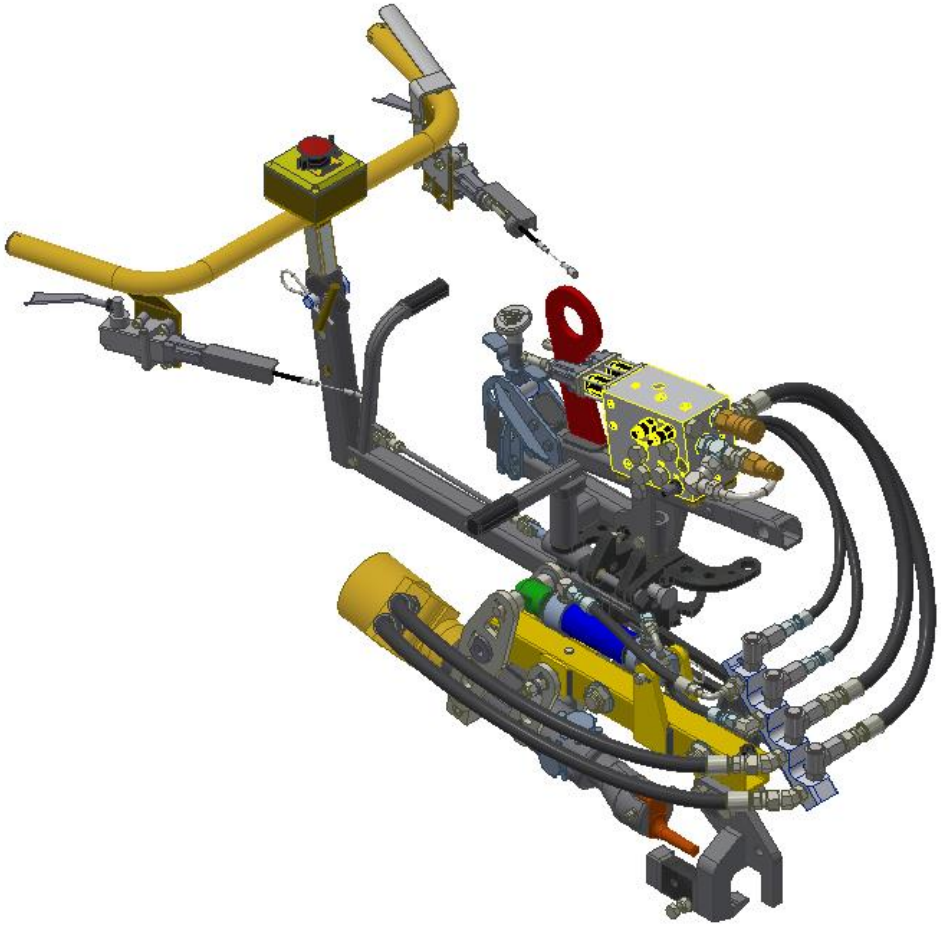
Melvelle Equipment Corp Pty Ltd

"Proud Australian Manufacturers"

186-EYE "Broken E-Clip" Remover

Operation, Training & Maintenance Manual



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Notes:

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1. Preface

Every attempt has been made to present accurate and current information within this manual. However, as product development on the Broken E-Clip Remover and components used within is continuous, the information contained herein may be subject to change without notice, and without incurring obligation.

The information provided within this manual is the sole property of Melvelle Equipment Corporation Pty Ltd (MEC) and as such, reproduction or replication of any material contained within is not allowed without the written consent of MEC.

Information provided within this manual assumes:

- The person(s) operating the machinery have read and understand this manual and other manuals provided for specific components
- The person(s) operating are properly trained and equipped to safely and professionally operate this machinery
- The person(s) operating utilise the correct attachments and/or tools, and are trained and equipped to use them safely and professionally

SERVICING THE 186-EYE "BROKEN E-CLIP" REMOVER

This manual contains safety, operation and periodic maintenance instructions. MEC recommends that servicing of equipment, other than periodic maintenance, must be performed by MEC or certified and authorised dealer. Please read the following warning.

WARNING

SERIOUS INJURY OR DEATH COULD RESULT FROM THE IMPROPER REPAIR OR SERVICE OF THIS EQUIPMENT.

REPAIRS AND / OR SERVICE OF THIS EQUIPMENT MUST ONLY BE PERFORMED BY MELVELLE EQUIPMENT CORP. PTY LTD. OR CERTIFIED AND AUTHORISED DEALER.

THE USER SHALL NOT MODIFY THE DESIGN OR CONFIGURATION OF EQUIPMENT WITHOUT CONSULTING MEC

2. Safety Information

This operation and training manual is intended to complement existing site procedures.

The following site documentation must be reviewed by the trainee before commencing training:

- Safe Work Procedures (SWP)
- Isolation Procedures

If the training package information conflicts with existing site documentation, then the authorised site and/or end user is to consult with MEC in regards to any possible amendments or modifications required.

The following practices and procedures must be adhered to:

- Always complete Pre-Operation Checks prior to use and report any defects if found
- Only connect equipment with compatible MEC equipment
- Only operate the equipment for its intended purpose
- Never operate with guards missing or damaged
- PPE Equipment as a minimum should be worn at all times according to this manual and as per site specifications
- Ensure Isolation Procedures are followed prior to carrying out any maintenance
- If any faults or damage to this machine are found during pre-operation checks or operation, tag the machine “Out-of-Service” and follow site procedures

Following the above mentioned and the information contained within this manual will ensure safe, efficient operation of the equipment.

3. Safety Symbols

The safety symbols and signal words, as shown below, are used to emphasise all operator, maintenance and repair actions which, if not strictly followed, could result in a life-threatening situation, bodily injury or damage to the equipment.

3.1. Safety Symbols & Signal Words

	**This safety alert and signal word indicates a hazardous situation which, if not avoided, will result in death or serious injury.**
	**This safety alert and signal word indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**
	**This safety alert and signal word indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.**
	**This signal word indicates a potentially hazardous situation which, if not avoided, may result in property damage.**
	**This signal word indicates a situation which, if not avoided, will result in damage to the equipment.**
	**This signal word indicates a situation which, if not avoided, may result in damage to the equipment.**

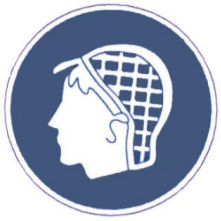
3.2. Hazard Warning Signs

	**This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all instructions to avoid possible injury or death.**
	**This is the fire risk symbol. It is used to alert you to the potential of a fire starting if ignition sources are present.**
	**This is the explosive risk symbols. It is used to alert you to the potential of an explosion /explosive substances present.**
	**This is the toxic hazard symbol. It is used to alert you to the presence of toxic substances.**
	**This is the corrosive risk symbol. It is used to alert you to the presence of corrosive substances.**
	**This is the electric shock risk symbols. It is used to alert you to the presence of an electrical supply.**
	**This is the battery symbol. It is used to alert you to the potential hazard of electrical supply, battery acid and leaking batteries.**

	**This is the hot surface symbol. It is used to alert you that the surfaces may be hot.**
	**This is the dangerous gases symbol. It is used to alert you to the presence of dangerous gases.**
	**This is the fluid under pressure symbol. It is used to alert you that there are fluids under pressure in this machinery.**
	**This is the sharp edges symbol. It is used to alert you to the presence of sharp edges or cutting hazard.**
	**This is the keep hands clear symbol. It is used to warn you to keep hands clear as there are pinch points present.**
	**This is the rotating parts symbols. It is used to warn you of rotating parts on the machinery. Keep clear of rotating parts.**

3.3. Personal Protection Symbols

	**This is the eye protection symbol. It is used when eye protection must be worn.**
	**This is the hearing protection symbol. It is used when hearing protection must be worn.**
	**This is the head protection symbol. It is used when head protection must be worn.**
	**This is the hand protection symbol. It is used when hand protection must be worn.**
	**This is the foot protection symbol. It is used when feet protection must be worn.**
	**This is the protective body clothing symbol. It is used when protective clothing must be worn.**

	**This is the face protection symbol. It is used when face protection must be worn.**
	**This is the long hair protection symbol. It is used when long hair is required to be contained or restrained.**

3.4. Prohibition Symbols

	**This is the naked flame symbol. It is used when there is not to be a fire, naked flame, ignition sources and smoking nearby.**

4. Safety Precautions

To ensure safe operation, please read and understand the following statements and their meanings. Also refer to supporting manuals from the engine manufacturer on specific operation and maintenance of the engine. This manual contains safety precautions which are outlined below.

Ensure all personnel operating this equipment are properly trained to ensure safe operation

Wear personal protective equipment around this machinery.
For example: safety glasses, hearing protection, head protection, protective clothing and safety shoes at all times.

Accidental starts can cause severe injury or death.
Disable engine by disconnecting negative (-) battery cable. Ensure machinery is started in the neutral position.

WARNING

Rotating parts can cause severe injury
Stay away whilst machine is in operation. Ensure ALL guarding is in place and secured before operation.

WARNING

Hot parts can cause severe burns.
Beware of hot parts on the machinery – i.e. exhaust, engine, hoses, radiator, solenoids, exposed metal components, etc.

WARNING

Carbon monoxide can cause severe nausea, fainting or death.
Avoid inhaling exhaust fumes and never operate the engine in a closed or refined area.

WARNING

Fuel can cause fires and severe burns.
Do not fill the fuel tank while the engine is hot or running.

Explosive gas can cause fires and severe acid burns.
Charge battery only in a well-ventilated area. Keep sources of ignition away.

High Pressure fluids can puncture skin and cause severe injury or death.
Do not work on fuel or hydraulic system without proper training and safety equipment. Ensure all hose connections are tight.

Clamping parts can cause severe injury.
Stay away whilst machine is in operation. Ensure ALL guarding is in place and secured before operation.

Loose hair, clothing and jewellery can cause severe injury.
Ensure hair is restrained; loose clothing not to be worn and jewellery must be removed before operating the machinery.

Electrical shock can cause injury.
Do not touch wires whilst engine is running. Disconnect negative (-) battery cable before any work on wires.

Attachment hoses must have a minimum working pressure rating of 2800psi. Do not use hoses and fittings that are not pressure rated.

Ignition sources can cause fires and severe burns.
There is <u>not</u> to be a fire, naked flame, ignition sources or smoking around any MEC machinery.

Toxic and/or Hazardous substances utilised in this machinery.
Beware of toxic and/or hazardous substances used within this machinery. Do not inhale, swallow or touch toxic/hazardous substances.

WARNING

Injury can occur due to terrain and operating speeds.
To ensure safe work is achieved, do not exceed walking pace whilst operating this equipment. Also note the terrain conditions (underfoot and rail conditions). Do not walk on sleepers or the rail head.

WARNING

Electrification can occur if used on live third rail and/or fourth rail.
Do not use equipment on live third rail and/or fourth rail electrification.

WARNING

Injury can occur through incorrect operation of the equipment.
Only operate the equipment for its intended use. Failure to do so may result in injury. Do not ride on or tow the equipment.

WARNING

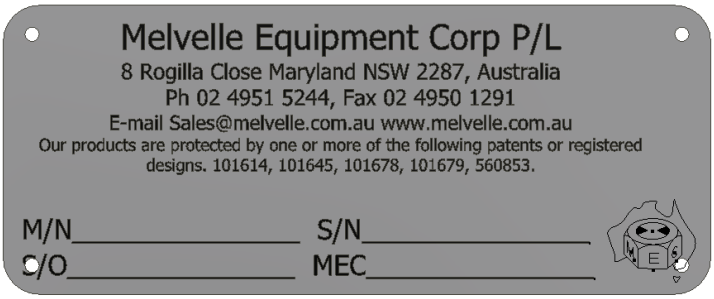
Accumulator Hazard.
This machine utilises hammers that have a pressure accumulator.
DO NOT disassemble hammers without consultation with MEC.

WARNING	WARNING
	
Vibration Hazard Normal and proper use of this equipment will expose the operator to vibration. Vibration exposure may cause and/or contribute to injury throughout the body. Ensure proper procedures are followed for vibration exposure levels to reduce the risk of injury. Refer to Specifications for vibration level data.	**Noise Hazard.** Ensure adequate hearing protection is worn whilst using this machinery. High sound levels may cause permanent hearing loss. Refer to Specifications for noise level data.

5. Equipment Stickers & Tags

Below are the stickers and tags utilised on this equipment.

IDTAG01 – Melvelle Identification Tag



IDTAG02 – Model & Serial No. Tag

IDTAG04 – Emergency Stop Warning Label

IDTAG08 – Lifting Point WLL 150kg

LAB0003 – Melvelle Newcastle Sticker

LAB0004 – Melvelle Achieving Excellence Sticker

LAB0006 – Danger – Keep Hands and Feet Clear Sticker

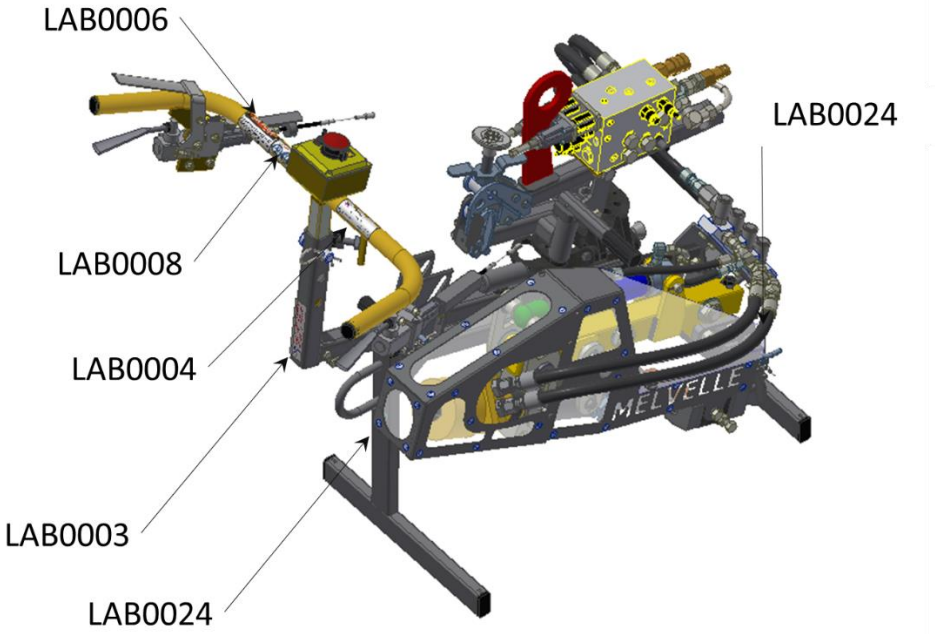
LAB0008 – Safety Label

LAB0009 – Hydraulic Oil Label

LAB0024 – LASHING POINT NO LIFTING

5.1. Stickers & Tags Locations

See below image for locations of stickers and tags.



6. Emergency Stop

This machine has been fitted with an Emergency Stop to increase the operational safety of MEC machinery.

Important information about the Emergency Stop:

- The Emergency Stop is designed to stop the engine and hence the work head in Emergency situations

- Dedicated machines have a dedicated Emergency Stop to the power pack – they are wired into the machine

- Trackpacks fitted with a wiring harness will not operate unless a work head with an Emergency Stop is connected and the wiring harness connectors are joined

- The Emergency Stop **WILL NOT OPERATE** unless it is electrically connected to the power pack. For Trackpack heads, if the Trackpack is not fitted with a wiring harness and plug, the Emergency Stop will not work

- The Emergency Stop is not intended to be used for normal stopping of the machinery

7. Introduction

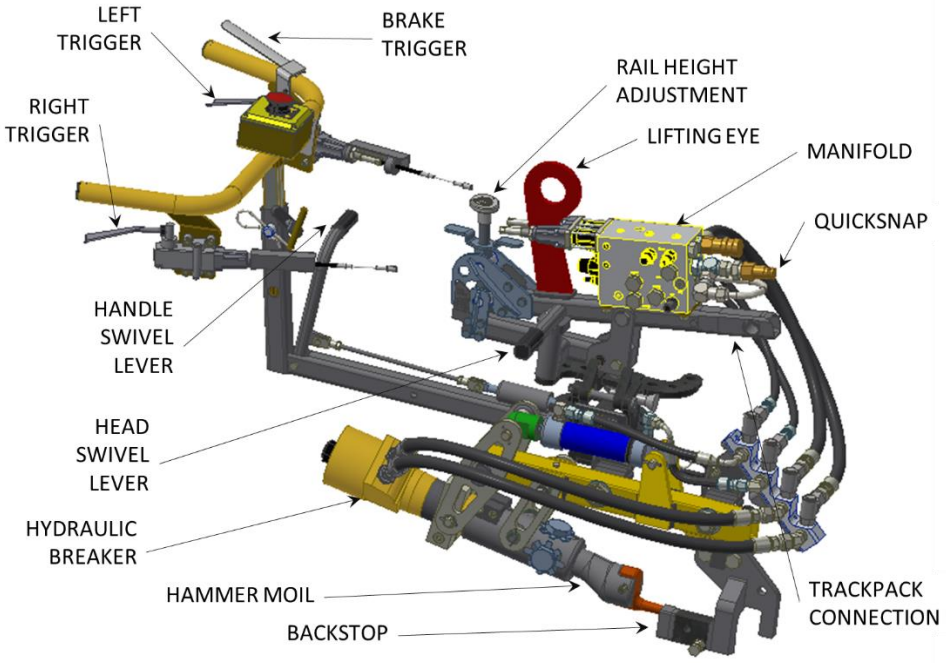
Melvelle Equipment Corp Pty Ltd (MEC) supply “Broken E-Clip Removers” to the rail industry. The 186-EYE E-Clip Remover is designed to remove E and PR Clips (elastic fasteners) that are broken at the shoulder or severely weathered that conventional methods are no longer successful. The 186-EYE has the ability to be used on rail sizes from 41kg/m to 68kg/m rail using traditional concrete sleepers, and can be swivelled from one side of the rail to the other in a matter of seconds.

The 186-EYE removes frozen/weathered clips that have corroded to the point where the wire is so thin that conventional hand tools and machinery that remove the clips by contacting with the top wire section, immediately break the clip. This machine strikes the end of the clip inside the shoulder and punches the clip out using a hydraulic breaker, while a backstop cups the shoulder and supplies a reaction force in both driving the clip and removing the moil from the shoulder.

By using the “186-EYE Broken E-Clip Remover”, injuries from traditional methods of removing these clips (swinging hammers) have been eliminated. These are (but not limited to):

- Back strain
- Repetitive strain injury
- Hammer strikes to legs
- Damage to feet through striking/or clips hitting ball of foot
- Struck by flying clips
- Infrastructure damage

The 186-EYE has inherent safety features built into the design. This includes counterbalanced design (user to lift <5kg during operation), emergency stops, hose covers, dual handed operation, guarding and lifting points (mechanical lifts). By providing equipment with these features ensure safe and efficient operation of MEC machinery.



8. Specifications

8.1. FP-186-EYE- Trackpack Work head

Engine	MEC Trackpack
Dimensions	1400mm long x 740mm wide x 1000mm high
Weight (wet)	85kg
Pressure (max)	193bar / 2800psi
Battery	12V
Hydraulic Oil[1]	ISO68
Hydraulic Hose Connection Size	½”
Pressure Settings:	
Hammer Pressure	103.5bar / 1500psi
Cylinder Pressure	34.5bar / 500psi
Preliminary Vibration Level (tested to ISO 5349)	5.92 m/s^2
Noise Level	107db(A)
Maximum Sound Pressure Level	125db(C)

9. Operation

Before use of the equipment, be aware of the operating environment and conditions for which the equipment is to be used. Ensure all users are trained to operate the machinery before operation.

9.1. Operating Conditions

The following outlines the duties and conditions for which the equipment is intended to be operated:

- Used on the intended rail line (gauge)
- Used within a possession
- Not to be used on third and/or fourth rail electrification
- Has the ability to be used in all environmental conditions providing the rail is clean and accessible (i.e. snow, extreme heat, etc may be considered hazardous to operation of the equipment)
- Equipment is designed to remove Pandrol ‘E’ Clip and ‘PR’ Clips (elastic fasteners) only
- Ensure operators are using hearing protection when using this machinery that is applicable to industry standards to reduce noise to acceptable levels
- Ensure operators adhere to industry accepted operating times for vibration exposure levels

Noise

In using the 186-EYE "Broken E-Clip" Remover, noise levels above the safe level are generated. Hearing protection must be worn by the operators and those in the vicinity of the machine operating.

As the machine has a noise level of 107db(A), the minimum allowable SNR (taking into account 'real world' application) is 26. A hearing protection device with a greater SNR than this will provide better protection to the operator and if available, is recommended to be used.

Vibration

The normal and proper use of the E-Clip Remover exposes the operator to levels of vibration (see Specifications). Below is a table from the Health and Safety Executive[1] (HSE – UK) displaying values of vibration (m/s^2) and the allowable Exposure Action Value (EAV – time take before action is required – 100 points) and also the Exposure Limit Value (ELV – maximum daily exposure – 400 points).

Vibration magnitude m/s^2	15 m	30 m	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
40	800									
30	450	900								
25	315	625	1250							
20	200	400	800							
19	180	360	720	1450						
18	160	325	650	1300						
17	145	290	580	1150						
16	130	255	510	1000						
15	115	225	450	900	1350					
14	98	195	390	785	1200					
13	85	170	340	675	1000	1350				
12	72	145	290	575	865	1150	1450			
11	61	120	240	485	725	970	1200	1450		
10	50	100	200	400	600	800	1000	1200		
9	41	81	160	325	485	650	810	970	1300	
8	32	64	130	255	385	510	640	770	1000	1200
7	25	49	98	195	295	390	490	590	785	865
6	18	36	72	145	215	290	360	430	575	720
5.5	15	30	61	120	180	240	305	365	485	605
5	13	25	50	100	150	200	250	300	400	500
4.5	10	20	41	81	120	160	205	245	325	405
4	8	16	32	64	96	130	160	190	255	320
3.5	6	12	25	49	74	98	125	145	195	245
3	5	9	18	36	54	72	90	110	145	180
2.5	3	6	13	25	38	50	63	75	100	125
2	2	4	8	16	24	32	40	48	64	80
1.5	1	2	5	9	14	18	23	27	36	45
1	1	1	2	4	6	8	10	12	16	20
	Daily exposure time									

Above limit value
Likely to be above limit value
Above action value
Likely to be above action value
Below action value

Given the current values of vibration for the E-Clip Remover as 5.92 m/s^2, the time to reach the EAV is 1hr 25min and 5hr 40min for the ELV.

[1] Retrieved from http://www.hse.gov.uk/vibration/hav/readyreckoner.htm on 10/04/2013

9.2. Pre-Operation Checks

Overall Inspection

1. Check that the equipment is free from damage or defects
2. If damaged, DO NOT USE. Contact MEC for repairs

Engine Oil

1. Check the level and quality of the engine oil and add if required
2. If contaminated or old, engine oil will be dark (nearly black)
3. If contaminated with water, engine oil will be a milky colour
4. Refer to manufacturer's instructions for specific data
5. If engine oil contaminated, replace before use

Hydraulic Oil

1. Check the level and quality of the hydraulic oil and add if required
2. Oil level to be just above the centre cone, under the filter breather cover, by 2-20mm
3. If contaminated, hydraulic oil will be discoloured
4. If contaminated with water, hydraulic oil will be a milky colour
5. If hydraulic oil contaminated, replace before use

Fuel

1. Check the level of fuel and add if required

Battery (if applicable)

1. Visually inspect the condition of the battery
2. Ensure there is no damage, acid levels are OK and the battery leads are free from defects
3. If damaged, replace before use

Light (if applicable)

1. Visually inspect condition and leads of light
2. Ensure there is no damage and leads are free from defects
3. Before starting, ensure the light is off

4. If damaged, replace before use

Hydraulic Hoses & Filter

1. Visually inspect the hoses and filter
2. Ensure there is no damage
3. If damaged, replace before use

Guards & Stickers/Tags

1. Inspect all guards and stickers/tags are in place and secure – refer to further document drawings for locations
2. Ensure there is no damage
3. If damaged, DO NOT use machinery. Replace before use

Emergency Stop

1. Ensure Emergency Stop plug is electrically connected
2. Ensure the wires are free from damage and connections are clean and dry

Moil/Moil Insert

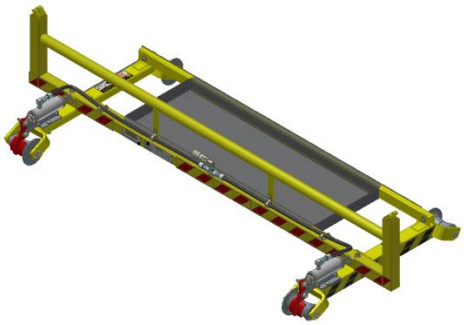
1. Inspect Moil for damage and wear before use
2. Ensure the moil slides and rotates freely.
3. Ensure at least one locking tab is securing each lock bolt.
4. Ensure pin between Moil and Moil insert is in place and secured.
5. Ensure the moil is lubricated before use
6. If damaged or excessive wear seen, replace moil insert.

9.3. Assembly/Setup Procedures

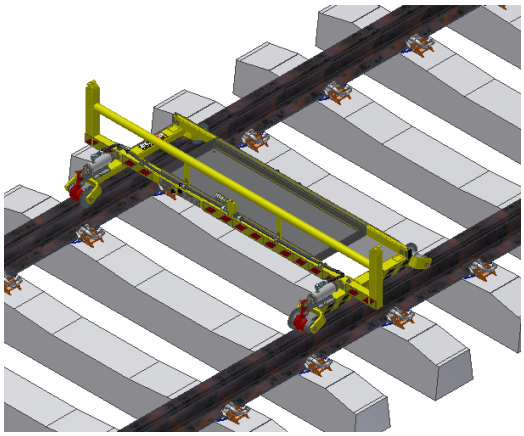
WARNING

Before any assembly and/or maintenance are performed, ensure the work head and engine are off and in a neutral position

9.3.1. Braked Machine Trolley



1. Conduct all pre-operational checks as per section 9.2.

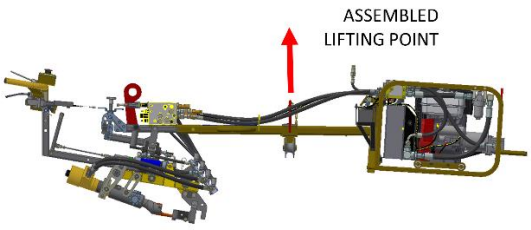


2. Assemble the trolley to the rail lines.

   Refer to Braked Machine Trolley Operation Manual for more information

9.3.2. Machine Assembly – Dedicated/Assembled Machine

1. Observe all safety precautions. Ensure the operation is being performed on safe and steady ground (no excessive slopes or dangerous terrain).
2. Conduct all pre-operational checks as per section 9.2.
3. An assembled E-Clip Remover Machine and trackpack weighs approximately 220kg. Using a certified lifting device (min 250kg), attach slings or a lifting

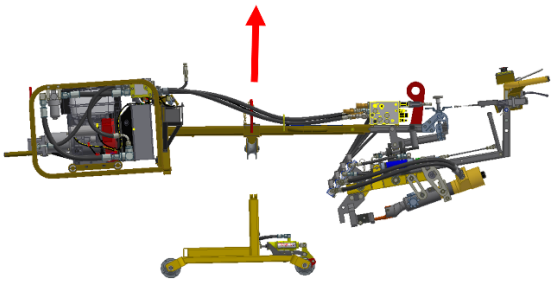


hook to the lifting point on the machine.

4. By following safe lifting procedures, lift the machine onto the trolley. The cross trolley rollers will sit onto the cross bar (tube).

CAUTION

When placing the machine onto the trolley, ensure hands are clear of the cross trolley rollers and cross bar (tube) as personal injury may occur.

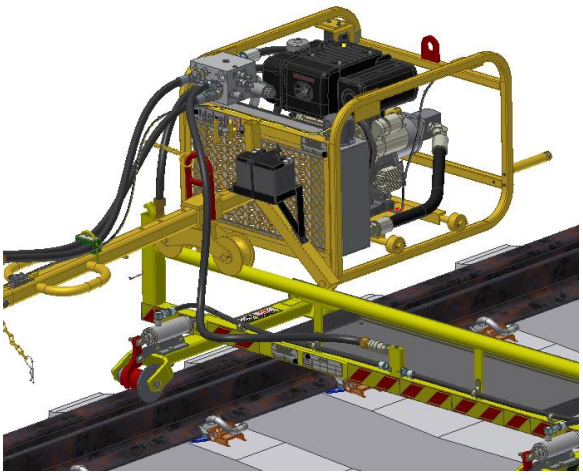


5. Remove the slings and/or hooks. The machine can now be moved to either rail for use. This is achieved by raising the head off the ground and sliding across the trolley. A second person may be required to assist and push the engine across the trolley.

6. Attach the chain to the trolley to ensure the machine will not roll during operation.

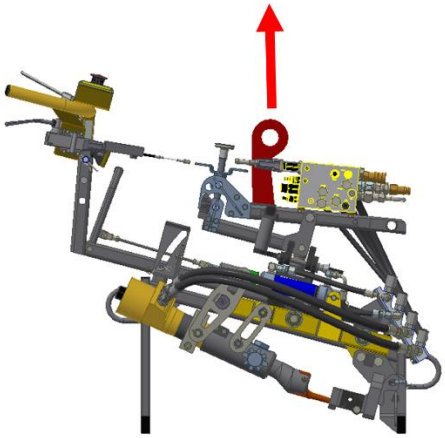
7. Connect the Brake hose to the Cylinder on the trolley.

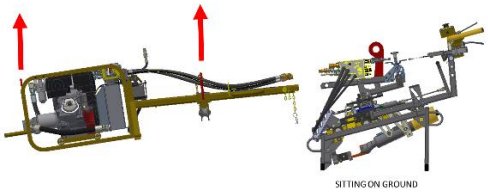
8. The equipment is now ready for use.

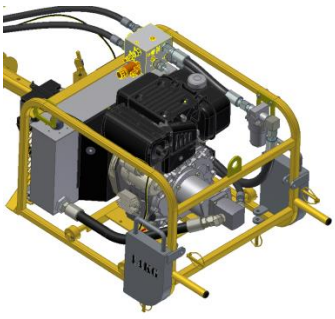


9.3.3. Machine Assembly – Trackpack

1. Observe all safety precautions. Ensure the operation is being performed on safe and steady ground (no excessive slopes or dangerous terrain).
2. Conduct all pre-operational checks as per section 9.2.
3. A Trackpack “Broken E-Clip” Remover Head weighs approximately 90 kg and a Trackpack weighs approximately 100kg.
4. Place work head onto the ground sitting in its transport stand. (Follow safe lifting procedures)
5. Adjust the pivot position (cross trolley rollers) to the correct position for the machine. For the “Broken E-Clip” Remover this is the furthest hole from the engine (refer section 14 for drawing of pin locations). Attach slings to the lifting lugs on the Trackpack.
6. By following safe lifting procedures, lift the Trackpack using slings ensuring it is kept level and easy to move (For more information refer to the Trackpack Manual).
7. Guide the Trackpack towards the work head and align the square attachment (hayman-reese style), sliding the items together. Insert the locking pin between the items and lock in position with the R -Clip. Lower the Trackpack to the ground and remove the slings.
8. Connect the hydraulic quick snaps together. Connect the electrical deutsch plugs together to ensure the Emergency stop and brake is connected to the trackpack.
9. The Trackpack and work head are now attached and can be lifted onto the machine trolley (the same as a dedicated machine). Refer to section 9.3.2 above for procedure on attaching to machine trolley.





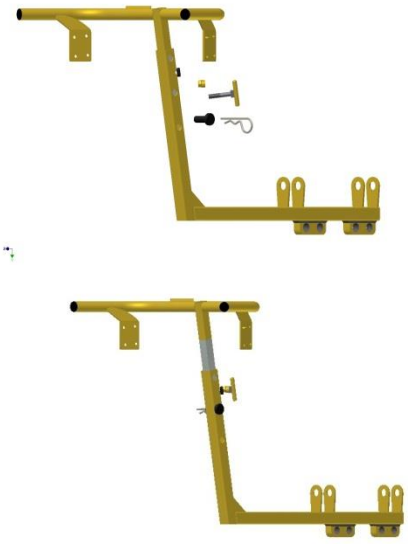


9.3.4. Handle Adjustment

The adjustment of the handles is done to achieve a comfortable height for the operator whilst using the machine.

To adjust the handles:

1. Loosen the T-Bolt and locking nut.
2. Remove the R-Clip and adjustment bolt from the handles.
3. Stand in the operating position and lift/lower the handles to the required height.
4. Replace the adjustment bolt and R-clip.
5. Tighten the T-Bolt and locking nut.

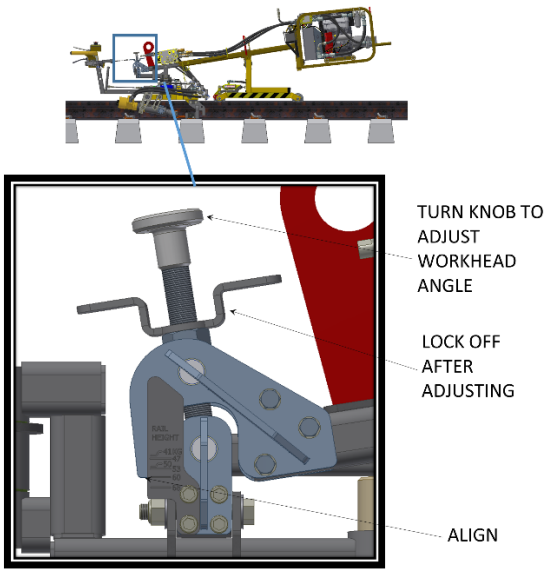


9.3.5. Machine Adjustment – Workhead Angle

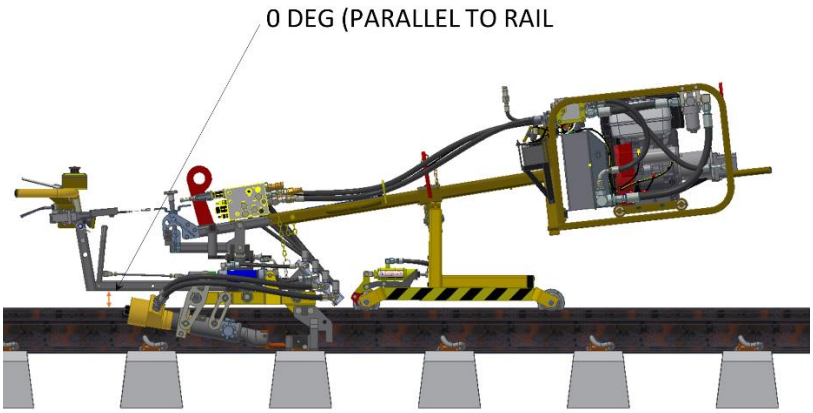
The head angle adjustment is required to ensure the 186-EYE work head is level with the rail and ensures correct engagement with the clips. This is required as the rail height changes between rail sizes and hence, the angle of the work head. Incorrect work head angle hinders the operation of the machine and operators will find it difficult to use the machinery.

To adjust the Workhead angle:

1. Ensure the Workhead is on the rail and connected to a Trackpack as per sections 9.3.1, 9.3.2, & 9.3.3 above. Turn knob to align edge of indicator plate to correct rail size. Tighten locking nut firmly by hand.



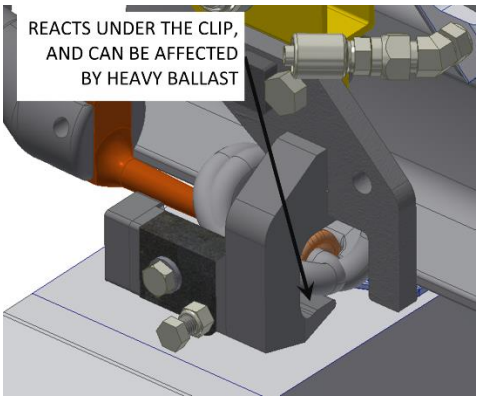
2. Following the above steps will align the work head parallel to the rail. Significantly worn rail may require a minor re-adjustment to ensure the work head is set parallel to the rail



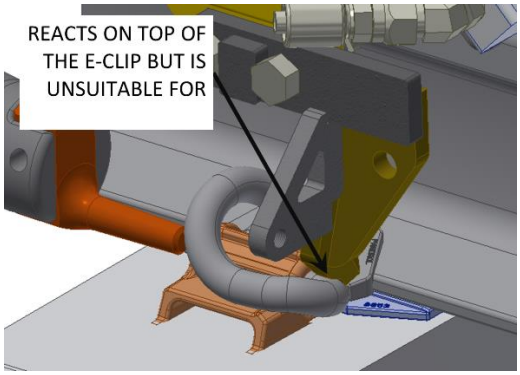
9.3.6. Backstop Selection

The FP-186-EYE is supplied with 3 style of Backstops for use with different style of clips and conditions. Depending on condition of track, mixture of clips to be removed one of the following backstops should be selected.

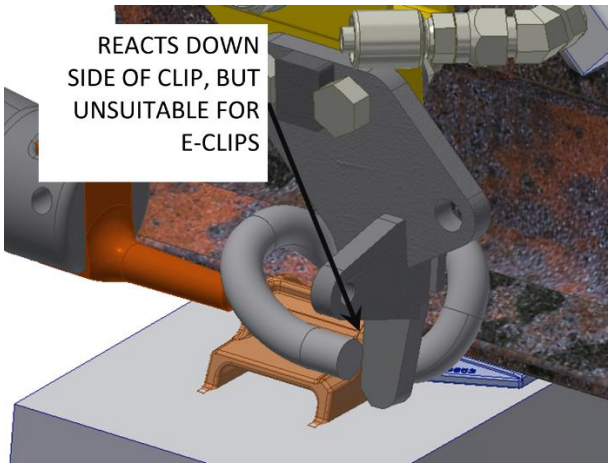
The first style is the Universal backstop that is suitable for both E-Clip, and PR-Clips but is limited in its operation when heavy ballast/dirt is present. The backstop is shown below. For this backstop to be useable the area under the rear part of the clip and shoulder must be clear of dirt.



The Second style is for E-Clip, and is not affected by heavy ballast, but does not work on PR-Clips. This style is easier to land on the clip during operation. Backstop shown below.

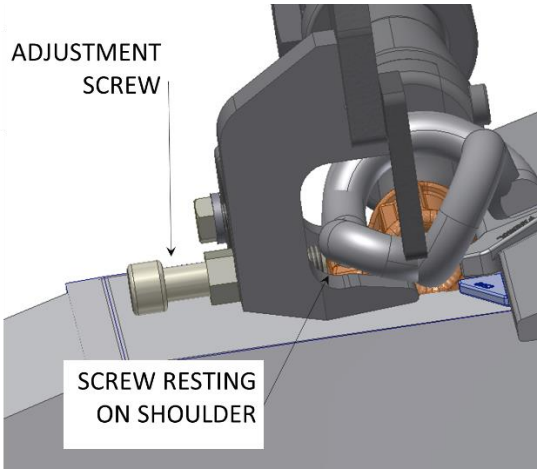


The third style is for PR-Clip, and is not affected by heavy ballast, but does not work on E-Clips, This style is easier to land on the clip during operation. Backstop shown below.

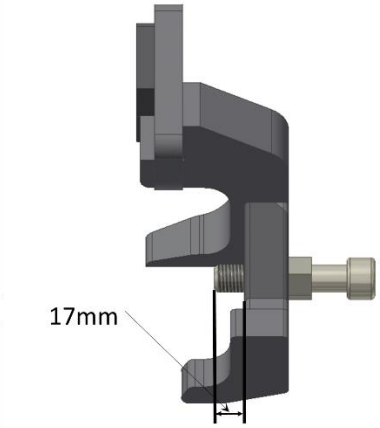

REACTS DOWN
SIDE OF CLIP, BUT
UNSUITABLE FOR
E-CLIPS

9.3.7. Backstop Adjustment for Universal backstop

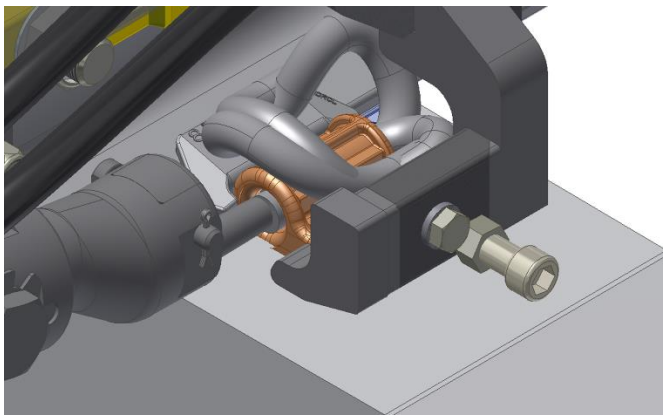
1. Ensure machinery is off and in neutral position before undertaking any work/adjustment
2. The backstop has an adjustment screw to account for various sleepers. The adjustment aligns the moil with the centre of the sleeper shoulder and aids in removal of the clip, equipment operation and moil life.



3. Typical adjustment position is 17mm as shown in the image across. To set this loosen the locking nut and adjust until the dimensions is achieved, then retighten the locking nut.



4. To test this position place the machine on a clip (as per section 0) and observe if the moil is in the centre of the clip. Measure and adjust if necessary. During equipment operation the machine is placed onto the shoulder until this stop is in contact - this gives the operator the correct operating position.



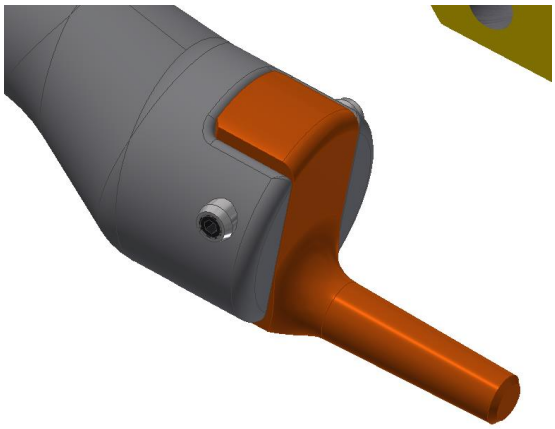
5. Note ballast and dirt around the shoulder can interfere with this backstop position. Pay attention to the moil position in relation to the clip centre.

9.3.8. Moil/Insert Replacement

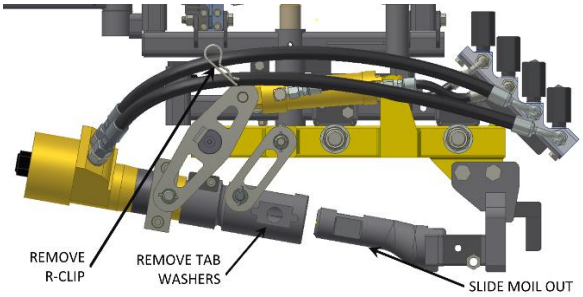
1. Apply the left hand trigger to retract the moil as per section 0.

2. Ensure the machine is off, then remove the lower Guard.

3. To remove the insert remove loosen the screws from one end of the pin then using a pin punch drive the roll pin from the moil. Note the pin does not need to be removed the full length. Inspect for damage and wear at the connection between the large moil and the moil insert. Reassemble in reverse order. Loctite 243 screw into roll pin.



4. To remove the large moil remove the insert as above then remove the top guard. Remove the R-clip in the cylinder and remove the pin between the arms as shown. This allows the moil to move back enough to clear the backstop.



5. Unfold the Tab washers on the two locking screw then remove the locking screws.

6. The moil should now slide out. Inspect the moil and locking screws for excessive wear or damage

7. Reassemble in reverse order. Ensure a nickle based anti-seize compound such as “CHESTERTON 725” is applied to the large moil. Apply a medium strength Loctite to the screws before bending the lock screws over.

8. The moil should slide and rotate freely inside the nose cone.

9.4. Operation Procedures

WARNING

Only authorised personnel shall start, operate or interfere with the normal working of portable machines or trolleys. The user shall be careful to use the machine in the intended way, avoiding over-loading.

9.4.1. Starting the Engine – Electric Start[1]

1. Observe all safety precautions
2. Ensure all pre-operation checks have been conducted
3. Assemble the work head, track pack and trolley as per the above assembly procedure.
4. Ensure Emergency Stop is electrically connected to power pack and not activated
5. Place the throttle at 50% power
6. Turn the key to its first position (on position)
7. Press the decompression lever (if Diesel)
8. Turn key to second position (starting position). Hold until engine starts and the release, allowing the key to return to its first position.
    a. If Diesel, with the decompression lever pressed, the fly wheel will quickly gain momentum (2-3 seconds) as the starter motor is activated.
    b. With the engine spinning, release the decompression lever whilst maintaining the key in the start position.
    c. The engine will start almost immediately. Once started return key to first position.
    d. Note: if the track-pack has a push button start, ignore key first position steps. Pressing the push button is the same as the key second position
9. Place throttle in idle (min) position and allow engine to warm up – refer manufacturers manual for required times
10. Move throttle to required rpm position, normally full throttle[2]

[1] Refer to engine manual for detailed engine instructions and requirements
[2] During first 50hrs do not exceed 70% maximum rated power

11. Power pack and hydraulic circuit are now in operation and tooling is able to be used.

9.4.2. Starting the Engine – Recoil Start[1]

1. Observe all safety precautions
2. Ensure all pre-operation checks have been conducted
3. Assemble the work head, track pack and trolley as per the above assembly procedure.
4. Ensure Emergency Stop is electrically connected to power pack and not activated
5. Place the throttle at 50% power
6. Turn the key to its first position (on position) if applicable.
7. Hold the grip and pull the cord until compression is found
8. Completely rewind the cord (allow to retract)
9. Press the decompression lever (if Diesel)
10. Using two hands, firmly and quickly pull the cord to start
11. Place throttle in idle (min) position and allow engine to warm up – refer manufacturers manual for required times
12. Place throttle at required rpm position, normally full throttle[2]
13. Power pack and hydraulic circuit are now in operation and tooling is able to be used.

[1] Refer to engine manual for detailed engine instructions and requirements
[2] During first 50hrs do not exceed 70% maximum rated power

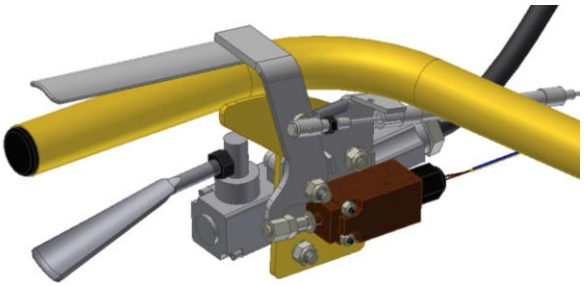
9.4.3. Equipment Operation – Releasing the Brake

All new machine trolleys are fitted with fail-safe brakes. These brakes are released by hydraulic pressure, supplied by connecting the ¼" hydraulic hose line to the trolley as stated in assembly procedures.

To release the brake on the trolley:

1. Observe all safety precautions
2. Ensure all pre-operation checks have been conducted as per section 9.2.

3. Ensure all Assembly Procedures have been followed and the E-Clip Remover is set up correctly on track as per sections 9.3.1, 9.3.2, 9.3.3, 9.3.4, & 9.3.5.
4. Ensure all hydraulic and electrical connectors are connected – these control the operation of the brakes and also the machine.
5. If there is a manual pull cable for the brake manifold (small flexible cable), connect this to the trigger – as shown.

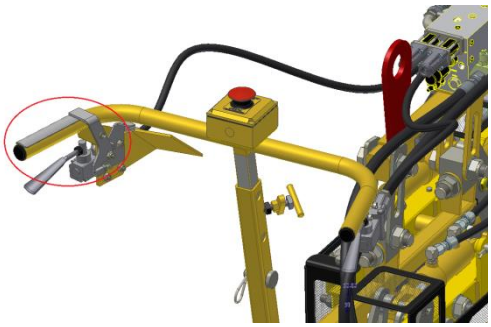


6. To assemble a manual pull cable to the brake trigger, slide the cable through the outer cable holder. Pull down on the cable connection at the end of the cable to open and slide over the ball located on the trigger. The outer cable should locate on the back of the outer cable holder. Adjustment of the cable may be required before and after assembly of the cable to the trigger.

7. Start the engine as per sections 9.4.1 & 9.4.2

8. To release the brakes, push down the trigger on top of the handles

9. The brakes will release and allow movement of the machine. For further information, please see trolley manual or contact MEC.

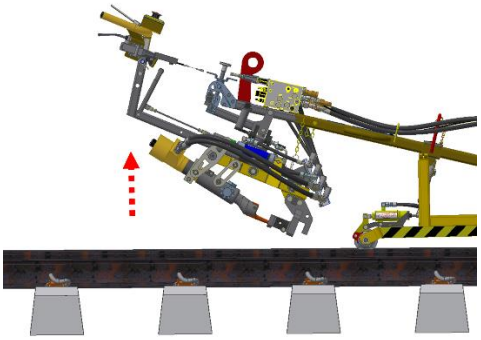


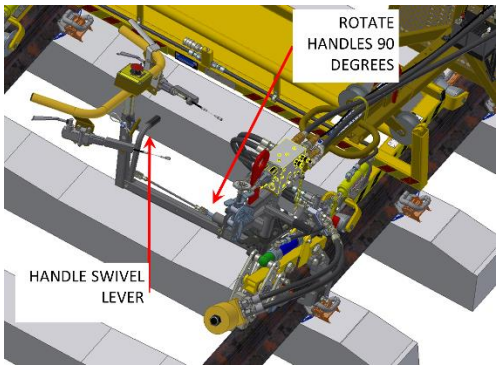
9.4.4. Changing Sides of the Rail

The 186-EYE is designed to alternate between rail sides quickly and easily. The operator handles are used to rotate the head.

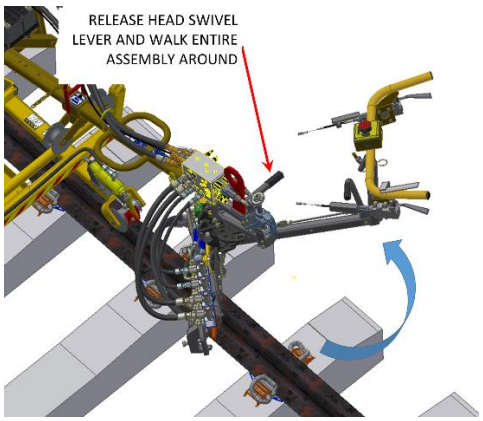
The 186-EYE can be switch from one side of the rail to another as follows:

1. Observe all safety precautions
2. Ensure all pre-operation checks have been conducted as per section 9.2.
3. Ensure the 186-EYE is assembled onto track per sections 9.3.1, 9.3.2, 9.3.3, 9.3.4, & 9.3.5.
4. Lift the handles and allow the Trackpack to rest against the top of the rail

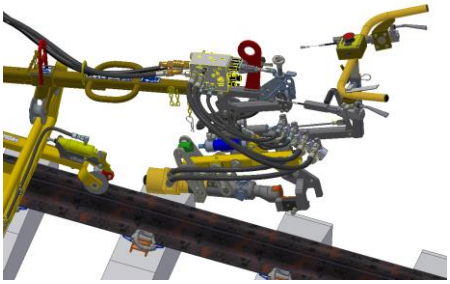




5. Pull back on the handle swivel lever and begin rotating the handle around. Release the lever and allow the lock to drop in at 90 degrees.
6. Release the lever on the right hand side (Head swivel lever) and walk the handles of the machine around 180 degrees. Take care not to catch hoses and cabling.
7. Flip the head swivel lever back down to lock the head in new position.



8. Pull back on the handle swivel lever and rotate the final 90 degrees.



9. The work head is now ready for operation on the opposite of the rail.

10. To change back to the first side reverse the operation.

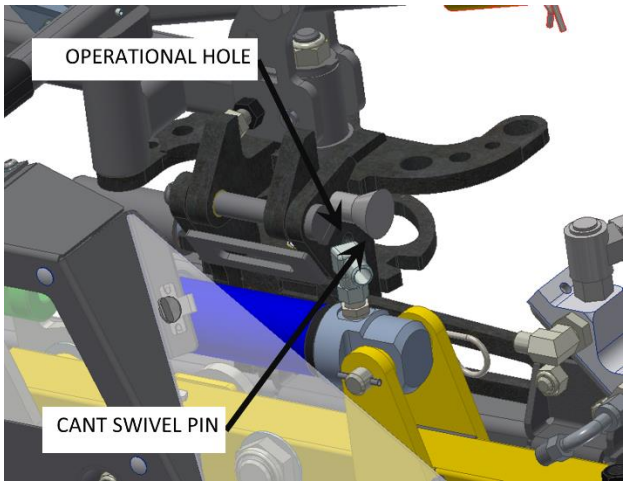
9.4.5. Equipment Operation – Releasing cant swivel

1. Observe all safety precautions

2. With the machine setup and sitting on track locate the head swivel pin.

3. Press the end of the pin and pull from the frame, a slight jiggle of the handle may be needed. Place the pin in the operational position.

4. Once the machinery is ready to be placed in the stand reinsert the pin into the locked position hole.

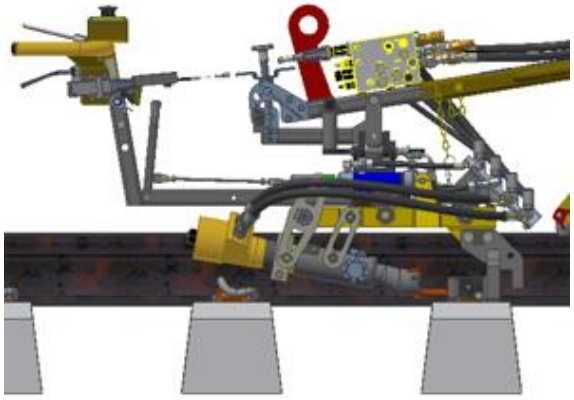


9.4.6. Equipment Operation – Removing Frozen/Broken Clips

5. Observe all safety precautions

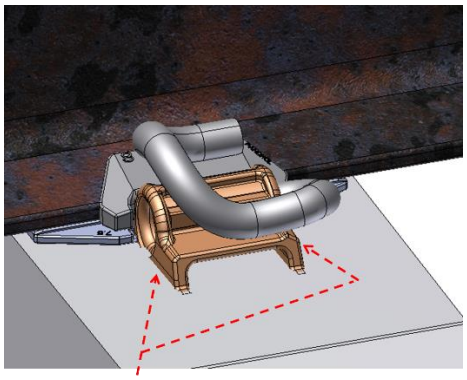
6. Ensure all pre-operation checks have been conducted as per section 9.2.

7. Ensure the 186-EYE is assembled onto track with the brakes connected as per sections 9.3.1, 9.3.2, 9.3.3, 9.3.4, & 9.3.5



8. Ensure the work head is set up for the chosen side of rail as per section 0.

9. Ensure the work head angle and stop bolt are set correctly as per section 9.3.5 and 9.3.6 respectively.

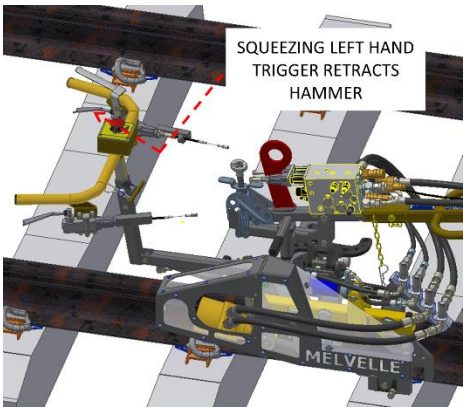


10. Ensure the sleeper is clean around the edges of the shoulder. Material build-up in this area will make it difficult to align the moil with the eye of the shoulder when using the universal backstop. Refer section 9.3.6 for Backstop clarification.

ENSURE FREE FROM MATERIAL BUILD UP

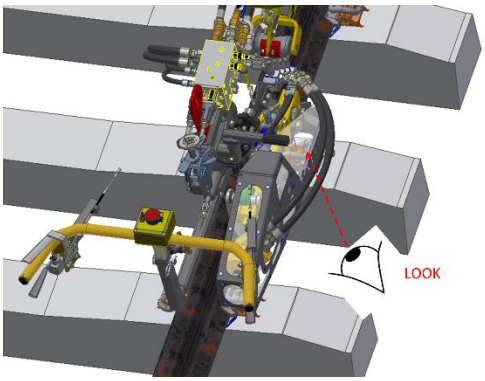
11. Start the engine as sections 9.4.1 & 9.4.2

12. Squeeze and release the left hand trigger. This will allow the cylinder to retract the moil.



NOTE: If the trigger is not released, the engine will lug down and can stall once the moil is fully retracted.

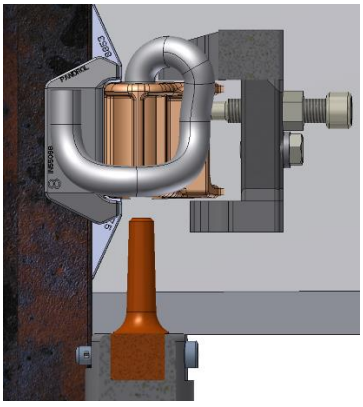
13. The operator's field of vision is quite narrow, but with practise, the speed and ease by which the moil is positioned increases dramatically.



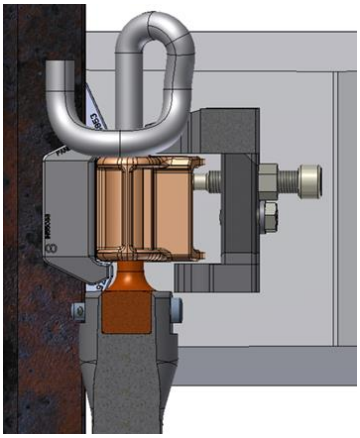
14. The line of sight for the operator varies depending on which side of the rail the head is set to.

15. When on the right hand side of the rail the operator can view the backstop through the view port in the guard. Position the backstop on the shoulder. The swivel off the work head allows the backstop to swing in from the side. The stop on the universal shoulder should set the position of the backstop.

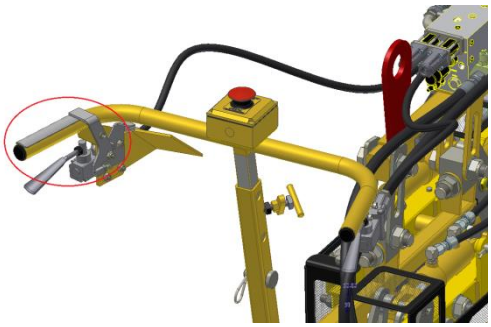
16. The machine is correctly positioned when the moil and the eye of the sleeper shoulder are in line.



17. The machine is now positioned correctly, ready to remove the clip. Activate both the left hand and right hand triggers simultaneously. The moil will engage with the clip and drive it out. Once the clip is free, release the right hand trigger to retract the moil. Once the moil is retracted release the left hand trigger to return the machine to neutral, ready to move on to the next clip.



18. To move to the next clip, either change rail sides as per section 0 or activate the brake lift switch and push the machine to the next sleeper.



9.4.7. Stopping the Engine[1]

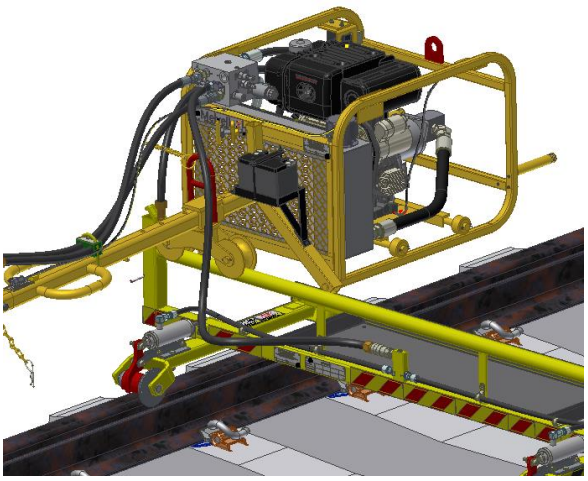
1. Place tooling and power pack to “NEUTRAL” position
2. Set the engine speed to idle (min) using accelerator
3. Turn the ignition key to OFF
4. Turn the battery isolator to off if machine is to stationary for a period of time.

[1] Refer to engine manual for detailed engine instructions and requirements

9.5. Disassembly Procedures

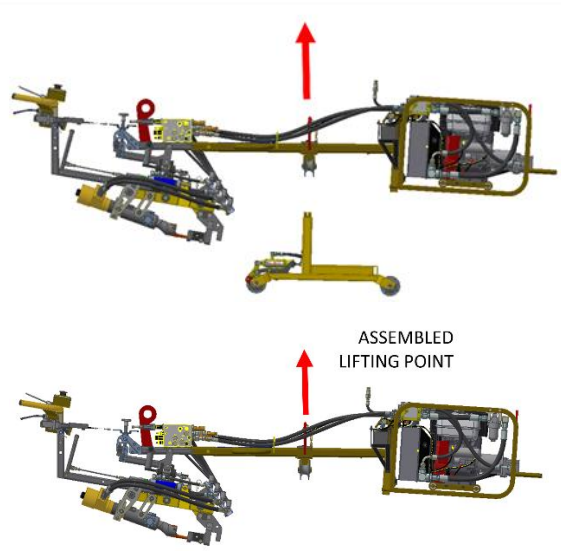
9.5.1. Removal Machine from Track

1. Observe all safety precautions
2. Ensure engine is off and no hydraulic flow is operating to brake cylinders
3. Disconnect the brake hose from the trolley cylinder



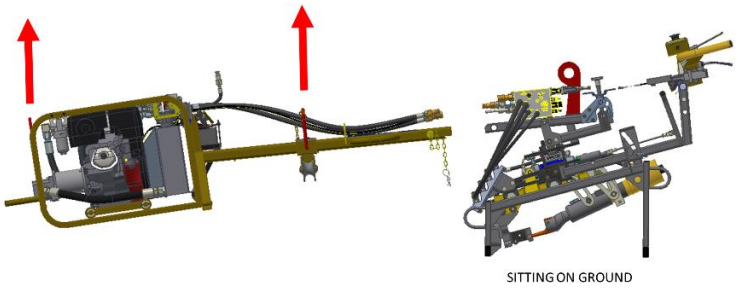
4. Disconnect the chain from the retaining profile to release the machine from the trolley

5. Lift and remove the workhead (and Trackpack) from the trolley using a certified lifting device (>250kg)
6. Whilst still coupled together, fit work head to stowage frame as per details below. The unit can now be safely loaded onto a truck/trailer for transport.



*Expected time for removal of trolley with workhead assembled is approximately five (5) minutes (using certified lifting devices). These times may increase or decrease depending on location, conditions, etc.

7. If required the unit can also be further separated as shown.



SITTING ON GROUND

9.5.2. Lifting the Machinery

1. DO NOT manually lift machinery
2. Observe all safety precautions
3. Ensure all pre-operation checks have been conducted
4. Attach slings or hooks into lifting points on the machinery – see below
5. Using a certified lifting device to >250kg, lift the machinery to required position as per machine assembly and disassembly.

10. Storage & Transport

10.1. Storage of E-Clip Machine

MEC equipment should be stored in a secure, safe, dry location to ensure the equipment is not damaged and maintained in good working order. If possible, machines may be placed onto racks or placed on the ground for storage. Storing the machines in the storage/transport frames will also help to keep the equipment free from damage and allow it to sit level.

Storage of the E-clip machine can either be done connected to a Trackpack or with the work head separate. In either case it is best to store the work head in its stowage frame. See below images for stowage frame operation.

10.2. Fitting Work Head to Stowage Frame

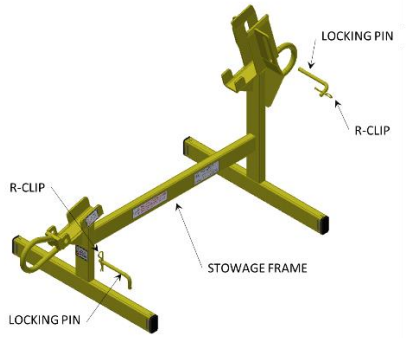
1. Ensure all locking pins are removed from the stowage frame and position on flat ground.

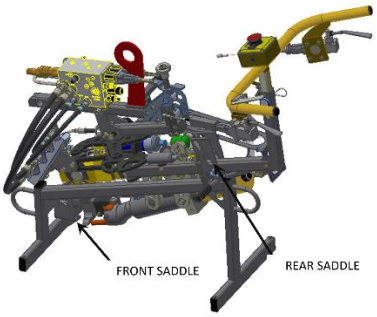
2. Ensure the unit is set up so the swivelling work head is on the right hand side like shown. Lock the cant swivel out by inserting the pin as per section 9.4.5. Lift the work head, or assembled work head and Trackpack until the lowest point of the work head is approximately 700mm off the ground. Note the unit should lift close to horizontal to the ground for ease of assembly.

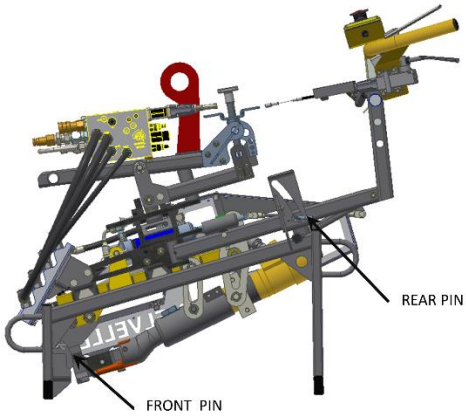
3. Slowly lower the unit down and guide the rear RHS section on the unit into the saddle. As the saddles engage continue to lower until the front saddle engages and the backstop rests against the small lower support.

4. With the unit sitting in the stand insert the front and rear locking pins and retain the pins with the supplied R-clips.

5. With the stowage frame attached to the work head the unit can be transported to its storage location.







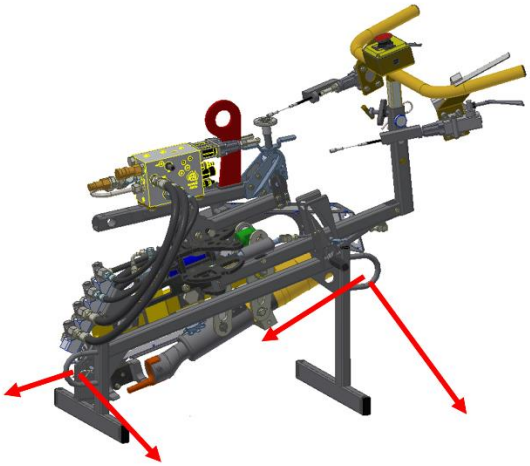
10.3. Transport of E-Clip Machine – Work Head Only

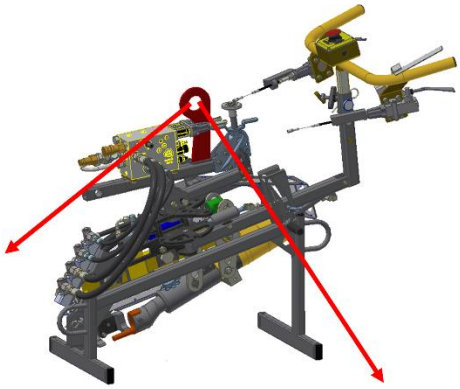
The best and safest way to transport the work head is in the supplied stowage frame. The stowage frame has tie down points and ensures no parts of the work head such as guards are damaged from incorrect lashing or unexpected movements during transport.

1. Ensure the work head is fitted and secured to the stowage frame as per section 10.2.

2. There are 2 ways to hold the unit. The first and recommended way is to lash the stowage frame down. With the work head in the correct position lash the frame down using the front and rear lashing ring. This method is used when the lashing points are at ground level.

3. The second method is used when the lashing points are too high to use the lashing rings such as in a box trailer. Lash across the trackpack connection between the lifting point and the manifold.





11. Equipment Protection & Care

NOTICE

In addition to the Safety Precautions found in this manual and the supporting tool and engine manuals, observe the following for equipment protection and care

- Make sure all couplers/connectors are wiped clean before connection
- The hydraulic circuit control valve in “NEUTRAL” position when coupling or uncoupling hydraulic tools. Failure to do so may result in damage to the couplers and cause overheating of the hydraulic system
- Always store hoses coupled together in a ‘loop’ to stop hydraulic lock due to the hoses and hydraulic oil heating
- Always store the “Broken E-Clip” Remover in a clean dry space, safe from damage or pilferage
- Make sure the power pack hydraulic circuit PRESSURE hose (male quick disconnect) is connected the PRESSURE hose for the tool (female quick disconnect) and vice versa for the RETURN hoses. Do not reverse circuit flow. This can cause damage to the internal seals of the equipment
- Always replace hoses, couplings and other components with replacement parts recommended by MEC. Hydraulic hoses must have a minimum working pressure of 2800psi
- Always keep critical tool markings such as warning stickers and tags legible
- Power pack and tooling repairs and/or service work must only be performed by MEC or certified and authorised dealer
- Do not use the power pack and/or tooling for applications for which it is not intended
- Ensure all bolts are tight and all covers/guards are fitted

12. Maintenance

WARNING

Before any maintenance of the machine or trolley is performed, ensure the work head and engine are off and in a neutral position. Ensure all potential energy is released from the system (springs, cylinders, etc). Ensure maintenance is performed by a competent and authorised person.

Tools Required to Complete Maintenance

Below are initial tools required to complete general maintenance tasks. Additional tools may be required.

• Allen Keys (various)	
• Hammer	
• Pin Punch (1/8” or 4mm)	
• Ruler and/or Vernier’s	
• Shifter or	
• Spanners (various)	
• Stilsons (>65mm opening)	

12.1. Maintenance Period[1]

REGULAR SERVICE PERIOD* Perform at every indicated month or operating hour interval, whichever comes first.		Each use	Every 1 month or 10hrs	Every 3 months or 50hrs	Every 6 months or 250hrs	Every year or 500hrs
ITEM						
Engine oil	Check level	X				
	Change			X (1)	X	
Engine oil filter	Change			X (1)		X
Fuel Level	Check/Fill	X				
Fuel Lines	Check		X			
	Replace					X
Fuel Filter	Check/Clean			X		
	Change					X
Air Filter	Check			X		
	Replace				X	
Engine cooling fins	Clean					X
Rocker arms clearance	Check & set					X (2)
Injectors	Clean & set					X (2)
Spark Plug	Check				X	
	Replace					X
Hydraulic oil Filter	Change			X (1)	X	
Hydraulic oil	Check	X				
	Change				X	
Hydraulic hoses	Check	X				
	Check/Change					X (3)
Hydraulic pump	Check			X (1) (4)		X (4)
Battery	Check	X				
Grease Nipples	Fill			X		
Backstops	Check	X				
Brake Lift Switch	Check	X				
Emergency Stop	Check	X				
Guards	Check	X				
Hammer	Check		X			
Hammer Nose Cone	Check		X			
Hammer Moil Retainer	Check		X			
Hammer Accumulator Pressure	Check		X			
Moils	Check	X				
Nuts, Bolts, Screws, Fittings	Check					X

*If heavy machine use, the service period may be less.

(1) First 50 hrs of use
(2) Only to be performed by MEC or certified and authorised dealer.
(3) A thorough inspection is required. If hoses undamaged, may leave in service. However, replace hoses every 3 years of operation.
(4) Flow and Pressure Check

[1] Refer to engine manual for detailed engine instructions and requirements

13. Troubleshooting[1]

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine won't start	Refer to engine manual for details	
	Battery charge low	Charge battery
	Battery connections loose/not attached	Check battery connections
	Emergency Stop not connected	Check Emergency stop connection
	No engine oil	Check engine oil
	No fuel	Check fuel quantity
	Fuel filter blocked	Check fuel filter
	Fuel solenoid is off	Check fuel solenoid position
No hydraulic oil flow/little flow	No hydraulic oil	Check hydraulic oil level
	Pressure and Tank (return) hoses interchanged	Check connection.
	Operation lever in neutral	Check operation lever position
	Couplers or hoses blocked	Remove restriction
	Filter Blocked or Old	Replace filter
	Hoses leaking	Check hoses
	Contamination in relief valve	Clean relief valve
	Pump damaged	Check pump
Hydraulic oil overheating	Air obstruction	Remove obstruction to ensure sufficient air flow around heat exchanger
	Incorrect oil for operating temperature	Replace oil with correct grade for operating conditions
	Dirty/old oil	Replace oil
	Tool valve closed	Change tool or valve to 'open centre'
Unable to connect hoses	Oil temperature and pressure increase in hoses	Allow hoses to cool
	Operation lever in operation position	Place lever in neutral
Emergency Stop does not work	Emergency Stop not connected to the machine	Connect Emergency Stop to the power pack
	Wiring and/or connections damaged	Inspect wiring and replace damaged parts
	Switch Damaged	Check/Replace switch
Hammer doesn't work. Pressure is not built up when trigger is activated	No or incorrect flow/pressure	Check flow/pressure by means of test equipment
	Seals defect in spool channel of valve housing	Dismount, check and replace seals

[1] Refer to engine manual for detailed engine instructions and requirements

Hammer doesn't work. Pressure is built up when trigger is activated	Back pressure too high	Make direct tank connection. (Max back pressure of 150psi) Alert MEC
	Quick-release coupling in return line defective	Locate and replace defective coupling
	Striking piston sticks, possibly due to thickening of cylinder	Check oil viscosity. Thin oil increases the risk of thickening
		Chamfer/polish the edge slightly at the cylinder dashpot (where the cylinder bore changes). Refer to hammer manual
	Spool/reversing spool or auxiliary spool sticking easily	Dismount and check that all parts move. Polish slightly if necessary. Refer to hammer manual
	Seals defective	Dismount, check and replace
Hammer runs weakly or irregularly	Insufficient flow	Check flow/pressure
	Seals defective	Replace seals
	Wear, internal leakage	Dismantle, check and replace defective or worn parts
		Check impurity or oil and oil viscosity at working temperature
		Thin oil = increased internal leakage
	Insufficient accumulator charge	Recharge accumulator
	Diaphragm defective	Replace diaphragm
Hoses pulsate	Accumulator defective	Replace accumulator diaphragm and charge with nitrogen
Oil leaking from hammer	Seals defective	Replace seals
Moil not restrained	Locking screws not tight/assembled correctly	Assemble/tighten Screws with tab washer
	Locking Screws damaged	Replace screws
Moil binding and not free to slide or rotate	Screws damaged	Inspect/ replace screws
Moil cannot align with clips	Incorrect backstop selected	Select correct backstop as per section 9.3.6
	Rail height incorrectly set	Align machine horizontal with the rail as per section 9.3.5

14. Further Documents

Please refer to the further documents within for drawing, risk assessment and other related information.

Further documents for the 186-EYE “Broken E-Clip” Remover:

Document No.	Description	Type
186-EYE-OPRA	Operational Risk Assessment	Document
108-215	Trolley to Power Pack Attachment	Drawing
143-48	Trackpack Boom Adjustment	Drawing
186-290	“Broken E-Clip” Remover Head Assembly	Drawing
186-291	“Broken E-Clip” Remover Trackpack Head (FP-186-EYE)	Drawing
186-299	Hydraulic Circuit Diagram	Drawing
ELEC-04	Electrical Circuit Diagram	Drawing

14.1. Operational Risk Assessment

	Machine: FP-186-EYE "Broken E-Clip" Remover								Form No.: -	
	ABN								Issue Date	26/02/2016
	WORKPLACE GENERIC HIRARC FORM								Version:	0

Company	**MELVELLE EQUIPMENT CORP**	**Department / Workplace:**	**Melvelle Offices**	**Date of Assessment 26/02/2016**	**Commenced:**	9am	**Completed:**	12md

Scope of Assessment: Identify the risks and hazards associated with the operation of a rail maintenance machine to remove rusted pandrol e-clips from in situ tracks.

Names of Risk Assessment Team: Gary Morris, Ben Derooy	**Names of additional personnel consulted during Risk Assessment:**	**Identified limitations of risk assessment: Only applies to risks identified as part of the operation of the machine.**
		Information Sources / References: AS4024.1-2006 Safety of Machinery, AS4024-2601-Two Handed Control Device

RISK ASSESSMENT MATRIX

Potential Consequences			Likelihood				
			Almost Certain	**Likely**	**Possible**	**Unlikely**	**Rare**
Keyword	**Description Safety Health & Hygiene**	**Description Environmental**	*Expected to occur*	*Will occur occasionally*	*May Occur*	*Not expected to occur*	*Requires unusual chain of events*
Minor	First Aid Injury	On-site release immediately contained with business unit resources	**Medium 8**	**Medium 7**	**Low 3**	**Low 2**	**Low 1**
Significant	Medical Treated Injury or illness	On-site release or offsite release immediately contained with smelter resources	**High 14**	**Medium 10**	**Medium 9**	**Low 5**	**Low 4**
Serious	Lost Time Injury or illness	Off-site release causing nuisance or community complaint. Breach of license condition	**High 16**	**High 15**	**Medium 12**	**Medium 11**	**Low 6**
Severe	Fatality or Permanently disabling injury of illness	Off-site release with detrimental impact to environment or community. Repeated breach of license conditions	**Extreme 24**	**Extreme 22**	**High 20**	**High 18**	**Medium 13**
Disastrous	Multiple Fatalities or work-related fatal diseases	Toxic release off-site with detrimental impact to environment or community	**Extreme 25**	**Extreme 23**	**Extreme 21**	**High 19**	**High 17**

LEGEND	**ACTION REQUIRED**	**NOTIFY**
LOW 1-6	Tolerable - Manage by Routine Procedures	
MEDIUM 7-13	Risk reduction required to "As low as Reasonably Practicable" ALARP	Design Team/Engineer
HIGH 14-20	Immediate action required to reduce risk. Authorisation required before proceeding on task	CEO
EXTREME 21-25	Intolerable. Cease activity until controls in place to reduce risk. Immediate & urgent Senior Management Team action required	CEO

MANAGEMENT ACTIONS

Comments	Refer to Action Plan
Risk Assessment Referred to:	Design Team
Risk Assessment Accepted by:	Andrew Melvelle
Risk Assessment findings recorded in the Project Design Folder	Design Team
Risk Assessment Findings communicated to:	Design Team, Melvelle Equipment Corp.

		Raw Risk Rating (no controls)				Residual Risk Rating (after controls)					
Ref no	Description / hazard / risk	Consequence (no controls)	Likelihood	Risk Level & Score	Controls	Consequence	Likelihood	Risk Level & Score	Is Risk Tolerable Y/N	Additional Controls Req	Action By / Name & date required
	Manual lifting of machine or segments of machine is dangerous to the operators back, and other areas	Serious	Likely	15	Use of lifting points for machines(crane) to lift the machine. No person to lift any machine at all . Lifting information supplied in manual	Serious	Rare	6	Y		
	Weight at handles through incorrect trackpack setup causing strain on operator (trackpack only)	Significant	Likely	10	Correctly adjust trackpack pin location. Details shown in manual	Significant	Rare	4	Y		
	Machine handles too low/high causing injury	Significant	Possible	9	Handles adjusted to the correct height. Procedure shown in manual	Significant	Rare	4	Y		
	Fluid levels too high causing overflow and low causing machine damage	Minor	Likely	7	Pre-start checklist requiring operator to check fluid levels before operating machine	Minor	Rare	1	Y		
	Exposure to hazardous materials such as fuel and oils	Minor	Likely	7	Hazardous material documentation in MSDS.	Minor	Rare	1	Y	MSDS	
	Fueling the fuel tank can lead to explosions, fires, and dangerous fumes being inhaled	Serious	Possible	12	Engine must only be re-filled when the power pack is stopped and in well ventilated area.	Serious	Rare	6	Y		
	Hand Injury can occur through connection of quick snap connections	Minor	Possible	3	Must be connected parellel to each other.	Minor	Rare	1	Y		
	Setting of height and backstops can lead to injury	Significant	Likely	10	Ensure machine is turned off and deadman employed. Use of manuals and procedures	Significant	Rare	4	Y	Procedure/manual	
	Injury through oil injection through hydraulic failure	Serious	Possible	12	Hose Protection installed. Maintenance/Inspection frequencies provided in manual	Serious	Rare	6	Y		
	Loud noise from engine and machine causing permanent hearing damage	Serious	Likely	15	Warning stickers instructing operator to wear hearing protection Operating instructions in Manual Instruct operator to wear hearing protection	Serious	Unlikely	11	Y		

14.2. Trolley to Power Pack Attachment

LOWERING POWERPACK AND WORK HEAD ONTO TROLLEY

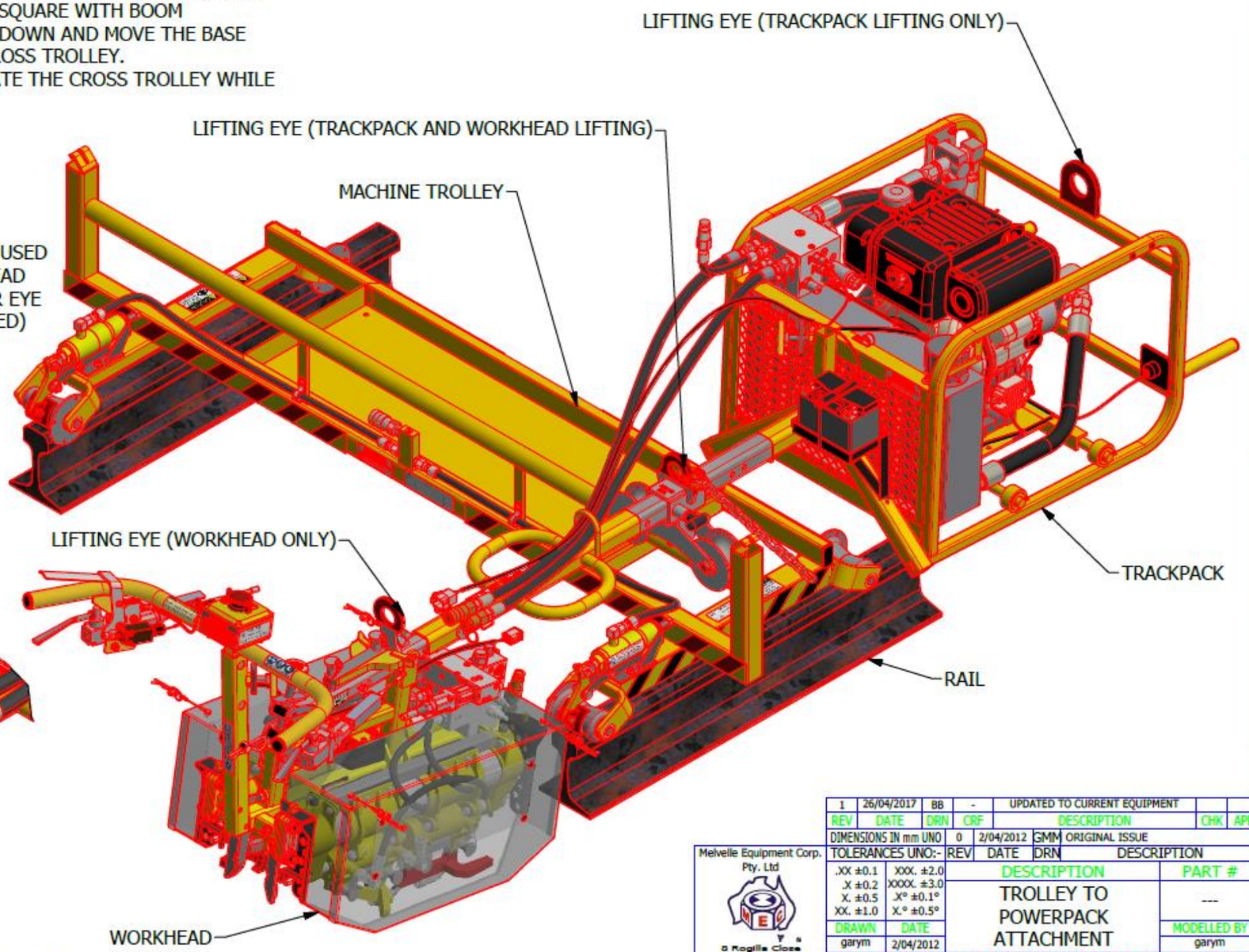
1. PLACE TROLLEY ONTO RAIL
2. LIFT POWERPACK AND WORKHEAD BY LIFTING EYE AS SHOWN
3. ROTATE CROSS TROLLEY UNTIL SQUARE WITH BOOM
4. SLOWLY LOWER THE ASSEMBLY DOWN AND MOVE THE BASE TROLLEY TO LINE UP WITH THE CROSS TROLLEY.

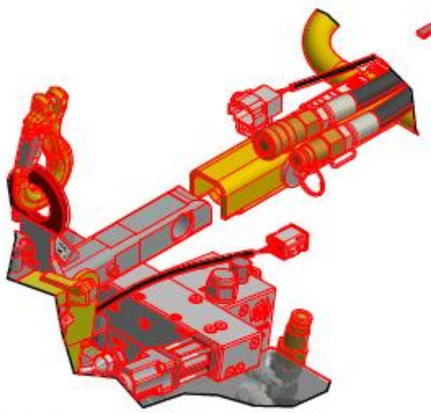
NOTE: DO NOT ATTEMPT TO ROTATE THE CROSS TROLLEY WHILE MACHINE IS BEING LOWERED.

NOTE

*SAME LIFTING PROCEDURE USED REGARDLESS OF WORKHEAD BEING USED

* WHEN LIFTING COMBINE WORKHEAD AND TRACKPACK LIFT FROM CENTER EYE ONLY (ENSURE BOOM PIN IS SECURED)





TRACKPACK TO WORK HEAD CONNECTION

REV	DATE	DRN	CHK	DESCRIPTION	APP
1	26/04/2017	BB	-	UPDATED TO CURRENT EQUIPMENT	
0	2/04/2012	GMM	ORIGINAL ISSUE		

DIMENSIONS IN mm UNO
TOLERANCES UNO:-
.XX ±0.1 XXX. ±2.0
.X ±0.2 XXXX. ±3.0
X. ±0.5 .X° ±0.1°
XX. ±1.0 X.° ±0.5°

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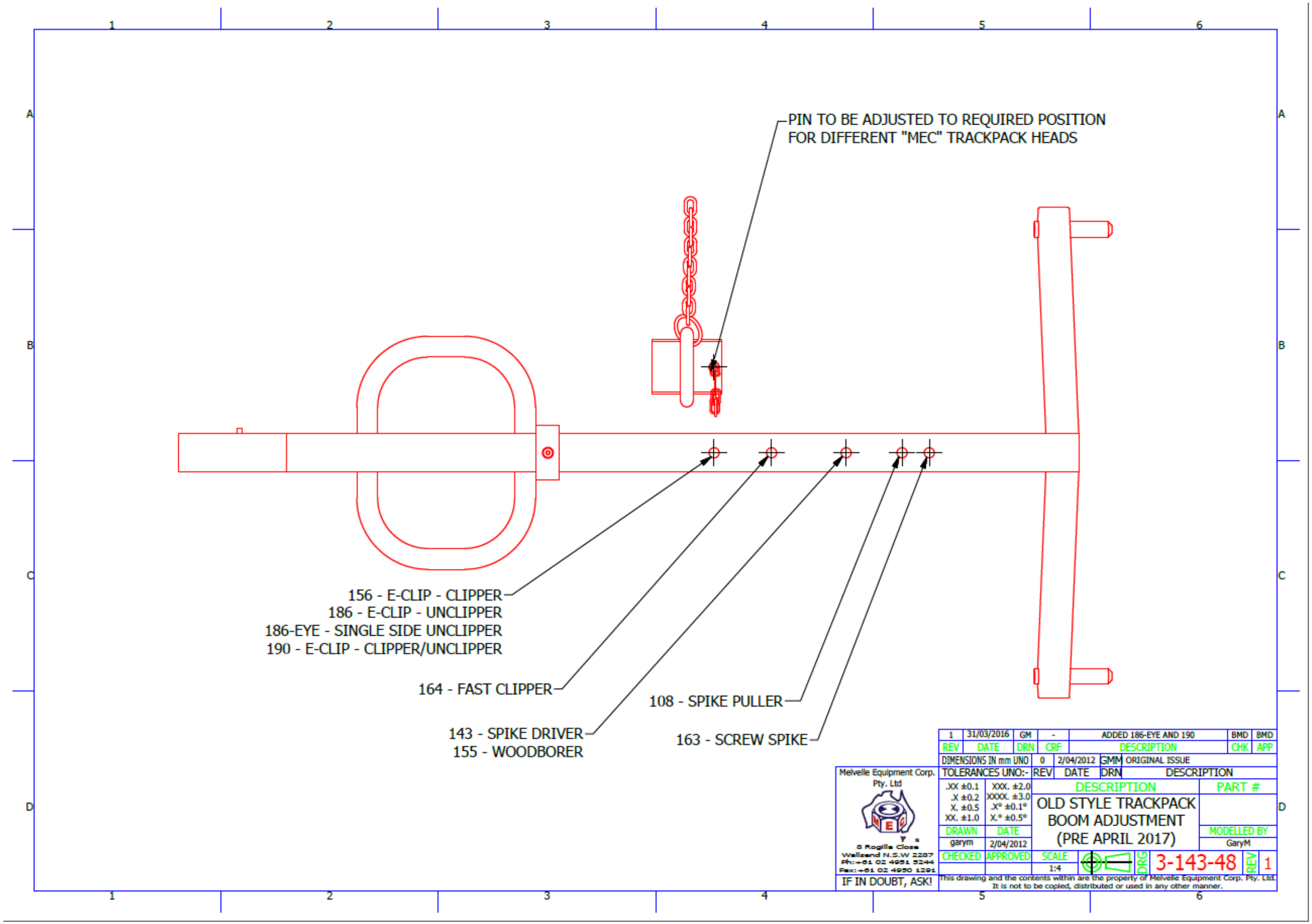
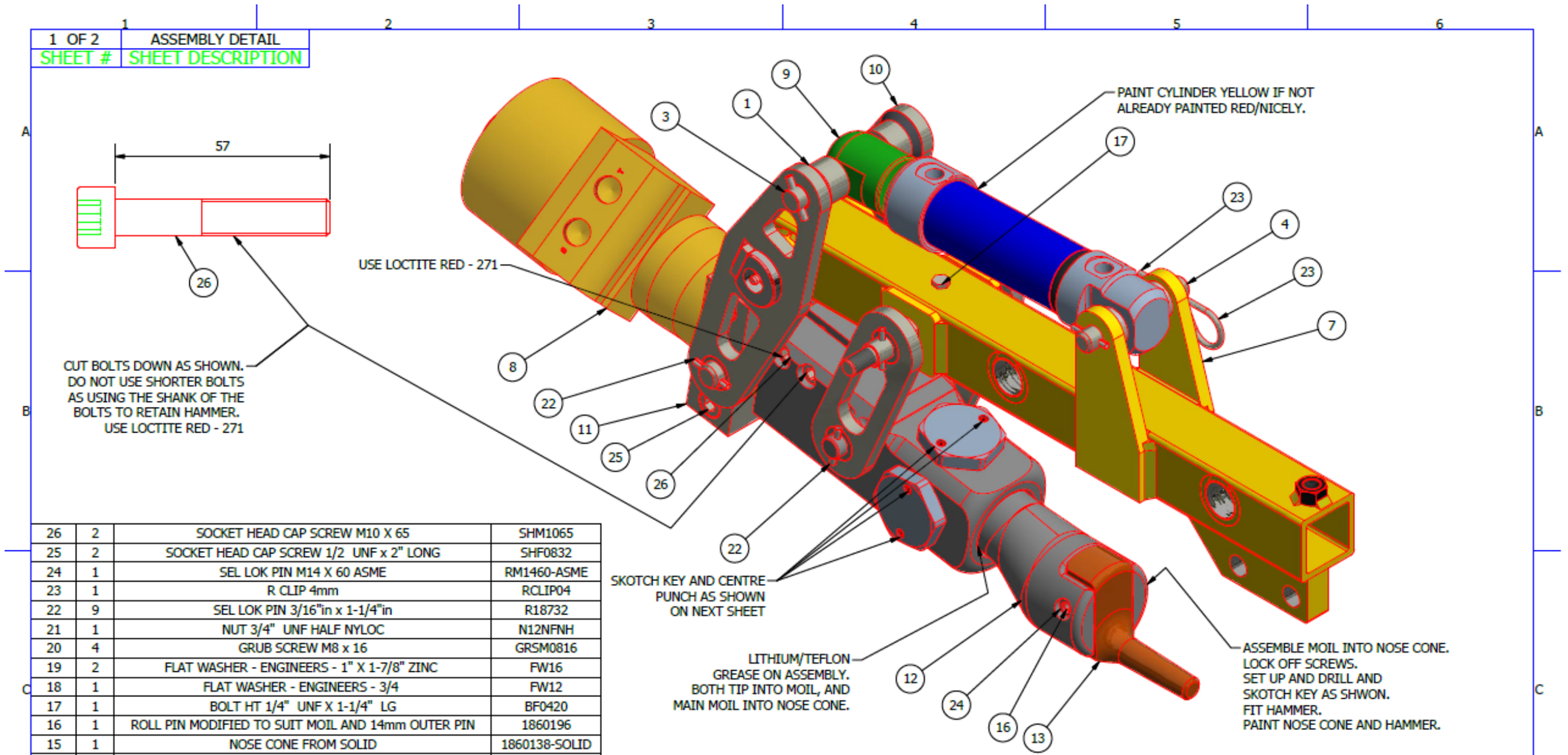
IF IN DOUBT, ASK!

DESCRIPTION	PART #
TROLLEY TO POWERPACK ATTACHMENT	---
DRAWN: garym, DATE: 2/04/2012	MODELLED BY: garym
CHECKED	APPROVED
SCALE: 1:8	DRG: 3-108-215 REV: 1

14.3. Trackpack Boom Adjustment



14.4. “Broken E-Clip” Remover Head Assembly



ITEM	QTY	DESCRIPTION	PART NUMBER
26	2	SOCKET HEAD CAP SCREW M10 X 65	SHM1065
25	2	SOCKET HEAD CAP SCREW 1/2 UNF x 2" LONG	SHF0832
24	1	SEL LOK PIN M14 X 60 ASME	RM1460-ASME
23	1	R CLIP 4mm	RCLIP04
22	9	SEL LOK PIN 3/16"in x 1-1/4"in	R18732
21	1	NUT 3/4" UNF HALF NYLOC	N12NFNH
20	4	GRUB SCREW M8 x 16	GRSM0816
19	2	FLAT WASHER - ENGINEERS - 1" X 1-7/8" ZINC	FW16
18	1	FLAT WASHER - ENGINEERS - 3/4	FW12
17	1	BOLT HT 1/4" UNF X 1-1/4" LG	BF0420
16	1	ROLL PIN MODIFIED TO SUIT MOIL AND 14mm OUTER PIN	1860196
15	1	NOSE CONE FROM SOLID	1860138-SOLID
14	2	LOCKING SCREW FOR NOSE CONE EYE MACHINE KEYED	1860137-SKOTCH
13	1	MOIL, END INSERT	1860133
12	1	HAMMER MOIL MAIN SECTION	1860131
11	1	REAR CLAMP BLOCK PAIR	1860100
10	1	INSIDE DRIVE ARM FABRICATION	1860075
9	1	PTE HYDRAULIC CYLINDER	1860067
8	1	MODIFIED HAMMER BODY AND TRIGGER	1860066
7	1	RIGHT HAND FRAME FABRICATION	1860061
6	1	PIN SWING ARM	1860019
5	1	PIN DRIVE ARM	1860016
4	1	PIN CYLINDER LUG	1860015
3	1	PIN CYLINDER CLEVIS	1860014
2	2	SWING ARM FABRICATION	1860013
1	1	OUTSIDE DRIVE ARM FABRICATION	1860012

PARTS LIST

REV	DATE	DRN	CRF	DESCRIPTION	CHK	APP
2	23/11/2020	-	-	CLARIFIED ROLL PIN DATA	-	-
1	17/08/2018	-	-	CHANGED TO MACHINED NOSE CONE, WITH SKOTCH KEY LOCKING.	-	-
0	3/03/2017	-	-	ORIGINAL ISSUE	-	-

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IF IN DOUBT, ASK!

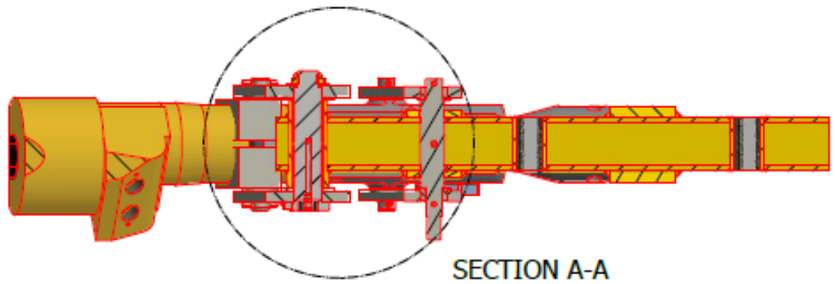
TOLERANCES UNO:-
.XX ±0.1 XXX. ±2.0
.X ±0.2 XXXX. ±3.0
X. ±0.5 .X° ±0.1°
XX. ±1.0 X.° ±0.5°

DIMENSIONS IN mm UNO

DESCRIPTION	PART #
HEAD ASSEMBLY	1860173
	MODELLED BY: Andrewt

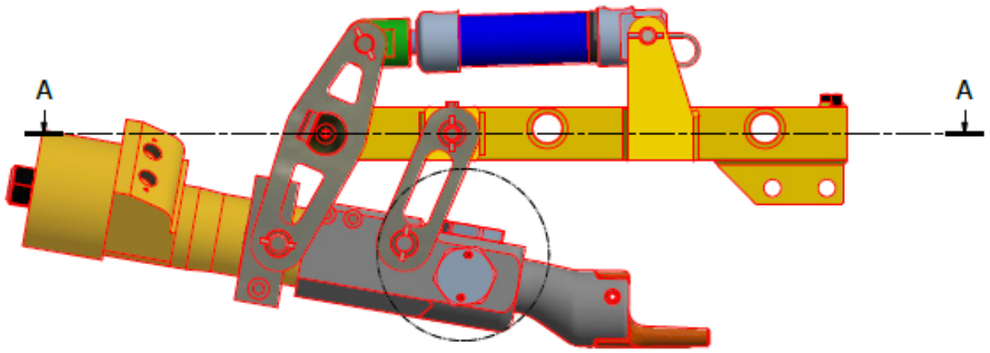
DRAWN	DATE	SCALE	DRG	REV
garym	3/03/2017	1:2	3-186-290	2
CHECKED: BMD	APPROVED: BMD			

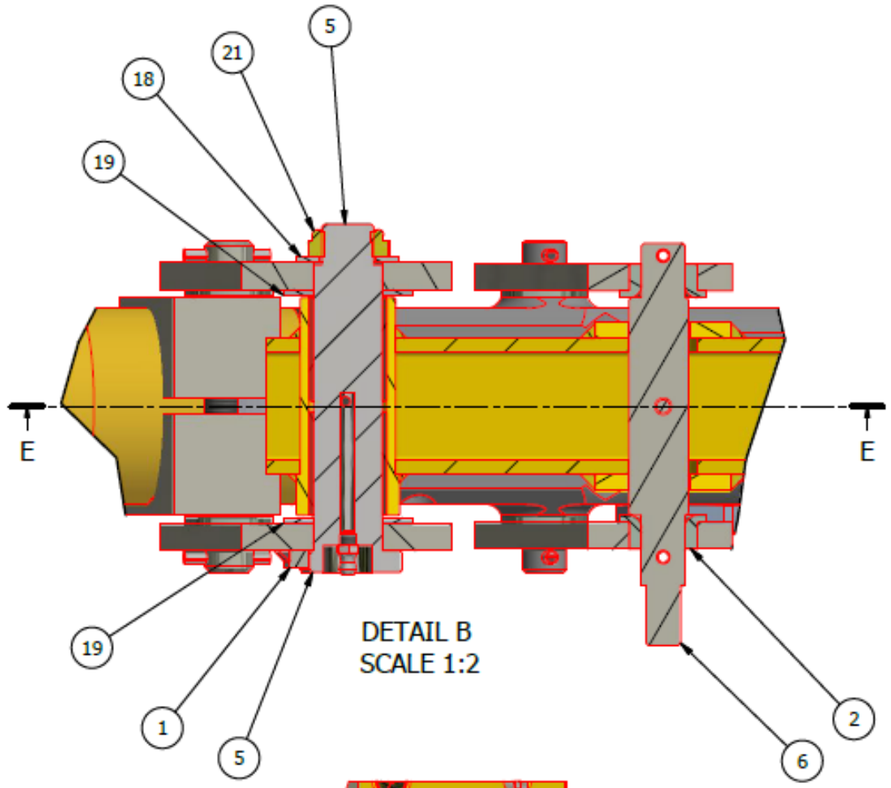
2 OF 2	SECTION VIEWS
SHEET #	SHEET DESCRIPTION



B

SECTION A-A
SCALE 1:5

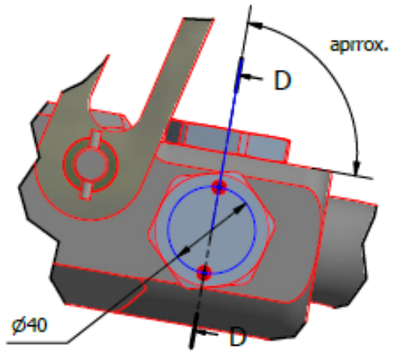




DETAIL B
SCALE 1:2

SECTION E-E
SCALE 1:5

FIRMLY LOCK GRUB SCREW BELOW SURFACE OF LOCKING SCREW.
CENTRE PUNCH LOCKING SCREW IN 2 PLACES TO LOCK GRUB SCREW IN PLACE.

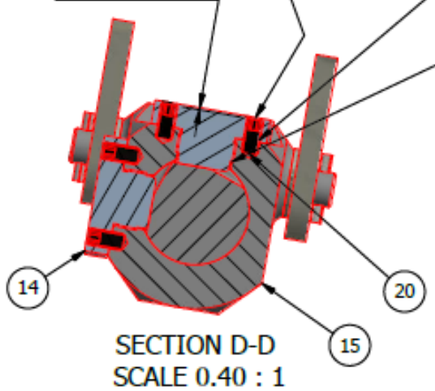


DETAIL C
SCALE 0.40 : 1

APPROX. 1mm BELOW SURFACE.

DRILL 17 DEEP
TAP 17 DEEP
M8x1.25 - 4 OFF.

LOCTITE RED 263 - HIGH STRENGTH SCREWS ON ASSEMBLY.
TIGHTEN AS FOLLOWS.
ALLOW FACES TO CONTACT THEN TIGHTEN A FURTHER 1/12 OF A TURN.
BOLTS MUST BE FIRMLY TIGHT.



SECTION D-D
SCALE 0.40 : 1

REV	DATE	DRN	CRF	DESCRIPTION	CHK	APP
2	23/11/2020	-	-	CLARIFIED ROLL PIN DATA	-	-
1	17/08/2018	-	-	CHANGED TO MACHINED NOSE CONE, WITH SKOTCH KEY LOCKING.	-	-
0	3/03/2017	-	-	ORIGINAL ISSUE	-	-

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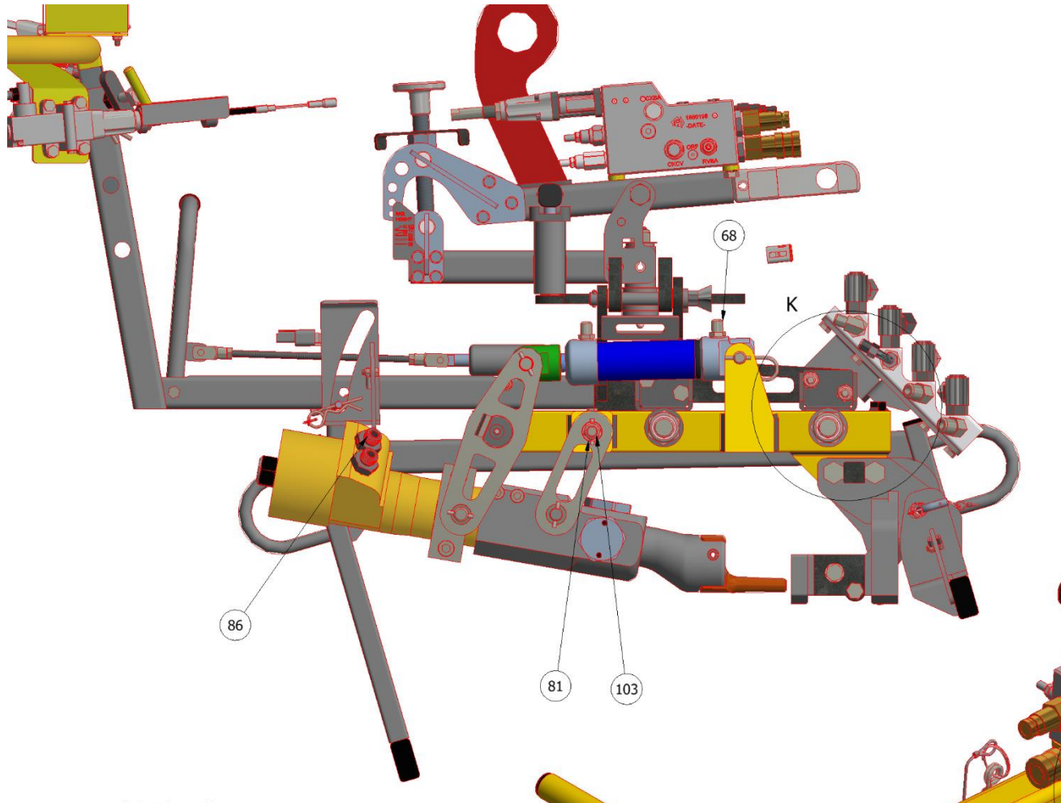
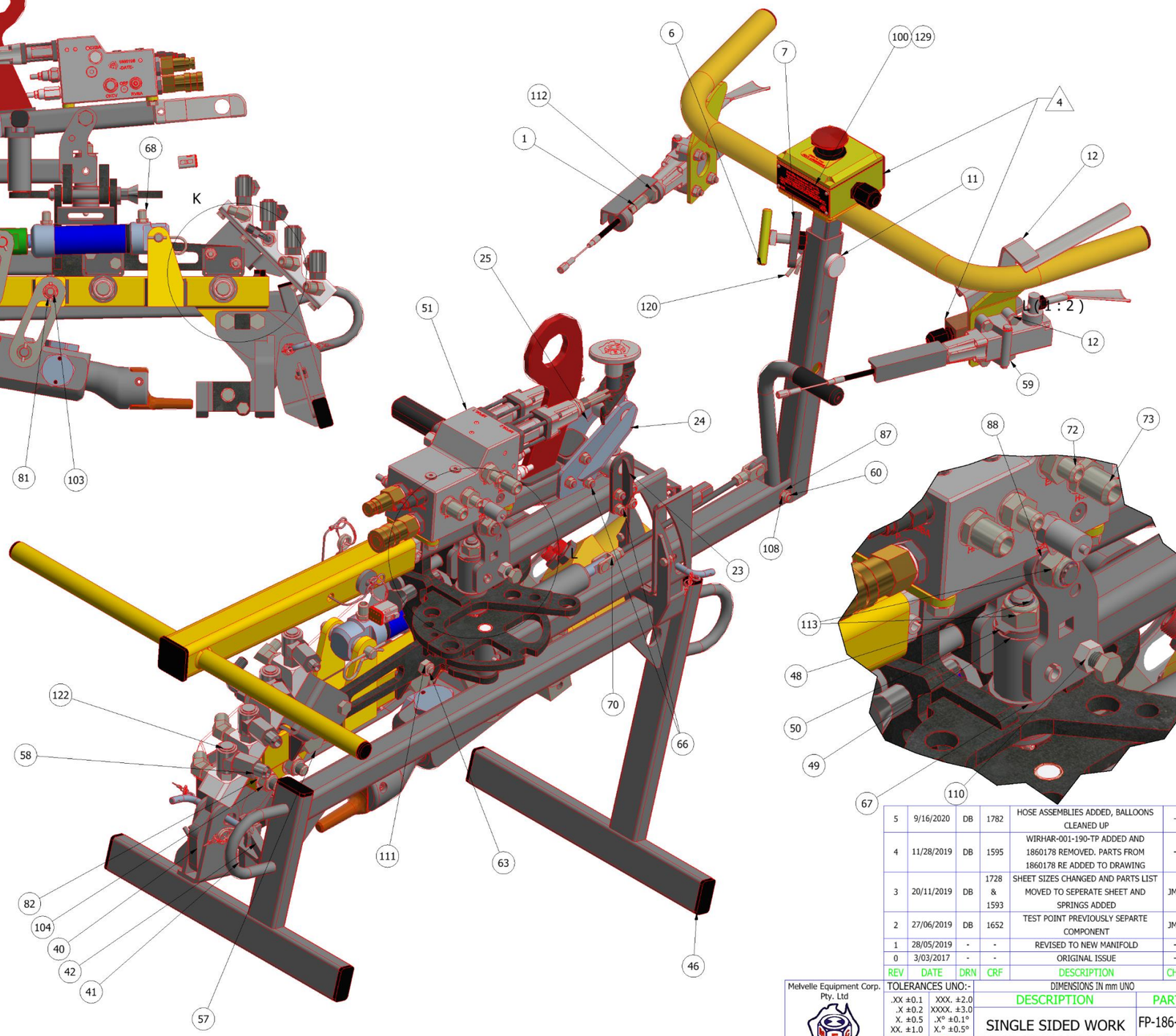
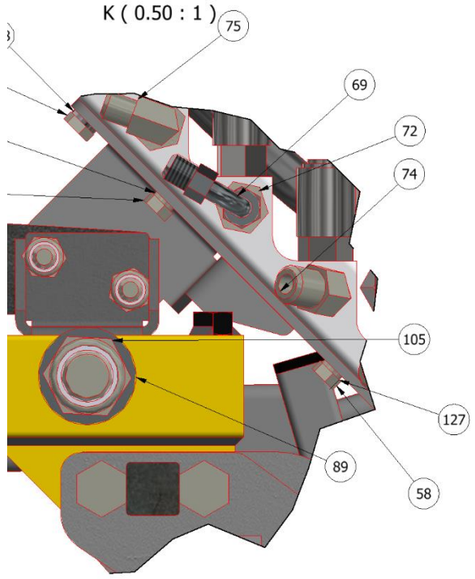
TOLERANCES UNO:-		DIMENSIONS IN mm UNO	
.XX ±0.1	XXX. ±2.0	DESCRIPTION	PART #
.X ±0.2	XXXX. ±3.0	HEAD ASSEMBLY	1860173
X. ±0.5	.X° ±0.1°		MODELLED BY
XX. ±1.0	X.° ±0.5°		Andrewt
DRAWN	DATE		
garym	3/03/2017		
CHECKED	APPROVED	SCALE	DRG 3-186-290 REV 2
BMD	BMD	VAR	

14.5. “Broken E-Clip” Remover Trackpack Head (FP-186-EYE)







REV	DATE	DRN	CRF	DESCRIPTION	CHK	APP
5	9/16/2020	DB	1782	HOSE ASSEMBLIES ADDED, BALLOONS CLEANED UP	-	-
4	11/28/2019	DB	1595	WIRHAR-001-190-TP ADDED AND 1860178 REMOVED. PARTS FROM 1860178 RE ADDED TO DRAWING	-	-
3	20/11/2019	DB	1728 & 1593	SHEET SIZES CHANGED AND PARTS LIST MOVED TO SEPERATE SHEET AND SPRINGS ADDED	JMC	JMC
2	27/06/2019	DB	1652	TEST POINT PREVIOUSLY SEPARTE COMPONENT	JMC	JMC
1	28/05/2019	-	-	REVISED TO NEW MANIFOLD	-	-
0	3/03/2017	-	-	ORIGINAL ISSUE	-	-

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IF IN DOUBT, ASK!

TOLERANCES UNO:-		DIMENSIONS IN mm UNO	
.XX ±0.1	XXX. ±2.0	DESCRIPTION	PART #
.X ±0.2	XXXX. ±3.0	SINGLE SIDED WORK HEAD NEW MANIFOLD	FP-186-EYE-C
X. ±0.5	.X° ±0.1°		
XX. ±1.0	X.° ±0.5°		
DRAWN	DATE		MODELLED BY
dominicb	11/20/2019		bend
CHECKED	APPROVED	SCALE	DRG 2-186-292 REV 5
		1 : 4	

2 OF 5	PARTS LIST
SHEET #	SHEET DESCRIPTION

ITEM	DESCRIPTION	PART NUMBER	ITEM QTY
65	BOLT M12 X 35 ZINC GR8.8	BM12035-88Z	2
64	BOLT METRIC M16 x 75LG GR8.8 ZINC	BM1675	1
63	BOLT M12 x 30	BM1230	4
62	BOLT M10 x 25 HEX HEAD HT	BM1025	3
61	BOLT M10 x 20 HEX HEAD HT	BM1020	2
60	BOLT M8 x 50LG ZINC	BM0850Z	2
59	BOLT METRIC M8 X 35 ZINC GR8.8	BM0835-88Z	7
58	BOLT METRIC M8 X 20 LG ZINC GR8.8	BM0820Z88	4
57	BOLT - BRIGHT 1" UNF X 3" LG	BF1648	2
56	BOLT HT 5/8"UNF x 2.5"	BF1040	2
55	1/2in UNF x 3/4"in	BF0812	1
54	CABLE MOUNT PLATE WITH TAPPED HOLES	1900020	2
53	CABLE MOUNT PLATE WITH HOLES	1900019	2
52	LOCKING NUT WITH TABS	1860206	1
51	HYDRAULIC MANIFOLD 186-EYE	1860198	1
50	PIN TAB WASHER	1860177	1
49	PIN RETAINING WASHER	1860176	1
48	MAIN HEAD ROTATION PIVOT PIN	1860175	1
47	HEAD ASSEMBLY	1860173	1
46	STAND FABRICATION	1860172	1
45	GUARD PLASTIC VIEW PORT PANEL	1860171	1
44	END GUARD HALF	1860170	1
43	GUARD FRONT SECTION	1860169	1
42	ECLIP BACKSTOP FABRICATION	1860167	1
41	PR CLIP BACKSTOP	1860166	1
40	UNIVERSAL UNDERCLIP BACKSTOP	1860165	1
39	HANDLE RELASE ROD	1860164	1
38	HANDLE PIVOT PIN	1860163	1
37	RAIL HEIGHT INDICATOR TAG	1860162	1
36	HANDLE PIVOT RELEASE LEVER	1860161	1
35	HEAD TO HEAD FRAME BRACKET	1860160	2
34	MOUNT FOR SWIVEL BLOCK FABRICATION	1860159	1
33	HANDLE LOCKING PIN	1860158	1
32	HEAD SWING PIN	1860157	1
31	PIVOT LOCKING PIN	1860156	1
30	LOCKING PIN RHS HANDLE	1860155	1
29	LOCKING NUT WITH TABS	1860154	1
28	RAIL HEIGHT ADJUSTER PIN	1860153	1
27	TOP TRUNNION	1860152	1
26	BOTTOM TRUNNION ASSEMBLY	1860151	1
25	LONG THREADED TRUNION RETAINING PLATE	1860150	1
24	SHORT THREADED TRUNION RETAINING PLATE	1860149	1
23	LOWER TRUNION RETAINER SIDE	1860148	2
22	TRACKPACK CONNECTION	1860147	1
21	BOLT IN HANDLE LOCK	1860146	1
20	SWING FRAME FABRICATION	1860145	1
19	PIVOT PLATE 186-EYE	1860144	1
18	PIVOT UPPER FRAME WITH LOCK MOUNT	1860143	1
17	HANDLE BASE FABRICATION	1860142	1
16	TRIGGER CABLE FOR 186-EYE	1860141	2
15	186 EYE - HOSE SWIVEL BLOCK	1860140	1
14	CARRYING HANDLE FOR MEC WORKEADS	1860121	1
13	CONTROL CABLE ACTUATOR - TRIGGER END ASS	1860120	2
12	CLIPPER BRAKE TRIGGER ASSEMBLY	1860113	1
11	HANDLE LOCKING PIN	1860027	1
10	TOP HANDLE FABRICATION	1860024	1
9	REMOTE CONTROL TRIGGER-M10	1640035	2
8	TILT CLAMP KNOB (MAP OF AUST.)	1570071	1
7	TEE BOLT LOCKING NUT	1450284	1
6	1/2" TEE LOCKING BOLT 2" LONG	1450283	1
5	CONTROL CABLE END CAP MOUNTS TO 1450165	1450166	4
4	SNAP CONNECTOR FLUSH FACED 1/2 BSPP MALE	1430005	1
3	SNAP CONNECTOR FLUSH FACED 1/2 BSPP FEMALE	1430004	1
2	CABLE GUARD FOR THIN CABLES	1081369	2
1	CABLE ADAPTER TRIGGER TO CABLE	1081364	4

PARTS LIST

ITEM	DESCRIPTION	PART NUMBER	ITEM QTY
130	190-TP WORKHEAD WIRING HARNESS WITH LIGHT PREMANUFACTURED - REPRESENTATION	WIRHAR-001-190-TP	1
129	U DRIVE SCREW	UDSCREW	4
128	10MM SPRING WASHERS	SWM10	5
127	5/16" SPRING WASHER	SW05	2
126	SPRING COMPRESSION-0.975" ODx3.5"OAL 44Lbs/In RATE	SPC247788900770-CGN	2
125	SOCKET HEAD CAP SCREW M6 x 20	SHM0620	4
124	SOCKET HEAD CAP SCREW M5 x 75	SHM0575	8
123	SOCKET HEAD BUTTON M6 X 16 STAINLESS 304 A270	SHBM06016-304SS	5
122	90 DEG DUAL PLANE SWIVEL 3/4" SAE - 3/4" JIC	RS90DP-12JIC	2
121	90 DEG DUAL PLANE SWIVEL 9/16" SAE - 9/16" JIC	RS90DP-09JIC	2
120	R CLIP 5mm	RCLIP05	1
119	SEL LOK PIN 1/2" x 2 1/2"	R50064	1
118	SEL LOK PIN 3/16in x 1-1/4in	R18732	1
117	SEL LOK PIN 3/16` X 7/8` ZINC PL.	R18722	2
116	SEL LOK PIN 1-4 X 1 3_4	R0428	1
115	DOWTY SEAL 1/2"BSPP STD	R04B-08	2
114	QUICK RELEASE PIN 12mm DIA X 40mm SSTEEL	PIN-QRBALL-012040-SS	1
113	NUT M16 NYLOC	NM16N	2
112	NUT M16 FINE THIN NUT (ZINC)	NM16HF	4
111	NUT M12 NYLOC	NM12N	4
110	NUT M12 x 1.75 PITCH ZINC	NM12ISO	2
109	NUT M8 ZINC	NM08Z	2
108	NUT M8 NYLOC	NM08N	16
107	NUT M6 NYLOC	NM06N	4
106	NUT M4 NYLOC ZINC	NM04N8Z	2
105	NUT 1 UNF NYLOC THIN	N16NFNH	2
104	NUT 5/8" UNF NYLOC	N10NFN	2
103	NUT 1/2 UNF NYLOC	N08NFN	1
102	HOSE END MEGA CRIMP FEMALE - 9/16"JIC X 1/4"HOSE	MCJF-0904	1
101	ESTOP WARNING LABEL REVERSED	IDTAG12	1
100	MELVELLE MODEL & SERIAL N-O AL TAG	IDTAG02	1
99	H082 + MCORF-1308 + 00750 + MCJF-1208	H082-00830-080	1
98	H082 + MCJF-1208 + 00750 + MCJF1208	H082-00830-000-1212	2
97	H082 + MCORF-1308 + 00700 + MCJF-1208	H082-00780-080	1
96	H042 + MCJF-0904 + 00680 + MCJF-0904	H042-00750-000	1
95	H042 + MCJF-0904 + 00560 + MCJF-0904	H042-00630-000	1
94	H042 + MCJF-0904 + 00320 + MCJF90M-904	H042-00395-005	1
93	H042 + MCJF-0904 + 00140 + MCJF90M-0904	H042-00215-005	1
92	FLAT WASHER MELVELLE MODIFIED - 15mm - ZINC	FWM15	2
91	FLAT WASHER - ENGINEERS - M4	FWM04	2
90	FLAT WASHER - ENGINEERS - 1/4" X 1/2" ZINC	FW0408	4
89	FLAT WASHER - ENGINEERS - 1" X 1-7/8" ZINC	FW16	2
88	FLAT WASHER - ENGINEERS - 5/8" X 1-1/4" ZINC	FW10	1
87	FLAT WASHER - ENGINEERS - 5/16" X 5/8" ZINC	FW05	23
86	NIPPLE 1/2"BSPP - 13/16" ORFS	FP2-0813	2
85	LS3 LIMIT SWITCH	ELECT100	1
84	EMERGENCY STOP BUTTON & ENCLOSURE	ELECT69	1
83	D8 STYLE, SIZE 6 WING PIN, 11MM LONG STEEL ZINC	DZUSD8-6-WING-11-Z	3
82	DISK LOCK WASHER 16mm ZINC PLATED	DL016	2
81	DISK LOCK WASHER 12mm ZINC PLATED	DL012	2
80	M8 DISC LOCK WASHERS	DL008	2
79	DISK LOCK WASHER 6mm STAINLESS STEEL	DL006SS	5
78	PLUG, DEUTSCH, DT, 2-WAY	D-DT06-2S	1
77	BLANKING PIN, DEUTSCH, SIZE 16, DT & DTM, WHITE	D-CONT-16-BLANK	2
76	COUNTER SUNK CAP SCREW M4 x 35 ZINC	CSM0435Z	2
75	ELBOW 90 MM 3/8"BSPP X 9/16"JIC	CP56-0609	1
74	ELBOW 45 M/M 3/8"BSPP X 3/4"JIC	CP38-0612	2
73	NIPPLE 3/8"BSPP X 3/4"JIC	CP2-0612	2
72	NIPPLE 3/8" BSPP X 9/16" JIC	CP2-0609	3
71	NIPPLE M/M 1/2" X 1/2" BSPP	CP1-0808	2
70	M8x1.25 PINNED CLEVIS, 42LG, 8.15 SLOT, 16 WIDE	CLEVIS-001	2
69	F/SHORT 90 F/M 9/16"JIC	C93-0909	1
68	NIPPLE 9/16"UNO X 9/16"JIC	C3-0909	2
67	THRUST GLACIER WASHER 25.4 x 44.5 x 1.6THK	BSHGT-02540445016	2
66	BOLT METRIC M8 X 65LG GR8.8 ZINC	BM0806588Z	7

PARTS LIST

IF IN DOUBT, ASK!

REV	DATE	DRN	CRF	DESCRIPTION	CHK	APP
5	9/16/2020	DB	1782	HOSE ASSEMBLIES ADDED, BALLOONS CLEANED UP	-	-
4	11/28/2019	DB	1595	WIRHAR-001-190-TP ADDED AND 1860178 REMOVED. PARTS FROM 1860178 RE ADDED TO DRAWING	-	-
3	20/11/2019	DB	1728 & 1593	SHEET SIZES CHANGED AND PARTS LIST MOVED TO SEPERATE SHEET AND SPRINGS ADDED	JMC	JMC
2	27/06/2019	DB	1652	TEST POINT PREVIOUSLY SEPARTE COMPONENT	JMC	JMC
1	28/05/2019	-	-	REVISED TO NEW MANIFOLD	-	-
0	3/03/2017	-	-	ORIGINAL ISSUE	-	-

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TOLERANCES UNO:- DIMENSIONS IN mm UNO

.XX ±0.1	XXX. ±2.0
.X ±0.2	XXXX. ±3.0
X. ±0.5	.X° ±0.1°
XX. ±1.0	X.° ±0.5°

DESCRIPTION: SINGLE SIDED WORK HEAD NEW MANIFOLD

PART #: FP-186-EYE-C

MODELLED BY: bend

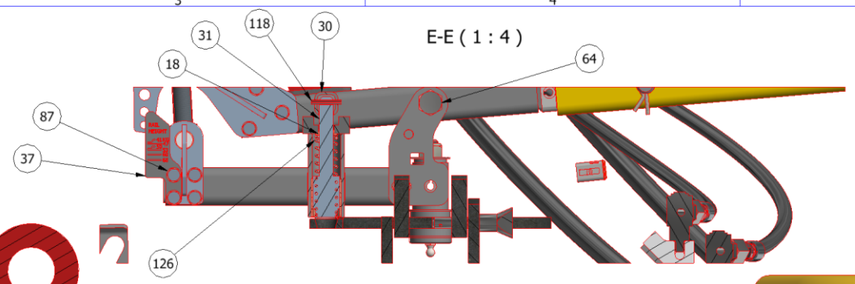
DRAWN	DATE
dominicb	11/20/2019

CHECKED	APPROVED	SCALE
		-

DRG: 2-186-292 REV: 5

3 OF 5	SECTION VIEWS
SHEET #	SHEET DESCRIPTION

E-E (1 : 4)



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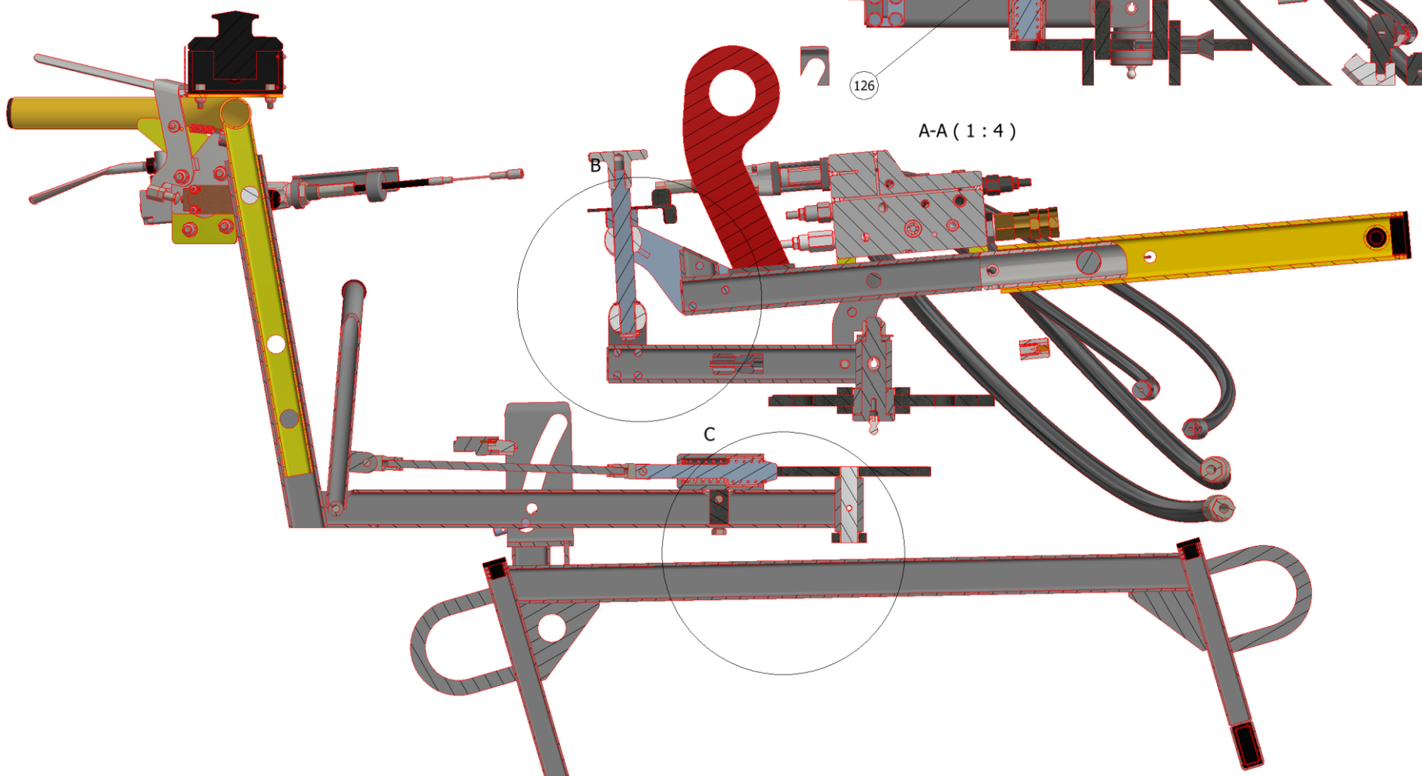
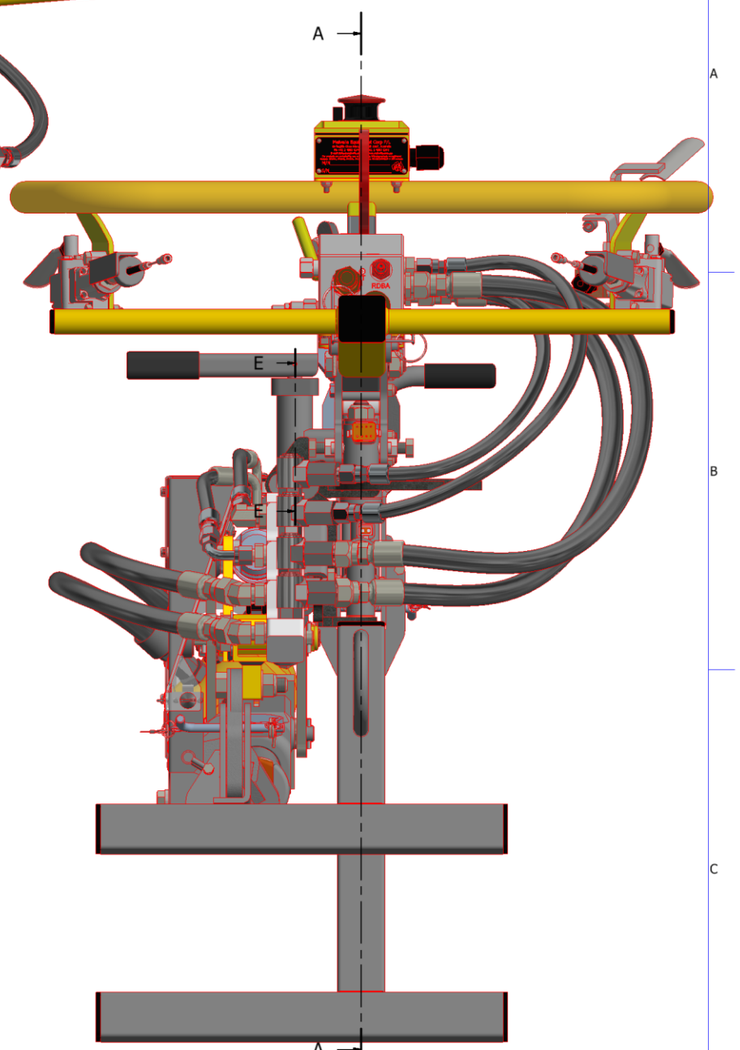
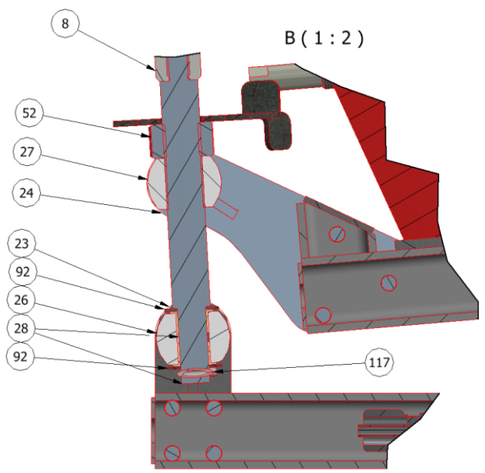
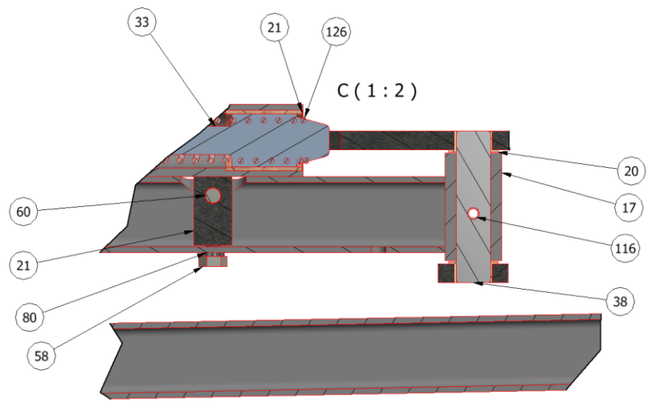




B (1 : 2)



C (1 : 2)



REV	DATE	DRN	CRF	DESCRIPTION	CHK	APP
5	9/16/2020	DB	1782	HOSE ASSEMBLIES ADDED, BALLOONS CLEANED UP	-	-
4	11/28/2019	DB	1595	WIRHAR-001-190-TP ADDED AND 1860178 REMOVED. PARTS FROM 1860178 RE ADDED TO DRAWING	-	-
3	20/11/2019	DB	1728 & 1593	SHEET SIZES CHANGED AND PARTS LIST MOVED TO SEPERATE SHEET AND SPRINGS ADDED	JMC	JMC
2	27/06/2019	DB	1652	TEST POINT PREVIOUSLY SEPARTE COMPONENT	JMC	JMC
1	28/05/2019	-	-	REVISED TO NEW MANIFOLD	-	-
0	3/03/2017	-	-	ORIGINAL ISSUE	-	-

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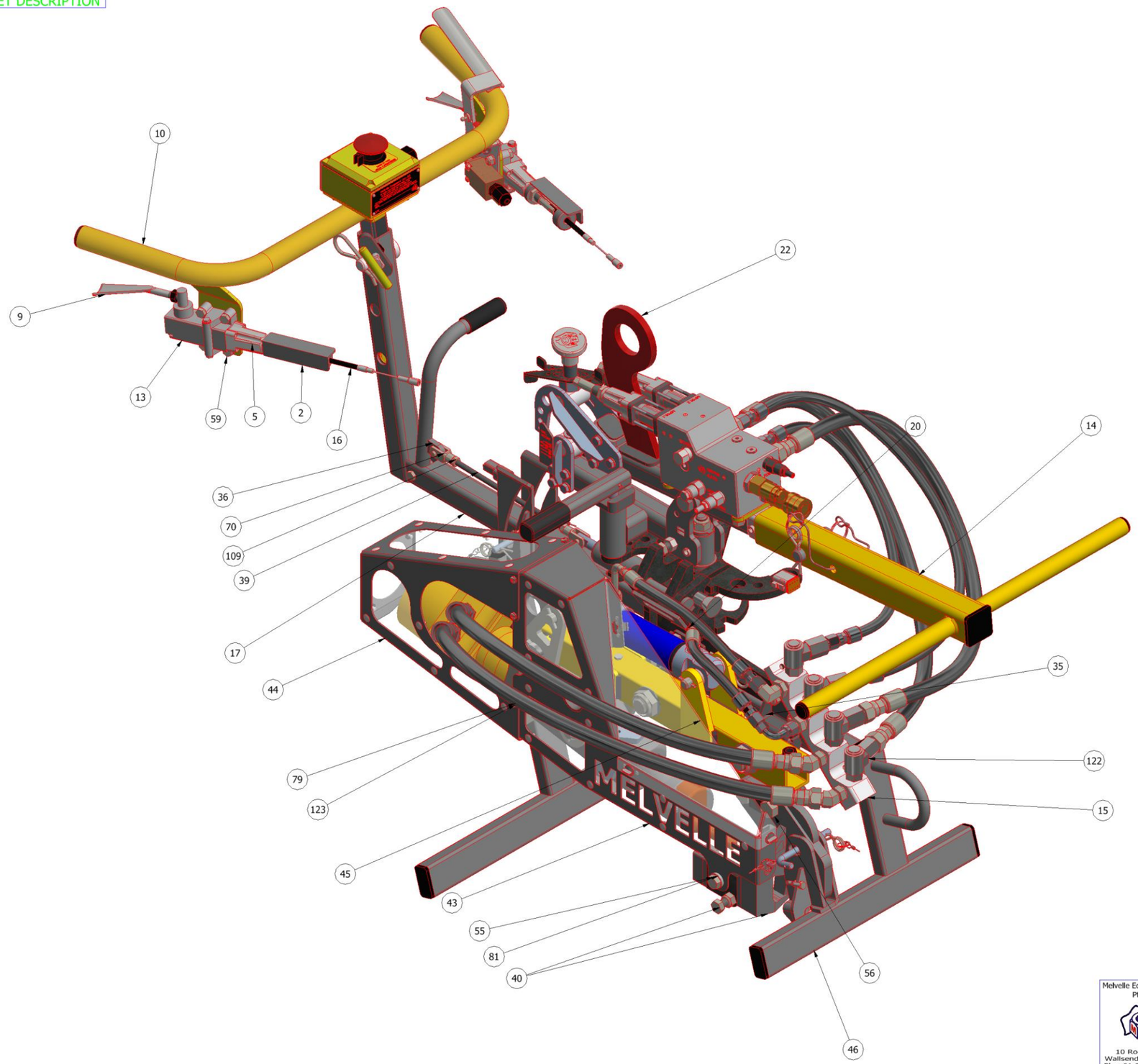
IF IN DOUBT, ASK!

TOLERANCES UNO:-		DIMENSIONS IN mm UNO	
.XX ±0.1	XXX. ±2.0	DESCRIPTION	PART #
.X ±0.2	XXXX. ±3.0	SINGLE SIDED WORK HEAD NEW MANIFOLD	FP-186-EYE-C
X. ±0.5	.X° ±0.1°		
XX. ±1.0	X.° ±0.5°		MODELLED BY
DRAWN	DATE		bend
dominicb	11/20/2019		
CHECKED	APPROVED	SCALE	DRG 2-186-292 REV 5
		1 : 4	

4 OF 5	ASSEMBLY
SHEET #	SHEET DESCRIPTION



REV	DATE	DRN	CRF	DESCRIPTION	CHK	APP
5	9/16/2020	DB	1782	HOSE ASSEMBLIES ADDED, BALLOONS CLEANED UP	-	-
4	11/28/2019	DB	1595	WIRHAR-001-190-TP ADDED AND 1860178 REMOVED. PARTS FROM 1860178 RE ADDED TO DRAWING	-	-
3	20/11/2019	DB	1728 & 1593	SHEET SIZES CHANGED AND PARTS LIST MOVED TO SEPERATE SHEET AND SPRINGS ADDED	JMC	JMC
2	27/06/2019	DB	1652	TEST POINT PREVIOUSLY SEPARTE COMPONENT	JMC	JMC
1	28/05/2019	-	-	REVISED TO NEW MANIFOLD	-	-
0	3/03/2017	-	-	ORIGINAL ISSUE	-	-

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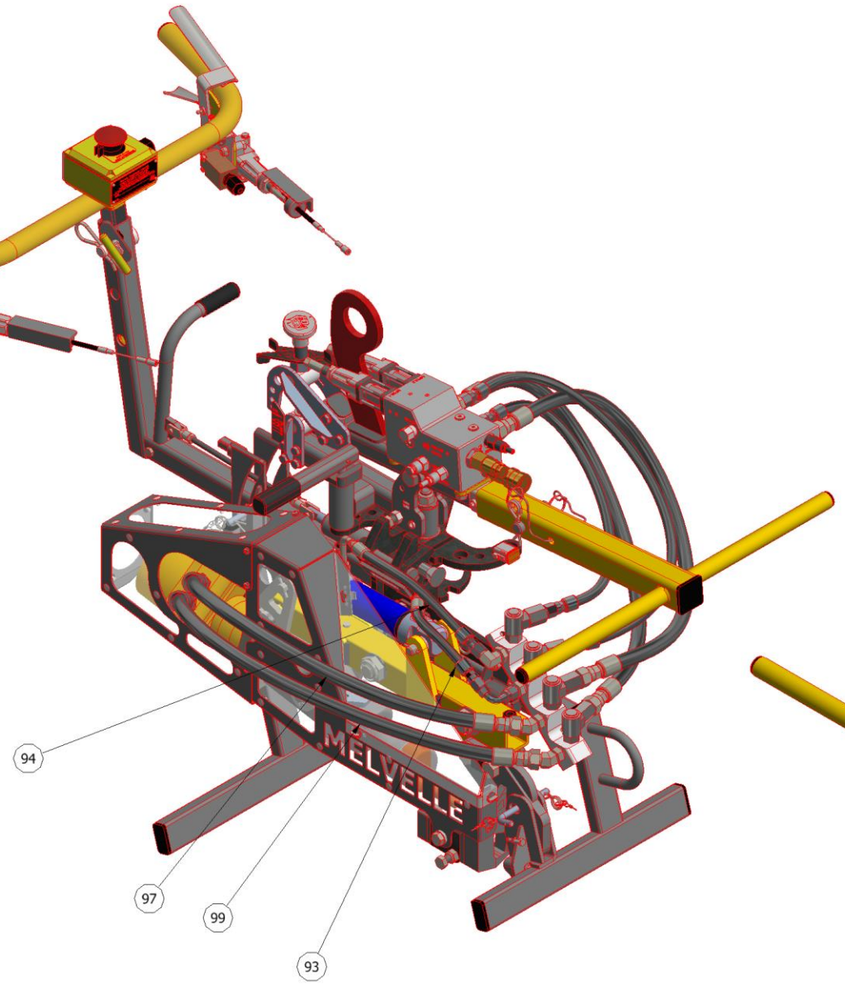
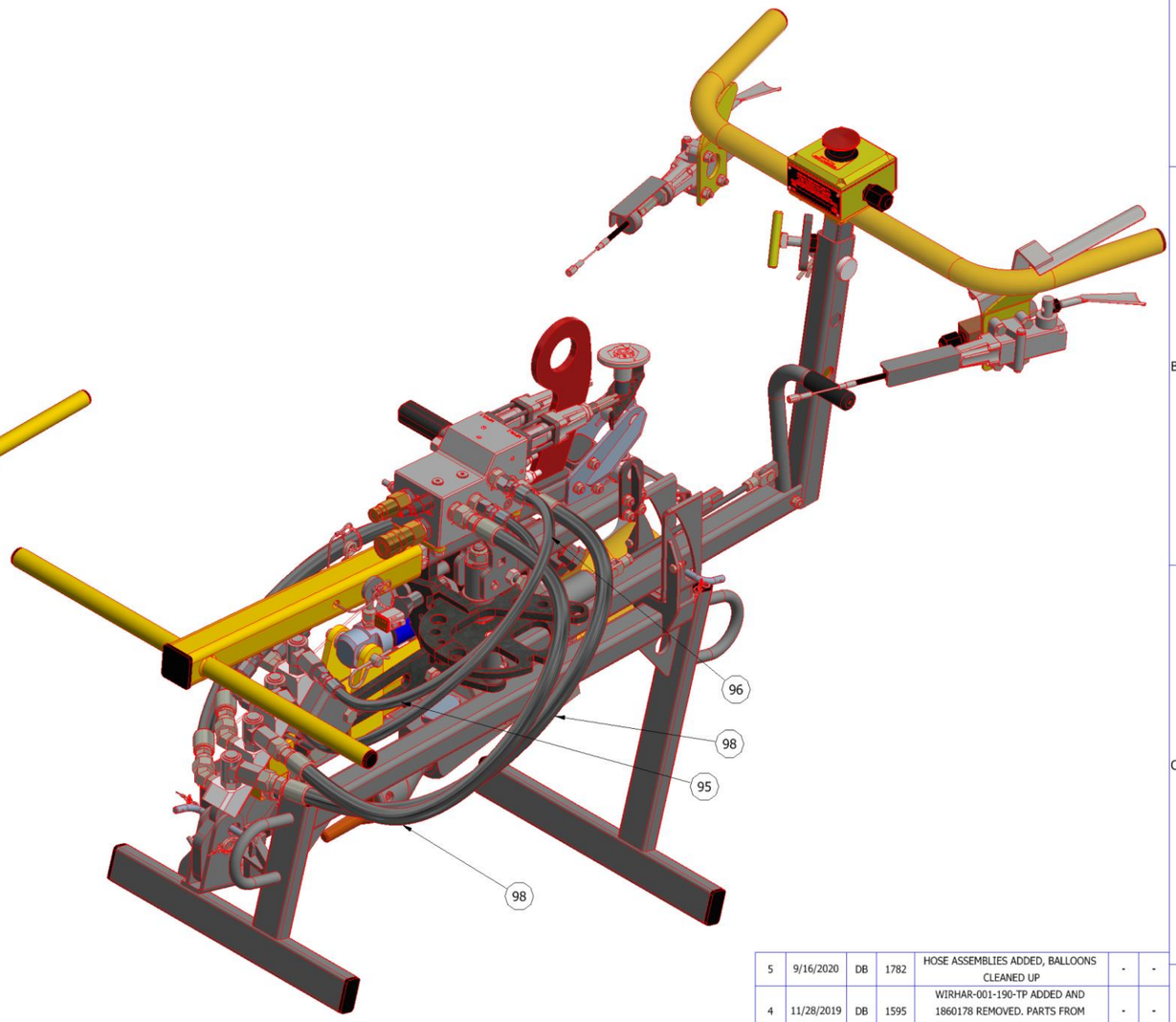
IF IN DOUBT, ASK!

TOLERANCES UNO:-		DIMENSIONS IN mm UNO	
.XX ±0.1	XXX. ±2.0	DESCRIPTION	PART #
.X ±0.2	XXXX. ±3.0	SINGLE SIDED WORK HEAD NEW MANIFOLD	FP-186-EYE-C
X. ±0.5	.X° ±0.1°		
XX. ±1.0	X.° ±0.5°		
DRAWN	DATE		MODELLED BY
dominicb	11/20/2019		bend
CHECKED	APPROVED	SCALE	DRG 2-186-292 REV 5
		1:4	

5 OF 5	HOSE ASSEMBLY
SHEET #	SHEET DESCRIPTION





REV	DATE	DRN	CRF	DESCRIPTION	CHK	APP
5	9/16/2020	DB	1782	HOSE ASSEMBLIES ADDED, BALLOONS CLEANED UP	-	-
4	11/28/2019	DB	1595	WIRHAR-001-190-TP ADDED AND 1860178 REMOVED. PARTS FROM 1860178 RE ADDED TO DRAWING	-	-
3	20/11/2019	DB	1728 & 1593	SHEET SIZES CHANGED AND PARTS LIST MOVED TO SEPERATE SHEET AND SPRINGS ADDED	JMC	JMC
2	27/06/2019	DB	1652	TEST POINT PREVIOUSLY SEPARTE COMPONENT	JMC	JMC
1	28/05/2019	-	-	REVISED TO NEW MANIFOLD	-	-
0	3/03/2017	-	-	ORIGINAL ISSUE	-	-

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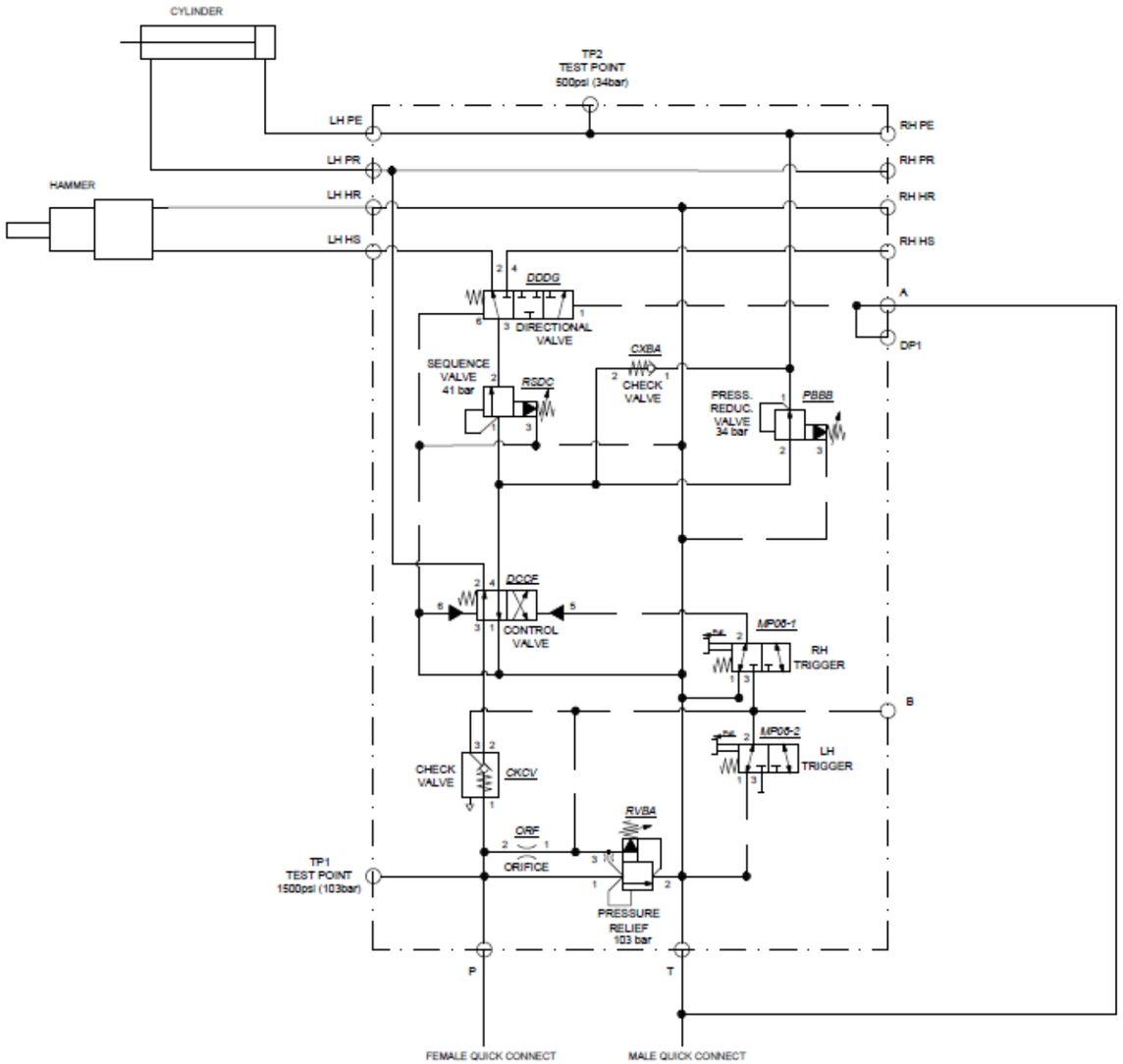
IF IN DOUBT, ASK!

TOLERANCES UNO:-		DIMENSIONS IN mm UNO	
.XX ±0.1 .X ±0.2 X. ±0.5 XX. ±1.0	XXX. ±2.0 XXXX. ±3.0 .X° ±0.1° X.° ±0.5°	DESCRIPTION: SINGLE SIDED WORK HEAD NEW MANIFOLD	PART #: FP-186-EYE-C
DRAWN: dominicb	DATE: 11/20/2019		MODELLED BY: bend
CHECKED	APPROVED	SCALE: VARIES	DRG 2-186-292 REV 5

14.6. Hydraulic Circuit Diagram (Pre February 2019)



ITEM	QTY	DESCRIPTION	LENGTH	PART No.

MATERIAL/CUT LIST

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8 Kogilla Close
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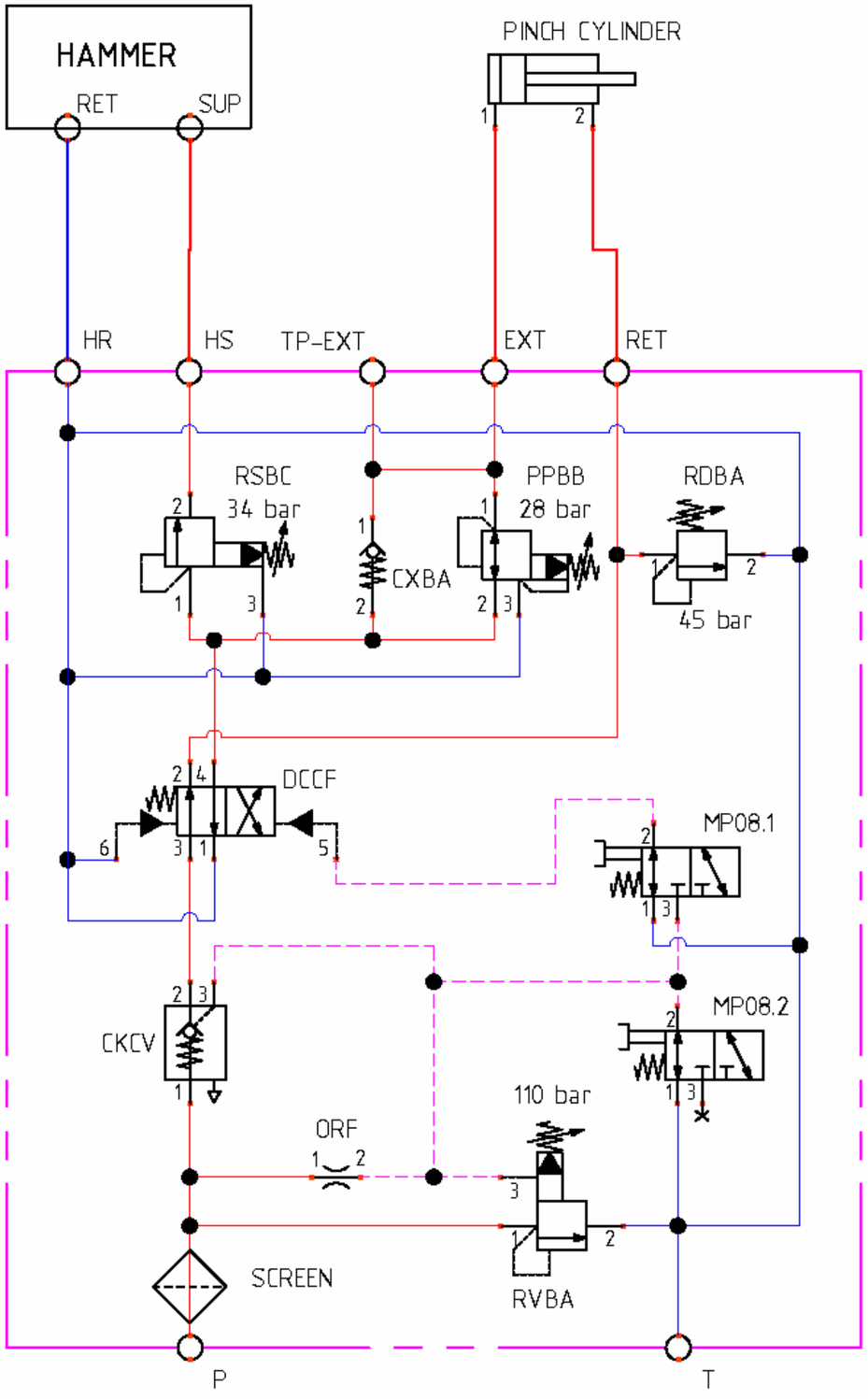
Fax: +61 02 4950 1291

IF IN DOUBT, ASK!

DIMENSIONS IN mm UNO		0	15/10/12	AFG	ORIGINAL ISSUE
TOLERENCES UNO:-		REV	DATE	DRN	DESCRIPTION
.XX ±0.1	XXX. ±2.0	DESCRIPTION			PART
.X ±0.2	XXXX. ±3.0	186-EYE E-CLIP REMOVER HYDRAULIC CIRCUIT			FP-186-
X. ±0.5	.X° ±0.1°				
XX. ±1.0	X.° ±0.5°				
DRAWN	DATE				AUTOCA
GM	15/10/12				DRAWIN
CHECKED	APPROVED	SCALE		DRG	3-186-299
GMM	GMM	NTS			

14.7. Hydraulic Circuit Diagram (Post February 2019)

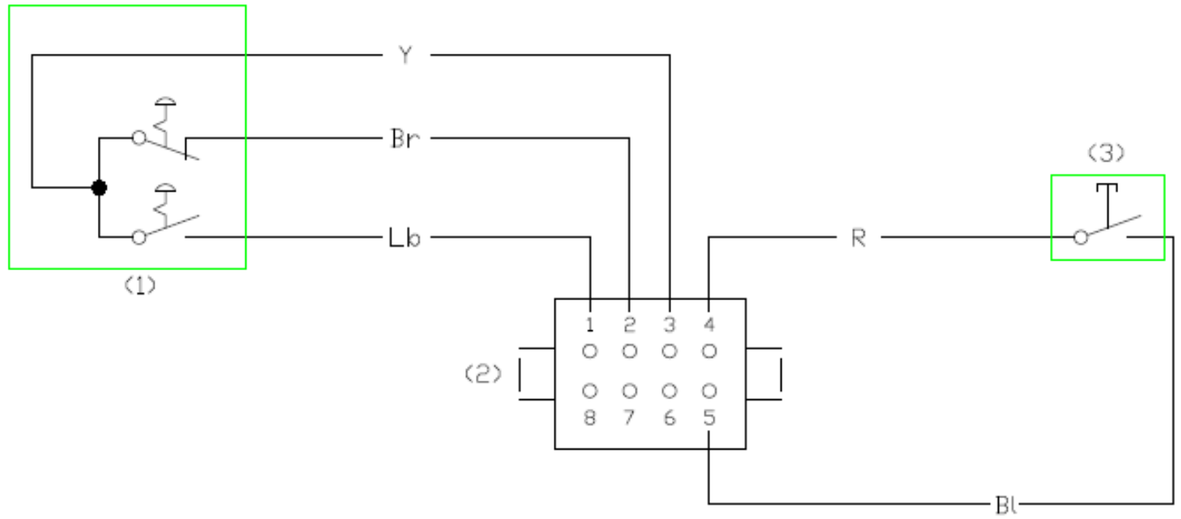


ITEM ID	QTY	MODEL CODE	DESCRIPTION	MANUFACTURER
	1	TBA	MANIFOLD BODY	SUN/CFP
CKCV	1	CKCV XCN	PILOT OP. CHECK VALVE - SCREW-IN CARTRIDGE	SUN HYDRAULICS
CXBA	1	CXBA XAN	CHECK VALVE	SUN HYDRAULICS
DCCF	1	DCCF XXN	DIRECTION CONTROL VALVE - HYD. PILOT OPERATED - SCREW-IN CARTRIDGE	SUN HYDRAULICS
MP08	2	MP08-30T	3/2 WAY MANUAL PULL TO SHIFT DIRECTION CONTROL VALVE	HYDRAFORCE
ORF	1	ORF/M6X1.0SC	M6 SELF CLEANING ORIFICE 1.0MM	CUSTOM FLUIDPOWER
PPBB	1	PPBB LNN	PILOT OPERATED PRESSURE REDUCING/RELIEVING VALVE	SUN HYDRAULICS
RSBC	1	RSBC LBN	PILOT OPERATED SEQUENCE VALVE	SUN HYDRAULICS
RVBA	1	RVBA LAN	PILOT OP. VENTABLE RELIEF VALVE	SUN HYDRAULICS
RDBA	1	RDBALDN	RELIEF VALVE - DIRECT ACTING	SUN HYDRAULICS
SCREEN	1	SCRM7161040S	SAFETY SCREEN 12mm 40MIC	LEE

ITEM ID	PORT TYPE	DESCRIPTION	PORT SIZE
EXT, HR, HS, RET	BSP	3/8 BSPP	G 3/8-19
P, T	BSP	1/2 BSPP	G 1/2-14
TP-EXT	BSP	1/4 BSPP	G 1/4-19

14.8. Electrical Circuit Diagram

Wire Colours			
Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light Blue
G	Green	Lg	Light Green
R	Red	P	Pink
W	White	Gr	Green
G/W	Green/White		



ITEM	QTY	DESCRIPTION	LENGTH	PART No.
3	1	LS3 LIMIT SWITCH	N/A	ELECT100
2	1	DT8 MALE HOUSING 8 WAY	N/A	ELECT92
1	1	EMERGENCY STOP ENCLOSURE	N/A	ELECT69

MATERIAL/CUT LIST

REVISION NOTES
REV 1 GMM 03/07/2013 - ADDED PLUG BETWEEN RIBBION SWITCH AND HEAD
REV 2 AFG 17/09/2013 - REMOVED PLUG, CHANGED TO LIMIT SWITCH, ADDED LENGTHS

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IF IN DOUBT, ASK!

TOLERENCES UNO:-		DIMENSIONS IN mm UNO	
.XX ±0.1	XXX. ±2.0	DESCRIPTION	PART #
.X ±0.2	XXXX. ±3.0	TRACKPACK HEAD ELECTRIC SCHEMATIC	TP HEAD
X. ±0.5	.X° ±0.1°		AUTOCAD
XX. ±1.0	X.° ±0.5°		DRAWING
DRAWN	DATE		
AdrianG	15/01/2013		
CHECKED	APPROVED	SCALE	DRG 3-ELEC-04 REV 2
GaryM	AdrianG	NTS	