



**Avon Barrier Company Ltd.**

**THE ARMSTRONG EB950 CR.**  
**High Security Rising Arm Barrier.**

**Installation and Maintenance Manual.**



Example Picture Only.



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## **INTRODUCTION.**

**This manual provides information on the Avon EB950 CR Armstrong Hydraulically operated High Security Rising Arm Barrier and is designed to assist the Installers, Maintainers, Operators and System Integrators .**

**Should you require any further information or specific assistance please contact our security specialists at our UK Head Office.**

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### **Scope of Document.**

**The EB950 CR shall hereafter be referred to as the 'Barrier' or 'EB950 CR'.**

**This document is intended for those who will:**

**Install / interface the Barrier**

**Operate the Barrier**

**Maintain the Barrier**

### **Important: Note for system/site designers.**

**Please make use of the Risk Assessments contained in this manual.**

**The safe operation of the EB950 CR depends on a careful balancing of the various risk factors which are inevitably associated with operating a massive piece of moving equipment in a public area. It is vital that these factors are taken into consideration before the system specifications are made final.**

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## **HEALTH AND SAFETY.**



**This symbol indicates a potentially hazardous situation that might result in minor injury or machine damage. It also indicates strict attention must be given to the instructions following this symbol.**

**Where associated equipment is supplied or fitted by others, the seller and purchaser of the equipment are responsible for ensuring that:**

**The equipment complies with all Safety Requirements,**

**The associated equipment does not adversely affect the operation or safety of equipment supplied by Avon Barrier Company Limited.**

**It is the sole responsibility of the owner/user of the equipment to establish which legislation is applicable to the country in which the equipment is installed, and to ensure subsequent compliance with all national and local regulations.**

**It is also important that the owner/user of the equipment has assessed all equipment and operational hazards, which might arise from the presence of electrical power, powered machinery and exposed moving parts, both pre and post-installation of the equipment. It is recommended that this assessment be reviewed before the equipment is set to work.**

## **PRODUCT DESCRIPTION.**

**The Avon EB950 CR Armstrong is a Crash Rated Rising Arm Barrier which provides high level of security against unauthorised vehicle access. Designed to withstand substantial direct impact forces, the Barrier has the ability to protect sites from extreme aggressive vehicle borne threat.**



**Designed and manufactured by engineers with a wealth of experience in the fields of High Security and Access Control, the EB950 CR is a highly dependable security product that will easily interface with a wide range of control equipment.**

**Units are assembled in our UK fabrication facility using heavy gauge materials to give maximum strength and durability, this makes the EB950 CR the ideal product to protect high security establishments.**

**The EB950 CR has been fully crash tested in excess of U.S DoS Standard K12/L3.**

**It absorbed an impact in excess of 7610kg at 50 K.p.h. and remained operational.**

**It conforms to the B.S.I Specification PAS 68 – 1 Specification for Security Barriers Part 1: General requirements.**

**The EB950 CR has an hydraulically powered boom which can protect a road width up to a maximum of 5 metres, this is dependant upon site conditions and should be specified at time of quotation/order.**

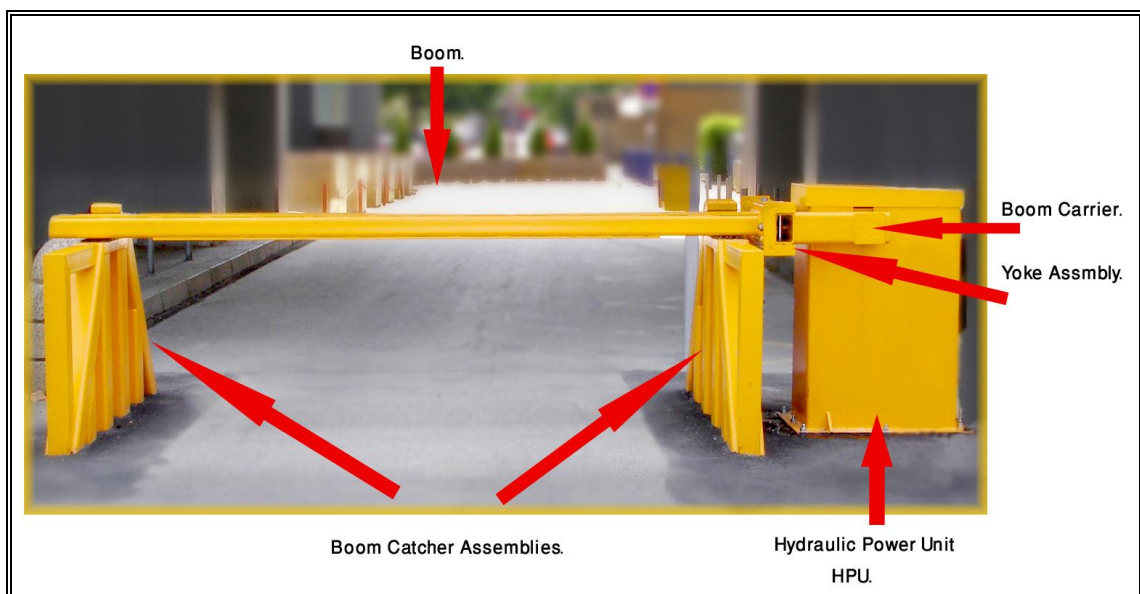
**Barrier height 1060mm. Clear width opening: 2m – 4.5m in 0.5 metre increments.**

**Raise & lower times 6-10 seconds, dependent on boom length.**

Barrier cabinet 740cm wide x 600cm deep x 1240cm high. The barrier arm (Boom) is supported on either side of the roadway by two A-frame support structures. The Hydraulic power unit, barrier mechanisms and electrical controls are housed in the Barrier cabinet, sited behind one of the 'A-frames'.

The heavy-gauge steel Boom is raised and lowered via an hydraulic cylinder through a crank and Yoke / Carrier assembly, to which the boom is attached, pivoting in heavy-duty non-metallic bearings at the top of the enclosure.

The yoke is clamped to the boom carrier such that on impact the boom can slide into the catchers. The Catcher frames are set deeply into the concrete foundations to take the impact load. The heavily constructed catchers are designed to trap the boom, preventing it from lifting during impact. Barrier cabinet, Boom and Boom Catcher are shot blasted, zinc primed and finished in a textured polyester powder-coat paint.



Example Picture Only.

## **GENERAL SPECIFICATION.**

### **Barrier Cabinet.**

Constructed from thick steel plate, it houses the Hydraulic Power Unit ( HPU ), operating mechanism and electrical enclosures. Access is via a hinged security door and a removable top cover.

The Electrical controls are housed in their own individual panels within the cabinet, one of these is equipped with a rotary mains switch to isolate the equipment for maintenance purposes.



### **Hydraulics.**

The Hydraulic Power pack uses a motor driven pump to actuate the hydraulic ram, this in turn raises and lowers the barrier boom. Emergency hand pump / manual release facilities are provided and are incorporated in the cabinet.

The hydraulic power pack fluid reservoir is contained within the base of the cabinet enclosure. The positive displacement pump draws fluid from the reservoir through a suction filter, and delivers it at high pressure to the cylinder, via the solenoid directional control valve.

A relief valve prevents excess pressure being generated in the system.

The full-bore cylinder connection is fitted with an over-centre valve, controlled from the cylinder annulus supply, which prevents negative pressure being developed in the supply line from load over-run and prevents lowering of the boom in the event of a hose failure.

### **Hydraulic Cylinder.**

The cylinder is of steel construction, with a maintenance free spherical rod-end bearing.

### **Electrical.**

Supply requirements: 230v AC single phase 50 hertz 16 amps.

Supplies should be protected by a type “C” magnetic circuit breaker.

Cable entry is via conduit through the base of the barrier cabinet.

System control utilises a programmable logic controller which allows for a wide variety of configurations and control /monitor interfaces.

The hydraulic pump is powered by a 2.2kw 3 phase motor which is controlled by a single phase to three phase inverter.

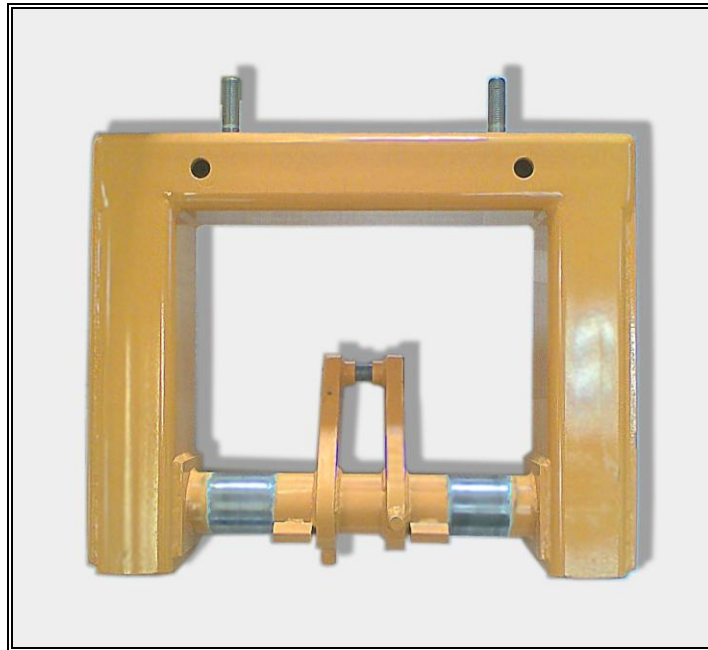
Proximity switches, triggered by cams fixed to the crankshaft, control the raised and lowered positions of the boom.

### **Boom Catcher Frames.**

**Fabricated from heavy steel sections anchored into the foundations.  
Designed to support the boom in the lowered position and withstand a full impact load.  
Recess in catchers prevents the boom from lifting when impacted.  
Outboard extensions on the 'attack' side inhibit vehicle from running up catcher frame.**

### **Boom Carrier Assembly.**

**Fabricated from heavy steel sections, the assembly comprises twin cranks welded to a solid steel shaft, which rotates in heavy-duty PTFE bearings. The crank is rotated through approximately 85° by the action of the hydraulic ram.**



### **Boom / Yoke assembly.**

**Fabricated from thick, reinforced hollow steel section, clamped to boom carrier using four 20mm bolts. The yoke / clamp assembly is designed to allow the boom to slide a specified distance in the event of a collision. This allows the boom to locate in the catcher frame recesses which prevent vertical movement of the boom under impact.**

### **Options.**

**The Barrier comes with a push-button control as standard, however it can be customised to interface with a wide range of access control equipment to suit specific customer requirements (available as options) and any configuration including (but not limited to) inductive loop systems, card readers, communication equipment and manned guard panic systems can be accommodated.**

**Large head (200mm Diameter) or small head (100mm Diameter) red / green traffic lights can be provided, with status signalling received from the logic controller and optional back indication outputs.**

# INSTALLATION.



Health & Safety.



Installation Risk Assessment form included with this manual.

## Personnel.

All installation works must be carried out only by suitably qualified and experienced personnel, who are familiar with the risks and dangers inherent to their particular discipline, and the precautions necessary to minimise them.

Only carry out installation works;

When suitable warning signs are posted and area is cordoned off to traffic.

If no hazard exists (e.g. crushing hazard, slipping hazard, etc.)

With correct tools and equipment.

After carrying out the appropriate Risk Assessments.

Training on Installation and Maintenance can be provided by Avon Barrier Co. Ltd upon request.

## Standard Equipment Supplied.

1 off; Cabinet c/w hydraulic power pack, drive unit and electrical control equipment.

2 off; Boom Catcher Frames.

1 off; Cabinet foundation plate.

1 off; Boom / Yoke assembly.

## Optional Extras.

Safety Inductive Road Loops.

Safety Photo Cells.

Boom mounted Safety Edges.

Warning Sounder.

Warning Signs

Traffic Lights.

Boom Lights.

Boom Skirts.

## Access Options.

Avon Token Acceptor. Avon Swipe Card Reader

Avon Proximity Card reader. Avon Radio Controller. Avon Digital Keypad

Avon Inductive Loop Detector. Avon Infra Red System. Avon Audio Intercom.

Avon Tagging System. Avon Radar Detector. Avon Dual Enclosure.

Vehicle warning signs and slowing / stop signalling equipment may be located at the approach to the Barrier.

### **General Description.**

**Drawing EB950CR-1-08 shows foundation details, including cable duct into cabinet. Drawing EB950CR-1-05-details the installation procedure and should be carefully studied before installation commences. Drawings and schematics are supplied with this manual and should be used in conjunction with the following installation guidance.**

**The barrier cabinet should not be located in an area susceptible to flooding.**

**Catcher frames require a 1 metre deep foundation.**

**Reinforcement cages are set in the first pour grade C35 concrete, which should be trowelled flat and level at 700mm below finished floor level. It is important that the foundations on either side of the roadway are at the same elevation (within 5mm).**

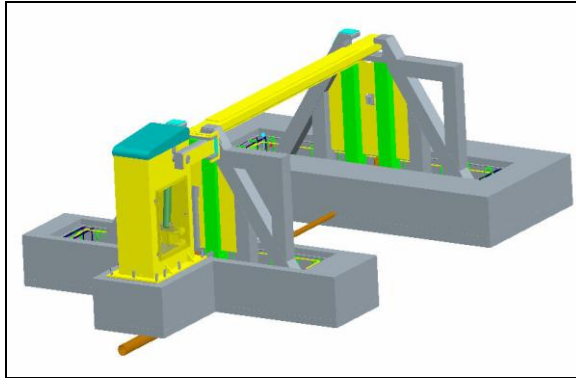
**When the concrete has set the catcher frames are mounted and levelled, the top face of the cabinet mounting plate is to be at finished road level. Frames must be set parallel, with boom rests level and in line within 3mm.**

**Position 50mm minimum diameter conduit for electrical mains and control cables from the cabinet entry in the support plate to the cable trench outside. Avoid 90° sharp bends and sharp edges. Finish with draw-wire.**

**The cabinet is mounted to the foundation plate and the boom is attached in the following manner; remove cabinet top cover, (instruction can be found on page 22), ensure any cabling for boom lights or safety edges is pulled through from the boom into boom carrier. With the boom down on the catcher frame rests, connect the boom to its support yoke with bolts provided. It may be necessary to hand pump the boom carrier to line up with the boom. Tighten bolts to 100N-m torque. Ensure that the boom is level and centred in the catcher.**

**Using the hydraulic hand pump, raise and lower the boom a few times to check operation. Instruction for manual pumping operation can be found in the maintenance section of this manual on page 23 section A.**

**Catcher frames, cabinet foundation plate, cabinet and boom must all be mounted, secured and in correct alignment before final concrete pour takes place. Fill with grade 35 concrete up to finished road level.**



**Drawings show equipment with and without concrete foundations and are for illustrative purposes only.**

**Electrical.**

**Note: Electrical installation must be in accordance with current local regulations. All cable sizes must conform to site specification and current regulations. Power cables to be routed in separate conduit from signal cables.**

**Refer to the site specific 'External Connections' schematic which is included in the main electrical enclosure.**

**The Barrier cabinet is supplied complete with all hydraulic equipment, electric control circuitry and boom operating mechanism.**

**The hydraulic system is self-contained and no on-site connections are required. The electrical equipment is located inside a transparent fronted enclosure, above the hydraulic power pack.**

**The mains supply is connected to the rotary isolator switch and control cables to DIN rail mounted terminals.**

**Connect single phase power supply cables to mains isolator switch on the small electrical enclosure.**

**Connect signal cables between the control stations and the Barrier cabinet to numbered terminals in the main electrical enclosure.**

**Connect cables to any other electrical equipment on the installation.**

**Connect photocell, boom light and safety edge cables if fitted.**

**Picture Inside Cabinet.**

**1: Main Electrical Panel.**

**2: Hydraulic Ram  
Manifold.**

**3: Rotary Isolation Switch.**

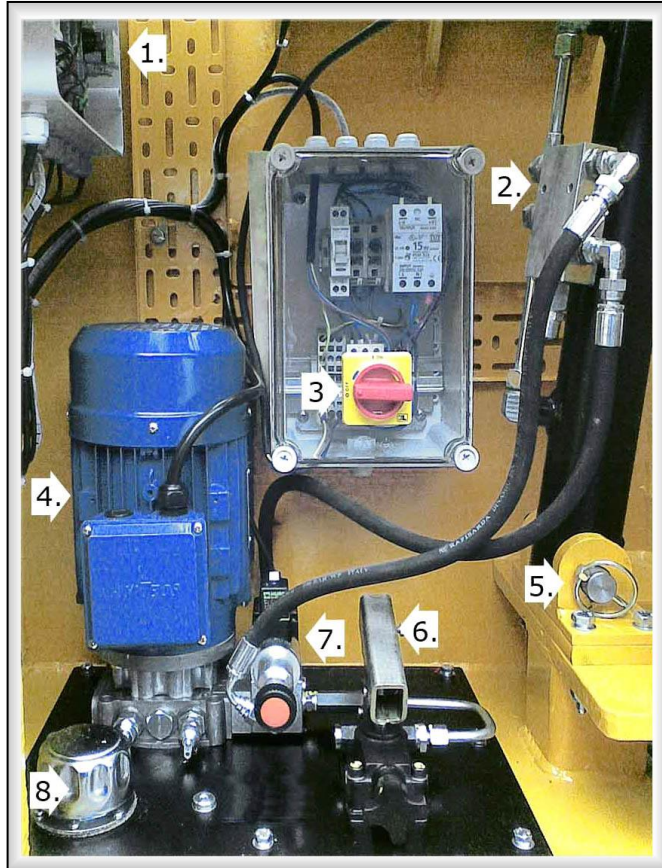
**4: 3 phase Electric Motor.**

**5: Lower Ram Pivot.**

**6: Manual Pump.**

**7: Solenoid Raise Valve.**

**8: Oil Filler Cap.**



## COMMISSIONING.



Make sure area around barrier and boom is free from obstruction and is isolated from pedestrian and vehicular traffic.



Rotary mains power disconnect switch must be in the OFF position  
Boom must be in fully lowered position, if not then use manual hand pump;  
(instructions can be found in the maintenance section of this manual).  
Check all fastenings and mounting bolts are secure.  
Check boom is centrally located within the catcher frame.  
Check hydraulic fluid level is between 1cm and 5 cm below the top of the reservoir.  
Oil must be visible through filler hole.  
Replenish if necessary. See C.O.S.H.H sheets for handling precautions..  
Check incoming voltage at rotary disconnect switch and refit switch cover.  
Slide electrical control box out of cabinet and remove cover.  
To prevent accidental operation of barrier, temporarily remove common supply wire to any access control equipment (Terminal 1).

Switch disconnect switches ON.



Equipment will now be live, observe all normal precautions for working near live equipment.





Use jumper wire between T1 (common) and T2 (Raise) to raise boom.  
Check for smooth acceleration / deceleration, and correct position of boom at maximum raise position (minimum 85 degrees from horizontal).  
Adjust raised limit switch if required.

Use jumper wire between T1 (common) and T3 (Lower) to lower boom.  
Check for smooth acceleration / deceleration, and correct position of boom at maximum lowered position ( horizontal and resting gently on catcher).  
Operate through several cycles to allow oil to warm up.  
Several minor adjustments of the limit switch may be required to achieve optimum positioning.

Note: Commissioning engineer should be familiar with the operation of the Mitsubishi Alpha controller fitted to this equipment. Please consult page 16.


### Pressure tests.

Attach pressure test gauge to test point on motor flange manifold.



Use  button on Alpha controller to operate Raise solenoid and use  button to operate the motor. Observe and note pressure reading during raise.

Release motor button  before releasing solenoid button .

Leave barrier in fully raised position and check for boom 'creeping' down.

Use  button on Alpha controller to operate motor and lower the boom.  
Observe and note pressure reading during lower.

Release  button before boom is fully lowered to allow time for deceleration.

With the boom in the lowered position use  button on Alpha controller to operate the motor and lower the boom hard against the catcher. Continue to run the motor until gauge reading stabilises. Note maximum reading. Release  button .

	<b>Minimum.</b>	<b>Maximum.</b>	<b>Actual.</b>
<b>Forced fully lowered.</b>	<b>140 bar</b>	<b>220 bar</b>	
<b>During raise.</b>	<b>80 bar</b>	<b>180 bar</b>	
<b>During lower.</b>	<b>140 bar</b>	<b>180 bar</b>	

**Actual readings should be between minimum and maximum parameters.**

**If the boom judders whilst lowering then the over-centre valve may need adjusting; the adjustment procedure is explained in the maintenance section of this manual on page 24 para E.**

**If the movement of the boom or the reading on the pressure test gauge was erratic during both the raise and lower cycles, or the boom lifts slowly then there may be air in the hydraulic fluid. Procedure for bleeding air from fluid is explained in the maintenance section of this manual on page 24 para G.**

**Operational tests.**

**Switch off power at disconnect switch, remove jumper wire, replace access control wires and refit covers and lid. Restore power and operate barrier using access control system. Check operation of safety devices, (edge strips, photo cells, induction loops etc) and ensure the system responds as per the mode of operation in the works instruction.**

**Check for operation of traffic lights, boom lights and any other optional equipment that may be fitted.**

**Operate barrier several times and then check oil level and for oil leaks.**

**Make a final check for tightness of all fasteners.**

## **OPERATION.**



### **Health & Safety.**



The risk assessments included in this manual should be studied and appropriate operational methodologies should be established before the equipment is operated. The owner should ensure that one or more competent persons are responsible for controlling the access system and advising vehicle users of the correct entry and exit procedures.

Training should include instruction on safe practices and known hazards, including normal and emergency use.

Operators and attendants should be directed NOT to operate the Barrier unless the area is clear and all covers / guards are in place.

### **General.**

Opening and closing is usually achieved by a standard Avon Barrier push button controller, however other access control equipment may be used.

To operate the Barrier a signal is required going from normally open to closed, for a pulse length of not more than 1 second.

The barrier will not normally be stopped or reversed during its travel, due to the boom inertia. However, if a 'Site Secure' facility is provided, it may be reversed during the raise cycle in order to secure the site in case of imminent threat.

The 'Site Secure' push button (if fitted) will lock in the down position and can be released by twisting the button or using the key, (depends on type supplied).

Depending on the customer requirements, the 'Site Secure' facility may over-ride the safety systems and this should be taken into account when establishing operational procedures.

### **Access Control.**

A wide variety of access control methods, safety systems and security requirements may be applied to the EB950 CR, these reflect the specific needs of individual sites and may include:

Site Secure facility which over-rides safety devices.

Site Secure which does not over-ride safety devices.

Automatic induction loop triggered exit.

Automatic induction loop triggered closing.

Barrier interlock system.

A site specific operation and maintenance manual along with training and certification of Operation and Maintenance personnel can be provided by Avon Barrier Company Ltd upon request.

Details for manual operation of the Barrier, in the event of power failure, are given in the Maintenance section of this Document pack. Before attempting manual operation, ensure that the electrical power is switched off at the main isolator.

Do not attempt to operate if there is evidence of failure of any hydraulic components – call Maintenance Engineer for assistance.

## **TECHNICAL DESCRIPTIONS.**

### **General Description of system components.**

The EB950 CR Barrier uses an electric motor to drive a submersed high pressure positive displacement oil pump. The high pressure (max 220 bar) hydraulic fluid is applied to an hydraulic ram which acts upon a heavy duty cam which in turn rotates the shaft mechanism through 85 degrees, thus lifting or lowering the boom.

The 3 phase electric motor is powered through an inverter which is programmed to give a controlled acceleration and deceleration of the boom.

The inverter changes the single phase incoming supply to 3 phase to supply the motor.

Applying hydraulic pressure to the bottom of the ram will raise the boom.

Applying hydraulic pressure to the top of the ram will lower the boom.

An electrically operated solenoid valve changes the direction of flow of the hydraulic fluid;

When the solenoid is OFF and the motor is running, the boom will lower.

When the solenoid is ON and the motor is running, the boom will raise.

The raised and lowered positions are monitored using proximity detectors.

Proximity detectors ( limit switches ) are 'Normally Closed', therefore:

when the boom is not raised, the Raised limit switch will be ON.

when the boom is raised, the Raised limit switch will be OFF.

When the boom is not lowered, the Lowered limit switch will be ON.

when the boom is lowered, the Lowered limit switch will be OFF.

A programmable Mitsubishi Alpha controller is used to operate the system and monitors the following inputs and controls the following outputs:

Inputs from access control equipment (open / close push button etc)

Inputs from proximity switches. ( actual position of boom )

Inputs from safety equipment ( road loops, safety edges, photo cells etc ).

Output to inverter. (accelerates and decelerates motor ).

Output to solenoid. ( raises the boom when ON ).

Output to traffic lights. Lights show green when output is ON.( if fitted ).

Output for back indication. Provides clean contact indicating boom is in lowered position .

### **Brief description of generic operation; Raise.**

Boom is in the lowered position. Lowered limit switch is OFF. Raised limit switch is ON.

Operator presses the Open button: The Alpha controller detects 'Raise' closed circuit and closes the solenoid circuit, the Solenoid energises. The Alpha controller then closes the 'Run Inverter' circuit and the inverter accelerates the motor.

Boom Raises: The lowered limit switch is now ON. The raised limit switch remains ON.

As the Boom approaches the raised position the raised limit switch turns OFF.

The Alpha controller detects raised limit open circuit and opens the 'Run' Inverter circuit.

The inverter decelerates and stops the motor and the solenoid switches OFF.

Boom is now in the raised position. Raised limit switch: OFF. Lowered limit switch is ON.

### **Brief description of generic operation; Lower.**

Boom is in the raised position. Lowered limit switch is ON. Raised limit switch is OFF.

The Operator presses Close button. The Alpha controller detects 'Lower' closed circuit and checks the safety device input; if the input is open circuit then the Alpha controller closes the 'Run Inverter' circuit and the inverter then accelerates the motor.

As the boom lowers, the raised limit switch turns ON. Lowered limit switch remains ON.

As the boom approaches the lowered position the lowered limit switch turns OFF.

The alpha controller detects 'lowered limit' open circuit and opens the 'Run inverter' circuit. The inverter decelerates and then stops the motor.

Boom is now in Lowered position. Lowered limit switch is OFF. Raised limit switch is ON.

## Alpha Controller.

**Input connections.** →

**Display screen shows:**

**Input conditions on top line.**

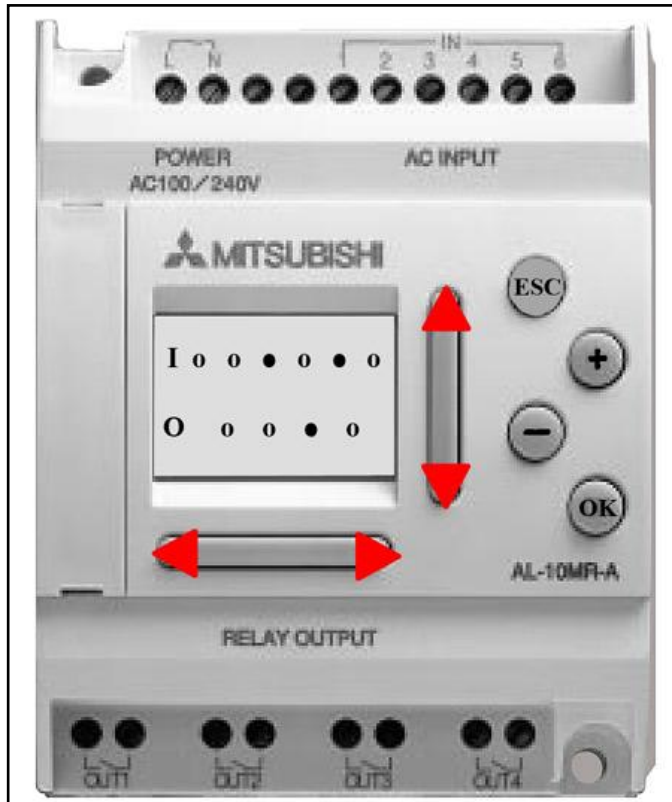
**Solid circle represents ON  
(Closed) condition.**

**Empty circle represents OFF  
(Open) condition.**

**Output conditions on lower line.**

**The example picture shows:  
Inputs 3 & 5 in 'On' condition,  
Output 3 in 'On' condition.**

**Output connections** →



**Note; this unit is pre-programmed at the Avon Barrier factory and should not require any changes in the menu mode.**

**The ◀ button will run the inverter / motor.**

**The ▶ button will activate the Raise solenoid.**

**Button marked OK is used to begin the test mode.**

**Button marked ESC is used to exit the test mode.**

**Buttons marked + and - will enter the Menu Mode.**

**The unit will default to 'Run' mode when power is applied.**

**If the 'Menu' mode is accidentally accessed, then press the ESC button until 'Run' mode is restored. Alternatively remove and then re-apply mains power, this will reset the unit.**

**The test mode is used for factory testing and will raise and lower the boom continuously. It is not recommended for use on site other than by Avon Barrier engineers and then only with all the necessary safety precautions in place.**

**If the motor runs continuously for more than one minute, the controller will enter a 'Timeout' mode. This can be reset by switching the mains power off and back on again.**

**An understanding of the input and output functions is beneficial for successful fault finding and the following descriptions should therefore prove useful in the unlikely event of a fault developing.**

## **Alpha controller Inputs and Outputs .**

- A. Input number One: Barrier Raised limit switch. Normally Closed.**  
Normal indication on the Alpha display; Solid circle = Closed circuit.  
The circuit is opened when the boom approaches the raised position and the raised limit switch is triggered by the pick-up lug on the cam, this causes an open circuit between Terminal 6 ( 24v supply ) and Terminal 12 on the main terminal block.
- B. Input number Two: Raise signal. Normally Open.**  
Normal indication on the Alpha display; Empty circle = Open circuit .  
The Circuit is closed when the 'Raise' button is pressed or other access control equipment is operated and creates a closed circuit between Terminal 1 ( 24v supply ) and Terminal 2 on the main terminal block.
- C. Input number Three: Lower signal. Normally Open.**  
Normal indication on the Alpha display; Empty circle= Open circuit .  
The circuit is closed when the 'Lower' button is pressed or other access control equipment is operated and creates a closed circuit between Terminal 1 ( 24v supply ) and Terminal 3 on the main terminal block.
- D. Input number Four: Site Secure. Normally Closed.**  
Normal indication on the Alpha display; Solid circle = Closed circuit.  
The circuit is opened when the Site Secure button is pressed and creates an open circuit between Terminal 1 ( 24v supply ) and Terminal 4 on the main terminal block.
- E. Input number Five: Presence. (safety equipment). Normally Open.**  
Normal indication on the Alpha display; Empty circle = Open circuit .  
The circuit is closed when a photocell, safety edge, induction loop or other safety device is triggered and creates a closed circuit between Terminal 1 ( 24v supply ) and Terminal 5 on the main terminal block.
- F. Input number Six: Barrier Lowered limit switch. Normally Closed.**  
Normal indication on the Alpha display; Solid circle = Closed circuit.  
The circuit is opened when the boom approaches the lowered position and the lowered limit switch is triggered by the pick-up lug on the cam creating an open circuit between Terminal 6 ( 24v supply ) and Terminal 13 on the main terminal block.
- G. Output number One : Inverter Run.**  
Normal indication on the Alpha display; Empty circle = Open circuit .  
When the circuit is closed the inverter will enter 'Run' mode.
- H. Output number Two: Raise solenoid.**  
Normal indication on the Alpha display; Empty circle = Open circuit .  
When the circuit is closed the raise solenoid will switch ON and the Boom will raise when the motor runs.
- I. Output number Three: Traffic lights. ( If applicable).**  
Normal indication on the Alpha display; Empty circle = Open circuit .  
When the circuit is open: the traffic light will show Red and when the circuit is closed the traffic light will show Green.
- J. Output number Four: Lowered. ( Back indication ).**  
Normal indication on the Alpha display; Empty circle = Open circuit .  
The circuit is closed when the boom is in the lowered position.

### Inverter.

The Inverter is used to control the voltage and frequency of the power supplied to the electric motor and provides a smooth acceleration and deceleration of the boom. It prevents overloading or stalling of the motor on start-up and enables full control of raise and lower speeds to be maintained.

When a 'Run' signal is received from the Alpha controller, the inverter carries out a pre-programmed sequence, accelerating the boom up to its optimum speed.

When the 'Run' signal is removed, the pre-programmed deceleration sequence brings the boom to a controlled stop.

Power input to the inverter is 230v single phase, this is converted to a three phase output for the motor. Fault code tables and keypad operation details are to be found in the fault finding section of this manual.



#### A. Safety devices.

Depending on site specifications, various safety devices may be fitted e.g.

Induction loops to detect vehicle presence, photocells to detect vehicles or persons, safety edge sensors to detect contact with vehicles or persons.

During the lower cycle, if the safety device circuit is closed, then the Alpha controller will stop the boom from lowering further.

When the safety device circuit is re-opened, then the boom will continue to lower.

#### B. Site Secure facility.

Some sites may have a Site Secure mode whereby if the boom is raised or raising and the site secure button is pressed, then the boom will stop raising and will lower.

This may over-ride the safety device circuit, depending on the system specification.

#### C. Loop Detectors.

Some systems may be fitted with inductive loop detectors, the loop is buried a few centimetres beneath the road surface and is connected to a loop detector unit mounted in the main electrical enclosure.

#### D. Safety Loop.

When a vehicle is on this road loop, the detector unit closes the safety circuit which then inhibits the Alpha controller from activating the 'Lower' mode.

#### E. Free Exit Loop.

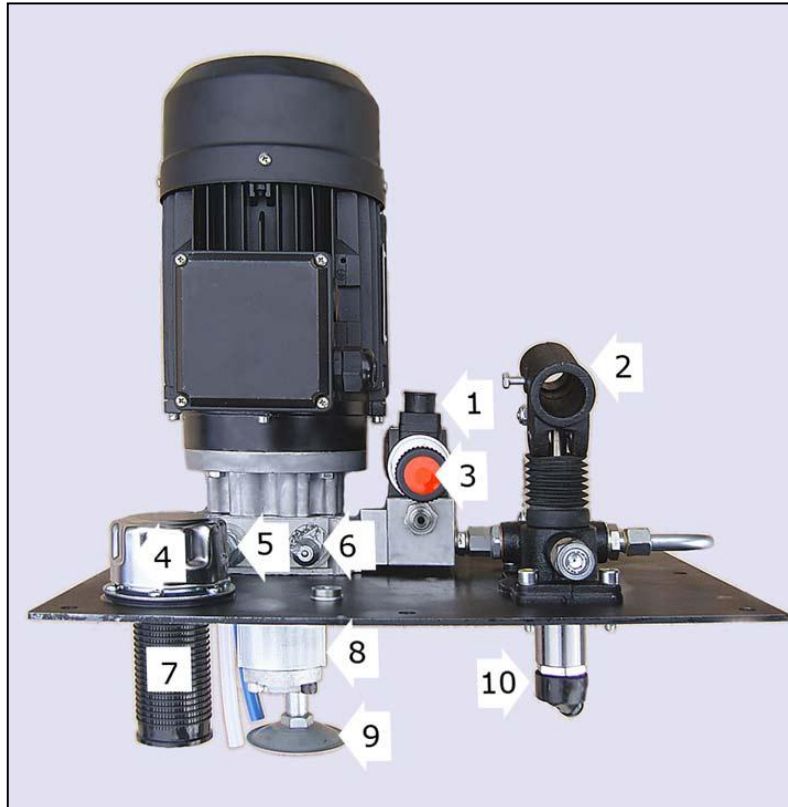
Loop detector used to provide a 'free exit' mode whereby a vehicle approaching the Barrier drives onto a road loop, the loop detector then closes the 'Raise' Circuit and the Barrier will raise automatically.

#### F. Auto Closing Loop.

Loop detector used to provide an automatic closing mode whereby a vehicle leaving the road loop causes the detector to close the 'Lower' circuit thus automatically lowering the barrier. Often used in conjunction with 'free exit' mode.

## Hydraulic System.

1. Raise Solenoid.
2. Socket for manual Pump handle.
3. Thumbwheel for manual operation.
4. Oil Filler cap
5. Pressure Relief Valve.
6. Pressure Take-off connection.
7. Oil strainer.
8. Pump.
9. Intake / oil filter.
10. Intake for manual pump.



A. The solenoid acts to change the direction of flow of the hydraulic oil. When OFF, the pressurised fluid is directed to the top of the ram with the fluid returning to tank from the bottom of the ram, this will lower the boom. With the solenoid ON, the fluid is directed to the bottom of the ram with return to tank being from the top, this will raise the boom.

B. A manually operated pump allows the boom to be operated in case of power failure.

C. In the event of a power failure, the thumbwheel is used to manually operate the Raise solenoid to allow the hand operated pump to raise the boom.

D. The oil filler cap is removed to check the oil level and top-up if required.

E. The pressure relief valve acts as a safety valve and will dump hydraulic fluid back to the tank if pressure exceeds the maximum setting. This valve is factory set and should not require any adjustment.

F. The pressure take-off point is used to connect a suitable pressure test gauge. It is fitted with a spring loaded self-closing valve and a removable dust cap.

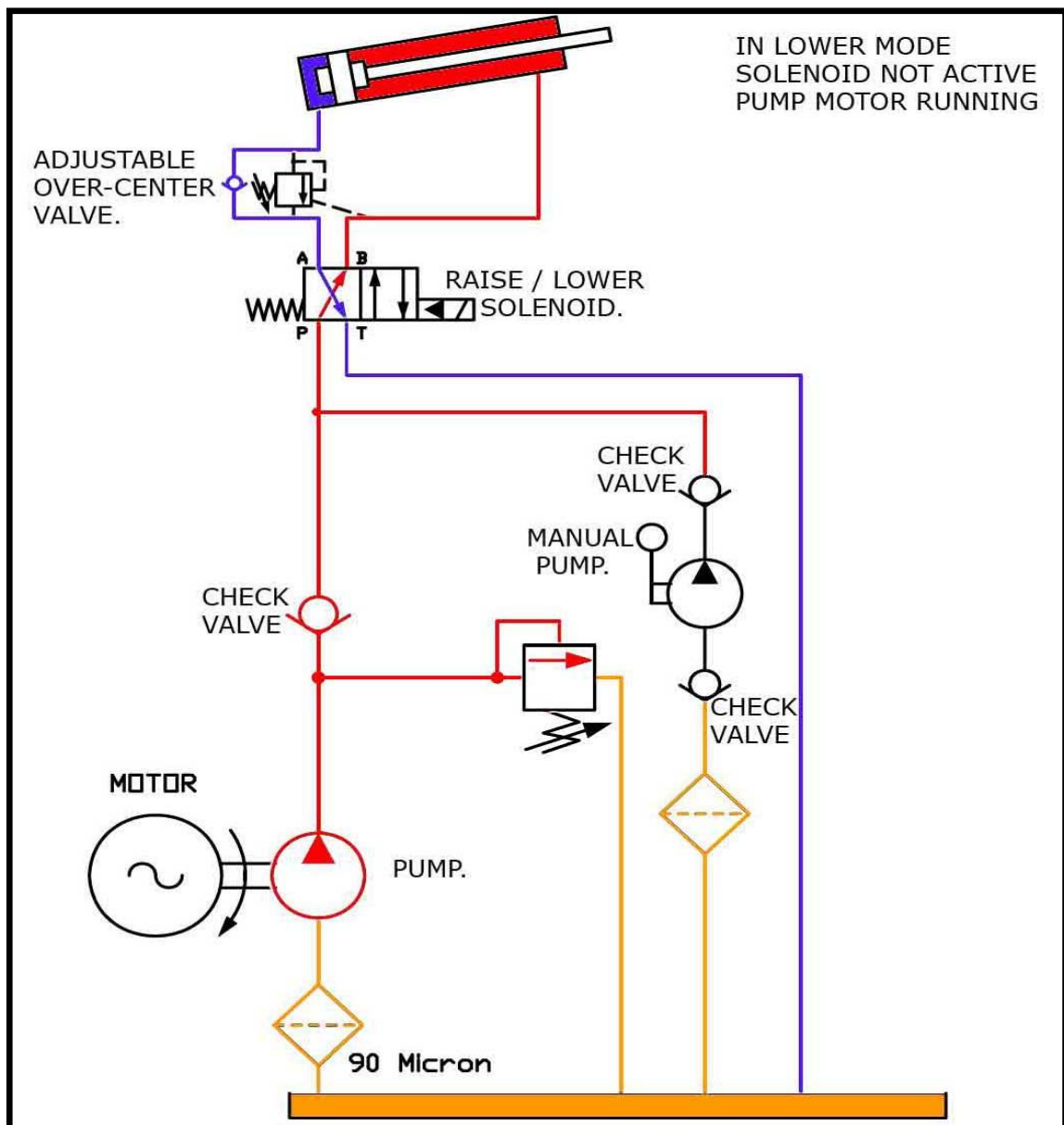
G. The Oil strainer will act to filter any oil being added to the reservoir and prevents ingress of foreign objects when the filler cap is open.

H. Main high pressure oil pump is of the submersible type and draws fluid from the reservoir via the filter.

I. Intake to the high pressure pump. Filter screen acts to protect the pump from particles larger than 90 microns and is washable.

J. The manual pump draws its oil from this submerged intake.

## Hydraulic Operation Schematic.



### Over Centre Valve.

The adjustable over-centre valve is used to overcome the weight of the boom during the lower cycle and enables a smooth descent of the boom.

It also acts to prevent an uncontrolled descent in the event of a hose failure.

It functions by using the supply-line pressure to control the flow of fluid returning to the tank. With the supply pressure acting on an adjustable spring-loaded valve, any decrease in supply pressure causes a decrease in the return-line flow rate and this provides an even flow rate throughout the lower cycle.

The valve is located at the bottom of a manifold block which is attached to the side of the hydraulic ram. See illustration on page 12.

The valve has a sealing cap and washer, which cover the adjusting screw.

Guidelines for adjustment are contained in the maintenance section of this manual.

## MAINTENANCE.



### Health & Safety.



It is the sole responsibility of the owner/user of the equipment to establish which legislation is applicable to the equipment being maintained, and to ensure subsequent compliance with all national and local regulations.

It is important that the owner / user of the equipment has assessed all equipment and operational hazards which might arise from the presence of electrical power, powered machinery and exposed moving parts during maintenance operations.

It is recommended that this assessment be reviewed before maintenance or repairs are carried out.

### Maintenance Risk Assessment form included with this manual.

All maintenance works must be carried out only by suitably qualified and experienced personnel, who are familiar with the risks and dangers inherent to their particular discipline, and the precautions necessary to minimise them.

Only carry out maintenance works;

When suitable warning signs are posted and area is cordoned off from traffic.

If no hazard exists (e.g. crushing hazard, slipping hazard, etc.)

With correct tools and equipment.

After carrying out the appropriate Risk Assessments.

Training on Maintenance can be provided by Avon Barrier Co. Ltd upon request.

### Drawings and schematics.

Site specific drawings and schematics are supplied at commissioning of the equipment and should be used in conjunction with the following maintenance guidance.

It is strongly recommended that any personnel responsible for the maintenance of this equipment should thoroughly familiarise themselves with the contents of this manual and with the site specific details of the individual installation, before attempting to undertake maintenance, fault finding or repair.

The lockable door on the side of the Barrier cabinet gives access to :  
The mains disconnect switch, oil filler cap, hydraulic power unit, lower ram pivot, solenoid control valve, manual hand pump and top cover hand-nut.  
The removable top cover gives access to the limit switches, top ram pivot, main shaft bearings and the electrical control panel enclosure.

## Panel Access Procedures.



Switch off rotary power disconnect switch before removing top cover.



To remove the top cover: open the side access door. On the left and below the Perspex covered control panel enclosure is a black plastic hand-nut, this should be unscrewed (turned to the right) until it disconnects from the cover. The top cover may now be removed by slightly lifting the rear of the cover and sliding it towards the front



Switch off rotary power disconnect switch before removing control panel.



The transparent-fronted control panel contains the Alpha controller, inverter, loop detectors, relays and control wiring connections. It is accessed by first removing the cabinet top cover as described above, and then lifting the panel enclosure upwards until it slides off its rails. It can then be laid horizontally on top of the cabinet.

Observations of the Alpha controller and Inverter display panels can be made without removing the transparent cover. The cover is removed by undoing the four screws.

### Periodic Maintenance.

#### Weekly maintenance:

Observe barrier in operation and check for:

Erratic operation. Unusual noises. Damage to safety devices.

Operation of traffic lights and induction loop systems (if fitted).

Open cabinet door and check for signs of damage and oil leaks.

#### Monthly maintenance:

Same as weekly checks but additionally:

Remove oil filler cap and check oil level;

Oil should be visible between three and five centimetres below the top of the filler hole.

#### First 100 operational hours:

The oil should be changed.

One operational hour is equal to approx 200 raise & lower cycles.

#### Quarterly maintenance:

Same as weekly and monthly checks but additionally;

Remove top cover and check main shaft bearings for signs of wear or free-play.

Check that main shaft assembly is moving centrally between bearing blocks.

Apply grease to greasing points at bottom ram pivot if fitted, otherwise apply lubricating maintenance spray.

Check hydraulic hoses for signs of damage or abrasion.

Check the tightness of the boom retaining bolts, the boom cabinet mounting bolts and the main shaft bearing-block bolts.

The top ram bearing should be checked for free play. This bearing should not be greased or sprayed with lubricant.

#### Annual maintenance:

After 3000 operational hours or every 12 months: Same as quarterly maintenance but additionally: The oil should be changed and the filter screen should be cleaned.



Switch off electrical power before carrying out maintenance procedures



### Maintenance guidelines.

#### **A. Manual operation of boom.**

Switch off power using rotary disconnect switch.

Refer to illustration on page 12 for HPU description.

To lower the boom, insert handle into manual pump socket and pump up and down.

To raise the boom, turn the raise solenoid thumbwheel inwards (clockwise) until a small resistance is felt, turn a further half turn. Do not over tighten, finger tight only.

Insert handle into manual pump socket and pump up and down.

Manually raising or lowering the boom may require substantial physical effort.

#### **B. Topping up the oil:**

Use a DIN 51519 Hydraulic Mineral Oil, Viscosity ISO 3348.

A list of suitable oils and COSSH data sheets and handling precautions are contained in the information section at the end of this manual.

Care should be taken to prevent any contamination of the oil or the oil reservoir.

Oil should be added through the filler hole on top of the HPU. (see page 19.)

Filling should be done slowly as the filler hole is fitted with a strainer which restricts the flow of oil into the reservoir.

Attention should be paid if frequent topping up is required, as this may be a sign of leakage.

#### **C. Changing the oil:**

Remove the oil filler cap and the screws holding the cap housing in place.

Remove the cap housing and strainer basket. The oil should be pumped out of the reservoir using a suitable hose and extractor pump.

The reservoir should be refilled with the correct grade of oil to within 3 to 5 cm from the top of the reservoir.

Check the oil level again after several operational cycles of the barrier.

#### **D. Cleaning the oil filter:**

Refer to diagram on page 19.

Drain the oil as described previously.

Remove the 8mm hex head bolts that secure the HPU base plate to the reservoir tank.

Lift the HPU, complete with motor and base plate, high enough to be able to access the filter / strainer unit, and prop it in place. Take care not to damage the cork gasket.

Do not use wooden props as this risks wood particles falling into the reservoir.

Undo the filter locknut and remove the filter from the intake pipe.

Thoroughly clean the filter in paraffin / kerosene or other suitable cleaner.

Compressed air may be used to clean and dry the filter.

Refit the cleaned and dried filter and tighten the locknut.

Lower the HPU into place, taking care not to allow any dirt to fall into the reservoir.

Refit and tighten the HPU retaining bolts.

Refill with oil as described previously.

**E. Adjusting the over-centre valve.**

Refer to the illustration on page 12, and the description on page 20

Operate the barrier several times to bring the oil up to working temperature.



Only make adjustments to this valve with the boom in the lowered position.



Remove the sealing cap from the over-centre valve, take care not to lose the sealing washer. Using a 5mm Allen key, turn the adjusting screw one quarter turn inwards (clockwise). Replace and tighten the sealing cap and washer.

Test by lowering the barrier several times.

It may be necessary to repeat the procedure several times as the balance of this valve requires a very fine adjustment.

When the final adjustments have been made, raise the boom and observe it in the raised position to check that it does not 'creep' downwards.

**F. Adjusting the limit switches.**

To remove the cabinet top cover; refer to access procedures on page 22.

Refer to page 26 for faultfinding limit switch.

In theory, moving the limit switch closer to, or further away from the pick-up point will adjust its sensitivity while the vertical adjustment will change the point in the cycle at which it is triggered, although in practice a fine combination of these two adjustments is required.

Earlier or later triggering is achieved by moving the limit switch bracket up or down, and more or less sensitivity is achieved by loosening the locknuts around the body of the switch and moving it closer to or further away from the pick-up point.

Normally only very fine adjustments are required and care should be taken not to move the switch far from its original position.

As the limit switch does not actually stop the boom but only triggers the deceleration mode, this will make correct adjustment a matter of trial and error.

**G. Bleeding air from the hydraulic system.**

Using a 17mm spanner, crack open the hose connection at the point where the flexible hose joins the top of the hydraulic ram manifold. (Refer to illustration on page 12.)

Position an absorbent material to soak up any oil, pressurise the line by using the hand pump and observe for air / oil exiting the connection. Continue slowly pumping until the oil runs clear with no sign of air bubbles. Retighten the connection.

Repeat the procedure with the hose connection at the bottom of the ram manifold after manually engaging the raise solenoid. ( See page 23 section A for manual raise / lower procedures.)

## **FAULT FINDING.**

If a fault condition should occur the following steps should be taken:



**Make sure area around barrier and boom is free from obstruction and is isolated from pedestrian and vehicular traffic.**



Try to determine the exact nature of the fault, i.e. barrier will not raise, will not lower, raises slowly, does not lower fully etc.

Check that the power supply is ON.

Carry out a visual inspection of the equipment, look for any signs of damage.

Check inside the cabinet for signs of oil leaks and check the oil level.  
Oil must be visible max 5 cm from the top of the filler orifice.

Switch the power supply off, using the rotary disconnect switch in the barrier cabinet, wait a few seconds and then switch back on. This will reset the Alpha controller and the Induction loop detectors (if fitted).

Check if fault has cleared.

Switch the power supply off again, wait for 5 minutes and then switch back on.  
This will reset the Inverter.

If the fault has not cleared, or if it re-occurs after operating the system, then use the following guidelines.

### **Accessing the electrical control panel.**

See access procedure on Page 22 and lift out the electrical control panel enclosure.  
Switch the rotary power disconnect switch back on.



**Equipment will now be live, observe all normal precautions for working near live equipment.**



The Alpha controller and the Inverter display screens may now be read and noted.  
Check that the input and output indications on the Alpha controller match the current status of the barrier; see pages 16 & 17.

Check that the inverter is not displaying a fault code; See pages 18 & 27.

Use the following list of fault finding guidelines in conjunction with the Alpha controller input / output display.

### **Raise Input.**

Use the access control system to open the lane (raise barrier) and observe the input indicator on the Alpha controller which should show on and off condition if the open lane button is repeatedly pressed. Alternatively a jumper wire can be used between Terminals 1 and 2 on the main terminal block.

### **Lower Input.**

Use the access control system to close the lane (lower barrier) and observe the input indicator on the Alpha controller which should show on and off condition if the close lane button is repeatedly pressed. Alternatively a jumper wire can be used between Terminals 1 and 3 on the main terminal block.

If a Site Secure facility is provided, the boom will lower and over-ride safety devices, therefore if the barrier will not lower using the normal Lower (lane close) circuit, but will lower using the Site Secure circuit, then this can be used as an indication that the problem may be in the safety device circuit.

### **Safety devices Input.**

Check that the Alpha controller display is showing an open indication.

If a closed circuit is indicated then check the safety devices.

i.e. check photocells, safety edges and induction loop indicators.

Refer to the site specific wiring schematic stored in the electrical panel enclosure.

Safety devices can be disconnected from the terminal block, one at a time, to narrow down the active device.

Note; a closed circuit condition in any of the safety devices will prevent the barrier from lowering but should not prevent it from raising.

### **Site secure Input.**

Check that the Alpha controller display is showing a closed indication.

If an open circuit is indicated then check the site secure push buttons are not locked in the ON position.

Note; an open circuit condition will lower the barrier and will also prevent it from raising.

### **Limit switch.**

The limit switch is equipped with an LED indicator next to the cable entry point.

Check that this lamp is lit when **not** near to the metal pick-up point, then check the lamp goes out when near to the pick-up point. A spanner or other metal object may be used to check for activation of the limit switch.

Whilst activating the limit switch, check for correct indication on the Alpha controller display screen.

### **Alpha controller.**

If the motor runs for more than one minute, a timer in the Alpha controller will cause the system to enter the 'Timeout' mode. The screen will display a flashing 'Timeout' warning which can be cleared by resetting the Alpha controller.

The Alpha controller can be 'reset' by switching off the mains power for a few seconds and then switching back on.

### **Loop Detector.**

Loop detector unit can usually be found in the top right of the electrical panel. Different models may be fitted, depending on site specifications, but basic functions remain similar, the status LED on the front of the detector unit should change colour as a vehicle or other metal object passes across the road loop. This can be tested either using a vehicle or a steel object laid on the road over part of the loop. Sensitivity can be adjusted and frequency can be changed. User instructions may be found on the front and side of the detector unit.

### Inverter.

The display panel on the inverter normally shows the frequency setting, but in the event of a fault condition a fault code will be shown.

The following fault code tables should be used to determine the fault condition and appropriate action may then be taken.

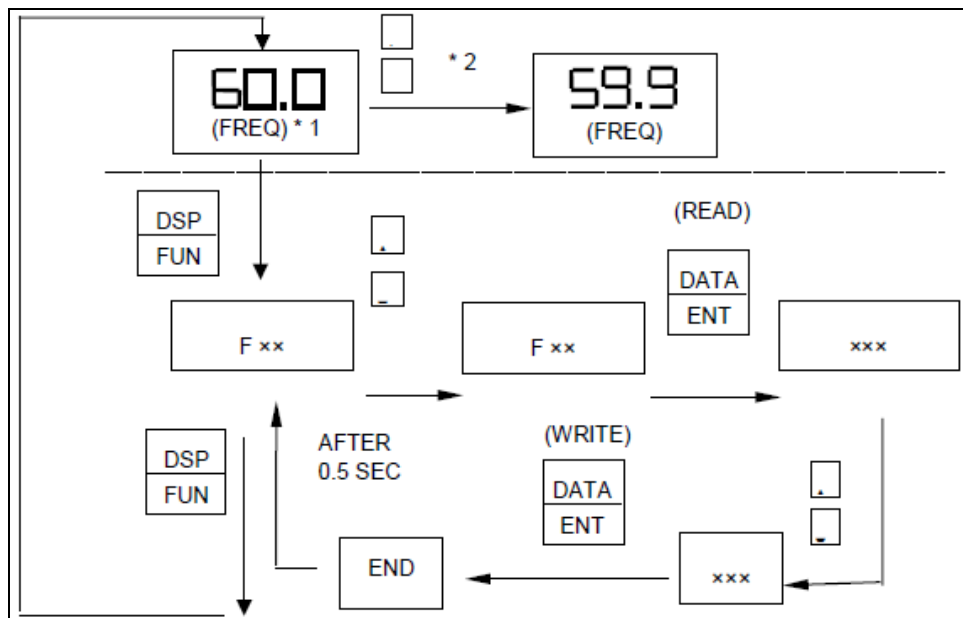
If an inverter fault condition is suspected, but the fault code display may have been reset either by switching the power off and on or because the fault condition was transitory; then the F30 parameter may be used to display the last three fault codes which are stored in the internal memory.

#### F\_30: Last three faults

1. Last three faults: indicate the sequence of the occurrence of malfunctions by the location of decimal point. x.xx indicates a recently happened malfunction. xx.x indicates the last malfunction that happened. xxx. Indicates the earliest malfunction in the record.
2. After entering the F\_30 function, the x.xx trip record will be displayed first. After that, press ▲ button and you can read activity in a chronological order. xx.x → xxx. → x.xx → ,, consecutively.
3. After entering F\_30 function, if the RESET button is pressed, the trip record will be cleared. Indication display -.--, --.-, and ---.
4. When the content of trip indicates O.CC, it will indicate the latest trip code is OC-C and so on.

#### Flowchart for Inverter Keypad operation.

Note: The inverter is programmed at the Avon Barrier factory and no changes to the parameters should be made.



Parameters that are specific to the EB950 CR are listed below, all other parameters are set to manufacturers defaults.

F01 – Acceleration Time – 1.5s

F02 – Deceleration time – 1.5s

F04 – Motor rotation – forward-0

F05 – V/F pattern – high starting torque- 2

F06 – Frequency upper limit – 40Hz

F07 – Frequency lower limit – 0Hz

F10 – Start / stop control – terminal-1

F18 – (Motor rated current / Inverter rated current) x 100

For 8A motor rated current in delta connection

F18 =  $8/10.5 \times 100 = 76.1$

F22 – Reverse lockout – 1 – locked.

#### Inverter Fault Codes.

INDICATION	CONTENT	POSSIBLE CAUSE	COUNTERMEASURE
CPF	Program error	Outside noise interference	Place a RC surge absorber in parallel with the noise generating magnetic contact
EPR	EEPROM error	EEPROM defective	Replace EEPROM
OV	Voltage too high while not operating	1. Power source voltage too high. 2. Detection circuitry defective	1. Examine the power supply 2. Return the inverter for repair
LV	Voltage too low while not operating	1. Power source voltage too low. 2. Detection circuitry defective.	1. Examining the power supply 2. Return the inverter for repair
OH	Inverter over heat while not operating	1. Detection circuit defective. 2. Environment over-heat or poor ventilation	1. Return the inverter for repair 2. Improve ventilation

#### Manual reset operative malfunctions (Auto-Reset inoperative)

INDICATION	CONTENT	POSSIBLE CAUSE	COUNTERMEASURE
OC	Over-current at stop condition	Detection circuit malfunction	Return the inverter for repair
OL1	Motor over-load	1. Loading too large 2. Improper V/F model setting 3. Improper F_18 setting	1. Increase capacity of motor 2. Adjust to use a proper V/F curve setting 3. Adjust F_18 according to instruction
OL2	Inverter over-load	1. Loading too large 2. Improper V/F model setting	1. Increase capacity of inverter 2. Adjust to use a proper V/F curve setting

INDICATION	CONTENT	POSSIBLE CAUSE	COUNTERMEASURE
OCS	Transient over-current starting machine	<ol style="list-style-type: none"> <li>1. Motor coil short-circuit with external casing</li> <li>2. Motor connection wire short-circuit with grounding</li> <li>3. Transistor module damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Examining motor</li> <li>2. Examining wiring</li> <li>3. Replace transistor module</li> </ol>
OCA	Over-current at acceleration	<ol style="list-style-type: none"> <li>1. Acceleration time setting too short</li> <li>2. Improper V/F feature selection</li> <li>3. Applied motor capacity exceeds inverter capacity</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust acceleration time to longer setting</li> <li>2. Adjust to a proper V/F curve</li> <li>3. Replace and install another inverter with appropriate capacity</li> </ol>
OCC	Over-current at steady speed	<ol style="list-style-type: none"> <li>1. Transient alteration of the loading</li> <li>2. Transient alteration of the power supply</li> </ol>	<ol style="list-style-type: none"> <li>1. Examining the loading configuration</li> <li>2. Install inductor on the power supply input side</li> </ol>
OCd	Over-current at deceleration	Deceleration setting too short	Adjust to use a longer acceleration time
OCb	Over-current at breaking	DC Breaking frequency, breaking voltage, or breaking time setting too long	Adjust to reduce settings of F_15, F_16, or F_17
OVC	Over-voltage at operation/deceleration	<ol style="list-style-type: none"> <li>1. Deceleration time setting too short or inertial loading too large</li> <li>2. Power supply voltage variation too large</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust to use a longer deceleration time</li> <li>2. Install a inductor on the power supply input side</li> <li>3. Increase the capacity of inverter</li> </ol>
LVC	Insufficient voltage level at operation	<ol style="list-style-type: none"> <li>1. Power supply voltage too low</li> <li>2. Power supply voltage variation too large</li> </ol>	<ol style="list-style-type: none"> <li>1. Improve power source quality</li> <li>2. Adjust to use a longer acceleration time</li> <li>3. Increase capacity of inverter</li> <li>4. Install a reactor on the power supply input side</li> </ol>
OHC	Heat-sink over heated at operation	<ol style="list-style-type: none"> <li>1. Loading too heavy</li> <li>2. Ambient temperature too high or poor ventilation</li> </ol>	<ol style="list-style-type: none"> <li>1. Examining the loading</li> <li>2. Increase capacity of inverter</li> <li>3. Improve ventilation</li> </ol>

## RISK ASSESSMENTS.

### Operation.

Equipment : EB 950 CR. Armstrong Crash Rated, Rising Arm Barrier.

Assessment By Adrian Boyson. (Signed) : \_\_\_\_\_  
 (Printed) : \_\_\_\_\_

Position : Commissioning Engineer. Date : 26/09/07.

Risk Assessment On site operation. Reviewed. \_\_\_\_\_  
 Applies to: \_\_\_\_\_

#### INSTRUCTIONS FOR USE

Each hazard must be assessed and qualified for the likelihood of possibility of injury and the severity of any injury so caused.

The numeric assessments are then multiplied to achieve a risk rating for each of the hazards identified.

<u>POSSIBILITY OF INJURY (P)</u>	<u>SEVERITY OF INJURY (S)</u>
1 = Little possibility (Low)	1 = Slight/Minor
2 +	2 +
3 = Possibility (Medium)	3 = Serious – Over 3 days absence
4 +	4 +
5 = Very Likely (High)	5 = Major/Death
<b>POSSIBILITY OF INJURY OF 5 – ASSESSMENT AND RISK RATING OVER 6 - CORRECTIVE ACTION MUST BE TAKEN IMMEDIATELY</b> <b>RISK RATING 10 OR OVER – WILL RESULT IN AN IMMEDIATE CESSATION OF WORK IF THE RISK CANNOT BE REDUCED</b>	<b>* ACTION BY REFERS TO INDIVIDUALS, PRINCIPAL CONTRACTOR, CLIENT ETC</b>

Risk assessment of persons or vehicles contacting barrier boom whilst in normal operation.

Probability of event with no safety features in place = High.(5)

Severity of consequences= Major/Fatal.(5)

Risk rating= 25.

Actions to reduce probability should take the following into account ; stop input, whether activated from ‘Stop’ push button, photo-beam, edge-strip or safety-loop etc, results in ‘Run’ signal being taken off PLC and thus causing inverter to ramp down. Ramp down is set at 1.5 seconds.

The tip of a 5 meter boom will be travelling at approximately 1.5mps. While ramping-down the boom will be decelerating, taking this deceleration into account, the tip will travel between 1. and 0.5mtrs after the stop button has been operated.

#### Actions to reduce probability:

1. Safety loops to prevent barrier lowering onto vehicle.

Comment; Loops would need to be placed at a sufficient distance to allow for the delay in stopping boom.

Ineffective for pedestrians.

Event Probability Reduction score for Vehicles= 1.

Pedestrians= 0.

**2. Photo-detectors to prevent barrier lowering onto pedestrians.** Comment: Detectors would not guarantee prevention of contact between vehicles/pedestrians and boom due to 1 to 1.5mtr travel of boom tip after detector was activated).

Event Probability Reduction score for Vehicles= 1.  
Pedestrians= 1.

**3. System operated manually, (visual check).**

Comment: Relies on system operator maintaining constant observation of boom area during each lower cycle.

Event Probability Reduction score for Vehicles= 2.  
Pedestrians= 2.

**4. Physical barrier/fencing to prevent pedestrian access.**

Comment: Depends on suitability of site to establish an effective pedestrian no-go zone.

Event Probability Reduction score for Vehicles= 0.  
Pedestrians= 4.

**5. Audible warning sounder when lowering barrier.**

Comment: Not effective for deaf persons. Noise pollution depending on site environment.

Event Probability Reduction score for Vehicles= 1.  
Pedestrians= 1.

**6. Traffic light control.**

Comment: Effectiveness depends entirely on user observation and obeying of rules.

Event Probability Reduction score for Vehicles= 2.  
Pedestrians= 0.5.

**7: Warning lights/colours on boom.**

Comment: Effectiveness depends entirely on user observation.

Event Probability Reduction score for Vehicles=0.5.  
Pedestrians= 0.5

#### Actions to reduce Severity of consequences:

**1: Edge detectors**

Comment: Only effective after collision has occurred. Helps prevent further damage. Not effective for pedestrians.

Severity of consequences reduction score for Vehicles= 1.  
Pedestrians= 0.

**2: Speed restrictor bumps.**

Comment: Can be effective in reducing collision speed.  
Not effective for pedestrians.

Severity of consequences reduction score for Vehicles= 2.  
Pedestrians= 0.

#### Conclusions.

The nature of the equipment gives very limited scope for reduction of Event Consequences, therefore attention must be paid to reducing the Probability of Event. The above Reduction scores only bring the risk down to an acceptable level if several measures are put in place concomitantly.

Most effective single measure for vehicle *and* pedestrian safety is the use of a manual operation system, (without an exit closing loop). The safety of such a system depends heavily on the operator being properly trained and alert during every operation cycle.

Most effective single measure for pedestrian safety is the effective isolation of the barrier area from all pedestrian traffic.

If the system is to be used in circumstances where site-security will override safety, then the isolation of the area from pedestrians should be considered mandatory as should an entirely manual operation by fully trained personnel .



## RISK ASSESSMENT Maintenance

Equipment : EB 950 CR. Armstrong Crash Rated, Rising Arm Barrier.

Assessment By (Printed) : Adrian Boyson. (Signed) : \_\_\_\_\_

Position : Senior Commissioning Engineer. Date : \_\_\_\_\_

Risk Assessment Maintenance and Repair.

Applies to: \_\_\_\_\_

### INSTRUCTIONS FOR USE

Each hazard must be assessed and qualified for the likelihood of possibility of injury and the severity of any injury so caused.

The numeric assessments are then multiplied to achieve a risk rating for each of the hazards identified.

<b><u>POSSIBILITY OF INJURY (P)</u></b>	<b><u>SEVERITY OF INJURY (S)</u></b>
1 = Little possibility (Low) 2           + 3 = Possibility (Medium) 4           + 5 = Very Likely (High)	1 = Slight/Minor 2           + 3 = Serious – Over 3 days absence 4           + 5 = Major/Death
<b>POSSIBILITY OF INJURY OF 5 – ASSESSMENT AND RISK RATING OVER 6 - CORRECTIVE ACTION MUST BE TAKEN IMMEDIATELY            RISK RATING 10 OR OVER – WILL RESULT IN AN IMMEDIATE CESSATION OF WORK IF THE RISK CANNOT BE REDUCED</b>	
<b>* ACTION BY REFERS TO INDIVIDUALS, PRINCIPAL CONTRACTOR, CLIENT ETC</b>	

### HAZARD/HARM POTENTIAL

<b>ACTIVITY:</b> Working area around barrier.	Possibility (P)	x	Severity (S)	=	Risk Rating (P x S)	* Action By ABC	Final Risk Rating 3
	3	x	2	=	6		
<b><u>HAZARD:</u></b> <u>Risk of injury/damage to persons or property.</u>			<b><u>Action</u></b> <u>Engineer to use barriers and/or traffic cones to isolate area if necessary.</u>				
<b>ACTIVITY:</b> Maintenance/inspection of barrier.	Possibility (P)	x	Severity (S)	=	Risk Rating (P x S)	* Action By ABC	Final Risk Rating 3
	3	x	2	=	6		
<b><u>HAZARD:</u></b> <u>Risk of injury/damage to persons or property due to inadvertant operation of barrier.</u>			<b><u>Action:</u></b> <u>Engineer to isolate equipment as per method statement.</u>				
<b>ACTIVITY:</b> Working on electrical componants.	Possibility (P)	x	Severity (S)	=	Risk Rating (P x S)	* Action By ABC	Final Risk Rating 5
	2	x	5	=	10		

<b>HAZARD:</b> <u>Risk of electrocution and / or burns from live equipment.</u>			<b>Action</b> <u>Engineer to liase with site electrician and electrically isolate barrier if needed.</u>				
<b>ACTIVITY:</b> Working on hydraulic system.	<b>Possibility</b>  (P)  2	x   x	<b>Severity</b>  (S)  5	=   =	<b>Risk Rating</b> (P x S)  10	<b>* Action By</b>  ABC	<b>Final Risk Rating</b>  5
<b>HAZARD:</b> Sudden loss of pressure. Hydraulic oil spillage.			<b>Action</b> <u>Engineer to ensure boom is lowered and system pressure is released as per method statement. Spill absorbent matting to be used to contain any spillage.</u>				
<b>ACTIVITY:</b> Removal of boom.	<b>Possibility</b>  (P)  3	x   x	<b>Severity</b>  (S)  3	=   =	<b>Risk Rating</b> (P x S)  9	<b>* Action By</b>  ABC	<b>Final Risk Rating</b>  3
<b>HAZARD:</b> <u>Risk of injury/damage to persons or property</u> Manual / mechanical handling risks.			<b>Action</b> <u>Personnel trained in manual / mechanical handling techniques.</u> <u>Engineer to use correct PPE. Liase with site safety personnel when using mechanical handling methods and adhere to Avon Barrier and site method statements.</u>				
<b>ACTIVITY:</b> Removal or disconnection of hydraulic ram or ram pivot pins.	<b>Possibility</b>  (P)  3	x   x	<b>Severity</b>  (S)  4	=   =	<b>Risk Rating</b> (P x S)  12	<b>* Action By</b>  ABC	<b>Final Risk Rating</b>  4
<b>HAZARD:</b> <u>Risk of injury/damage to persons or property due to sudden descent of boom.</u>			<b>Action:</b> <u>Engineer to use Avon Barrier brace-lock tools as per method statement.</u>				
<b>ACTIVITY:</b>	<b>Possibility</b>  (P)  2	x   x	<b>Severity</b>  (S)  3	=   =	<b>Risk Rating</b> (P x S)  6	<b>* Action By</b>  ABC	<b>Final Risk Rating</b>  3



**RECORD OF RISK ASSESSMENT**  
**Installation.**

**Equipment :** EB 950 CR. Armstrong Crash Rated, Rising Arm Barrier.

**Assessment By (Printed) :** Adrian Boyson. (Signed) \_\_\_\_\_

**Position :** Commissioning Engineer. **Date :** \_\_\_\_\_

**Risk Assessment** INSTALLATION.

**Applies to:** \_\_\_\_\_

**INSTRUCTIONS FOR USE**

Each hazard must be assessed and qualified for the likelihood of possibility of injury and the severity of any injury so caused.

The numeric assessments are then multiplied to achieve a risk rating for each of the hazards identified.

<u>POSSIBILITY OF INJURY (P)</u>	<u>SEVERITY OF INJURY (S)</u>
1 = Little possibility (Low)	1 = Slight/Minor
2 +	2 +
3 = Possibility (Medium)	3 = Serious – Over 3 days absence
4 +	4 +
5 = Very Likely (High)	5 = Major/Death

<b>POSSIBILITY OF INJURY OF 5 – ASSESSMENT AND RISK RATING OVER 6 - CORRECTIVE ACTION MUST BE TAKEN IMMEDIATELY</b> <b>RISK RATING 10 OR OVER – WILL RESULT IN AN IMMEDIATE CESSATION OF WORK IF THE RISK CANNOT BE REDUCED</b>	<b>* ACTION BY REFERS TO INDIVIDUALS, PRINCIPAL CONTRACTOR, CLIENT ETC</b>
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**HAZARD/HARM POTENTIAL**

1. Hazards from general site conditions (housekeeping etc)	Possibility (P)	x	Severity (S)	=	Risk Rating (P x S)	* Action By	Final Risk Rating
	3	x	2	=	6	ABC	3

<u>Comments</u> <b>Large size and weight of components make general housekeeping conditions particularly important.</b>	<u>Action</u> <b>All installation personnel tasked to keep work areas tidy.</b>
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2. Hazards from tripping and physical collision.	Possibility (P)	x	Severity (S)	=	Risk Rating (P x S)	* Action By	Final Risk Rating
	3	x	2	=	6	ABC	3

<u>Comments</u>		<u>Action</u> <u>Installation personnel tasked to use barriers and warning tape to highlight components when necessary.</u>					
3. Hazards from transporting components using FLT, Lorry loader or overhead crane.	Possibility (P) 2	x	Severity (S) 5	=	Risk Rating (P x S) 10	* Action By ABC	Final Risk Rating 5
<u>Comments</u> <u>Risk of injury to personnel within transport area.</u> <u>Risk of injury when loading/unloading from HGV.</u>		<u>Action</u> <u>Banksman to keep area clear of personnel while components being transported from point to point.</u> <u>Banksman must be used when loading/unloading HGV.</u> <u>Trained personnel to use appropriate lifting equipment and methodologies. Equipment to be inspected for correct capacity and up to date certification.</u>					
4. Hazards from assembly of large/heavy components.	Possibility (P) 3	x	Severity (S) 3	=	Risk Rating (P x S) 9	* Action By ABC	Final Risk Rating 3
<u>Comments</u> <u>Possibility of crushing and/or trapping injuries.</u>		<u>Action</u> <u>Safety boots, helmets and gloves must be worn.</u> <u>Suitable blocks/slings and trestles to be used to support components prior to and during assembly.</u>					
5. Hazards from components falling or tipping.	Possibility (P) 3	x	Severity (S) 3	=	Risk Rating (P x S) 9	* Action By ABC	Final Risk Rating 3
<u>Comments</u> <u>Boom catcher assemblies are unstable in vertical position.</u>		<u>Action</u> <u>Assemblies to be suitably braced/supported whenever in the vertical position. Boom catchers to be stored in horizontal position.</u>					
6. Hazards from sudden lowering of boom during testing.	Possibility (P) 3	x	Severity (S) 5	=	Risk Rating (P x S) 15	* Action By ABC	Final Risk Rating 5

<b>Comments</b> <u>Weight and length of boom result in large forces being exerted on entire structure especially during raise operation.</u>			<b>Action</b> <u>Boom not to be fitted until both boom catchers and ground plate/HPU are fitted and bolted down in final positions. All bolts to be fully tightened prior to boom being attached.</u> <u>All fasteners and top and bottom ram pins must be fully tightened and all welds to be subjected to thorough visual inspection before boom is initially raised and again after raise/lower cycle is completed.</u> <u>Area around boom to be cordoned off using barriers and kept clear of personnel while boom is in raised position.</u>				
7. Hazards from pinching/crushing of operatives during testing.	Possibility (P) 3	x	Severity (S) 3	=	Risk Rating (P x S) 9	* Action By ABC	Final Risk Rating 3
<b>Comments</b> <u>Moving parts of boom and ram pose possible risk to installation and other personnel.</u>			<b>Action</b> <u>Installation personnel trained in operation of system and aware of potential hazards. Raise/lower tests carried out using remote control boxes.</u>				
8. Hazards from working with live electrical system.	Possibility (P) 2	x	Severity (S) 5	=	Risk Rating (P x S) 10	* Action By ABC	Final Risk Rating 5
<b>Comments</b> <u>Risk of electrocution / burns.</u>			<b>Action</b> <u>Only trained / qualified personnel to work on live electrical equipment.</u> <u>Mains supply to be isolated except when essential for testing/operation.</u>				
9. Hazards from substances.	Possibility (P) 2	x	Severity (S) 2	=	Risk Rating (P x S) 4	* Action By ABC	Final Risk Rating 2
<b>Comments</b> <u>Hydraulic oil presents skin damage risk and risk of slipping.</u>			<b>Action</b> <u>Personnel to wear appropriate PPE and equipment to be kept clean and dry.</u>				
	Possibility (P) 2	x	Severity (S) 5	=	Risk Rating (P x S) 10	* Action By ABC	Final Risk Rating 5
<b>Comments</b>			<b>Action</b>				

# **CERTIFICATES AND DATA SHEETS.**

## **COSHH Statements**

### **HYDRAULIC OIL DATA SHEET**

#### **1: IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING**

**Hyspin AWS 32 6018-UK Product Name: Code:**

**Application: Hydraulic systems**

**Company: Castrol (U.K.) Limited**

**Address: Burmah Castrol House, Pipers Way, Swindon, Wiltshire, SN3 1RE**

**Telephone (24 hours): 01793 512712 Fax: 01793 491442**

#### **2: COMPOSITION/INFORMATION ON INGREDIENTS**

**Composition: Highly refined mineral oil and additives**

**Hazardous Ingredient(s) Symbol Risk Phrases Other Information %**

**This product contains ingredients classified as hazardous. However, they are NOT present in sufficient quantities to warrant classifying the product as hazardous**

**All constituents of this product are listed in EINECS (European Inventory of Existing Commercial Chemical Substances) or ELINCS (European List of Notified Chemical Substances) or are exempt.**

**Refer to Section 8 for Occupational Exposure Limits.**

#### **3: HAZARDS IDENTIFICATION**

**This product is NOT classified as hazardous**

#### **4: FIRST AID MEASURES**

**Eyes: Irrigate immediately with copious quantities of water for several minutes**

**Skin: Wash thoroughly with soap and water or suitable skin cleanser as soon as possible**

**Inhalation: Remove from exposure**

**Ingestion: Obtain medical attention. Do NOT induce vomiting.**

#### **5: FIRE FIGHTING MEASURES**

**Suitable Extinguishing Media: Carbon dioxide, powder, foam or water fog - Do not use water jets**

**Special Exposure Hazards: None Special Protective Equipment: None**

#### **6: ACCIDENTAL RELEASE MEASURES**

**Personal Precautions: Spilt product presents a significant slip hazard**

**Environmental Precautions: Prevent entry into drains, sewers and water courses**

**Decontamination Procedures: Soak up with inert absorbent or contain and remove by best available means**

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#### **7: HANDLING AND STORAGE**

**Handling: When used in high-pressure systems, leakage may result in mist formation so presenting a hazard**

**To avoid the possibility of skin disorders, repeated or prolonged contact with products of this type must be avoided. It is essential to maintain a high standard of personal hygiene**

**Storage: No special precautions**

#### **8: EXPOSURE CONTROLS/PERSONAL PROTECTION**

**Occupational Exposure Limits:-**

**Substance 8 Hr.TWA STEL Source/Other Information**

**Mineral oil (see Oil mist, mineral) 5mg/m<sup>3</sup> 10mg/m<sup>3</sup> EH40 (OES)**

**Engineering Control Measures: Mechanical methods to minimise exposure must take precedence over personal protective measures**

**Personal Protective Equipment: Avoid skin and eye contact. Wear impervious gloves (eg of PVC), in case of repeated or prolonged contact. Change contaminated clothing and clean before re-use**

## **9: PHYSICAL AND CHEMICAL PROPERTIES**

**Physical State: Liquid**

**Colour: Amber**

**Odour: Mild**

**Boiling Point/Range (°C): Above 250**

**Pour Point: (°C): Below minus 30**

**Kinematic Viscosity @ 40°C (cSt): 32**

**Flash Point (closed, °C): Above 170**

**Autoignition (°C): Above 250**

**Explosive Properties (%): Not determined**

**Relative Density (at 20°C): Below 1.0**

**Water Solubility: Insoluble**

**Fat Solubility: Not determined**

## **10: STABILITY AND REACTIVITY**

**Stability: Stable, will not polymerise**

**Conditions to Avoid: Temperatures (°C) above 90**

**Materials to Avoid: Strong oxidising agents**

**Hazardous Decomposition Products: None**

## **11: TOXICOLOGICAL INFORMATION**

**The following toxicological assessment is based on a knowledge of the toxicity of the product's components Expected oral LD50, rat > 2g/kg**

**Health Effects On Eyes: May cause transient irritation**

**On Skin: Unlikely to cause harm on brief or occasional contact**

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**By Inhalation: Mist and vapours may cause irritation to nose and respiratory tract**

**By Ingestion: May cause nausea, vomiting and diarrhoea.**

**Chronic: Repeated and prolonged skin contact may lead to skin disorders**

**Other: None known**

## **12: ECOLOGICAL INFORMATION**

**Environmental Assessment: When used and disposed of as intended, no adverse environmental effects are foreseen**

**Mobility: Mobile liquid. Insoluble in water. Non-volatile.**

**Persistence and Degradability: Inherently biodegradable**

**Bioaccumulative Potential: Bioaccumulative based on logP values of constituents**

**Ecotoxicity: Not expected to be toxic to aquatic organisms**

**Not expected to be inhibitory to sewage bacteria**

## **13: DISPOSAL CONSIDERATIONS**

**Disposal must be in accordance with local and national legislation.**

**Unused Product: May be sent for reclamation**

**Used/Contaminated Product: Dispose of through an authorised waste contractor to a licensed site**

**May be incinerated**

**Packaging: Must be disposed of through an authorised waste contractor**

**May be steam cleaned and recycled**

## **14: TRANSPORT INFORMATION**

**This product is NOT classified as dangerous for transport**

## **15: REGULATORY INFORMATION**

**This product is NOT classified as dangerous for supply in the UK**

**Hazard Label Data:-**

**EC Directives: Waste Oil Directive, 87/101/EEC**

**Framework Waste Directive, 91/156/EEC**

**Statutory Instruments: Health & Safety at Work, etc. Act 1974**

**Consumer Protection Act 1987**

**Environmental Protection Act 1990**

**Codes of Practice: Waste Management. The Duty of Care**

**Guidance Notes:**

Occupational exposure limits (EH 40)  
 Carcinogenicity of mineral oils (EH 58)  
 Skin cancer caused by oil [MS(B)5]  
 Save your skin! - Occupational Contact Dermatitis [MS(B)6]  
 Dermatitis - cautionary notice [SHW 367]  
 Effects of mineral oil on the skin [SHW 397]

16: OTHER INFORMATION

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The data and advice given apply when the product is sold for the stated application or applications. The product is not sold as suitable for any other application. Use of the product for applications other than as stated in this sheet may give rise to risks not mentioned in this sheet.

You should not use the product other than for the stated application or applications without seeking advice from us.

If you have purchased the product for supply to a third party for use at work, it is your duty to

take all necessary steps to secure that any person handling or using the product is provided with the information in this sheet.

If you are an employer, it is your duty to tell your employees and others who may be affected of any hazards described in this sheet and of any precautions which should be taken.

Further copies of this Safety Data Sheet may be obtained from Castrol (U.K.) Limited.

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List of suitable hydraulic oils.

BRAND (alphabetical)	Hydraulic-mineral oil HLP to DIN 51524, part 2	
	ISO - VG32	ISO - VG46
	Temperature Range	
	+10 to +60 degrees C	+20 to +70 degrees C
AGIP	AGIP OSO 32	AGIP OSO 46
ARAL	ARAL VITAM GF 32	ARAL VITAM GF 46
ASEOL	ASEOL PLUS 16-110	ASEOL PLUS
BP	BP BARTRAN HV 32	BP BARTRAN HV 46
CASTROL	CASTROL HYPIN AWS 32	CASTROL HYPIN AWS 46
ESSO	ESSO NUTO H 32	ESSO NUTO H 46
FUCHS	RENOLIN MR 10	RENOLIN MR
GULF	GULF HARMONY 32 AW	GULF HARMONY 46 AW
MOBIL	MOBIL D.T.E. 24	MOBIL D.T.E.
PANOLIN	PANOLIN HLP 32	PANOLIN HLP 46
SHELL	SHELL TELLUS OIL 32	SHELL TELLUS OIL 46
TEXACO	RANDO OIL HD A-32	RANDO OIL HD A-46



**CERTIFICATION OF CONFORMITY.**

**E C MACHINERY DIRECTIVE 98/37/EEC**

**E C LOW VOLTAGE DIRECTIVE EN60204-1:1998**

**E C ELECTROMAGNETIC COMPATIBILITY  
DIRECTIVE EN 50081-1 & EN 50082-2**

**U.K. PAS68 7500-50 / US DoS SD-STD-02**

**We hereby certify that EB950CR complies with the relevant provisions of the Directives detailed above.**

**Manufactured by :  
Avon Barrier Company Ltd  
Nova House  
195 South Liberty Lane  
Ashton Vale Trading Estate  
Bristol  
BS21 2TN**

**Signed :**

**Date : 9th February 2006**

**Name : P A Jeffrey**

**Position: Technical Director, Avon Barrier Company Ltd**



## **WARRANTY DOCUMENT**

### **DETAILS OF THE INSTALLATION**

**Client:**

**Contact:**

**Address:**

**Site Details:** As above.

**We, Avon Barrier Company Limited, guarantee our product for twelve months from the completed installation date, provided that it is maintained in accordance with the schedule detailed in the operating and maintenance manual.**

**Consumable items and items subject to failure caused by damage are not covered. Additional items to complete the installation procured from third party suppliers are covered by our warranty.**

**Name:** P.H.Jeffrey

**For and on behalf of:** Avon Barrier Company Limited

**Address:**

**Nova House  
195 South Liberty Lane  
Ashton Vale Trading Estate Bristol BS3 2UU**

**Signature:**

**Date:**



## **WARRANTY AND LIMITATION OF LIABILITY**

Avon Barrier Company Limited (hereinafter referred to as “The Company”) warrants that, during the first 12 months following delivery, the product will be free from defects in material and workmanship. The Company’s sole obligation under the terms of this warranty shall be to repair (or at The Company’s discretion, to replace) any defective product/part, without extra charge to the Buyer, provided that:-

1. Buyer gives The Company written notice of any such claimed defect within such period of 12 months.
2. The product, if installed, was installed by The Company’s authorised installer.
3. The product has not been modified, subjected to misuse, improper maintenance, negligence or accident, or used with parts not authorised by The Company.

**NO OTHER WARRANTY IS EXPRESSED AND NONE SHALL BE IMPLIED, INCLUDING WITHOUT THE WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR USE.**

**THE FOREGOING STATES THE ENTIRE LIABILITY OF THE COMPANY WITH RESPECT TO THE PRODUCT.**

### **DISCLAIMER**

**IN NO EVENT SHALL THE COMPANY BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH RESULT FROM USE BY BUYER, OR ANY OTHER PARTY, OF THE PRODUCT. NEITHER SHALL THE COMPANY’S LIABILITY EXCEED THE AMOUNTS PAID BY THE BUYER FOR THE PRODUCT THEREUNDER.**

Careful consideration must be given to the selection, placement and design of a Barrier installation, and care taken to ensure that approaching vehicles as well as pedestrians are fully aware of the Barrier system and its operation.

Proper illumination, clearly worded signage and auxiliary safety devices, should be considered.

Avon Barrier Co. Ltd. has information available on many such pieces of safety equipment not specifically listed



**Avon Barrier Company Ltd.**

## **Commissioning Certificate.**

**This is to certify that the Avon Barrier Company equipment listed herewith has been satisfactorily installed, tested and commissioned .**

**It complies with the required mode of operation as per the works instruction and is accepted as fully serviceable. Instruction in the safe use and mode of operation of the equipment has been given to the relevant personnel.**

**Signed by:**

**For and on behalf of Avon Barrier Co.Ltd.**



**For and on behalf of**



**Dated:.....**