OPMAN01370

Figure 3.50

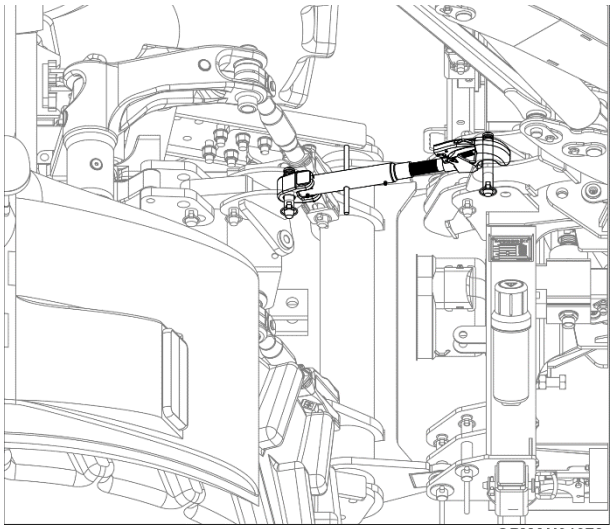
3.4.3.16 Gently reverse the tractor to the machine lining up the H frame ball ends with the lower linkage pin holes in the reach arm mainframe.



OPMAN01377

Figure 3.51

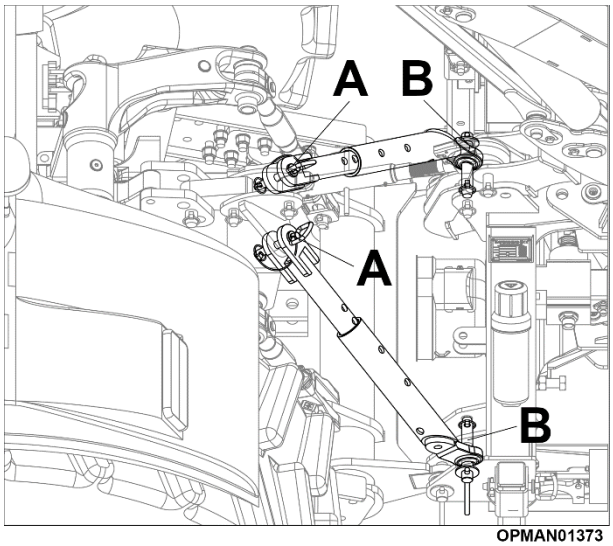
3.4.3.17 Refit the lower linkage pins and securing linch pins from the reach arm to secure the H frame to the reach arm.



OPMAN01372

Figure 3.52

3.4.3.18 Fit the tractor adjustable top link in between the stabiliser bracket “flying fish” and the top link cushion on the main reach arm fabrication.



OPMAN01373

Figure 3.53

3.4.3.19 Slide a pair of outer and inner stabiliser tubes into each other.

Fit the inner tube clevis to the stabiliser bracket “flying fish” using the supplied pin and linch pin; see Figure 3.53 (A).

Fit the outer tube ball end to the upper hole found just above the lower link arm fitting holes of the reach arm mainframe using the supplied pin and linch pin; see Figure 3.53 (B).

IMPORTANT DO NOT fit the telescopic tube locking pins at this point.

3.4.3.20 Repeat the process of the other side.

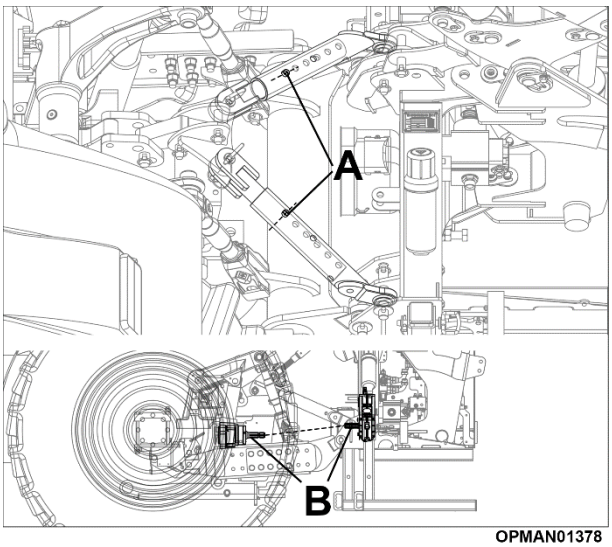


Figure 3.54

3.4.3.21 Start the tractor and gently raise the reach arm to a position where:

- A suitable hole is found where the locking pin can be fitted through the inner and outer stabiliser tubes; see Figure 3.54 (A).
- The splined output shaft of the tractor and splined input shaft of the reach arm are roughly horizontal to each other; see Figure 3.54 (B).

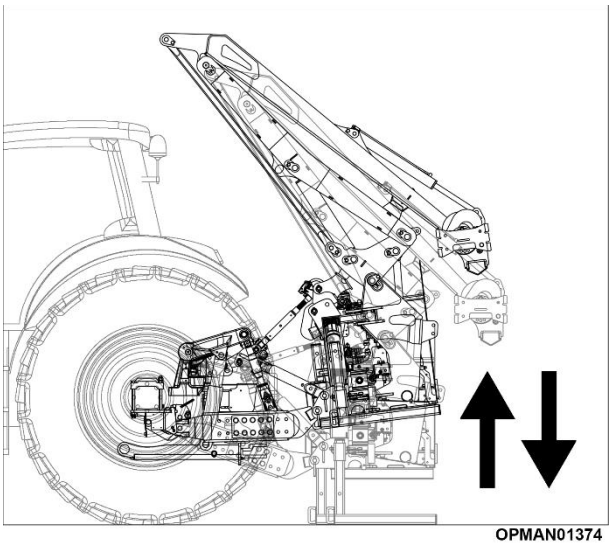


Figure 3.55

3.4.3.22 Leave the tractor and inspect the machine to see the machine is sitting horizontal and level. If the machine is not sitting horizontal lower the machine back to the floor and adjust the machine top link.

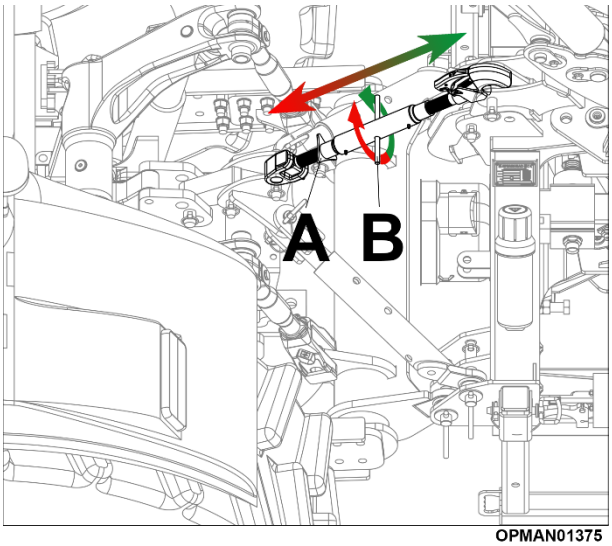


Figure 3.56

To adjust the top link:

3.4.3.23 Loosen the locking tab; see Figure 3.56 (A)

3.4.3.24 Turn the adjustable top link barrel in between the stabiliser bracket “flying fish” and the top link cushion on the main reach arm fabrication to ensure the reach arm assembly is sitting parallel with the floor; see Figure 3.56 (B).

If the machine when raised was pitched forwards (towards the tractor):

- Lengthen the top link to push the reach arm away from the tractor.

If the machine when raised was pitched backwards (away from the tractor):

- Shorten the top link to pull the reach arm closer to the tractor.

3.4.3.25 Enter the tractor and raise the reach arm again and inspect the angle of the reach arm and repeat the process again if necessary to ensure the machine is sitting level.

3.4.3.26 Tighten the locking tab; see Figure 3.56 (A)

3.4.3.27 Stop the tractor and fit the locking pin and linch pin into the stabiliser tubes; see Figure 3.57 (A).

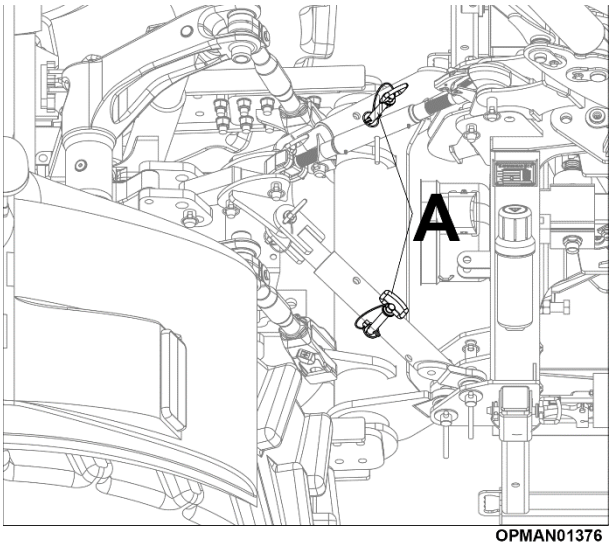


Figure 3.57

3.4.3.28 Start the tractor and lower the linkages of the tractor until the weight of the reach arm is placed on the stabilisers. Allow the machine to settle.

3.4.3.29 Stop the tractor and inspect the reach arm for a final time to see:

- the reach arm is not sitting excessively high.
- whether the splined output shaft of the tractor and splined input shaft of the reach arm are roughly horizontal to each other.

3.4.3.30 If adjustments are required to be made, return to the tractor and repeat the various processes by adjusting the stabilisers to the next upper/lower hole until a correct position is found.

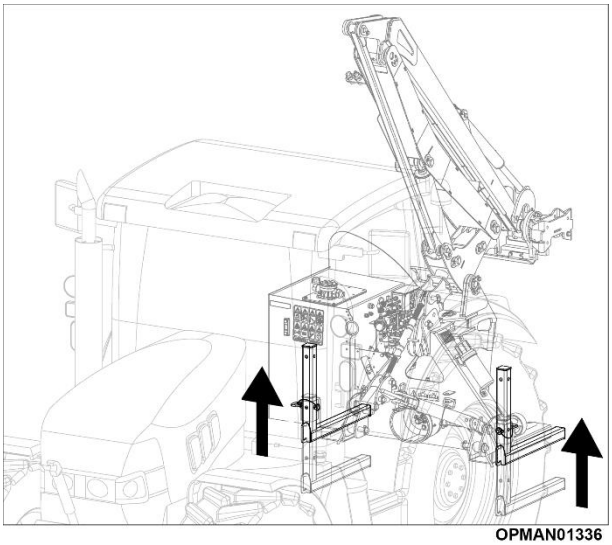


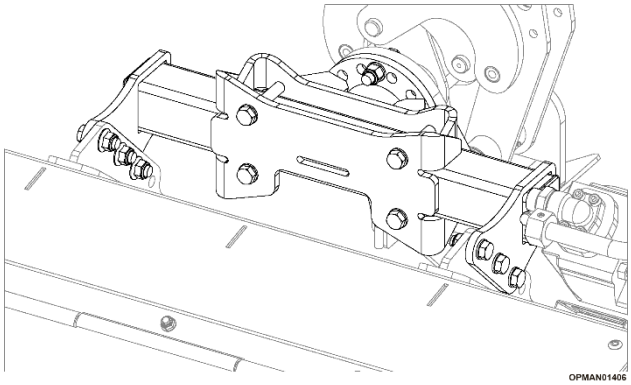
Figure 3.58

3.4.3.31 Raise the two machine stands found at the front of the mainframe of the machine.

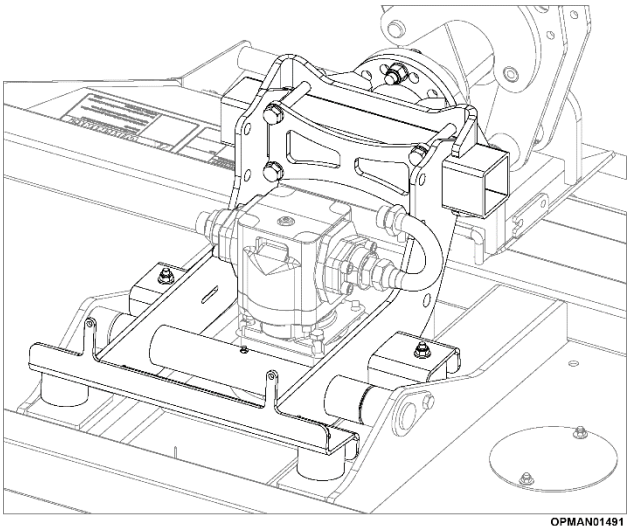
3.4.3.32 Proceed to fit the input PTO driveshaft in between the tractor and reach arm.

3.5 Attachment – Fitting

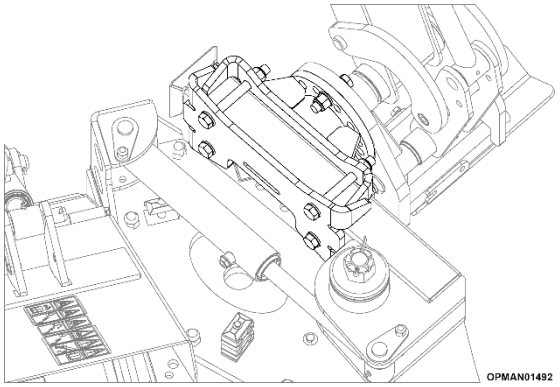
3.5.1 Standard



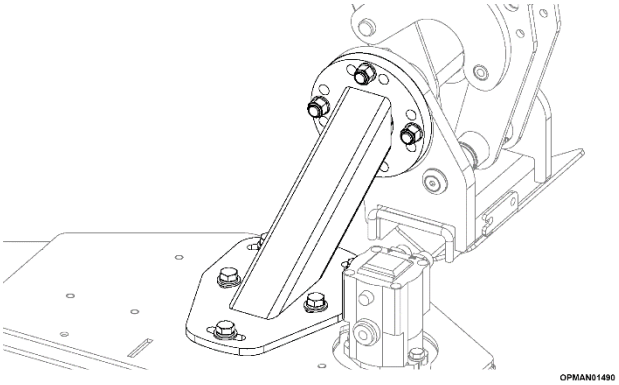
Flail Head 80mm Attachment Mounting
(Powerdrive flail head attachment shown)
Figure 3.59



Rotary Head Attachment Mounting
(MD rotary head attachment shown)
Figure 3.60



Ditch Cleaner Attachment Mounting
Figure 3.61



Round Attachment Mounting
(sawblade attachment shown)
Figure 3.62

Spearhead Machinery's reach arm attachments have a selection of different mounting methods to secure them to the reach arm. The standard, most common method of attachment is the four bolt clamp securing bracket which fits round 80mm (3' 5/32") square box section. This is found on all of Spearhead's flail head range; see Figure 3.59. A similar variation of this is used to secure the rotary head range, see Figure 3.60, and ditch cleaner attachment; see Figure 3.61.

Spearhead Machinery sawblade and cutterbar range of attachments use an alternative fitting method which uses a direct fitment to the reach arm head crowd bracket using four bolts spread out in a circular pattern; see Figure 3.62.

Spearhead Machinery cannot give detailed specific guidance to the fitment of all potential reach arm attachments as the list of attachments which can be adapted to fit Spearhead's Twiga reach arm range is exhaustive. For detailed guidance refer to the specific operators manual for the reach arm attachment.

3.5.2 Standard Fitting – Box Section

This below procedure is written showing the correct fitment of a Spearhead Powerdrive flail head to a Spearhead Twiga Classic range of reach arms fitted with an 80mm box section. The same procedure can be applied to similar attachments which feature a box section mounting such as Spearhead's rotary head range and ditch cleaner.

Spearhead Machinery cannot give detailed specific guidance to the fitment of all potential reach arm attachments as the list of attachments which can be adapted to fit Spearhead's Twiga reach arm range is exhaustive. For detailed guidance refer to the specific operators manual for the reach arm attachment.

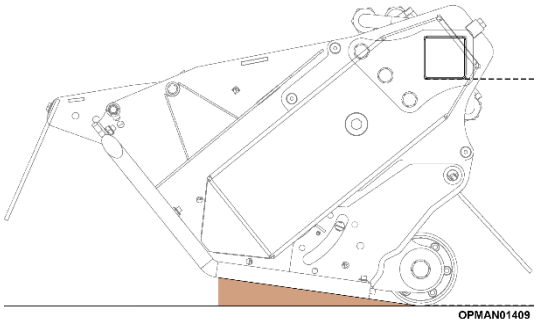


Figure 3.63

3.5.2.1 Place the attachment in a secure and stable state on a flat, hard surface where it will not move.

Raise the attachment to a position where the box section mounting point on the attachment is sitting parallel with the ground so the reach arm will be able to easily fit to the attachment.

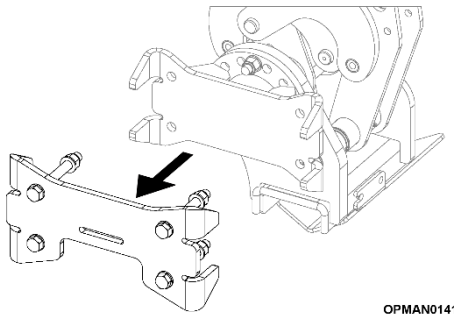


Figure 3.64

3.5.2.2 Loosen and remove the four securing bolts and nuts and their accompanying flat washers from the reach arm and retain the outer clamping bracket.

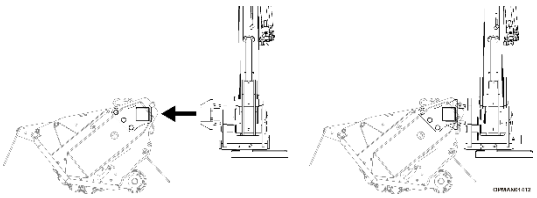


Figure 3.65

3.5.2.3 Carefully bring the tractor and reach arm to the attachment positioning the reach arm:

- So the jaws of the clamping bracket line up either side of the 80mm (3' 5/32") box section mounting point on the attachment.
- So the reach arm bracket is placed centrally in the width of the attachment.

3.5.2.4 Switch off the tractor and apply the handbrake.

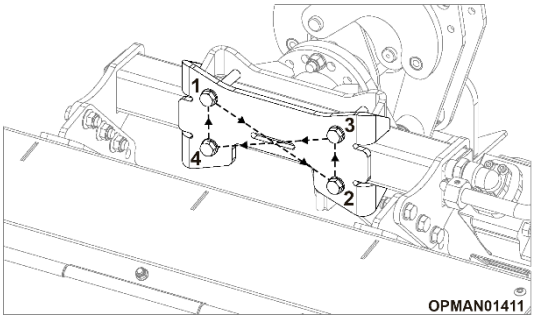


Figure 3.66

3.5.2.5 Refit the outer clamping bracket and its accompanying fasteners in the assembly order shown in Figure 3.66.

3.5.2.6 Gradually tighten up each of the four fasteners in a cross pattern to pull in and fully secure the attachment to the reach arm. Fully torque each of the fasteners to the correct torque settings given in Section 8.11.

3.5.2.7 Proceed to connect the hydraulic hoses.

3.5.3 Standard Fitting - Cutterbars, Sawblades, Finecut Rotary Head

This below procedure is written showing the correct fitment of a Spearhead sawblades attachment to a Spearhead Twiga Classic range of reach arms fitted with a circular section mounting face. The same procedure can be applied to similar attachments which feature a circular section mounting such as Spearhead's cutterbar range.

Spearhead Machinery cannot give detailed specific guidance to the fitment of all potential reach arm attachments as the list of attachments which can be adapted to fit Spearhead's Twiga reach arm range is exhaustive. For detailed guidance refer to the specific operators manual for the reach arm attachment.

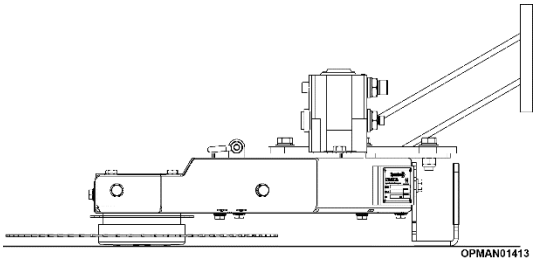


Figure 3.67

3.5.3.1 Place the attachment in a secure and stable state on a flat, hard surface where it will not move.

Raise the attachment to a position where the box section mounting point on the attachment is sitting parallel with the ground so the reach arm will be able to easily fit to the attachment.

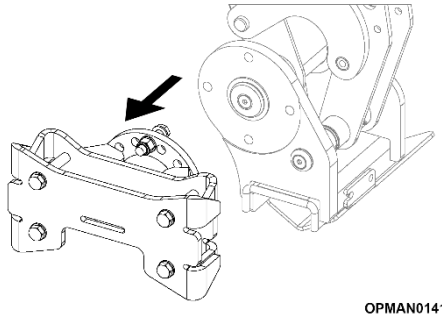


Figure 3.68

3.5.3.2 Loosen and remove the four securing bolts and nuts and their accompanying flat washers from the reach arm and remove the complete standard clamping bracket assembly.

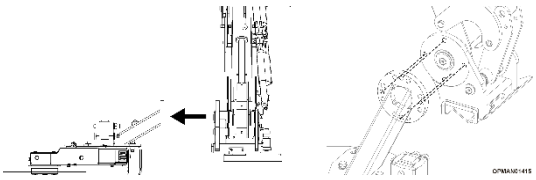


Figure 3.69

3.5.3.3 Carefully bring the tractor and reach arm to the attachment positioning the reach arm so the bolt holes on the reach arm mounting flange plate line up with the mounting flange plate on the attachment.

So the reach arm bracket is placed centrally in the width of the attachment.

3.5.3.4 Switch off the tractor and apply the handbrake.

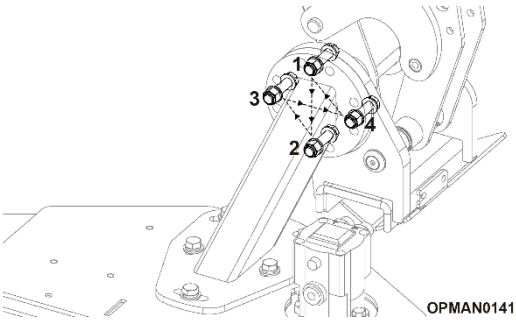


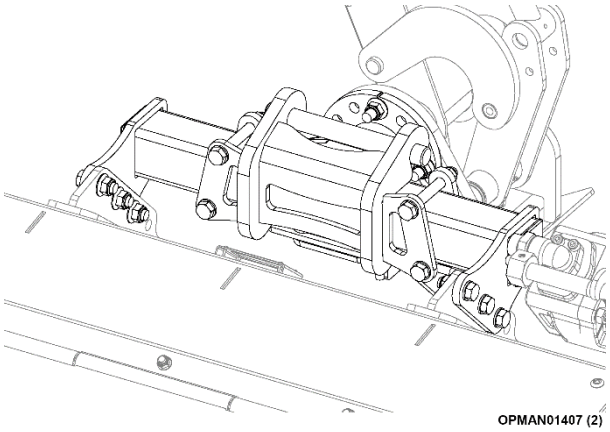
Figure 3.70

3.5.3.5 Fit the four bolts, flat washers and nuts between the reach arm and the attachment.

3.5.3.6 Gradually tighten up each of the four fasteners in a cross pattern to pull in and fully secure the attachment to the reach arm. Fully torque each of the fasteners to the correct torque settings given in Section 8.11.

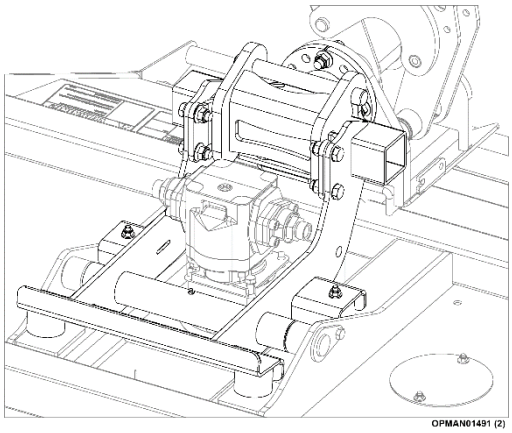
3.5.3.7 Proceed to connect the hydraulic hoses.

3.5.4 Quick Release



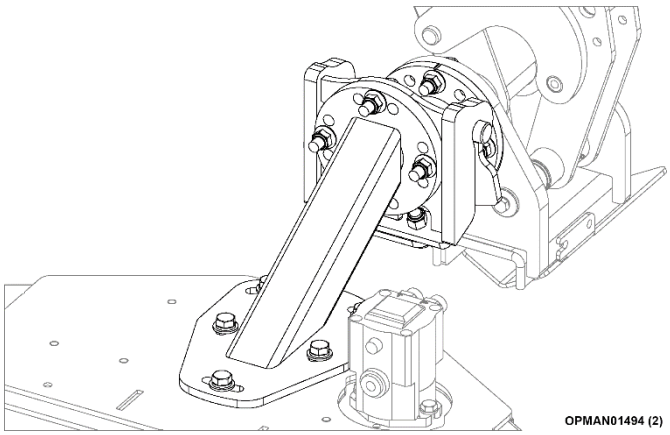
Flail Head 80mm Attachment Mounting
(Powerdrive flail head attachment shown)

Figure 3.71



Rotary Head Attachment Mounting
(MD rotary head attachment shown)

Figure 3.72



Round Attachment Mounting
(sawblade attachment shown)

Figure 3.73

Spearhead offers a mechanical quick attachment as an option at additional cost which allows for the reach arm attachment to be fitted and removed from the reach arm with minimum tools. This setup works through an intermediate quick-release bracket system which is designed to aid operators with multiple attachments who require minimum downtime in changing between attachments in less than ideal non-workshop conditions.

The mechanical quick attachment option is combined with the hydraulic hose quick attachment option which allows for the hydraulic hose connections to be fitted and removed with no tools. For guidance on fitting hydraulic hoses using the hydraulic hose quick attachment option see Section 3.6.2.

3.5.5 Fitting - Quick Release

This below procedure is written showing the correct fitment of a Spearhead Powerdrive flail head to a Spearhead Twiga Classic range of reach arm fitted with the mechanical quick attachment option.

All Spearhead attachments fitted with the mechanical quick attachment option use the same fitting procedure.

Spearhead Machinery cannot give detailed specific guidance to all potential reach arm attachments as the list of attachments which can be adapted to fit Spearhead's Twiga reach arm range is exhaustive. For detailed guidance refer to the specific operators manual for the reach arm attachment.

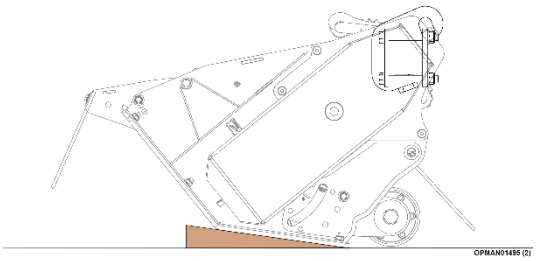


Figure 3.74

3.5.5.1 Place the attachment in a secure and stable state on a flat, hard surface where it will not move.

Raise the attachment to a position where the quick hitch bracket mounting point on the attachment is sitting parallel with the ground so the reach arm will be able to easily fit to the attachment.

3.5.5.2 Inspect the attachment quick release bracket fasteners to ensure the quick release bracket is secure to the attachment.

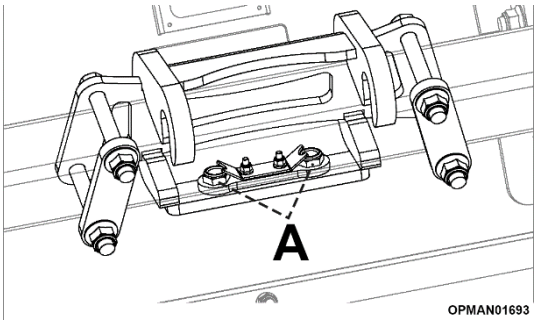


Figure 3.75

3.5.5.3 Inspect the attachment quick release bracket to ensure that both nuts are present inside the captive nut holes on the attachment quick release bracket.

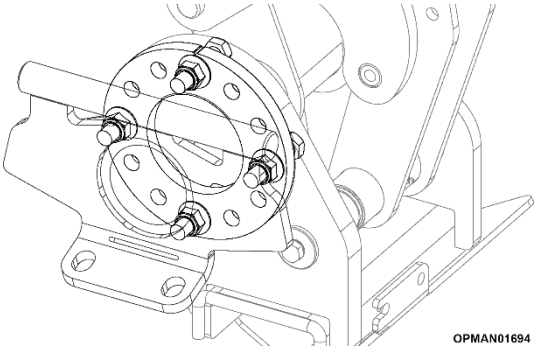


Figure 3.76

3.5.5.4 Inspect to see that the fasteners which hold the male quick hitch bracket to the reach arm are correctly tightened.

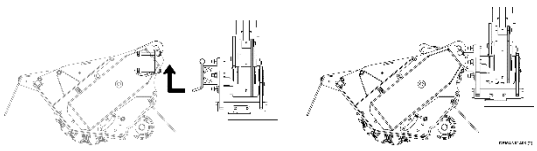


Figure 3.77

3.5.5.5 Carefully bring the tractor and reach arm to the attachment lowering the reach arm male quick hitch bracket below the female bracket found on the attachment. Once in line gently raise the reach arm to engage the bar into the round slot between the male and female brackets.

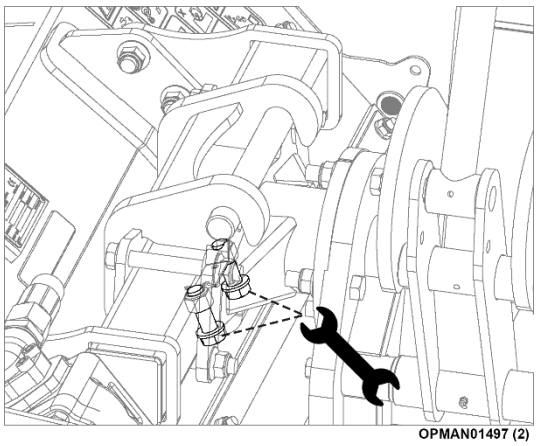


Figure 3.78

3.5.5.6 Safely stop the tractor.

3.5.5.7 Fit the bolts and flat washers through the lined up slot holes found in the male and female quick hitch brackets and tighten correctly.

3.5.5.8 Proceed to connect the hydraulic hoses.

3.6 Hydraulic Hoses – Fitting

CAUTION! Ensure maintenance personnel wear suitable PPE clothing when working with the machine to ensure a reduced risk of skin injuries. Frequent or prolonged contact with hydraulic oil may cause dermatitis and other skin disorders including (more rarely) skin cancer when not wearing impenetrable gloves. Use paper or cardboard to search for leaks and not hands or any other body parts.

Follow the guidance of the lubricant manufacturer with regards to handling oils, solvents, cleansers and other chemical agents.

CAUTION! Keep hands and body away from pin holes and nozzles ejecting hydraulic oil. Ingested or penetrated hydraulic oil in the body can become gangrenous. Removal must be carried out professionally by a suitable Doctor.

CAUTION! Relieve hydraulic pressure before disconnecting lines or working on the system. This is carried out by safely stopping the machine and leaving it for at least 30 minutes to naturally depressurise. Only once this has been completed and suitable safety glasses and impenetrable gloves have been put on can the hydraulic hoses connecting the reach arm and attachment be removed.

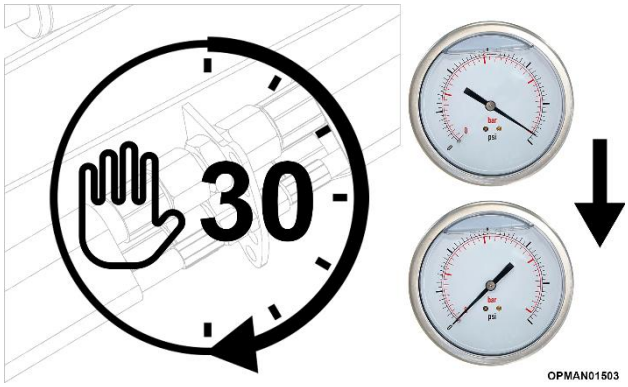


Figure 3.79

Due to the reach arm having a closed hydraulic system, the operator is unable to quickly relieve pressure from the system when the machine is stopped. It is important to stop the tractor and machine and wait for at least 30 minutes to allow the machine to depressurise before trying to disconnect the attachment from the reach arm.

Spearhead Twiga Classic machines come as standard with “spanner fit” BSP hydraulic hose fittings on the reach arm bulkhead to connect the reach arm to the attachment, however the machine can be specified with quick release hydraulic hose couplings.

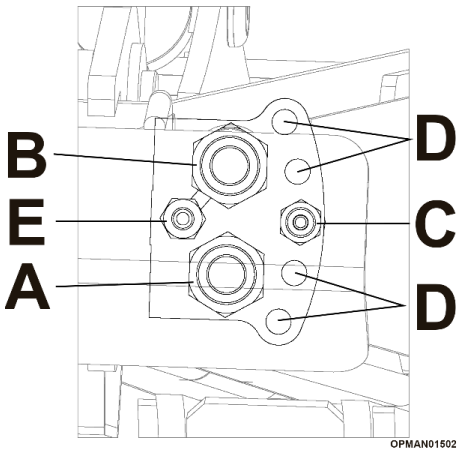


Figure 3.80
Twiga Classic Standard Bulkhead Fittings

Item	Use	Bulkhead Size	Example
A	Pressure	1”	
B	Return	1”	
C	Case Drain	3/8”	
D	Spare	3/8”	Hydraulic Hood Hydraulic Rear Roller Narrow Lane Bracket
E	Electric Cable Gland	N/A	

Table 3.1

With reference to Figure 3.80, Twiga Classic reach arms are manufactured with two large 1” hose ports and one 3/8” port connecting to the oil tank. They are assembled with the intention that the lower 1” bulkhead port (A) is for fitting the pressure hydraulic hose to the attachment and the upper 1” bulkhead port (B) is for fitting the return hydraulic hose to the attachment. The smaller 3/8” bulkhead port (C) is to cater for some reach arm attachments which feature a “case drain” hydraulic hose to protect the hydraulic motor in use.

Spearhead Machinery’s range of attachments sometimes have different size requirements of hydraulic hoses. This may require the alteration of the hydraulic hose adaptors found on the reach arm hose bulkhead to allow for the correct connections to be made between the reach arm and attachment. Use the minimum amount of adaptors to create the correct connections of the two machines. It is important to thoroughly read the specific section in the attachments operators manual for complete clarity on the requirements and correct fitting of the attachment to the reach arm base unit. Hydraulic hose diagrams for each of the Twiga Classic models are found in Section 8.5.

Four additional holes are found on the reach arm hose bulkhead plate; see Figure 3.80 (D). These holes allow for the fitting of additional hydraulic hoses to power machine options which require a hydraulic supply, such as a flail head with a hydraulic front hood or rear roller. It is important to assess the reach arm and reach arm attachment for their specification and options fitted to find out what the requirements of each of the hydraulic hoses connected to the bulkhead will be required to do.

Hydraulic hoses for connecting the reach arm to the attachment are always supplied with the attachment and not with the reach arm base unit.

IMPORTANT: It is important that all standard hydraulic hoses and any additional ones are placed and safely secured underneath the arm guards and placed through any other guides if possible to ensure that they are correctly routed and protected when in work from damage. See Section 2.15 for guidance on hydraulic hoses guards and fixings.

3.6.1 Standard

Figure 3.81

Spearhead Twiga Classic machines come as standard with “spanner fit” BSP hydraulic hose fittings on the reach arm bulkhead to connect the reach arm to the attachment. When connecting the hoses from the attachment to the reach arm bulkhead it is important to keep the hydraulic hoses and adaptors free of contamination and dirt. If any component is dirty ensure that it is cleaned with some clean rag before proceeding to fit the hoses. On a machine fitted with standard “spanner fit” hydraulic hoses, never disconnect an attachment hydraulic hose and leave the ends exposed. Utilise the threaded blanking caps supplied on the hydraulic hoses with the reach arm. It is of upmost importance to replace the threaded blanking caps back on the reach arm bulkhead adaptors once the reach arm attachment has been removed to ensure there will be no large oil leak at very high pressure once the reach arm is placed back into work.

It is important that all hydraulic hoses are installed without being twisted or kinked and are routed to allow for the movements possible with the reach arm and attachment without them become chafed, pinched or stretched.

Figure 3.78 and Table 3.1 give guidance to the standard layout for hydraulic hoses at the reach arm bulkhead. It is important to assess the reach arm for its specification and options fitted to understand the uses of each of the hydraulic hoses and also inspect the operators manual for the reach arm attachment to gain full clarity on the correct way to connect the attachment to the reach arm base to ensure it works correctly.

The following procedure gives guidance to fitting hydraulic hoses with figures being illustrated by an Powerdrive flail head attachment. Similar procedures are used to fit other compatible Spearhead reach arm attachments. Section 3.7.3 gives guidance to correctly routing hydraulic hoses on each Spearhead reach arm attachment. Full guidance to attachment fitting and hydraulic hose routing will be given in the reach arm attachment operators manual.

Fitting

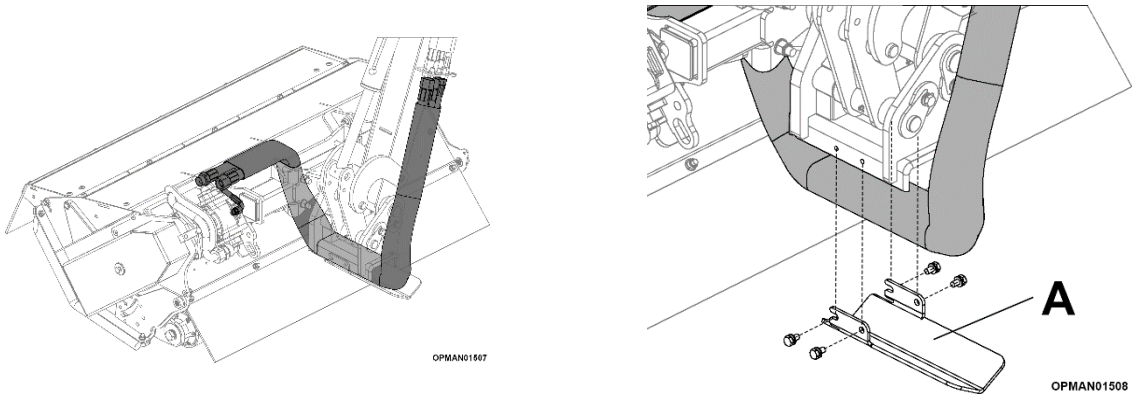


Figure 3.82

3.6.1.1 On the Powerdrive flail head, thread the hydraulic hoses from the reach arm attachment underneath the head mount bracket and through the hose carrier plate bolted to the bottom of the reach arms head crowd bracket to position the hydraulic hoses towards the reach arm bulkhead connection point.

Depending on the quantity of hydraulic hoses coming from the attachment may require the removal and refitting of the carrier plate; see Figure 3.82 (A). Ensure that the hydraulic hoses are placed through suitable hose sleeving to keep them together.

Note that not all Spearhead attachments which can be connected to Spearhead's Twiga Classic range will be possible to be placed the hose carrier plate found at the bottom of the reach arms head crowd bracket. The hose carrier plate should be used where possible.

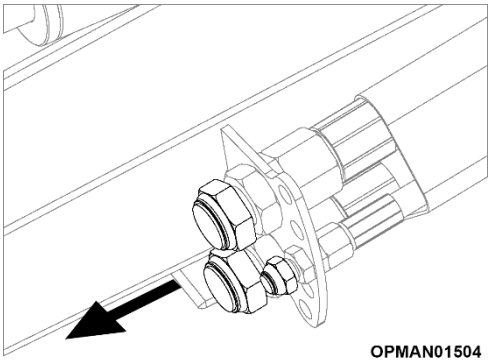


Figure 3.83

3.6.1.2 Place a suitable oil catch tray below the reach arm and gently loosen and remove each of the blanking plugs found on the hose bulkhead and the attachment hoses.

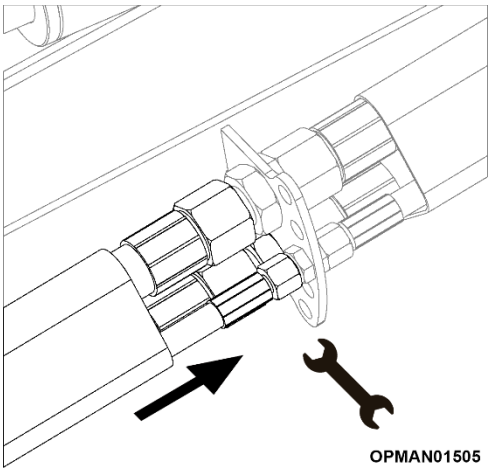


Figure 3.84

3.6.1.3 Ensuring both the hose and adaptor are clean, carefully fit the attachment hydraulic hoses to the reach arm hose bulkhead.

Check that all hydraulic hoses are installed without being twisted or kinked and are routed to allow for the movements possible with the reach arm and attachment without them become chafed, pinched or stretched. See guidance in Section 3.7.1.

Gain assistance if required to raise the collective hydraulic hoses and fit the couplings to the reach arm bulkhead. The collective hydraulic hoses may be heavy.

3.6.1.4 Torque the hydraulic connections to the correct torque settings as stated in Section 8.11.

3.6.1.5 Start the tractor and gently operate the reach arm. There may be an initial delay in response due to the hydraulic hoses draining of oil when the blanking plugs were removed. These need to refill.

3.6.1.6 Safely stop the tractor and inspect the hydraulic connections for leaks.

Removing

CAUTION! Relieve hydraulic pressure before disconnecting lines or working on the system. This is carried out by safely stopping the machine and leaving it for at least 30 minutes to naturally depressurise. Only once this has been completed and suitable safety glasses and impenetrable gloves have been put on can the hydraulic hoses connecting the reach arm and attachment be removed.

Figure 3.85

3.6.1.7 To remove the attachment hydraulic hoses from the reach arm it is important to stop the tractor and machine and wait for at least 30 minutes to allow the machine to depressurise before trying to disconnect the attachment from the reach arm.

3.6.1.8 Place suitable containers and equipment below the machine bulkhead to collect hydraulic oil.

3.6.1.9 Gently loosen each of the hydraulic hoses and fit blanking caps to the exposed ends on the attachment hydraulic hose and bulkhead fittings on the reach arm.

3.6.2 Quick Release Option

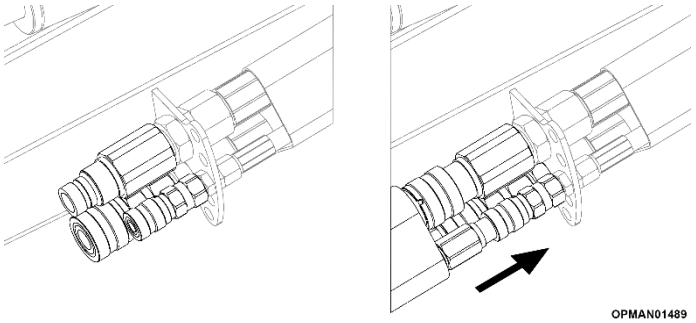


Figure 3.86
Twiga Classic Quick Release Fittings

Spearhead Twiga Classic machines in combination with the mechanical quick attachment option, see Section 3.5.5, can be optioned with quick release hydraulic fittings on the reach arm bulkhead to connect the reach arm to the attachment. When connecting the hoses from the attachment to the reach arm bulkhead it is important to keep the hydraulic hoses and flat face couplings free of contamination and dirt. If any component is dirty ensure that it is cleaned with some clean rag before proceeding to fit the hoses. If any flat face quick release hydraulic fittings are removed from the hydraulic hose of the attachment or machine bulkhead, utilise threaded blanking caps to cover the exposed ends on the hydraulic hoses. It is of upmost importance to use threaded blanking caps to cover exposed ends on hydraulic hoses to ensure there will be no large oil leak at very high pressure once the reach arm is placed back into work.

To remove or the quick release hydraulic fittings from the reach arm bulkhead hoses, it is important to stop the tractor and machine and wait for at least 30 minutes to allow the machine to depressurise before trying to loosen the blanking caps/fittings from the reach arm.

Figure 3.80 and Table 3.1 give guidance to the standard layout for hydraulic hoses at the reach arm bulkhead. It is important to assess the reach arm for its specification and options fitted to understand the uses of each of the hydraulic hoses and also inspect the operators manual for the reach arm attachment to gain full clarity on the correct way to connect the attachment to the reach arm base to ensure it works correctly.

The following procedure gives guidance to fitting hydraulic hoses with figures being illustrated by a Powerdrive flail head attachment. Similar procedures are used to fit other compatible Spearhead reach arm attachments. Section 3.7.3 gives guidance to correctly route hydraulic hoses on each Spearhead reach arm attachment. Full guidance to attachment fitting and hydraulic hose routing will be given in the reach arm attachment operators manual.

Fitting

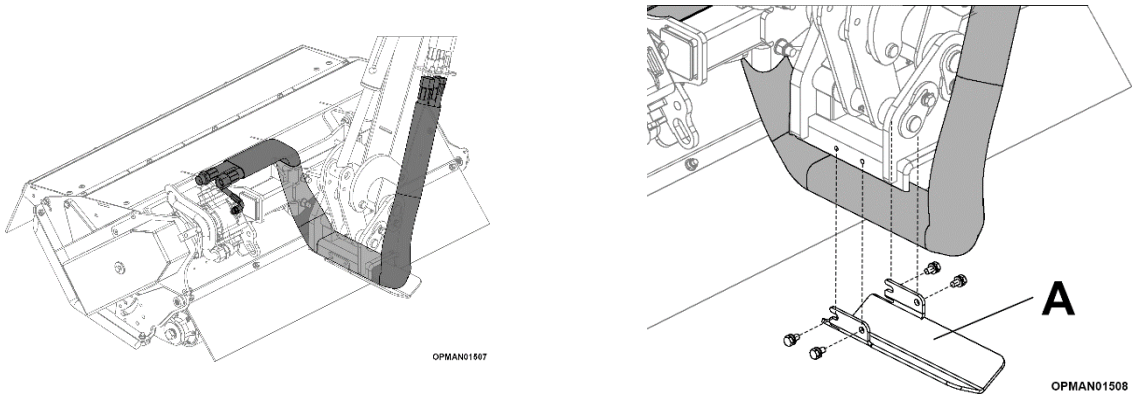


Figure 3.87

3.6.2.1 On the Powerdrive flail head, thread the hydraulic hoses from the reach arm attachment underneath the head mount bracket and through the hose carrier plate bolted to the bottom of the reach arms head crowd bracket to position the hydraulic hoses towards the reach arm bulkhead connection point.

Depending on the quantity of hydraulic hoses coming from the attachment may require the removal and refitting of the carrier plate; see Figure 3.87 (A). Ensure that the hydraulic hoses are placed through suitable hose sleeving to keep them together.

Note that not all Spearhead attachments which can be connected to Spearhead's Twiga Classic range will be possible to be placed the hose carrier plate found at the bottom of the reach arms head crowd bracket. The hose carrier plate should be used where possible.

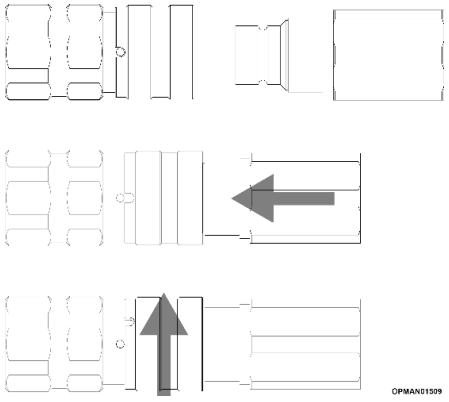


Figure 3.88

3.6.2.2 Ensuring both the male and female quick release adaptors are clean, carefully push on the attachment hydraulic hoses to the reach arm hose bulkhead quick release adaptors. An audible click should be heard when the male and female hydraulic couplings are engaged correctly.

Check that all hydraulic hoses are installed without being twisted or kinked and are routed to allow for the movements possible with the reach arm and attachment without them become chafed, pinched or stretched. See guidance in Section 3.7.1.

Gain assistance if required to raise the collective hydraulic hoses and fit the couplings to the reach arm bulkhead. The collective hydraulic hoses may be heavy.

3.6.2.3 Rotate the collar on each of the female quick release couplings once the attachment has been made to lock

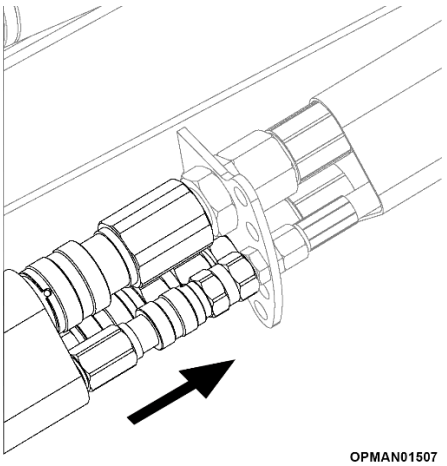


Figure 3.89

couplings and ensure that they cannot come apart; see Figure 3.88.

3.6.2.4 Start the tractor and gently operate the reach arm.

3.6.2.5 Safely stop the tractor and inspect the hydraulic connections for leaks.

Removal

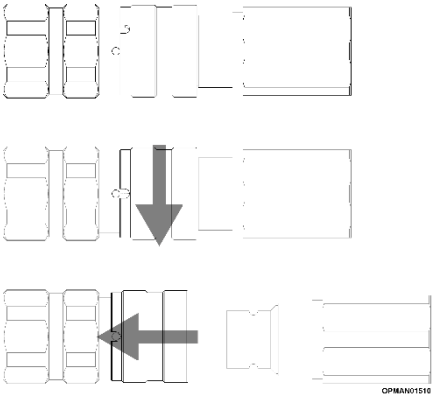


Figure 3.90

3.6.2.6 To remove the attachment hydraulic hoses from the reach arm rotate the collar on each of the female quick release couplings so the slot lines up with the ball on the coupling; see Figure 3.90.

3.6.2.7 Firmly supporting the hydraulic hose pull the collar back on the female quick release coupling which will release the female coupling from the male coupling.

3.6.2.8 With reference to Figure 3.87 (A), carefully slide the hydraulic hoses through the hose carrier plate and leave the hydraulic hoses off the floor and on the attachment.

3.6.3 Debris Blower (option)

The debris blower fitted as an option on the Twiga Classic reach arm range are connected and operated directly from the tractor cab controls and oil supply, rather than through the services and oil supply of the reach arm.

Before proceeding to fit or remove the hydraulic hoses to the tractor, with the tractor safely stopped, relieve the hydraulic pressure from the tractor. This can be done by placing the specific tractor hydraulic service into float.

Fitting

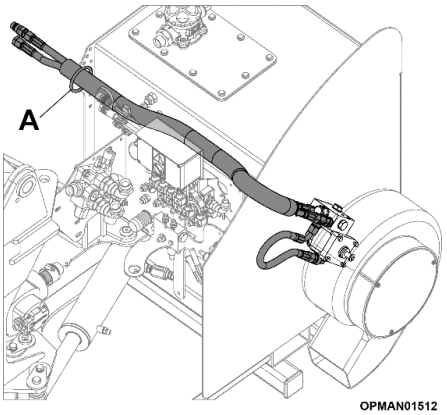


Figure 3.91
(Left-hand, Pilot control machine shown)

3.6.3.1 Route the hydraulic hoses from the debris blower to the front of the oil tank of the machine routing the hoses over the rear panel of the tank and down the side of the tank, routing the hoses above the valve block.

3.6.3.2 Place the hoses through the hose guide found at the front of the machine; see Figure 3.91 (A).

3.6.3.3 Ensure the hydraulic hoses and kept together by being placed through the supplied hose sleeving between the debris blower and the tractor.

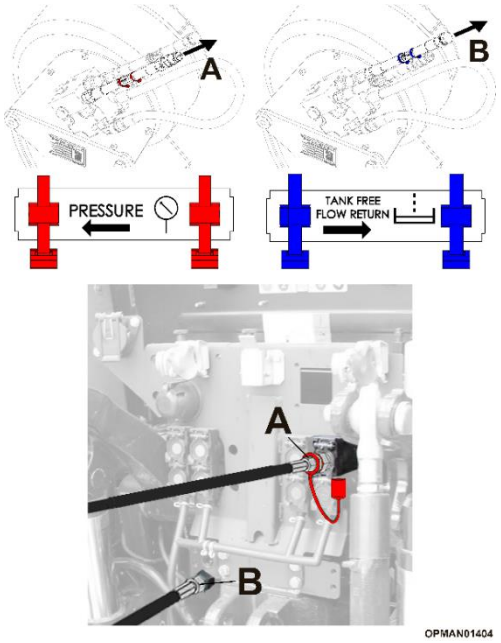


Figure 3.92

3.6.3.4 Under the preference of the operator and which service they wish to use on the tractor, fit the pressure hydraulic hose to one bank of services on the tractor. The pressure hydraulic hose for the debris blower is marked with a red label; see Figure 3.92 (A).

The pressure hydraulic hose features a male quick release hydraulic coupler and when connecting the hose to the tractor it is important to keep the hose free of contamination and dirt. Ensure that the tractors hose ports are capped or clean before connecting the hydraulic hose to the tractor.

3.6.3.5 The return hydraulic needs to be fitted a free flow return on the tractor. The return hydraulic hose for the debris blower is marked with a blue label; see Figure 3.92 (B).

3.6.3.6 Place a suitable oil catch tray below the hydraulic hose and gently loosen and remove the blanking plug found on the hose end.

3.6.3.7 Fit the hydraulic hose to the free flow return on the tractor and torque to the correct torque settings as stated in Section 8.11.2.

Depending on the size of the free flow hydraulic port on the tractor may require the use of hydraulic adaptors to correctly fit the hydraulic hose to the tractor.

3.6.3.8 Start the tractor and briefly operate the debris blower using the correct spool control on the tractor.

Listen to hear how the debris blower is operating. The debris blower should be working with a smooth, constant sound. A surging sound indicates the flow rate of oil to the debris blower is too great. If this is the case, reduce the oil flow rate on the operating tractor spool until a smooth, constant sound is maintained. The debris blower should be operated at the highest speed possible for it to offer its best debris clearing ability yet maintain this sweet spot in operation.

3.6.3.9 Safely stop the tractor and inspect the hydraulic connections for leaks.

It is important to thoroughly read the debris blower operators manual for complete clarity on the requirements and correct fitting of the debris blower to the reach arm base unit to ensure safe operation.

Removal

With the tractor switched off and secured in position on level ground, relieve the hydraulic pressure from the tractor by placing the specific tractor hydraulic service into float.

The pressure debris blower hydraulic hose features a quick release hydraulic coupler which can be removed by first pushing in and then pulling out the connections. The return debris blower hydraulic hose is fitted directly into the free-flow return and requires spanners for removal. When disconnecting the hoses to the tractor it is important to keep the hoses, quick couplers and swivels free of contamination and dirt. Never disconnect a hydraulic hose and leave the quick coupler end exposed. Utilise the coloured plastic caps or blanking caps supplied on the hoses to keep them contaminant free. Ensure that the tractors hose ports are capped and clean

before leaving the hydraulic hoses with the machine. If any component is deemed dirty ensure that it is cleaned with some clean rag.

3.6.4 Hydraulic Narrow Lane Bracket (option)

The hydraulic narrow lane bracket fitted as an option on the Twiga Classic reach arm range are connected and operated directly from the tractor cab controls and oil supply, rather than through the services and oil supply of the reach arm.

The hydraulic narrow lane bracket is connected to the tractor by three sections of hydraulic hose which take the same path down to the reach arm attachment as the rest of the attachment hydraulic hoses.

Before proceeding to fit or remove the hydraulic hoses to the tractor, with the tractor safely stopped, relieve the hydraulic pressure from the tractor. This can be done by placing the specific tractor hydraulic service into float.

Fitting

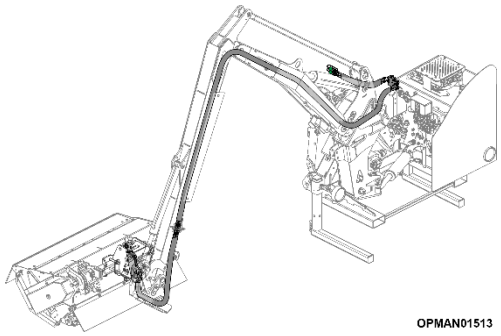
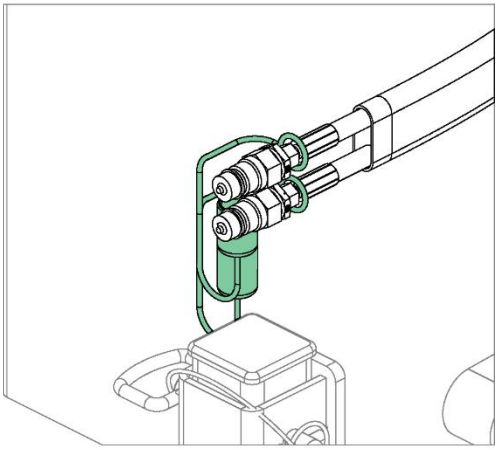


Figure 3.93
(Left-hand S55 machine with Powerdrive flail head shown)

3.6.4.1 It should be inspected to ensure the hydraulic narrow lane bracket hoses are routed to take the same path down to the reach arm attachment as the rest of the attachment hydraulic hoses. They should be fitted underneath each of the arm guards and placed through the hose carrier plate before reaching the narrow lane bracket assembly and hydraulic ram.

Check that all hydraulic hoses are installed without being twisted or kinked and are routed to allow for the movements possible with the reach arm and attachment without them become chafed, pinched or stretched. See guidance in Section 3.7.1.

3.6.4.2 Ensure the hydraulic hoses and kept together by being placed through the supplied hose sleeving between the tractor and machine.



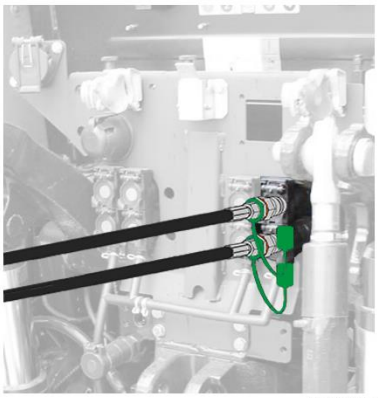


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Figure 3.94

3.6.4.3 Under the preference of the operator and which service they wish to use on the tractor, fit the pair of hydraulic hoses to one bank of services on the tractor.

It is not critical as to which service the hose is fitted to as long as it's from the same bank. Swapping the hoses over will cause the action in the tractor to be mirrored opposite; it is down to the preference of the operator in how they wish to operate the controls in the tractor.

The hydraulic hoses feature male quick release hydraulic couplers and when connecting the hoses to the tractor it is important to keep the hoses free of contamination and dirt. Ensure that the tractors hose ports are capped or clean before connecting the hydraulic hose to the tractor.

3.6.4.4 Start the tractor and gently operate the narrow lane bracket using the correct spool control on the tractor. There may be an initial delay in response due to the hydraulic hoses and narrow lane hydraulic ram filling with oil.

If the response from the narrow lane bracket is slow, inspect the flow rate for the specific spool on the tractor and increase if necessary. The hydraulic hose to the narrow lane bracket features a restrictor to prevent excessive oil flow to the hydraulic ram.

3.6.4.5 Safely stop the tractor and inspect the hydraulic connections for leaks.

Removal

With the tractor switched off and secured in position on level ground, relieve the hydraulic pressure from the tractor by placing the specific tractor hydraulic service into float.

The hydraulic narrow lane bracket hydraulic hoses feature quick release hydraulic couplers so they can be removed by first pushing in and then pulling out the connections. When disconnecting the hoses to the tractor it is important to keep the hoses, quick couplers and swivels free of contamination and dirt. Never disconnect a hydraulic hose and leave the quick coupler end exposed. Utilise the coloured plastic caps supplied on the hoses to keep them contaminant free. Ensure that the tractors hose ports are capped and clean before leaving the hydraulic hoses with the machine. If any component is deemed dirty ensure that it is cleaned with some clean rag.

3.6.5 Hydraulic Front Hood & Rear Roller (flail head option)

Some of Spearhead's reach arm attachments which can be fitted to the Twiga Classic reach arm range, such as the Powerdrive flail head have options such as hydraulic front hood and rear roller. The options are connected and operated directly from the tractor cab controls and oil supply, rather than through the services and oil supply of the reach arm.

Twiga Classic machines come fitted with spare auxiliary hydraulic hoses between the main arm bulkhead and dipper arm bulkhead to allow for the transfer of hydraulic oil to operate different hydraulically operating options which may be fitted to the reach arm attachment.

Before proceeding to fit or remove the hydraulic hoses to the tractor, with the tractor safely stopped, relieve the hydraulic pressure from the tractor. This can be done by placing the specific tractor hydraulic service into float.

Fitting

The following section is writing describing the correct fitment of hydraulic hoses to the tractor for an Powerdrive flail head fitted with hydraulic rear roller. The same procedure can be used for an Powerdrive flail head fitted with hydraulic front hood.

Spearhead Machinery cannot give detailed specific guidance to the fitment of all potential reach arm attachments as the list of attachments which can be adapted to fit Spearhead's Twiga reach arm range is exhaustive.

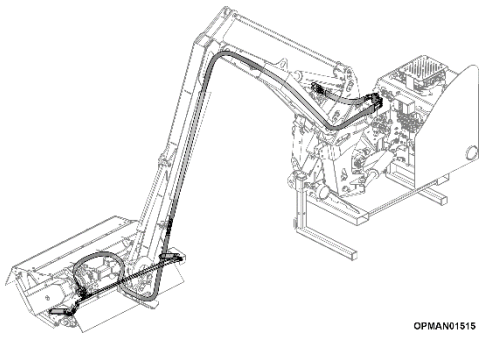

Figure 3.95
(Left-hand S55 machine with Powerdrive flail head with hydraulic rear roller shown)

3.6.5.1 Connect the hydraulic hoses for the attachment to the reach arm bulkhead following the guidance as given in Section 3.6.1 for attachments fitted with standard spanner fit hydraulic couplings and Section 3.6.2 for attachments fitting with quick release hydraulic couplings.

3.6.5.2 Ensure the hydraulic hoses and kept together by being placed through the supplied hose sleeving between the tractor and machine.

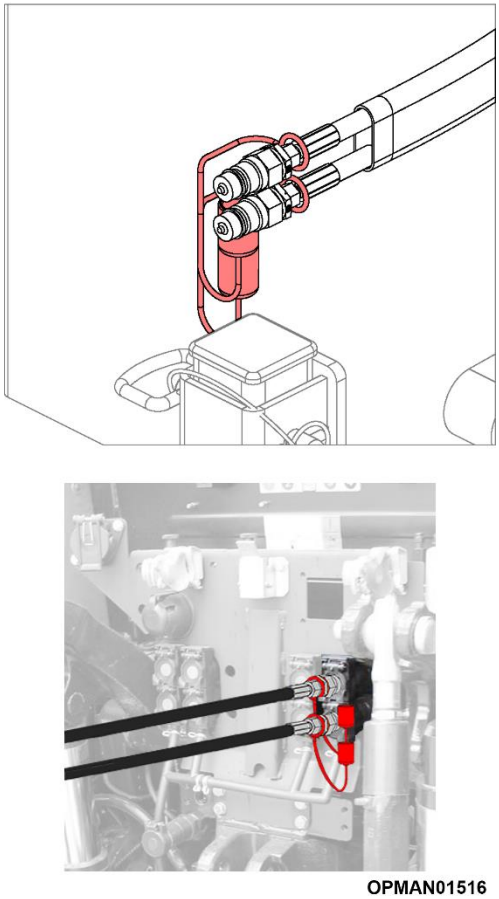

Figure 3.96

3.6.5.3 Under the preference of the operator and which service they wish to use on the tractor, fit the pair of hydraulic hoses to one bank of services on the tractor.

It is not critical as to which service the hose is fitted to as long as it's from the same bank. Swapping the hoses over will cause the action in the tractor to be mirrored opposite; it is down to the preference of the operator in how they wish to operate the controls in the tractor.

The hydraulic hoses feature male quick release hydraulic couplers and when connecting the hoses to the tractor it is important to keep the hoses free of contamination and dirt. Ensure that the tractors hose ports are capped or clean before connecting the hydraulic hose to the tractor.

3.6.5.4 Start the tractor and gently operate the hydraulic front hood/rear roller using the correct spool control on the tractor. There may be an initial delay in response due to the hydraulic hoses and ram(s) filling with oil.

If the response from the hydraulic front hood/rear roller is slow, inspect the flow rate for the specific spool on the tractor and increase if necessary. The hydraulic hose to the hydraulic front hood/rear roller features a restrictor to prevent excessive oil flow to the hydraulic ram.

3.6.5.5 Safely stop the tractor and inspect the hydraulic connections for leaks.

It is important to thoroughly read the reach arm attachment operators manual for complete clarity on the requirements and correct fitting of the specific attachment to the reach arm base unit to ensure safe operation of all features.

Removal

With the tractor switched off and secured in position on level ground, relieve the hydraulic pressure from the tractor by placing the specific tractor hydraulic service into float.

Hydraulic front hood and rear roller hydraulic hoses feature quick release hydraulic couplers so they can be removed by first pushing in and then pulling out the connections. When disconnecting the hoses to the tractor it is important to keep the hoses, quick couplers and swivels free of contamination and dirt. Never disconnect a hydraulic hose and leave the quick coupler end exposed. Utilise the coloured plastic caps supplied on the hoses to keep them contaminant free. Ensure that the tractors hose ports are capped and clean before leaving the hydraulic hoses with the machine. If any component is deemed dirty ensure that it is cleaned with some clean rag.

3.7 Hydraulic Hoses – Routing

3.7.1 General Points & Hose Care

Spearhead Machinery cannot give specific guidance to the correct hose routing of all potential reach arm attachments as the list of attachments which can be adapted to fit Spearhead's Twiga reach arm range is exhaustive.

It is important that all hydraulic hoses are installed without being twisted or kinked and are routed to allow for the movements possible with the reach arm and attachment without them become chafed, pinched or stretched.

Twists

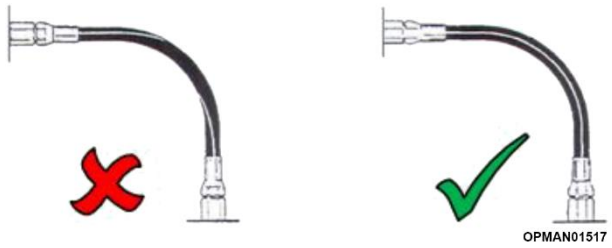

Figure 3.97

When routing the hydraulic hoses between the reach arm bulkhead and the attachment think of the operations and positions which could be made and simulate how the hydraulic hoses will move as a result when the machine is being used.

Hydraulic hoses are severely weakened when twisted and can cause hydraulic pressure pulses through the hoses potentially loosening hydraulic connections.

Spearhead recommends fitting hoses loosely at each end fitting when being initially installed and inspect to see the hydraulic hose is not twisted before being correctly tightened. The majority of Spearhead hydraulic hoses feature a coloured line or writing down the length of the hose to give indication that the hydraulic hose is straight and correctly orientated.

Sharp Bends

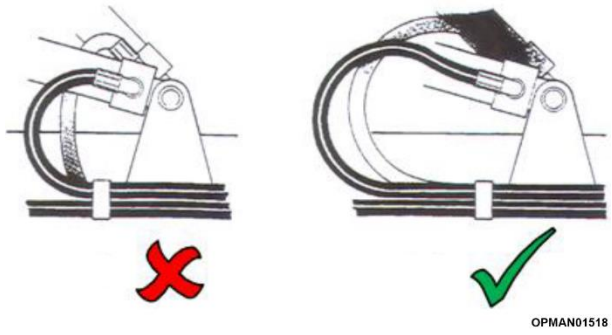

Figure 3.98

Install hydraulic hoses ensuring that they are not too tightly bent; see Figure 3.98. Ensure that hydraulic hoses are sufficiently long enough to allow for safe loop to be created considering how this may change when at the extreme ends of work.

Chafed Hoses

Figure 3.99

Hydraulic hoses should always be fitted ensuring that they are not chafed on any objects. Always give plenty of clearance around sharp objects and reposition if possible; see Figure 3.99.

Cable ties can be used to safely secure and guide hydraulic hoses in safe paths from obstructions when in use.

Always use hydraulic hose sleeving to cluster groups of hydraulic hoses going to nearby locations on the machine. Using hydraulic hose sleeving protects the rubber coating on hydraulic hoses and can extend hydraulic hose life.

Ensure that all hydraulic hoses are kept off the ground and away from rotating and moving parts of the reach arm and attachment.

Always torque the hydraulic connections to the correct torque settings as stated in Section 8.11.

3.7.2 Guide Points

Twiga Classic reach arms can feature several guides and points to correctly route hydraulic hoses which should always be used.

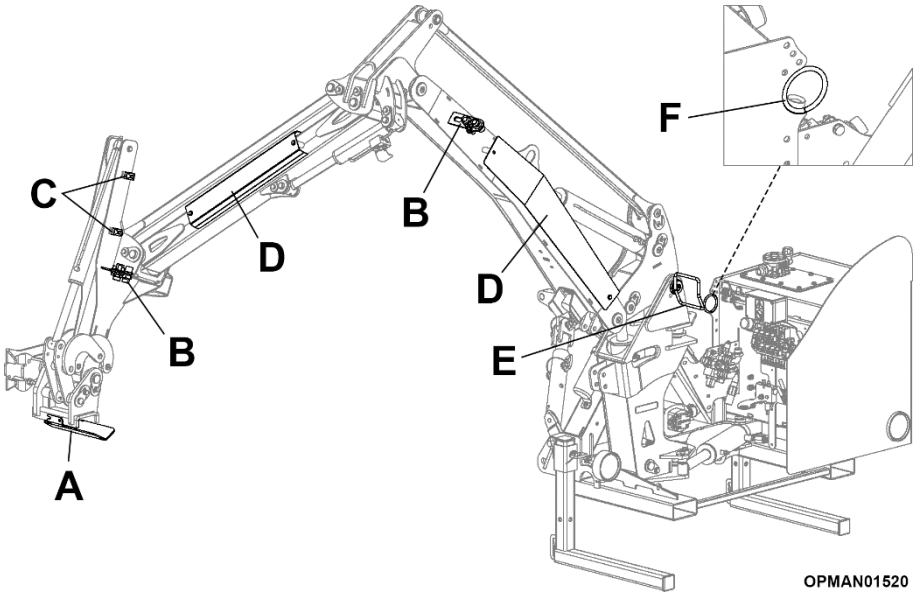

Figure 3.100
(Twiga Classic VFR left-hand model shown)

With reference to Figure 3.100,

- Head crowd bracket hose carrier plate (A)
- Arm hose bulkheads (B)
- Hose clamps (C)
- Arm hose guards (D)
- Lift frame hose guide (E)
- Oil tank bulkhead loop (F)

Using all these guides and points will reduce the chance of potential issues with hydraulic hoses as well as reducing the chance of potential damage in storage or use.

Figure 3.100 is illustrated using a Twiga Classic VFR model. Variations to the placement of components may vary depending on the machine model. It is important to fully inspect the specific machine.

Spearhead reach arms and reach arm attachments are designed to operate under high pressure. Inspect all hydraulic hoses regularly for their condition.

Hydraulic hose warranty is limited to faulty materials or manufacture and not due to chafing, abrasion, cuts or pinching while in work or damage to threads due to overtightening.

Only use genuine Spearhead replacement parts when replacing hydraulic hoses. Some hydraulic hoses are laser etched with its part number near the end fittings to aid the purchase of replacement spare parts when required.

3.7.3 Attachment Examples

The below figures give basic guidance with how to route hydraulic hoses between the Twiga reach arm and the specific reach arm attachment.

It is important to evaluate each reach arm and reach arm attachment combination separately using the guidance given throughout this section of the operators manual as well as the guidance given in the specific reach arm attachment operators manual.

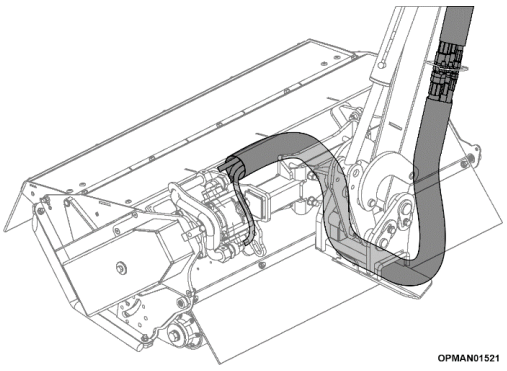

Figure 3.101
Powerdrive Flail Head
(1.2m, Belt Drive model shown)

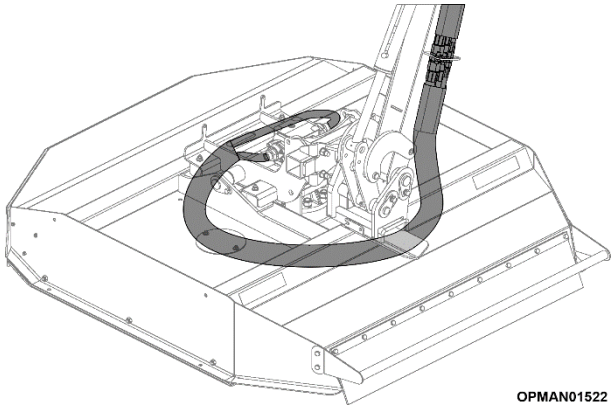

Figure 3.102
Rotary Head
(SP12 MD model shown)

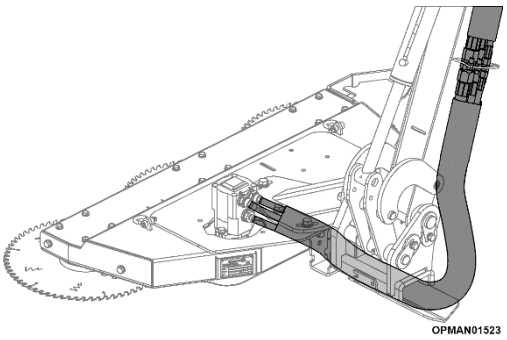

Figure 3.103
Sawblade
(SP15 Trisaw model shown)

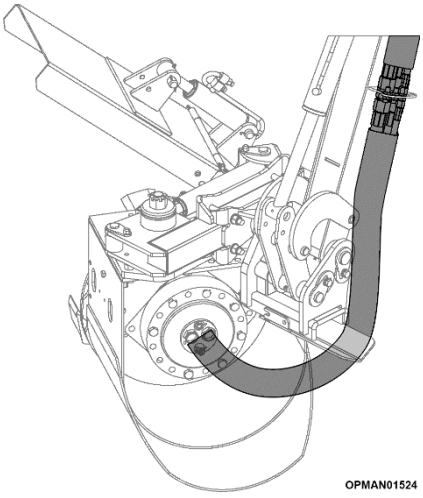

Figure 3.104
Ditch Cleaner

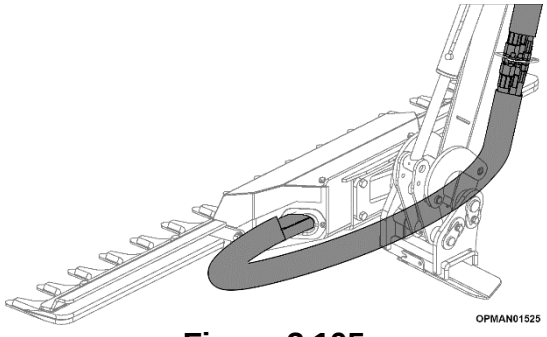

Figure 3.105
Cutterbar
(SP23 HD model shown)

3.8 Electrical Connections – Fitting

3.8.1 Flashing LED Lights Overview

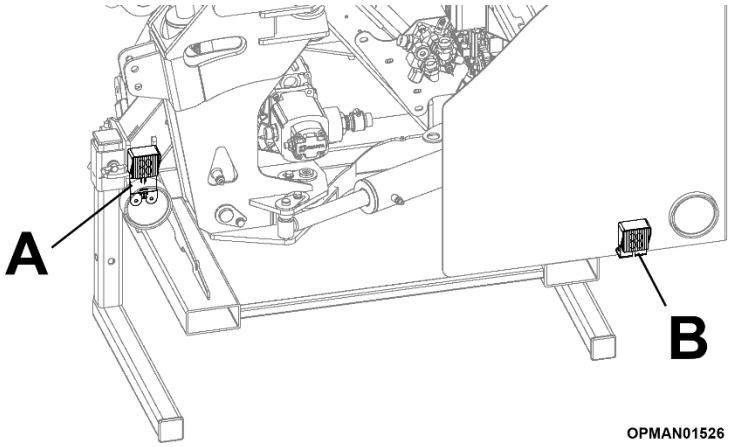

Figure 3.106
(Left-hand build model shown)

Flashing LED lights are available on Twiga Classic machines as part of the “Highway Kit” option offered by Spearhead Machinery aimed at machines destined to be used on roads in the presence of road users and public bystanders. With reference to Figure 3.106, these additional flashing LED lights are a pair of lights which are fitted behind the mainframe, near the slew post (A) and the rear of the oil tank (B). These flashing LED lights can be controlled to display a range of different flashing patterns to bystanders and road users.

Depending on if the Twiga Classic machines is fitted with the standard “Pilot” control system or “Minipilot” control system will determine how the lights are plugged into the power system and how they can be adjusted to relay different flashing patterns.

3.8.1.1 Pilot Control System

The flashing LED lights on the Twiga Classic Pilot control system uses a toggle button found behind the joystick to allow for the flashing LED lights to be switched on and off.

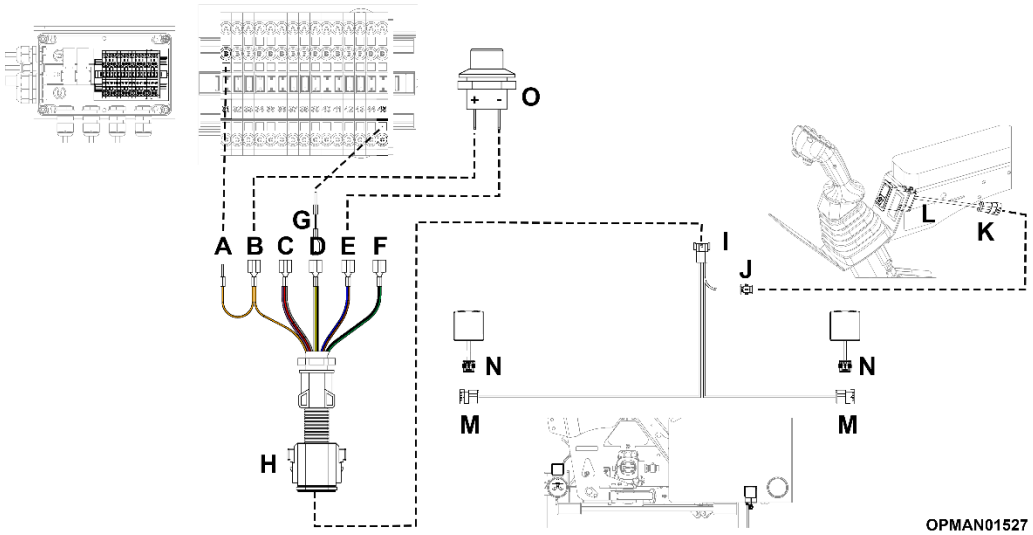

Figure 3.107 – Pilot Control System Flashing LED Lights Wiring

LETTER.	COLOUR/USE.	TERMINAL TYPE.	DESTINATION END 1.	DESTINATION END 2.
A	Orange	Boot Lace	Pin 31B in switchbox	-
B	Orange	Female Spade	Positive on button (O)	-
C	Purple/Red/Grey	Female Spade	Leave loose	-
D	White/Yellow/Black	Female Spade	Black cable (G)	-
E	Blue/Brown	Female Spade	Negative on button (O)	-
F	Black/Green	Female Spade	Leave loose	-
G	Black	Male Spade/Boot Lace	White/Yellow/Black cable (D)	Pin 45C in switchbox
H	See Letters A-F	8 way Male Deutsch	8 way Female Deutsch (I)	-
I	Black	8 way Female Deutsch	8 way Male Deutsch (H)	-
J	Black	3 way Female Superseal	3 way Male Superseal (K)	-
K	Black	3 way Male Superseal/ Britax Rocker Switch 2-pin plug	3 way Female Superseal (J)	Flashing LED Light Rocker Switch (L)
L	Flashing LED Light Rocker Switch	Britax Rocker Switch Socket	Britax Rocker Switch 2-pin plug (K)	-
M	Black	4 way Male Superseal	4 way Female Superseal (N)	-
N	Flashing Light Cluster	4 way Female Superseal	4 way Female Superseal (M)	-
O	Press Button	Spade +	Female Spade (B)	-
		Spade -	Female Spade (E)	-

Table 3.2 – Pilot Control System Flashing LED Lights Main Loom Wiring Uses

With reference to Figure 3.107 and Table 3.2, the flashing LED light loom on the pilot control system is connected to the 12 way male deutsch plug at one end which pass through the side of the junction box and connects to the junction box in two positions (A/D2) to gain a 12v power source and to the flashing pattern button (B/E) which allows for the flashing LED light pattern to be changed.

The “oil tank” side (J) output cable on the LED light loom outside of the junction box features a three way superseal (G) which needs to connected to the toggle switch located behind the joystick (H). This switch allows for the lights to be switched on and off.

3.8.1.2 Minipilot Control System

The Twiga Classic Minipilot control system uses a specific button found on top of the Minipilot control box to allow for the flashing LED lights to be switched on and off.

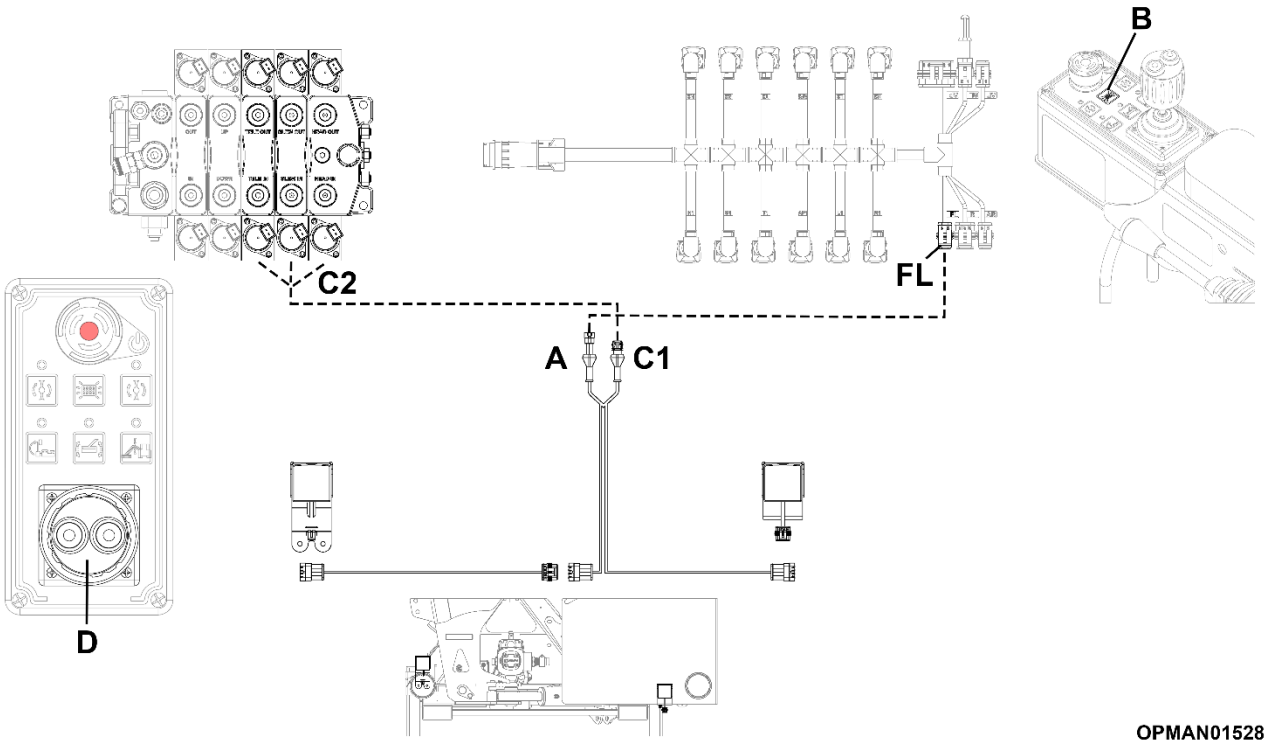

Figure 3.108 – Minipilot Control System Flashing LED Lights Wiring
(Five bank valve block machine shown)

With reference to Figure 3.108 the flashing LED lights on the Minipilot control system are connected to the loom via three way female superseal (A) into the three way male superseal marked FL (FL) on the main valve block wiring loom. The lights are able to switched on and off by using the flashing light on the Minipilot control box (B).

The flashing pattern of the LED lights can be changed by connecting the two way male junior power timer connector programming wire (C1) into one of the valve block bank electrical connections (C2).

3.8.1.3 Select one of the electrical connections on the various valve block banks (C2) and remove it, either:

- Slew In
- Slew Out
- Head In
- Head Out
- Tele In (telescopic models only)
- Tele Out (telescopic models only)

3.8.1.4 Connect the junior power timer connector programming wire (C1) into the removed valve block bank electrical connector (C2) as a replacement.

3.8.1.5 Switch on the Minipilot control box and press the flashing LED button (B) to switch on the flashing LED lights on the rear of the machine.

3.8.1.6 Operate the joystick in the same way as how the service would be operated in use with the removed valve block bank electrical connection. This will alter the flashing pattern of the LED lights.

See Section 4.2 for guidance on how to use the Minipilot joystick and control box assembly.

For example:
Junior power timer connector programming wire (C1) into the “Slew In” connection (C2):

- Press and hold right-hand button on the joystick and turn the joystick anticlockwise (for left-hand build Twiga Classic machines)
- Press and hold left-hand button on the joystick and turn the joystick anticlockwise (for right-hand build Twiga Classic machines)

3.8.1.7 Release and repeat this procedure to sequence through the various flashing patterns.

3.8.1.8 Once the required flashing pattern has been selected the flashing LED lights can be switched off on the Minipilot control box (B) and the control box can be switched off completely.

3.8.1.9 Disconnect the junior power timer connector programming wire (C1) and replace the previously removed valve block connector (C2).

3.8.2 Oil Cooler

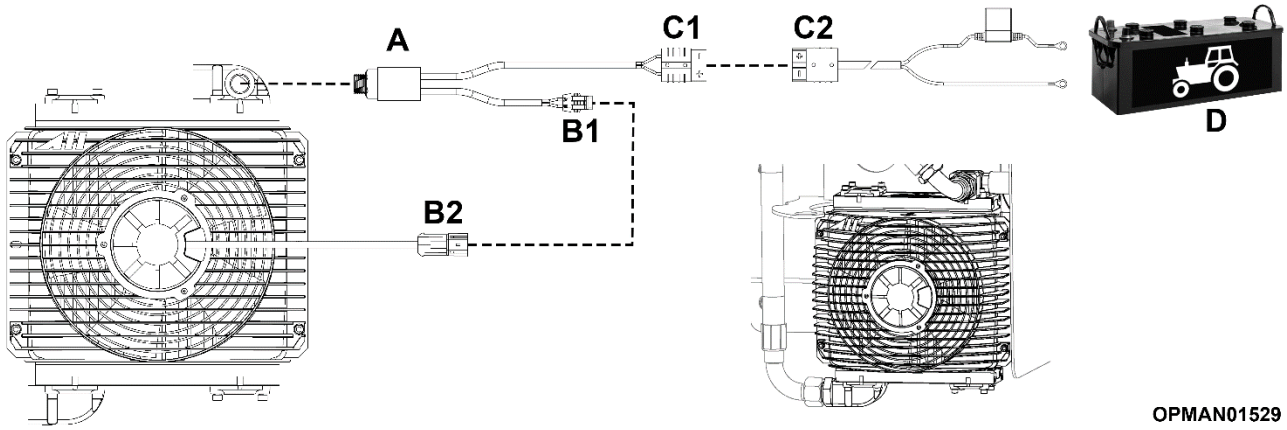

Figure 3.109 - Twiga Classic Oil Cooler Option

The Twiga Classic reach arm range can be fitted with an oil cooler for machines working in more demanding conditions. The oil cooler is fitted with a temperature sensor fitted in line and cools the oil before the oil returns to the tank.

The oil cooler runs off a 12 volt power supply direct from the tractors battery into the oil coolers thermostat relay. If the oil gets above 47°c, then the oil cooler electric fan engages to bring the oil down to below that temperature.

With reference to Figure 3.109, to fit the oil cooler:

3.8.2.1 Ensure that the oil cooler thermostat relay is firmly tightened on the oil cooler port (A).

3.8.2.2 Connect the male metri-pack two-way connector (B1) into the female metri-pack two-way connector lead coming from the oil cooler electric fan (B2).

3.8.2.3 Connect the oil coolers Anderson two-way plug (C1) into the battery leads Anderson two-way plug (C2).

3.8.2.4 Connect the positive and negative terminals onto the tractor battery (D).

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4 Machine Controls

4.1 Pilot

4.1.1 Pilot Controls Overview

The pilot low pressure hydraulic proportional control system is the standard fitment on Twiga Classic reach arms.

All functions of the working reach arm are controlled on the joystick. The main raising, lowering and in and out movements are directly hydraulically connected to the valve block giving strong feedback to the operator in use. Other movements of the reach arm (slew, head movement and tele/VFR (if applicable)) electrically control the pilot valve electric solenoids which then in tern hydraulically control the service on the given valve. This is due to the limited directions of movement which can be achieved with the joystick.

The start and stop of the attachment rotor is controlled via a cable control lever which is mounted on the side of armrest which is connected to the reach arms rotor control valve. This lever lets the operator change the attachment rotors operating direction and allows for a secure neutral, stopped position to be selected as well.

Secondary controls for optional features such as flashing LED lights on the reach arm are controlled by a pair of rocker switches found behind the joystick.

Figure 4.1

Visual work guidance is given by looking at the decal found in front of the joystick to aid its operation. Another decal is found on the side of the armrest bracket to give guidance on how to correctly operate the rotor control valve; see Figure 4.1.

4.1.2 Starting And Stopping The Machine

On Pilot control machines to allow for the movement of the reach arm requires the engagement of the tractors Power Take-off.

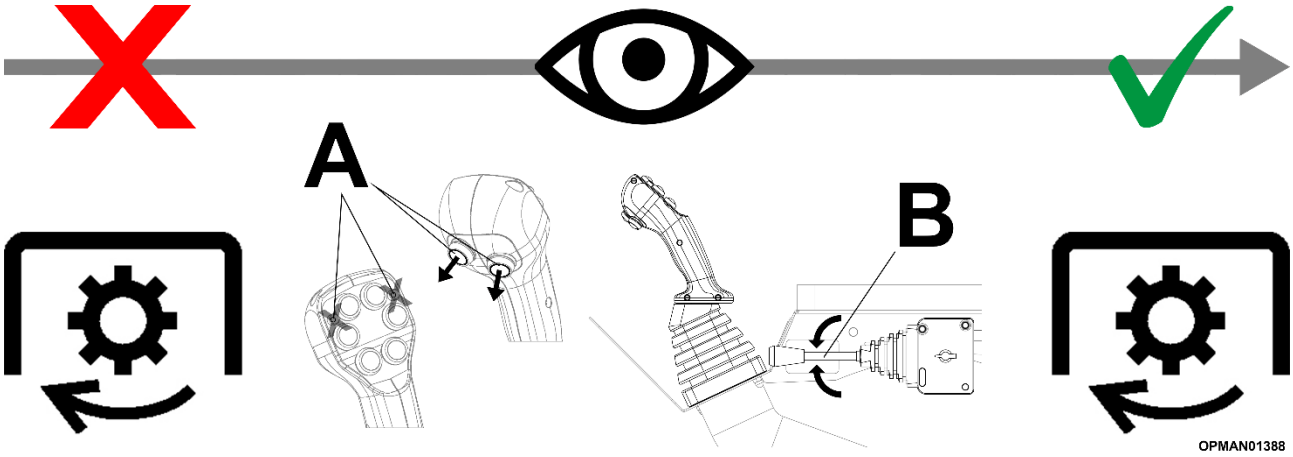


Figure 4.2

With reference to Figure 4.2, ensure that before engaging the tractor Power Take-off (PTO):

4.1.2.1 The joystick head float and arm float buttons are released, and the lights are not illuminated on the joystick face (A).

4.1.2.2 The rotor control lever is placed in its neutral position (B).

4.1.2.3 The joystick is not touched and is in its centered position.

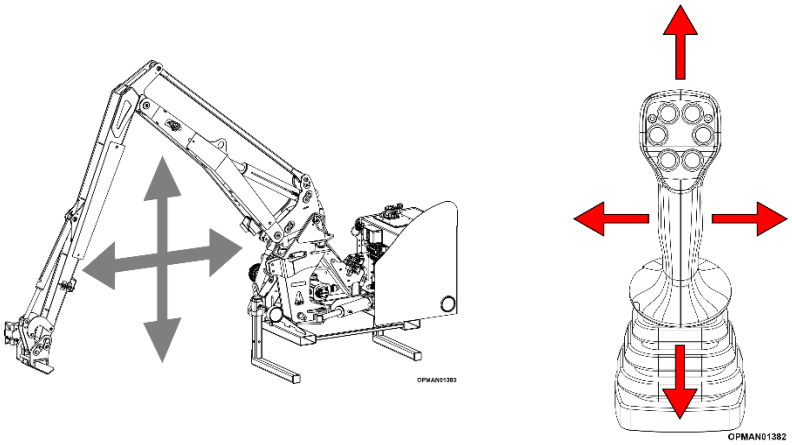
4.1.2.4 The tractor engine is idle.

When the PTO is engaged using the tractors controls the joystick which controls the positioning of the reach arm is then “live” and can be placed into work.

The reach arm attachment can be operated in both directions by either pulling up or pushing down on the rotor control lever.

4.1.3 Left-hand Build

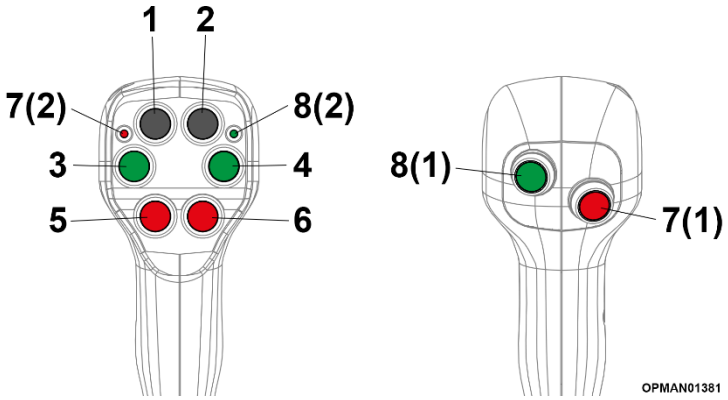
Joystick Movements



Forward	Arm Down
Backwards	Arm Up
Left	Arm Out
Right	Arm In

Figure 4.3

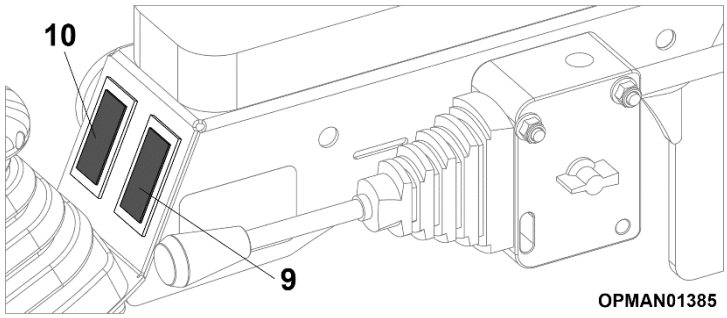
Joystick Buttons & Lights



1	Telescopic + VFR Arm Out
2	Telescopic + VFR Arm In
3	Slew Out
4	Slew In
5	Head Anticlockwise
6	Head Clockwise
7(1)	Arm Float
7(2)	Arm Float Light
8(1)	Head Float
8(2)	Head Float Light

Figure 4.4

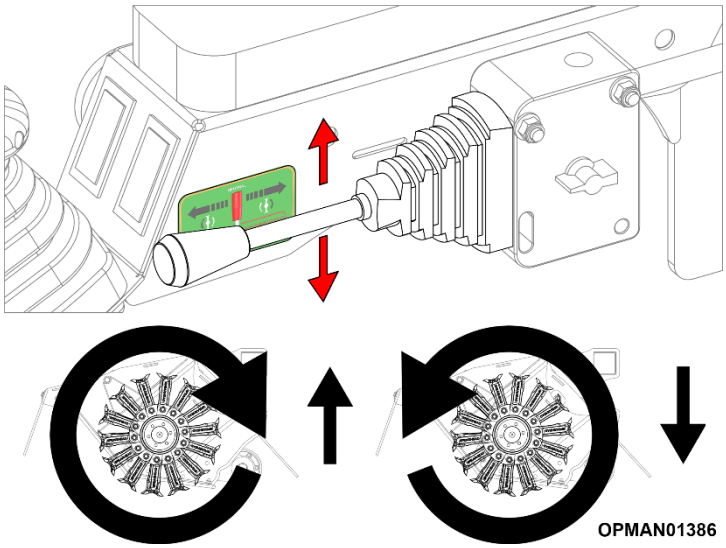
Secondary Rocker Switches



9	Flashing LED's on/off (option)
10	Spare

Figure 4.5

Rotor Reverse Movements



Up Down

Up Rotor direction 1

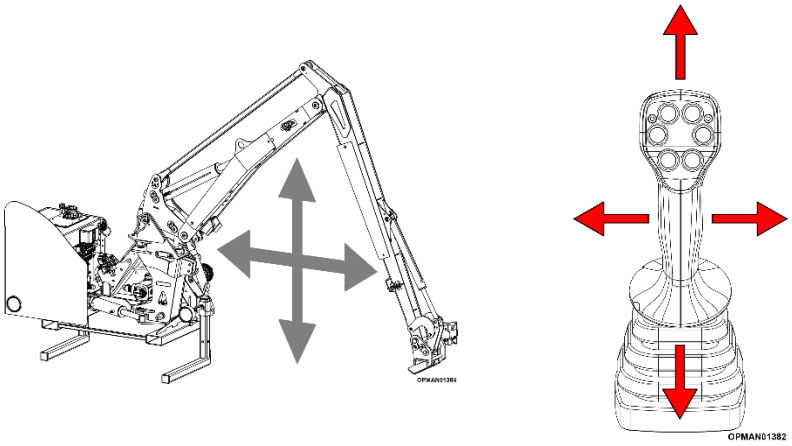
Neutral Stopped rotor

Down Rotor direction 2

Figure 4.6
(Powerdrive Flail head with T flails shown)

4.1.4 Right-hand Build

Joystick Movements



Forward Arm Down

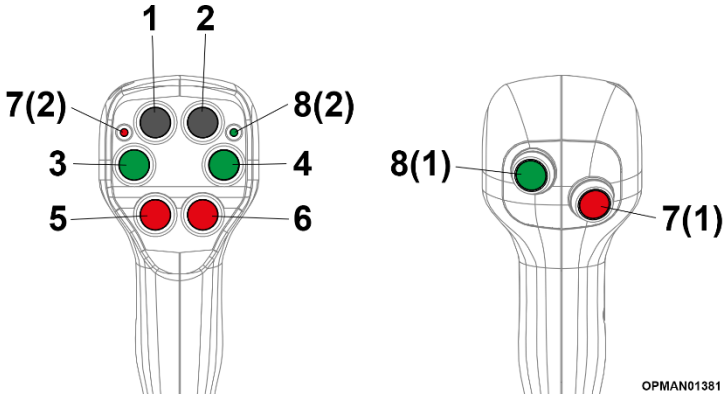
Backwards Arm Up

Left Arm In

Right Arm Out

Figure 4.7

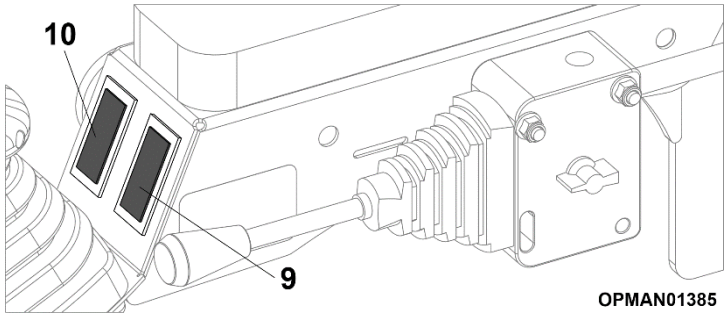
Joystick Buttons & Lights



1 Telescopic + VFR Arm In
2 Telescopic + VFR Arm Out
3 Slew In
4 Slew Out
5 Head Clockwise
6 Head Anti-clockwise
7(1) Arm Float
7(2) Arm Float Light
8(1) Head Float
8(2) Head Float Light

Figure 4.8

Secondary Rocker Switches

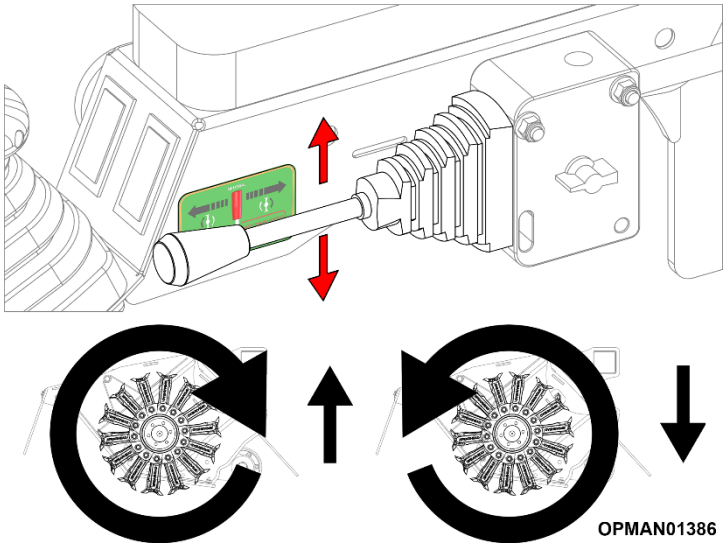


9 Flashing LED's on/off (option)

10 Spare

Figure 4.9

Rotor Reverse Movements



Up Down

Up Rotor direction 1

Neutral Stopped rotor

Down Rotor direction 2

Figure 4.10
(1.2m flail head with T flails shown)

4.2 Minipilot

4.2.1 Minipilot Controls Overview

The Minipilot electric control system is the optional fitment on Twiga Classic reach arms.

All functions of the working reach arm are controlled on the joystick control box assembly. The main raising, lowering and in and out movements are controlled on the joystick which is electrically connected to the pilot valve electric solenoids which then in tern hydraulically control the service on the given valve. Additional movements (if applicable) of the arm are given by holding one of the two buttons found on the top of the joystick.

Other operating features of the reach arm (flashing LED's (if fitted), auto-reset, head float and arm float (if fitted)) are controlled by using the control box keypad which is also electrically connected to the valve block of the machine. Indication as to whether the feature is being operated is shown by the light being illuminated above the specific button on the control box.

The start and stop of the attachment rotor is controlled via a cable control lever which is mounted on the side of armrest which is connected to the reach arms rotor control valve. This lever lets the operator change the attachment rotors operating direction and allows for a secure neutral, stopped position to be selected as well.

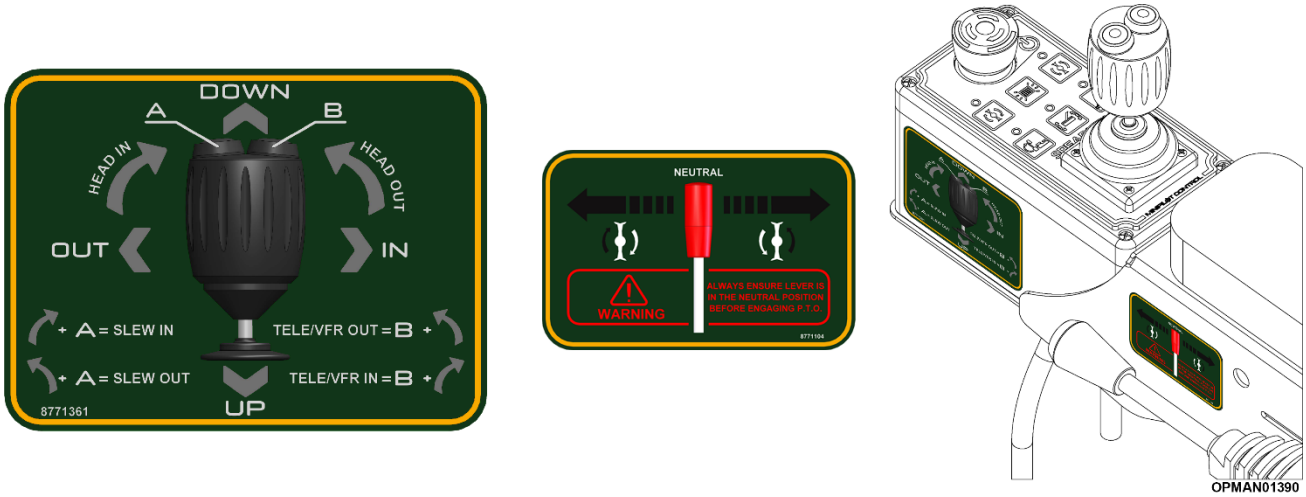


Figure 4.11

Visual work guidance is given by looking at the decal found on the side of the joystick control box to aid its operation. Another decal is found on the side of the armrest bracket to give guidance on how to correctly operate the rotor control valve; see Figure 4.11.

4.2.2 Starting And Stopping The Machine

On Minipilot control machines to allow for the movement of the reach arm requires the engagement of the tractors Power Take-off and for the joystick control box to be switched on.

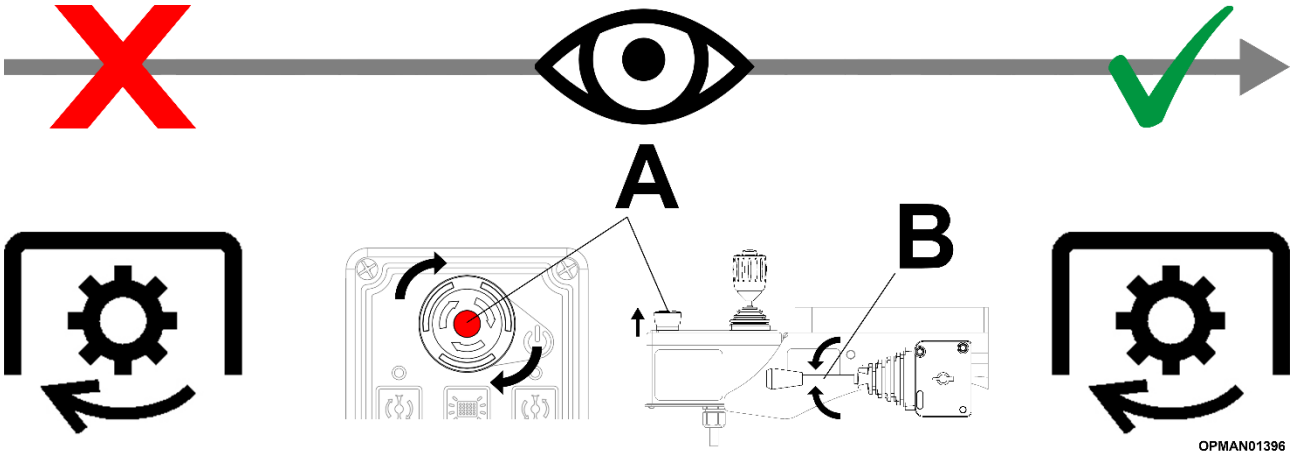


Figure 4.12

With reference to Figure 4.12, ensure that before engaging the tractor Power Take-off (PTO):

4.2.2.1 Switch on the power on the Minipilot joystick control box by rotating the red power/emergency stop button clockwise which will release it up. The centre of the button will illuminate red indicating that power is supplied to the system and is working.

4.2.2.2 The rotor control lever is placed in its neutral position (B).

4.2.2.3 Check the joystick buttons lights are not illuminated on the control box face.

4.2.2.4 The joystick is not touched and is in its centered position.

4.2.2.5 The tractor engine is idle.

When the PTO is engaged using the tractors controls the joystick which controls the positioning of the reach arm is then “live” and can be placed into work.

The reach arm attachment can be operated in both directions by either pulling up or pushing down on the rotor control lever.

4.2.3 Left-hand Build

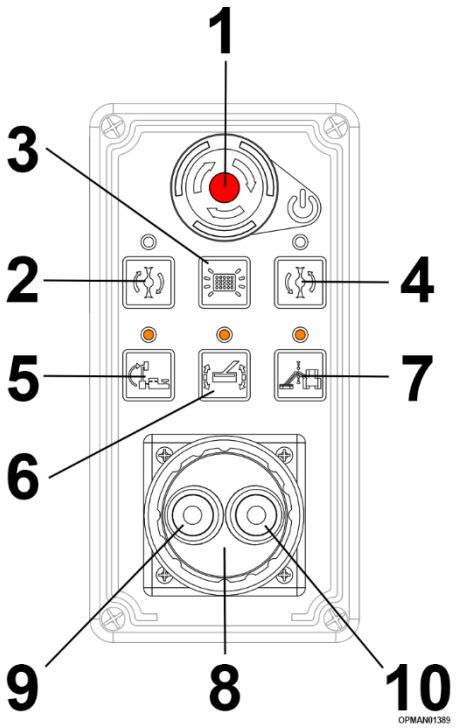


Figure 4.13

No.	Description.
1	Pull out main power on with combined push power off/emergency stop switch with twist to reset with red illuminating light.
2	Not used.
3	Flashing beacons.
4	Not used.
5	Not used.
6	Head float.
7	Arm float (if fitted)
8	Joystick with twisting function.
9	Left-hand control button to aid secondary functions.
10	Right-hand control button to aid secondary functions.

Combined Functions

8 Up	Arm down.
8 Down	Arm up.
8 Left	Arm out.
8 Right	Arm in.
9 + 8 Left	Arm slew out.
9 + 8 Right	Arm slew in.
10 + 8 Left	Telescopic arm/VFR out.
10 + 8 Right	Telescopic arm/VFR in.

4.2.4 Right-hand Build

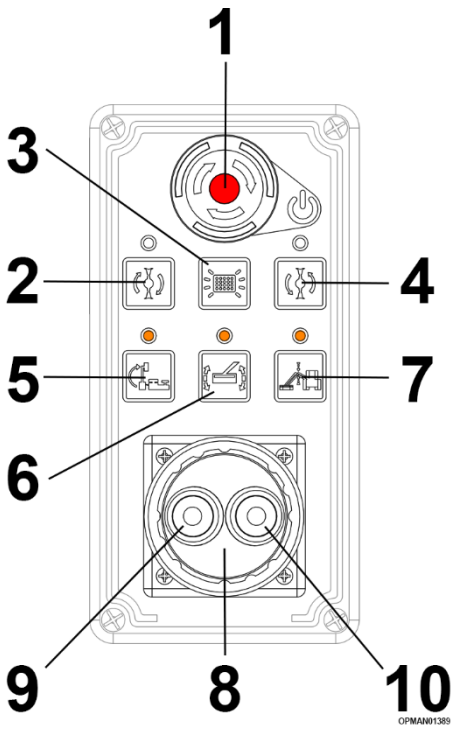


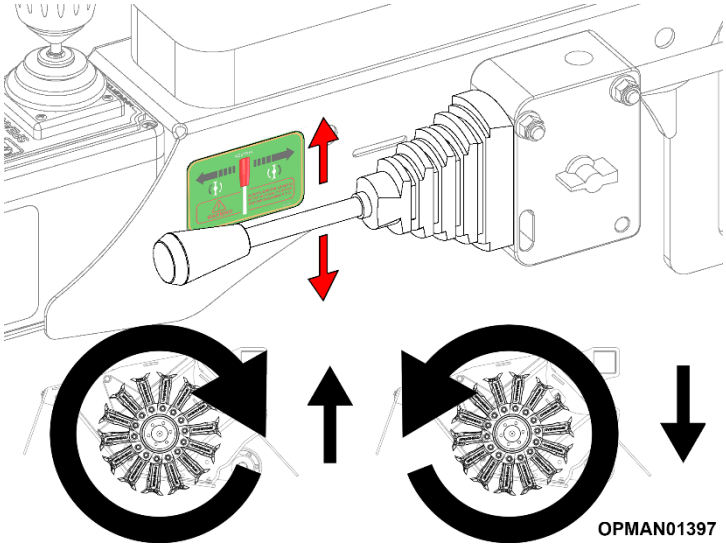
Figure 4.14

No.	Description.
1	Pull out main power on with combined push power off/emergency stop switch with twist to reset with red illuminating light.
2	Not used.
3	Flashing beacons.
4	Not used.
5	Not used.
6	Head float.
7	Arm float (if fitted)
8	Joystick with twisting function.
9	Left-hand control button to aid secondary functions.
10	Right-hand control button to aid secondary functions.

Combined Functions

8 Up	Arm down.
8 Down	Arm up.
8 Left	Arm in.
8 Right	Arm out.
9 + 8 Left	Arm slew in.
9 + 8 Right	Arm slew out.
10 + 8 Left	Telescopic arm/VFR in.
10 + 8 Right	Telescopic arm/VFR out.

4.2.5 Rotor Reverse Movements



Up Down

Up Rotor direction 1

Neutral Stopped rotor

Down Rotor direction 2

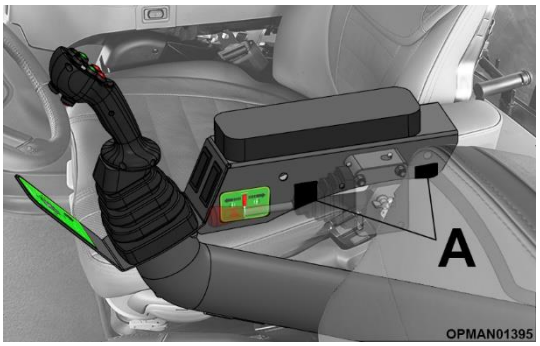
Figure 4.15
(1.2m flail head with T flails shown)

4.3 Control Fitting

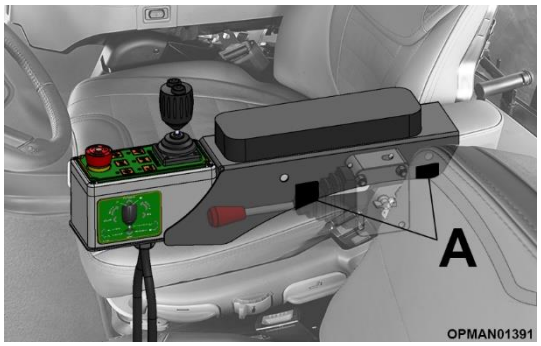
Twiga Classic reach arm machines come supplied with a control armrest bracket with a foam armrest pad.

The control armrest bracket can be fitted to the tractor in two different ways by either slipping over the existing armrest of the tractor or removing the armrest of the tractor seat and using a replacement armrest bracket in its place supplied by Spearhead Machinery.

4.3.1 Armrest Fitting - Using The Existing Tractor Seat Armrest



Pilot Control System

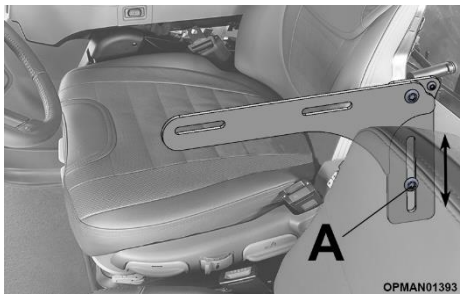


Minipilot Control System

Figure 4.16

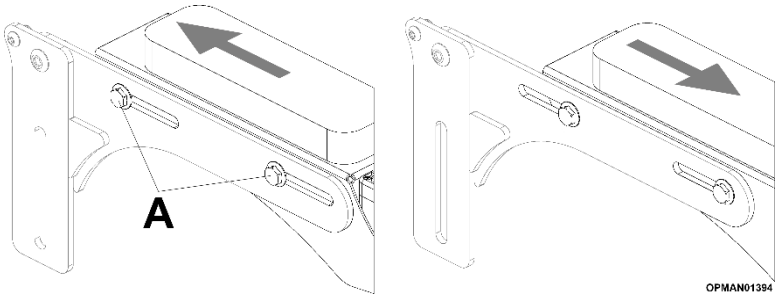
If the dimensions of the tractors seat armrest allow, the metal reach arm control armrest can be slid over the existing tractors seat armrest and secured in position using the two straps supplied with the assembly as shown in Figure 4.16 (A).

4.3.2 Armrest Fitting - Using The Twiga Classic Replacement Armrest



Armrest Bracket Only

Figure 4.17



Armrest Pushed Rearwards Armrest Pushed Forwards

Figure 4.18

If the dimensions of the tractors seat armrest do not allow or at the preference of the operator, the existing tractor seat armrest can be removed and replaced with the reach arm armrest bracket offered from Spearhead Machinery.

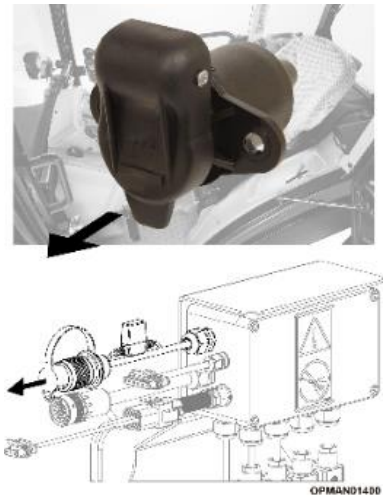
The supplied control armrest bracket is universal and can be adjusted vertically to the right position to suit the operator by loosening the side bolt and sliding the armrest bracket up and down; see Figure 4.17 (A). Retighten the bolt after to secure the position.

With reference to Figure 4.18, the armrest can be adjusted for by loosening the two side bolts (A) found on the inside of the armrest and sliding the armrest forwards or backwards can lengthen or shorten the operators reach to the joystick. Retighten the two bolts after to secure the position. The universal side mounting plate allows the armrest to mounted on either side of the plate making it compatible for left-hand and right-hand arm mounting and use.

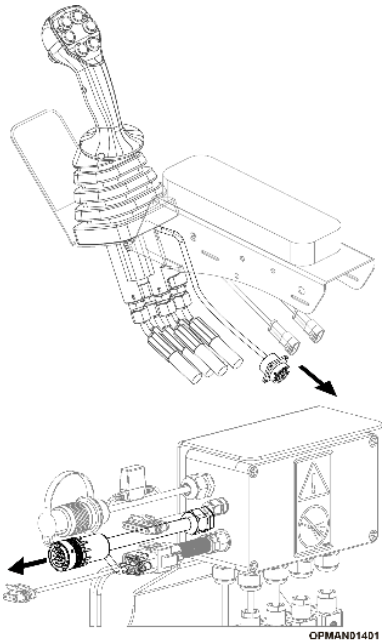
4.4 Connecting The Controls

4.4.1 Pilot Control Machines

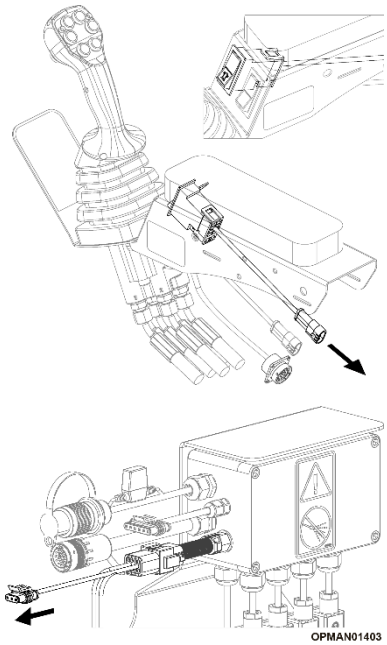
Rotor Control Fitting
Figure 4.19



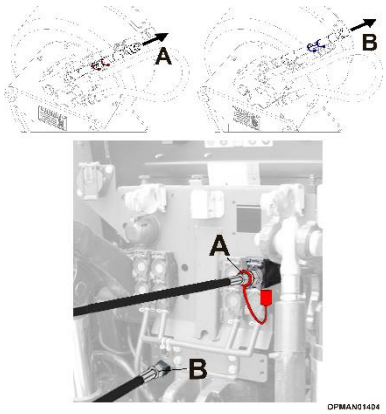
12v Tractor Power Supply
Figure 4.20



Joystick Control
Figure 4.21



Flashing LED's (option)
Figure 4.22



Debris Blower (option)
Figure 4.23

Narrow Lane Bracket (option)
Figure 4.24

Ensure the rotor control lever is mounted on the outside of the control armrest bracket using the two designated holes to secure it.

The control armrest assembly and its accompanying hydraulic hoses and electrical connections need to be placed through the rear window of the tractor.

Multiple connections then need to be made to allow the system to work correctly:

4.4.1.1 The electrical power cable from the control box needs to be plugged into the tractor 12v power supply found inside the cab; see Figure 4.20.

4.4.1.2 The joystick control cable is connected between the control box and the joystick assembly; see Figure 4.21.

4.4.1.3 If optioned, the flashing LED light cable leaving the control box needs to be connected to the correct secondary rocker switch found behind the joystick; see Figure 4.22.

4.4.1.4 If optioned, the debris blower hydraulic hoses need to be connected to the tractor.

- The pressure hydraulic hose needs to be connected to a hydraulic spool of the tractor; see Figure 4.23 (A). This hose features a red tag and features a quick-release coupling.
- The return hydraulic hose needs to be connected to an unrestricted free-flow hydraulic return on the tractor; see Figure 4.23 (B). This hose features a blue tag and features no coupling. The debris blower does not come equipped with a fitting adaptor to fit to the tractor. This needs to be provided by the operator.

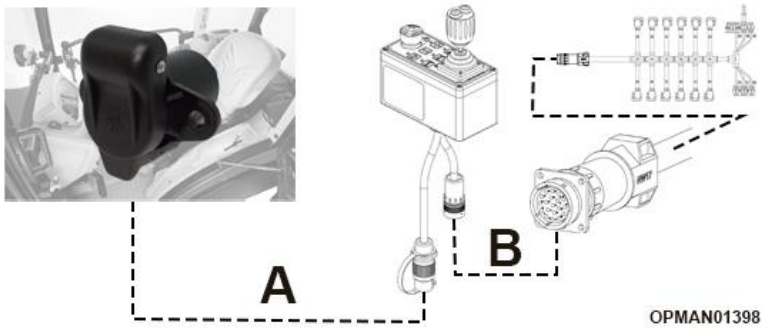
4.4.1.5 If optioned, the narrow lane hydraulic hoses need to be connected to a pair of free hydraulic spools on the rear of the tractor; see Figure 4.24.

4.4.1.6 Inspect to see if any other hydraulic or electrical control connections are required to be made depending on the reach arm attachment specification by consulting the reach arm attachment operators manual.

4.4.2 Minipilot Control Machines

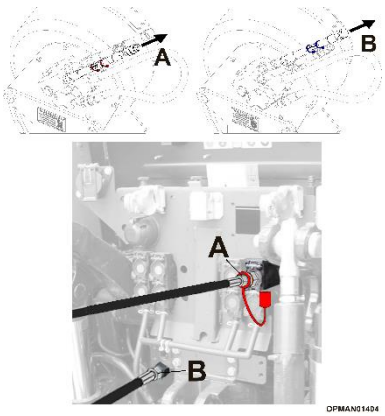
Rotor Control Fitting

Figure 4.25



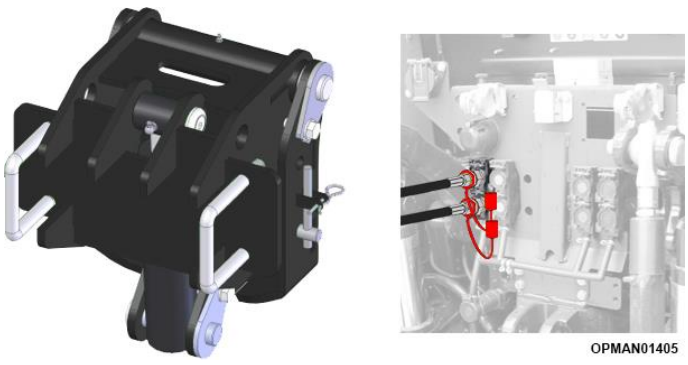
12v Tractor Power Supply and Joystick Control

Figure 4.26



Debris Blower (option)

Figure 4.27



Narrow Lane Bracket (option)

Figure 4.28

The control armrest assembly and its accompanying electrical connections need to be placed through the rear window of the tractor.

Ensure the rotor control lever is mounted on the outside of the control armrest bracket using the two designated holes to secure it.

The control armrest assembly and its accompanying hydraulic hoses and electrical connections need to be placed through the rear window of the tractor.

Multiple connections then need to be made to allow the system to work correctly:

4.4.2.1 The electrical power cable from the Minipilot control box needs to be plugged into the tractor 12v power supply found inside the cab; see Figure 4.25 (A).

4.4.2.2 The joystick control cable is connected between the Minipilot control box and the valve block loom; see Figure 4.25 (B).

4.4.2.3 Check the specification of the reach arm attachment. The attachment may require additional connections to be made directly to the reach arm or tractor before commencing operation. An example may be hydraulic hose connections for a hydraulic rear roller on a flail head.

4.4.2.4 If optioned, the debris blower hydraulic hoses need to be connected to the tractor.

- The pressure hydraulic hose needs to be connected to a hydraulic spool of the tractor; see Figure 4.26 (A). This hose features a red tag and features a quick-release coupling.
- The return hydraulic hose needs to be connected to an unrestricted free-flow hydraulic return on the tractor; see Figure 4.26 (B). This hose features a blue tag and features no coupling. The debris blower does not come equipped with a fitting adaptor to fit to the tractor. This needs to be provided by the operator.

4.4.2.5 If optioned, the narrow lane hydraulic hoses need to be connected to a pair of free hydraulic spools on the rear of the tractor; see Figure 4.27.

4.4.2.6 Inspect to see if any other hydraulic or electrical control connections are required to be made depending on the reach arm attachment specification by consulting the reach arm attachment operators manual.

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5 Machine Requirements

5.1 Operator Requirements

IMPORTANT: Read, understand and follow the safety messages stated throughout this section and the rest of this operator's manual. Serious injury or death may occur unless care is taken to follow the warnings.

Safe operation of the Twiga reach arm machine is down to the responsibility of the qualified operator. A qualified operator has thoroughly read and understood the machine, attachment and attaching tractor operator's manuals and is experienced in the correct and safe operation of all machines and all associated safety guidance. In addition to the safety information contained in this manual, warning and operational decals are fixed around the machine; see Section 2.14.2. The attachment and connecting tractor will also have them as well with information given in their respective operator's manual.

If any part of the operation safe use of the machine is not completely understood, consult a local Spearhead dealer or Spearhead for complete explanation.

If the operator cannot read the manuals for themselves or does not completely understand the operation of the equipment, it is the responsibility of the supervisor to read and explain the manuals, safety practices and operating instructions to the operator.

Personal Protection Equipment (PPE)

See Figure 5.1

- Always wear safety glasses
- Hard hat
- Steel toe safety footwear
- Gloves
- Hearing protection
- Close fitting clothing
- Respiration or filter mask (depending on working conditions)

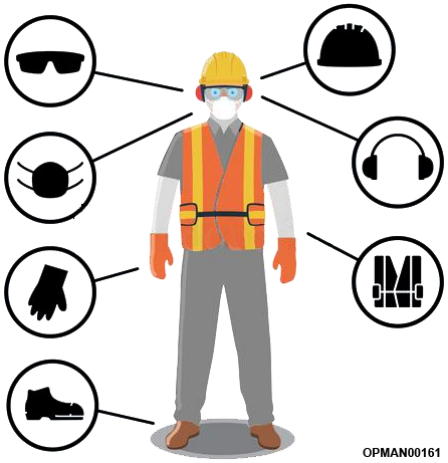


Figure 5.1 - PPE Items

DANGER! Do not use drugs or alcohol immediately before or while operating the tractor and machine. Drugs and alcohol will affect an operator's alertness and concentration and ability to operate the collective machinery safely.

Before operating the tractor and machine, a machine operator on prescription or over-the-counter medication must consult a medical professional regarding any side effects of the medication that would hinder their ability to operate the equipment safely.

Supervisors must **never** allow anyone to operate the collective machinery when it is known that their alertness or coordination is impaired. Serious injury or death could occur to the operator and/or bystanders if the operator is under the influence of drugs or alcohol.

Figure 5.2 – Do Not Use Drugs Or Alcohol

5.2 Tractor Requirements

The tractor used to operate the machine must have sufficient capacity to lift, pull and operate the Power Take Off (PTO) at the machines rated speed (540 rpm) while travelling at a working ground speed for the conditions and quantity of material of the work site. Operating the machine with a tractor which does not meet the requirements set by Spearhead may cause the tractor and/or machine damage, potentially risking danger to the operator and bystanders.

The working tractor **MUST** effectively offer the following characteristics to fit any of the Twiga reach arm machines.

Tractor Requirement (1)	**Machine**				
	S55	**S60**	**VFR55**	**VFR60**	**T65**
Driver Protection	Approved cab (for country of use) with protective structure or Roll Over Protection Structure (ROPS) and seat belt. See local tractor standards (2)				
Safety Devices	Slow Moving (SMV) emblem, lighting, PTO master shield. See local tractor standards (3)				
Horsepower Requirement	80hp/60kW (4)	80hp/60kW (4)	80hp/60kW (4)	80hp/60kW (4)	80hp/60kW (4)
Minimum Tractor Weight	3500kg (7717lbs)	3750kg (8268lbs)	3750kg (8268lbs)	4000kg (8819lbs)	4250kg (9370lbs)
Attachment	Rear mount CAT 2 three-point linkage				
Hydraulic	3 double acting hydraulic spool valves				
Electrical	12 volt power supply through Durite 3 Pin Plastic Non-Reversable Socket for power to the joystick 12 volt battery power supply to oil cooler (if fitted)				
Front/Rear End Weights	Required in order to maintain the 20% weight required on the front or rear axle (5)				
Power Take Off (PTO)	540 RPM 1” 3/8 6-spline; see Section 1.5.1				

Table 5.1 - Tractor Requirements and Capabilities

Notes:

(1) Spearhead constantly reviews and improves product designs and reserve the right to change this information. Contact your Spearhead Sales representative if you have any queries.

(2) The tractor must be fitted with a locally approved cab or Roll Over Protection Structure (ROPS) and have a seat belt to protect the operator from falling from the tractor or during a rolling over incident. Only operate the tractor when seated in the operator’s seat with the seat belt securely fastened.

(3) All guarding must be maintained to perfect working condition. Always replace shields and guards that were removed for access to service or repair the tractor or machine. Never operate machine/tractor without all safety devices in position.

(4) Variations in power requirement can depend on the vegetation to be cut, terrain condition, operator experience and the physical condition of the machine and/or tractor. Running a machine on an overly large tractor may cause damage through overpowering the machine in heavy working conditions.

(5) Front end weight is critical to maintain steering control and prevent the tractor from rearing up. Front weight and weight carriers can be purchased through an authorized tractor dealership.

6 Setting Up The Machine

6.1 Unfolding The Machine

NOTE this section of procedures is illustrated showing a left-hand build, standard arm machine being folded out into work position. On right-hand build machines some of these procedures may be mirrored. It is important to thoroughly read Sections 4.1 and 4.2 to gain full clarity of the correct button and joystick operations to safely operate and move the reach arm and attachment into the correct work position before being beginning work.

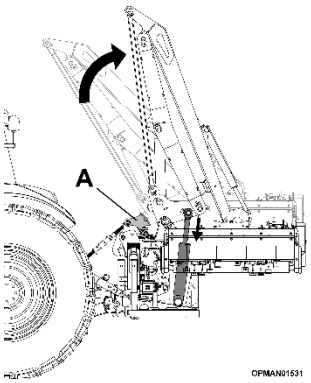


Figure 6.1
(left-hand build machine shown)

6.1.1.1 Ensuring the joystick is correctly connected and live, safely start the tractor and engage the tractors PTO at idle RPM.

6.1.1.2 Gently push down on the joystick to raise the main arm sufficiently off the flip over bracket; see Figure 6.1 (A).

6.1.1.3 Safely disengage the PTO, switch off the joystick and stop the tractor.

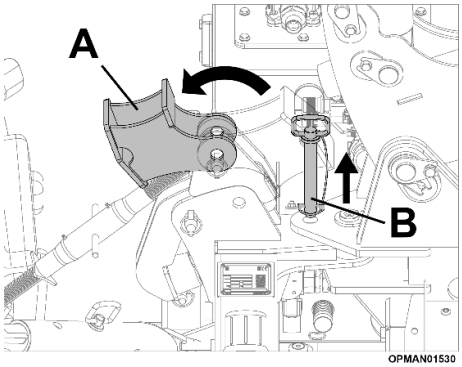


Figure 6.2

6.1.1.4 Leave the tractor and turn over the “flip over” bracket; see Figure 6.1 (A) and remove the slew locking pin (B) and safely keep it.

6.1.1.5 Return to the tractor and safely start the tractor and engage the tractors PTO at idle RPM.

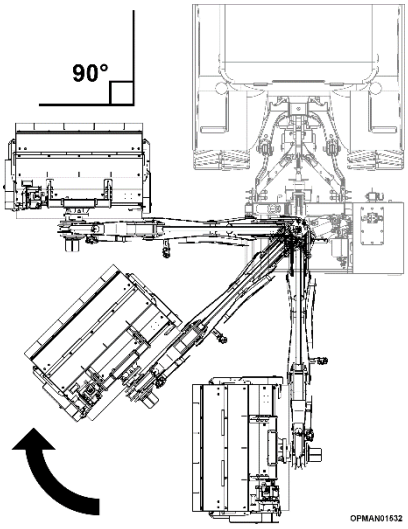


Figure 6.3
(left-hand build machine shown)

6.1.1.6 Use the “slew out” joystick control button to operate the slew hydraulic ram to rotate the reach arm into “work position”.

Adjustments may be required using the joystick to “push out” the arm and attachment in order for the attachment to clear the inside tractor tyre and ground when the arm is being slewed and placed into the work position.

6.1.1.7 Safely disengage the PTO, switch off the joystick and stop the tractor.

6.1.1.8 Leave the tractor and inspect to see the reach arm is folded out and parallel with the rear of the tractor. If the machine is either too far forward or rearward, safely slew the machine back into “transport” position and adjust the slew limit bolt as shown in Section 6.2 to bring the reach arm into the correct position.

6.2 Adjusting The Slew Stop

A slew stop bolt is found on the mainframe of the machine to limit the slewing distance of the reach arm slew post when its folded from transport position into work position to make the reach arm parallel with the rear of the tractor. The reach arm should be slewed to a parallel position with the rear of the tractor to ensure that the attachment works “square on” with the direction of travel.

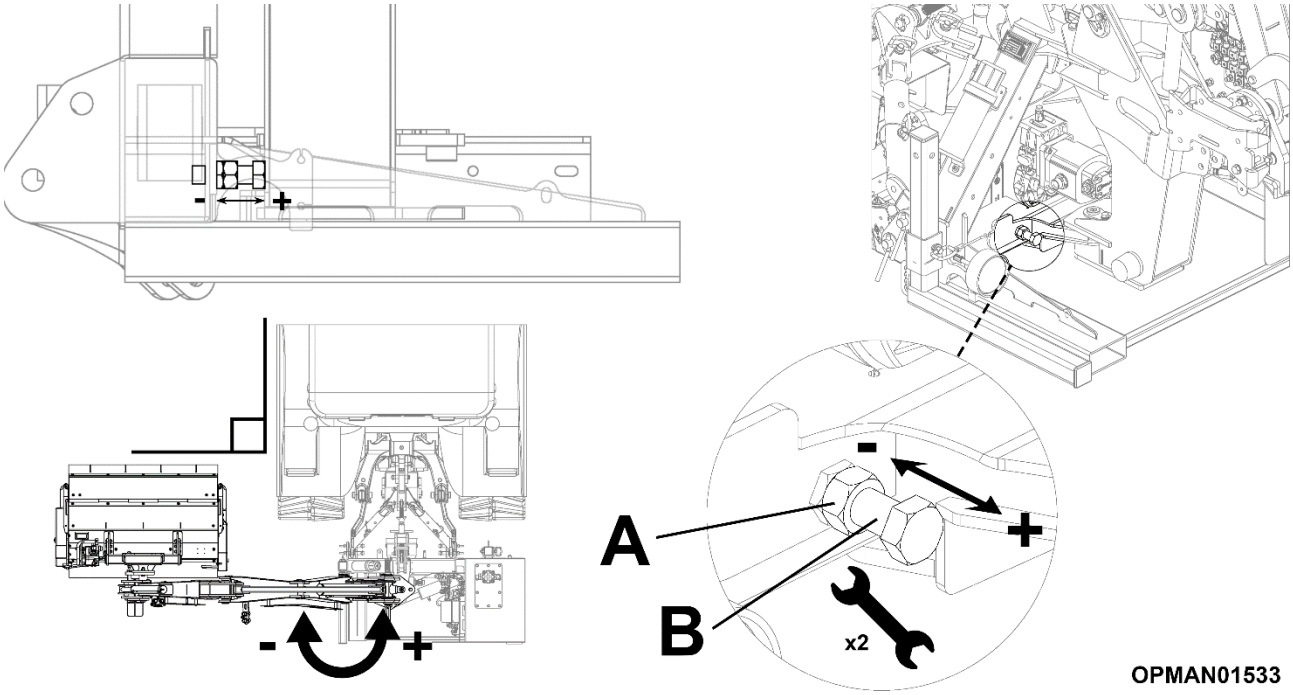


Figure 6.4
Slew Stop Adjustment

With reference to Figure 6.4, to adjust the slew stop:

6.2.1.1 Safely start the tractor, switch on the joystick and engage the tractors PTO at idle RPM and using the joystick controls slew the reach arm into transport position.

6.2.1.2 Safely disengage the PTO, switch off the joystick and stop the tractor.

6.2.1.3 Loosen the slew stop locking nut (A).

6.2.1.4 Turn the adjustment bolt (B) clockwise to rotate the reach arm further (clockwise direction) in work position or anti-clockwise to move the reach arm further away (anti-clockwise direction).

6.2.1.5 Tighten the slew stop locking nut (A) to secure the adjustment bolt (B) in position.

6.2.1.6 Return to the tractor and safely start the engine. Engage the PTO at idle RPM and slew the reach arm into work position.

6.2.1.7 Safely disengage the PTO, switch off the joystick and stop the tractor.

6.2.1.8 Leave the tractor and inspect the position of the reach arm and attachment.

If the reach arm is rotated too far or too little, repeat the process again and adjust the slew stop bolt.

6.3 Folding The Machine

NOTE this section of procedures is illustrated showing a left-hand build, standard arm machine being folded into transport position. On right-hand build machines some of these procedures may be mirrored. It is important to thoroughly read Sections 4.1 and 4.2 to gain full clarity of the correct button and joystick operations to safely operate and move the reach arm and attachment into the correct transport position before beginning work.

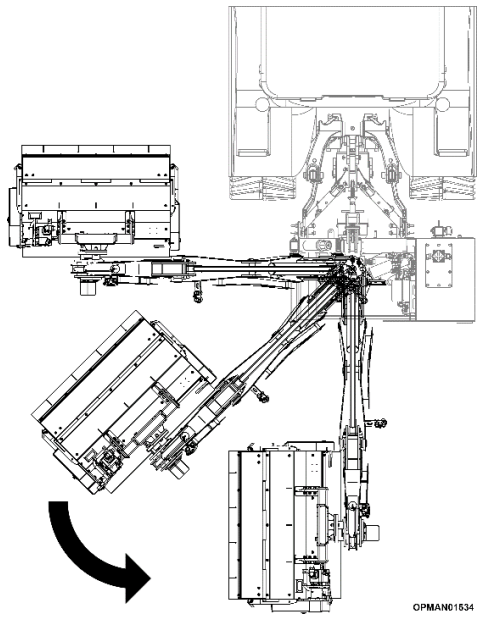


Figure 6.5
(left-hand build machine shown)

6.3.1.1 Ensuring the joystick correctly connected and live, safely start the tractor and engage the tractors PTO at idle RPM.

6.3.1.2 Ensuring the reach arm attachment is completely stopped, use the “slew in” joystick control button to operate the slew hydraulic ram to rotate the reach arm into “transport position”.

Adjustments may be required using the joystick to “bring in” the arm and attachment in order for the attachment to clear the inside tractor tyre and ground when the arm is being slewed and placed into the transport position.

6.3.1.3 Safely disengage the PTO, switch off the joystick and stop the tractor.

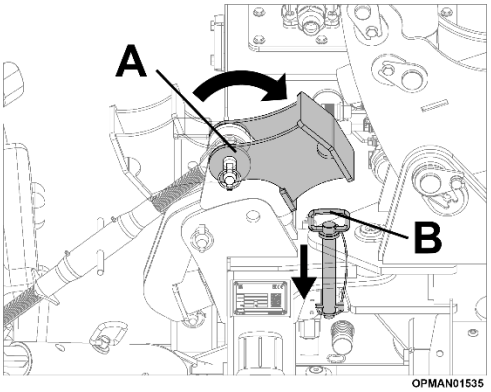


Figure 6.6

6.3.1.4 Leave the tractor and turn over the “flip over” bracket; see Figure 6.6 (A) and fit the slew locking pin (B) through the slot in the slew post and through the mainframe.

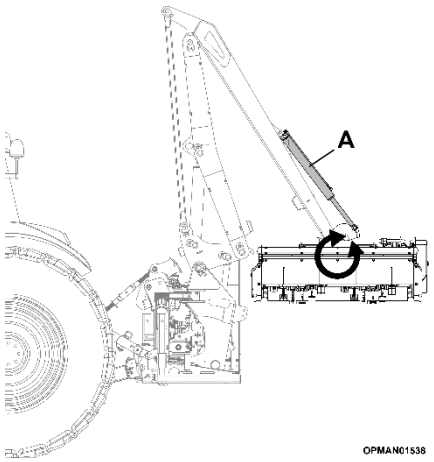


Figure 6.7
(left-hand build machine shown)

6.3.1.5 Return to the tractor and safely start the tractor and engage the tractors PTO at idle RPM.

6.3.1.6 Adjust the position of the reach arm attachment so its put into a compact and safe position for transport by operating the dipper ram (A).

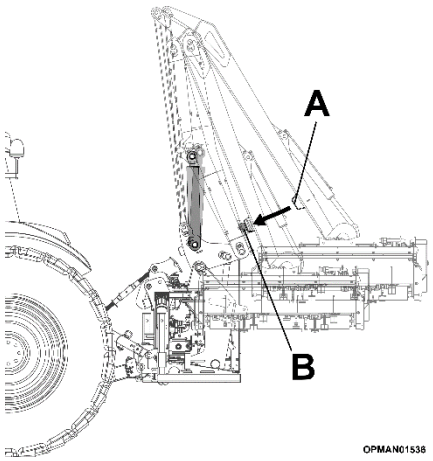


Figure 6.8
(left-hand build machine shown)

6.3.1.7 With reference to Figure 6.8, use the joystick to pull the dipper arm against the main arm.

The dipper arm features a folded plate (A) on its underside, which will come in contact with the rubber bump stop found on underside of the main arm (B) when the arm is fully closed.

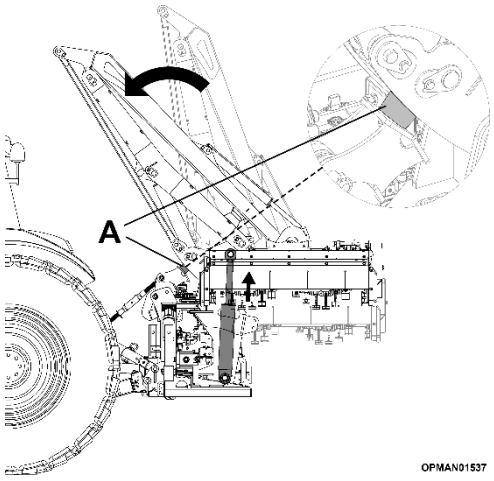


Figure 6.9
(left-hand build machine shown)

6.3.1.8 With reference to Figure 6.9, aim to lower the main arm against the flip over bracket.

6.3.1.9 Inspect and judge how the reach arm will move back to ensure that the reach arm will not hit the cab of the tractor when the main arm is leant onto the flip over bracket.

If there is potential, adjust the lower linkage of the tractor to ensure that it will clear and remain safe. Remember to consider the movement of the reach arm whilst it is being transported by the tractor.

6.3.1.10 If everything is correct, gently pull back on the joystick to lower the bump stop found on the main arm onto the flip over bracket; see Figure 6.9 (A).

6.3.1.11 Safely disengage the PTO, switch off the joystick and proceed to move the tractor as required.

7 Using The Machine

7.1 Starting And Stopping The PTO

Only operate the machine from the tractor operator's seat with the seatbelt securely fastened. The tractor must be equipped with a ROPS cab.

DANGER! Do not let the anyone stand in between the tractor and reach arm whilst the tractor engine and PTO is running. Serious chance of entanglement, crushing and death may occur.

DANGER! Stop the PTO when the machine is not being operated. Twiga Classic reach arm machines can be left with the PTO being driven without the reach arm attachment working without the attachment working. Ensure the machine is completely stopped when the operator is not sat on the tractor's seat.

WARNING! Do not let the attachment cutting blades/flail turn when the reach arm is raised when not working in material for any reason; including clearance or for turning. Raising the reach arm exposes the attachments cutting blades/flails which creates a potentially serious hazard and could cause serious injury or even death from objects thrown from the machine.

WARNING! Do not put hands or feet anywhere near the operating machine. Blade contact can result in serious injury or even death. Stay away until all motion has stopped and the decks are securely blocked up.

As standard, Spearhead's Twiga Classic reach arm range use a dedicated stand alone oil tank with a tractor PTO driven oil pump to provide oil to allow of the hydraulic rams and attachment to operate.

To operate and control these features require the use of the machine joysticks and accompanying controls. The Twiga Classic range of machines can be optioned with either the Pilot or Minipilot control systems and there are some slightly different operating requirements in order to safely start and stop the PTO of the tractor before operating the hedge cutter.

The below sections give guidance on how to safely start and stop the PTO.

Pilot

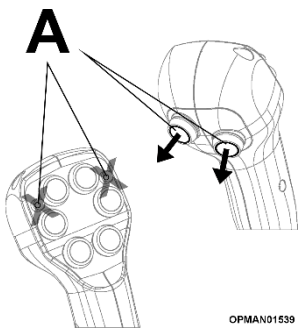


Figure 7.1

Minipilot

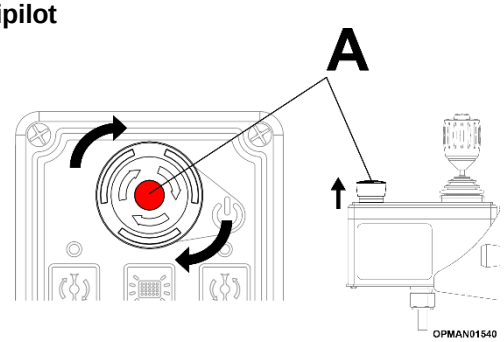


Figure 7.2

To start the Power Take-off (PTO):

7.1.1.1 Pilot control machines:
Ensure the joystick head float and arm float buttons are released, and the lights are not illuminated on the joystick face; see Figure 7.1 (A).

Minipilot control machines:
Switch on the power on the Minipilot joystick control box by rotating the red power/emergency stop button clockwise which will release it up; see Figure 7.2 (A). The centre of the button will illuminate red indicating that power is supplied to the system and is working.

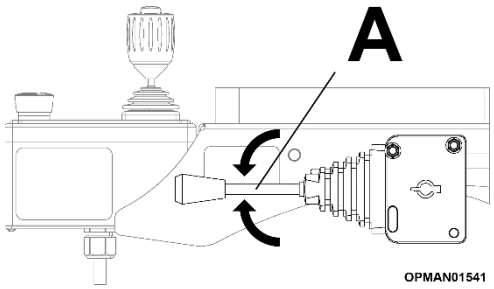


Figure 7.3
(Minipilot control system shown)

7.1.1.2 Ensure the rotor control lever found on the side of the armrest is placed in its neutral position; see Figure 7.3 (A).

7.1.1.3 The joystick is not touched and is in its centered position.

7.1.1.4 The tractor engine is at idle.

7.1.1.5 Press the tractor control button to engage the PTO.

IMPORTANT: If you hear unusual noises or see or feel abnormal vibrations, disengage the PTO immediately. Inspect the reach arm and tractor to determine the cause of the noise or vibration and repair the abnormality before proceeding to use the machine or attachment.

Allow the machine to idle for at least 15 minutes to let the hydraulic oil come up to correct operating temperature.

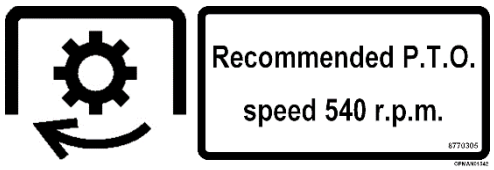


Figure 7.4

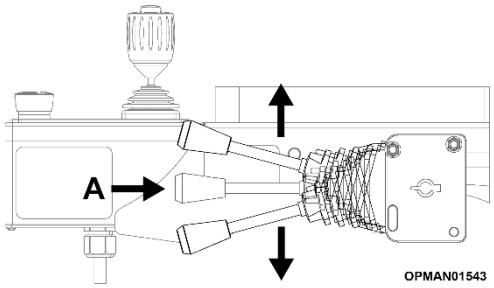


Figure 7.5

7.1.1.6 Once up to temperature the reach arm hydraulic controls can now be operated and the reach arm and attachment can be moved as required.

The rate at which the reach arm moves will be slower than “at work” speed as the hydraulic valve is designed to be operated at the full 540 rpm PTO speed recommended for the machine and the attachment.

7.1.1.7 After safely assessing the work environment following the guidance given in Section 2.7 and placed the reach arm in a suitable position, pull up or push down the rotor control lever found on the side of the armrest to start the rotor on the reach arm attachment; see Figure 7.5.

7.1.1.8 Evaluate to see the reach arm attachment is operating the correct direction and let the machine come up to speed.

If the direction is incorrect. Place the rotor control lever back into the central neutral position; see Figure 7.5 (A) and allow the reach arm attachment come to a complete stop.

Place the rotor control lever in the opposite direction and let the machine come up to a constant speed.

7.1.1.9 Bring the machine up to correct operating speed; 540 rpm.

7.1.2 Disengaging the Power Take-off (PTO)

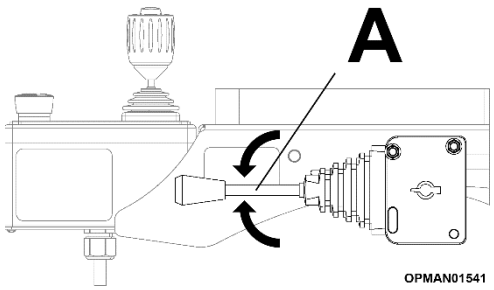


Figure 7.6

To shut down the machine:

7.1.2.1 Bring the tractor RPM gently down to idle.

IMPORTANT: Do not engage or disengage the machine at a high RPM unless there is an emergency situation.

7.1.2.2 Place the rotor control lever into the central neutral position; see Figure 7.6 (A) and allow the reach arm attachment come to a complete stop.

7.1.2.3 Press the tractor control button to disengage the PTO.

7.1.3 Forward & Power Take-off Speed

Once the power take-off has been engaged following the guidance given in Section 7.1, start off driving at a slow speed and gradually increase while maintaining complete control of the tractor.

Moving slowly at first will prevent the tractor from rearing up and loss of steering control. The tractor should never be operated at speeds that cannot be safely handled or which will prevent the operator from stopping quickly during an emergency. If the power steering or engine ceases operating, stop the tractor immediately as the tractor will be difficult to control.

Spearhead's range of reach arm attachments are designed to cut a range of material in a wide range of applications and working environments. Travel at a speed that allows the attachment sufficient time to cut through the vegetation and maintain its operating speed to prevent overloading the attachment.

Speed for cutting will dependent upon the reach arm attachment and the application, type, and density of the material to be cut. Read the specific reach arm attachment operators manual for complete cutting and operation guidance. Always operate the reach arm and attachment at its full rated PTO speed (540 rpm), to maintain correct operation of the reach arm and cutting rotor speed for the reach arm attachment. See the front of the mainframe of the machine for a guidance decal on the rated required operating speed for the machine.

Figure 7.7 – Tractor Driving Guidance

Refer to the tractor operator's manual or the tractor instrument panel for the engine speed and gear to provide the required PTO and desired ground speed. Make sure that the machine is operating at its full rated speed before entering the reach arm attachment into the vegetation to be cut. If it becomes necessary to temporarily regulate engine speed, increase or decrease the throttle gradually.

WARNING! Do not exceed the rated PTO speed for the machine. Excessive PTO speed can cause hydraulic system or attachment failures resulting in serious injury or death. See the front of the mainframe of the machine for guidance on the correct operating PTO speed for the machine.

Forward speed is achieved by transmission gear selection and not by the engine operating speed. The operator may be required to experiment with several gear range combinations to determine the best gear and range which provides the most ideal performance from the mower and most efficient tractor operation. As the severity of cutting conditions increase, the ground speed should be decreased by selecting a lower gear to maintain the proper operating PTO speed.

7.1.4 Machine Stability

With the reach arm and attachment being infinitely moveable into different positions, this will regularly change the centre of gravity and stability of the machine and require the upmost of concentration and reaction from the operator.

Before beginning work, extend the reach arm out slowly to its maximum reach and ensure that the opposite tyre of the tractor is still on the ground. It is advisable to have additional personnel to check this. If the tyre lifts, retract the reach arm and safely add additional ballast in the form of wheel weights to the raised wheel until the tyre is showing evidence of bearing some load. Some Spearhead reach arm models have an option of oil tank ballast weights to add as an alternative.

Repeat the process of inspection, after placing the machine into transport position and taking the machine onto the public highway. Front end weight is critical to maintain steering control and prevent the tractor from rearing up. Front weight and weight carriers can be purchased through an authorized tractor dealership. If additional weight ballast is added to the tractor, ensure that the maximum permissible axle loads are not exceeded.

Ensure that the reach arm is only ever fitted to a tractor that meets the minimum weight requirements as stated in Section 1.5.1. The tractor should exceed the weight of the machine by at least 20%.

WARNING! Failure to have at least 20% sufficient load over the front axle or to drive at inappropriate speeds on undulating terrain may result in a loss of directional control.

7.1.5 Cornering

Perform turns with the tractor and reach arm at slow speeds to determine how the tractor handles with the attached reach arm when at work and during transport. Determine the safe speed to maintain proper control of the tractor when making turns.

When turning the machine, the centre of gravity is raised making the complete machine less stable. To avoid overturns, drive the tractor with care and at safe speeds, especially when operating over rough ground, crossing ditches or slopes, and turning corners. Sudden, abrupt movements can induce overturning reactions.

Ensure that the reach arm is always fully slewed into its transport position and each of the arm fabrications are fully retracted onto each of their respective bump stops to maintain the reach arms position as much as possible before transporting the machine out of work. Ensure that the slew pin is fitted to secure the slew post from moving.

Use extreme caution when operating on steep roads. Keep the tractor in a low gear when going downhill. **Do not** coast or free-wheel downhill.

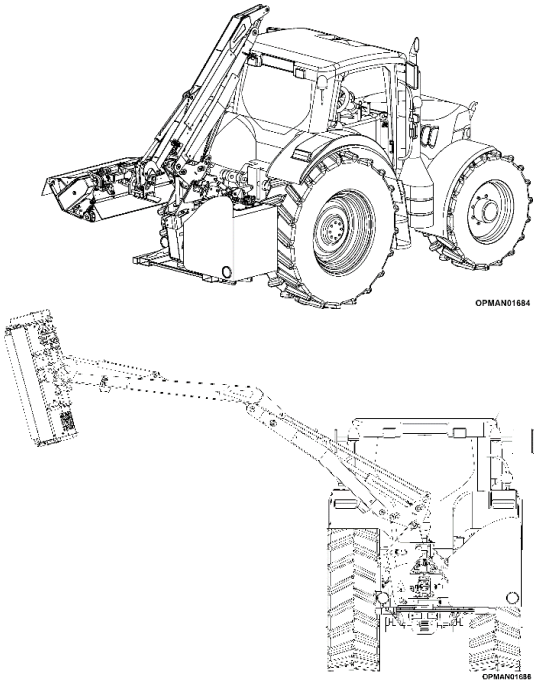
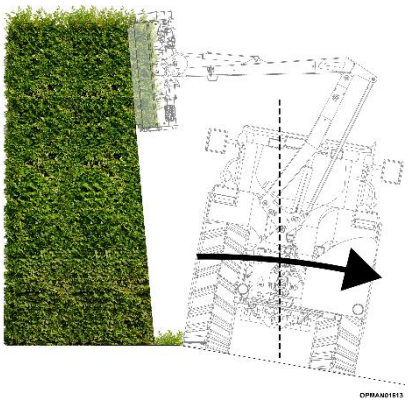
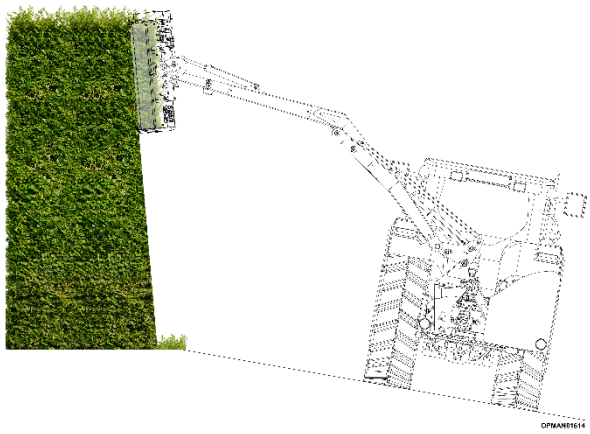


Figure 7.8 – Tractor Stability
(left-hand build machine shown)

7.1.6 Working On Adverse Slopes, Embankments And Un-level Ground



Incorrect Procedure
Figure 7.9



Correct Procedure
Figure 7.10

(left-hand build machines shown)

When working with the reach arm and attachment in a high cutting position and closely in it is possible for the reach arm to go over centre and make the reach arm and tractor unstable and potentially fall over; see Figure 7.9.

To overcome this and improve stability and safety, if possible, move the tractor further away from the hedge and extend the arm to bring the arm before centre and maintain stability; see Figure 7.10.

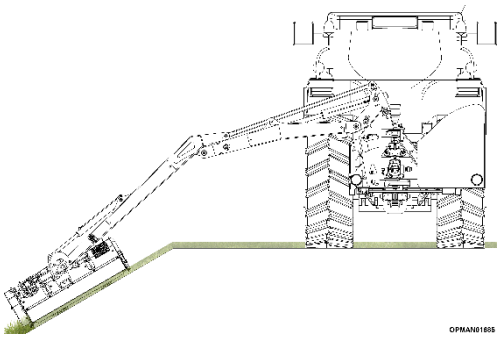


Figure 7.11
(left-hand build machine shown)

Likewise when cutting with the reach arm in low positions, in areas such as embankments or dykes extend the reach arm and bring the tractor away from the edge of the embankment if possible to increase the stability of the machine when in work; see Figure 7.11. Benefits are also brought in an improved view of the attachment at work.

Stability can be greatly maintained by ensuring that the reach arm is only ever fitted to a tractor that meets the minimum weight requirements as stated in Section 1.5.1. The tractor should exceed the weight of the machine by at least 20%.

It is always best practice whilst at work and during transport, to carry out major arm adjustments slowly in order to ensure the stability of the machine. Sudden, abrupt movements can induce excessive overturning reactions.

DANGER! When working with the machine avoid high speed hydraulic movements which could cause overturning.

Sudden changes in ground contours, such as potholes and undulating ground can change the tractors balance and cause a change in direction. This can be very dangerous and could lead to overturning especially working on areas such as embankments.

7.2 Cutting Procedure

Figure 7.12

7.2.1 General Guidance

7.2.1.1 **DO NOT** angle the attachment in such a way as to throw cut material towards the tractor.

7.2.1.2 Keep the tractor at the correct PTO operating speed as requested on the decal found above the output shaft on the mainframe of the machine to maintain the correct rotor speed of the attachment.

7.2.1.3 Inspect the attachment to see the machine is set correct for the application. Some applications require different rotor operating speeds to others, for example hedge cutting in comparison to verge mowing. For full attachment operating requirements see the attachment operators manual.

7.2.1.4 Avoid rushing into the work and maintain an even, steady speed to ensure a clean cut. Do not use excessive force when positioning the head into heavy branches or stumps. Damage to the machine may result. It is best to let the head ‘eat away’ slowly at heavy cutting jobs.

NOTE Working speed will be dependant on the particular machine and model that this accessory is being operated on; refer to the operation manual for that machine for details.

7.2.1.5 Always give the blades or chains enough material to 'bite' into, particularly when a hedge has a lot of leaf and very flexible thin stems.

7.2.1.6 When using the head for trimming trees and shrubs, let the head ‘saw' into them. Do not lower the head down directly onto a tree or stump. The blades or chains are designed to cut with the end, any misuse can cause damage to the blade and risks foreign objects or blades/chains and other parts being ejected from the machine causing risk to bystanders, operator, tractor or the nearby environment.

7.2.2 Hedge Cutting

7.2.2.1 Consider how the job should be done before commencing work, as every hedge has a different height, width, thickness and density of growth. Hedges that have previously been cut by machine tend to have denser growth, and although they can be cut to any desired shape, it is advisable to trim to the same shape and height as before.

7.2.2.2 Before beginning work, inspect the attachment to see the machine is set correct for verge mowing operations. For full requirements see the attachment operators manual.

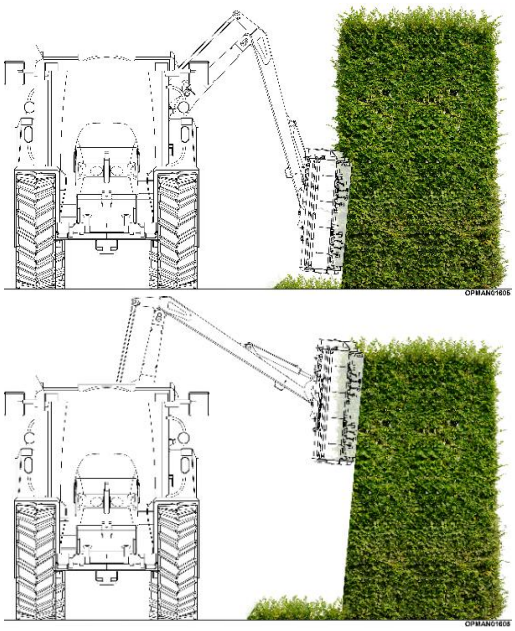


Figure 7.13
(left-hand build machine shown)

7.2.2.3 Begin cutting the hedge from the “field side”, beginning from the bottom and then working up to the top.

Use the attachment to “trim” the hedge down to the previous cut, as the old growth will be very thick and strong and can cause premature wear to the flails and cause the machine to stall.

Repeat cutting of the hedge causes the new growth to 'tiller' (spread out) and thicken up the hedge. It is advisable to cut the hedge side at a slight angle rather than straight, otherwise the hedge may eventually die at the bottom due to lack of light; see Figure 7.13.

7.2.2.4 If during any time of the cutting procedure the tractor becomes unstable due to cut material falling on it, disengage the rotor of the attachment and gently bring the tractor away from the hedge and push the arm gradually outward. Lower the attachment to the floor and safely stop the tractor. Wearing suitable PPE, remove the cut material from the attachment.

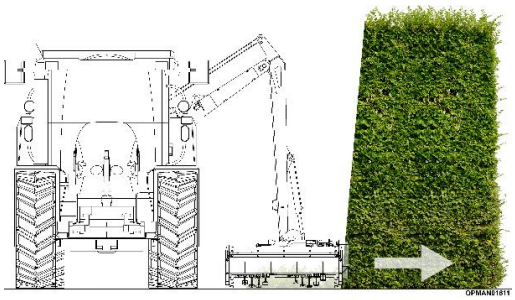


Figure 7.14
(left-hand build machine shown)

7.2.2.5 Cut the base of the hedge to tidy up and chop the hedge side debris and to force it back into the base of the hedge. This leaves the maximum thickness of hedge on the “road side” to prevent the possibility of any debris being thrown through the hedge into the path of oncoming vehicles.

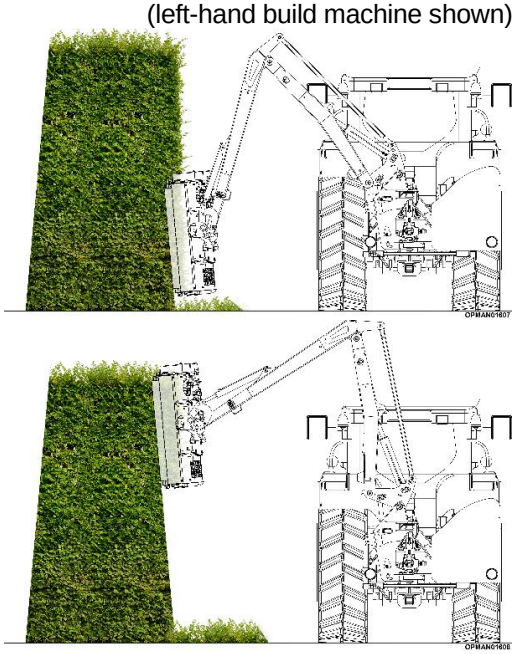


Figure 7.15
(left-hand build machine shown)

7.2.2.6 Proceed to cut the “road side”, beginning from the bottom and then working up to the top.

Use the same procedure as the “field side” cutting the hedge at a slight angle to maintain the wellbeing of the hedge.

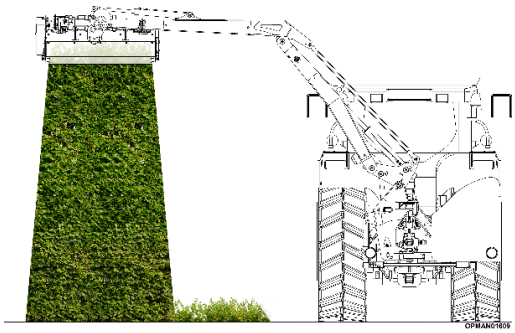


Figure 7.16
(left-hand build machine shown)

7.2.2.7 Trim the top of the hedge down to the height of the previous year's trim.

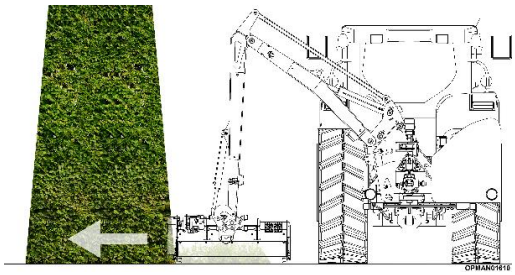


Figure 7.17
(left-hand build machine shown)

7.2.2.8 Cut the base of the hedge finally to tidy up and chop the hedge side and top debris and to force it back into the base of the hedge.

Figure 7.18
(left-hand build machine shown)

DANGER! NEVER CUT TO THE BLIND SIDE OF A HEDGE!

It is impossible to see any potential hazards or dangers and the position of the reach arm attachment would allow debris to be propelled through the hedge towards the tractor and operator.

7.2.3 Verge Mowing

7.2.3.1 Run the motor at the correct PTO operating speed as requested on the decal found above the output shaft on the mainframe of the machine.

7.2.3.2 Inspect the attachment to see the machine is set correct for verge mowing operations. For full requirements see the attachment operators manual.

7.2.3.3 During verge mowing operations the correct operating speed should be maintained to prevent sudden changes in head motor spindle speeds, reducing risk of motor damage.

7.2.3.4 Advance the machine at a rate which is suitable for the attachment. Avoid taking in too much grass into the attachment as it will be increased strain on the machine and reach arm, along with reducing the resulting finish left by the machine after it has been cut.

If the rotor slows down or begins to choke up with grass, raise the attachment up a little and allow grass to fall clear of the attachment.

Before returning to cutting let the rotor speed recover and increase to the correct operating speed again.

7.2.3.5 When verge mowing on the ground, the head should always be ‘carried’ rather than ‘dragged’ on the skids.

Dragging the attachment will increase the side loads on the reach arm and decreasing the horsepower available to the attachment and reduce the ability of the accumulator the carry part of the weight of the reach arm during mowing operations. It is recommended that the attachment is carried in such a way that a proportion of its weight is supported by the reach arm it is attached to, and a proportion is carried by the attachment skids.

When worked in this manner the skids, in combination with the pivoted mounting on the head, will allow it the freedom to follow the contours of the ground better.

7.2.3.6 During verge mowing operations the correct operating speed should be maintained to prevent sudden changes in head motor spindle speeds, reducing risk of motor damage.

7.2.3.7 Never force the head into heavy branches or stumps - damage to the unit may result.

7.2.3.8 When working alongside or clearing ditches, take a first cut along the edge of the ditch so that the ditch limits can be seen.

7.2.4 Stalling The Attachment Rotor

If the attachment rotor becomes choked and stalls, the tractor will potentially stall, and the belts may slip on the reach arm attachment (if fitted).

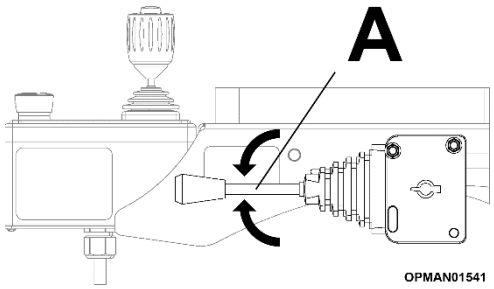


Figure 7.19

To safely handle the machine in a stall:

7.2.4.1 Place the rotor control lever immediately into the central neutral position; see Figure 7.19 (A), bring the tractor RPM gently down to idle and safely stop the tractor.

7.2.4.2 Allow the attachment rotor to come to a complete stop.

7.2.4.3 Ensuring that the rotor has stopped and it is safe to do so, lift the attachment off the obstruction using the reach arm controls.

7.2.4.4 Disengage the tractor PTO and safely stop the tractor engine.

7.2.4.5 Press the main power button on the reach arm controls to switch the system off and stop any potential movements whilst inspecting the machine.

7.2.4.6 With extreme caution, if a blocked foreign component has caused the machine to suddenly operate incorrectly or altogether ensure that all the correct levels of Personal Protection Equipment (PPE) is worn for safety purposes. Consider gaining extra personnel for assistance.

WARNING! Never in any circumstances run or reverse the rotor to clear the attachment of any blockage.

7.2.4.7 If the cause of sudden incorrect running of the machine is due to the machine colliding or hitting a foreign object, inspect the area and remove, or mark the location of the debris so it’s not hit again.

7.2.4.8 Inspect the condition of the machine, reach arm and tractor and make any needed repairs before proceeding to use the machine again. Make sure the blades or chains are not damaged or broken and the machine is intact and undamaged before resuming operation. If in doubt; do not restart.

7.2.5 Stopping The Machine In An Emergency

In an emergency situation the priority is to stop the machine as quickly as possible. Safety is of upmost importance at the expense of the wellbeing of machine.

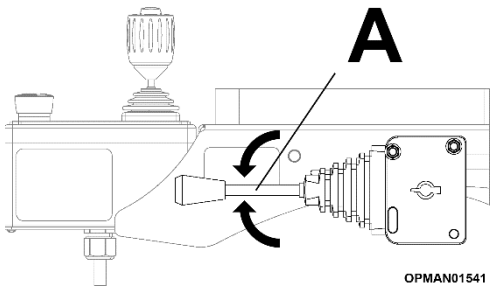


Figure 7.20

To stop the machine in an emergency:

7.2.5.1 Safely stop the tractor and switch off the engine immediately.

7.2.5.2 Press the main power button on the reach arm controls to switch the system off and stop any actions from the machine.

7.2.5.3 Place the rotor control lever into the central neutral position; see Figure 7.20 (A) and allow the reach arm attachment come to a complete stop.

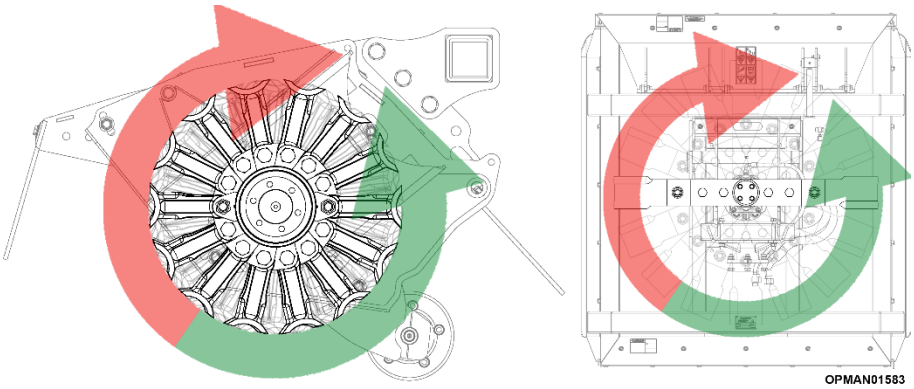
7.2.5.4 Safely assess the cause for the emergency stop and act in a correct way following the guidance of health and safety and the risk assessment.

7.3 Machine Features

Twiga Classic reach arm come with a selection of different operating features as standard with additional features available as an option.

7.3.1 Rotor-Reverse

The rotor-reverse option found on the Twiga Classic range to allow the reach arm attachment to be operated in two directions.



Flail Head
(Powerdrive flail head model shown)

Rotary Head
(HD model shown)

Figure 7.21
Attachment Rotor Reverse

- On flail head attachments this allows the machine in being able to cut in a downhill direction as well as an uphill direction. Downhill cutting is suitable for heavy-duty mulching to break down heavy growth and uphill cutting for cleaner cut and finish.
- On rotary head attachments this allows the machine in being able to cut in a clockwise direction as well as an anti-clockwise direction.

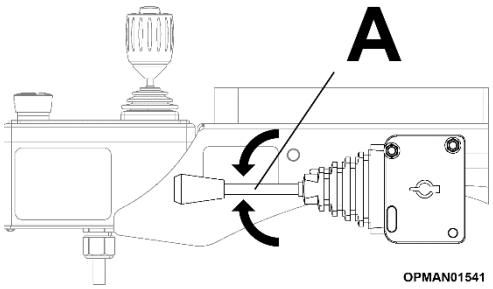


Figure 7.22
(Minipilot control system shown)

To operate the rotor reverse requires the use of the rotor reverse lever found on the side of the joystick.

IMPORTANT: If the rotor is required to go from one rotation direction to the other it is important the rotor is disengaged with the tractor engine speed at idle and the rotor is completely stopped before placing the lever into the other direction.

For full guidance on how to safely engage and disengage the rotor reverse see Section 7.1.

7.3.2 Break-Back

Figure 7.23
Twiga Classic Break-Back With Manual Reset
(left-hand build machine shown)

The Twiga Classic 'break-back' system operates by automatically rotating backwards and raising upwards the reach arm and attachment to allow the machine to clear an obstacle, such as a telegraph pole or tree.

The system requires the operator to safely advance or retreat the machine and then return the reach arm and attachment back to the work position.

7.3.3 Head Float

The “head float” feature found on the Twiga Classic range allows a greater attachment ability in following changing ground contours across its width. This feature allows the head crowd to automatically change its angling position during work without user input.

Machines fitted with Pilot Control System

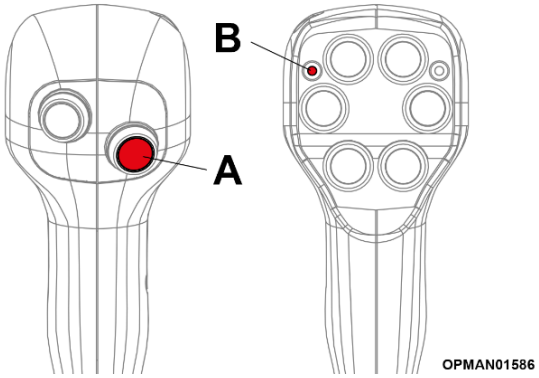


Figure 7.24
Pilot Control Head Float Joystick Buttons

With reference to Figure 7.24, to use the “head float” option on machines fitted with the Pilot control system requires the PTO for the reach arm to be engaged and then one single press of the left-hand, red rear button found on the joystick (A).

Indication that “head float” is operation is given by an illuminated red light found on the left-hand side of the front of the joystick (B). The reach arm attachment will then automatically adjust its position when in work.
To disengage “head float” requires a single press of the left-hand, red rear button found on the joystick (A) again.

Indication that “head float” is disengaged is given by the once illuminated red light found on the left-hand side of the front of the joystick (B) now going out.

Machines fitted with Minipilot Control System

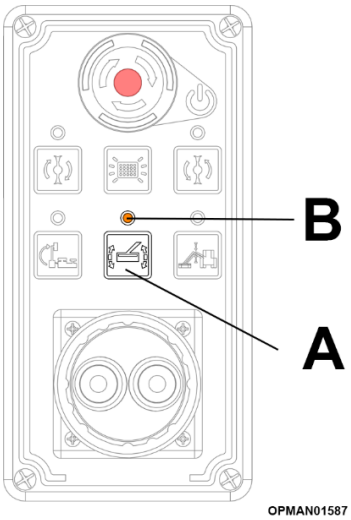


Figure 7.25
Minipilot Control Head Float Joystick Buttons

With reference to Figure 7.25, to use the “head float” option on machines fitted with the Minipilot control system requires the PTO for the reach arm to be engaged and Minipilot control box switched on and then one single press the use of head float button found on the Minipilot control box (A).

Indication that “head float” is operation is given by an illuminated orange light found above the button (B). The reach arm attachment will then automatically adjust its position when in work.

To disengage “head float” requires one single press the use of head float button found on the Minipilot control box (A) again.

Indication that “head float” is disengaged is given by the once by an illuminated orange light found above the button (B) now going out.

7.3.4 Arm Float (option)

Spearhead’s “Arm Float” option available for the Twiga Classic range allows a greater arm ability in following changing ground contours. This feature allows the main lift ram to automatically change its length and allow the arm to raise and lower during work without user input.

Machines fitted with Pilot Control System

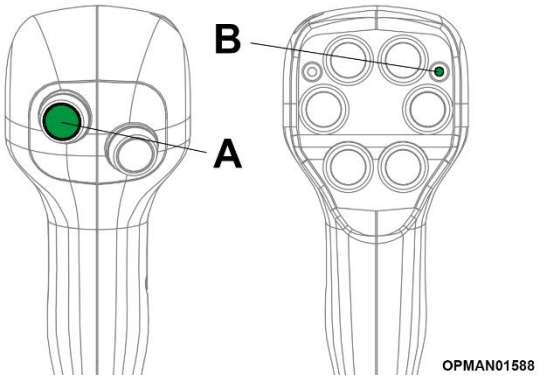


Figure 7.26
Pilot Control Arm Float Joystick Buttons

With reference to Figure 7.26, to use the “arm float” option on machines fitted with the Pilot control system requires the PTO for the reach arm to be engaged and then one single press of the right-hand, green rear button found on the joystick (A).
Indication that “arm float” is operation is given by an illuminated green light found on the right-hand side of the front of the joystick (B). The reach arm will then automatically adjust its position when in work.

To disengage “arm float” requires a single press of the right -hand, green rear button found on the joystick (A) again.

Indication that “arm float” is disengaged is given by the once illuminated green light found on the right -hand side of the front of the joystick (B) now going out.

Machines fitted with Minipilot Control System

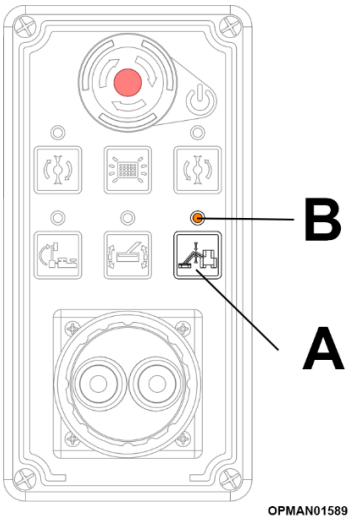


Figure 7.27
Minipilot Control Arm Float Joystick Buttons

With reference to Figure 7.27, to use the “arm float” option on machines fitted with the Minipilot control system requires the PTO for the reach arm to be engaged and Minipilot control box switched on and then one single press the use of arm float button found on the Minipilot control box (A).

Indication that “arm float” is operation is given by an illuminated orange light found above the button (B). The reach arm will then automatically adjust its position when in work.

To disengage “arm float” requires one single press the use of arm float button found on the Minipilot control box (A) again.

Indication that “arm float” is disengaged is given by the once by an illuminated orange light found above the button (B) now going out.

7.3.5 Narrow Lane (option)

Figure 7.28
Twiga Classic “Narrow Lane” Option
(left-hand build machine shown)

Spearhead’s “Narrow Lane” option available for the Twiga Classic range is an intermediate addition fitted between the reach arm and the reach arm attachment. The narrow lane option uses a single ram operated by the tractor spool to allow the cutting attachment to be brought inside the width of the tractor and provides an additional arc of operation when in work.

The narrow lane option is a big benefit to hedge cutting operators working on small, single track roads.

For full guidance on using the “Narrow Lane” option; see Section 3.6.4.

7.3.6 Debris Blower (option)

Figure 7.29
Twiga Debris Blower Option

Spearhead’s debris blower option available for the Twiga Classic range is an addition fitted to the rear of the reach arm, just behind the oil tank.

The debris blower option is operated by the tractor spool which turns a hydraulically driven impeller to blow cut debris back into the hedgerow after the attachment has cut the verge or hedge. This option keeps the roads and pathways clear without the need for secondary clearing of the site once the works have been carried out.

For full guidance on using the debris blower option; see Section 3.6.3.

7.3.7 Highway Kit (option)

Spearhead's "Highway Kit" option available for the Twiga Classic range adds a range of additional features to make the machine more easily seen to road users in road work applications such as hedge cutting and verge mowing.

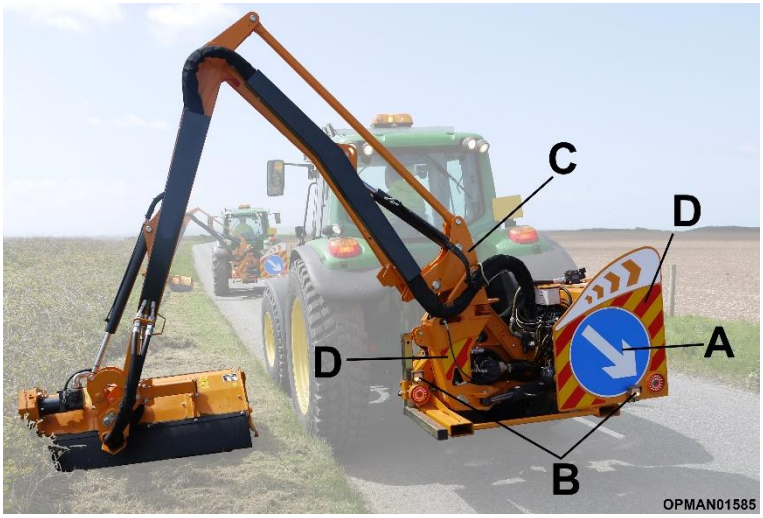


Figure 7.30
Twiga Classic "Highway Kit" Option
(left-hand build S55 model shown)

With reference to Figure 7.30, the "Highway Kit" features the following additions;

- Warning Arrow – a magnetic pass sign placed on the rear of the oil tank to guide passing traffic (A)
- Flashing LED's – additional lighting fitted to the rear panel and mainframe of the machine increasing visibility (B)
- Alternative Colour - for the requirements of the end user and/or increased visibility (C)
- Highway Chevrons – for high visibility during night operations (D)

For full guidance on using the flashing LED feature (C) as part of the "Highway Kit" option; see:

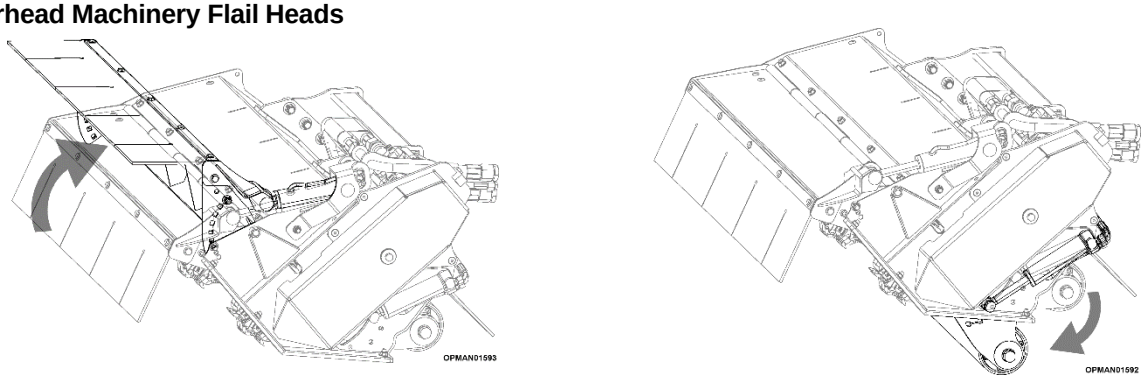
- Section 4.13/4.14 for machines equipped with the Pilot control system.
- Section 4.23/4.24 for machines equipped with the Minipilot control system.

7.3.8 Attachment Options

The range of potential compatible attachments which can be fitted to Spearhead reach arm's is exhaustive and are not limited to Spearhead branded attachments. It is important to fully inspect the attachment and its accompanying operators manual to gain full knowledge on the hydraulic and operating requirements of the attachment and its compatibility with the Spearhead reach arm.

A full list of Spearhead compatible reach arm attachments with the Twiga Classic reach arm range can be found in Section 1.6.

Spearhead Machinery Flail Heads

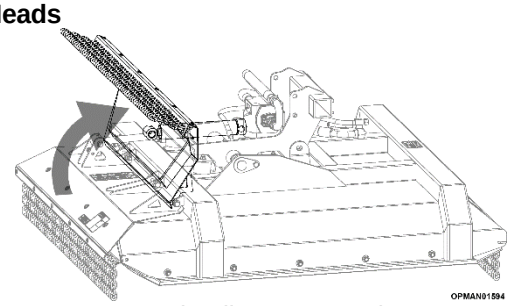


Hydraulic Front Hood Hydraulic Rear Roller

Figure 7.31 – Example Spearhead Flail Head Options

(Powerdrive model shown)

Spearhead Machinery Rotary Heads



Hydraulic Front Hood

Figure 7.32 – Example Spearhead Rotary Head Options

(HD model shown)

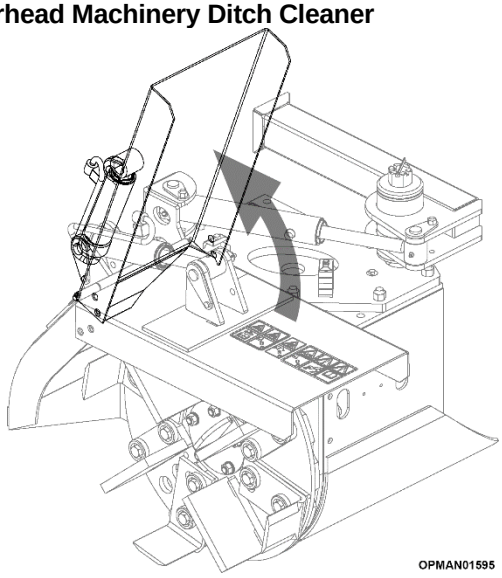
Some Spearhead flail and rotary head attachments can be specified with hydraulically operated optional features, such as a front hood or rear roller, or in some cases both features. These optional features connect directly into the tractors hydraulic system and use the tractors hydraulic oil supply and bypass the hydraulic system of the reach arm. Due to this, the operation of these features requires the use of the specific tractor spool control in the tractor in which the specific feature hydraulic hoses are connected to and not through the control features found on the joystick and/or control box.

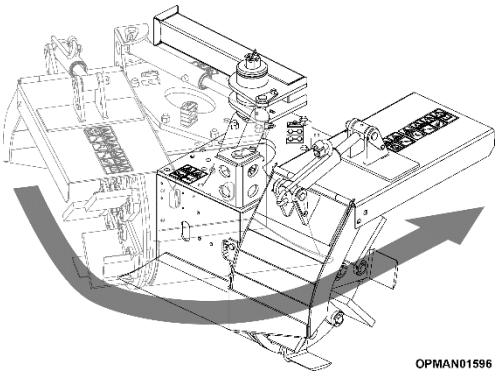
It is important to slowly test the operation of these features and the feedback from how fast the operations will be carried by operator inputs with the spool on the tractor. Each operating feature will be connected into the tractor hydraulics with two hoses: one for pressure and one for return. It is important that both hydraulic hoses go into the same bank on the tractor. If the machine does not respond in the desired direction for how the tractor spool is operated, the pressure and return hydraulic hoses can be swapped around to create the opposite operation outcome.

DANGER! Due to the flail and rotary head being hydraulically independent of the reach arm these features can be operated without the tractor PTO and reach arm being in operation. It is important, if possible, to lock the tractor spool controls from being able to be functioned when the machine it out of work, to ensure accidental damage is not caused to the machine, tractor, operator or other bystanders and road users.

For full guidance on using the flail or rotary attachment; see the supplied operators manual for the attachment.

Spearhead Machinery Ditch Cleaner





Hydraulic Ejection Chute Hydraulic Ejection Angle

Figure 7.33 – Spearhead Ditch Cleaner Features

The Spearhead ditch cleaner features an adjustable hydraulically operated ejection chute and ejection angle. These features connect directly into the tractors hydraulic system and use the tractors hydraulic oil supply and bypass the hydraulic system of the reach arm. Due to this, the operation of these features requires the use of the specific tractor spool control in the tractor in which the specific feature hydraulic hoses are connected to and not through the control features found on the joystick and/or control box.
It is important to slowly test the operation of these features and the feedback from how fast the operations will be carried by operator inputs with the spool on the tractor. Each operating feature will be connected into the tractor hydraulics with two hoses: one for pressure and one for return. It is important that both hydraulic hoses go into the same bank on the tractor. If the machine does not respond in the desired direction for how the tractor spool is operated, the pressure and return hydraulic hoses can be swapped around to create the opposite operation outcome.

DANGER! Due to the ditch cleaner being hydraulically independent of the reach arm these features can be operated without the tractor PTO and reach arm being in operation. It is important, if possible, to lock the tractor spool controls from being able to be functioned when the machine it out of work, to ensure accidental damage is not caused to the machine, tractor, operator or other bystanders and road users.

For full guidance on using the Spearhead ditch cleaner; see the supplied operators manual for the attachment.

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8 Maintenance

WARNING! Before proceeding to carry out maintenance on the machine, ensure that you have thoroughly read and understand the list of safety warnings in Section 2. This section gives safe guidance to ensure the wellbeing on all personnel working with or near the machine as well as the machine itself during the maintenance process.

8.1 Periodic Maintenance

Perform service, repairs, lubrication and maintenance procedures outlined throughout Section 8 to ensure the longevity and reliability of the reach arm, reach arm attachment and the tractor.

In general:

8.1.1.1 Inspect for loose or missing fasteners, worn or broken parts, leaky or loose fittings, worn bushes and any other moving parts which are worn or missing.

8.1.1.2 Replace any worn or broken parts with genuine Spearhead parts under the guidance of the specific section stated in Section 8.

8.1.1.3 Lubricate the machines specified by the lubrication schedule as stated in Section 8.2.

8.1.1.4 **Never** lubricate, adjust or remove material while it is running or in motion.

8.1.1.5 Torque all bolts and nuts to the settings specified in Section 8.11.

8.2 Lubrication & Greasing

The mechanical components of the machine in use must be lubricated to avoid wear and heat build-up. Lubrication may be through the use of grease or oil. Oil allows higher relative speeds of items such as gearboxes, whereas grease is generally used to lubricate items such as bearings or bushes. In both cases it is important to ensure lubrication is given to these various items to ensure their longevity and reliability in use.

8.2.1 Gearbox

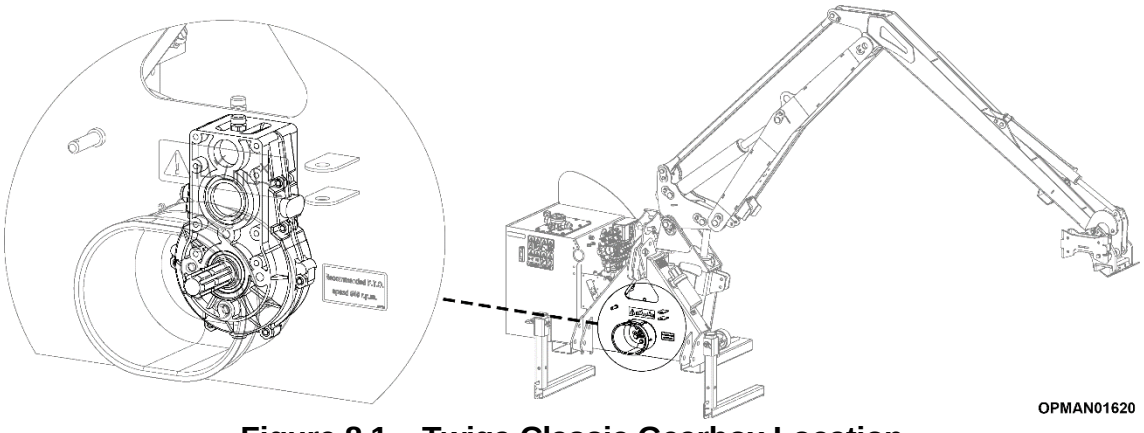


Figure 8.1 – Twiga Classic Gearbox Location
(left-hand build S55 model shown)

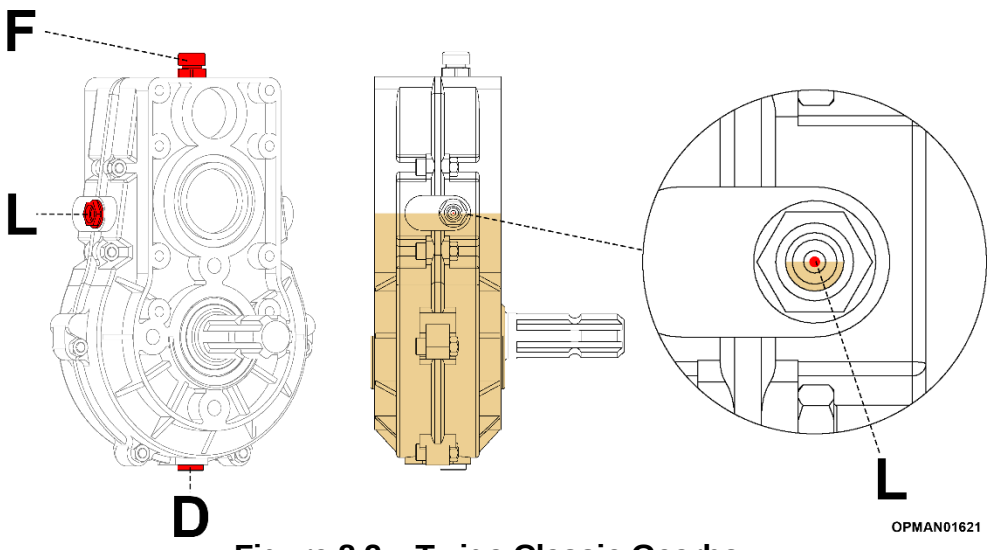


Figure 8.2 – Twiga Classic Gearbox

The gearbox has been filled to the correct quantity prior to shipment. However, the oil level should be **checked by viewing the sight glass window on the side of the gearbox before operating the machine for the first time and regularly thereafter**. It is important to fill and maintain the gearbox with the correct quantities of oil. Overfilling the gearbox with oil does not improve lubrication and may cause overheating. Using an under filled gearbox can cause overheating and premature wear to components such as seals.

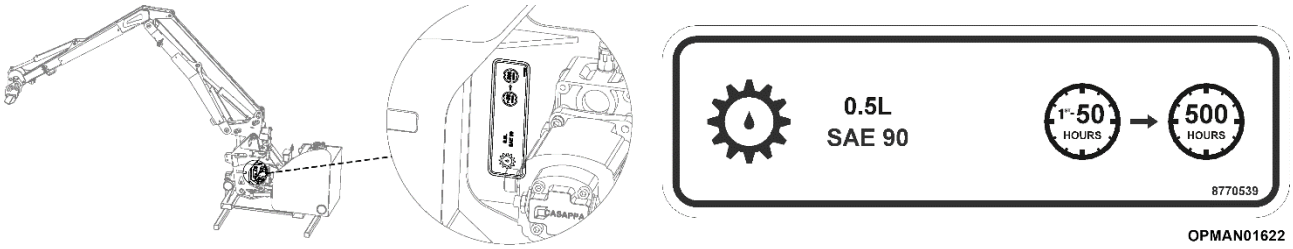


Figure 8.3 - Twiga Classic Gearbox Oil Decal
(left-hand build S55 model shown)

The correct quantity of oil to use in the gearbox is done by ensuring the oil is filled to the red bullseye mark on the sight glass window found on the side of the gearbox; see Figure 8.2 (L). A guide to the amount of oil required for the gearbox is given approximately in the table below as well as being stated on the decal found above the gearbox on the machine; see Figure 8.3.

Spearhead gearboxes are recommended to be filled with:

SAE EP80-90W or GL-4/GL-5 grade oil.

Any different or higher SAE grade of oil is not recommended.

	Twiga Classic
Gearbox	0.5 litres (0.88 pints)

Table 8.1 – Twiga Classic Gearbox Oil Capacities

Changing the oil regularly prevents problems associated with deterioration, moisture build up in the oil and the potential presence of metallic particles which form early in the machines life. Oil changes are recommended on Twiga Classic machines **after the first 50 hours**, and **then every 500 hours thereafter**.

Oil Service

With reference to Figure 8.2, to drain the oil, the gearbox fitted with a **drain plug (D)**. If there are facilities to vacuum draw the oil out of the respective gearbox, the oil can be drawn out through the fill hole/breather location (F) instead which is considerably easier.

To refill the gearbox with oil, remove the fill plug/breather (F) and pour in the correct grade of oil until the level reaches the red bullseye mark found on the sight glass window (L).
The gearbox should not require additional lubricant unless the box is cracked or a seal is leaking. It is recommended that the oil level is **checked every day before operation** and additional oil added if it's required to bring it up to the red bullseye mark, see Figure 8.2 (L), **before proceeding to use the machine**. Ensure the oil level remains at the correct level as otherwise permanent damage could be caused to the gearbox.

8.2.2 Oil Tank

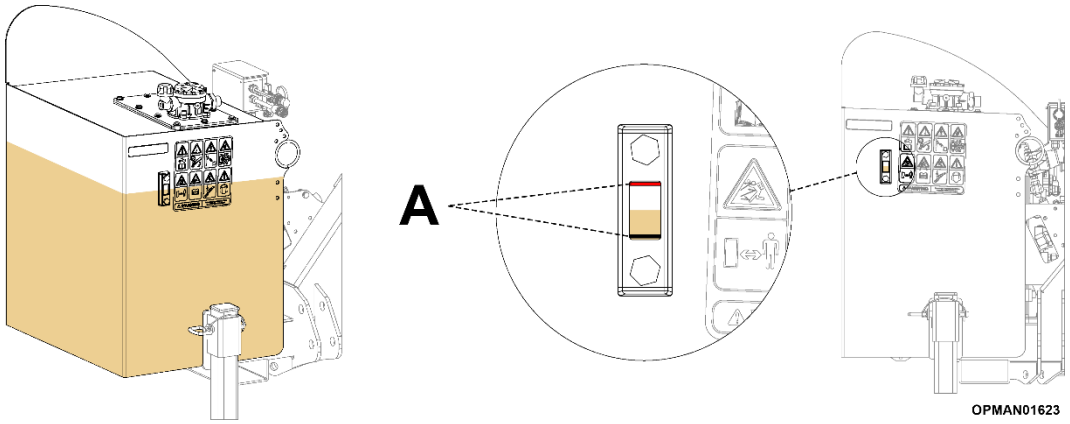


Figure 8.4 – Twiga Classic Oil Tank Level Gauge
(left-hand build machine shown)

The oil tank has been filled to the correct quantity prior to shipment. However, the oil level should be **checked by viewing the sight glass window on the front of the oil tank before operating the machine for the first time and regularly thereafter**. It is important to fill and maintain the oil tank with the correct quantities of oil. Underfilling the oil tank with oil may cause overheating.

The correct quantity of oil to use in the oil tank is done by ensuring the oil is filled between the upper red mark and lower black mark on the sight glass window found on the front of the oil tank; see Figure 8.4 (A). A guide to the amount of oil required for the gearbox is given approximately in the table below.

Spearhead oil tanks are recommended to be filled with:

HD46 grade oil.
Panolin HLP Synth E 46

Any different or higher HD grades of oils are not recommended.

	Twiga Classic
Oil Tank	190 litres (334 pints)

Table 8.2 – Twiga Classic Oil Tank Oil Capacities

Changing the oil regularly prevents problems associated with deterioration, moisture build up in the oil and the potential presence of metallic particles which form early in the machines life, along with maintaining cooling efficiency. Oil changes are recommended on Twiga Classic machines **after the first 50 hours**, and **then every 500 hours thereafter**.

Oil Service

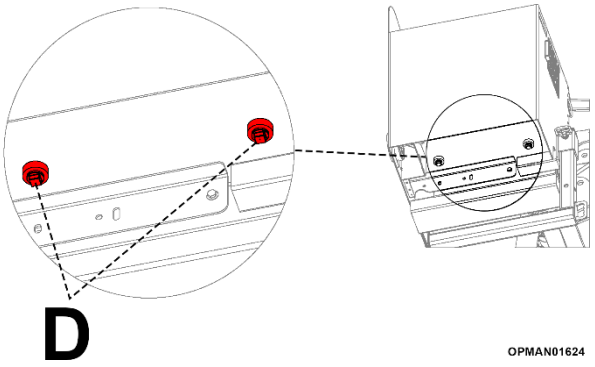


Figure 8.5

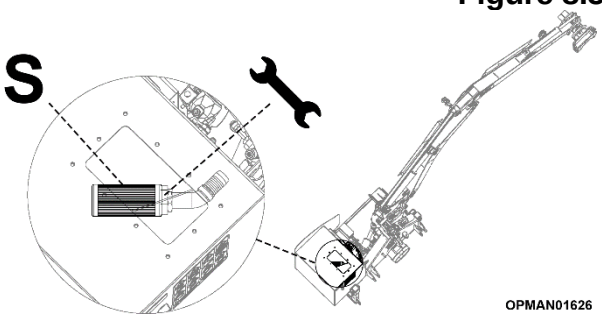


Figure 8.6
(left-hand build machine shown)

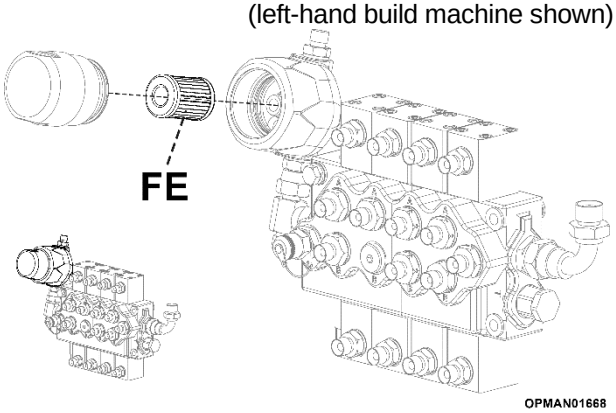


Figure 8.7
(4-bank valve block shown)

Figure 8.8

8.2.2.1 With reference to Figure 8.5, to drain the oil, the oil tank is fitted with **two drain plugs (D)** at the front and the rear of the underside of the oil tank.

If there are facilities to vacuum draw the oil out of the oil tank, the oil can be drawn out through the **returns filter assembly** instead which can be easier.

8.2.2.2 Inspect the oil for its condition.

8.2.2.3 With the oil tank fully drained visually inspect the suction strainer found at the bottom of the inside of the oil tank; see Figure 8.6 (S).

8.2.2.4 Inspect to see there's no debris left on the outside of the filter. If there is debris, remove the cover plate and gasket from the top of the oil tank and use an open-ended spanner to loosen and remove the suction strainer.

8.2.2.5 Inspect and clean the suction strainer with a suitable cleaning agent and clean rag. Replace it back inside the oil tank and tighten.

8.2.2.6 Inspect the condition of the tank cover gasket and clean off the original silicone sealant. Recoat the used gasket on both sides with silicone sealant or replacement gasket if damaged and then replace the tank cover. Replace and tighten all bolts correctly.

Pilot Control Version Only

8.2.2.7 Only Twiga Classic machines fitted with the Pilot control system remove and replace the service filter element found near the control valve; see Figure 8.7 (FE).

8.2.2.8 With reference to Figure 8.5 (D), replace the two drain plugs at the front and the rear of the underside of the oil tank adding hydraulic sealant to them to ensure they remain oil tight.

8.2.2.9 Unscrew the returns filter assembly lid and remove the filter element and filter element casing.

8.2.2.10 Fill the oil tank with the correct grade of oil until the level reaches between the upper red mark and lower black mark on the sight glass window found on the front of the oil tank.

8.2.2.11 Replace the filter element casing and place in a new filter element into the housing.

8.2.2.12 Inspect the oil seal for condition and replace and tighten the returns filter assembly lid.

8.2.2.13 Briefly operate the machine and inspect to ensure there are no oil leaks found in the system.

8.2.3 PTO Shaft

IMPORTANT: Proper and correct frequency of lubrication of all the rotating and sliding parts of the PTO shaft fitted to the machine is essential for the correct function, longevity and reliability of the shaft. Insufficient lubrication or contamination is one of the most frequent causes of PTO shaft failure.

The joints, telescopic member and shields must be lubricated at intervals related to the environment and working conditions for the machine.

Binnachi recommend **NLGI #2 Molybdenum Disulphide Grease** on all crosses, telescoping members and shields. This grease contains additives which offer corrosion resistance, strength and adhesion at extreme pressures (EP) along with other benefitting properties.

When lubricating cross kits, pump grease until the grease purges from all four bearing caps. **Pump the grease gradually**. Avoid high pressures, especially those possible from pneumatic equipment.

The joint assemblies on each of the different shafts are accessible by rotating the plastic safety shield until the cut-out hole allows the grease point to be exposed. When maintaining the shafts inspect the joint for movement by holding the shaft on either side of the joint and if there is noticeable play in the driveline, replace the joint before it causes severe damage to the driveline.

NOTE: All values throughout this section are given on the assumption that a **manually operated grease gun** is used to carry out the greasing procedures giving a **predicted quantity of 0.8-1.0g of grease per pump**.

For reference to the required grease maintenance points on each of the respective shafts see below..

WARNING! It is mandatory to safely stop the tractor and machine before carrying out maintenance on the PTO shaft.

Input Shaft

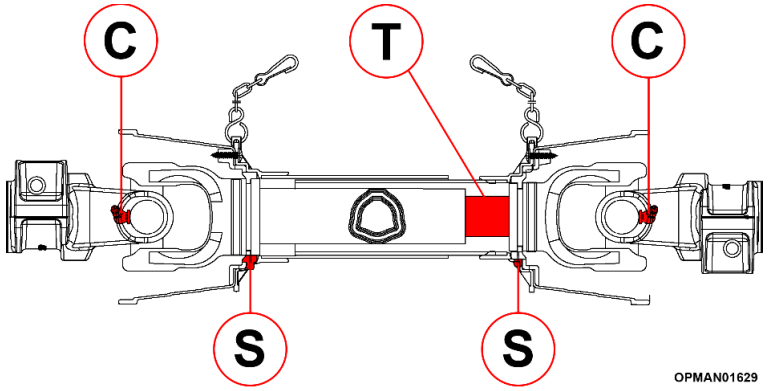


Figure 8.9 – Twiga Classic Input Shaft Grease Locations

		Frequency Of Lubrication		
Model	**PTO Input Speed (Shaft Size)**	**(C) - Cross**	**(S) – Shield Bearings**	**(T) – Telescopic Tube**
Twiga Classic	540 (B6)	8 hours	50 hours	8 hours

Table 8.3 – Twiga Classic Input Shaft Grease Quantities

*- due to the operating characteristics of the Twiga Classic reach arm machine, the requirement for the two halves of the input driveshaft to telescope in and out of each other is very minimal. However, Spearhead Machinery recommends greasing the inner and outer PTO driveshaft tubes to ensure the driveshaft can be removed easily and reduce corrosion and chance of driveshaft tube seizure.

8.2.4 General Machine Greasing Point Locations

8.2.4.1 Twiga Classic Standard Arm (S55, S60)

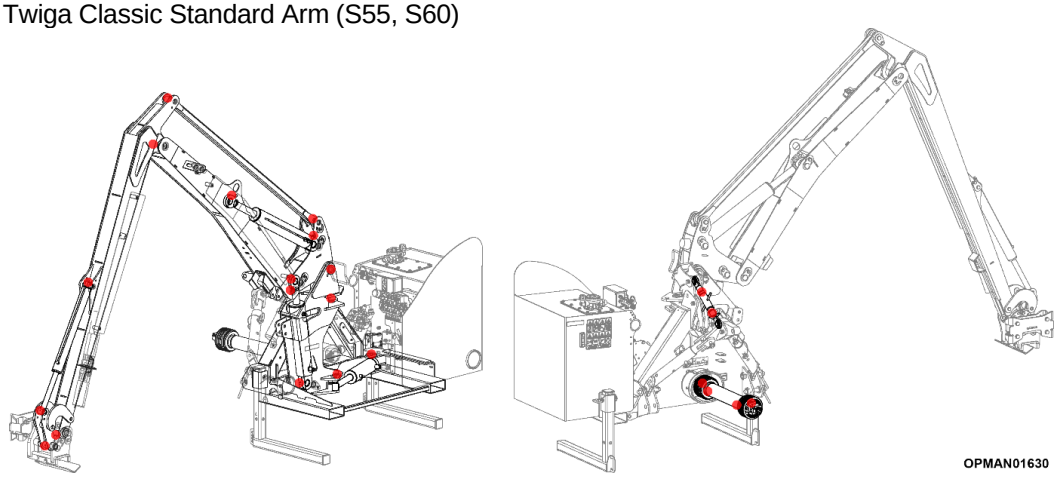


Figure 8.10 – Twiga Classic Standard Arm Grease Point Locations
(left-hand build S55 model shown)

8.2.4.2 Twiga Classic Telescopic Arm (T65)

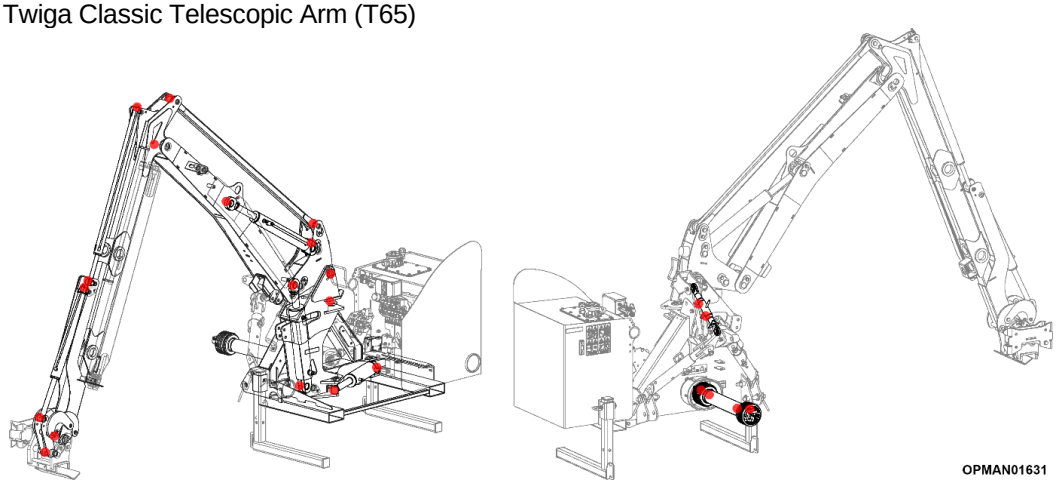


Figure 8.11 – Twiga Classic Telescopic Arm Grease Point Locations
(left-hand build machine shown)

8.2.4.3 Twiga Classic Variable Forward Reach Arm (VFR55, VFR60)

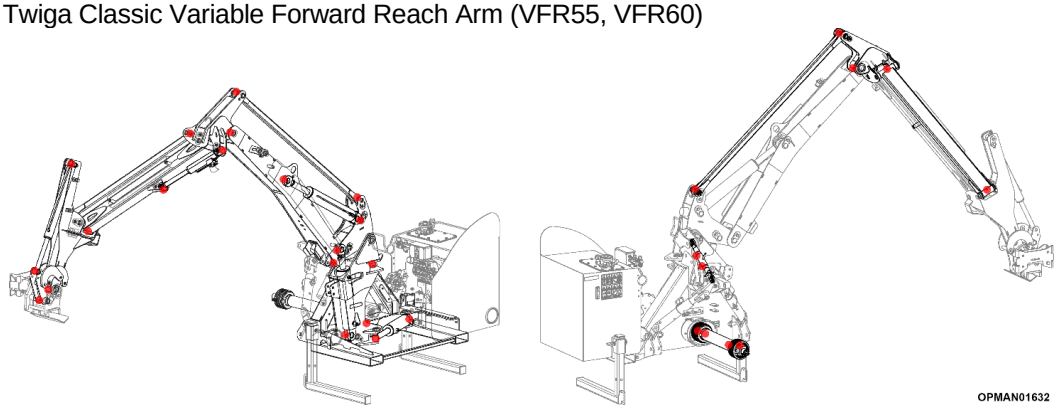


Figure 8.12 – Twiga Classic Variable Forward Arm Grease Point Locations
(left-hand build VFR55 model shown)

See Section 8.2.5 for reference to the routine greasing schedule for each of the relevant locations on each of the Twiga Classic machines.

8.2.5 Greasing Schedule

With reference to the position of grease points in Figures 8.10, 8.11 and 8.12 for each particular Twiga Classic reach arm type, the following greasing schedule should be adhered to, to ensure reliability and longevity in components.

Grease each grease point until grease purges from the grease nipple.

IMPORTANT: Table 5.9 and this section is written on the greasing requirements for the reach arm. It is important to following the greasing requirements for the reach arm attachment also as stated in the reach arm attachments operators manual.

IMPORTANT: With extended and harder working conditions, these greasing times may need to be shortened to compensate for the machine more intensive work requirements.

NOTE: All values throughout this section are given on the assumption that a **manually operated grease gun** is used to carry out the greasing procedures giving a **predicted quantity of 0.8-1.0g of grease per pump**.

Grease Point(s)	Frequency	Grease Type
Input PTO Shaft	See Section 8.3.2	Molybdenum Disulphide
Stabiliser Top Link x2	Every 8 hours	Molybdenum Disulphide
Slew Post x2	Every 8 hours	Molybdenum Disulphide
Slew Hydraulic Ram x2	Every 8 hours	Molybdenum Disulphide
Lift Hydraulic Ram x2	Every 8 hours	Molybdenum Disulphide
Lift Frame	Every 8 hours	Molybdenum Disulphide
Tie Bar x2	Every 8 hours	Molybdenum Disulphide
Main Arm Clevis x2	Every 8 hours	Molybdenum Disulphide
Dipper Hydraulic Ram	Every 8 hours	Molybdenum Disulphide
Telescopic Hydraulic Ram x2 *1	Every 8 hours	Molybdenum Disulphide
Forward Reach Hydraulic Ram x2 *2	Every 8 hours	Molybdenum Disulphide
Forward Reach Tie Bar x2 *2	Every 8 hours	Molybdenum Disulphide
Head Hydraulic Ram x2	Every 8 hours	Molybdenum Disulphide
Head Crowd Link	Every 8 hours	Molybdenum Disulphide
Telescopic Inner Dipper Arm*1	Every 8 hours	Wax Oil or equivalent

Table 8.4
Greasing Schedule For Various Components

*1 – Twiga Classic telescopic model only
*2 – Twiga Classic variable forward reach model only

8.3 PTO Shaft

Spearhead Twiga Classic reach arm machines feature Binacchi PTO drive shafts. PTO shafts require routine maintenance and sometimes more demanding maintenance requirements to ensure their longevity and reliability of service.

For frequent greasing requirements of the input PTO driveshaft on the machine; see Section 8.3.2.

8.3.1 Size Adjustment & Fitting To The Tractor

The input PTO shaft supplied with the Twiga Classic reach arm machine will be of standard supply as it came from the original manufacturer.

The input PTO shaft will be required to be modified/adjusted in order to fit the desired operating tractor. For guidance in how to carry this out; see Section 3.3.1.

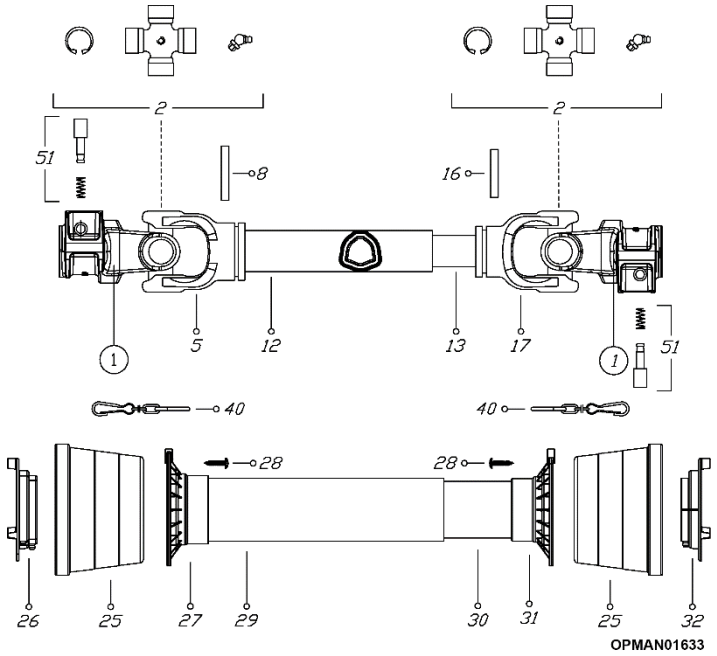
For fitting the input PTO shaft between the machine and the tractor; see Section 3.3.5.

8.3.2 Greasing

For the greasing requirements on the Twiga Classic reach arm driveshaft, refer to Section 8.2.3.

8.3.3 Input PTO shaft - Bearing Ring Replacement

With reference to Figure 8.13/Table 8.5, plastic wear bearing rings are found inside the PTO assembly to give a replaceable wearing surface between the metal PTO shaft and the outer plastic safety shield/cone (26/32). Due to the parts design aim, the wear rings inside the PTO assembly **will be required to be replaced over the working life of the PTO shaft** to ensure that the outer plastic safety shield/cone doesn't wear through and expose the rotating PTO shaft found inside.



Item No.	Description.	Qty.
1	Yoke Assembly	2
2	Cross Journal Assembly	2
5	Outer Tube Yoke	1
8	Outer Tube Pin	1
12	Outer Profile Tube	1
13	Inner Profile Tube	1
16	Inner Tube Pin	1
17	Inner Tube Yoke	1
25	Guard Cone	2
26	Outer Tube Bearing	1
27	Outer Tube Base Cone	1
28	Screw	6
29	Outer Guard Tube	1
30	Inner Guard Tube	1
31	Inner Tube Base Cone	1
32	Inner Tube Bearing	1
40	Chain	2
51	Taper Pin Assembly	2

Figure 8.13/Table 8.5 - Input Shaft Safety & Wearing Components

Following this section will allow the successful removal and replacement of the bearing spacer wear rings.

Disassembly

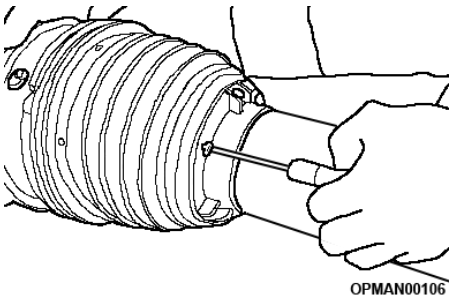


Figure 8.14

8.3.3.1 Remove the Philips head screws

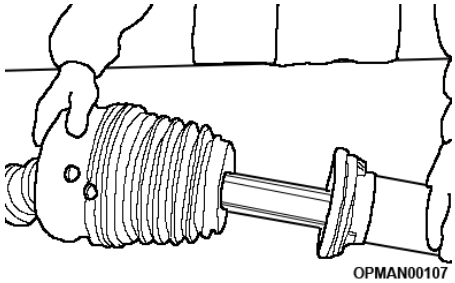


Figure 8.15

8.3.3.2 Remove the base cone and shield tube

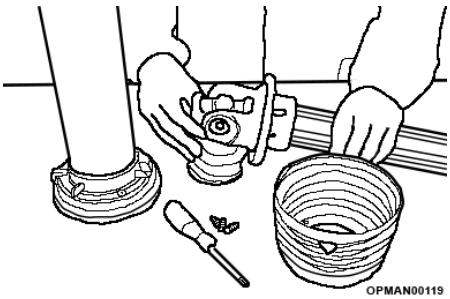


Figure 8.16

8.3.3.3 Remove the outer cone and the bearing ring

Reassembly

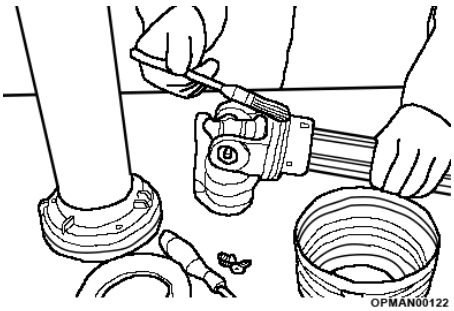


Figure 8.17

8.3.3.4 Grease the bearing groove on inner yokes

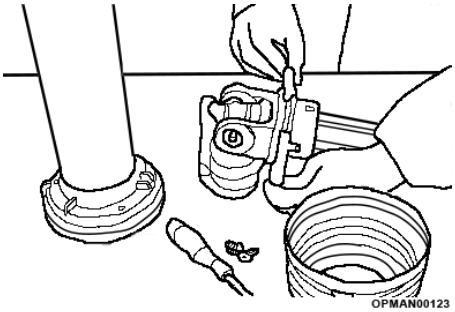


Figure 8.18

8.3.3.5 Fit the bearing ring into the yoke groove with the grease fitting facing the drive tube

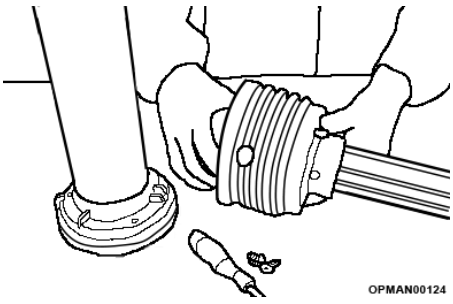


Figure 8.19

8.3.3.6 Install the outer cone, inserting the grease fitting through the proper hole

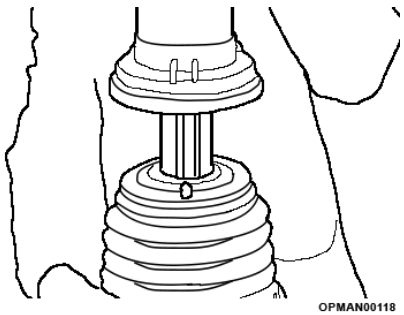


Figure 8.20

8.3.3.7 Install the base cone and shield tube

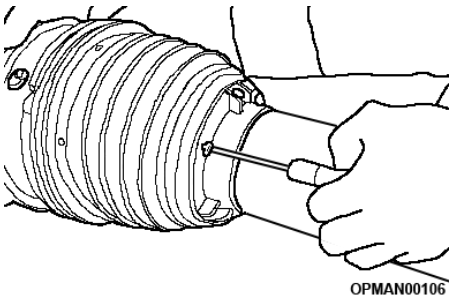


Figure 8.21

8.3.3.8 Tighten the Philips head screws. The use of an electric screwdriver is not recommended

8.4 Hydraulic Components – Maintenance & Adjustment

Before proceeding to carry out any maintenance requirements on the hydraulic system, ensure that you have thoroughly read and understood Section 2.4 on how to safely go about carrying out maintenance requirements to the machine, including how to approach the hydraulic system and its components. Section 2.3 should also be read to understand how to safely operate and use the machine in general.

8.4.1 Inspection

Hydraulic rams should be inspected on a daily basis before commencing work. Ensure all hydraulic hoses, lines and connections in good condition and tight before applying pressure.

Inspect the ram and the accompanying fitted items to it:

- Check for play and wear in either end of the ram pear pin bushes and replace if necessary.
- Replace the ram immediately if there is any apparent distortion or corrosion on the plated ram rod.

If there is a leak apparent, determine where the cause of this leak is from. Causes could be due to the hydraulic ram, hose adaptors or the hydraulic hoses. **Replace the component at fault if in any doubt before proceeding to use the machine**. Hydraulic ram seal spares kits are available.

Where parts are broken, damaged and deemed not fit for use; replace with genuine Spearhead parts; see Section 10.

8.4.2 Replacement

Hydraulic hoses can be replaced easily using standard tools. It is important to replace components with genuine Spearhead parts and correctly tighten neighbouring connections and fittings to the correct torque.

Replacing complete hydraulic rams and carrying out other hydraulic ram maintenance tasks are more specialist work requiring specialist lifting and supporting equipment to ensure the work is carried out safely. This work should be carried out in a clean environment by a Spearhead Machinery dealer.

Ensure the reach arm is safely stopped and disconnected from the tractor (hydraulically and electrically) and that the hydraulic system is fully depressurised before carrying out maintenance tasks. The reach arm should be safely supported to ensure that the machine does not inadvertently move when components are removed and personnel are working with the machine.

When carrying out work on the hydraulic system and replacing components, ensure that exposed hydraulic component ends and hoses are kept clean and are covered to ensure foreign objects and dirt are not introduced into the hydraulic system of the machine. Foreign objects can cause permanent damage to hydraulic system components. Maintaining a clean working environment to further reduce the chance of foreign objects being introduced into the machine.

It is important to protect hydraulic components if the machine is going to be potentially exposed to high temperature heat and risk of fire in some maintenance operations, for example during welding. High temperatures can permanently damage hydraulic components and loose sparks can start a fire. Hydraulic oil is highly flammable. Ensure the machine is free from leaks and is clean before beginning maintenance operations. If increased risk maintenance applications are required to be carried out near hydraulic components, ideally remove the components and refit once the maintenance operations are completed. Ensure a suitable fire extinguisher is available at all times.

CAUTION! Follow specialist professional guidance and the safety section with regards to working with and handling hydraulic oil and hydraulic components.

8.4.3 Hoses

Replace pinched and broken hydraulic hoses at once. Tighten any hydraulic fitting with fluid leaking from it. If fluid still leaks, loosen the fitting, apply a pipe thread compound to the threads and tighten. Care must be exercised when tightening hydraulic fittings. Too much tightening can cause the fittings to crack and require replacement fittings.

Hydraulic hose fitting torque setting are found in Section 8.11.2.

Although a small amount of oil will present from bleeding at all hydraulic fittings, significant amount of oil leaking from around the breather plug on the cylinder indicates that the seal in the cylinder is worn out. Replace the seals in the cylinder immediately before the cylinder is damaged or too much hydraulic fluid is lost.

CAUTION! Do not use the machine if the tractor hydraulic oil temperature exceeds 93° (200°F).

Ensure that all hydraulic hoses are correctly routed following the guidance given in Section 3.7.

Ensure that all machine guarding is reinstated on the machine to protect hydraulic components where required before using the machine again.

8.4.4 Component Identification

Twiga Classic reach arm machines come with a multitude of components in order to allow for the machine to operate the functions it required to offer.

8.4.4.1 Rotor Control Valve

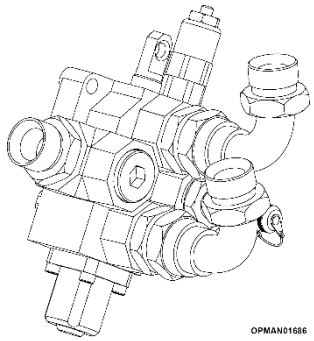
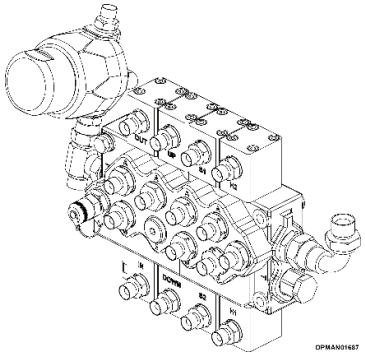


Figure 8.22 – Rotor Control Valve

The rotor control valve is mounted on the back of the mainframe of the machine and ensures the correct oil flow to the attachment after oil has been delivered to it from the oil pump. The rotor control valve is controlled by the rotor reverse lever mounted on the side of the joystick/armrest assembly by a cable to allow the operator to change the direction of rotation of the attachment if required during work.

8.4.4.2 Main Control Valve & Service Filter

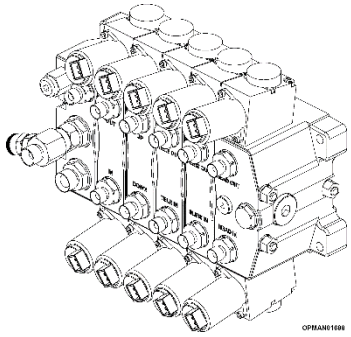


Pilot Control System
(4-bank version shown)

The main control valve is mounted on the inside of the oil tank of the machine and allows for the control of all hydraulic rams on the machine after oil has been delivered to it from the oil pump.

There are variations between the main control valve found on Twiga Classic machines dependent on whether the machine is specified with the Pilot control system or Minipilot control system.

The control valve used on the Pilot control system is solely hydraulic. It connects directly to hydraulic control joystick into each of the respective spools on the control valve. Hydraulic hoses then connect to each of the hydraulic rams. The joystick electric control cables connect to the Pilot valve (see Section



Minipilot Control System
(5-bank version shown)

Figure 8.23 - Control Valve & Service Filter

8.4.4.3) which then allows for the operation of each of the respective rams. A service filter is there to further filter the hydraulic oil going to the pilot valve; see Figure 8.24.

In contrast, the control valve used on the Minipilot control system uses an exclusively electric control joystick which connects directly to the electrical connections on the control valve to allow for the operation of each of the respective rams directly from the hydraulic connection on the block opposite.

4-bank or 5-bank build configurations are fitted to both control systems dependent on the model of machine specified. Variable forward reach and telescopic machines feature an additional fifth bank due their additional hydraulic ram.

8.4.4.3 Pilot Valve (Pilot control system only)

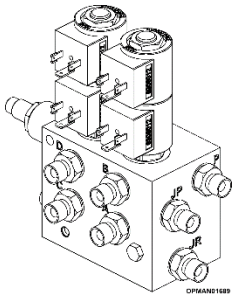


Figure 8.24 – Pilot Valve
(2-bank version shown)

A pilot valve is mounted on the inside of the oil tank of all Pilot control machines to allow for the operation of each of the hydraulic rams. The pilot valve is electrically operated from the joystick.

Either a 2-bank or 3-bank pilot valve are fitted dependent on the model of machine specified. Variable forward reach and telescopic machines feature an additional third bank due their additional hydraulic ram.

8.4.4.4 Break Back Valve

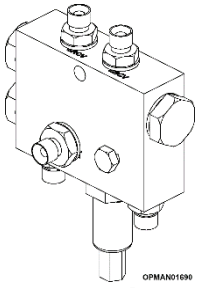


Figure 8.25 – Break Back Valve

A break back valve is mounted on the inside of the oil tank of all machines to allow for the machine to automatically slew back in response to hitting an obstacle. It is connected in the hydraulic line to the slew ram.

8.4.4.5 Head Float Valve

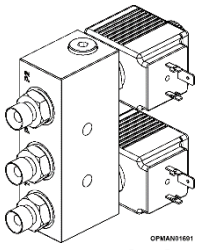


Figure 8.26 – Head Float Valve

The head float valve is mounted on the inside of the oil tank of all machines to allow for the attachment to automatically rotate and move its position in response to ground contours. Connected into the head ports on the valve block, the hydraulic valve features an electrical connection to the joystick to allow for the head float feature to switched on and off by the operator.

8.4.4.6 Arm Float Valve (option)

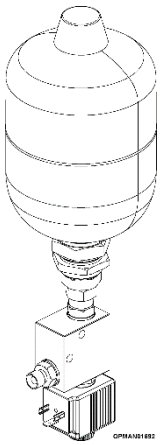


Figure 8.27 – Arm Float Valve

The arm float valve can be fitted as an option on all machines on the inside of the oil tank to allow for the armset to automatically raise and fall in response to ground contours. Connected into the lift ram ports on the valve block, the hydraulic valve features an electrical connection to the joystick to allow for the arm float feature to switched on and off by the operator. It is also connected directly to an accumulator bottle which gives a cushioning effect for the armset in work.

8.4.5 Valve Adjustment

The various control valves found on the Twiga Classic range of reach arms are calibrated at manufacture, however if any of the valves require adjustment they can be adjusted.

Rotor Control Valve

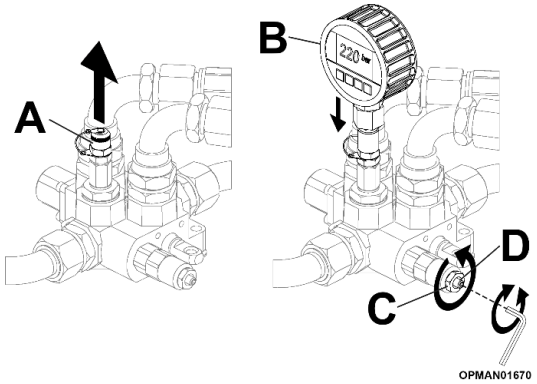


Figure 8.28

Item.	Pressure.
Rotor Control Valve Pressure Setting	220 bar

With reference to Figure 8.28, the control valve can be adjusted by:

8.4.5.1 Remove the valve test point cover cap (A).

8.4.5.2 Fit a suitable pressure measuring device (B) to the test point.

8.4.5.3 Loosen the nut found on the side of the rotor control valve (C).

8.4.5.4 Use an Allen socket to rotate the inner screw inwards and outwards (D) until the display gives a correct pressure setting for the valve of 220 bar.

8.4.5.5 Retighten the nut found on the side of the rotor control valve (C) to secure the setting.

4/5 Bank Control Valve (Pilot Control System Only)

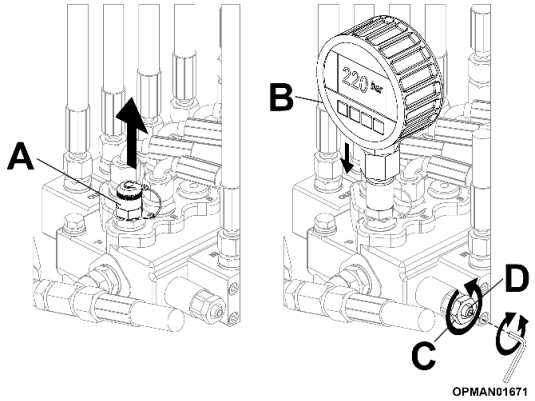


Figure 8.29

Item.	Pressure.
4/5 Bank Control Valve Pressure Setting	220 bar

With reference to Figure 8.29, the control valve can be adjusted by:

8.4.5.6 Remove the valve test point cover cap (A).

8.4.5.7 Fit a suitable pressure measuring device (B) to the test point.

8.4.5.8 Loosen the nut found on the side of the control valve (C).

8.4.5.9 Use an Allen socket to rotate the inner screw inwards and outwards (D) until the display gives a correct pressure setting for the valve of 220 bar.

8.4.5.10 Retighten the nut found on the side of the control valve (C) to secure the setting.

SDS 100 Electric 4 Bank Control Valve (Minipilot Control System Only)

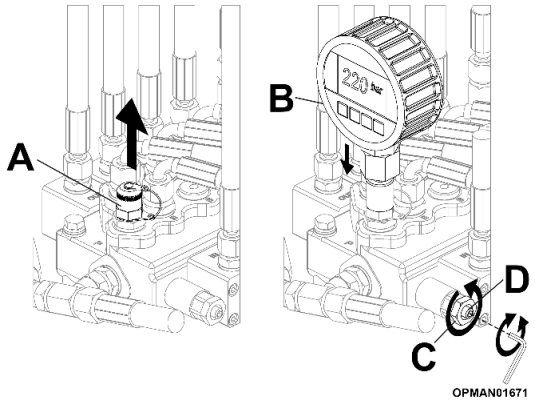


Figure 8.30

Item.	Pressure.
SDS 100 Electric 4 Bank Control Valve	220 bar

With reference to Figure 8.30, the control valve can be adjusted by:

8.4.5.11 Remove the valve test point cover cap (A).

8.4.5.12 Fit a suitable pressure measuring device (B) to the test point.

8.4.5.13 Loosen the nut found on the side of the control valve (C).

8.4.5.14 Use an Allen socket to rotate the inner screw inwards and outwards (D) until the display gives a correct pressure setting for the valve of 220 bar.

8.4.5.15 Retighten the nut found on the side of the control valve (C) to secure the setting.

Pilot Valve

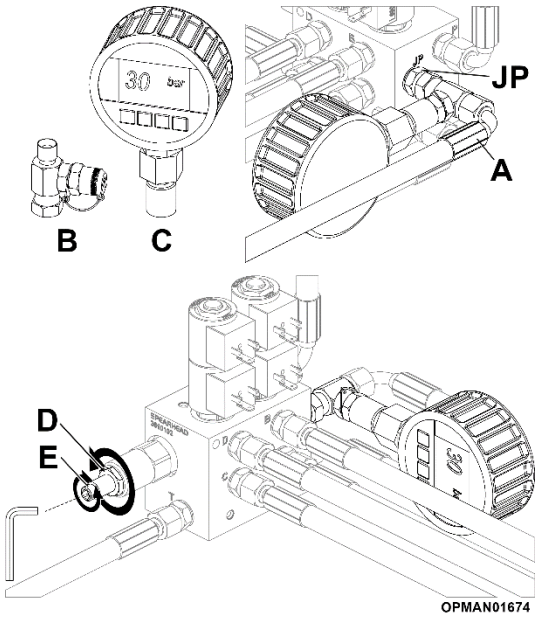


Figure 8.31

Item.	Pressure.
Pilot Valve	30 bar

With reference to Figure 8.31, the pilot valve can be adjusted by:

8.4.5.16 Remove the joystick pressure hydraulic hose (A) from the valve block (JP), leaving the adaptor.

8.4.5.17 Fit the 1/4” tee test point (B) on the exposed adaptor and refit the joystick pressure hydraulic hose (A).

8.4.5.18 Fit a suitable pressure measuring device (C) to the test point.

8.4.5.19 Loosen the locking nut found on the side of the pilot valve (D).

8.4.5.20 Use an Allen socket to rotate the screw inwards and outwards (E) until the display gives a correct pressure setting for the valve of 30 bar.

8.4.5.21 Retighten the nut on the pilot valve (D) to secure the setting.

Breakback Valve

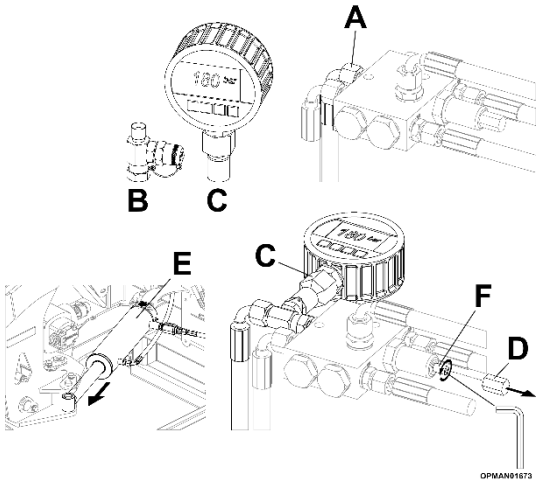


Figure 8.32

Item.	Pressure.
Breakback Valve	180 bar

With reference to Figure 8.32, the breakback valve can be adjusted by:

8.4.5.22 Remove the slew base hydraulic hose from the valve block (A), leaving the adaptor.

8.4.5.23 Fit the 1/4” tee test point (B) on the exposed adaptor and refit the slew base hydraulic hose.

8.4.5.24 Fit a suitable pressure measuring device (C).

8.4.5.25 Loosen and remove the cover nut found on the side of the breakback valve (D).

8.4.5.26 Operate and hold the “slew out” button on the joystick to extend the slew hydraulic ram (E).

8.4.5.27 Use an Allen socket to rotate the screw inwards and outwards (F) until the display gives a correct pressure setting for the valve of 180 bar.

8.4.5.28 Release and hold the “slew out” button on the joystick.

8.4.5.29 Refit the nut on the control valve (D) to protect the setting.

8.5 Hydraulic Diagrams

8.5.1 Base & Arm Hoses

8.5.1.1 Standard Arm (S55/S60)

NOTE this section is illustrated using a left-hand model. Right-hand model machines use exactly the hydraulic diagram; just in a mirrored layout.

Pilot Control System – S55/S60

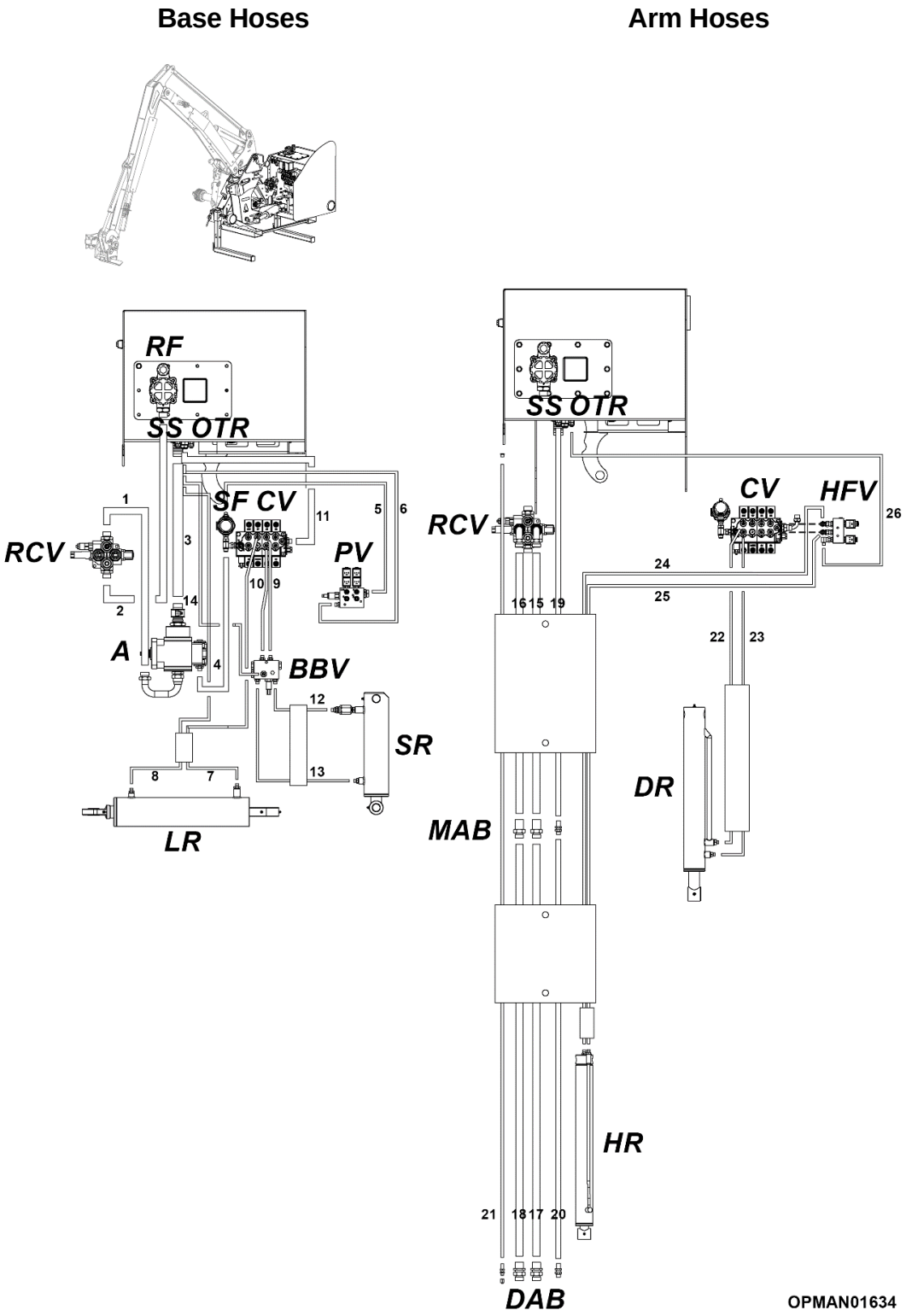
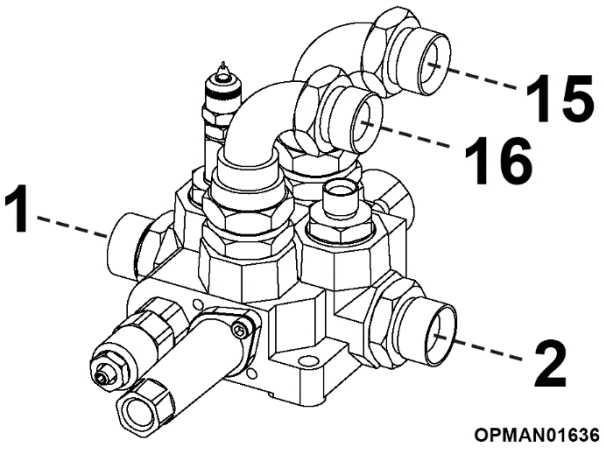
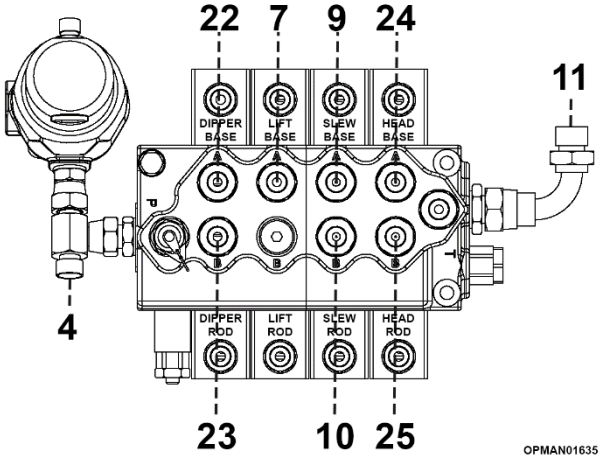


Figure 8.33 – Twiga Classic Standard Arm Pilot Control System Hose Diagram

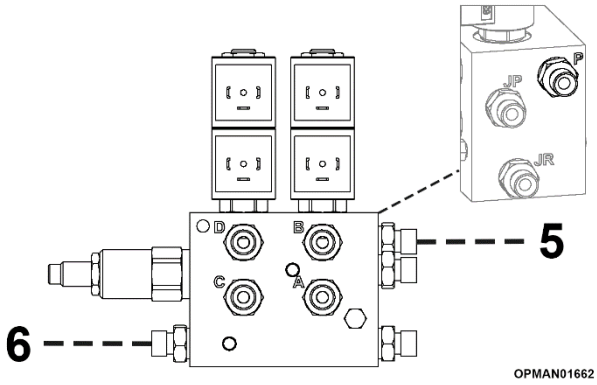
RCV
Rotor Control Valve Detail
(Twiga Classic Standard Arm)



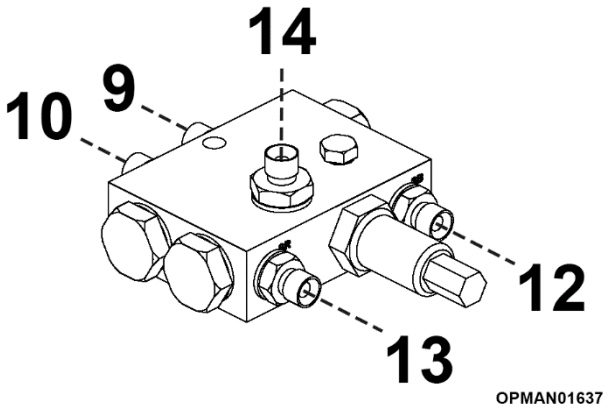
CV & SF
4 Bank Control Valve & Service Filter Detail
(Twiga Classic Standard Arm)



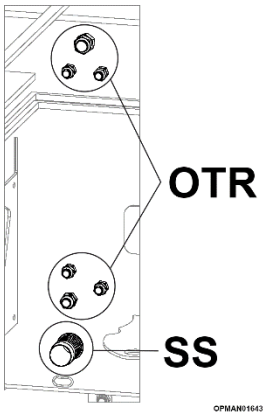
PV
2-Bank Pilot Valve
(Twiga Classic Standard Arm)



BBV
Break Back Valve
(Twiga Classic Standard Arm)



SS & OTR
Suction Strainer & Oil Tank Return
(Twiga Classic Standard Arm)



HFV
Head Float Valve
(Twiga Classic Standard Arm)

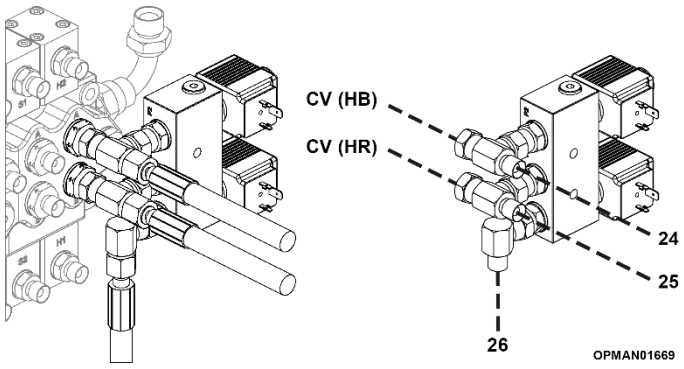


Figure 8.34
Twiga Classic Standard Arm Pilot Control System Hydraulic System Component Details

Item.	Description.
BBV	Break Back Valve
CV	4 Bank Control Valve
DAB	Dipper Arm Bulkhead
DR	Dipper Ram
HFV	Head Float Valve
HR	Head Ram
LF	Lift Ram
M	Motor
MAB	Main Arm Bulkhead
OTR	Oil Tank Return
PV	2 Bank Pilot Valve
RCV	Rotor Control Valve
RF	Returns Filter Assembly
SF	Service Filter
SR	Slew Ram
SS	Suction Strainer

Item.	Use.		Hose Size.
	End 1.	End 2.	
1	Motor (M)	Rotor Control Valve (RCV)	1”
2	Rotor Control Valve (RCV)	Returns Filter Assembly (RF)	1”
3	Suction Strainer (SS)	Motor (M)	1 1/2”
4	Motor (M)	Service Filter (SF)/ 4 Bank Control Valve Pressure Tee (CV)	3/8”
5	Service Filter (SF)	2 Bank Pilot Valve Pressure (PV)	1/4”
6	2 Bank Pilot Valve Pressure (PV)	Oil Tank Return (OTR)	1/4"
7	4 Bank Control Valve (CV)	Lift Ram Base End (LR)	1/4”
8	Lift Ram Rod End (LR)	Oil Tank Return (OTR)	1/4"
9	4 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4”
10	Break Back Valve (BBV)	4 Bank Control Valve (CV)	1/4"
11	4 Bank Control Valve (CV)	Oil Tank Return (OTR)	1/2"
12	Break Back Valve (BBV)	Slew Ram Base End (SR)	1/4”
13	Slew Ram Rod End (SR)	Break Back Valve (BBV)	1/4"
14	Break Back Valve (BBV)	Oil Tank Return (OTR)	1/4”
15	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
16	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
17	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
18	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
19	Oil Tank Return (OTR)	Dipper Arm Bulkhead (DAB)	3/8”
20	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	3/8”
21	Tractor Spool Controlled Attachment Accessory		1/4”
22	4 Bank Control Valve (CV)	Dipper Ram Base End (DR)	1/4”
23	Dipper Ram Rod End (DR)	4 Bank Control Valve (CV)	1/4"
24	Head Float Valve “P2” (HFV)	Head Ram Base End (HR)	1/4”
25	Head Ram Rod End (HR)	Head Float Valve “P1” (HFV)	1/4"
26	Head Float Valve “T” (HFV)	Oil Tank Return (OTR)	1/4"

Table 8.6
Twiga Classic Standard Arm Pilot Control System Hose Diagram Definitions

Minipilot Control System – S55/S60

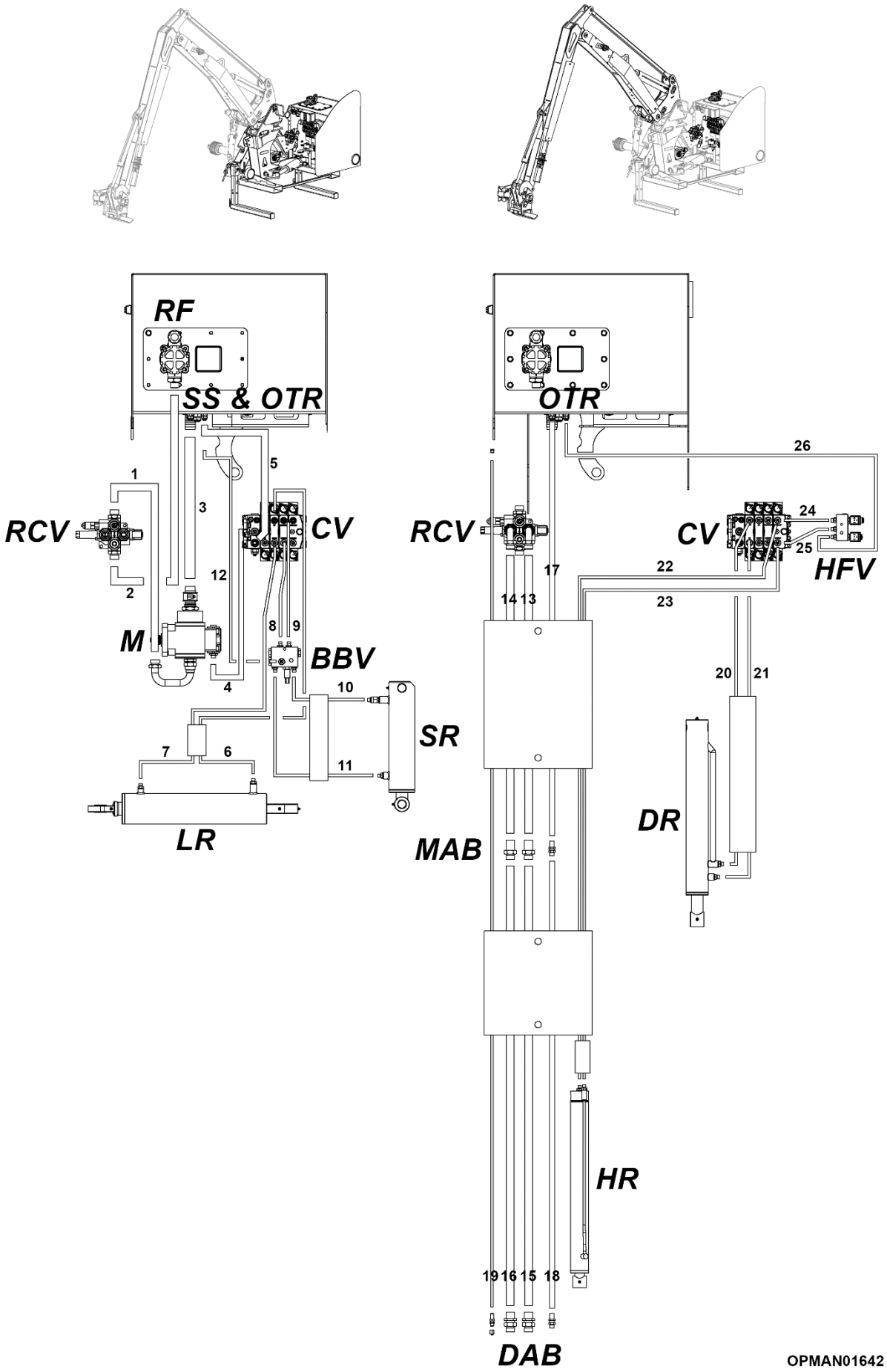
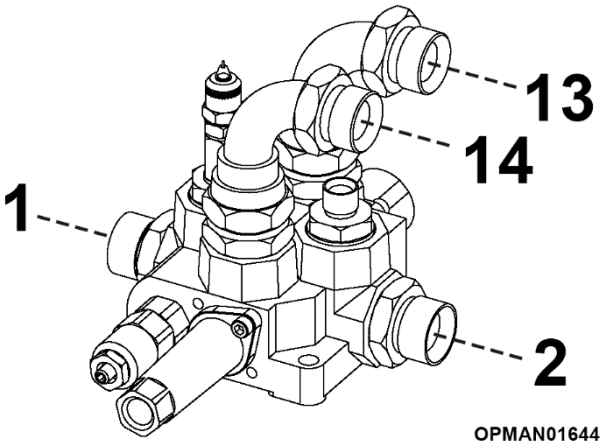
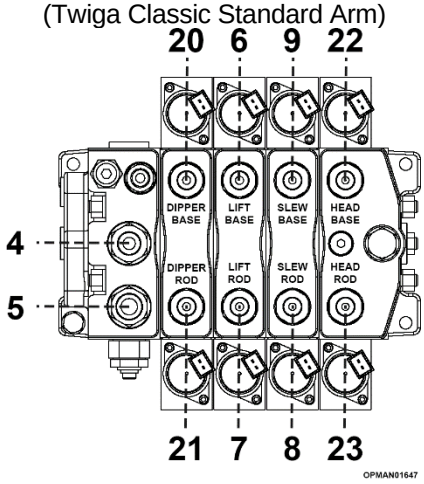


Figure 8.35 – Twiga Classic Standard Arm Minipilot Control System Hose Diagram

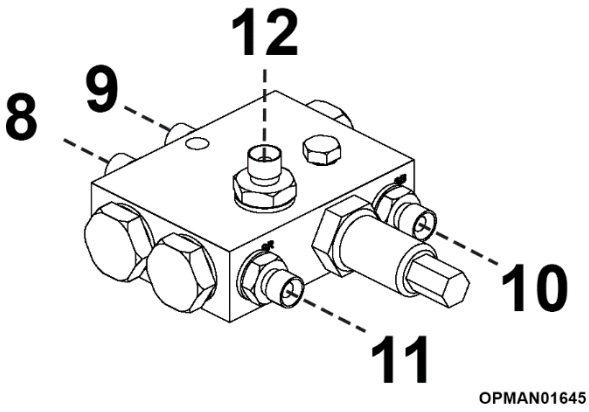
RCV
Rotor Control Valve Detail
(Twiga Classic Standard Arm)



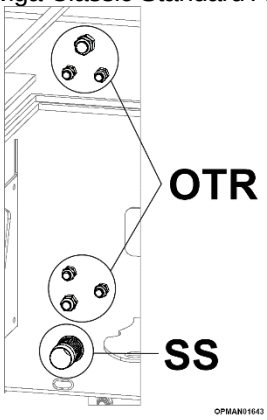
CV
SDS 100 Electric 4 Bank Control Valve Detail
(Twiga Classic Standard Arm)



BBV
Break Back Valve
(Twiga Classic Standard Arm)



SS & OTR
Suction Strainer & Oil Tank Return
(Twiga Classic Standard Arm)



HFV
Head Float Valve
(Twiga Classic Standard Arm)

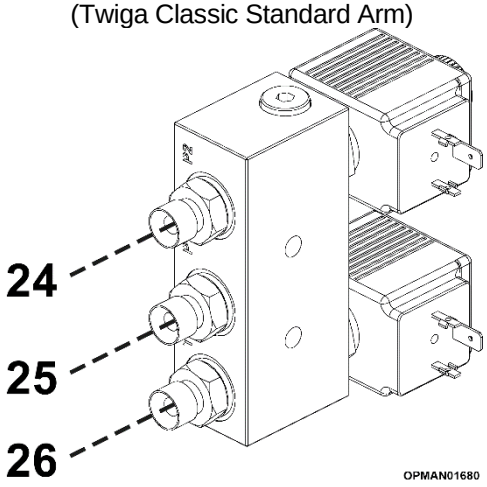


Figure 8.36
Twiga Classic Standard Arm Minipilot Control System Hydraulic System Component Details

Item.	Description.
BBV	Break Back Valve
CV	SDS 100 Electric 4 Bank Control Valve
HFV	Head Float Valve
LR	Lift Ram
M	Motor
OTR	Oil Tank Return
RCV	Rotor Control Valve
RF	Returns Filter Assembly
SS	Suction Strainer
SR	Slew Ram

Item.	Use.		Hose Size.
	End 1.	End 2.	
1	Motor (M)	Rotor Control Valve (RCV)	1”
2	Rotor Control Valve (RCV)	Returns Filter Assembly (RF)	1”
3	Suction Strainer (SS)	Motor (M)	1 1/2”
4	Motor (M)	SDS 100 Electric 4 Bank Control Valve (CV)	3/8”
5	SDS 100 Electric 4 Bank Control Valve (CV)	Oil Tank Return (OTR)	1/2”
6	SDS 100 Electric 4 Bank Control Valve (CV)	Lift Ram Base End (LR)	1/4"
7	SDS 100 Electric 4 Bank Control Valve (CV)	Lift Ram Rod End (LR)	1/4"
8	SDS 100 Electric 4 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4"
9	SDS 100 Electric 4 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4"
10	Break Back Valve (BBV)	Slew Ram Base End (SR)	1/4"
11	Break Back Valve (BBV)	Slew Ram Rod End (SR)	1/4"
12	Break Back Valve (BBV)	Oil Tank Return (OTR)	1/4"
13	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
14	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
15	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
16	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
17	Oil Tank Return (OTR)	Dipper Arm Bulkhead (DAB)	3/8”
18	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	3/8”
19	Tractor Spool Controlled Attachment Accessory		1/4"
20	SDS 100 Electric 4 Bank Control Valve (CV)	Dipper Ram Base End (DR)	1/4"
21	Dipper Ram Rod End (DR)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
22	SDS 100 Electric 4 Bank Control Valve (CV)	Head Ram Base End (HR)	1/4"
23	Head Ram Rod End (HR)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
24	Head Float Valve (HFV)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
25	Head Float Valve (HFV)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
26	Head Float Valve (HFV)	Oil Tank Return (OTR)	1/4"

Table 8.7

Twiga Classic Standard Arm Minipilot Control System Hose Diagram Definitions

8.5.1.2 Telescopic Arm (T65)

NOTE this section is illustrated using a left-hand model. Right-hand model machines use exactly the hydraulic diagram; just in a mirrored layout.

Pilot Control System – T65

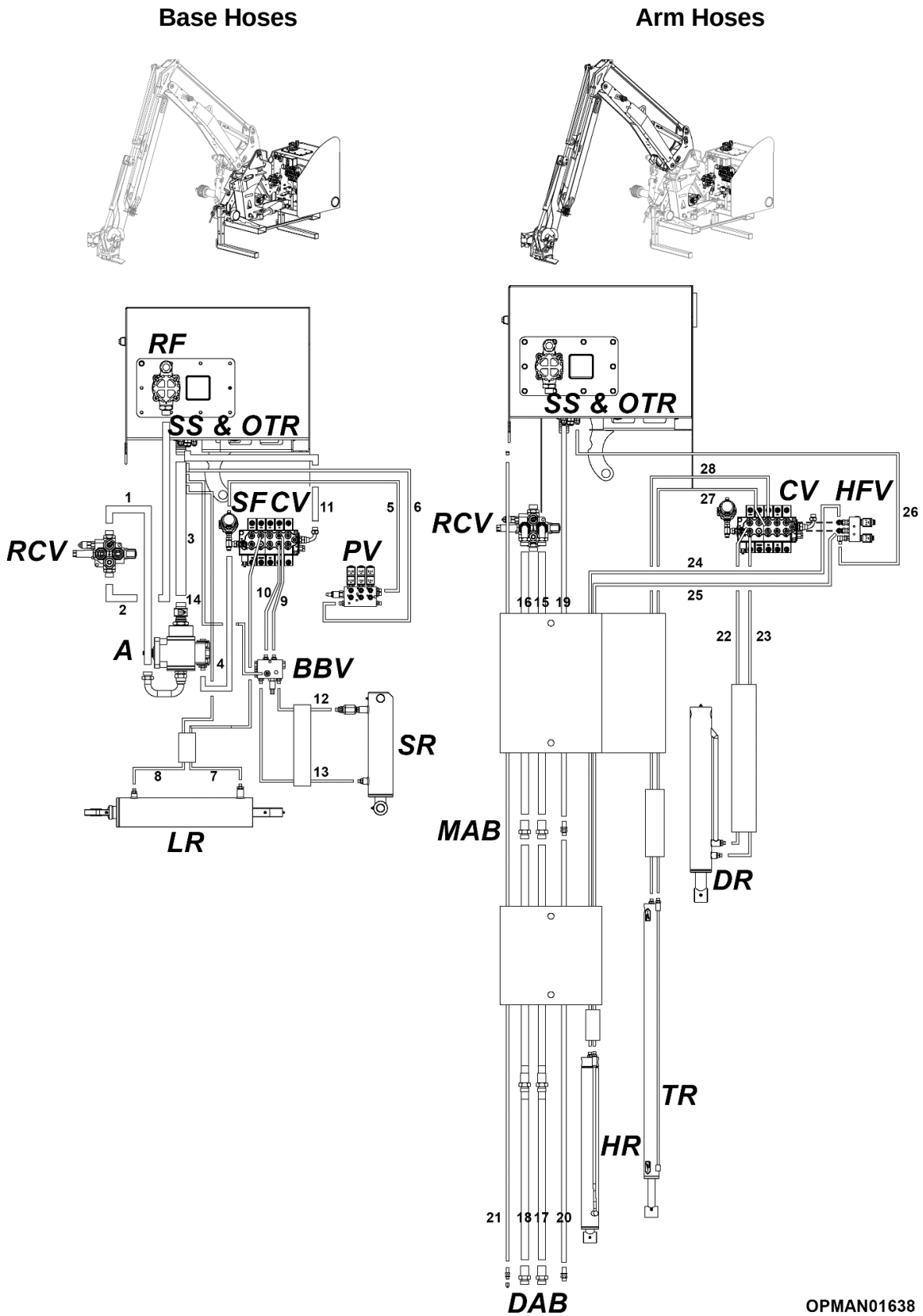
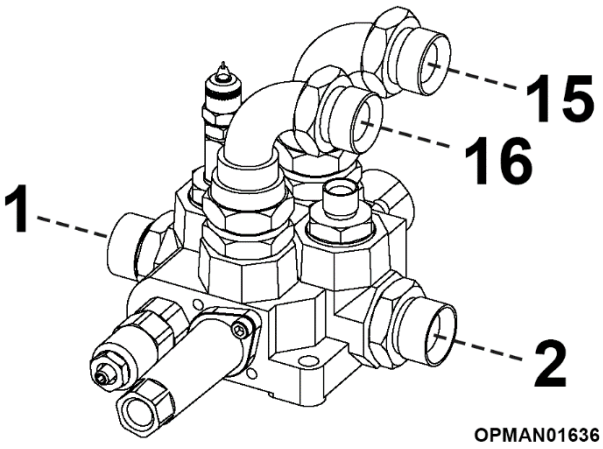
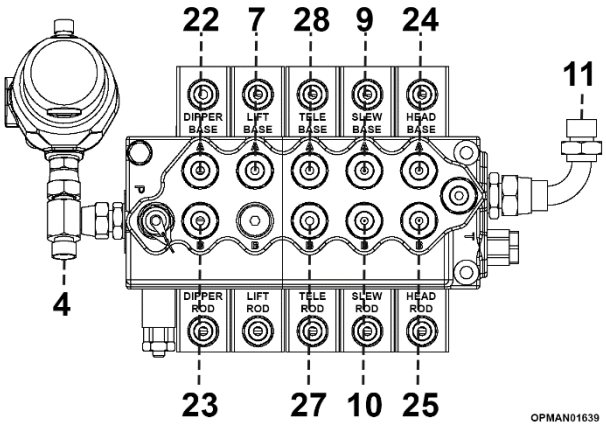


Figure 8.37 – Twiga Classic Telescopic Arm Pilot Control System Hose Diagram

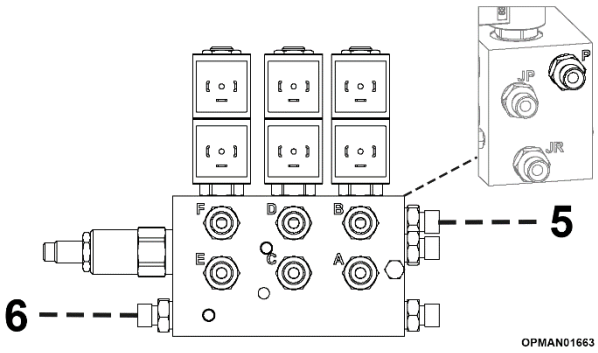
RCV
Rotor Control Valve Detail
(Twiga Classic Telescopic Arm)



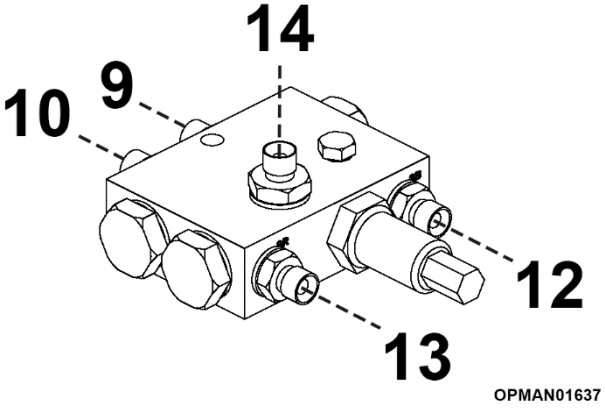
CV & SF
5 Bank Control Valve & Service Filter Detail
(Twiga Classic Telescopic Arm)



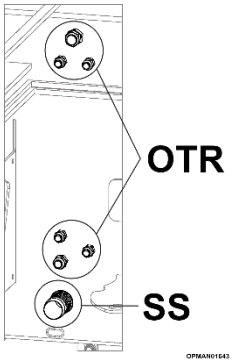
PV
3-Bank Pilot Valve
(Twiga Classic Telescopic Arm)



BBV
Break Back Valve
(Twiga Classic Telescopic Arm)



SS & OTR
Suction Strainer & Oil Tank Return
(Twiga Classic Telescopic Arm)



HFV
Head Float Valve
(Twiga Classic Telescopic Arm)

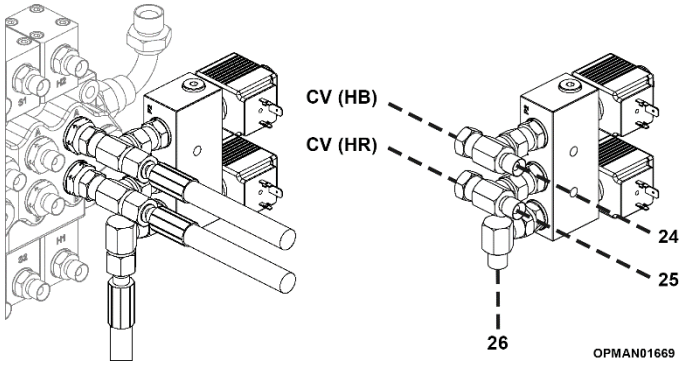


Figure 8.38
Twiga Classic Telescopic Arm Pilot Control System Hydraulic System Component Details

Item.	Description.
BBV	Break Back Valve
CV	5 Bank Control Valve
DAB	Dipper Arm Bulkhead
DR	Dipper Ram
HFV	Head Float Valve
HR	Head Ram
LR	Lift Ram
M	Motor
MAB	Main Arm Bulkhead
OTR	Oil Tank Return
PV	3 Bank Pilot Valve
RCV	Rotor Control Valve
RF	Returns Filter Assembly
SF	Service Filter
SR	Slew Ram
SS	Suction Strainer
TR	Tele Ram

Item.	Use.		Hose Size.
	End 1.	End 2.	
1	Motor (M)	Rotor Control Valve (RCV)	1”
2	Rotor Control Valve (RCV)	Returns Filter Assembly (RF)	1”
3	Suction Strainer (SS)	Motor (M)	1 1/2”
4	Motor (M)	Service Filter (SF)/ 5 Bank Control Valve Pressure Tee (CV)	3/8”
5	Service Filter (SF)	3 Bank Pilot Valve Pressure (PV)	1/4”
6	3 Bank Pilot Valve Pressure (PV)	Oil Tank Return (OTR)	1/4"
7	5 Bank Control Valve (CV)	Lift Ram Base End (LR)	1/4”
8	Lift Ram Rod End (LR)	Oil Tank Return (OTR)	1/4"
9	5 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4”
10	Break Back Valve (BBV)	5 Bank Control Valve (CV)	1/4"
11	5 Bank Control Valve (CV)	Oil Tank Return (OTR)	1/2"
12	Break Back Valve (BBV)	Slew Ram Base (SR)	1/4”
13	Slew Ram Rod End (SR)	Break Back Valve (BBV)	1/4"
14	Break Back Valve (BBV)	Oil Tank Return (OTR)	1/4”
15	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
16	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
17	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
18	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
19	Oil Tank Return (OTR)	Dipper Arm Bulkhead (DAB)	3/8”
20	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	3/8”
21	Tractor Spool Controlled Attachment Accessory		1/4"
22	5 Bank Control Valve (CV)	Dipper Ram Base End (DR)	1/4”
23	Dipper Ram Rod End (DR)	5 Bank Control Valve (CV)	1/4"
24	Head Float Valve “P2” (HFV)	Head Ram Base End (HR)	1/4”
25	Head Ram Rod End (HR)	Head Float Valve “P1” (HFV)	1/4"
26	Head Float Valve “T” (HFV)	Oil Tank Return (OTR)	1/4"
27	5 Bank Control Valve (CV)	Tele Ram Rod End (TR)	1/4”
28	5 Bank Control Valve (CV)	Tele Ram Base End (TR)	1/4"

Table 8.8
Twiga Classic Telescopic Arm Pilot Control System Hose Diagram Definitions

Minipilot Control System – T65

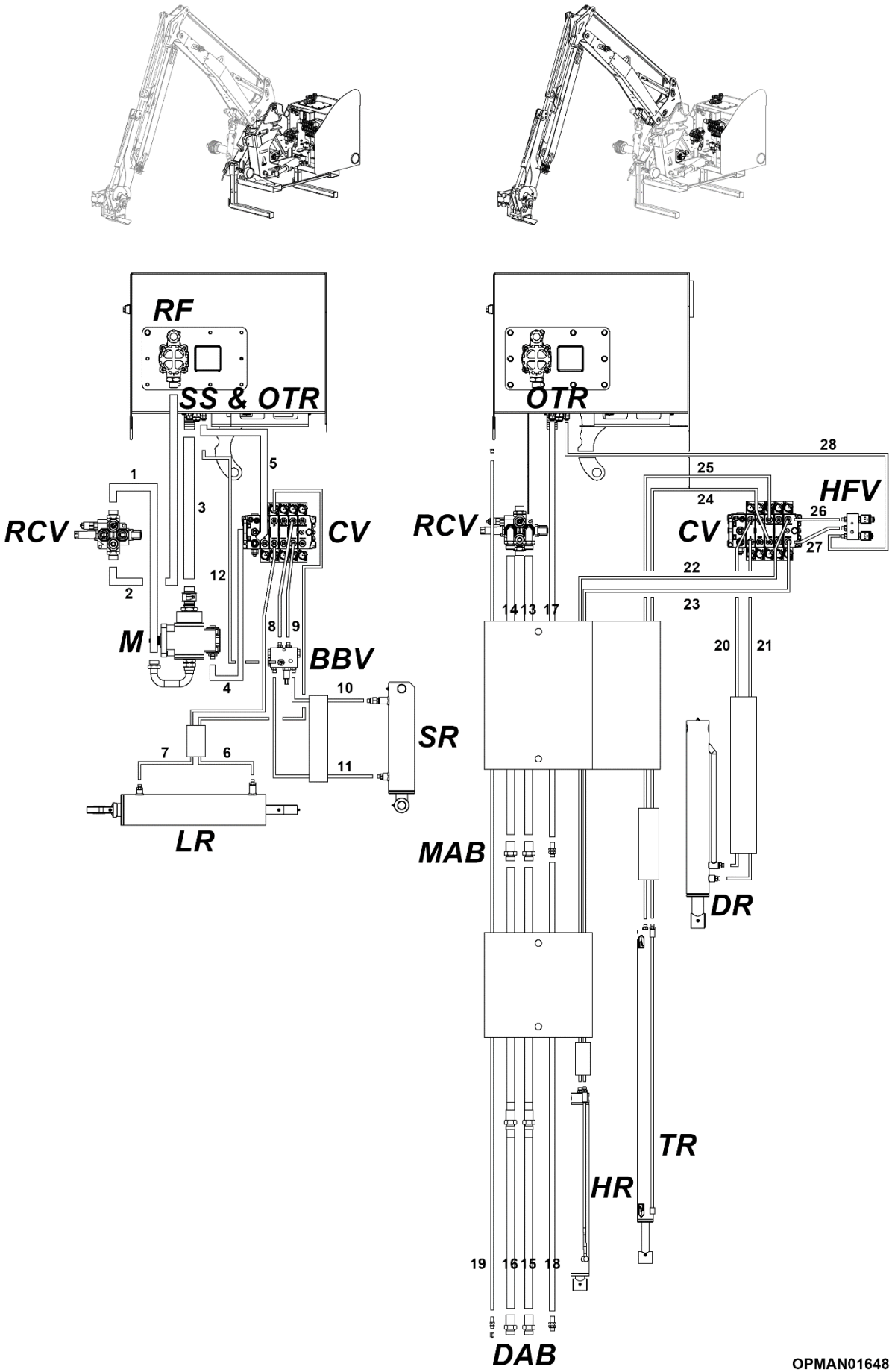
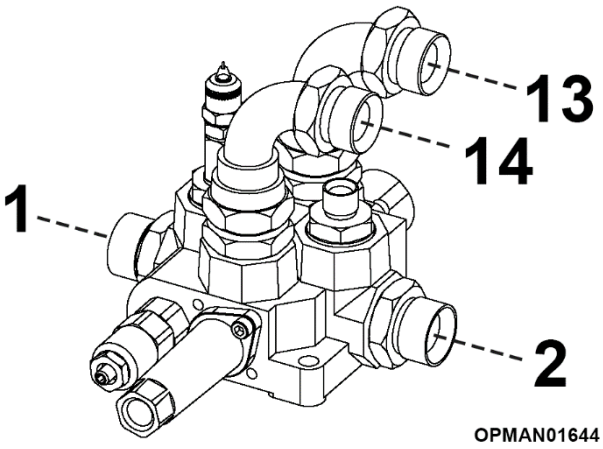
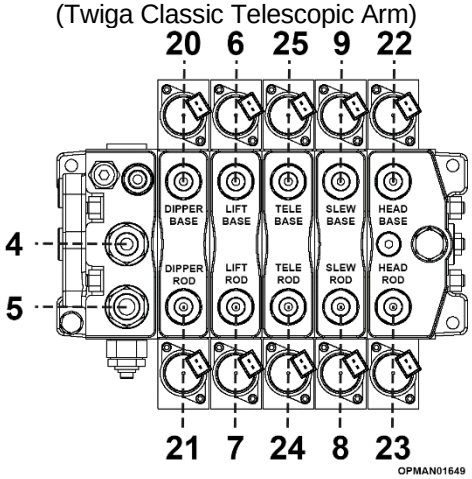


Figure 8.39 – Twiga Classic Telescopic Arm Minipilot Control System Hose Diagram

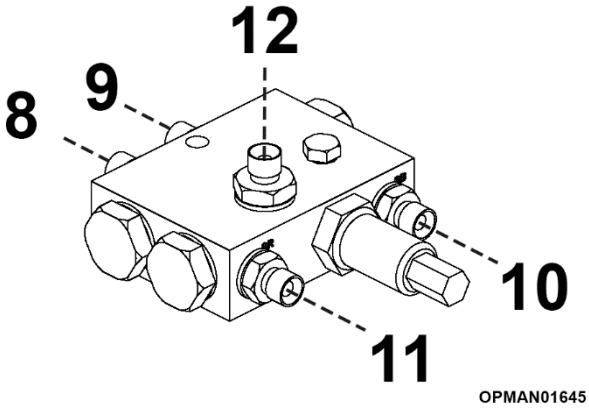
RCV
Rotor Control Valve Detail
(Twiga Classic Telescopic Arm)



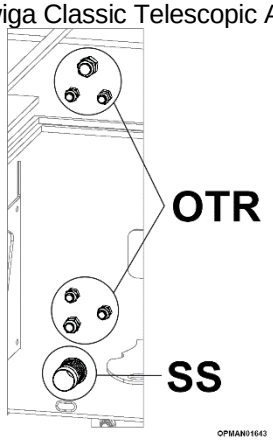
CV
SDS 100 Electric 5 Bank Control Valve Detail
(Twiga Classic Telescopic Arm)



BBV
Break Back Valve
(Twiga Classic Telescopic Arm)



SS & OTR
Suction Strainer & Oil Tank Return
(Twiga Classic Telescopic Arm)



HFV
Head Float Valve
(Twiga Classic Telescopic Arm)

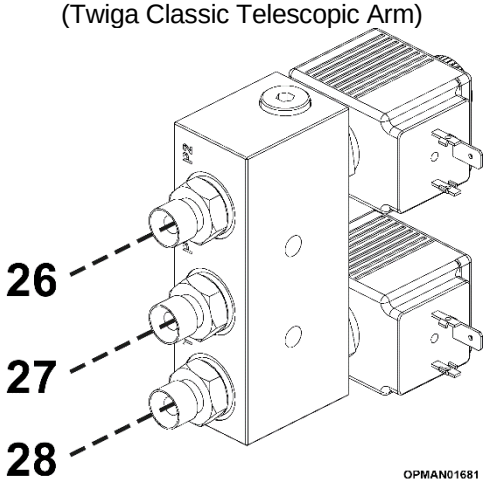


Figure 8.40
Twiga Classic Telescopic Arm Minipilot Control System Hydraulic System Component Details

Item.	Description.
BBV	Break Back Valve
CV	SDS 100 Electric 5 Bank Control Valve
DAB	Dipper Arm Bulkhead
DR	Dipper Ram
HFV	Head Float Valve
HR	Head Ram
LR	Lift Ram
M	Motor
MAB	Main Arm Bulkhead
OTR	Oil Tank Return
RCV	Rotor Control Valve
RF	Returns Filter Assembly
SR	Slew Ram
SS	Suction Strainer
TR	Tele Ram

Item.	Use.		Hose Size.
	End 1.	End 2.	
1	Motor (M)	Rotor Control Valve (RCV)	1”
2	Rotor Control Valve (RCV)	Returns Filter Assembly (RF)	1”
3	Suction Strainer (SS)	Motor (M)	1 1/2"
4	Motor (M)	SDS 100 Electric 5 Bank Control Valve (CV)	3/8”
5	SDS 100 Electric 5 Bank Control Valve (CV)	Oil Tank Return (OTR)	1/2"
6	SDS 100 Electric 5 Bank Control Valve (CV)	Lift Ram Base End (LR)	1/4"
7	SDS 100 Electric 5 Bank Control Valve (CV)	Lift Ram Rod End (LR)	1/4"
8	SDS 100 Electric 5 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4"
9	SDS 100 Electric 5 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4"
10	Break Back Valve (BBV)	Slew Ram Base End (SR)	1/4"
11	Break Back Valve (BBV)	Slew Ram Rod End (SR)	1/4"
12	Break Back Valve (BBV)	Oil Tank Return (OTR)	1/4"
13	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
14	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
15	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
16	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
17	Oil Tank Return (OTR)	Dipper Arm Bulkhead (DAB)	3/8”
18	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	3/8”
19	Tractor Spool Controlled Attachment Accessory		1/4"
20	SDS 100 Electric 5 Bank Control Valve (CV)	Dipper Ram Base End (DR)	1/4"
21	Dipper Ram Rod End (J)	SDS 100 Electric 5 Bank Control Valve (CV)	1/4"
22	SDS 100 Electric 5 Bank Control Valve (CV)	Head Ram Base End (HR)	1/4"
23	Head Ram Rod End (HR)	SDS 100 Electric 5 Bank Control Valve (CV)	1/4"
24	SDS 100 Electric 5 Bank Control Valve (CV)	Tele Ram Rod End (TR)	1/4"
25	SDS 100 Electric 5 Bank Control Valve (CV)	Tele Ram Base End (TR)	1/4"
26	Head Float Valve (HFV)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
27	Head Float Valve (HFV)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
28	Head Float Valve (HFV)	Oil Tank Return (OTR)	1/4"

Table 8.9
Twiga Classic Telescopic Arm Minipilot Control System Hose Diagram Definitions

8.5.1.3 Variable Forward Reach Arm (VFR55/VFR60)

NOTE this section is illustrated using a left-hand model. Right-hand model machines use exactly the hydraulic diagram; just in a mirrored layout.

Pilot Control System – VFR55/VFR60

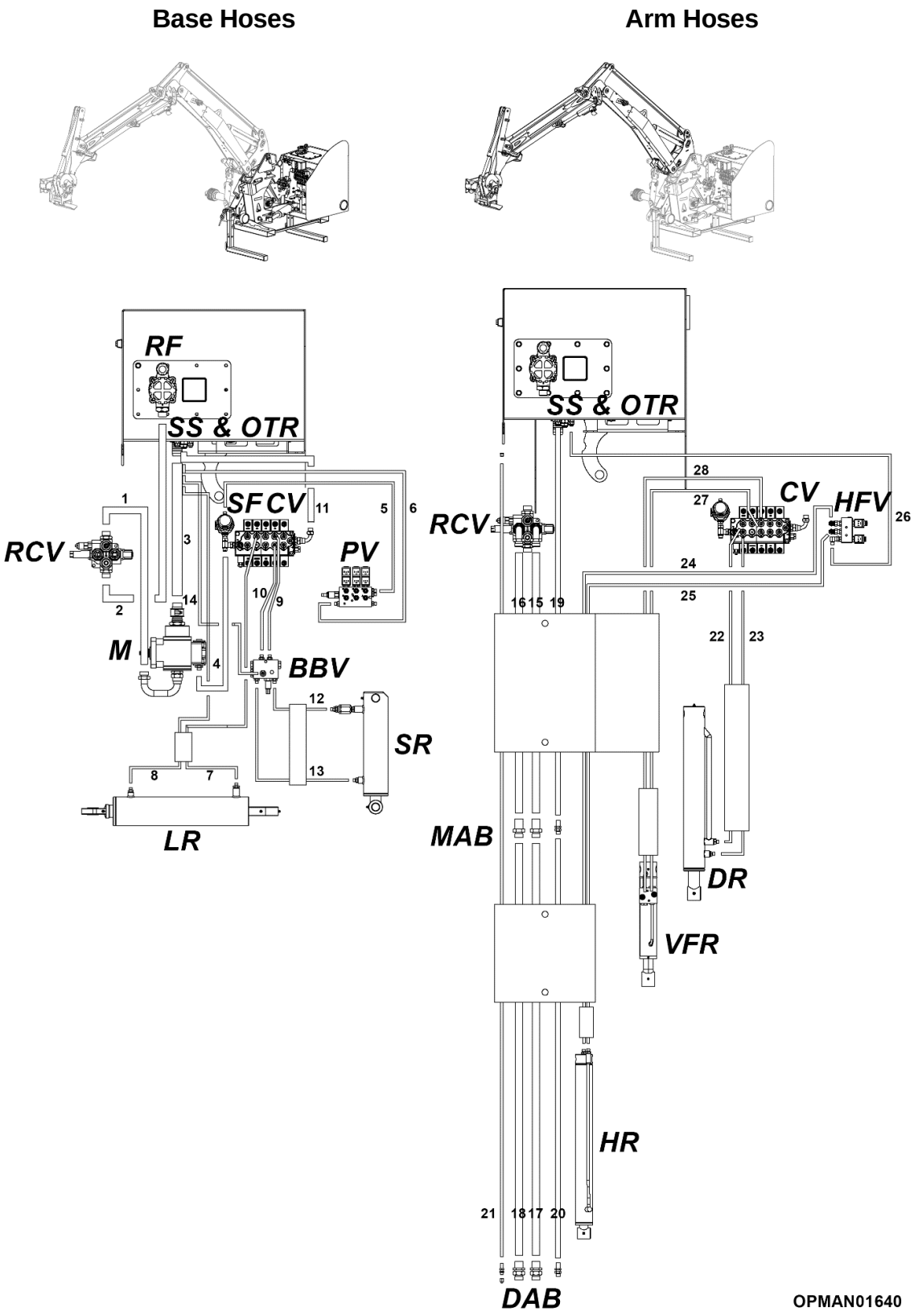
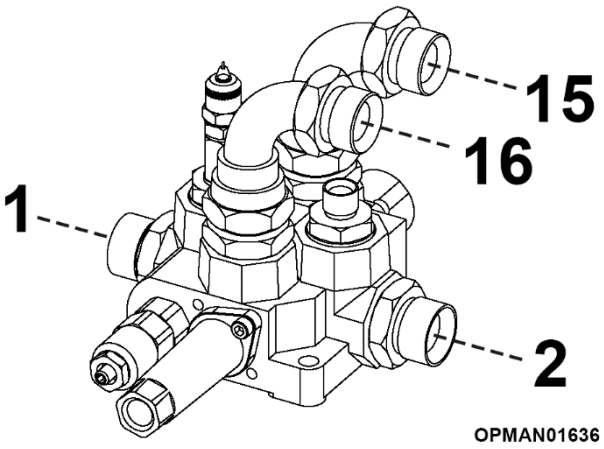
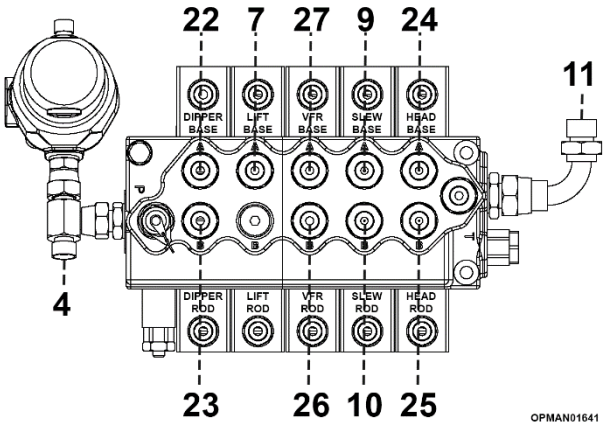


Figure 8.41 – Twiga Classic Variable Forward Reach Arm Pilot Control System Hose Diagram

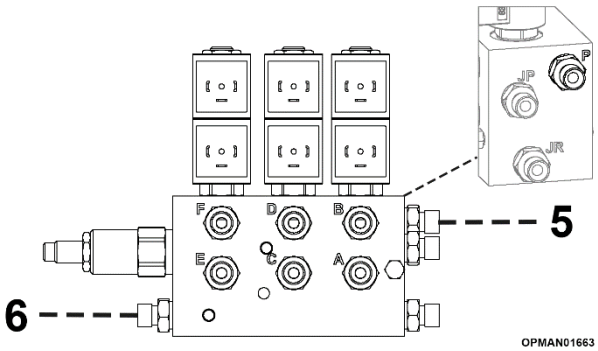
RCV
Rotor Control Valve Detail
(Twiga Classic Variable Forward Reach Arm)



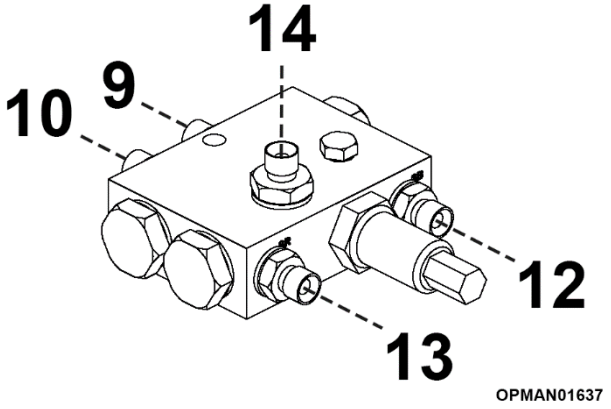
CV & SF
5 Bank Control Valve & Service Filter Detail
(Twiga Classic Variable Forward Reach Arm)



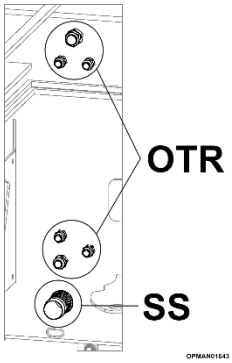
PV
3-Bank Pilot Valve
(Twiga Classic Variable Forward Reach Arm)



BBV
Break Back Valve
(Twiga Classic Variable Forward Reach Arm)



SS & OTR
Suction Strainer & Oil Tank Return
(Twiga Classic Variable Forward Reach Arm)



HFV
Head Float Valve
(Twiga Classic Variable Forward Reach Arm)

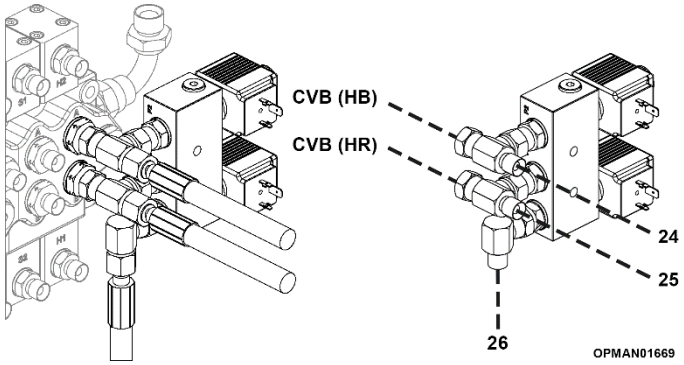


Figure 8.42
Twiga Classic Variable Forward Reach Arm Pilot Control System Hydraulic System Component Details

Item.	Description.
BBV	Break Back Valve
CV	5 Bank Control Valve
DAB	Dipper Arm Bulkhead
DR	Dipper Ram
HFV	Head Float Valve
HR	Head Ram
LR	Lift Ram
M	Motor
MAB	Main Arm Bulkhead
OTR	Oil Tank Return
PV	3 Bank Pilot Valve
RCV	Rotor Control Valve
RF	Returns Filter Assembly
SF	Service Filter
SR	Slew Ram
SS	Suction Strainer
VFR	Variable Forward Reach Ram

Item.	Use.		Hose Size.
	End 1.	End 2.	
1	Motor (M)	Rotor Control Valve (RCV)	1”
2	Rotor Control Valve (RCV)	Returns Filter Assembly (RF)	1”
3	Suction Strainer (SS)	Motor (M)	1 1/2”
4	Motor (M)	Service Filter (SF)/ 5 Bank Control Valve Pressure Tee (CV)	3/8”
5	Service Filter (SF)	3 Bank Pilot Valve Pressure (PV)	1/4”
6	3 Bank Pilot Valve Pressure (PV)	Oil Tank Return (OTR)	1/4"
7	5 Bank Control Valve (CV)	Lift Ram Base End (LR)	1/4”
8	Lift Ram Rod End (LR)	Oil Tank Return (OTR)	1/4"
9	5 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4”
10	Break Back Valve (BBV)	5 Bank Control Valve (CV)	1/4"
11	5 Bank Control Valve (CV)	Oil Tank Return (OTR)	1/2"
12	Break Back Valve (BBV)	Slew Ram Base (SR)	1/4”
13	Slew Ram Rod End (SR)	Break Back Valve (BBV)	1/4"
14	Break Back Valve (BBV)	Oil Tank Return (OTR)	1/4”
15	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
16	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
17	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
18	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
19	Oil Tank Return (OTR)	Dipper Arm Bulkhead (DAB)	3/8”
20	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	3/8”
21	Tractor Spool Controlled Attachment Accessory		1/4”
22	5 Bank Control Valve (CV)	Dipper Ram Base End (DR)	1/4”
23	Dipper Ram Rod End (DR)	5 Bank Control Valve (CV)	1/4"
24	Head Float Valve “P2” (HFV)	Head Ram Base End (HR)	1/4”
25	Head Ram Rod End (HR)	Head Float Valve “P1” (HFV)	1/4"
26	Head Float Valve “T” (HFV)	Oil Tank Return (OTR)	1/4"
27	5 Bank Control Valve (CV)	Variable Forward Reach Ram Rod End (VFR)	1/4”
28	5 Bank Control Valve (CV)	Variable Forward Reach Ram Base End (VFR)	1/4"

Table 8.10
Twiga Classic Variable Forward Reach Arm Pilot Control System Hose Diagram Definitions

Minipilot Control System – VFR55/VFR60

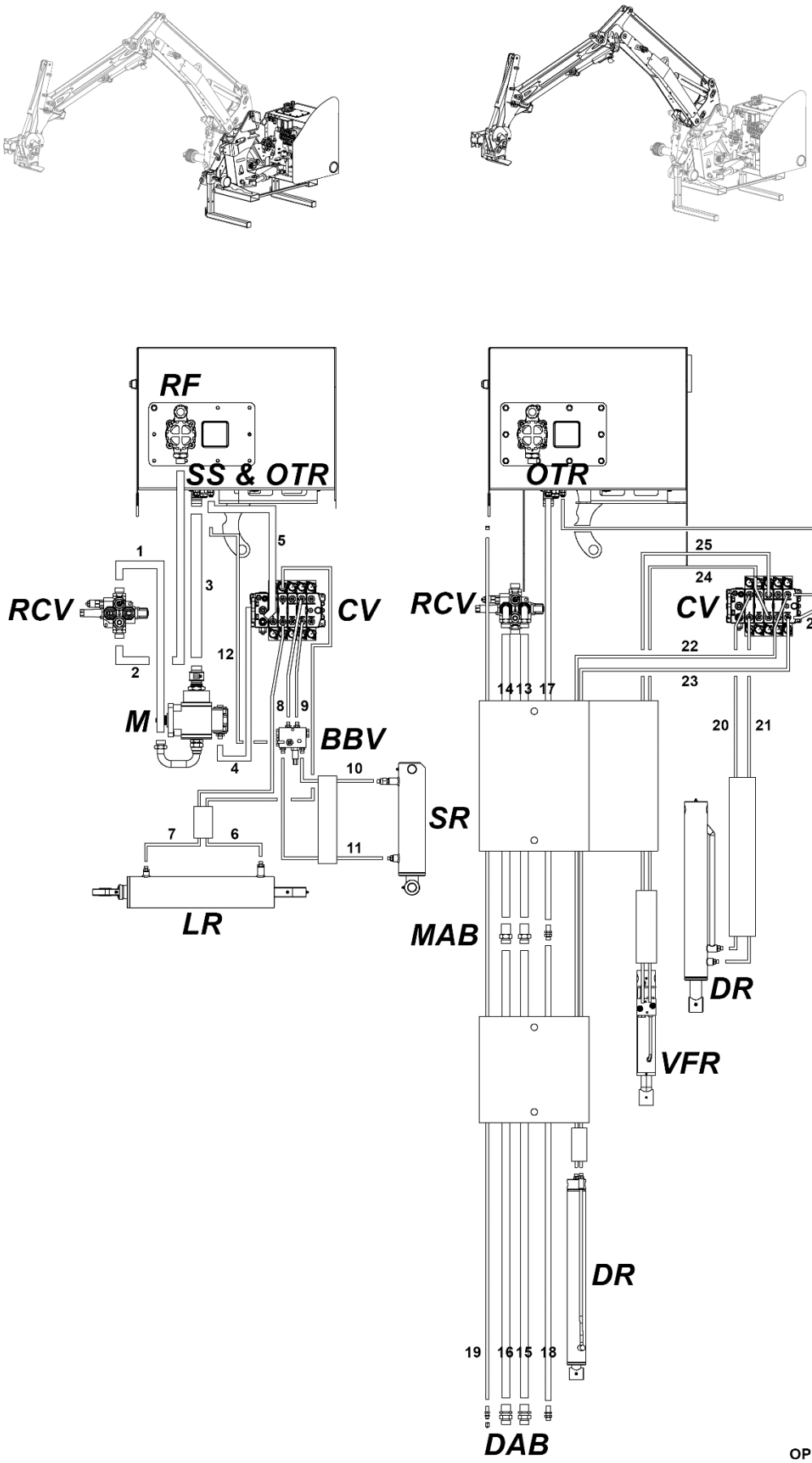
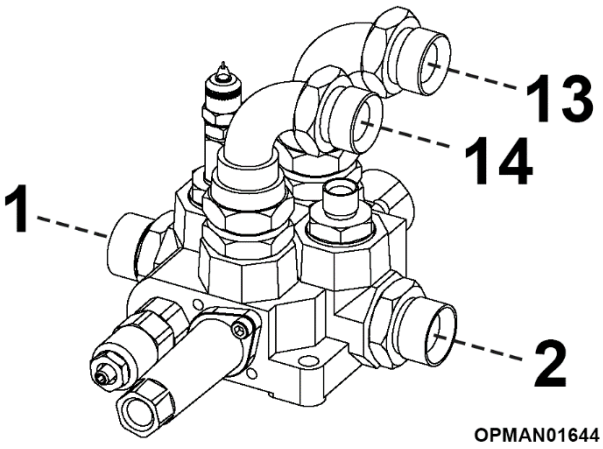
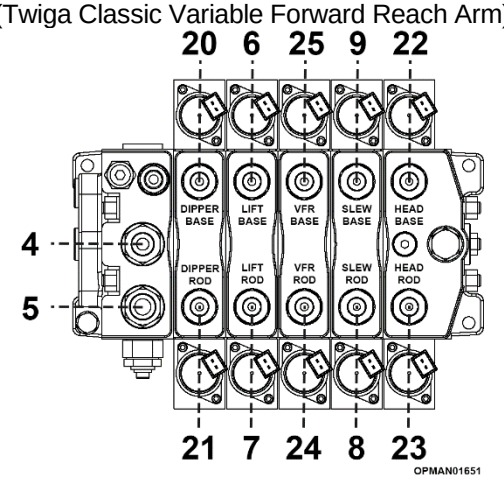


Figure 8.43 – Twiga Classic Variable Forward Reach Arm Minipilot Control System Hose Diagram

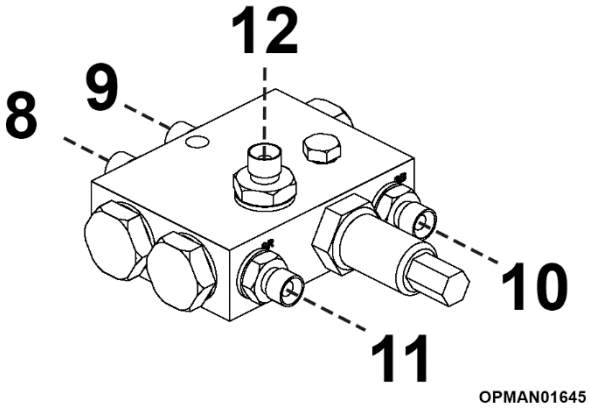
RCV
Rotor Control Valve Detail
(Twiga Classic Variable Forward Reach Arm)



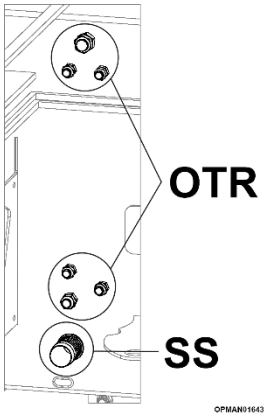
CV
SDS 100 Electric 5 Bank Control Valve Detail
(Twiga Classic Variable Forward Reach Arm)



BBV
Break Back Valve
(Twiga Classic Variable Forward Reach Arm)



SS & OTR
Suction Strainer & Oil Tank Return
(Twiga Classic Variable Forward Reach Arm)



HFV
Head Float Valve
(Twiga Classic Variable Forward Reach Arm)

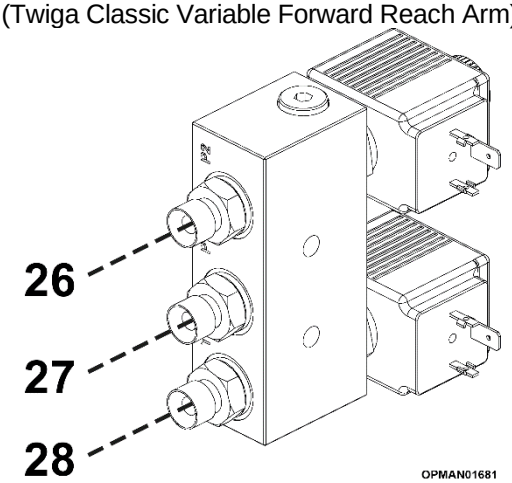


Figure 8.44
Twiga Classic Variable Forward Reach Arm Minipilot Control System Hydraulic System Component Details

Item.	Description.
BBV	Break Back Valve
CV	SDS 100 Electric 5 Bank Control Valve
DAB	Dipper Arm Bulkhead
DR	Dipper Ram
HFV	Head Float Valve
HR	Head Ram
LR	Lift Ram
M	Motor
MAB	Main Arm Bulkhead
OTR	Oil Tank Return
RCV	Rotor Control Valve
RF	Returns Filter Assembly
SR	Slew Ram
SS	Suction Strainer
VFR	Variable Forward Reach Ram

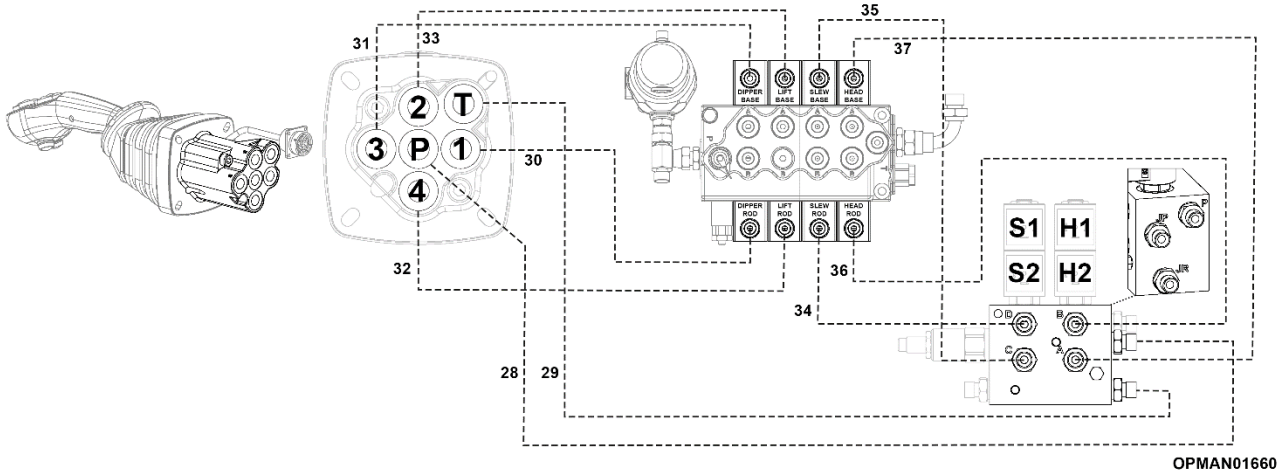
Item.	Use.		Hose Size.
	End 1.	End 2.	
1	Motor (M)	Rotor Control Valve (RCV)	1”
2	Rotor Control Valve (RCV)	Returns Filter Assembly (RF)	1”
3	Suction Strainer (SS)	Motor (M)	1 1/2”
4	Motor (M)	SDS 100 Electric 5 Bank Control Valve (D)	3/8”
5	SDS 100 Electric 5 Bank Control Valve (CV)	Oil Tank Return (OTR)	1/2"
6	SDS 100 Electric 5 Bank Control Valve (CV)	Lift Ram Base End (LR)	1/4"
7	SDS 100 Electric 5 Bank Control Valve (CV)	Lift Ram Rod End (LR)	1/4"
8	SDS 100 Electric 5 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4"
9	SDS 100 Electric 5 Bank Control Valve (CV)	Break Back Valve (BBV)	1/4"
10	Break Back Valve (BBV)	Slew Ram Base End (SR)	1/4"
11	Break Back Valve (BBV)	Slew Ram Rod End (SR)	1/4"
12	Break Back Valve (BBV)	Oil Tank Return (OTR)	1/4"
13	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
14	Rotor Control Valve (RCV)	Main Arm Bulkhead (MAB)	1”
15	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
16	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	1”
17	Oil Tank Return (OTR)	Dipper Arm Bulkhead (DAB)	3/8”
18	Main Arm Bulkhead (MAB)	Dipper Arm Bulkhead (DAB)	3/8”
19	Tractor Spool Controlled Attachment Accessory		1/4"
20	SDS 100 Electric 5 Bank Control Valve (CV)	Dipper Ram Base End (DR)	1/4"
21	Dipper Ram Rod End (DR)	SDS 100 Electric 5 Bank Control Valve (CV)	1/4"
22	SDS 100 Electric 5 Bank Control Valve (CV)	Head Ram Base End (HR)	1/4"
23	Head Ram Rod End (HR)	SDS 100 Electric 5 Bank Control Valve (CV)	1/4"
24	SDS 100 Electric 5 Bank Control Valve (CV)	Variable Forward Reach Ram Rod End (VFR)	1/4"
25	SDS 100 Electric 5 Bank Control Valve (CV)	Variable Forward Reach Ram Base End (VFR)	1/4"
26	Head Float Valve (HFV)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
27	Head Float Valve (HFV)	SDS 100 Electric 4 Bank Control Valve (CV)	1/4"
28	Head Float Valve (HFV)	Oil Tank Return (OTR)	1/4"

Table 8.11
Twiga Classic Variable Forward Reach Arm Minipilot Control System Hose Diagram Definitions

8.5.2 Joystick – Pilot Control Only

8.5.2.1 Standard Arm – S55/S60

Left-hand Build



Right-hand Build

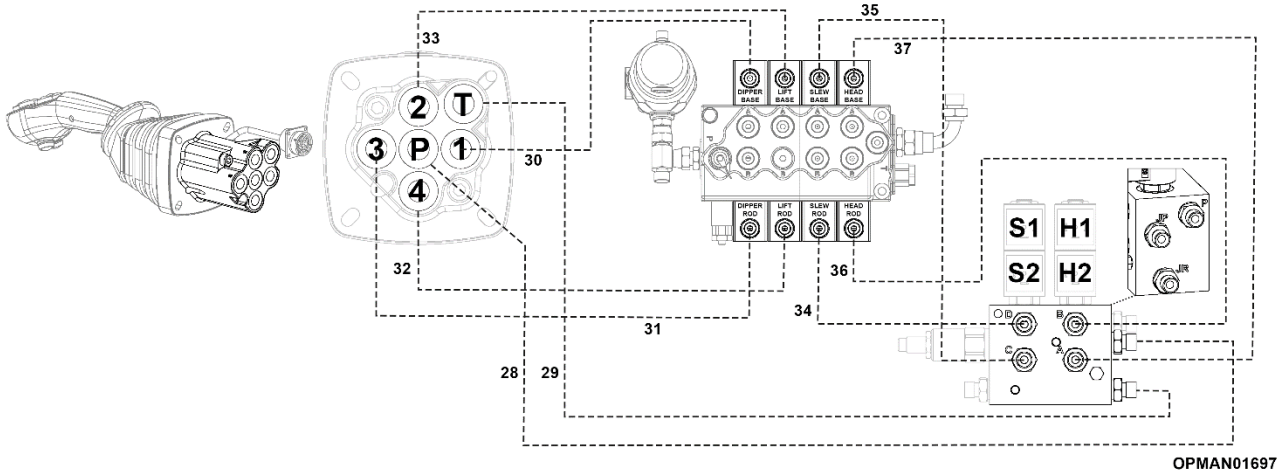


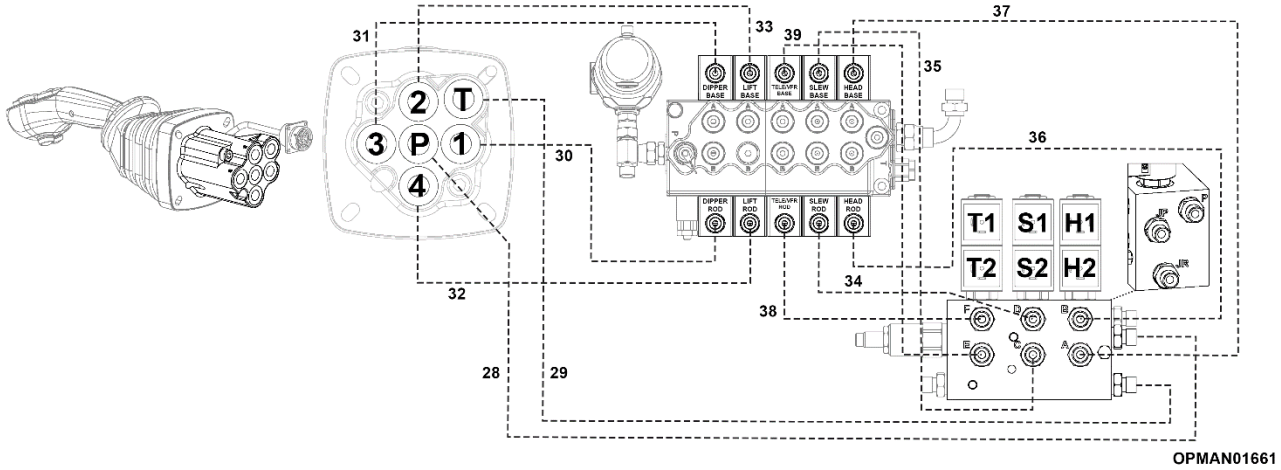
Figure 8.45 – Twiga Classic Standard Arm Pilot Control Joystick Hose Diagram

Item.	Build Configuration.	Use.		Hose Size.
		End 1.	End 2.	
28	Both	Joystick “P”	Pilot Valve “JR”	1/4"
29	Both	Joystick “T”	Pilot Valve “JP”	1/4"
30	Left-hand	Joystick “1”	4-Bank Control Valve “Dipper Rod”	1/4"
	Right-hand	Joystick “3”	4-Bank Control Valve “Dipper Rod”	1/4"
31	Left-hand	Joystick “3”	4-Bank Control Valve “Dipper Base”	1/4"
	Right-hand	Joystick “1”	4-Bank Control Valve “Dipper Base”	1/4"
32	Both	Joystick “4”	4-Bank Control Valve “Lift Rod”	1/4"
33	Both	Joystick “2”	4-Bank Control Valves “Lift Base”	1/4"
34	Both	Pilot Valve “D”	4-Bank Control Valve “Slew Rod”	1/4"
35	Both	Pilot Valve “C”	4-Bank Control Valve “Slew Base”	1/4"
36	Both	Pilot Valve “B”	4-Bank Control Valve “Head Rod”	1/4"
37	Both	Pilot Valve “A”	4-Bank Control Valve “Head Base”	1/4"

Table 8.12
Twiga Classic Standard Arm Pilot Control Joystick Hose Diagram Definitions

8.5.2.2 Telescopic & Variable Forward Reach Arm – T65/ VFR55/VFR60

Left-hand Build



Right-hand Build

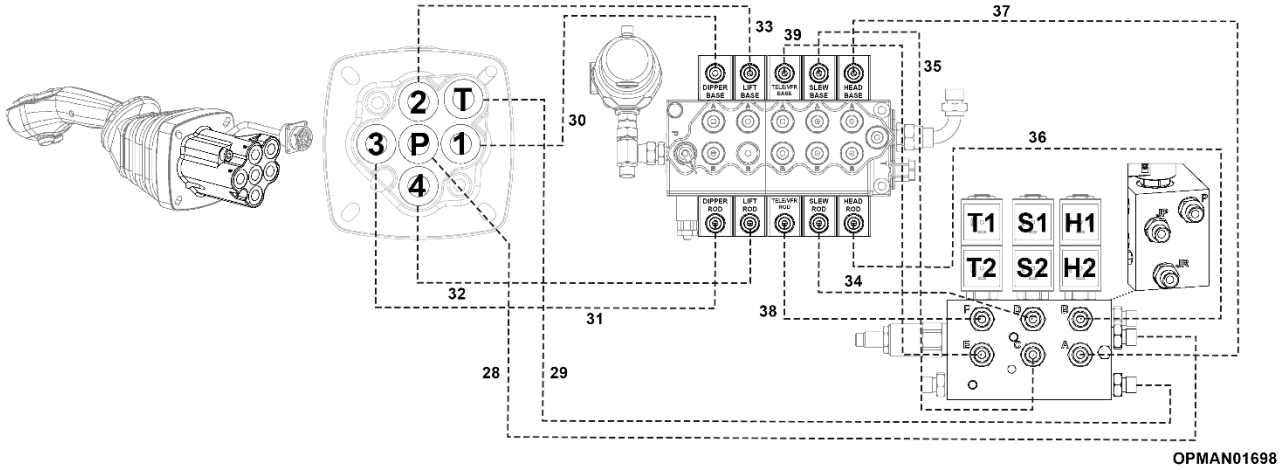


Figure 8.46 – Twiga Classic Telescopic & Variable Forward Reach Arm Pilot Control Joystick Hose Diagram

Item.	Build Configuration.	Use.		Hose Size.
		End 1.	End 2.	
28	Both	Joystick “P”	Pilot Valve “JR”	1/4"
29	Both	Joystick “T”	Pilot Valve “JP”	1/4"
30	Left-hand	Joystick “1”	5-Bank Control Valve “Dipper Rod”	1/4"
	Right-hand	Joystick “3”	5-Bank Control Valve “Dipper Rod”	1/4"
31	Left-hand	Joystick “3”	5-Bank Control Valve “Dipper Base”	1/4"
	Right-hand	Joystick “1”	5-Bank Control Valve “Dipper Base”	1/4"
32	Both	Joystick “4”	5-Bank Control Valve “Lift Rod”	1/4"
33	Both	Joystick “2”	5-Bank Control Valve “Lift Base”	1/4"
34	Both	Pilot Valve “D”	5-Bank Control Valve “Slew Rod”	1/4"
35	Both	Pilot Valve “C”	5-Bank Control Valve “Slew Base”	1/4"
36	Both	Pilot Valve “B”	5-Bank Control Valve “Head Rod”	1/4"
37	Both	Pilot Valve “A”	5-Bank Control Valve “Head Base”	1/4"
38	Both	Pilot Valve “F”	5-Bank Control Valve “Tele/VFR Rod”	1/4"
39	Both	Pilot Valve “E”	5-Bank Control Valve “Tele/VFR Base”	1/4"

Table 8.13
Twiga Classic Telescopic & Variable Forward Reach Arm Pilot Control Joystick Hose Diagram Definitions

8.5.3 Options

8.5.3.1 Oil Cooler

With reference to Figure 8.47, the Spearhead oil cooler option is available on all Twiga Classic reach arm models and fits between the rotor control valve (RCV) and the returns filter assembly (RF) found on the top of the oil tank of the machine. With reference to Section 8.5.1 and the hydraulic diagrams for the various armsets and control systems shown throughout this section, the oil cooler is fitted in substitution to hydraulic hose number 2.

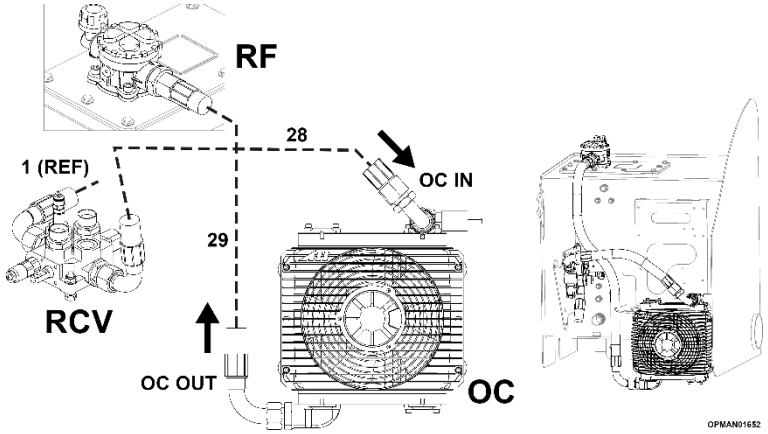


Figure 8.47
Twiga Classic Oil Cooler System Component Details

Item.	Use. End 1.	End 2.	Hose Size.
1	Motor (M)	Rotor Control Valve (RCV)	1”
28	Rotor Control Valve (RCV)	Oil Cooler In (OC IN)	1”
29	Oil Cooler Out (OC OUT)	Returns Filter Assembly (RF)	1”

Table 8.14
Twiga Classic Oil Cooler System Hose Diagram Definitions

8.5.3.2 Arm Float

With reference to Figure 8.48, the Spearhead arm float option is available on all Twiga Classic reach arm models and fits between the control valve (CV) and the accumulator (AC) found on the side of the inside of the oil tank of the machine. With reference to Section 8.5.1 and the hydraulic diagrams for the various armsets and control systems shown throughout this section, a tee adaptor is fitted to the lift port on the control valve and the hydraulic hose(s) are connected to the hydraulic lift ram (6/7).

Pilot Control System

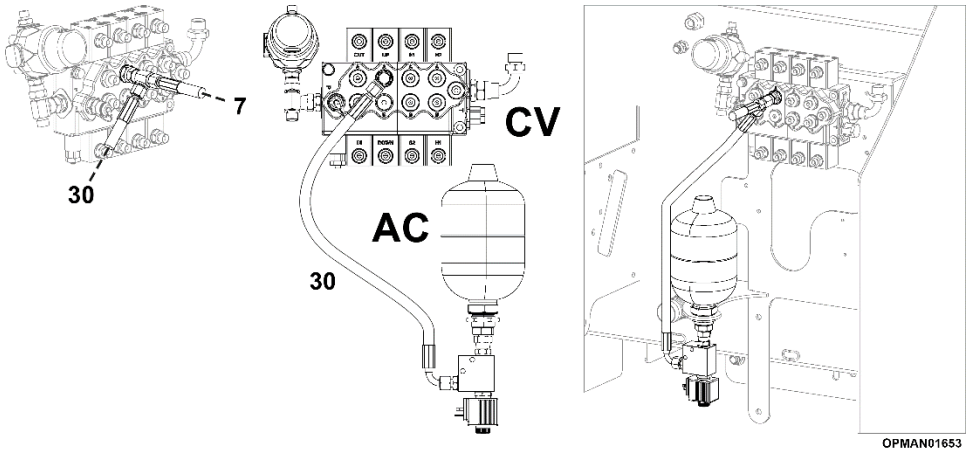


Figure 8.48
Twiga Classic Pilot Control System Arm Float Component Details
(S55/S60 (4 bank control valve) model shown)

Item.	Use.		Hose Size.
	End 1.	End 2.	
7	Control Valve (CV) “Lift” Tee	Lift Ram Rod End (LR)	1/4"
30	Control Valve (CV) “Lift” Tee	Accumulator (AC)	1/4"

Table 8.15
Twiga Classic Pilot Control System Arm Float Diagram Definitions

Minipilot Control System

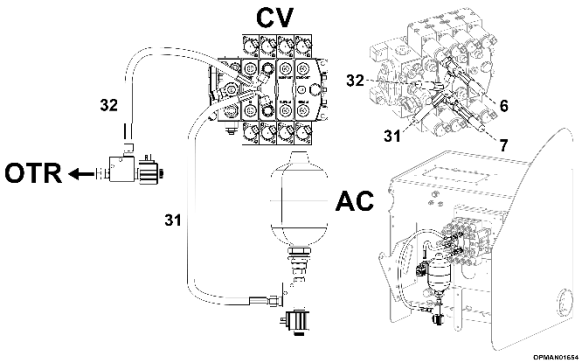


Figure 8.49
Twiga Classic Minipilot Control System Arm Float Component Details
(S55/S60 (4 bank control valve) model shown)

Item.	Use.		Hose Size.
	End 1.	End 2.	
6	Control Valve (CV) “Base” Tee	Lift Ram Base End (LR)	1/4"
7	Control Valve (CV) “Lift” Tee	Lift Ram Rod End (LR)	1/4"
31	Control Valve (CV) “Lift” Tee	Accumulator (AC)	1/4"
32	Control Valve (CV) “Base” Tee	Oil Tank Return (OTR)	1/4"

Table 8.16
Twiga Classic Minipilot Control System Arm Float Diagram Definitions

8.6 Electrical Components – Maintenance & Adjustment

8.6.1 Inspection

Electrical components should be inspected on a daily basis before commencing work. Ensure all electrical components and connections are in good condition and secure before beginning to use the machine pressure.

Inspect electrical components to:

- Check for tightness of connections and condition of components and replace if necessary.
- Replace the component immediately if there is any apparent damage or corrosion which could eventually cause unreliable and unsafe machine operation.

If there is an electrical fault apparent, determine where the cause of this is from. Causes could be due to a faulty components, corrosion or loose electrical connections. **Resolve, repair or replace the component at fault if in any doubt before proceeding to use the machine**. Many spare parts are available from Spearhead Machinery which may not mean the full component assembly will require replacement.

Where parts are broken, damaged and deemed not fit for use; replace with genuine Spearhead parts; see Section 10.

8.6.2 Replacement

Electrical components can be replaced easily using standard tools. It is important to replace components with genuine Spearhead parts and correctly secure them to connections to ensure reliable operation.

Some electrical repair tasks may require more specialist work and equipment requiring the assistance of a Spearhead Machinery dealer.

Ensure the reach arm is safely stopped and disconnected from the tractor (hydraulically and electrically) and that the hydraulic system is fully depressurised before carrying out maintenance tasks. The reach arm should be safely supported to ensure that the machine does not inadvertently move when components are removed and personnel are working with the machine.

When carrying out work on the electrical system and replacing components, ensure that exposed electrical connections components are covered to protect from water or impact damage. Water can cause permanent damage to the machine and intermittent faults which are hard to resolve. Ensure that all electrical components are protected from water when the machine is used, stored or cleaned.

It is important to protect electrical components if the machine is going to be potentially exposed to high temperature heat in some maintenance operations, for example during welding. High temperatures can permanently damage electrical components. If high temperature maintenance applications are required to be carried out near electrical components, ideally remove the components and refit once the maintenance operations are completed.

CAUTION! Follow specialist professional guidance and the safety section with regards to working with and handling electrical components.

8.7 Electrical Diagrams

8.7.1 Lights

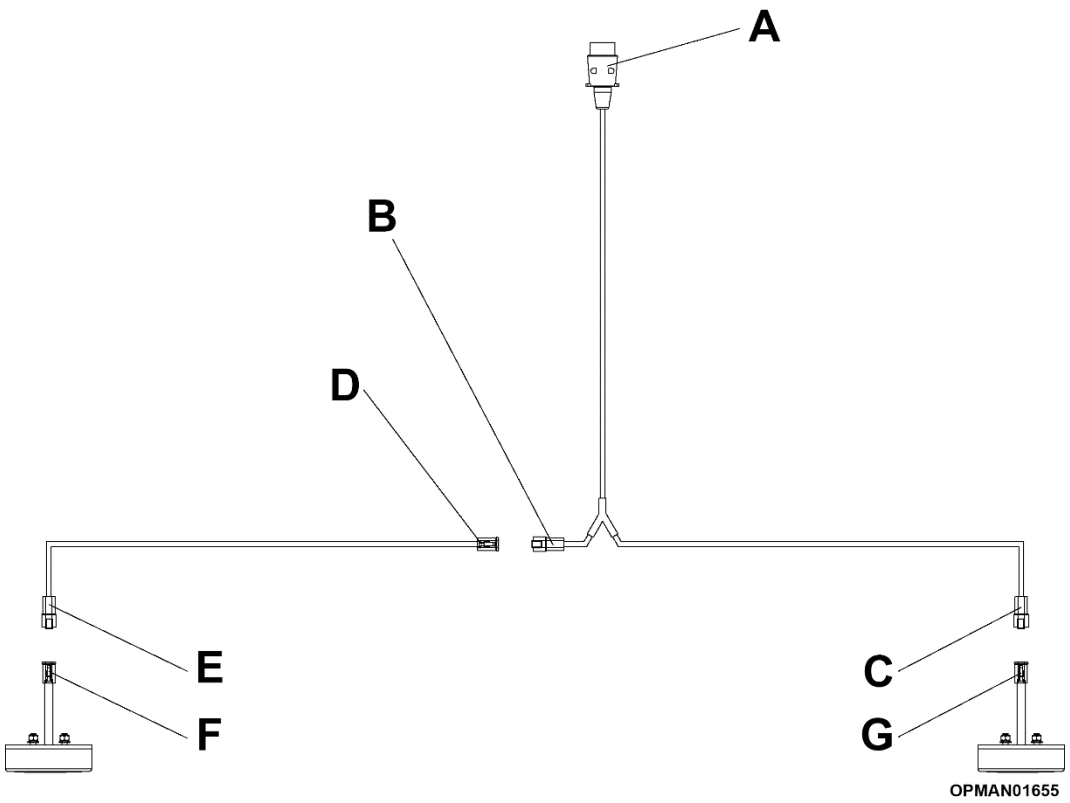


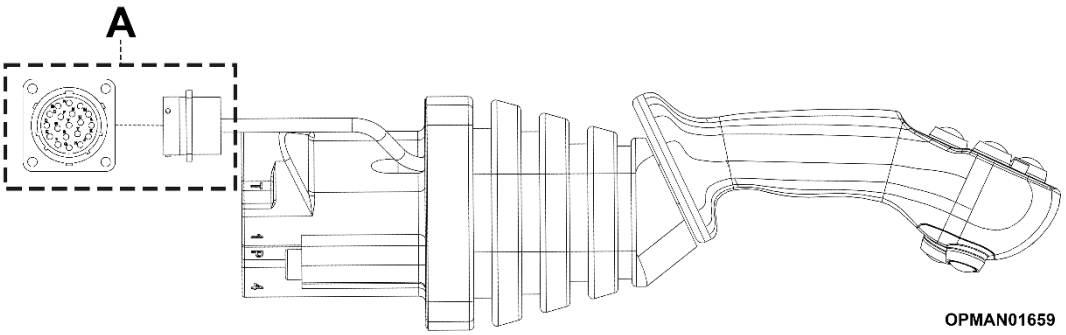
Figure 8.50
Twiga Classic Rear Lights

Item.	Pin.	Colour.	Use.
A	1	Yellow	LH Direction
	2	Not Used	
	3	White	Earth
	4	Green	RH Direction
	5	Brown	RH Side
	6	Red/Blue	Stop
	7	Black	LH Side
B	1	White	Earth
	2	Black	LH Side
	3	Blue	Stop
	4	Yellow	LH Direction
C	1	White	Earth
	2	Brown	RH Side
	3	Red	Stop
	4	Green	RH Direction
D/E	1	White	Earth
	2	Brown	LH Side
	3	Red	Stop
	4	Green	LH Direction
F	1	White	Earth
	2	Brown	Side
	3	Red	Stop
	4	Yellow	LH Direction

Table 8.17
Twiga Classic Rear Light Wiring Definitions

8.7.2 Joystick

8.7.2.1 Pilot



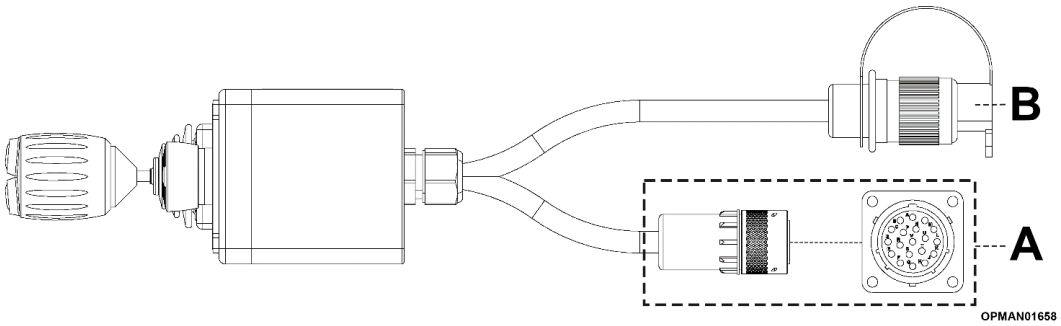
Item.	Description.	Connection Type.
A	19-Way Connector	19-Way Burndy Connector

Figure 8.51
Twiga Classic Pilot Joystick

Pin.	Colour.	Use.	Type.
A	-	-	-
B	-	-	-
C	-	-	-
D	Black	Positive/Live	-
E	-	-	-
F	-	-	-
G	-	-	-
H	-	-	-
J	Beige	Tele/VFR Out	Momentary
K	Blue	Tele/VFR In	Momentary
L	-	-	-
M	-	-	-
N	Red	Head Float	Detent
P	White	Arm Float*1	Detent
R	Green	Head Anticlockwise	Momentary
S	Yellow	Slew Out	Momentary
T	Grey	Head Clockwise	Momentary
U	Violet	Slew In	Momentary
V	brown	Negative/Earth	-

Table 8.18
Twiga Classic Pilot Joystick Definitions

8.7.2.2 Minipilot



Item.	Description.	Connection Type.
A	19-Way Connector	19-Way Burndy Connector
B	Power Socket	3-Pin Plug

Figure 8.52
Twiga Classic Minipilot Joystick

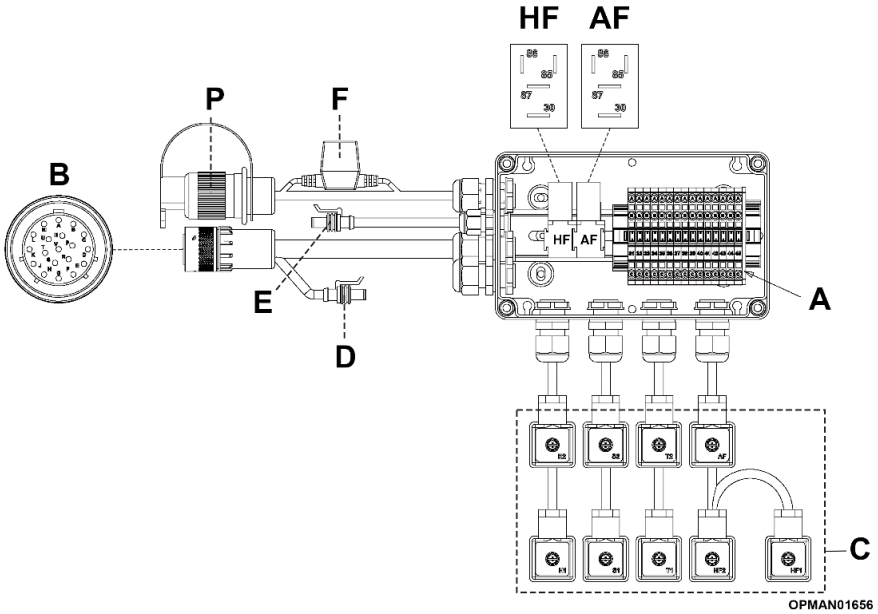
19-Way Connection – Figure 8.52 (A)

Pin.	Build Configuration.	Colour.	Use.
A	Both	Purple	Rotor (R1)
B	Both	White/Blue	-
C	Both	Red/Black	Arm Float*1
D	Both	Red/Brown	-
E	Both	Green/Red	Flashing LED's*2
F	Both	White/Red	Head (H1)
G	Both	Blue	Head (H2)
H	Both	White/Green	Slew (S1)
J	Both	Pink	Slew (S2)
K	Both	Grey	Tele/VFR (T1)*3
L	Both	Green	Tele/VFR (T2)*3
M	Both	Black/Red	Lift (L1)
N	Both	Black/Yellow	Lift (L2)
P	Left-hand	Red/White	Dipper (R1)
	Right-hand	Red/Yellow	Dipper (R2)
R	Left-hand	Red/Yellow	Dipper (R2)
	Right-hand	Red/White	Dipper (R1)
S	Both	Yellow	-
T	Both	Brown	Spare
U	Both	Black	Earth/Ground
V	Both	Black	Earth/Ground

Table 8.19
Twiga Classic Minipilot Joystick Definitions

8.7.3 Loom

8.7.3.1 Pilot Control



Item.	Description.	Connection Type.
A	Rail Connections	Rail
AF	Arm Float Relay	4-Pin Relay
B	19-Way Connector	19-Way Burndy Connector
C	Hirschmann Connections	3-Way Hirschmann Connector
D	Not Used	3-Way Superseal Connector
E	Not Used	6-Way Superseal Connector
F	15 Amp Fuse	15 Amp Blade Type Fuse
HF	Head Float Relay	4-Pin Relay
P	Power Socket	3-Pin Plug

Figure 8.53
Twiga Classic Pilot Control Loom

Rail Connections – Figure 8.53 (A)
19-Way Connection – Figure 8.53 (B)

Connection/Rail.	Colour.	Use.	End 1.	End 2.
31A	Red	Positive/Live	19-Way (D)	-
	Red	Positive/Live	19-Way (D)	-
33A	Green	Tele/VFR Out*1	19-Way (J)	T1 (1)
34A	Slate	Tele/VFR In*1	19-Way (K)	T2 (1)
35A	Orange	Head Float	19-Way (N)	HF Relay (86)
36A*2	Purple	Arm Float*2	19-Way (P)	AF Relay (86)*2
37A	Brown	Head Anti-clockwise	19-Way (R)	H2 (1)
38A	Teal	Slew Out	19-Way (S)	S2 (1)
39A	Blue	Head Clockwise	19-Way (T)	H1 (1)
40A	Pink	Spare	19-Way (U)	-
41A	Yellow	Spare	19-Way (H)	-
41C	Red	-	19-Way (H)	-
	White	-		-
42A	Black	Negative/Ground	19-Way (V)	-
	Black	Negative/Ground	19-Way (V)	-

*1 – Only used on the telescopic (T65) and variable forward reach (VFR55/VFR60) models
*2 – Only used on machine fitted with arm float option

Table 8.20
19-Way Rail Connection Definitions

Relay Connections – Figure 8.53 (AF/HF)

Connection/Rail.	Colour.	Use.	End 1.	End 2.
HF (30)	Red	Positive/Live	AF (30)	-
HF (87)	Red	HF Out	HF1 (1)	HF2 (1)
AF (30)	Red	Positive/Live	32A	-
AF (85)	Black	Negative/Ground	44C	
AF (86)	Purple	AF In*1	36C*1	
AF (87)	Red	AF Out*1	-	AF (1)*1

*1 – Only used on machine fitted with arm float option

Table 8.21
Relay Connections Definitions

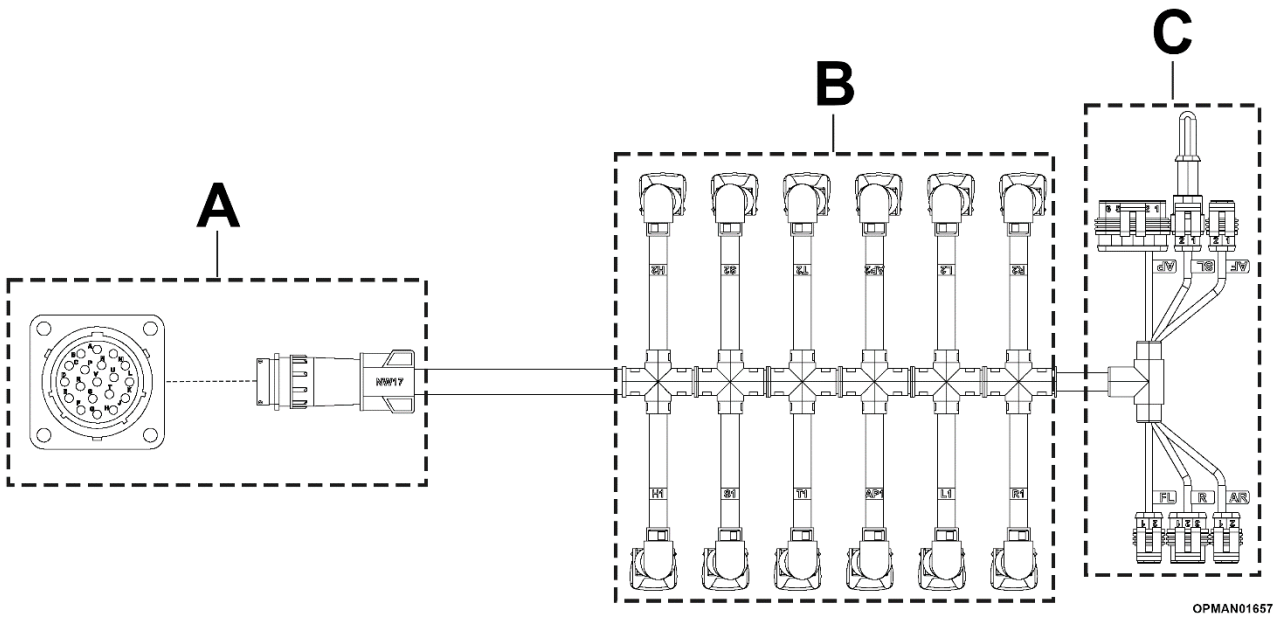
Earth Rail Connections – Figure 8.53 (C)

Connection/Rail.	Colour.	Use.	End.
43A	Black	Tele/VFR Out*1	T1 (2)*1
44A	Black	Tele/VFR In*1	T2 (2)*1
45A	Black	Head Float	HF1/2 (2)
42B	Black	Arm Float*2	AF (2)*2
43B	Black	Head Anti-clockwise	H2 (2)
44B	Black	Slew Out	S2 (2)
45B	Black	Head Clockwise	H1 (2)
42C	Black	Slew In	S1 (2)
43C	Black	-	-

*1 – Only used on the telescopic (T65) and variable forward reach (VFR55/VFR60) models
*2 – Only used on machine fitted with arm float option

Table 8.22
Earth Rail Connection Definitions

8.7.3.2 Minipilot Control



Item.	Description.	Connection Type.
A	19-Way Connector	19-Way Burndy Connector
B	Valve Block Connections	AMP Plug
C	Accessory Connections	Durite – 2-pin, 3-pin, 6-pin

Figure 8.54
Twiga Classic Minipilot Control Loom

19-Way Burndy Connection – Figure 8.54 (A)

Pin.	Colour.	Use.
A	Purple	Rotor (R1)
B	White/Blue	-
C	Red/Black	Arm Float*1
D	Red/Brown	-
E	Green/Red	Flashing LED's*2
F	White/Red	Head (H1)
G	Blue	Head (H2)
H	White/Green	Slew (S1)
J	Pink	Slew (S2)
K	Grey	Tele/VFR (T1)*3
L	Green	Tele/VFR (T2)*3
M	Black/Red	Lift (L1)
N	Black/Yellow	Lift (L2)
P	Red/White	Dipper (R1)
R	Red/Yellow	Dipper (R2)
S	Yellow	-
T	Brown	Spare
U	Black	Earth/Ground
V	Black	Earth/Ground

*1 – Only used on machine fitted with arm float option
*2 – Only used on machine fitted with flashing LED option
*3 – Only used on the telescopic (T65) and variable forward reach (VFR55/VFR60) models

Table 8.23
19-Way Burndy Connection Definitions

AMP Plugs – Figure 8.54 (B)

Plug.	Build Configuration.	Colour.	Use.
H1	Both	White/Red	Head Anti-clockwise
H2	Both	Blue	Head Clockwise
S1	Both	White/Green	Slew Out
S2	Both	Pink	Slew In
T1	Both	Grey	Tele/VFR Out*1
T2	Both	Green	Tele/VFR Int*1
AP1	Both	Blue/Yellow	-
AP2	Both	Green/White	-
L1	Both	Black/Red	Lift Up
L2	Both	Black/Yellow	Lift Down
R1	Left-hand	Red/White	Dipper Up
	Right-hand	Red/White	Dipper Down
R2	Left-hand	Red/Yellow	Dipper Down
	Right-hand	Red/Yellow	Dipper Up

*1 – Only used on the telescopic (T65) and variable forward reach (VFR55/VFR60) models

Table 8.24
AMP Plugs Connection Definitions

Ancillary Plugs – Figure 8.54 (C)

Plug.	Type.	Function.	Pin.	Colour.
AP	Durite 6-Pin	-	1	Black
			2	Green/Red
			3	Yellow
			4	Green/White
			5	Blue/Yellow
SL	Durite 2-Pin	-	1	White/Green
			2	White/Green
AF	Durite 2-Pin	Arm Float*1	1	Red/Black
FL	Durite 2-Pin	Flashing LED's*2	1	Green/Red
R	Durite 3-Pin	Rotor	1	Purple
			3	Red/Brown
AR	Durite 2-Pin	-	1	White/Blue

*1 – Only used on machine fitted with arm float option
*2 – Only used on machine fitted with flashing LED option

Table 8.25
Ancillary Plugs Connection Definitions

8.7.4 Flashing LED's

8.7.4.1 Pilot Control System

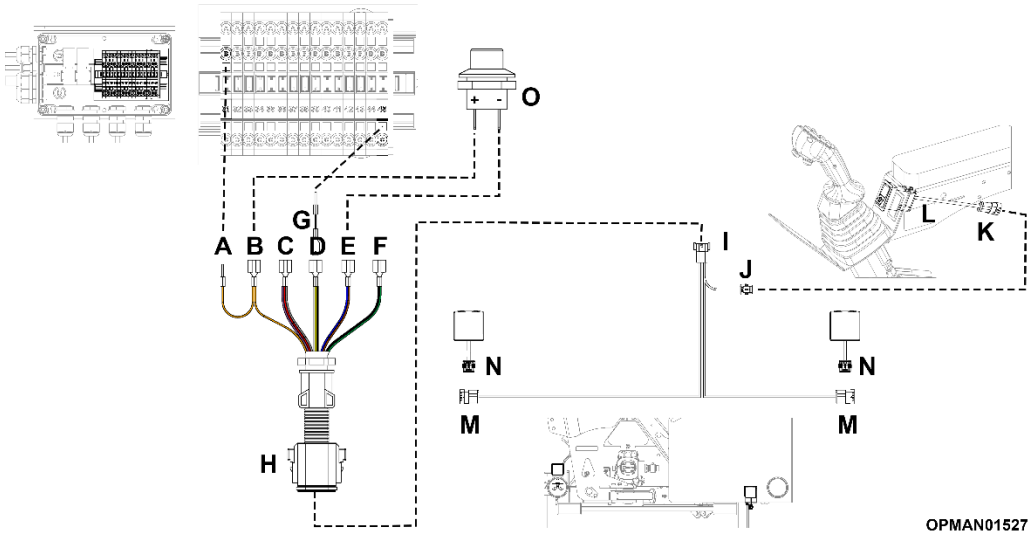


Figure 8.55
Twiga Classic Pilot Flashing Light Control Diagram

Plug.	Type.	Destination.	Function.	Pin.	Colour.
A	Boot Lace	Pin 31B switchbox	Power	-	Orange
B	Crimp	Momentary Switch, Positive	Power	-	Orange
C	Crimp	Loose	-	-	Purple/Red/Slate
D	Crimp	Crimp/Boot Lace (G)	Earth	-	White/Yellow/Black
E	Crimp	Momentary Switch, Negative	Pattern Change	-	Blue/Brown
F	Crimp	Loose	Sync	-	Black/Green
G	Crimp/Boot Lace	Crimp (D)/Pin 45C switchbox	Earth	-	Black
H	12-pin Deutsch	12-pin Deutsch (I)	Positive	1	Red
			Sync	2	Green
			Pattern Change	3	Brown
			Earth	4	White
			Earth	5	Yellow
			Negative	6	Blue
			Sync	7	Black
			Positive	8	Purple
			-	9	-
			Power In	10	Orange
			Power Out	11	Slate
			Earth	12	Black
I	12-pin Deutsch	12-pin Deutsch (H)	Positive	1	Red
			Sync	2	Green
			Pattern Change	3	Brown
			Earth	4	White
			Earth	5	Yellow
			Pattern Change	6	Blue
			Sync	7	Black
			Positive	8	Purple
			-	9	-
			Power In	10	Orange
			Power Out	11	Slate
			Earth	12	Black

J	2-way Superseal	2-way Superseal (K)	Power In	1	Red
			Power Out	2	Green
			Negative/Earth	3	Black
K	2-way Superseal	2-way Superseal (J)	Power In	1	Red
			Power Out	2	Green
			Negative/Earth	3	Black
L	Switch Connector	On/Off Switch	Power In	1	Red
			Looped To 9	3	Green
			Negative/Earth	5	Black
M	4-way Superseal	4-way Superseal (N)	Positive	1	Red
			Sync	2	Green
			Pattern Change	3	Brown
			Negative/Earth	4	White
N	4-way Superseal	4-way Superseal (M)	Live/Positive	1	Red
			Sync	2	Yellow
			Pattern Change	3	Blue
			Earth/Negative	4	Black
O	Momentary Switch	Boot Lace (A)	Power	1	Orange
		Crimp (C)	Pattern Change	2	Blue/Brown

Table 8.26
Twiga Classic Minipilot Flashing Light Control Diagram Definitions

8.7.4.2 Minipilot Control System

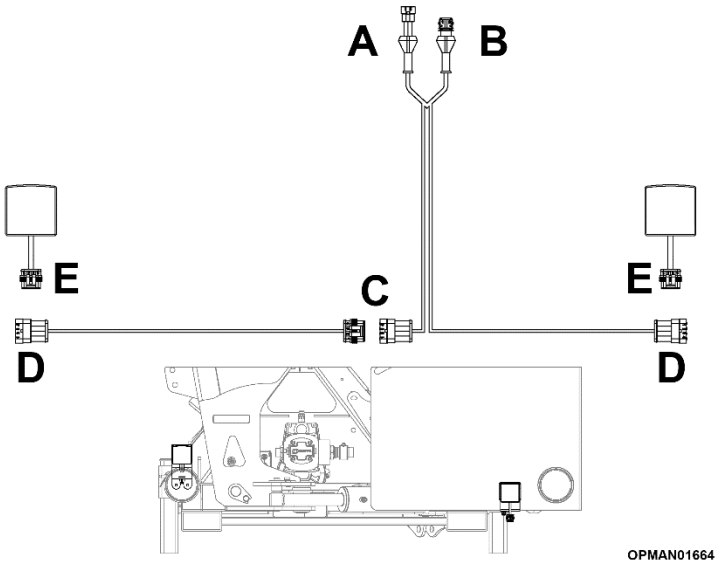


Figure 8.56
Twiga Classic Minipilot Flashing Light Control Diagram

Plug.	Type.	Function.	Pin.	Colour.
A	2-way Durite	Live/Positive	1	Red
		Earth/Negative	2	White
B	2-way Amp	Pattern Change	1	Brown
		Sync	2	Green
C	4-way Superseal	Live/Positive	1	Red
		Sync	2	Green
		Pattern Change	3	Brown
		Earth/Negative	4	White
D	4-way Superseal	Live/Positive	1	Red
		Sync	2	Green
		Pattern Change	3	Brown
		Earth/Negative	4	White
E	4-way Superseal	Live/Positive	1	Red
		Sync	2	Yellow
		Pattern Change	3	Blue
		Earth/Negative	4	Black

Table 8.27
Twiga Classic Minipilot Flashing Light Control Diagram Definitions

8.7.5 Arm Float

8.7.5.1 Pilot Control System

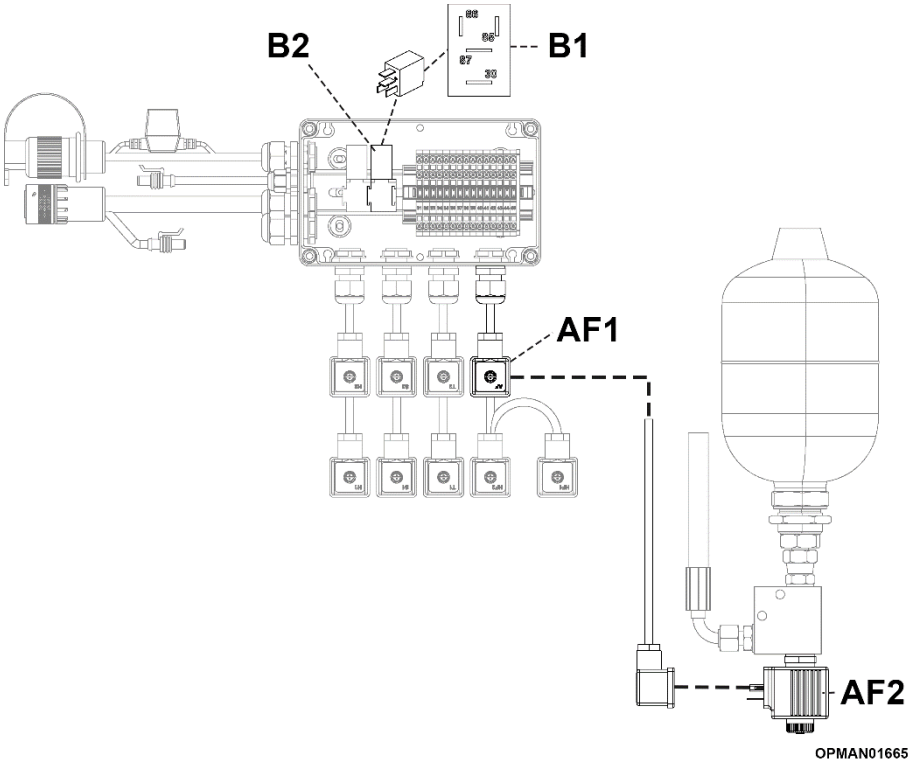


Figure 8.57
Twiga Classic Pilot Control System Arm Float Wiring Diagram

Item.	Description.	Connection Type.
AF1	Arm Float Loom Plug “AF”	Hirschmann Female Plug
AF2	Arm Float Loom Socket	Hirschmann Male Plug
B1	Arm Float Fuse	Durite Micro Relay
B2	Arm Float Fuse Control Box Board	Durite Relay Plug

Table 8.28
Twiga Classic Arm Float Wiring Diagram Definitions

8.7.5.2 Minipilot Control System

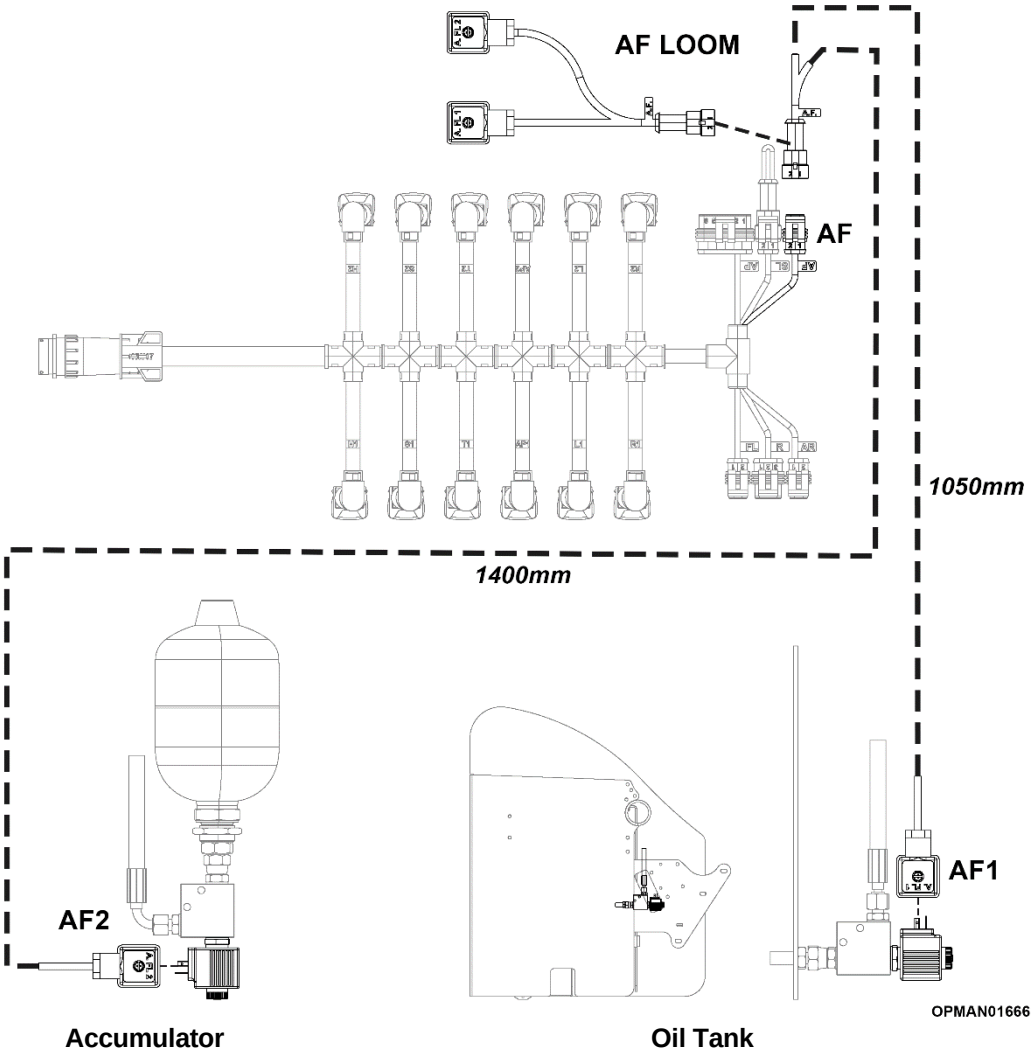


Figure 8.58
Twiga Classic Arm Minipilot Control System Float Wiring Diagram

Item.	Description.	End 1.	End 2.	Connection Type.	Cable Length
AF	AF	AF LOOM	-	Male Superseal	-
AF LOOM	AF1 Cable	AF	AF1 (Oil Tank)	Female Superseal/Hirschmann	1050mm
	AF2 Cable	AF	AF2 (Accumulator)		1400mm

Table 8.29
Twiga Classic Arm Minipilot Control System Float Wiring Diagram Definitions

8.7.6 Oil Cooler

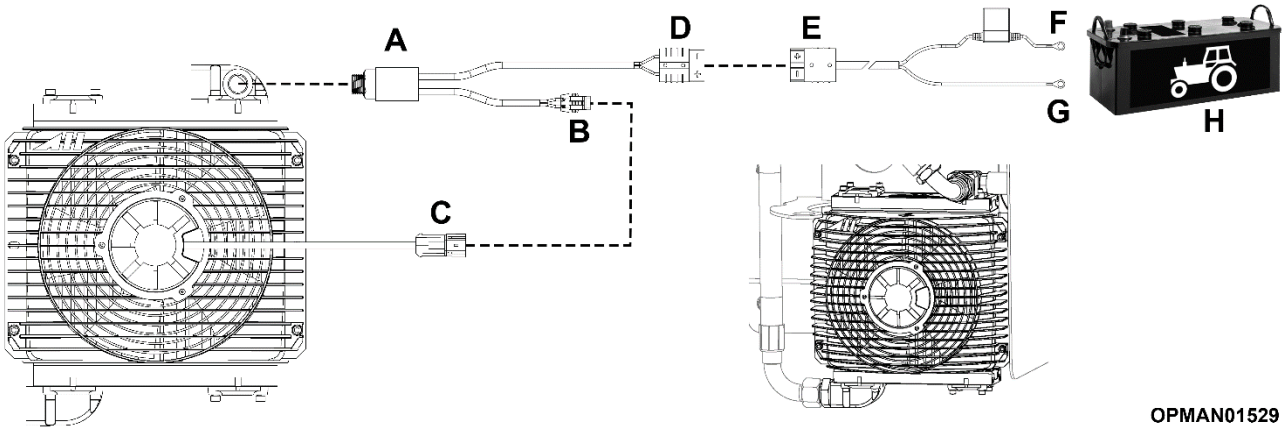


Figure 8.59
Twiga Classic Oil Cooler Wiring Diagram

Plug.	Type.	Destination.	Function.	Pin.	Colour.
A	½" BSP	Oil Cooler	Power Relay	-	-
B	Metri-Pack 2-way	Metri-Pack 2-way (C)	Positive	-	Red
			Negative/Earth	-	Black
C	Metri-Pack 2-way	Metri-Pack 2-way (B)	Positive	-	Red
			Negative/Earth	-	Black
D	Anderson 2-pin	Anderson 2-pin (E)	Positive	-	Red
			Negative/Earth	-	Black
E	Anderson 2-pin	Anderson 2-pin (D)	Positive	-	Red
			Negative/Earth	-	Blue
F	30A Blade Fuse	-	-	-	-
G	8mm Ring Terminal	Positive terminal, tractor battery (H)	Positive	-	Red
H	8mm Ring Terminal	Negative terminal, tractor battery (H)	Negative/Earth	-	Black
I	Tractor Battery	8mm Ring Terminal (F)	Positive	-	Red
		8mm Ring Terminal (G)	Negative/Earth	-	Black

Table 8.30
Twiga Classic Oil Cooler Wiring Diagram Definitions

8.8 Wear Pad Adjustment (T65 model only)

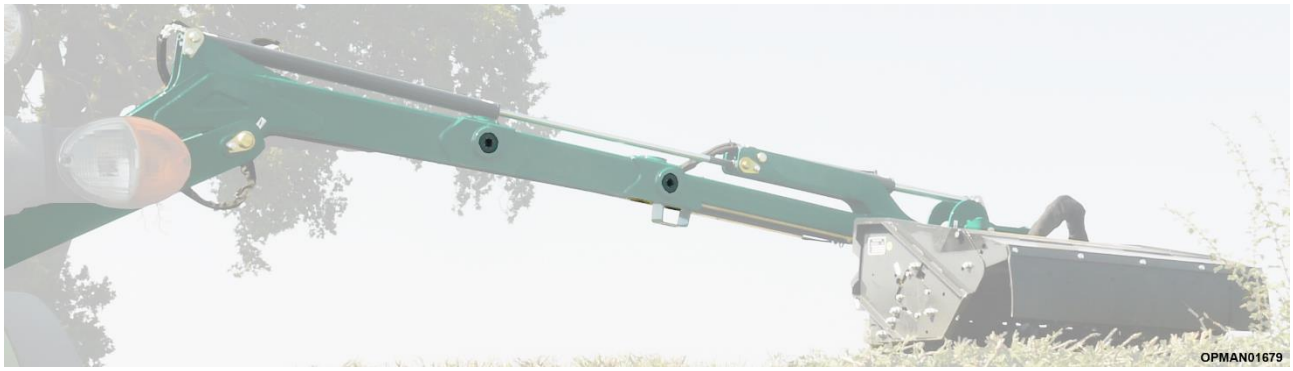


Figure 8.60
(Left-hand build reach arm shown)

Twiga Classic models fitted with a telescopic inner and outer dipper require routine adjustment of the wear pads to ensure that the inner and outer fabrications slide correctly in and out of each other when the hydraulic ram is operated.

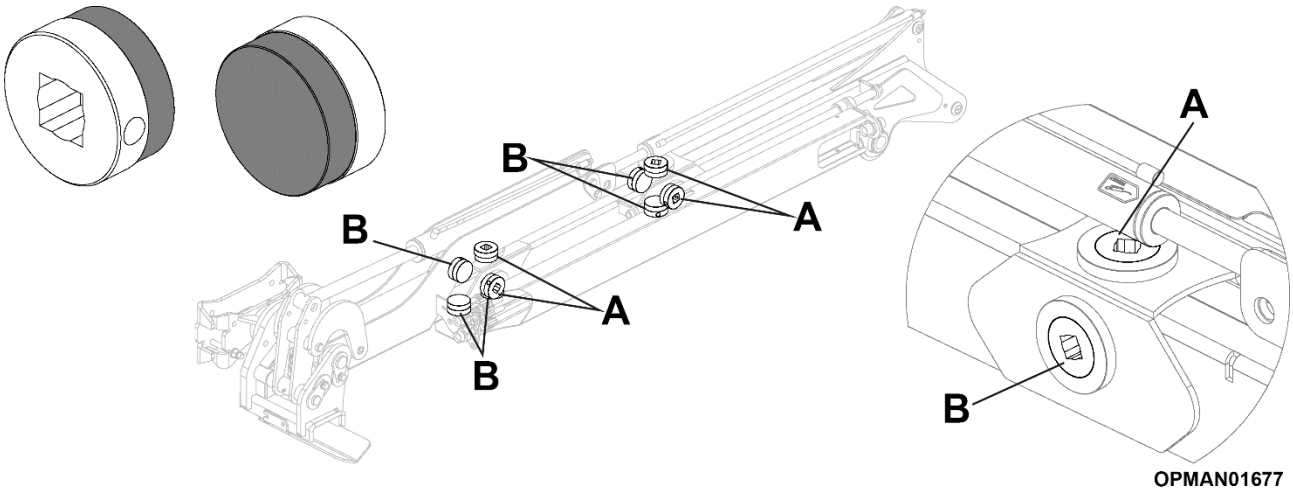


Figure 8.61
(Left-hand build reach arm shown)

With reference to Figure 8.61 (A/B), the telescopic outer arm is fitted with nine wear pads which thread into the fabrication and may require adjustment to ensure the inner and outer arms slide smoothly in and out from each other.

Some wear pads are obscured from being easily adjusted by either a hydraulic ram or belt guard; see Figure 8.61 (A). To overcome this, it is important to adjust the easily accessible wear pads (B) to these less accessible ones (A). The less accessible wear pads are tightened down to a flush fit during manufacture are should not be adjusted.

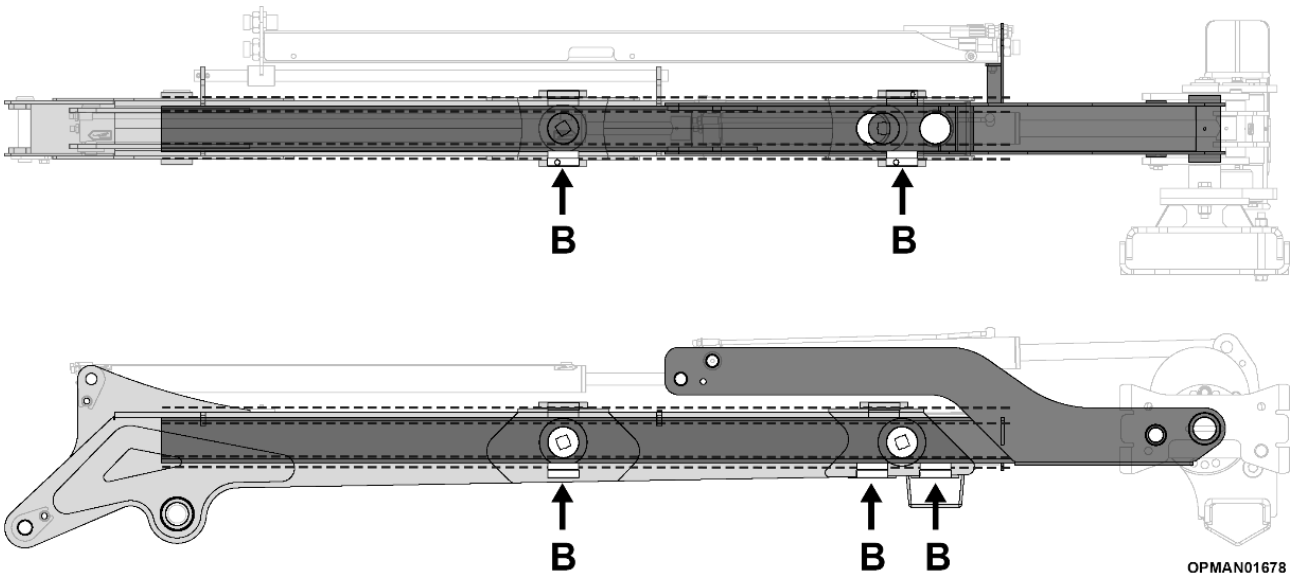


Figure 8.62
(Left-hand build reach arm shown)

To tighten the wear pads:

8.8.1.1 Fully retract the telescopic inner arm using the joystick controls and place the reach arm attachment on the floor in a suitable position to allow for the accessible wear pads to be adjusted and for the weight of the attachment to be taken off the telescopic dipper arm.

8.8.1.2 Tighten each wear pad (B) to gradually to push the telescopic inner arm backwards and upwards to take the excessive movement out between the inner and outer arms and make the parts parallel with each other.

8.8.1.3 Safely start the tractor and reach arm, raise the attachment off the ground and operate the telescopic ram gradually to its fullest extent. Listen and feel for tightness.

8.8.1.4 Safely stop the tractor and reach arm and make the required adjustments. Repeat the process of testing.

8.8.1.5 If the wear pads are fully screwed in and excessive movement is still found between the inner and outer arms, then the wear pads will be required to be removed and replaced.

IMPORTANT
It is important to regularly grease the telescopic inner arm to ensure the movement between the inner and outer arms are as smooth as possible.

8.9 Arm Float Recharge (option)

The Twiga Classic range of reach arms can be specified with an arm float option. This option allows for the reach arm to float when in work; particularly useful in verge mowing applications. The addition of a gas filled diaphragm accumulator included in the option allows for the arm to be cushioned in operation and allow the weight of the attachment to be placed on its roller rather than on the carrying arm; see Figure 8.63 (AC).

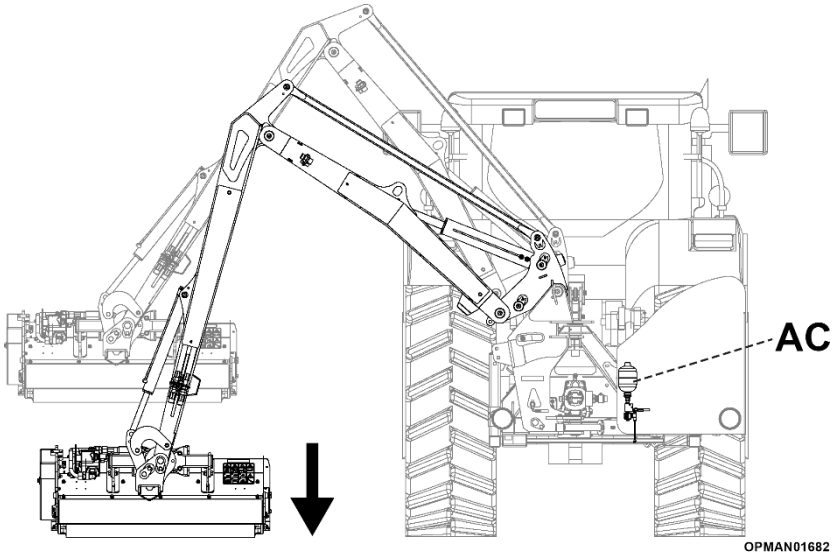


Figure 8.63
Arm Float Option
(Left-hand build reach arm shown)

There may be an occasion where the arm float does not work when the arm float option is activated on the joystick controls. The oil can drain out of the accumulator if it is not used regularly, therefore requiring the system to be recharged to allow for the arm float option to work correctly.

To recharge the arm float option:

8.9.1.1 Press the arm float option button on the joystick. An indication of the system working is shown by the specific light illuminating on the joystick.

8.9.1.2 Push the joystick forward to lower the attachment down to the ground; see Figure 8.63.

8.9.1.3 Continue to push the joystick forward for around five seconds to recharge the accumulator, then release.

8.9.1.4 Gently raise the reach arm by pulling back on the joystick to raise the arm.

8.9.1.5 Release the joystick back to centre. If the reach arm begins to drop automatically then the system is correctly recharged again, and the arm float option is working correctly.

8.10 Other Key Components

8.10.1 Pins & Bushes

Pins

Pins should be inspected regularly to ensure they are not worn, damaged or loose.

Ensure all pins and accompanying fasteners are tight and routinely checked following the guidance given on the Maintenance Sheet; see Section 8.12.

Ensure that the pins have not been worn in such a way to create a step. Make sure the pin is not bent and the head is not damaged. If in any doubt, replace.

Bushes

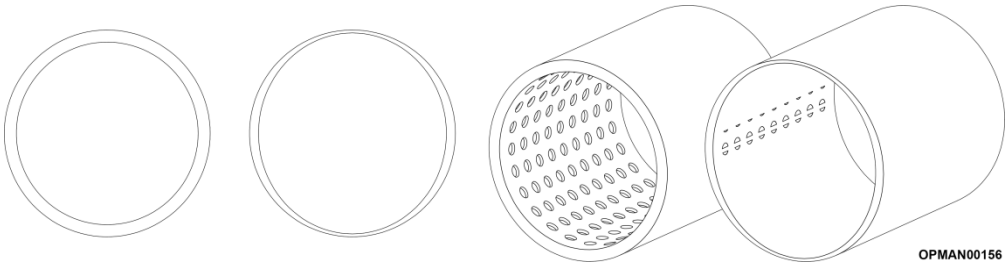


Figure 8.64 – New & Worn Bush Comparison
(Glacier bush shown)

The machine should be inspected regularly to ensure the bushes are not worn. Worn bushes should be replaced when there is excess movement. Bushes will wear oversize or oval with indication on the interior showing the oil galleries being worn away. To prevent premature wear grease the bushes (where applicable) following the greasing schedule; see Section 8.2.5.

8.11 Torque Settings

8.11.1 Nuts & Bolts

Specific Fastener Requirements

On Twiga Classic machines, there are some special fasteners/components which require specific torque settings to ensure they operate safely.

For torque settings for the reach arm attachment, see the reach arm attachment operators manual.

Use	Size	Grade	Torque Setting	
			Nm	Ft-lb
Sight Glass	M10	8.8	8-10	6-7
Pump To Gearbox	M10	8.8	45	33
Gearbox To Chassis	M12	8.8	80	59
Splined Coupling Nut	M12	8.8	70	51
Attachment Clamp	M16	8.8	280	207

Table 8.31 – Twiga Classic Specific Fastener Torque Settings

Non-specific Fastener Requirements

The below tables give reference to the **maximum** recommended tightening torques for standard, zinc plated finished bolts on Spearhead machines. **These settings can be applied to hex, socket countersunk and socket button screws.**

Size	Grade					
	8.8		10.9		12.9	
	Nm	Ft-lb	Nm	Ft-lb	Nm	Ft-lb
M5	5	3	7	5	8	6
M6	14	10	12	9	14	10
M8	34	25	29	21	34	25
M10	68	50	57	42	68	50
M12	119	88	99	73	119	88
M14	189	139	158	116	189	139
M16	295	218	246	181	295	218
M18	406	299	338	249	406	299
M20	576	424	480	354	576	424
M22	783	577	652	481	783	577
M24	995	734	829	612	995	734
M30	1977	1458	1647	1215	1977	1458

Table 8.32 – Standard Fastener Torque Settings

8.11.2 Hydraulic Fittings

Throughout all Twiga Classic machines, BSP hoses and BSP and metric adaptors are used. See the relevant headings for adaptors and hoses.

Port Adaptors With Bonded Seals

The below tables give reference to the **maximum** recommended tightening torques for standard, BSP and metric port adaptors found on Twiga Classic machines.

Size	Thread	Torque Setting		Spanner Size
		Nm	Ft-lb	
1/4"	BSP	18	13	19mm
3/8”	BSP	31	23	22mm
1/2"	BSP	49	36	27mm
5/8”	BSP	60	44	30mm
3/4”	BSP	80	59	32mm
1”	BSP	125	92	41mm
1 1/4"	BSP	190	140	50mm
1 1/2"	BSP	250	184	55mm
2”	BSP	420	310	70mm

Table 8.33 – Twiga Classic Adaptor Torque Settings

Hydraulic Hoses

The below tables give reference to the **maximum** recommended tightening torques for standard, hydraulic hoses on Twiga Classic machines.

NOTE: Inspect the hose for the type of fitting on the specific end to tighten. Twiga Classic machines can feature hoses with different sized end fittings for example. In this case follow the torque setting required for the fitting rather than the hydraulic hose size.

Size	Thread	Torque Setting		Spanner Size
		Nm	Ft-lb	
1/4"	BSP	34	25	19mm
3/8”	BSP	47	35	22mm
1/2"	BSP	102	75	27mm
5/8”	BSP	122	90	30mm
3/4”	BSP	149	110	32mm
1”	BSP	203	150	41mm
1 1/4"	BSP	305	225	50mm
1 1/2"	BSP	305	225	55mm
2”	BSP	400	295	70mm
M12	Metric	16	12	15mm
M14	Metric	16	12	17mm
M18	Metric	37	27	22mm
M22	Metric	47	35	27mm
M36	Metric	179	132	41mm

Table 8.34 – Twiga Classic Hydraulic Hose Torque Settings

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8.12 Machine Inspection Record

SPEARHEAD	MACHINE INSPECTION RECORD (For All Twiga Classic Models)	Pre-delivery inspection:	Select
		Installation inspection:	Select
		Daily pre-work inspection:	Select

Model:	Serial No:
Inspector name (print):	Inspection date:
Company/Position:	
Inspector signature:	

Visual Checks	Comments	OK
Check that an operator's instruction manual in the correct language for the working territory is in the machine document holder.		
Check that the operator's instruction manual is filled in and serial number is present and matches the serial number of the machine.		
Warning decals are present, clean and in good order		
Inspect main fabrications for damage – arms, tank, slew post e.t.c.		
Inspect all hosing for damage – kinks, twists chafing or weeping		
Ensure hydraulic hoses and electrical cables are routed to tractor through the various hose guides and underneath hose guards.		
Inspect all machine valves and hydraulic hose connections for damage and oil leaks.		
Inspect all hydraulic rams for damage, oil leaks and corrosion.		
Clean any oil spillages from the machine.		
Inspect all hydraulic ram breathers are present		
Inspect all lighting on the machine to ensure it is operating correctly		
Inspect PTO shaft and cone guards for integrity and condition		
Inspect to see all fixed guarding protection is present		
Inspect all machine stands are retracted and secured		
Inspect the reach arm attachment using its own inspection sheet found in the operators manual.		
Ensure the reach arm does not come into contact with the tractor when it is placed into its transport position.		
Visually inspect all rubber bump stops on the machine for condition.		
Ensure that the machine controls are placed inside the tractor and any hoses/cables are secured and well away from the PTO shaft when in work.		
Ensure the machine controls are removed from the machine to protect from damage when out of use e.g. weather.		
Ensure that all linkage pins are securely fitted in all holes with linch pins and the holes have not become oversized.		
Ensure that all exposed hydraulic hose ends are capped which are not connected.		
Ensure that the tractor is fitted with the cab guard kit supplied with the machine or with an equivalent.		
Ensure the correct tongue is fitted to fit the make and model of tractor the reach arm is being fitted to.		

Mechanical Checks	Comments	OK
Check all hydraulic hoses and adaptors for tightness and tighten to the correct torque setting given in the operator's instruction manual.		

Ensure the gearbox oil quantity is to the level mark. Consult the maintenance schedule to see whether an oil change is scheduled.		
Ensure the oil tank quantity is to the level mark. Consult the maintenance schedule to see whether an oil change is scheduled.		
Ensure the gearbox breather are present and free from dirt.		
Check the gearbox mounting fasteners are tight to the correct torque setting given in the operator's instruction manual.		
Randomly test for loose nuts and bolts. Tighten to manual settings.		
Check all machine guarding is fitted and is tight and secure.		
Inspect the machine top link to ensure that it is securely locked in position and the reach arm is angled correctly and protected from moving once work has begun.		
Ensure the machine joystick and armrest is securely attached to the tractor armrest.		
Grease all grease points in accordance with the operator's manual.		
Inspect all machine optional extras for their integrity and secureness to the tractor.		
Check that the input PTO shaft is correctly seated at both the tractor and machine end.		
Ensure the PTO retaining chain is fitted stopping guard rotation.		
Ensure the reach arm is mounted securely to the tractor and the stabilisers are fitted correctly.		
Inspect each of the PTO bearing wear rings for wear.		
Tractor spec meets spec requirement of the machine (PTO rpm/HP).		
Check tractor tyre condition and pressures against the tractor operator's manual.		
Ensure the machine flip over bracket is placed from transport into working position before operating the machine.		
Inspect all machine optional extras for their integrity and secureness to the tractor.		
Ensure the reach arm attachment is securely attached to the reach arm and tractor (mechanically and hydraulically).		
Check and adjust the machine slew bump stop to ensure the machine slews into the correct position when it is required to work.		
Check that the main hydraulic oil suction strainer hose clips are tight and secure.		

Running Checks	Comments	OK
Slew the machine between transport and work position to check for smoothness as well for pinch points on the chassis.		
Fully extend and retract the machine, checking for pinch points on the chassis and various arms.		
Engage the PTO and listen for excessive noise from either the PTO shaft, gearbox or pump with the attachment disengaged at idle and then normal operating speed. Check for excess noise and heat build-up in components.		
Engage the PTO and listen for excessive noise from either the PTO shaft, gearbox or pump with the attachment engaged at idle and then normal operating speed. Check for excess noise and heat build-up in components.		
Ensure that the rotor control lever is placed in its neutral position before starting the machine.		
Engage/disengage/engage the rotor control lever to operate the reach arm attachment in both directions to see it is working correctly when the machine is at operating speed.		
Use all joystick machine functions to ensure the machine works correctly.		

Operate the joystick stop button to ensure the machine stops in an emergency.		
Ensure all machine lighting is clean and works correctly.		
Ensure the slew locking pin is fitted/removed when required.		

Other comments:

Disclaimer: All guidance and maintenance advise to be carried out on the machine as written in this inspection record is deemed on the provision that the operator/maintenance operative has fully read and understood the specific operators manual for the given model of machine and follows the guidance and safety precautions described within it.

Spearhead claims no responsibility to any machine and/or physical harm caused by anything other than the practice guidelines stated in its specific machine model operators manual.

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8.13 Machine Storage

Follow the following sections for guidance to correctly storing Twiga Classic machines out of working use and preparing back into correct working condition.

8.13.1 Preparing The Machine For Storage

Following seasonal use it is important to prepare the machine for storage, thinking of the preservation of parts condition and ease of reintroduction when bringing the machine back into work after periods of no use.

Follow the following points:

8.13.1.1 Thoroughly wash the machine removing all traces of grass and dirt.

Great care should be taken when using pressure washers. **Do not** hold the pressure washer lance close to the paintwork, electrical items and items containing seals as this can cause damage and discolouration.

Spearhead does not recommend using steam cleaners.

8.13.1.2 Remove and store the input PTO shaft.

8.13.1.3 Grease all grease points following the guidance given in Section 8.2.4 and 8.2.5.

8.13.1.4 Retract the machine in its most compact position to protect components from damage.

For example, on telescopic machines retract the telescopic ram to protect the telescopic inner dipper arm and hydraulic ram rod from damage and corrosion

8.13.1.5 Liberally smear grease along the length of any exposed plated hydraulic ram rods and any other exposed threaded item.

8.13.1.6 Tighten all fasteners, pins and hoses to the recommended torque.

8.13.1.7 Replace any wear bushes on the machine.

8.13.1.8 Cover any exposed hydraulic hose ends, especially if the attachment has been detached from the reach arm.

8.13.1.9 Use touch up paint available from Spearhead where necessary to preserve the appearance of the machine.

8.13.1.10 Ideally store the machine in the dry indoors, on a firm surface or stands, away from the elements. This will greatly preserve the machines physical appearance and condition.

8.13.1.11 Ensure that the machine joystick controls and electrics are protected from the weather using at a very minimum a waterproof bag. Ideally they should be completely removed and brought indoors.

8.13.1.12 Ensure the machine is left on a level ground on its stands to ensure it does not fall over.

Figure 8.65 – Prepare For Storage

It is also best practice to inspect the machine for worn/damaged items which will be required to be replaced before entering work again in the new season. Consult the maintenance schedule for the machine (Section 8.12) as well as other specific maintenance task sections to see what could be required to be done to the machine.

Ordering replacement parts at the beginning of this period with plenty of time will potentially reduce the delays of reintroduction into work with out of stock items. Many other local operators will be carrying out the same procedure at the same time.

Where parts are broken, damaged and deemed not fit for use; replace with genuine Spearhead parts; see Section 10.

Spearhead Twiga Classic reach arm machines are designed to withstand the most rigorous conditions and with a little care and attention will give many years of trouble free service. So as not to invalidate the warranty and to avoid problem, use only genuine Spearhead parts and make sure the machine is not driven at a speed in excess of 540 rpm on the PTO.

8.13.2 Returning The Machine Back To Work

Returning the machine back to work, in most cases, is similar to preparing the machine for storage shown in Section 8.13.1. If the procedure shown in that section is adhered to, a lot of the preparation work will have already been done to quickly reintroduce the machine back into work condition.

Follow the following points:

8.13.2.1 Depending on the period of the machine being unused and whether the machine has been stored outside, the machine may require cleaning.

Great care should be taken when using pressure washers. **Do not** hold the pressure washer lance close to the paintwork, electrical items and items containing seals as this can cause damage and discolouration.

Spearhead does not recommend using steam cleaners.

8.13.2.2 Fit the input PTO shaft following the guidance given in Section 3.3.5 and ensure the push-pins in each end of the PTO shaft fully retract to ensure the shaft is correctly secured and seated.

8.13.2.3 If not carried out before storage, grease all grease points following the guidance given in Section 8.2.5.

8.13.2.4 If not carried out before storage, tighten all fasteners, pins and hoses to the recommended torque.

8.13.2.5 Fit the joystick controls, armrest and any other connections required to the machine.

8.13.2.6 Remove the smeared grease found along the length of exposed plated hydraulic ram shafts and any other exposed threaded item which were put on during the storage period.

8.13.2.7 Carry out a full machine inspection, using the Machine Inspection Record guide sheet found in Section 8.12.

8.13.2.8 Thoroughly inspect the reach arm attachment to be fitted to the reach arm in accordance with guide sheet found in the reach arm attachment operators manual.

Where parts are broken, damaged and deemed not fit for use; replace with genuine Spearhead parts; see Section 10.

Spearhead Twiga Classic reach arm machines are designed to withstand the most rigorous conditions and with a little care and attention will give many years of trouble free service. So as not to invalidate the warranty and to avoid problem, use only genuine Spearhead parts and make sure the machine is not driven at a speed in excess of 540 rpm on the PTO.

9 Troubleshooting

IMPORTANT
This troubleshooting guide gives guidance to giving possible causes and remedies to issues associated with the Twiga reach arm. Any issues related to the attachment fitted to the reach arm requires the use of the troubleshooting guide of the reach arm attachment.

	Symptom	Possible Cause	Remedy
9.1	**Machine noise**	a) Loose bolts	Check and tighten to the correct torque. See Section 8.11
		b) Damage to a fabrication or cracks	Repair fabrication in specialised, approved workshop or replace component with genuine part
		c) Worn bushes	Inspect the machine for wear and replace bushes where required
		d) Lack of grease	Grease various locations on the machine following the guidance given in Section 8.2.5
		e) Vibration	See “Vibration” symptom heading below
		f) Attachment	Inspect the reach arm attachment to see whether the cause of the machine noise is the attachment rather than the reach arm.
9.2	**Metal fatigue on fabrication**	a) Too fast working/transportation speed	Slow down! See Section 2 on the guidance to correctly driving the machine correctly in work and during transportation
		b) Used in a poor manner/condition	See Section 2 on the guidance to correctly driving the machine correctly in work and during transportation. See Section 8 on the guidance to correctly maintaining the machine
9.3	**Vibration!**	a) Worn gearbox bearings	Replace bearings and seals
		b) PTO speed too high	Reduce PTO speed to the correct operating speed
		c) Oil surge	PTO speed too high, reduce PTO speed to the correct operating speed
		d) Attachment	Inspect the reach arm attachment to see whether the cause of the machine vibration is the attachment rather than the reach arm.
9.4	**Gearbox overheating**	a) Incorrect oil level	Fill to level mark on gearbox
		b) Incorrect grade of oil	Drain existing oil and refill using the correct grade; see Section 8.2.1
		c) Incorrect operating speed	Operate the PTO speed at the correct speed as stated on the decal on the gearbox
		d) Attachment overloaded	Reduce forward speed or increase height of cut of the reach arm attachment
9.5	**Gearbox noise**	a) Lack of oil	Fill to level mark on gearbox
		b) Worn gears	Replace gears with genuine Spearhead part
		c) Worn bearings	Replace bearings with genuine Spearhead part
9.6	**Damaged gearbox**	a) PTO shaft guard bottoming out – too long	Shorten the telescopic tubes following the guidance in Section 3.3.4
		b) Engaged PTO drive with too much speed	Ensure a steady engagement into driving the PTO with a low tractor engine speed
		c) Lack of grease on sliding tubes of drive shaft	Remove and split the PTO shaft following guidance in Section 8.2.3 and grease the two halves
9.7	**Gearbox oil leak**	a) Damaged gasket	Replace gasket
		b) Faulty breather	Remove the breather and clean or replace
		c) Incorrect oil level	Fill to level mark on gearbox
9.8	**Oil tank overheating**	a) Incorrect oil level	Fill to level mark on oil tank gauge
		b) Oil grade incorrect	Drain and refill oil tank with the correct grade oil
		c) PTO speed too fast	Ensure the tractor’s PTO speed matches the requirement of the reach arm

		d) Ambient temperature too high	Reduce work rate or install an oil cooler (if oil cooler fitted, check sensors)
		e) Attachment overloaded	Reduce forward speed or increase height of cut of the reach arm attachment
9.9	**Damage to PTO shaft**	a) Reach arm raised too high on tractor – too greater angle	Reduce height of reach arm
		b) PTO shaft guard bottoming out – too long	Shorten the telescopic following the guidance in Section 3.3.4
		c) Engaged PTO drive with too much speed	Ensure a steady engagement into driving the PTO with a low tractor engine speed
		d) Not enough overlap	Purchase another input shaft and cut to the correct length (to give sufficient overlap) following the guidance given in Section 3.3.4
		e) Lack of grease	Grease various locations on the shaft following the guidance given in Section 8.2.3
9.10	**Breakback operating frequently**	a) Attachment overloaded	Reduce forward speed or increase height of cut of the reach arm attachment
		b) Weight of machine being carried on rear roller	Use head float
		c) Machine not set vertical	Shorten top link
		d) Slew stop pin not adjusted correctly	Adjust the slew stop pin
9.11	**Breakback not working**	a) Fault with valve	Contact Spearhead dealer
9.12	**Hydraulics not responding**	b) Oil level low	Fill to level mark on oil tank gauge
		c) Oil pump suction filter blocked	Replace filter element
		d) Oil leak in pressure line	Check machine for leaks
		e) Driveline broken	Check pump is rotating
		f) Faulty joystick connections	Inspect hydraulic and electrical joystick connections between the joystick and the various hydraulic/electrical components on the machine
9.13	**Joystick control unresponsive**	a) Air in lines from the joystick (Pilot control only)	Relieve air from the joystick hydraulic hoses by loosening each line from the
		b) PTO speed too slow	Increase PTO speed to the correct operating speed
9.14	**Joystick not working**	a) Fuse blown	Replace fuse
		b) Electrical plug not connected properly	Check electrical connection
9.15	**Machine slewing slowly**	a) Slew ram restrictor not set correctly	Adjust slew ram restrictor
		b) Valve block leak	Inspect how the reach arm is moving and inspect the valve block responsible for the movement for a leak
		c) Oil level low	Fill to level mark on oil tank gauge
		d) Oil pump suction filter blocked	Replace filter element
		e) Oil leak in pressure line	Check machine for leaks
9.16	**Attachment operating slow**	a) PTO speed too slow	Increase PTO speed to the correct operating speed
		b) Oil level low	Fill to level mark on oil tank gauge
		c) Oil pump suction filter blocked	Replace filter element
		d) Oil leak in pressure line	Check machine for leaks
		e) Driveline broken	Check pump is rotating
		f) Faulty joystick connections	Inspect hydraulic and electrical joystick connections between the joystick and the various hydraulic/electrical components on the machine

9.17	**Reach arm creeping**	a) Hydraulic ram seal leak	Inspect how the reach arm is moving and inspect the hydraulic ram producing the movement for seal leak
		b) Oil leak in pressure line	Check machine for leaks
		c) Valve block leak	Inspect how the reach arm is moving and inspect the valve block responsible for the movement for a leak
9.18	**Lights not working**	a) Power supply not plugged in	Ensure power supply is plugged in correctly inside the tractor cab
		b) Electrical connections corroded	Check, clean and replace electrical connections where required and available.
		c) Fuse blown	Replace fuse
9.19	**Machine swaying whilst moving**	a) Worn bushes	Inspect machine and replace bushes
		b) Stabiliser brackets incorrectly adjusted	Adjust stabiliser brackets
		c) Tractor linkages worn	Inspect tractor linkages
9.20	**Telescopic arm not moving smoothly**	a) Tele pads worn on incorrectly adjusted	Adjust tele wear pads. Inspect and replace if on maximum adjustment
9.21	**Head float not working correctly**	a) Electrical fault	Check wiring and contact Spearhead dealer
9.22	**Arm float option not working correctly**	a) Electrical fault	Check wiring and contact Spearhead dealer
		b) Accumulator bottle depressurised	Recharge accumulator using the correct procedure

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10 Spare Parts

10.1 Genuine Spare Parts

Cost savings associated with the purchase of non-genuine spare parts can be difficult to dismiss, however it is essential to consider the potential safety and longer term performance of the machine and not just the short term financial gains when setting out to repair or refurbish a Spearhead product.

Spearhead Machinery consider all parts not supplied or manufactured by Spearhead Machinery as imitation or copied, it is impossible to guarantee their reliability and they may cause damage to your machine. Genuine Spearhead parts are made to specific standards to give performance and safety. Substitute components may not meet specifications and may fail in a hazardous manner that could cause injury.

Not only can non-genuine spare parts cause damage to the machine, but they may also result in lower performance and invalidate the machine's warranty. To maintain the Spearhead Machinery warranty requires the use of genuine Spearhead Machinery parts.

Spearhead Machinery utilises an interactive parts manual system which uses the machines serial number to give the exact parts required for the that particular machine. Section 10.2 gives guidance on how to use the Spearhead Machinery interactive parts manual system and find correct replacement parts.

It is important to state that **Spearhead Machinery does not sell directly to end users** but instead uses an extensive dealer network to provide to its customer base. Section 10.4 gives guidance to find your nearest Spearhead Machinery dealer.

Purchasing Genuine Spearhead Parts will give you peace of mind that your machines performance won't be compromised and can cost less than you think, so contact your local dealer for a quote before buying non-genuine spare parts.

10.2 How To Obtain The Correct Spare Part Numbers

For correct part numbers; use the Spearhead interactive online parts books. These are available at https://my.spearheadmachinery.com/parts/public-interactive-parts-database/
You will need to enter the machine serial number; see Figure 1.5.

10.2.1.1 Enter the serial number.

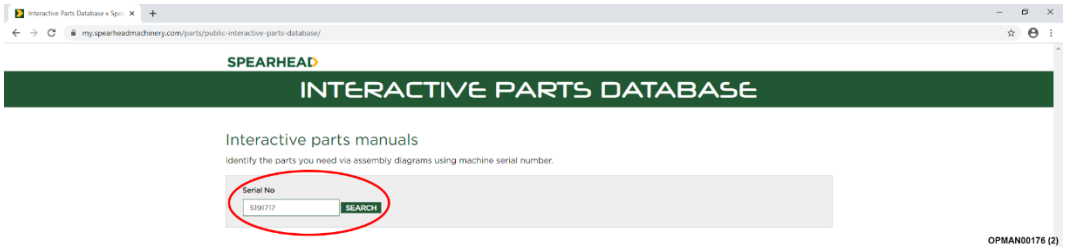

Figure 10.1 – Type In Serial Number

10.2.1.2 After entering the serial number a specification for the machine will appear. Click on the serial number; see Figure 10.2.

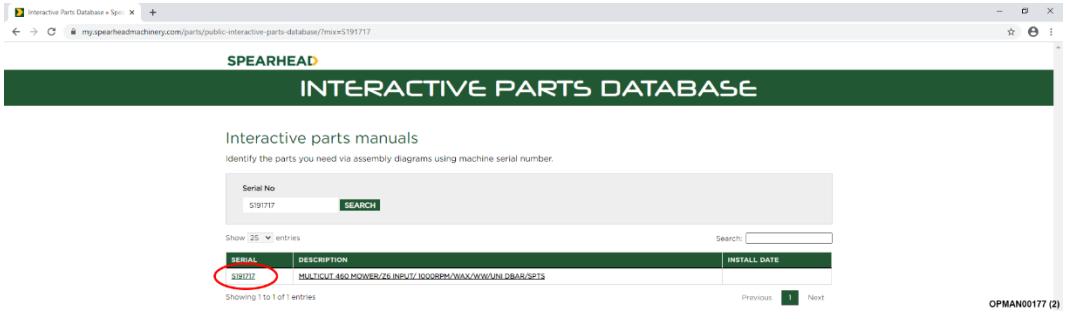

Figure 10.2 – Click On Serial Number

10.2.1.3 After clicking on the serial number a full parts breakdown, specific to the machine serial number will appear showing the various parts and assemblies of the machine. Click on the specific assembly picture required; see Figure 10.3.

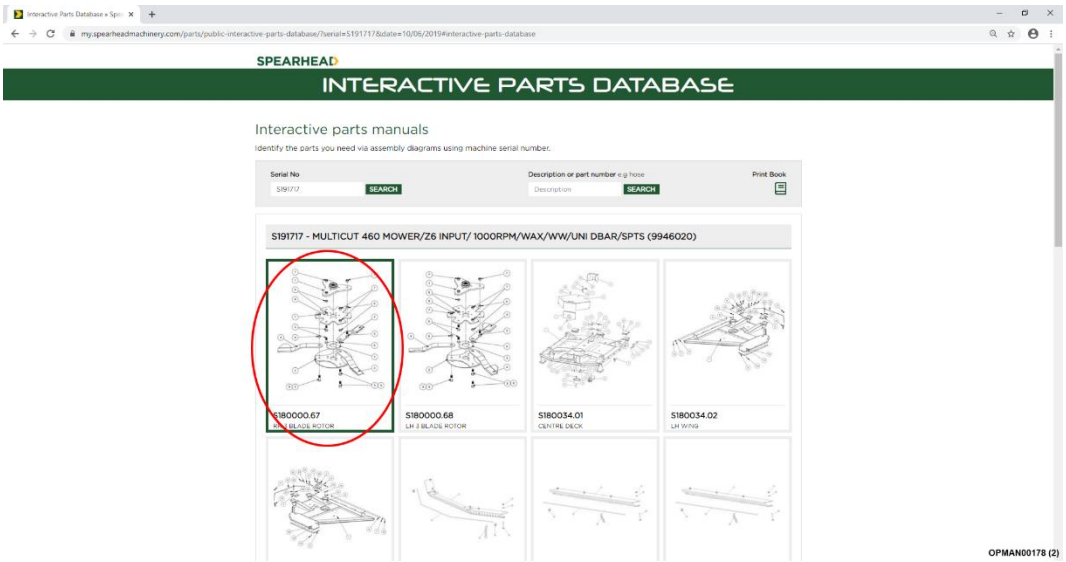

Figure 10.3 – Click On Assembly

10.2.1.4 You will finally be presented with a full exploded parts breakdown for that particular assembly, giving part numbers and the quantities required; see Figure 10.4.

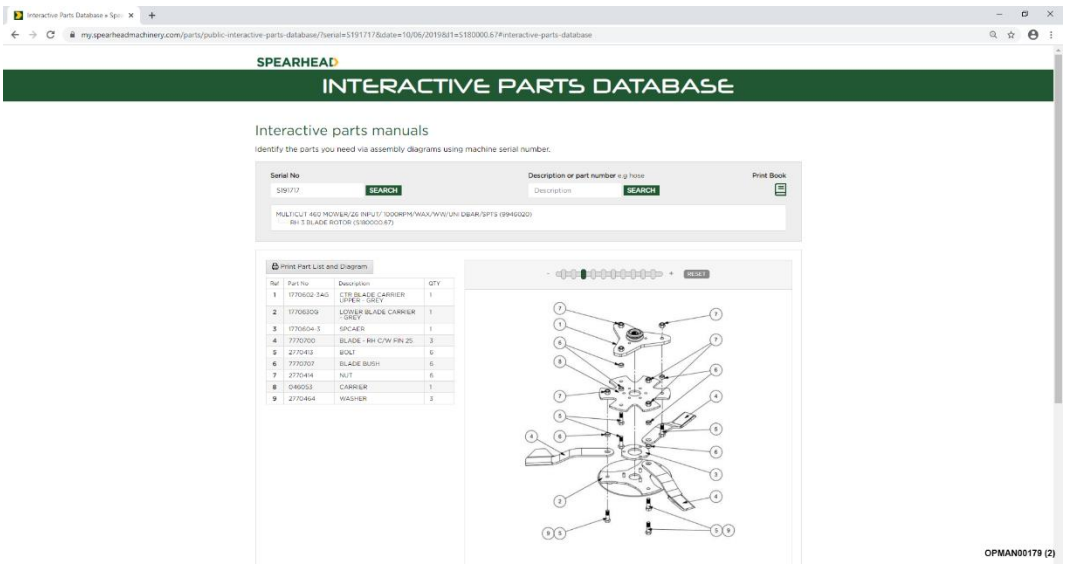

Figure 10.4 – Exploded Parts Breakdown With Bill Of Materials

10.3 Spare Parts Ordering

It is important to note that when it comes to ordering replacement parts, that this can **only** be carried out through a Spearhead dealer. **Spearhead does not accept direct customer parts orders over email, fax or telephone**.

For guidance on finding your local Spearhead dealer; see Section 10.4.

10.4 Dealer Network

Spearhead has an extensive dealer network which can offer genuine replacement parts.

In order to make it easier to find your local Spearhead dealer, the Spearhead website has a Dealer Locator facility.

http://www.spearheadmachinery.com/dealer-locator/

To find your local Spearhead dealer enter your location or postcode into the “Your location” box and then press “Search”; see Figure 10.5.

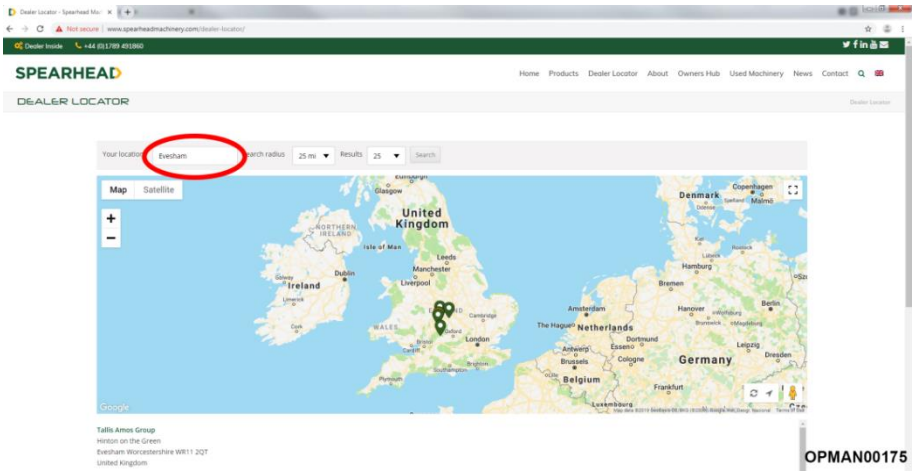

Figure 10.5 – Dealer Locator

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