EDC15-01 DECLIPPER
for Pandrol E and PR clips

A Heavy Duty RRV Attachment for Extracting Pandrol Clips

Issue 3

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Introduction

In 2009 Thomson Engineering Design in association with Balfour Beatty Rail Plant developed an RRV attachment incorporating a combination installer / extractor for E-Clips and PR401 Clips.

Although this never proved popular for installing clips due to the track born vibration causing clips to fall from the sleepers, the extractor has been in more-or-less continuous use ever since.

This has led to a number of enquiries for an extraction attachment utilising the system developed in 2009 but in a lighter and more compact format.

This document outlines a design and specification for such an attachment to be known as the EDC15-01 Declipper.

The key features of this new design are:

• Hydraulic retraction of de-clipping hooks
• Simple and independent adjustment of hook heights
• Ability to de-clip one rail or two
• Containment of flying clips
• Easy Tilt adapter head
• Full RIS1530 Issue 5 compliance
Overview

The EDC15-01 Declipper is attached to the RRV via the normal quick coupler via a unique Easy Tilt adapter head. Dual hydraulic services are connected to the auxiliary supply from the host machine and used to raise and lower the de-clipping hooks at each side of the machine.

All other systems are self-contained within the attachment. Fail safe brakes use the weight of the attachment head to apply brake pads to the rear wheels. A 12 Volt battery, recharged by a built-in solar panel, powers the marker lights which are controlled by an electronic direction sensor.

At the start of the shift the de-clipping hooks are adjusted to the correct heights by the use of the hand wheels on either side of the machine.

The de-clipping modules are also adjustable sideways to precisely position the de-clipping hooks.
General Specifications

A general arrangement drawing of the EDC15-01 Declipper is given on page 6 showing the standard model.

Other general specifications are as follows:

Overall Dimensions 2,277 mm (L)
1,920 mm (W)
1,364 mm (H) on legs
Wheelbase 1,762 mm
Overall Weight 1,980 kg

Wheels

Wheel Profile P1
Wheel Diameter 225 mm
Wheel Bearings Deep Groove Ball Bearings
Sealing Rubber Seals both sides
Wheel Capacity 1,500 kg per wheel

Brakes

Brake System Direct on wheel
No. of Braked Wheels 2 (rear)
Brake Lining Material 5 mm Asbestos-free
Design Total Brake Force 2.1 kN
Max. Design Gradient 1:25

Dual Hydraulic System

Max. Inlet Pressure 300 Bar
System Pressure 150 Bar
Cylinder Bore 80 mm
Cylinder Stroke 400 mm
Hose Burst Protection 2PO Check Valves

Lighting System

System Voltage 12 V
Battery Type Gel Filled
Charging System Solar Panel
Control On/ Off Toggle Switch
Direction Detection Automatic
Lights LED
Protection 20A Re-setable Breaker

1 Pressure control valve fitted
2 Fitted directly on cylinders
3 Mains Charger available
4 Magnetic wheel sensor on R/H rear wheel
Adapter Head

Type 2 piece - hinge mounted
Rotation Easy-Tilt system
Options + / - 10 degrees
A full range of 2 pin head types are available

De-Clipping Modules

Type Spring Loaded Hook
Retraction Hydraulic
Adjustment By Hand Wheel
Adjustment Range 50 mm
Total Hook Travel 150 mm
Lateral Adjustment +/- 15 mm

Stability on Track

Centre of Mass in working mode 267 mm Above Rail Level
Track Twist Compensation Pivoting Front Axle
Max. Working Cant 200 mm

Stability in Transit

Centre of Mass in Transport Mode 461 mm Above Ground Level
Rear Leg Centres 850 mm
Ground Unevenness Compensation Legs on Pivoting Front Axle
No. of Lifting Points 2
Lifting Point Height 283 mm Above Centre of Mass

Optional Equipment

Elephant’s-Foot Rollers For use with light excavators
Air Brakes In place of standard brakes
Hydraulic Brakes In place of standard brakes
Work Lights Requires uprated battery
Uprated Battery Include uprated solar panel

For security in transport, each end of the machine is equipped with steel channels for lashing down with ratchet straps and lashing point eye plates for chaining to a lorry.

Four magnets set into the back face of the off side rear wheel are used to trigger the automatic direction switch to control the marker lights.
Fail-Safe Braking System

The standard braking system uses the weight of the adapter head to apply the brakes to the rear wheels through a linkage as illustrated below.

This system has been developed from the system used in our Fastclip attachments which have been in service since 2001 without incident.

The brakes are designed to produce a braking effort equivalent to 8% of the mass of the machine which is in excess of the requirements of RIS1530-plt Issue 5.

Fail-safe air brakes are available as an option.

Hydraulically released spring brakes with a separate manual parking brake may also be specified if required.
Wheels

In operation a considerable part of the RRV’s weight is used to press down on the attachment to improve stability.

To cope with this load the wheels are fitted with heavy duty deep groove ball bearings of 115mm OD and 27mm width running on 50mm axle shafts.

The bearings are grease packed and sealed for a long, maintenance-free life. Shims on either side of the wheel guarantee the correct back-to-back dimension.

Bearings are a common standard size for easy replacement.

Wheels are P1 profile and are fully turned from EN8 billets. Wheels may be case hardened if required.

If the machine is to be used with smaller excavators, elephant’s-foot rollers - which engage with the rail head to hold the machine down - can be specified. Please note that the use of elephant’s-foot rollers requires more care on the part of the operator to avoid colliding with fish plates and insulated block joints.
The Easy Tilt adapter head assembly is shown in the exploded view below. It consists of a base fabrication mounted on the chassis cross shaft with teflon bushes and a tiltable upper section.

The replaceable Easy Tilt adapter head is swivel mounted onto the base fabrication. This adapter head is specially designed to work with quick couplers which have to be fully crowded before releasing.

Simply push back the spring loaded hooks and the adapter head frame can hinge up for easy release.

The adapter head swivels on an 80mm diameter centre pin and is held in place by a 25mm EN24 cross pin through an EN8 collar. A slot and peg system limit the rotation of the head to 10 degrees either side.

Adapter heads are also available for Atlas, Mecalac and all other excavator hitch types.
De-Clipping Modules

The heart of the de-clipping system is the de-clipping hook. This is made from a work hardening steel to give a long working life and is mounted on a substantial pin and bush hinge arrangement.

Twin heavy-duty coil die springs are set to give a total of 16kN preload on the hook which is enough to prevent it rising in normal operation but will allow the hook to jump over really badly stuck clips without damaging the sleeper.

Working at walking pace the mass of the machine and the RRV is used to drive the clips from the housing in a smooth continuous operation.

The hooks (one on each side of the machine) remove the clips on one side of each rail as the machine travels along the track. At the end of the work site the RRV lifts the machine up, turns to face the other way and returns back to the start point removing the remaining clips.

In this way miles of clips can be swiftly removed.

The height of each hook can be independently adjusted prior to the start of work to compensate for worn rails, rails of different section heights, worn rail pads and different sleeper configurations. It is even possible to set one of the hooks too high to catch the clips when only one rail is to be released.

To prevent the clips flying and causing damage or injury, the whole hook arrangement is enclosed behind 12mm reinforced rubber baffles on three sides and by the rail section on the fourth side.

The rubber baffles to the front and rear of the unit have cut-outs in the bottom edge to allow the operator to see the hook when setting the working height.

A roller running against the head of the rail on the opposite side to the hook prevents the hook jumping out of alignment.
The entire de-clipping system is housed in a substantial fabricated subframe which incorporates a 50mm close tolerance mounting boss at the rear end and a cylinder rod connection point at the front.

On the top of the assembly is the working height adjuster mechanism. This uses a handwheel and a 4mm pitch leadscrew to adjust the position of a ‘finger’ which in turn operates a spring valve in the outer casing to stop the cylinder as it descends and thus control the working height of the de-clipping hook.

The operation of the cylinder is shown in the pictures on page 12. When fully retracted the cylinder lifts the entire mechanism clear of the rail head for traversing S+C and other track obstacles.

Where elephant’s-foot rollers are fitted these are integrated into the same hydraulic system so that retracting the de-clipping hooks simultaneously releases the elephant’s-foot rollers for easy passage over fish plates and IBJ’s.
With the cylinder retracted (left) the whole de-clipping mechanism is raised clear of the rail head for safe transit on track and for transport.

When the cylinder is extended it lowers the de-clipping mechanism until the finger of the adjuster depresses the spring loaded plunger of the valve. This locks off the cylinder at the preset working position.

In this way the de-clipping hooks can be quickly retracted to overcome an obstacle then quickly and accurately returned to the working position all from the cab of the host machine.

When elephant’s-foot rollers are fitted these automatically retract and deploy at the same time.

The casing of the module assembly is mounted onto the chassis with three bolts at each end.

These bolts pass through slots in the module end plates which allow the modules to be adjusted sideways to accurately position the hooks above the centre of the clip housings.

This minimises the effort required to remove the clips and thus improves the life of the de-clipping hooks.

A sticker close to the operating handle on each side of the machine reminds the operator of the correct setting for the de-clipping hooks.
With the rubber baffles rendered as clear plastic, the approach of the de-clipping hook to the clip can be clearly seen.

The momentum of the RRV and the machine is used to drive out the clips.
Images
Note how, in use, the adapter head is tilted forwards to release the brakes and the reaction rollers run along the side of the rail head to hold the de-clipping units in line with the clips.

Red and white marker lights - automatically switched to show white in the forward direction and red in the rear or red all round when stationary - are mounted in substantial steel box sections to minimise damage in transit and use.

Transport legs are retracted to above rail head level when working.
Some safety quick couplers must be fully crowded under the boom before the coupler can be released. With many attachments this can lead to a lot of strain being placed on the adapter system as the attachment is tilted up under the boom.

The unique tilting head arrangement on the EDC15-01 Declipper overcomes this issue by allowing the quick coupler to be crowded whilst releasing the adapter head frame to hinge up.

With many attachments this can lead to a lot of strain being placed on the adapter system as the attachment is tilted up under the boom.
Current Status of the Product

At Issue 3 this document presents the proposed design of a prototype Declipper following further consultation with users of the 2009 machine and incorporates the following modifications to the design presented in the second issue.

- Tilting Adapter Head to work with Geith quick couplers
- Dual hydraulic system for independent control of de-clipping modules
- Change to sealed-for-life wheel bearings

The de-clipping system has been proven in field trials over five years, the braking system has been installed in 75 Fastclip attachments and has been in use without incident since 2001.

The lighting system is an industry-standard arrangement and is fully proven.

We are confident that this machine will work with little or no modification provided that sufficient weight can be applied by the RRV to prevent the machine jumping over the clips. In an existing prototype MK3c Fast Clip machine this has been shown to be a reasonable assumption however the fitting of elephant’s-foot rollers will provide a fall-back option.

It is not considered desirable to fit elephant’s-foot rollers at the prototype stage as the risk of them colliding with fish plates and IBJ’s will require extra planning and marking of the rail prior to the commencement of work.

In order to progress further with this design we need the support of a purchaser who is willing to work with us during the trial phase and to cope with the delays which may arise during the Network Rail or London Underground approval processes.

Balfour Beatty have indicated that they may be willing to assist in this process by purchasing the first unit at a discount from list price and Alan Morris of Network Rail has offered to find a sponsor for the Product Acceptance process.
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We strongly recommend contacting the factory to ensure that details given are still current.

More than half our business comes from special products designed and built as one-off’s and we are always pleased to discuss amended specifications should the product detailed here not meet your exact requirements.