



B. HEPWORTH
AND COMPANY LIMITED

**...performance wiper
systems...**

INSTALLATION AND MAINTENANCE

INSTRUCTIONS FOR THE

80NM COMPACT

SINGLE STATION

WINDSCREEN WIPER SYSTEM

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GENERAL INFORMATION AND SAFETY SUMMARY

As we will have no influence on the installation of complete windscreen wiper systems if installation is to be carried out by the customer, we are unable to accept liability for installation errors.

If you require any additional information or any special problems arise which the installation/maintenance instructions do not treat in sufficient detail please contact B. Hepworth and Co Ltd directly.

Safety Precautions

CAUTION! BEWARE OF INJURY!

BEFORE WORKING ON THE WIPER SYSTEM, OBSERVE THE FOLLOWING REMARKS WITHOUT FAIL!

Most wiper motors have a park setting, which permits them to default to the parked position if connected to the vehicle electrical system, even when the wiper is switched off. FOR THIS REASON, AT THIS POINT IN TIME, NEITHER MAY THE WIPER ARM BE MOUNTED, NOR MAY ANY PERSON HAVE HANDS, FINGERS, ETC ANYWHERE NEAR THE WIPER SYSTEM. Even small wiper motors can neither be braked nor stopped by hand.

NEVER REACH INTO THE AREA OF THE ROD LINKAGE WHEN THE SYSTEM IS RUNNING!

When putting into service (i.e. when connecting the wiper motor to the vehicle electrical system, even if the wiper switch is in the 0 position), never leave any loose items such as screwdrivers in the area of the wiper system, as flying objects could lead to injury.

Please ensure the equipment is handled with care. Do not drop or bang the equipment down on a hard surface taking extra care around the area where the motor shaft is situated. Do not hammer the motor shaft when installing the equipment, as this will cause the motor gear plate to deform causing premature failure of the unit.

Introduction

The Windscreen Wiper system utilised is detailed on the following pages. The primary components that form the Windscreen Wiper System are the wiper motor linkage, the wiper arm assemblies and wiper blades.

CHAPTER 1

Functional and Equipment Description of System

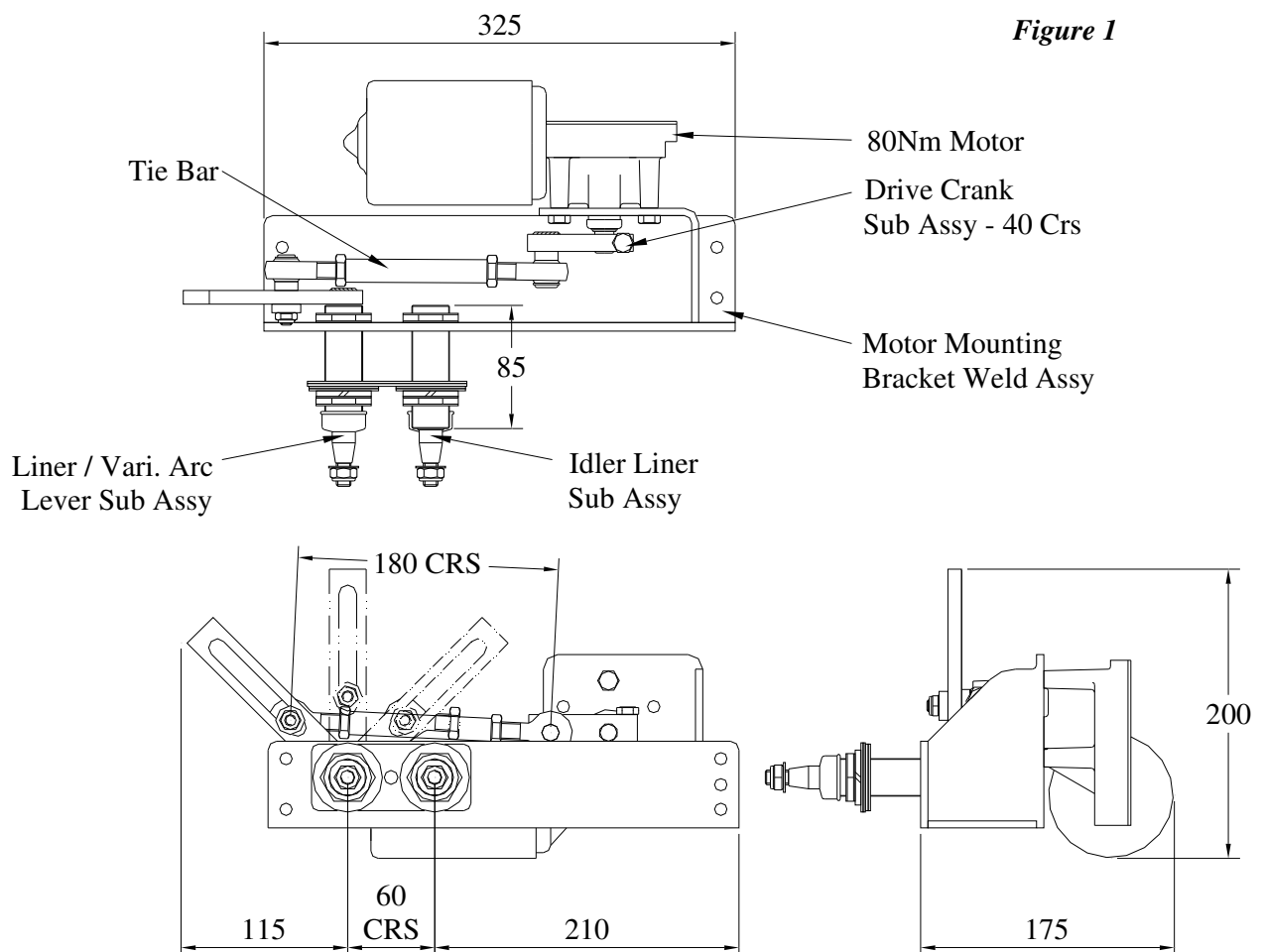
Wiper Motor Assembly

The wiper motor and bracket is shown in Figures 1. & 2. The electric wiper motor forms the central part of the windshield wiper system. The motor is mounted on a fabricated mild steel bracket which is polyester powder coated to prevent corrosion. The motor is connected electrically by means of a multi-pin connector. Ref Figure 3.

The drive lever is secured to the wiper motor shaft and connected through a tie bar, to the spindle lever assembly. These components transfer the motor shaft rotation to the wiper arm assemblies.

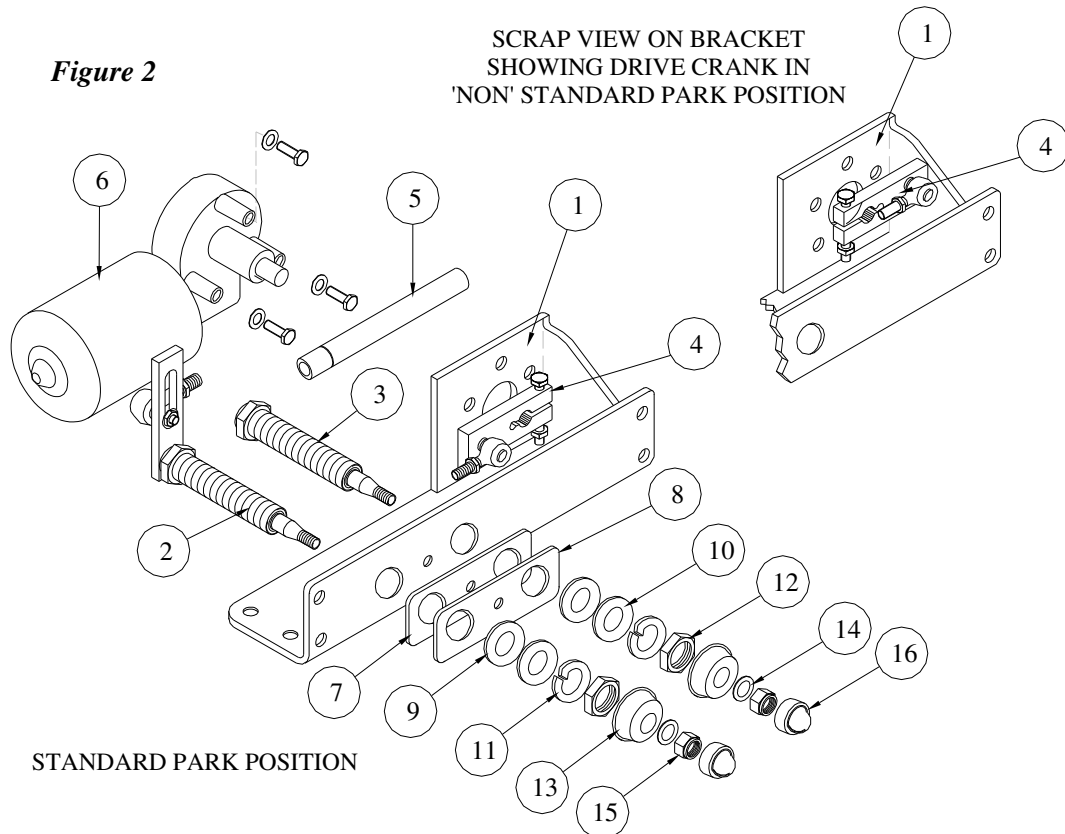
The drive mechanism provided transfers the rotary output from the motor; to a reciprocating motion of the spindles, this mechanism is zinc plated and is sized to give the correct angle of arc for the windscreen wiper arm being driven.

The Spindles that drive the wiper arms pass through the bulkhead, connecting the drive mechanism to the wiper arm; these are manufactured from stainless steel, to prevent corrosion. The spindles are driven from the main drive crank by connecting tie bars which distributes the load evenly between the arms of the wiper arm thus reduces the load on the individual interfaces between the wiper arm and the spindles.



Exploded View of Linkage

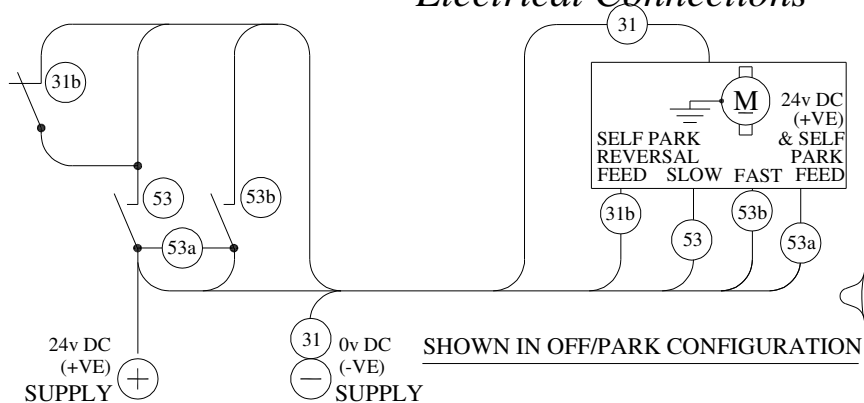
Figure 2



ITEM	DESCRIPTION	QTY
1	Motor Mounting Bracket	1
2	Liner V.Arc Lever Sub Assy	1
3	Idler Liner Sub Assy	1
4	Drive Crank Sub Assy 40 Crs	1
5	Tie Bar – 115mm Overall	1
6	80Nm (IER) Motor	1
7	Idler Plate - Gasket	1
8	Idler Plate	1

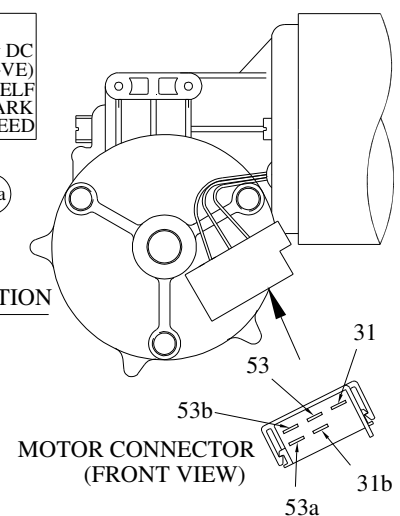
ITEM	DESCRIPTION	QTY
9	26mm Washer - Neoprene	2
10	26mm Washer – Flat	2
11	26mm Washer – Single Coil	2
12	M26 Hex. Nut	2
13	26mm Weather Cap	2
14	10mm Washer - Flat	2
15	M10 Nylock Nut	2
16	10mm Nut Weather Cap	2

Electrical Connections



WIRING CONNECTION CODE	
31	0v DC (-ve) Supply
53	Slow Speed
53b	Fast Speed
53a	24v DC (+ve) Supply & Self Park
31b	Self Park – Reversal Speed

Figure 3



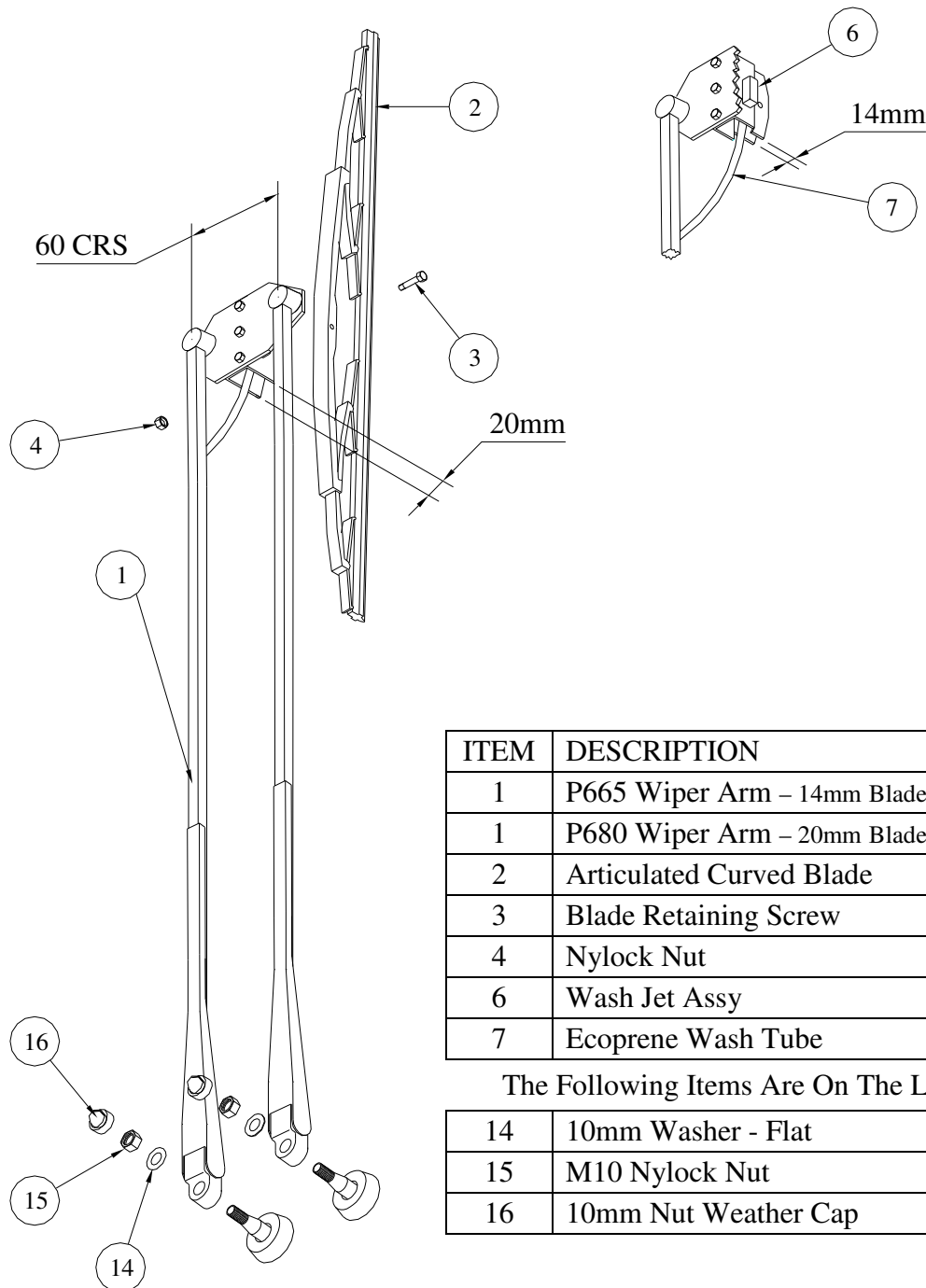
Wiper Arm Assembly

The wiper arm is manufactured from stainless steel and is polyester powder coated to prevent corrosion and to be of good appearance.

The wiper arm is shown in Figure 4. One wiper arm assembly is used on each unit. The wiper arm assembly mounts directly onto the spindles protruding through the bulkhead. The wiper arm is secured to the spindle via a series of nuts and washers.

The blade is secured to the arm assembly using the blade clip arrangement on the arm and blade bolt.

Figure 4 – Medium Duty Arm



ITEM	DESCRIPTION	QTY
1	P665 Wiper Arm – 14mm Blade Clip	1
1	P680 Wiper Arm – 20mm Blade Clip	1
2	Articulated Curved Blade	1
3	Blade Retaining Screw	1
4	Nylock Nut	1
6	Wash Jet Assy	1
7	Ecoprene Wash Tube	Metres

The Following Items Are On The Linkage

14	10mm Washer - Flat	2
15	M10 Nylock Nut	2
16	10mm Nut Weather Cap	2

Wiper Arm Assembly

The wiper arm is manufactured from stainless steel and is polyester powder coated to prevent corrosion and to be of good appearance.

The wiper arm is shown in Figure 4. One wiper arm assembly is used on each unit. The wiper arm assembly mounts directly onto the spindles protruding through the bulkhead. The wiper arm is secured to the spindle via a series of nuts and washers.

The blade is secured to the arm assembly using the blade clip arrangement on the arm and blade bolt.

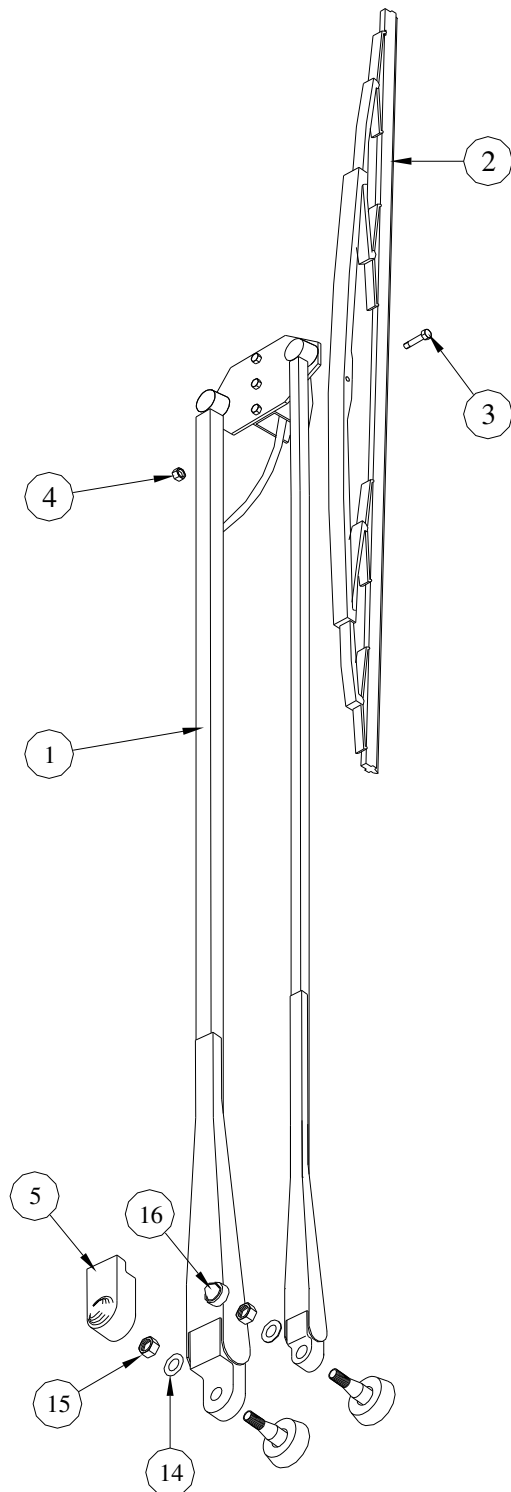


Figure 4 – Heavy Duty Arm

ITEM	DESCRIPTION	QTY
1	P84 Wiper Arm	1
2	Articulated Curved Blade	1
3	Blade Retaining Screw	1
4	Nylock Nut	1
5	Arm Head Weather Cap	1
6	Wash Jet Assy	1
7	Ecoprene Wash Tube	Metres

The Following Items Are On The Linkage

14	10mm Washer - Flat	2
15	M10 Nylock Nut	2
16	10mm Nut Weather Cap	2

CHAPTER 2

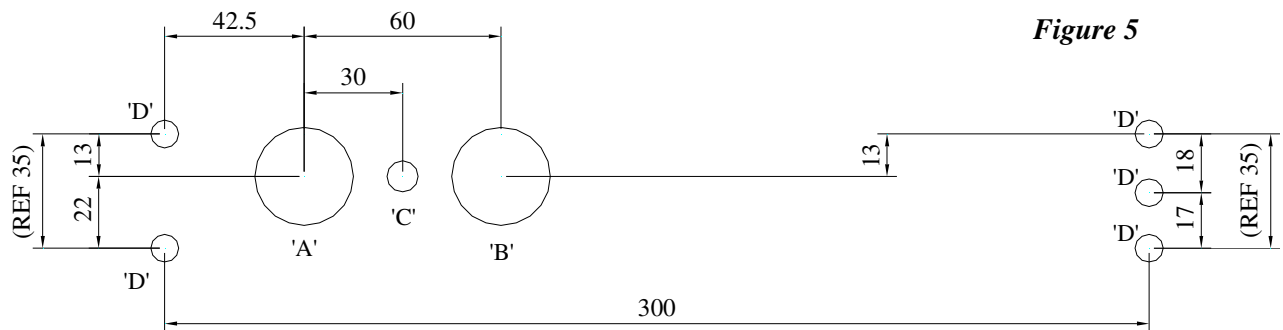
Installation Instructions

These instructions are meant as a guide. If you experience any difficulty in the fitting of these units, please do not hesitate to contact us for advice.

Drilling Diagram

NOTE - Drilling Diagram is NOT to size and is for reference only

DRILLING DIAGRAM - FOR 80Nm COMPACT UNITS



Drill holes 'A' and 'B' at Ø30mm (*Note Hole 'B' not required on Pendulum units*)

Drill hole 'D' at Ø8.5mm (*5 options shown*)

Drill hole 'C' at Ø9.5mm (*Only required if wash tube is fitted through bulkhead between spindles*)

Fitting the Wiper Motor Assembly

When the spindle positions have been drilled in the bulkhead, the following procedures apply.

With Reference to Figures 1 & 2, Pages 4 & 5.

1. Remove Weather Caps - (*Item 16*). M10 Nuts - (*Item 15*). Flat Steel Washers - (*Item 14*), Weather Caps - (*Item 13*). M26 Nuts - (*Item 12*). Single Coil Washers - (*Item 11*), Flat Steel Washers - (*Item 10*), Neoprene Washers - (*Item 9*), Idler Plate - (*Item 8*) and finally Idler Plate Gasket - (*Item 7*). NOTE: - Keep safe as will be required on assembly.

NOTE the Motor Unit is MOUNTED from INSIDE the Bulkhead.

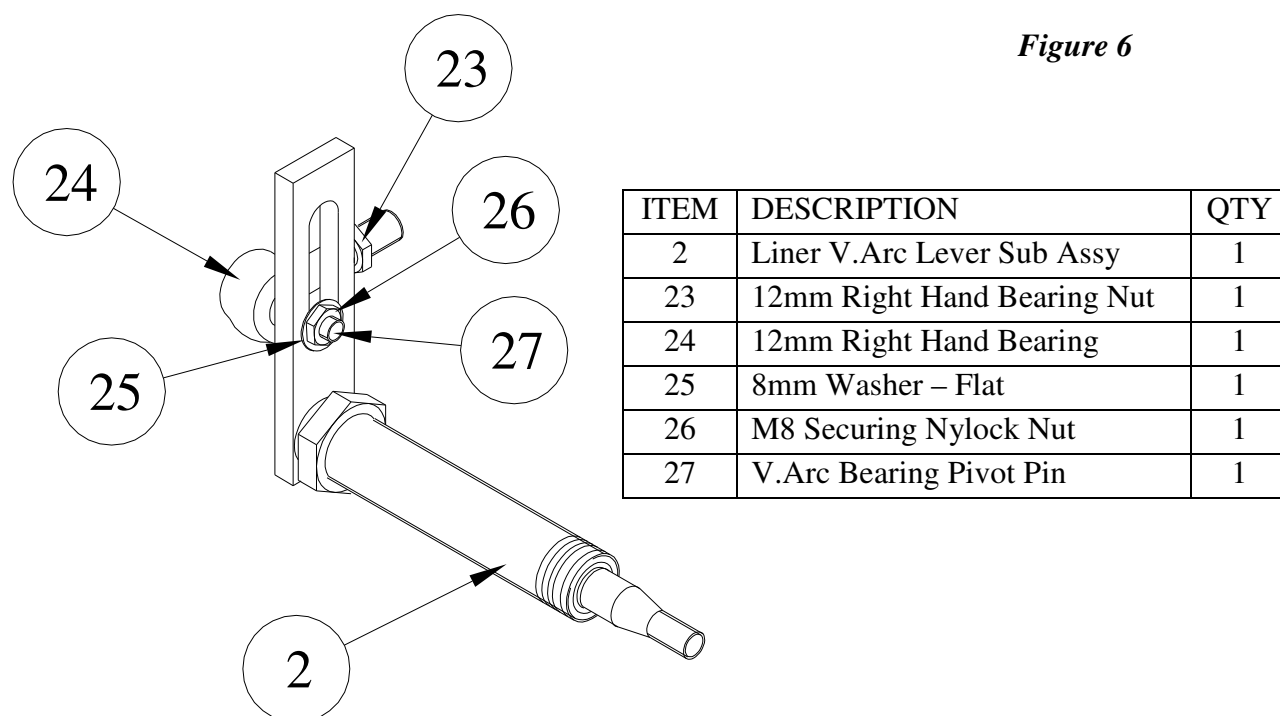
2. **From Inside Bulkhead** - Fit Motor Unit inside Bulkhead and fix in place through predrilled mounting holes (Fixing bolts not supplied).

3. **From Outside Bulkhead** - ENSURE a proprietary sealant (Not supplied) is used around all points of entry through bulkhead.
4. **Fit following items** - Idler Plate Gasket - (*Item 7*) and Idler Plate - (*Item 8*) over both Liners, next to bulkhead, then onto each Liner a Neoprene Washer - (*Item 9*), a Flat Steel Washer - (*Item 10*), a Single Coil Washer - (*Item 11*), a M26 Nut - (*Item 12*) and finally a Weather Cap - (*Item 13*).

Vari Arc Units - Arc adjustment

1. Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
2. Slacken Bearing Nuts at both ends of Tie Bar and Securing Nylock Nut - (*Item 26*) on Vari Arc Lever.
3. Slide Bearing/Tie Bar Assembly Pivot Pin - (*Item 27*) towards Liner/Spindle Assembly to INCREASE arc to 90° max or away from Liner/Spindle Assembly to DECREASE arc to 40° min.
4. Ensure you note markings on lever when correct arc is reached. **Important: Pantograph Systems must not exceed 90° arc of wipe**
5. Adjust arc until blade parks approximately 75mm from edge of screen when screen is dry. Test on a wet screen to prove clearance is acceptable.
6. Tighten Bearing Nuts at both ends of Tie Bar and Securing Nylock Nut - (*Item 26*) on Vari Arc Lever (Torque 18-20Nm)

IMPORTANT: Ensure BEARING CENTRES are as stated in drawing (Figure 1)



Electrical Connections

The 80Nm Marine Motor is available in either 12v or 24v DC, and are both, two speed self-parking motors with Insulated Earth Return as standard.

The motor should be connected through a two speed self-park multi speed control switch, a toggle switch or a rotary switch (not supplied – Can be ordered separately).

For Ships Supply's of nominal 110/120v AC 1 Phase – one of the following will be required

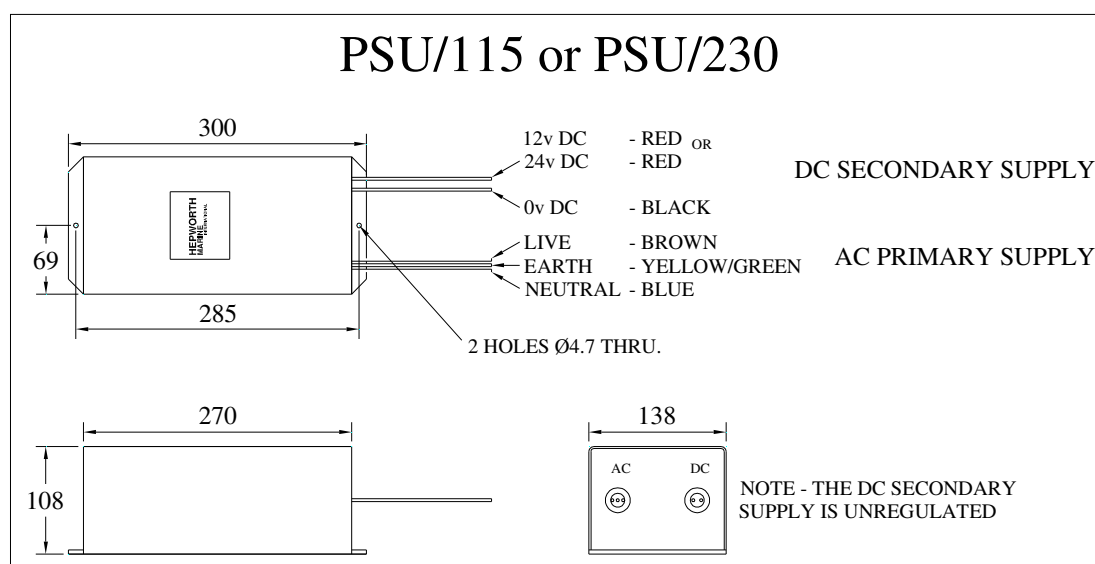
PSU/115/12/6	POWER SUPPLY UNIT-115v 12v 6amp	will power 1 Motor Unit
PSU/115/12/12	POWER SUPPLY UNIT-115v 12v 12amp	will power 2 Motor Units
PSU/115/24/6	POWER SUPPLY UNIT-115v 24v 6amp	will power 1 Motor Unit
PSU/115/24/12	POWER SUPPLY UNIT-115v 24v 12amp	will power 2 Motor Units

For Ships Supply's of nominal 220/240v AC 1 Phase – one of the following will be required

PSU/230/12/6	POWER SUPPLY UNIT-230v 12v 6amp	will power 1 Motor Unit
PSU/230/12/12	POWER SUPPLY UNIT-230v 12v 12amp	will power 2 Motor Units
PSU/230/24/6	POWER SUPPLY UNIT-230v 24v 6amp	will power 1 Motor Unit
PSU/230/24/12	POWER SUPPLY UNIT-230v 24v 12amp	will power 2 Motor Units

Note if more than 2 motors required – information of part number and supply details will be given on request

Wiring the Power Supply Unit (PSU)



AC Primary Side

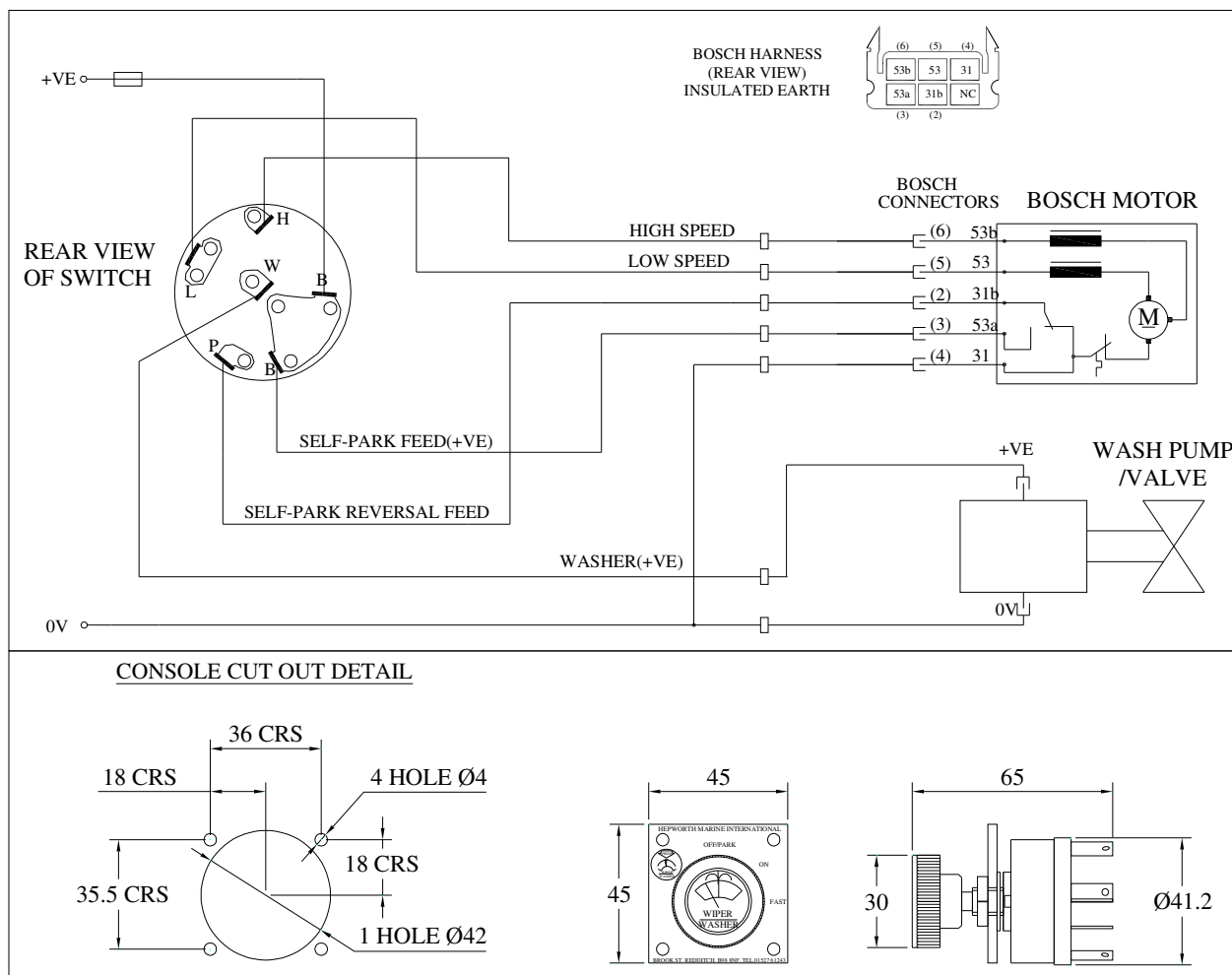
Connect the Live, Earth and Neutral wires on the AC Primary side of the Power Supply Unit to the Ships Supply -**110/120v AC 1 Phase** to a PSU/115 Unit, or **220/240v AC 1 Phase** to a PSU/230 Unit

DC Secondary Side

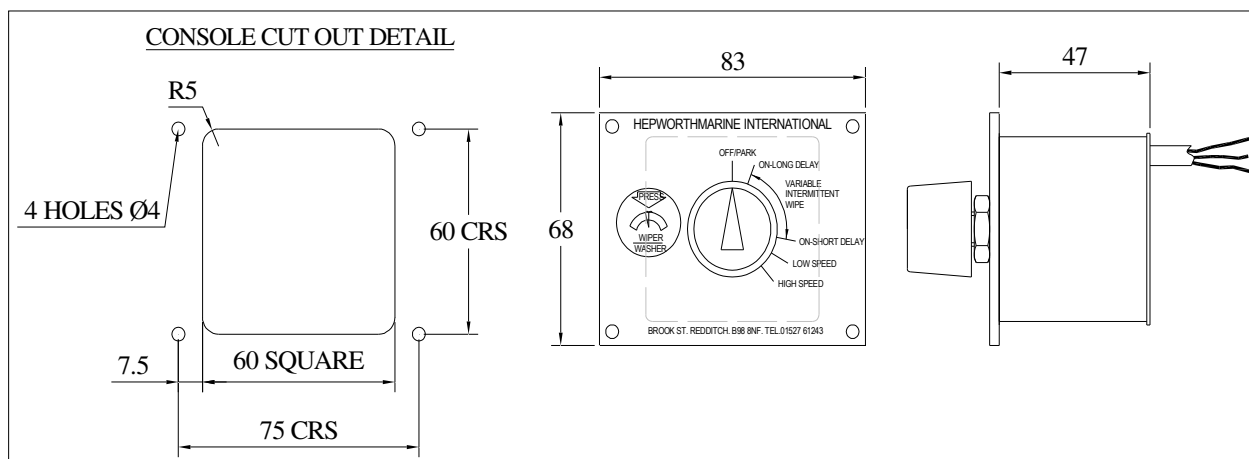
Connect the **12v** or **24v DC (+ ve)** to the Toggle, Rotary or Multi Speed Control Switch as the positive ship's supply

Connect the **0v DC (- ve)** to the Toggle, Rotary or Multi Speed Control Switch as the negative ship's supply

Wiring to a Rotary Switch

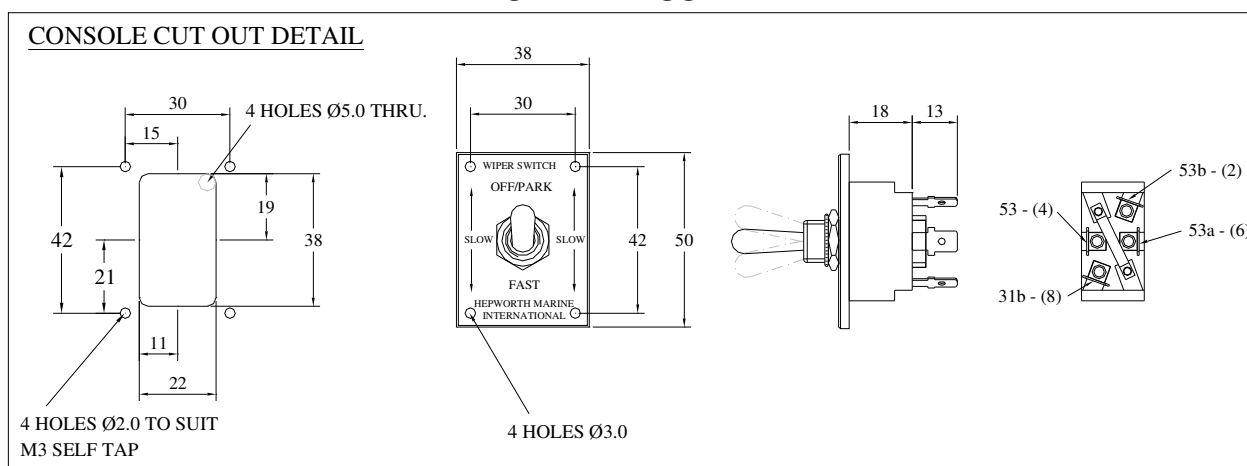


Wiring to a Multi Speed Control Switch



The RED wire on the switch	To terminal 53a on the motor - (SELF PARK FEED) and the positive ship's supply – 12v or 24v DC (+ ve)
The WHITE wire on the switch	To terminal 53b on the motor - (HIGH SPEED)
The YELLOW wire on the switch	To terminal 53 on the motor - (LOW SPEED)
The BLUE wire on the switch	To terminal 31b on the motor - (SELF PARK REVERSAL FEED)
The BLACK wire on the switch	To terminal 31 on the motor and the negative ship's supply – 0v DC (- ve)
The BROWN wire on the switch	To the Washer Pump (+ ve)

Wiring to a Toggle Switch

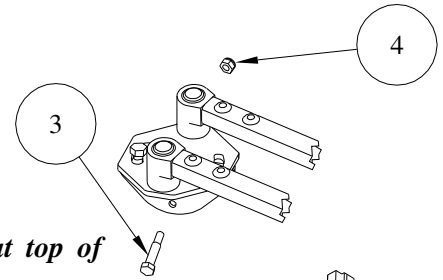


Position 8 on the switch	To terminal 31b on the motor (SELF PARK REVERSAL FEED)
Position 4 on the switch	To terminal 53 on the motor (LOW SPEED)
Position 6 on the switch	To terminal 53a on the motor (SELF PARK FEED) and the positive ship's supply – 12v or 24v DC (+ ve)
Position 2 on the switch	To terminal 53b on the motor (HIGH SPEED)
The negative ship's supply – 0v DC (- ve)	To terminal 31 on the motor

Fitting the Wiper Blade

With Reference to Figure 4, Page 6.

1. Remove Blade Retaining Screw - (Item 3) and Nut - (Item 4) from Blade Clip on arm.
2. Place Wiper Blade into Blade Clip on Arm.
(Note If only one end of blade rubber captive, it must be at top of screen.)
3. Ensure that all fixing holes align. Secure in place with Blade Retaining Screw - (Item 3) and Nut - (Item 4). Important DO NOT over torque Blade Screw and Nut, as Blade is required to pivot on glass.



The wiper blades should be changed every 6 months but this is dependent on use and operating conditions

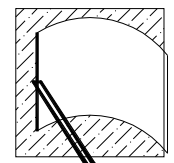
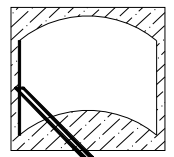
(Wiper Blades - Ref Table1, Page 15 & Table 2 – continued, Page 17)

Fitting the Wiper Arm Assembly

IMPORTANT: - the Blade must be fitted to the Arm prior to the Arm being fitted. (This is to prevent the Blade Clip damaging the screen,)

With Reference to Figure 4, Page 6.

1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly, then disconnect all Electrical Power.
2. **From Outside Bulkhead** - While Unit is being run, it is IMPORTANT to observe direction drive spindle rotates in immediately before it stops. This direction will give PARK POSITION.
3. Fit Arm onto Spindle allowing Blade to lie as shown in drawings approx 75mm from edge of glass in PARKED POSITION.
4. Fit a Flat Washer - (Item 14) on to spindle next to Arm Head, then a M10 Nylock Nut - (Item 15)
5. Only tighten Nut sufficiently to allow Arm and Blade to travel across glass when Motor is run to see if positioning is correct.
6. If incorrectly positioned - DO NOT ATTEMPT TO ROTATE OR TWIST ARM ON SPINDLE this will damage splined end of drive spindle, resulting in Arm and Blade slipping in operation.
7. To correct alignment errors, - loosen Nut and gently pull Arm up Spindle, realign and repeat stages above.
(Arm Extractor Tool is available see Figure7, Page 18 for instructions)
8. When correctly aligned, tighten Spindle Nut to 36-38Nm. Then fit Weather Caps supplied with Arm and Linkage.



CHAPTER 3

Maintenance

Introduction

This chapter contains all preventative maintenance and removal and replacement procedures for the windscreen wiper components. Preventative maintenance procedures include the information required to replace the wiper blades.

Safety Precautions

Always disconnect the power when servicing the Windscreen Wiper System, or on any ancillary components. Serious damage to the Equipment and/or Personal Injury may occur if the power is not disconnected.

Scheduled Maintenance Action Check

Table 1 is a Scheduled Maintenance Action Index. The index provides a list of all performance tests if applicable and preventative maintenance procedures. The table has three columns: Periodicity, Equipment and Task

The Periodicity column indicates the intervals between the maintenance tests and preventative maintenance procedures.

The equipment column lists the equipment, assembly or subassembly that corresponds to the maintenance action.

The task column lists the maintenance task to be performed.

Table 1

PERIODICITY	EQUIPMENT	TASK
Daily	Wiper Blades	Inspect wiper blades for damage, torn or missing rubber blades. Replace wiper blades as required
Daily	Windscreen Wiper System	Perform function test of wiper washer system. Do not carry out function test on a dry screen
Daily	Washer Tubing and Spray Nozzle	Inspect tubing for damage or loose connection on nozzle. Check operation of spray nozzle on windscreen
Daily	Wash Tank	Insure wash tank is filled with washer fluid to prevent wipers being used on a dry screen
3 Monthly	Fixings of wiper arm to wiper spindle	Check torque settings M10 = 36-38Nm
Six Monthly or As required	Wiper Blades	Replace wiper blades

Table 1- continued

PERIODICITY	EQUIPMENT	TASK
6 Monthly	Complete System	<p>Check all torque settings for complete wiper system:</p> <p>M8 = 18-20Nm (<i>Motor Bolts, Drive Crank, Fixing Nuts/Bolts & V.Arc Lever</i>)</p> <p>M10 = 36-38Nm (<i>Spindle Nut</i>)</p> <p>M12 = 28-30Nm (<i>Tie Bar</i>)</p> <p>M26 = 78-82Nm (<i>Liner - Steel Structure / Bulkhead</i>)</p> <p>M26 = 50-52Nm (<i>Liner - G.R.P.</i>)</p> <p>Carry out a visual check for wear in rod end</p>

CHAPTER 4

Troubleshooting

Introduction

This chapter provides all the instructions and information necessary to locate problems and conduct tests on the windscreen wiper system components. The trouble-shooting chart is provided for logical isolation of faults.

Safety Precautions

Always disconnect the power when servicing the Windscreen Wiper System, or on any ancillary components. Serious damage to the Equipment and/or Personal Injury may occur if the power is not disconnected.

Troubleshooting Procedures

Typical windshield wiper system troubleshooting procedures are contained in Table 2. These troubleshooting and repair procedures should be followed when encountering operational problems with the windshield wiper system

Table 2

SYMPTOM	PROBABLE CAUSE	TESTS AND CHECKS	CORRECTIVE ACTION
Wiper motor fails to start	On/off switch	Check position of switch	Turn switch to on position
	Voltage Level	Check supply voltage to switch. Check wiring and switch connections	Replace switch. Correct loose wiring connections. Replace broken wires
	System Jammed	Check wiper linkage	Release linkage. Release wiper arm
	Defective wiper motor		Replace motor
Motor shaft turns but linkage & arm remain static	Defective or loose drive crank	Check linkage for a loose drive crank	Secure or replace drive crank. (Clean motor output shaft with wire brush before replacing.)

Table 2 - Continued

SYMPTOM	PROBABLE CAUSE	TESTS AND CHECKS	CORRECTIVE ACTION
System operates but wiper arm remains static	Wiper arm	Check for loose wiper arm connection onto drive spindle	Secure or replace wiper arm (Clean spline on spindles with wire brush before replacing.) Torque to M10 = 36-38Nm
Slow Motor Operation	Voltage Level Switch Motor Bracket Linkage Defective Wiper Motor	Check for 12v or 24v DC supply to wiper system Check for broken bracket Check to see if Linkage is free moving	Correct voltage supply problem Replace faulty switch Replace defective bracket Free linkage replace worn or damaged components Replace Wiper Motor
Erratic Motor	Voltage level Switch Wiring	Check for 12v or 24v DC supply to wiper system Check for loose or broken wires	Correct voltage supply problem Replace faulty switch Repair or replace wiring up to motor. Replace motor if this wiring is damaged
Arm and Blade not operating correctly or over sweep operation	Voltage level Linkage Spindle Arm Blade	Check for 12v or 24v DC supply to wiper system Check for worn or broken linkage Check for excessive wear in spindle Check that arm is not loose on spindle Check for excessive wear on arm Check fixing for wear Check blade for wear Check for excessive smearing on screen	Correct voltage supply problem Replace Linkage Replace Spindle Re-tighten Spindle Replace Arm. (Clean spline on spindles with wire brush before replacing.) Replace Blade Replace Blade Replace Blade
Washer system not working correctly	No water from jets	Check water level in tank Check for damage to tank Check Pump is operational	Fill tank Replace tank Replace pump if faulty

CHAPTER 5

Maintenance Instructions

IMPORTANT NOTE:

Before replacing the Drive Crank, Motor, Tie Bar or Liner/Lever Sub Assemblies, it is necessary to remove the entire Wiper Motor Unit from the Bulkhead

Retain all items removed in a safe place, as they will be required on reassembly. If you experience any difficulty in fitting these units, please do not hesitate to contact us for advice. Use the drawings for reference.

To Remove the Entire Wiper Motor Unit Assembly

With Reference to Figures 1 & 2, Pages 4 & 5.

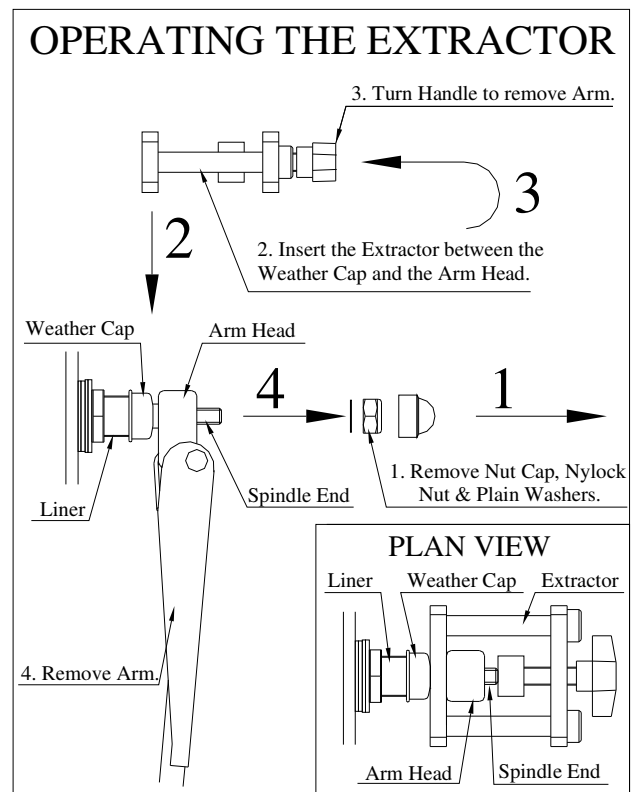
Figure 7

Removal

1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly; then disconnect all Electrical Power. Disconnect wiring from Motor.

IMPORTANT: Please make a note of PARKED position of ARMS and BLADES, before removal

2. **From Outside Bulkhead** - Remove Arm Caps, Nuts and Washers. Then using Arm Extraction Tool carefully remove Arms
3. Remove 26mm Weather Caps - (*Item 13*), M26 Nuts - (*Item 12*), 26mm Single Coil Washers - (*Item 11*), 26mm Flat Steel Washers - (*Item 10*) 26mm Neoprene Washers - (*Item 9*), Idler Plate - (*Item 8*) and finally Idler Plate Gasket - (*Item 7*).
4. **From Inside Bulkhead** - Unscrew Fixing Bolts from Motor Mounting Bracket - (*Item 1*).
5. Carefully remove entire Wiper Motor Unit from Bulkhead.



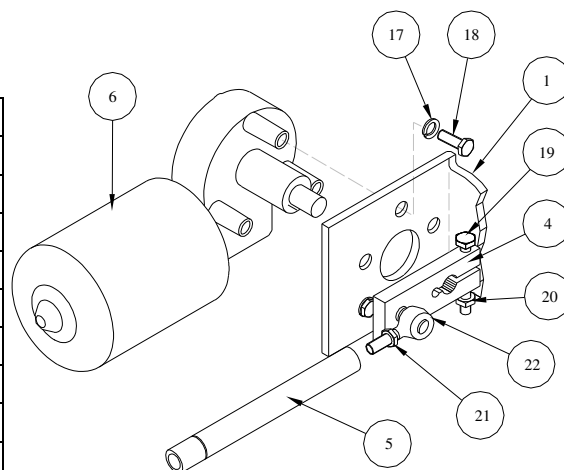
Replacement

1. **From Inside Bulkhead** – Fit Motor Unit, through predrilled mounting holes and fix in place. (Fixing bolts not supplied)
2. **From Outside Bulkhead** - ENSURE a proprietary sealant (Not supplied) is used around all points of entry through bulkhead.
3. **Fit following items on to Liners- next to bulkhead**, Idler Gasket - (*Item 7*), Idler Plate - (*Item 8*), a Neoprene Washer - (*Item 9*), a Flat Steel Washer - (*Item 10*), a Single Coil Washer - (*Item 11*), a Nut - (*Item 12*) and a Weather Cap - (*Item 13*).

To Replace the Drive Crank Assembly

Figure 8

ITEM	DESCRIPTION	QTY
4	Drive Crank Sub Assy 40 Crs	1
5	Tie Bar – 115mm Overall	1
6	80Nm 24v (IER) Motor	1
17	8mm Washer – Single Coil	3
18	M8 Fixing Bolts	3
19	M8 Securing Bolt	1
20	M8 Securing Nylock Nut	1
21	M12 Left Hand Bearing Nut	1
22	M12 Left Hand Bearing	1



Removal

1. From Inside Bulkhead - Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
2. Carefully remove entire Wiper Motor Unit from Bulkhead.
(With reference to page 14.)
3. IMPORTANT: Please make a note of Drive Crank POSITION relative to SPINDLE LEVER, as this will affect PARK position for ARMS and BLADES, i.e. SPINDLE LEVER facing towards Motor or away from Motor
4. From Front of Unit - Slacken both Bearing Nuts at either end of Tie Bar.
5. Slacken Drive Crank Nut - (Item 20), and Bolt - (Item 19), carefully remove Drive Crank/Bearing Assy - (Item 4), from Motor Drive Shaft.
6. Unscrew Tie Bar - (Item 5) from Drive Crank Bearing (Left Hand Thread) - (Item 22)

Replacement

1. From Front of Unit - Screw Tie Bar onto Bearing (Left Hand Thread) - (Item 22) of NEW Drive Crank/Bearing Assy - (Item 4).
2. Carefully fit Drive Crank/Bearing Assy - (Item 4), over Motor Drive Shaft, (referring to Note after operation 2 on 'To Remove' for position.) Tighten Drive Crank Nut - (Item 20), and Bolt - (Item 19).
3. Tighten both Bearing Nuts at either end of Tie Bar.

IMPORTANT: Ensure BEARING CENTRES are as stated in drawing (Figure 1)

4. **From Inside Bulkhead** - Replace entire Wiper Motor Unit into Bulkhead
(Refer to replacement instructions, Page 18).
5. **From Outside Bulkhead** - Replace Washers, Nuts and Weather Caps on Liners. Replace Arm and Blade (Refer to fitting instructions for replacement Page 14.)

To Replace the Wiper Motor

Removal

1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
2. Carefully remove entire Wiper Motor Unit from Bulkhead
(*With reference to page 14.*)

IMPORTANT: Please make a note of Drive Crank POSITION relative to SPINDLE LEVER, as this will affect PARK position for ARMS and BLADES, i.e. SPINDLE LEVER facing towards Motor or away from Motor

3. **From Front of Unit** - Slacken both Bearing Nuts at either end of Tie Bar.
4. Slacken Drive Crank Nut - (*Item 20*), and Bolt - (*Item 19*), carefully remove Drive Crank/Bearing Assy - (*Item 4*), from Motor Drive Shaft.
5. Unscrew three fixing bolts - (*Item 18*) and remove with washers - (*Item 17*) remove Wiper Motor - (*Item 6*)

Replacement

1. From Rear of Unit - Replace Wiper Motor - (*Item 6*) replace and tighten three fixing bolts - (*Item 18*) and washers- (*Item 17*)
2. From Front of Unit - Carefully fit Drive Crank/Bearing Assy - (*Item 4*), over Motor Drive Shaft, (*referring to Note after operation 2*) on 'Removal' for position. Tighten Drive Crank Nut - (*Item 20*), and Bolt - (*Item 19*).
3. Tighten both Bearing Nuts at either end of Tie Bar.

IMPORTANT: Ensure BEARING CENTRES are as stated in drawing (Figure 1)

4. **From Inside Bulkhead** - Replace entire Wiper Motor Unit into Bulkhead
(Refer to replacement instructions, *Page 18*).
5. **From Outside Bulkhead** - Replace Washers, Nuts and Weather Caps on Liners. Replace Arm and Blade (*Refer to fitting instructions for replacement Page 14.*)

To Replace the Tie Bar

Removal

1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
2. Carefully remove entire Wiper Motor Unit from Bulkhead.
(*With reference to page 14.*)

IMPORTANT: Please make a note of Drive Crank POSITION relative to SPINDLE LEVER, as this will affect PARK position for ARMS and BLADES, i.e. SPINDLE LEVER facing towards Motor or away from Motor

3. ***From Front of Unit*** - Slacken both Bearing Nuts at either end of Tie Bar.
4. Slacken Drive Crank Nut - (*Item 20*), and Bolt - (*Item 19*), carefully remove Drive Crank/Bearing Assy - (*Item 4*), from Motor Drive Shaft.
5. Unscrew Tie Bar - (*Item 5*) from Drive Crank Bearing (Left Hand Thread) - (*Item 22*)
6. Repeat operation 5 on Liner/Lever/Bearing Assy (Right Hand Thread) and remove Tie Bar- (*Item 5*),

Replacement

1. ***From Front of Unit*** - Screw NEW Tie Bar (NOTE groove is on Right Hand end of Tie Bar) onto Bearing (Right Hand Thread) at Liner/Lever/Bearing Assy.
2. Screw NEW Tie Bar on to Bearing (Left Hand Thread) - (*Item 22*) of Drive Crank/Bearing Assy.
3. Carefully fit Drive Crank/Bearing Assy - (*Item 4*), over Motor Drive Shaft, (***referring to Note after operation 2***) on 'Removal' for position. Tighten Drive Crank Nut - (*Item 20*), and Bolt - (*Item 19*).
4. Tighten both Bearing Nuts at either end of Tie Bar.

IMPORTANT: Ensure BEARING CENTRES are as stated in drawing (Figure 1)

5. ***From Inside Bulkhead*** - Replace entire Wiper Motor Unit into Bulkhead (Refer to replacement instructions, ***Page 18***).
6. ***From Outside Bulkhead*** - Replace Washers, Nuts and Weather Caps on Liners. Replace Arm and Blade (***Refer to fitting instructions for replacement Page 14.***)

To Replace the Lever/Liner/Spindle Sub Assembly

Removal

1. ***From Inside Bulkhead*** - Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
2. Carefully remove entire Wiper Motor Unit from Bulkhead.
(***With reference to page 14.***)

IMPORTANT: Please make a note of Drive Crank POSITION relative to SPINDLE LEVER, as this will affect PARK position for ARMS and BLADES, i.e. SPINDLE LEVER facing towards Motor or away from Motor

3. Slacken both Bearing Nuts on Tie Bar.

IMPORTANT: Make a note of the protrusion length of the Liner and/or Spindle from the front of the Bracket - (*Item 1*),

4. Unscrew Tie Bar from Right Hand Bearing of Liner/Lever/Bearing Assy.
5. Unscrew remove entire Liner/Lever/Bearing Assy from Bracket.

Replacement

1. Screw entire Liner/Lever/Bearing Assy into Bracket..
2. Screw Tie Bar onto Right Hand Bearing at Main Liner/Lever/Bearing Assy.
3. Tighten both Bearing Nuts on Tie Bar.

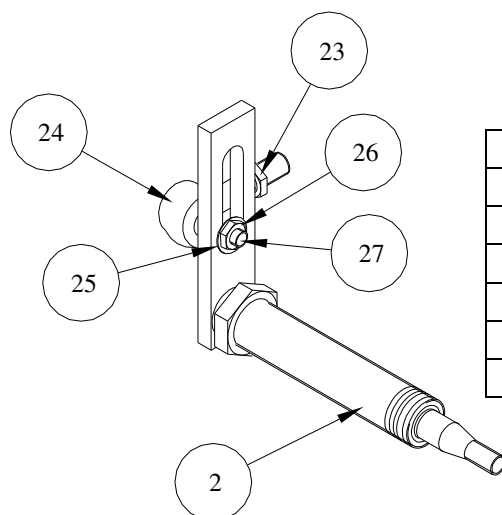
IMPORTANT: Ensure BEARING CENTRES are as stated in drawing (Figure 1)

4. **From Inside Bulkhead** - Replace entire Wiper Motor Unit into Bulkhead (Refer to replacement instructions, *Page 18*).
5. **From Outside Bulkhead** - Replace Washers, Nuts and Weather Caps on Liners. Replace Arm and Blade (*Refer to fitting instructions for replacement Page 14.*)

Vari Arc Units - Arc adjustment

7. Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
8. Slacken Bearing Nuts at both ends of Tie Bar and Securing Nylock Nut - (*Item 26*) on Vari Arc Lever.
9. Slide Bearing/Tie Bar Assembly Pivot Pin - (*Item 27*) towards Liner/Spindle Assembly to INCREASE arc to 90° max or away from Liner/Spindle Assembly to DECREASE arc to 40° min.
10. Ensure you note markings on lever when correct arc is reached. **Important: Pantograph Systems must not exceed 90° arc of wipe**
11. Adjust arc until blade parks approximately 75mm from edge of screen when screen is dry. Test on a wet screen to prove clearance is acceptable.
12. Tighten Bearing Nuts at both ends of Tie Bar and Securing Nylock Nut - (*Item 26*) on Vari Arc Lever (Torque 18-20Nm)

IMPORTANT: Ensure BEARING CENTRES are as stated in drawing (Figure 1)



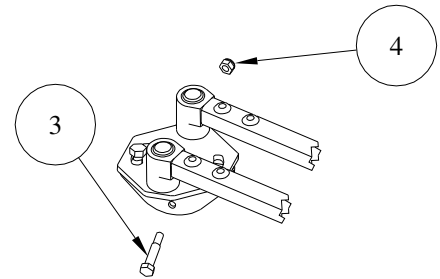
ITEM	DESCRIPTION	QTY
2	Liner V.Arc Lever Sub Assy	1
23	12mm Right Hand Bearing Nut	1
24	12mm Right Hand Bearing	1
25	8mm Washer – Flat	1
26	M8 Securing Nylock Nut	1
27	V.Arc Bearing Pivot Pin	1

To Replace the Wiper Blade

Removal

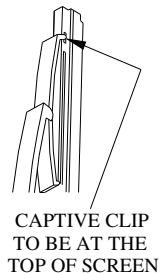
With Reference to Figure 4, Page 6.

1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
2. **From Outside Bulkhead** - Carefully pull Wiper Arm Assembly away from windscreen to enable access to Wiper Blade.
3. Undo M4 Nylock Nut - (Item 4), remove it and Blade Retaining Screw - (Item 3)
4. Remove Blade from Blade Clip on Arm.



Replacement

1. **From Outside Bulkhead** - Replace Wiper Blade - (Item 2) into Blade Clip (Note If only one end of blade rubber captive, it must be at top of the screen.)
2. Ensure that all fixing holes align. Secure in place with Blade Retaining Screw - (Item 3) and Nut - (Item 4). Important DO NOT over torque Blade Screw and Nut, as Blade is required to pivot on glass.



The wiper blades should be changed every 6 months but this is dependent on use and operating conditions. (Wiper Blades - Ref Table1, Page 15 & Table 2 – continued, Page 17)

To Replace the Wiper Arm

Removal

With Reference to Figure 4, Page 6.

1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly; then disconnect all Electrical Power.
2. **From Outside Bulkhead** - While Unit is being run it is IMPORTANT to observe direction drive spindle rotates in, immediately before it stops. This direction will give PARK POSITION.
3. Remove 10mm Nut Cap(s) - (Item 16), M10 Nylock Nut(s) - (Item 15) and 10mm Flat Washer(s) - (Item 14). Then using Arm Extraction Tool carefully remove Arm (Arm Extractor Tool is available see Figure 7, Page 18 for instructions)

Replacement

IMPORTANT: - the Blade must be fitted to the Arm prior to the Arm being fitted. (This is to prevent the Blade Clip damaging the screen,)

(Refer to fitting instructions for replacement, Page 14)

CHAPTER 6

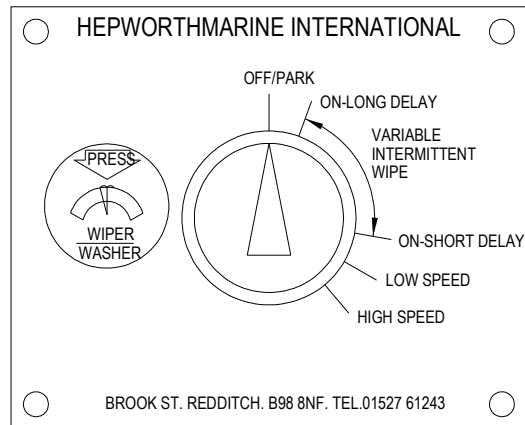
Operation Instructions

Switch Operation – Multi-Switch

1. Check switch is in the off position before starting. (**OFF/PARK**)

IMPORTANT DO NOT RUN WIPERS ON A DRY SCREEN.

2. To apply water to the screen, press the knob. (**WIPER WASHER**) This will apply water for the duration of pressing the button. The wiper will also operate for 3-4 wipes at normal speed after the water stops.
3. Turn the knob **CLOCKWISE** it will (**CLICK**) which turns the wipers on. The switch is now in the area of variable intermittent wipe cycle time. Which is between the (**ON-LONG DELAY**) and (**ON-SHORT DELAY**) positions.



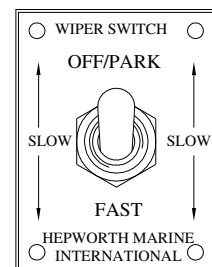
4. The further clockwise the knob is turned between the two positions shorter the delay between the wipes.
5. Turn the knob **CLOCKWISE** to the next (**CLICK**) (**LOW SPEED**) gives a continuous wipe across the screen at a standard speed, with no delay between the wipes.
6. Turn the knob **CLOCKWISE** to the last (**CLICK**) (**HIGH SPEED**) gives a continuous wipe across the screen at a faster speed, with no delay between the wipes.
7. Turn the knob **ANTI-CLOCKWISE** to the off position when finished. (**OFF/PARK**)

Switch Operation – Toggle Switch

1. Check switch is in the off position before starting. (**OFF/PARK**)

IMPORTANT DO NOT RUN WIPERS ON A DRY SCREEN.

2. This Switch does not control water.
3. Pushing the Toggle to the centre position (**SLOW**) gives a continuous wipe across the screen at a standard speed, with no delay between the wipes.



4. Pushing the Toggle to the bottom position (**FAST**) gives a continuous wipe across the screen at a faster speed, with no delay between the wipes.
5. Push the Toggle to the top position when finished. (**OFF/PARK**)

Switch Operation – Rotary Switch

1. Check switch is in the off position before starting. (**OFF/PARK**)

IMPORTANT DO NOT RUN WIPERS ON A DRY SCREEN.

2. To apply water to the screen, press the knob. (**WIPER WASHER**) This will apply water for the duration of pressing the button. (Note – it does not activate the wiper)
3. Turn the knob **CLOCKWISE** it will (**CLICK**) which turns the wipers on, (**ON**). This setting gives a continuous wipe across the screen at a standard speed, with no delay between the wipes.
4. Turn the knob **CLOCKWISE** to the last (**CLICK**) (**FAST**). This setting gives a continuous wipe across the screen at a faster speed, with no delay between the wipes.
5. Turn the knob **ANTI-CLOCKWISE** to the off position when finished. (**OFF/PARK**)

Note – for other all other switch or control instructions refer to the ship's fitters/suppliers manual.

