



Spring Starter Operator's Guide  
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## Introduction

Thank you for purchasing the IPU Spring Starter.

The starter should provide you with thousands of maintenance free engine starts. If for any reason you do experience any problems with your starter please write, or telephone us directly, contact your local agent who will be happy to resolve your problem or visit our website for more information at [www.ipu.co.uk/starting](http://www.ipu.co.uk/starting).

This booklet provides you with all the information you need to install and operate your IPU SureStart Spring Starter.

**Please note** once fitted it is important to rotate the engine before using the spring starter for the first time. This is to ensure the spring starter is installed correctly and reduces the risk of damage to the engine and the starter motor. [Instructions on how to do this are on page 5](#).

## Contents of Box

- Starter motor
- Winding handle
- Getting started user manual
- Operating instruction stickers, as required
- Check card
- Bolts/nuts/spacer, as required

## Before using the Spring Starter for the first time

Before you operate the IPU SureStart Spring Starter for the first time you must complete the following:

### **TO ROTATE THE ENGINE WITHOUT STARTING**

1. Pull reset button
2. Wind clockwise  $1\frac{3}{4}$  turns
3. Operate the trip lever
4. Continue winding
5. Operate starter for 1 complete engine revolution

The above steps ensure the Spring Starter is fitted correctly and will not cause damage to the starter or the engine. If any of the above steps cannot be completed please contact IPU on +44 (0) 121 511 0460 for further support.

### **DO NOT OPERATE THE STARTER WITH ENGINE DECOMPRESSED**

## Basic steps

After you have completed the preparation steps on page 4 below are the basic operating procedures:

### TO START

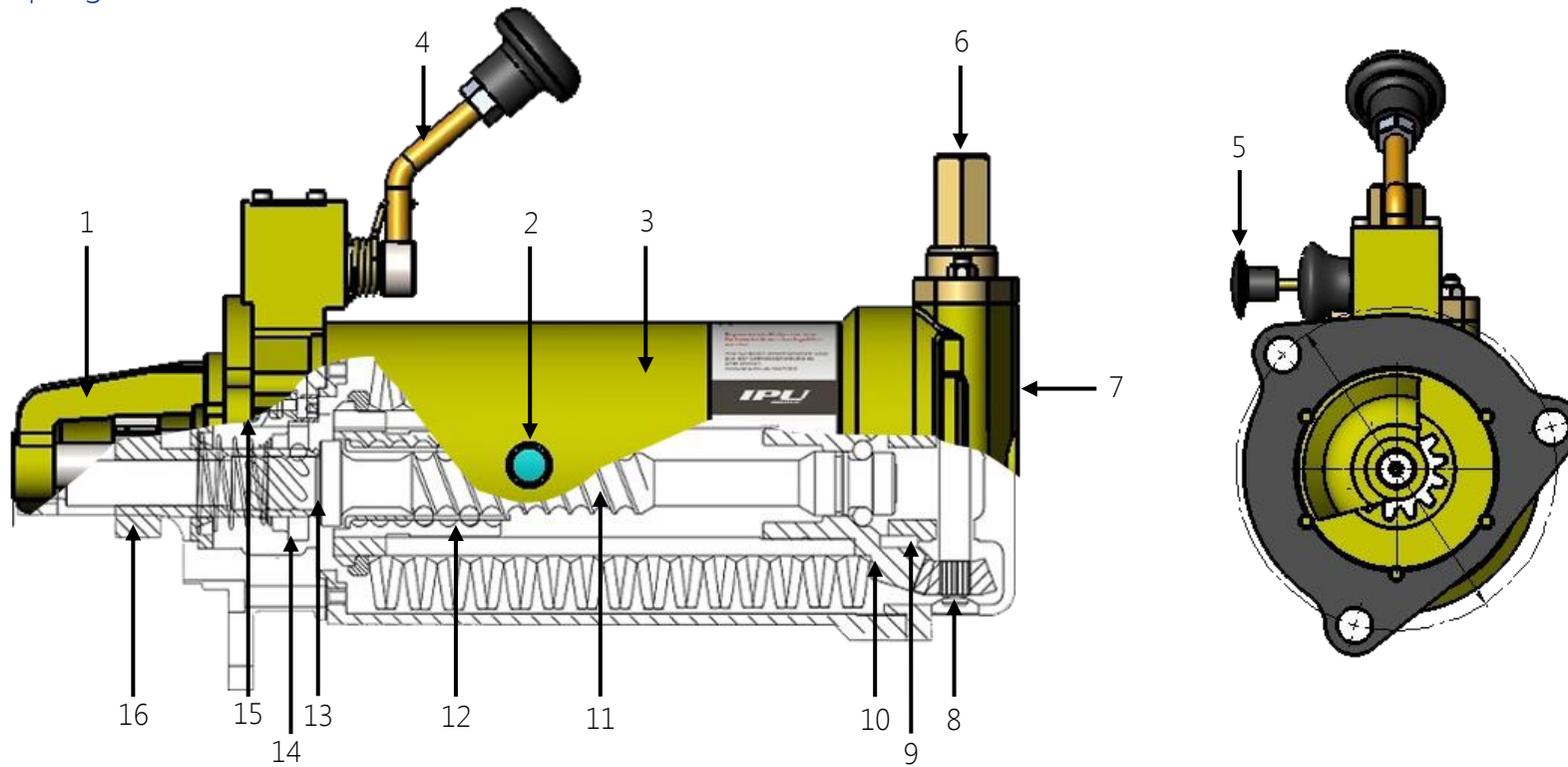
1. Gearbox must be in neutral
2. Fuel on
3. Set excess fuel
4. Open throttle
5. Pull reset button
6. Wind clockwise until RED springs are showing:
  - WHITE springs visible = unwound
  - RED springs visible = wound for starting
7. Operate the trip lever

### TO UNWIND STARTER

Crank the handle in an anti-clockwise direction until the WHITE springs appear in the inspection window.

**CAUTION: Do not dismantle or remove starter from engine unless WHITE springs are visible.**

## The IPU Spring Starter



1	Front Housing	5	Reset Knob	9	Spacer Shims	13	Circlip
2	Viewing Window	6	Input Adaptor	10	Drive Gear	14	Drive Ratchet
3	Body	7	Rear Housing	11	Drive Shaft	15	Lock
4	Trip Lever	8	Bevel Pinion	12	Drive Nut	16	Drive Pinion

## Installation

**CAUTION:** Do not attempt to wind and trip the starter unless it is fitted on an engine. The unit will break if it is held in a vice energised and released. The warranty will NOT BE VALID.

The IPU Starter is easy to install and operate. It requires no special skills or tools. You should, however, still read the following step-by-step instructions before fitting or operating the starter.

## Rotation

The starter ranges are designed for anticlockwise rotation engines only, viewed from the flywheel end. In other words, the starter replaces clockwise rotation electrical, pneumatic or hydraulic starters. (See Appendix II). See Appendix V for modified operation of anticlockwise starter.

## Engine Space

Check that you have sufficient room on the engine crankcase to fit the starter (see Appendix I).

## Replacing the Original Starter

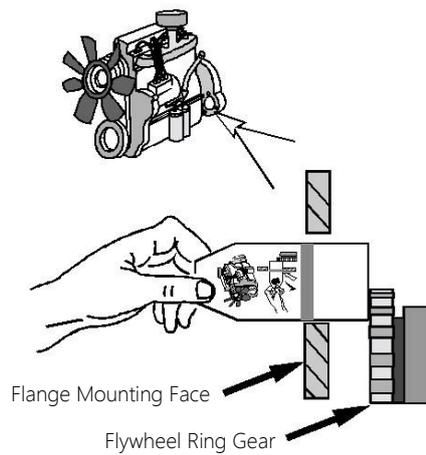
Remove the existing electric, pneumatic or hydraulic starting device, ensuring that you retain any spacers already present, unless the starter model that you have already has a spacer included with it.

Make sure that while removing the old starter you do not disconnect the fuel shut-off valve. On some applications there may be an electrical engine shut-off valve. This can either be operated by direct supply from the battery or converted to manual shut-off.

## IPU Design

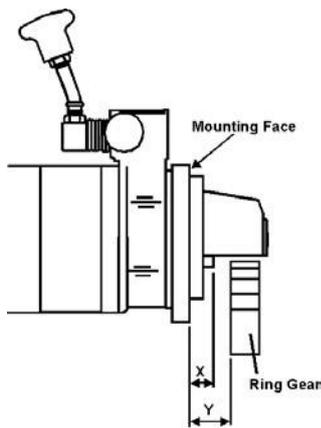
You may find when replacing your current starter with the IPU Starter that there is a difference between the numbers of teeth on the two pinions. This is a design feature adapted to make a larger body diameter IPU Starter replaces a smaller diameter electric starter. This is achieved by offsetting the spigot and mounting holes of the starter from its centreline and increasing the number of teeth to compensate for this.

## Pre Installation checks



The IPU Starter is designed so that when installed on the engine, in the unwound position, there is between 3 and 5 mm clearance between the pinion face and the flywheel ring gear. To ensure that the clearance is correct, press the 'check card' (provided) against the ring gear and ensure the flange mounting face sits in the safe area.

## Alternative



Measure the mounting face to pinion face dimension 'X', and the mounting face to ring gear depth 'Y'. The distance  $Y-X$  should be between 3 and 5 mm.

## Final Preparation

To complete the installation tighten the nuts or bolts (whichever is appropriate for your application) to the torque recommended by the engine manufacturer.

The starter is assembled so that in the majority of applications the winding handle is in a position suitable for you to wind the starter comfortably. If this is not the case the angle of the winding handle position can be changed to suit your needs. See Position Code Procedure.

The Operating Instruction Sticker should be stuck close to the engine, so that it is clearly visible to the starter operator.

## Operation

1. If the starter is fitted on a tractor or mechanical handling vehicle, such as a fork lift truck or a loader, ensure that the gearbox is in the neutral position.
2. Ensure that the fuel is turned OFF.
3. Using the winding handle, rotate the winding adaptor until the WHITE spring is visible in the window. Move the trip lever to the trip position.
4. The engine will rotate but not start. This will ensure that the starter is operating normally.
5. Check the fuel valve is in the 'ON' position and that fuel is reaching the fuel pump.
6. Adjust the throttle to between 1/2 and 3/4 open.
7. The trip lever (with the knob), of the starter, must be in an upright position. If this is not the case, pull the reset knob (black). The trip lever will immediately spring to its upright position.
8. When starting an engine fitted with an in-line pump for the first time, it may be necessary to press the excess fuel button on the pump.
9. Fit the Cranking handle and wind the handle in a clockwise direction until RED springs are visible through the inspection windows (See Appendix II for number of turns). With the RED spring visible the starter is ready to start the engine.
10. To start your engine, push the trip lever down through 90°.
11. If the engine does not start repeat the above steps. Your engine will normally start within three attempts.

**IMPORTANT: Do not attempt to start the engine with an electric or other starter while the IPU Starter is wound and engaged.**

## Unwinding

Set trip lever to the vertical position.

Then, to unwind and de-energize the starter motor, simply unwind the crank handle in an anti-clockwise direction. It may be necessary, at first, to exert extra force to disengage the clutch. Continue unwinding until white springs are visible through the inspection windows. At this point the starter pinion will also retract to its rest position.

## Slow Engine Cranking

The IPU Starter can be used to slowly crank an engine, for the adjustment of tappets, pump timing or equipment coupled to your engine. With the red trip lever in the upright (downward for anticlockwise starter) position turn the winding handle clockwise for two turns. This will engage the pinion with the ring gear. Now trip the lever through 90°. The black reset knob will pull in and lock the red trip lever in this position. The engine can now be turned slowly with the winding handle, and any adjustments, to the engine, may be made. Once slow cranking is completed you should pull the black reset knob and either fully wind to start the engine (see Operation) or unwind to disengage the pinion (see Unwinding).

## Dual Starting Engines

See Appendix IV for important information.

Where the engine has the facility to be operated using two starters (electric starter and the IPU starter), the IPU starter must have its pinion disengaged from the engine flywheel when the alternative starter is being used. The pinion is disengaged by turning the winding handle in an anticlockwise direction, until no further unwinding is possible. This also applies to vehicles fitted with a IPU starter that are being 'bump' started e.g. forklifts, tractors.

## Cold Starting

When starting at ambient temperatures below 0°C, it will be necessary to use some form of starting aid. Starting can be achieved through various forms of ether-assisted aids which are available in aerosol cans or as auto start kits.

To cold start proceed with normal starting operation. Prior to tripping, spray the ether into the air intake, or if your engine is fitted with an auto start kit inject the ether inside the inlet manifold. If the engine fails to start, repeat the whole operation immediately. The engine should now start.

## Trouble Shooting

Operation of your IPU Starter should be trouble free, as long as the starter has been fitted correctly (see [installation – page 8](#)), and the correct engine and starter operation is adhered to (see [operation – page 11](#)). If a problem does occur it is often possible for the operator to identify and correct the situation.

### Faulty Winding Mechanism

On turning the winding handle two turns in a clockwise direction the winding adaptor should rotate smoothly, thus causing the drive pinion to move forward and engage with the flywheel ring gear. Further rotation should cause the spring pack to gradually compress as viewed through the body inspection window.

FAULT	CAUSE	ACTION
Winding adaptor is jammed so that cranking handle will not turn	The bevel pinion is broken and is locking the drive gear rotation	<i>The bevel pinion must be replaced and the drive gear checked for damage</i>
Winding adaptor's rotation is 'stiff' or not-smooth	The meshing between the bevel pinion and drive gear is too tight	<i>Shims (part no. 20026) must be added or removed from between the rear housing bearing and the drive gear</i>
Winding adaptor rotates but the spring core does not compress and the pinion and core pack does not rotate.	The bevel pinion or the input shaft is broken	<i>The bevel pinion or input shaft must be replaced</i>
Winding the adaptor does not cause the spring pack to compress or the drive pinion to move forward to engagement (the drive pinion does however rotate)	The drive ratchet is broken or the circlip has come loose	<i>Fit new ratchet or circlip as appropriate</i>
	The pinion is jammed on the drive shaft due to burring on five start thread or due to excessive rust	<i>Burring can be removed with a grinding stone or a new drive shaft fitted</i>
Operation is normal up to compression of spring pack, but starter then discharges prematurely before pack is fully compressed	The lock height is incorrect	<i>Adjust lock to correct height, using lock height gauge.</i>
	The lock and/or ratchet are worn	<i>Replace worn component(s)</i>

## Jammed Starter

FAULT	CAUSE	ACTION
The starter jams during compression of the spring pack or fails to discharge on tripping	The drive shaft or drive nut threads are worn causing the ball bearings to jam between the nut and the shaft.	Set trip lever to vertical position. Turn the Winding Adaptor anti-clockwise, until the white springs are visible through the window.
<u>If</u> the starter still cannot be discharged	Place the starter in a strong wooden box and contact IPU for further instructions.	

**WARNING** Do NOT attempt to dismantle a jammed starter as this is extremely dangerous and requires expert attention. Please contact your local IPU agent. Also keep your fingers away from the pinion.

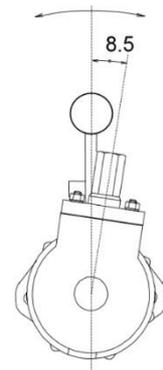
## Position Code Procedure

The winding handle position relative to the angle of the nose sub-assembly can be rotated through 360°, in 8.5° steps, to achieve the best winding position. Starters are made to a pre-set position in the factory that should be right for your application. If however, you require an alternative position follow the steps below:

1. For the factory built position code, refer to outline or general arrangement drawing.
2. For an alternative position code, decide on the angle between the release lever and input adaptor to suit your application (e.g. your selected angle = +10°).
3. Select the nearest position code from the table below (e.g. 8.5°+ = 2B).
4. To achieve the selected (2B) position code, align the hole next to the letter '0' at the front end of the body, against the hole designated '2' on the front housing. Use the correct through bolt to secure the front mounting bracket, the housing and the body in this position. (Note: For starter without separate mounting bracket secure housing assembly to the body).
5. Place the rear housing on the body and align the radial hole 'B' against the letter '0' on the body. Secure the body and the rear housing in this position.
6. Fit the remaining screws and tighten to a torque of 6-8 Nm.

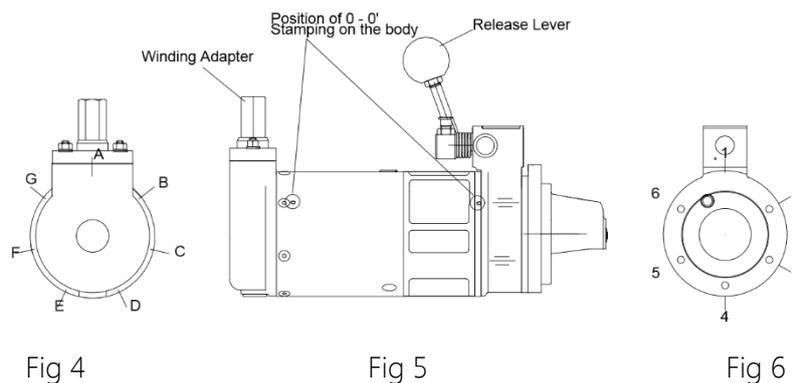
Clockwise is + angle;  
anti-clockwise is –  
angle

Datum line



## Position Code Table

Code	Angle '+'	Code	Angle '-'
1A	0	1A	0
2B	8.6	6G	8.6
3C	17.1	5F	17.1
4D	25.7	4E	25.7
5E	34.2	3D	34.2
6F	42.9	2C	42.9
1G	51.4	1B	51.4
2A	60	6A	60
3B	68.6	5G	68.6
4C	77.1	4F	77.1
5D	85.7	3E	85.7
6E	94.2	2D	94.2
1F	102.9	1C	102.9
2G	111.6	6B	111.6
3A	120	5A	120
4B	128.6	4G	128.6
5C	137.1	3F	137.1
6D	145.7	2E	145.7
1E	154.2	1D	154.2
2F	162.9	6C	162.9
3G	171.4	5B	171.4
4A	180	4A	180

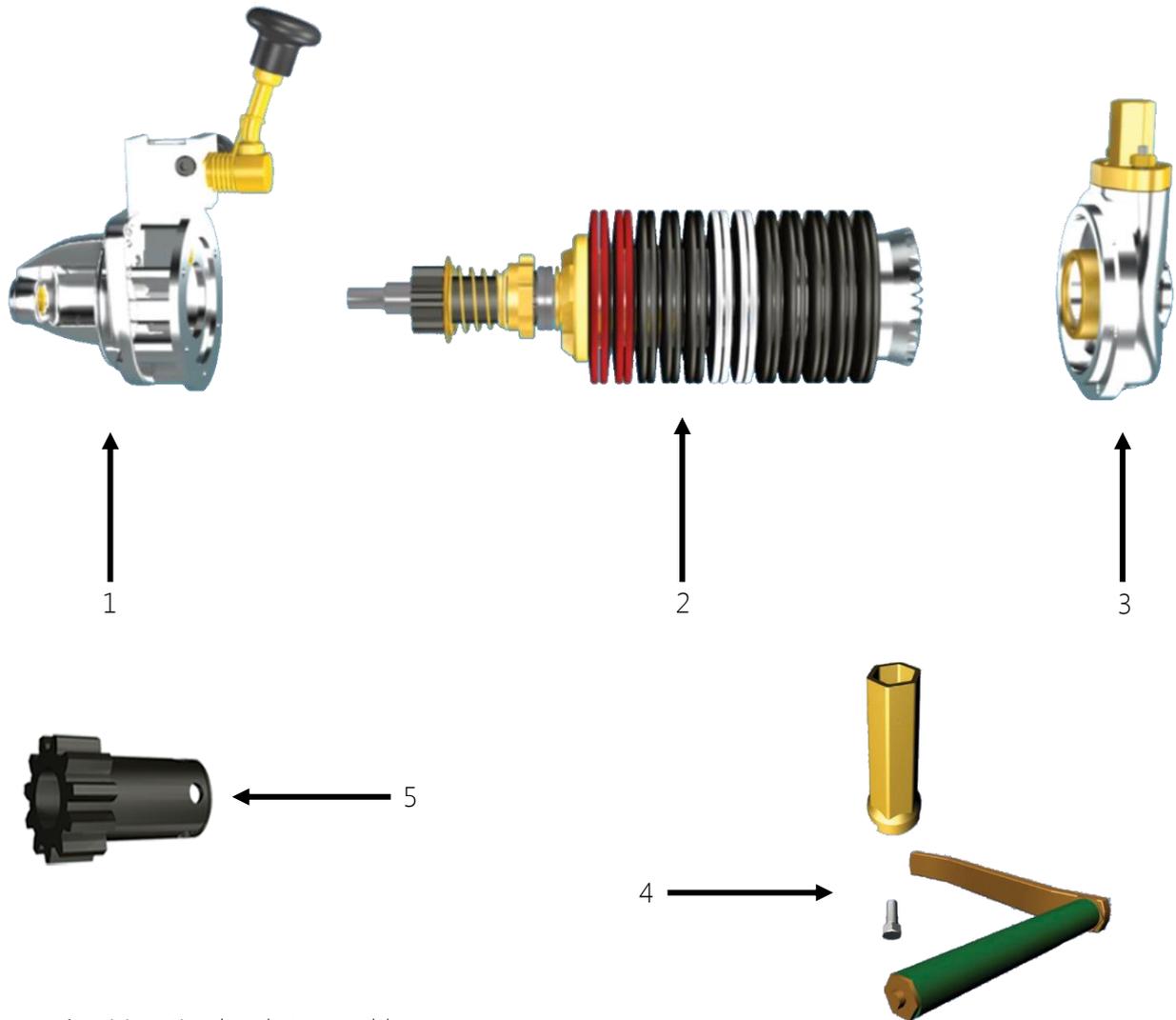


Note: The six through holes on the front housing are designated by numbers 1 to 6 clockwise, looking from the rear of the housing (Fig 6).

The seven radial tapped holes on the rear housing are designated by letters A to G clockwise, looking from the rear of the housing (Fig 4).

On the starter body, only two of the holes at either end are in line. These are marked with 'O' next to each hole (Fig 5).

## Appendix 1: Replacement Parts List



1. Mounting bracket assembly
2. Core assembly
3. End housing assembly
4. Cranking handle assembly
5. Pinion

## Appendix 2: Important Operating Instructions

### Storage Mounting



On some applications, the IPU spring starter is being tested while fitted to the storage bracket next to the engine.

This causes serious internal damage to the starter and will result in premature failure when later used on the engine.

Any damage caused by this action will not be covered under warranty. This bulletin does not apply to starters fitted permanently on any engine.

The starter should NOT be tested on the storage bracket under any circumstances. The starter may only be operated when properly fitted to the engine.

### Instructions for 'Dual -Start Engines'

On engines fitted with dual starting system, such as electrical and manual starter, the manual starter must not remain engaged with Flywheel when starting with the electric starter. Or when the engine starts automatically with electrical starter (such as on a ships emergency generator).

To ensure the starter is not engaged, leave the trip lever in the trip position when the starter is not in use. This will ensure that the starter pinion is not engaged with the engine flywheel.



Reset position

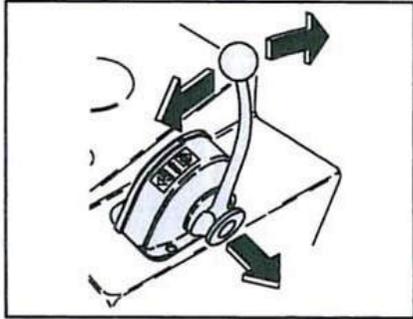


Trip position  
(when starter is not in use)

Failure to follow this action may damage the Starter. Any damage caused by this action will not be covered under warranty.

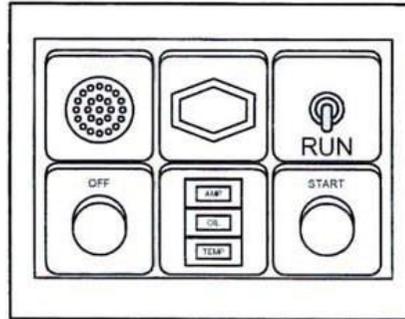
## Appendix 5: Anti-clockwise Starters

(1)



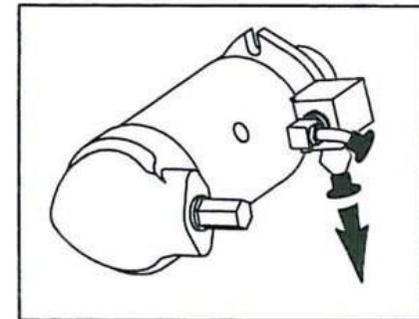
Pull hub out, move to full RPM.  
(forward or reverse)

(2)



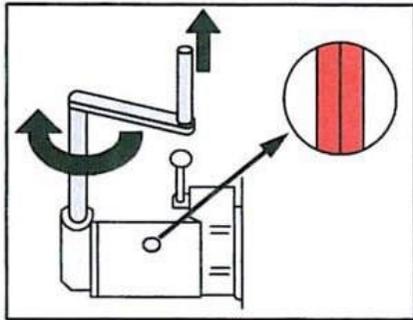
Switch main switch to 'run'

(3)



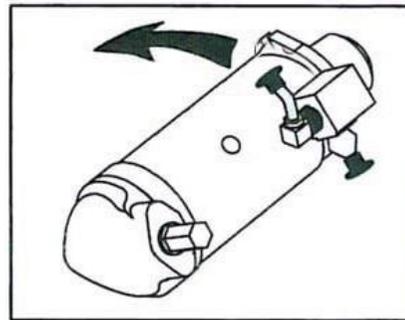
Pull the reset button. Trip lever  
will spring into reset position

(4)



Wind hand crank clockwise until  
red springs show in sight glass.  
Remove hand crank

(5)



Push trip lever to start engine

(TO UNWIND)



Turn hand crank  
counterclockwise until white  
springs show in sight glass.

Caution: - Do not dismantle or remove starter from engine unless fully unwound.  
- Once the spring starter is energised it must be released or unwound.  
- Do not attempt to use electric start with spring starter energised.

## Appendix 6: Routine Testing of IPU Starter

It is important to establish that the pinion has returned to its rest position (out of Engagement) after routine testing has been carried out. See instructions below.

1. Whilst winding, if the engine DOES rotate then please follow the procedure below;
2. With the 'trip' lever this time in 'Reset Position' unwind the starter anti-clockwise 2-3 turns
3. The Pinion will retract back to its Rest position (out of Engagement).
4. Once the above steps have been carried out, with the trip lever in 'trip' position, wind the starter clock-wise to ensure the Pinion is disengaged with flywheel ring-gear.
5. Rotate the winding handle a few more turns.
6. Observe that the WHITE spring is rotating and there is no rotational movement of the engine crankshaft.
7. If the engine crankshaft rotates, remove the starter from the engine.
8. Contact IPU Engineering, supplying full details by email to [ipu@ipu.co.uk](mailto:ipu@ipu.co.uk)

### IMPORTANT NOTICE

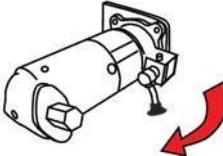
**IMPORTANT NOTICE**

After routine testing has been carried out with the manual starter, the drive pinion must be disengaged from the flywheel ring-gear.

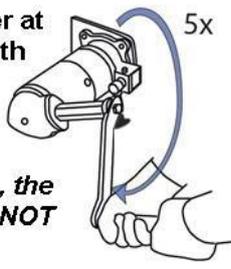
To ensure that the drive pinion is NOT engaged, the following steps must be taken:

**Step 1:**  
Ensure the engine is turned Off

**Step 2:**  
Trip Lever must be in 'Trip Position'



**Step 3:**  
Wind the starter at least 5 turns with the handle.



*Whilst winding, the engine should NOT rotate.*

## Contact Details

IPU Group

Cygnus Way

West Bromwich

West Midlands

B70 0XB

United Kingdom

Phone: +44 (0) 121 511 0460

Fax: +44 (0) 121 511 0401

Web: [www.ipu.co.uk/starting](http://www.ipu.co.uk/starting)

Email: [ipu@ipu.co.uk](mailto:ipu@ipu.co.uk)