



B. HEPWORTH
AND COMPANY LIMITED

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

INSTALLATION AND MAINTENANCE

INSTRUCTIONS FOR THE

2NM 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

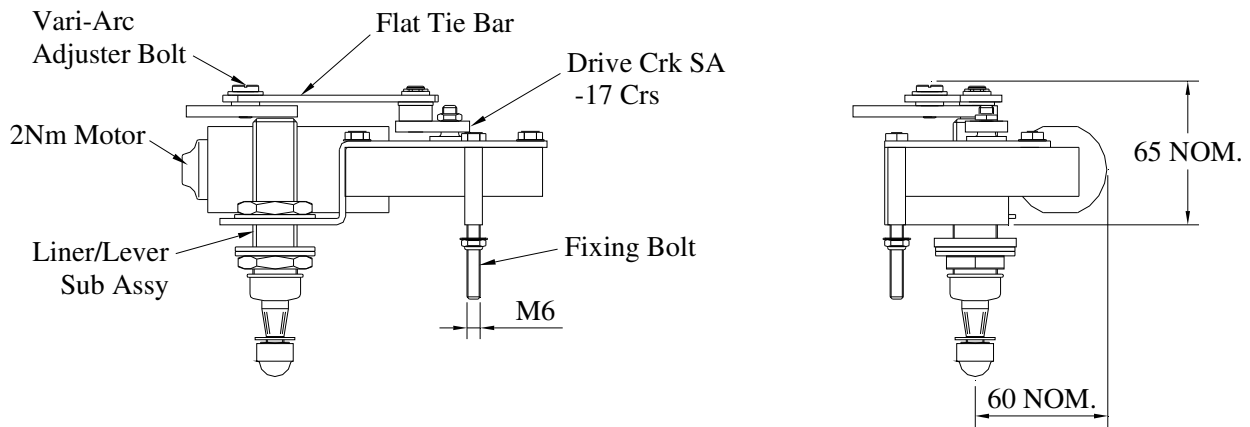
The wiper motor and bracket are shown on pages 4 & 5. The electric wiper motor forms the central part of the windshield wiper system. The motor is mounted on a fabricated mild steel bracket which is polyester powder coated to prevent corrosion. The motor is connected electrically by means of a multi-pin connector.

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

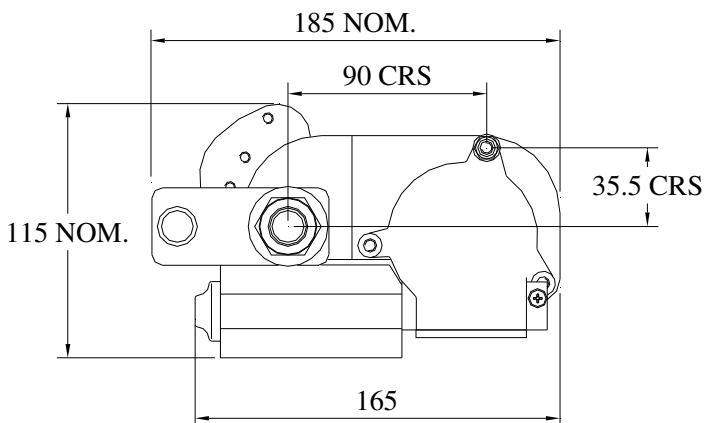
The drive mechanism provided transfers the rotary output from the motor; to a reciprocating motion of the spindles, this mechanism is zinc plated and is sized to give the correct angle of arc for the windscreen wiper arm being driven.

The Spindle that drives the wiper arm passes through the bulkhead, connecting the drive mechanism to the wiper arm; this are manufactured from stainless steel, to prevent corrosion.

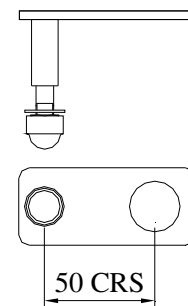
Pendulum Unit



Pantograph Unit



Idler Liner/Plate Assy 652001700



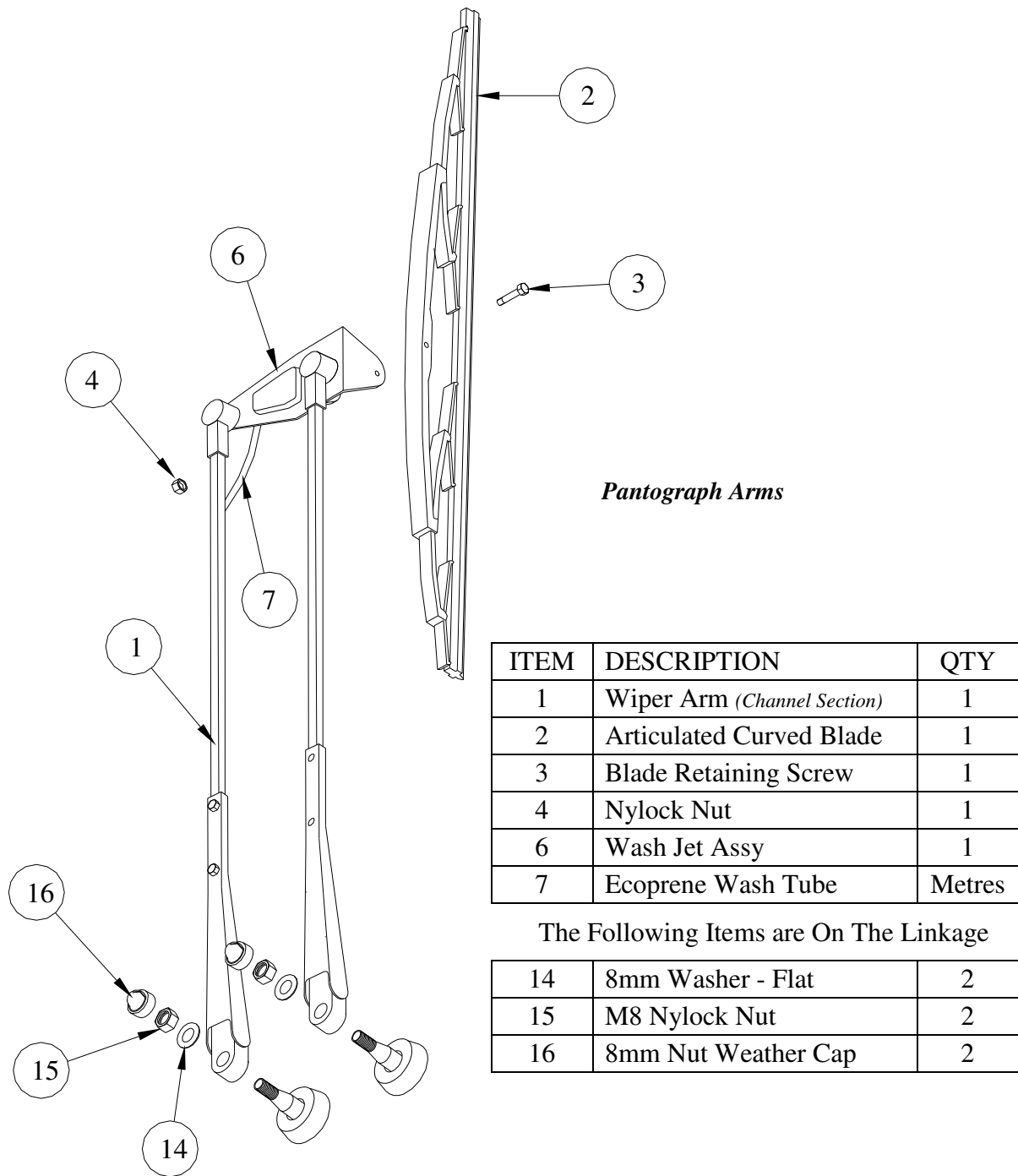
Wiper Arm Assembly - Pantograph

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

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 spindles via a series of nuts and washers.

Note: In some cases the Arm may have a forward crank to aid wiping.

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



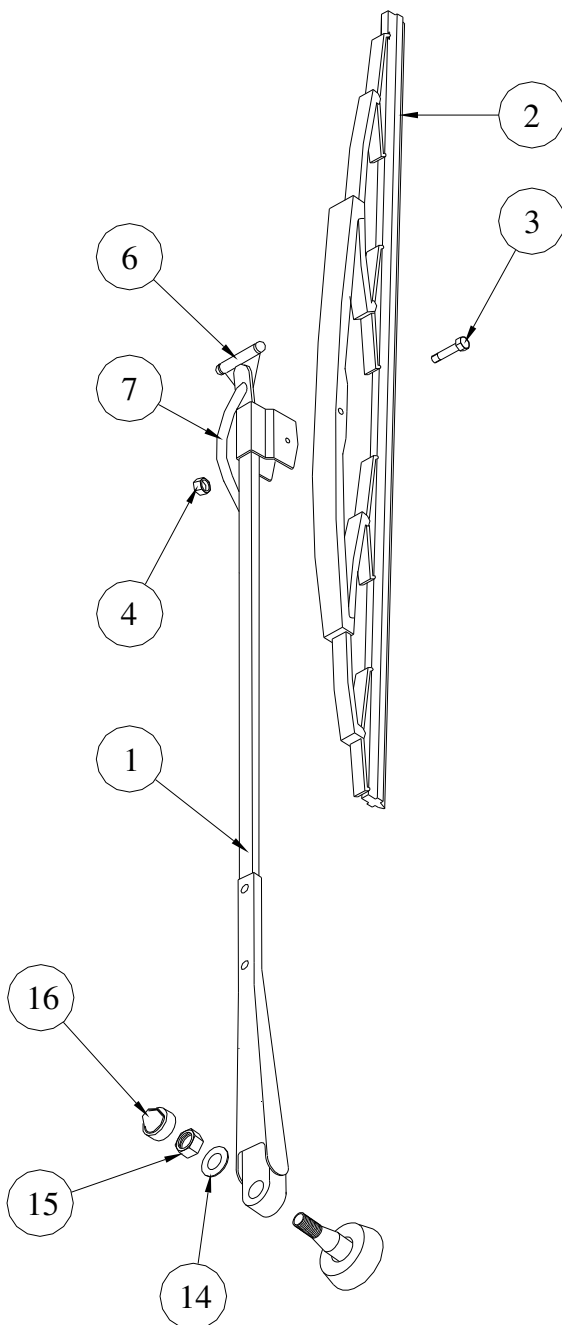
Wiper Arm Assembly - Pendulum

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

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

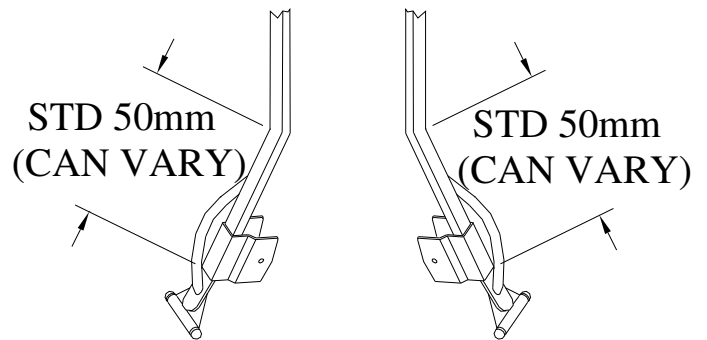
Note: In some cases the Arm may have a sideways crank to aid wiping (see details below.)

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



Pendulum Arms – Straight and Cranked

RIGHT HAND LEFT HAND
CRANK 5°- 25° CRANK 5°- 25°



ITEM	DESCRIPTION	QTY
1	Wiper Arm (<i>Channel Section</i>)	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	8mm Washer - Flat	1
15	M8 Nylock Nut	1
16	8mm Nut Weather Cap	1

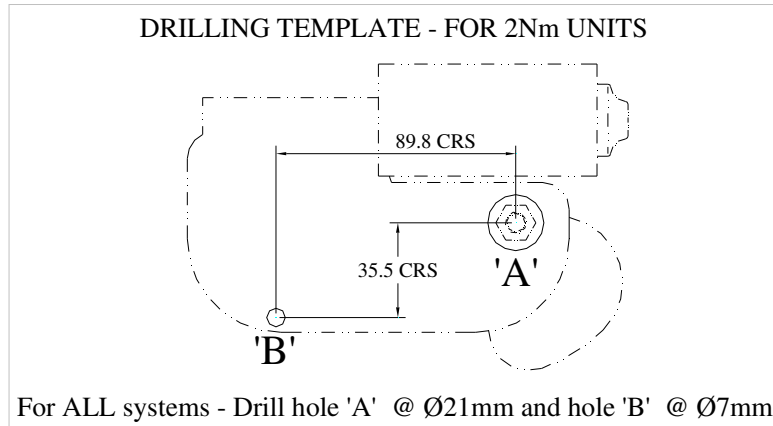
CHAPTER 2

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

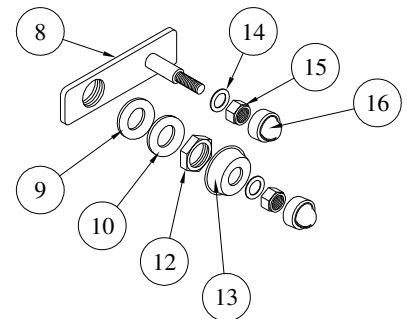


Fitting the Wiper Motor Assembly

NOTE Motor Unit is MOUNTED from INSIDE Bulkhead. When spindle positions have been drilled in bulkhead, the following procedures apply.

With Reference to the Unit Drawings - Pages 4 & 5.

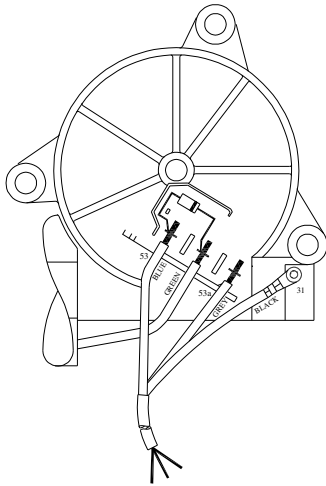
1. Remove 8mm Nut Cap - (*Item 16*), M8 Nylock Nut - (*Item 15*), 8mm Flat Steel Washer - (*Item 14*), 20mm Weather Cap - (*Item 13*), M20 Nut - (*Item 12*), 20mm Flat Steel Washer - (*Item 10*), 20mm Neoprene Washer - (*Item 9*), and finally Idler Plate/Liner Assy - (*Item 8*). (If fitted for PANTOGRAPH Units) NOTE: - Keep safe as will be required on assembly.
2. **From Inside Bulkhead** – Fit Motor Unit, through predrilled mounting holes and fix in place. (M6 Fixing Screw not supplied – (*Item 31*))
3. **From Outside Bulkhead** - ENSURE a proprietary sealant (*Not supplied*) is used around all points of entry through bulkhead.
4. Fit following items - Over Liner, next to bulkhead fit Idler Plate/Liner Assy- (*Item 8*). (If Required for PANTOGRAPH Units) Then onto Main Liner a 20mm Neoprene Washer - (*Item 9*), a 20mm Flat Steel Washer - (*Item 10*), a M20 Nut - (*Item 12*) and finally a 20mm Weather Cap - (*Item 13*).
5. Important if Idler Plate/Liner Assy- (*Item 8*) is fitted, the 8mm Nut Cap - (*Item 16*), M8 Nylock Nut - (*Item 15*), 8mm Flat Steel Washer - (*Item 14*), will need to be removed prior to Arm being fitted.
6. **From Inside Bulkhead:** - Connect vehicle wiring to Motor.



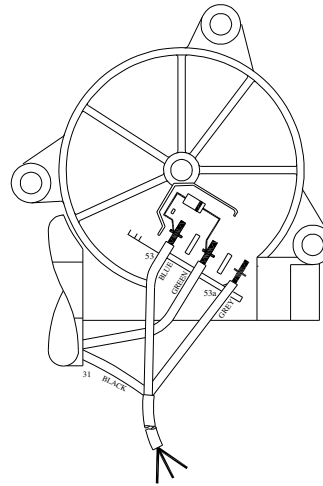
Electrical Connections 12v/24v DC

The 20Nm Marine Motor is available in either **12v** or **24v DC**, and are both, single speed self-parking motors. Insulated Earth Return is available on request.

The motor should be connected through a Single Pole Double Throw toggle switch (**not supplied – Can be ordered separately**).

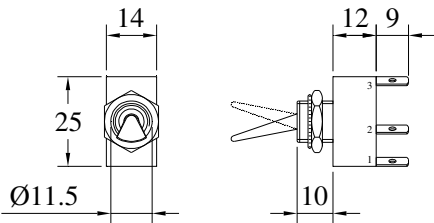


NON - Insulated Earth Return
(Std Unit)



Insulated Earth Return
(IER Unit)

Single Pole/Double Throw Switch



		Wiring Details	
		Motor	Switch
31	Black Wire		Position 1 and Negative Ship's supply
53	Blue Wire (Single Speed)		Position 2
53a	Grey Wire		Position 3 and Positive Ship's supply

Electrical Connections 110v/230v AC

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 1-2 Motor Units
 PSU/115/12/12 POWER SUPPLY UNIT-115v 12v 12amp will power 3-4 Motor Units

PSU/115/24/6 POWER SUPPLY UNIT-115v 24v 6amp will power 1-2 Motor Units
 PSU/115/24/12 POWER SUPPLY UNIT-115v 24v 12amp will power 3-4 Motor Units

For Ships Supply's of nominal 220/2420v AC 1 Phase – one of the following will be required

PSU/230/12/6 POWER SUPPLY UNIT-230v 12v 6amp will power 1-2 Motor Units
 PSU/230/12/12 POWER SUPPLY UNIT-230v 12v 12amp will power 3-4 Motor Units

PSU/230/24/6 POWER SUPPLY UNIT-230v 24v 6amp will power 1-2 Motor Units
 PSU/230/24/12 POWER SUPPLY UNIT-230v 24v 12amp will power 3-4 Motor Units

Wiring the Power Supply Unit (PSU)

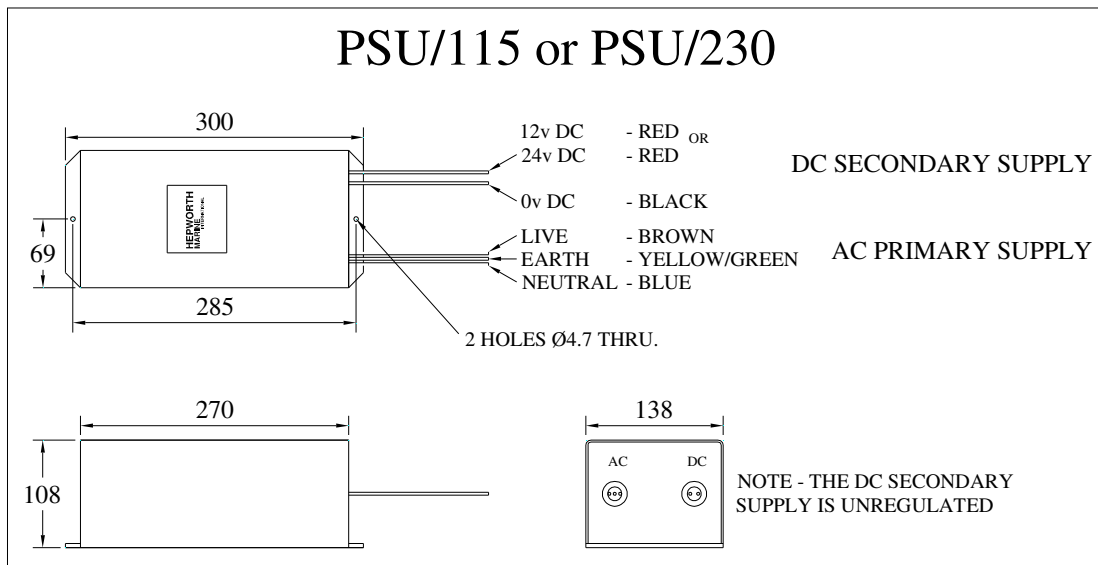
AC Primary Side

Connect Live, Earth and Neutral wires on AC Primary side of Power Supply Unit to 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

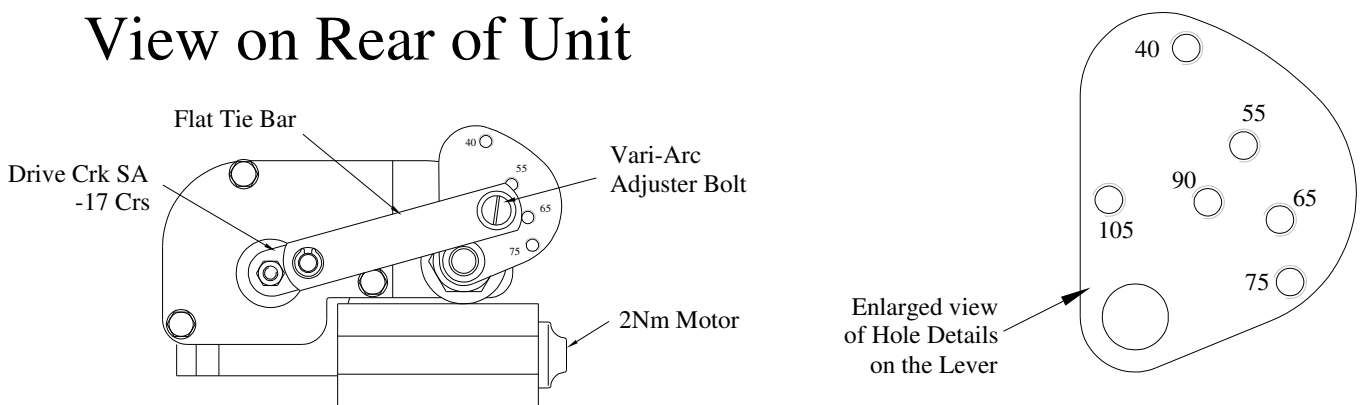
Connect **12v DC** or **24v DC** (+ ve) to Toggle as the positive ship's supply

Connect the **0v DC** (- ve) to the Toggle Switch as the negative ship's supply



Arc Adjustment

View on Rear of Unit

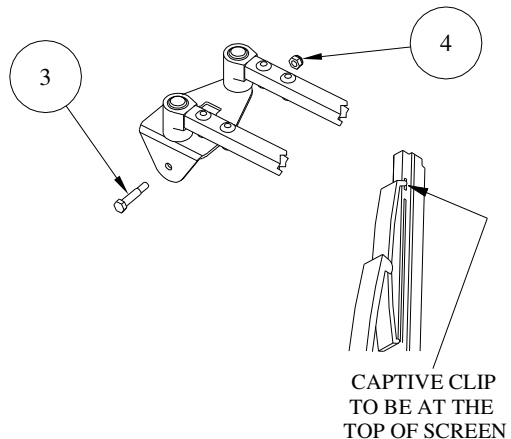


1. Undo M6 Adjuster Bolt on Vari Arc Lever.
2. Reposition Flat Tie Bar and M6 Adjuster Bolt into threaded hole centre required. Note each hole position has respective angle marked against it. (**N.B Angles are 40, 55, 65, 75, 90 and 105**)
3. Tighten M6 Adjuster Bolt on Vari Arc Lever when desired arc is reached.

Fitting the Wiper Blade

With Reference to Arm Drawings – Pages 6 & 7.

1. **From Outside Bulkhead** - Remove Blade Retaining Screw - (Item 3) and Nut - (Item 4) from Blade Clip on Main Arm. - (Item 1)
2. Place Wiper Blade - (Item 2) into Blade Clip. (Note captive end on blade rubber to 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. (Ref Table 1, Page 12 & Table 2- continued, Page 14 – Wiper Blades)

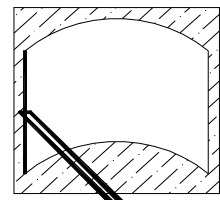
Fitting the Wiper Arm Assembly – Both Arms

With Reference to Arm Drawings – Pages 6 & 7.

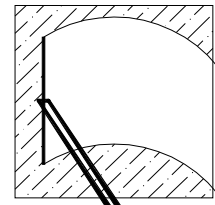
1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly, and then disconnect all Electrical Power.
2. **From Outside Bulkhead** - While Unit is being run, it is IMPORTANT to observe direction drive spindle rotates in immediately before it stops. This direction will give PARK POSITION.

Pantograph Arms Only:

3. Fit Arm onto Spindle allowing Blade to lie approx 50-75mm from edge of glass in PARKED POSITION.
4. Fit a M8 Flat Washer - (Item 14) on to spindle next to Arm Head, then a M8 Nylock Nut - (Item 15)



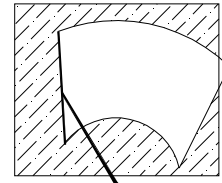
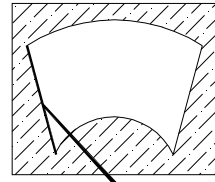
5. Only tighten Nut sufficiently to allow Arm and Blade to travel across glass when Motor is run to see if positioning is correct.
6. If incorrectly positioned - DO NOT ATTEMPT TO ROTATE OR TWIST ARM ON SPINDLE this will damage splined end of drive spindle, resulting in Arm and Blade slipping in operation.



7. To correct alignment errors, - loosen Nut and gently pull Arm up Spindle, realign and repeat stages above. (Arm Extractor Tool is available see diagram on page 16 for instructions)
8. When correctly aligned, tighten M8 Spindle Nut 30-32Nm. Then fit Weather Cap supplied with Linkage - (Item 16)

Pendulum Arms Only:

3. Fit Arm onto Spindle allowing Blade to lie approx 50-75mm from edge of glass in PARKED POSITION.
4. Fit a Flat Washer - (*Item 14*) on to spindle next to Arm Head, then a M8 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 diagram on page 16 for instructions*)
8. When correctly aligned, tighten M8 Spindle Nut 30-32Nm. Then fit Weather Cap supplied with Linkage - (*Item 16*)



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 M8 = 18-20Nm
Six Monthly or As required	Wiper Blades	Replace wiper blades
6 Monthly	Complete System	Check all torque settings for complete wiper system: M6 = 7- 9Nm (<i>on Motor & D. Crk</i>) M8 = 18-20Nm (<i>on Spindle and VA. Lever</i>) M20 = 58-62Nm (<i>on Liner - Steel</i>) M20 = 50-52Nm (<i>on Liner - G.R.P.</i>) Carry out a visual check for wear in rod end

CHAPTER 4

Troubleshooting

Introduction

This chapter provides all 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 Voltage Level System Jammed Defective wiper motor	Check position of switch Check supply voltage to switch. Check wiring and switch connections Check wiper linkage	Turn switch to on position Replace switch. Correct loose wiring connections. Replace broken wires Release linkage. Release wiper arm 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 the drive crank. Clean motor output shaft with wire brush before replacing
System operates but wiper arm remains static	Wiper arm	Check for loose wiper arm connection onto drive spindle	Secure or replace wiper arm after cleaning spindles. Torque to M8 = 18-20Nm
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

Table 2 - Continued

SYMPTOM	PROBABLE CAUSE	TESTS AND CHECKS	CORRECTIVE ACTION	
Arm and Blade not operating correctly or over sweep operation	Voltage level	Check for 12v or 24v DC supply to wiper system	Correct voltage supply problem	
	Linkage	Check for worn or broken linkage	Replace Linkage	
	Spindle	Check for excessive wear in spindle	Replace Spindle	
	Arm	Check that arm is not loose on spindle	Re-tighten Spindle	
		Check for excessive wear on arm	Replace Arm, after cleaning spindle spline with wire brush.	
	Blade		Check fixing for wear	Replace Blade
			Check blade for wear	Replace Blade
		Check for excessive smearing on screen	Replace Blade	
Washer system not working correctly	No water from jets	Check water level in tank	Fill tank	
		Check for damage to tank	Replace tank	
		Check Pump is operational	Replace pump if faulty	

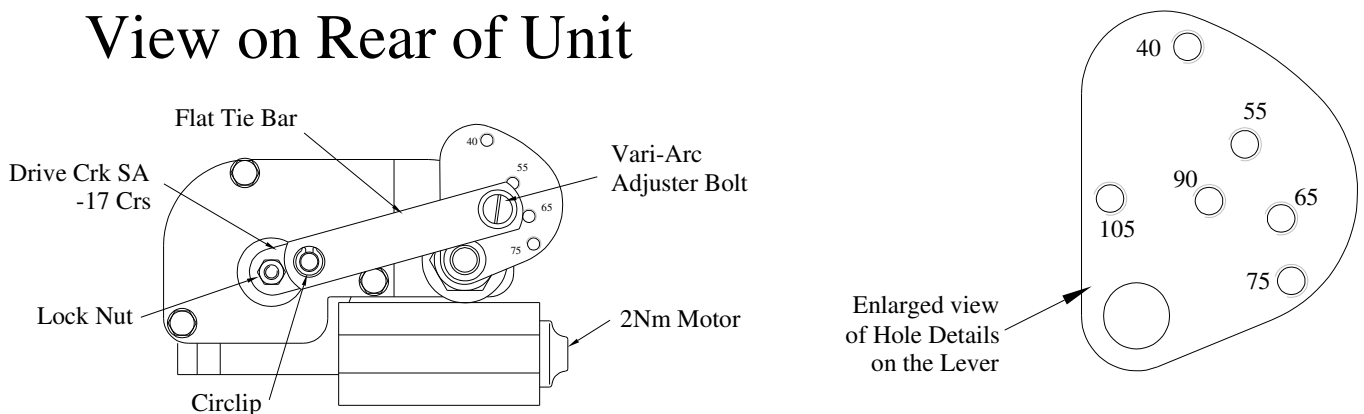
CHAPTER 5

Maintenance Instructions

NOTE: 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.

View on Rear of Unit



To Replace the Flat Tie Bar Assembly

Removal

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

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

2. ***From Rear of Unit*** - Undo M6 Adjuster Bolt on Vari Arc Lever and remove from Flat Tie Bar (***NOTE – keep safe as will be required on Replacement***)
Make a note of hole position for correct setting of arc on replacement.
3. Remove Circlip from Drive Crank Pin and remove Flat Tie Bar.

Replacement

1. ***From Rear of Unit*** - Carefully fit Flat Tie Bar over Drive Crank Pin, fit Circlip.
2. Fit M6 Adjuster Bolt on Vari Arc Lever. Replacing in same hole position (***referring to Note after operation 2 on ‘To Remove’ for position.***) for correct setting of arc on replacement.

To Replace the Drive Crank Assembly

Removal

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

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

2. Remove Circlip from Drive Crank Pin and remove Flat Tie Bar.
3. Remove Locking Nut, carefully remove Drive Crank Assy from Motor Drive Shaft.

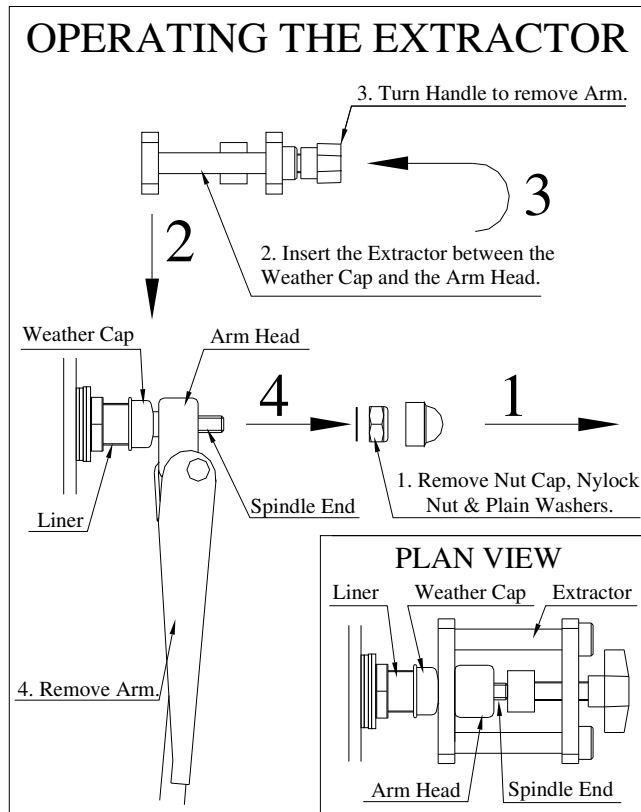
Replacement

1. ***From Rear of Unit*** – carefully fit Drive Crank Assy onto Motor Drive Shaft. Fit Locking Nut
2. Carefully fit Flat Tie Bar over Drive Crank Pin, fit Circlip.

To Remove the Entire Wiper Motor Unit Assembly

Removal

1. **From Inside Bulkhead** - Run Motor to insure it is parked correctly; disconnect all Electrical Power.
2. Disconnect wiring from Motor.
3. **From Outside Bulkhead** - **IMPORTANT:** Please make a note of PARKED position of ARMS and BLADES, before removal
4. Remove Arm Caps - (*Item 162*), Nuts - (*Item 15*), and Washers. - (*Item 14*), Then using Arm Extraction Tool carefully remove Arms
5. Remove M6 Nut and Washers from Fixing Screw
6. Remove 20mm Weather Cap - (*Item 13*), M20 Nut - (*Item 12*), 20mm Flat Steel Washer - (*Item 10*), 20mm Neoprene Washer - (*Item 9*), and finally Idler Liner/Plate Sub Assy - (*Item 8*). (If fitted for PANTOGRAPH Units) NOTE: - Keep safe as will be required on assembly.
7. Carefully remove entire Wiper Motor Unit from Bulkhead.



Replacement

1. **From Inside Bulkhead** – Fit Motor Unit, through predrilled mounting holes and fix in place.
2. **From Outside Bulkhead** - ENSURE a proprietary sealant (Not supplied) is used around all points of entry through bulkhead.
3. Fit following items - Over Liner, next to bulkhead fit Idler Plate/Liner Assy- (*Item 8*). (If Required for PANTOGRAPH Units) Then onto Main Liner a 20mm Neoprene Washer - (*Item 9*), a 20mm Flat Steel Washer - (*Item 10*), a M20 Nut - (*Item 12*) and finally a 20mm Weather Cap - (*Item 13*).
4. Important if Idler Plate/Liner Assy- (*Item 8*) is fitted 8mm Nut Cap - (*Item 16*), M8 Nylock Nut - (*Item 15*), 8mm Flat Steel Washer - (*Item 14*), will need to be removed prior to Arm being fitted.
5. Replace Washers, Nuts and Weather Caps on Liner. Replace Arm and Blade (*Refer to fitting instructions for replacement Pages 10 & 11.*)

To Replace the Vari-Lever/Liner Assembly

Removal

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

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

2. Carefully remove the entire Wiper Motor Unit from the Bulkhead. (*With reference to page 16.*)
3. ***From Rear of Unit*** - Undo M6 Adjuster Bolt on Vari Arc Lever and remove from Flat Tie Bar (***NOTE – keep safe as will be required on Replacement***)
Make a note of hole position for correct setting of arc on replacement.

IMPORTANT: Please make a note of LINER/SPINDLE PROTRUSION relative to FRONT FACE of MOUNTING BRACKET

4. Unscrew Vari-Lever/Liner Assembly from Mounting Bracket.

Replacement

1. ***From Rear of Unit*** - Screw Vari-Lever/Liner Assembly into Mounting Bracket. (*referring to Note after operation 3 on ‘Protrusion’ for position.*)
2. Fit M6 Adjuster Bolt on Vari Arc Lever. Replacing in same hole position (referring to Note after operation 2 on ‘To Remove’ for position.) (*referring to Note after operation 2 on ‘To Remove’ for position.*) for correct setting of arc on replacement.
6. ***From Inside Bulkhead*** – Fit Motor Unit, through predrilled mounting holes and fix in place.
7. ***From Outside Bulkhead*** - ENSURE a proprietary sealant (Not supplied) is used around all points of entry through bulkhead.
8. Fit following items - Over Liner, next to bulkhead fit Idler Plate/Liner Assy- (*Item 8*). (If Required for PANTOGRAPH Units) Then onto Main Liner a 20mm Neoprene Washer - (*Item 9*), a 20mm Flat Steel Washer - (*Item 10*), a M20 Nut - (*Item 12*) and finally a 20mm Weather Cap - (*Item 13*).
9. Important if Idler Plate/Liner Assy- (*Item 8*) is fitted 8mm Nut Cap - (*Item 16*), M8 Nylock Nut - (*Item 15*), 8mm Flat Steel Washer - (*Item 14*), will need to be removed prior to Arm being fitted.
10. Replace Washers, Nuts and Weather Caps on Liner. Replace Arm and Blade (*Refer to fitting instructions for replacement Pages 10 & 11.*)