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Bahamas Maritime Authority

**Report of the Investigation into
The Premature Release of the
Port Lifeboat on *M.V. Pac Monarch*
at Vancouver, Canada,
on 26 October 2000.**

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1. SUMMARY

1.1 The *M.V. Pac Monarch* arrived at Vancouver, BC, Canada, on 19 October 2000, and anchored at 0214. During the vessel's stay at anchor, the ship's lifeboats were lowered into the water on various occasions to ferry the crew to and from the shore for shore leave. As recorded in the Deck Logbook the port lifeboat, No 2, was used for shore leave onwards from 24 October 2000. On 26 October 2000 at approximately 1047 when the port lifeboat was being lowered into the water with four crew members on board, the lifeboat release mechanism disengaged releasing the boat stern first into the water from a height of about 15 metres.

1.2 The crew on board the lifeboat at the time were the second officer, third assistant engineer, an ordinary and able seaman. Following the accident various boats in the vicinity reportedly rushed to the assistance of the crew and lifeboat. The lifeboat had taken in water and was partially submerged at the stern.

1.3 Attempts to connect the lifeboat to the lifting blocks were unsuccessful as the stern hook was in the water and the stern of the boat was damaged. Access to the lifeboat was gained by hacking away at the broken stern canopy by means of an axe. All four crew members were recovered from the lifeboat. Three were rushed to hospital, but later died from their injuries. The fourth sustained minor injuries and was returned to the vessel.

2. PARTICULARS OF VESSEL

Name	<i>M.V. Pac Monarch</i>
Port of Registry	Nassau, Bahamas
Official Number	731998
IMO Number	9231030
Gross Tonnage	38878
Net Tonnage	24517
Overall Length	218.82m
Year of Build	April 2000
Type	Bulk Carrier
Owner Co.	Trans Pacific Shipping
Operator	Lasco Shipping Co.
Class	NKK
Time and Date of Incident	1047, 26 October 2000
Place of Incident	Vancouver, BC, Canada
Injuries dead,	3 crew members 1 crew member with minor injuries
Damage	Lifeboat badly damaged

3. DESCRIPTION AND OPERATION OF FALLS/HOOKS AND REALEASE SYSTEM

3.1 The lifting hooks and release mechanism fitted on the lifeboats were 'onload/off load' release hooks of type 'NS-Hook', manufactured by Nishi-Nippon FRP Ship Building Co. of Japan. (Annex II, Figs 1 & 2). (See also Makers Instruction Manual, Annex 3 for part numbers)

3.2 The coxswain, in pulling the Release Handle (9) in the Central Release Unit pulls the Reset Lever (6) down in the Hook Assembly which in turn releases the Blocking Lever (5). Releasing the Blocking Lever allows the hook to revolve on its spindle and consequently release the lifeboat fall.

3.3 Before launching the boat the main switch (S-1) should be on. The red lamp (S-2B) is lit signifying the boat is not afloat and that it is not safe to release. Once the boat is lowered and waterborne a water pressure switch fitted in the bottom of the boat is operated. This disengages interlock (10) by it being pulled upwards and the red lamp (S-2) in the control box goes out and the green lamp (S-3) is then lit to confirm that it is safe to release. The green light should remain alight all the time the boat is waterborne to indicate that the hooks are ready to release. The Safety Pin, (17), is then removed and the Release Handle (9) pulled. The boat is released as the fore and aft hooks (4) open and release the suspension rings.

3.4 The red light will illuminate as the green light goes out. The red light remains illuminated until the hooks are properly reset, when the Cable Connection Arms (12) again activate their switches after resetting.

3.5 The hooks can be released in an emergency when the life boat is not afloat and while on-load. To do this the glass in the access panel to the interlock (27) has to be broken.

3.6 Before recovering the lifeboat, a crew member must first 'reset' the hooks. To do this, the hooks have to be brought up to the closed position; the Blocking Lever engaged and the Reset Lever pushed upward to hold the Blocking Lever in place. Once this has been done at each hook, the Central Release Lever can be pushed in and the Safety Pin engaged. If the Blocking Lever is in the blocking position, the hook is secure and will remain locked. The lifeboat should then be able to be lifted safely to its stowage position.

4. NARRATIVE OF EVENTS

4.1 The *M.V. Pac Monarch* arrived at Vancouver, BC, Canada, on 19 October 2000, and anchored at 0214 in English Bay. During the vessel's stay at anchor, the ship's lifeboats were lowered into the water on various occasions to ferry the ship's crew to and from the shore for shore leave. As recorded in the deck logbook the port lifeboat, No 2, was used for shore leave onwards from 24 October 2000 and this was the last day the lifeboat had been used, 2 days prior to the accident.

4.2 When the lifeboat was lowered and recovered from the water on 24 October it was manned by the 3rd officer (3/O), in charge, assisted by the 3rd assistant engineer (3/E), Bosun and an able seaman (A/B). The lifeboat and its lifting gear were reportedly in good order with no apparent damage to the lifting mechanism. Both the hooks were reset by the A/B. The 3/O reset the release unit relying wholly on the alarm light box alone to indicate that the lifting mechanism was safely engaged to lift the boat out of the water.

4.3 On 26 October 2000 at approximately 1045 the chief officer (C/O) obtained permission from Vancouver Traffic Control to lower the port lifeboat to proceed to False Creek for crew liberty. The C/O was in charge of lowering the lifeboat assisted by an (A/B) and was positioned on the port lifeboat embarkation deck. The lifeboat crew assembled on deck and consisted of a 2nd officer (2/O), in charge of the lifeboat, assisted by the 3/E, an ordinary seaman (O/S) and an A/B. The lifeboat crew was properly attired and wearing life jackets and helmets. Communication between the C/O and 2/O by VHF set was tested and found satisfactory.

4.4 The C/O instructed his A/B to remove the toggle pin on top of the brake lever and then, after returning to him, remove the cradle clamp from the forward and aft davits. Permission was given for the lifeboat crew to board where upon the C/O confirmed with the 2/O, using the VHF set, that the lifeboat was clear to lower. The A/B was seated in the bows to starboard, the 2/O was seated in the cockpit, the 3/E was seated in the stern to port and the O/S seated in the stern to starboard. Contrary to instructions posted in English inside the lifeboat, none of the lifeboat crew were buckled into the seat belts. The C/O gave permission to the 2/O to start the boat engine and lower the lifeboat when he was ready. After starting the engine the 2/O pulled the davit winch remote control wire and the lifeboat started to swing out and the davits started lowering. When the lifeboat davits reached the support block the boat started lowering on the falls.

4.5 At this point the aft lifeboat hook mechanism disengaged allowing the stern of the boat to fall towards the vertical where the forward hook released and the boat fell 15 metres stern first into the water.

4.6 Various boats in the vicinity rushed to the assistance of the crew and lifeboat, which had taken in water and was partially submerged by the stern.

Attempts to connect the lifeboat to the lifting blocks were unsuccessful as the stern hook was in the water and the stern of the boat was damaged. Access to the lifeboat was gained by hacking away at the broken stern canopy by means of an axe. All four crew members were recovered from the lifeboat. Three were rushed to hospital, but later died from their injuries. The fourth, the A/B situated in the bow of the lifeboat, sustained minor injuries and was returned to the vessel.

5. DAMAGE TO LIFEBOAT

5.1 The stern section and canopy was heavily damaged and ripped open. The lifeboat release mechanism was displaced from its original position and the cockpit seat had been pushed forward against the steering wheel. The safety pin securing the release mechanism was open and the release handle was in the open position.

5.2 The aft hook latches were bent to port, the inner one quite severely (Photos. 7 & 8), and the hook had a scouring mark on the inner face.

5.3 No other damage to the release mechanism was found.

6. ANALYSIS

6.1 The Reset Lever is connected to the Cable Connection arm in the Central Release Lever assembly via a teleflex cable. When a load is applied to the hook, the force of friction between the Blocking Lever and the Reset Lever acts to prevent its movement. However, if there is no applied load on the hook then this friction force reduces to a negligible amount. In this no-load condition if the Central Release Lever has not been pushed in, the friction of the teleflex cables and linkages will not hold the Reset Lever in place. It will therefore tend to drop down under the influence of an external force such as caused by a change in direction of momentum of the boat.

6.2 Static load testing of the hook assembly has shown that the Reset Lever can fall down up to 25-30mm with the hook remaining capable of bearing the applied load of the lifeboat. However, the Reset Lever is then extremely vulnerable to the influences of any forces tending to move it downwards or opening direction.

6.3 The Central Release Lever is fitted with an interlock (10) to prevent inadvertent release of the hooks. This interlock is a blocking plate which swings into place under the action of a spring and out under the action of an electric solenoid coil (25). One end of the blocking plate is a lever which serves as an emergency release and as an indication of the position of the blocking plate. The operator is expected to ensure that the blocking plate is fully in place after resetting the hooks. (Fig.2, Annex 2). However, there are no reference marks on or near this lever to indicate the position of the blocking plate merely 'not blocked' and 'blocked' in the manufacturers instruction manual.

6.4 While the lifeboat is still in the water during the process of recovery and the forward and aft hooks have been reset correctly, there is a period of time when the suspension rings have been inserted into the hooks and the boat is riding the waves. With the boat in the water the solenoid coil (fig.2) connected to the Interlock Lever is energised and does not allow it to block movement of the Cable Connection Arm.

6.5 The riding action of the waves also creates conditions where the applied load on any hook can suddenly appear and disappear, resulting in the falls going from taut to slack. This, coupled with the associated change in momentum, can allow the Reset Lever to drop down slightly, as explained above. This pushes the Cable Connection Arm in the Central Release Unit to lift slightly to a position where it will no longer be blocked by the Interlock Lever when it is released by the solenoid valve.

6.6 The Central Release Unit houses micro-switches which serve as position indicators for the Cable Connection Arms and the Interlock Lever. However, there are excessive tolerances in the sensing arms of these micro-switches and tests have

shown that this can create conditions where the panel lights can provide a false indication of the status of the Cable Connection Arms and Interlock Lever. Therefore, when either or both the Cable Connection Arms are not being blocked by the Interlock Lever, the panel indicator lights incorrectly indicate that they are. A test on the starboard lifeboat, No.1, revealed that the indicator light in the control box showed that it was safe, even when an unsafe condition existed. The difference in the position of the interlock in the release mechanism between the safe and unsafe position was too small to be discernible.

6.7 The wear on the contact surface of the hook, (fig.3, Annex 2 and Replacement Standard, Manufacturers Instruction Manual, Annex 3) determines the limiting dimension of 122mm. The vessel was only 6 months old at the time of the accident and the boat had apparently been launched only 4 or 5 times, but this dimension on one of the hooks was already found to be 121.7mm. - below the minimum allowed for the hook to remain in a safe condition.

6.8 The red reference mark on the Cable Reset Lever does not line up with the 'red' alignment marks on the cheek plates on both the forward and aft hook assemblies. This applied to the 4 boats fitted on *M.V. Pac Monarch* and sister vessel *M.V. Pac Emperor* as well as the associated manufacturers' engineering drawings. With the passage of time and wear on the landing surfaces this situation may create an acceptance in the minds of those operating the boat that increasing misalignment is acceptable. (Photo. 1 & 2, Annex 2).

6.9 Resetting the hooks is a relatively complex three part, two handed process, the final stage of which is pushing up the Cable Reset Lever until its tip lines up with the 2 reference marks on the cheek plates of the hook assembly. Even when the hooks were correctly reset, the marks did not align correctly. On the aft hook assembly these marks face away from the operator which does not permit easy viewing or verification of the position of the Cable Reset Lever. Although an access window is provided on the lifeboat, it presents a difficult task for a person wearing a bulky life jacket and helmet, in the close proximity of a heavy steel fall to view and verify that the alignment of the Cable Reset Lever is correct with the 'red' marks on the cheeks of the hook assembly. (Photos. 5 & 6, Annex 2). However, it is recognized that the fall is orientated in the same direction as the forward fall in an attempt to increase the safety margin for 5 knot launching [IMO Res.MSC 48(66)].

6.10 The electrical control box has a system of lights to indicate whether the Cable Reset Levers have been correctly reset or not. These lights can change from 'red' to 'green', i.e. 'incorrect' to 'correct', even when the reset levers on the hook assemblies are only partially reset. This may create a condition where the operator is under the impression that the hooks are locked when, in fact, they are not.

6.11 The cause of the damage to the aft hook latches has not yet been determined. Under normal circumstances the hook releasing would not cause the latches any damage and there was no report of any damage when the boat was recovered 2 days earlier.

6.12 None of the 4 crew members were strapped into their seats although straps were provided. It is difficult to determine, under the circumstances, whether use of the straps would have saved the lives of the 3 crew members.

7. CONCLUSIONS

Due to the demise of the key person operating the release unit in the lifeboat and the many opportunities for error in resetting the hooks, it is difficult to determine the exact cause of the accident. However, a likely cause could be the jerk of the boat and associated rocking movement caused when the davits contacted the stoppers. This, coupled with the possibility of the mechanism not being reset fully, although all indications were that it was when the boat was last lifted out of the water, may have disarmed the hooking arrangement, allowing it to fall with tragic results.

8. RECOMMENDATIONS

The vessel Owners/Operators are recommended to:-

- 8.1. ensure that the crew of their vessels are fully conversant with the operating procedure for the release and recovery of a lifeboat fitted with this release equipment and the inherent weaknesses in the system,
- 8.2. issue instructions that all personnel in a lifeboat be seated and strapped in.

The manufacturers are recommended to:-

- 8.3. consider providing a viewing port on the side cheek of the central release mechanism to allow a direct view that the interlock (10) is actually blocking the Cable Connection Arm (12) when the mechanism has been reset,
- 8.4. consider fitting the aft hook with the open end facing forward so that the 'red' alignment marks are easily viewed when being reset by the lifeboat crew,
- 8.5. verify the 'red' marks in 8.4 align correctly before delivery,
- 8.6. revise the design of the hook with a view to reducing the wear at its contact point with the Blocking Lever.

The above recommendations should be carried out to all life boats, both existing and new.

The Classification Society Class NK are recommended to:-

- 8.7. reconsider their approval of this type of lifeboat and lifeboat release equipment until the manufacturers have carried out the recommendations in 8.3 to 8.6 above.

Annex I

Particulars of Lifeboat

Manufacturer	Nishi- F Co., Ltd. Yamaguchi Japan
Type	CML-19 (Totally enclosed life/rescue boat)
NKK Type Approval No.	N610 NK
Dimension	5.3 x 2.3 x 1.00m
Cubic Capacity	7.588 m ³
No. of Persons	25
Total Weight	3870kg
Bld. No	5580
Date of Build	April 2000
Type of hooks	NS Hook – on load/off load

Annex II

Photographs and figures

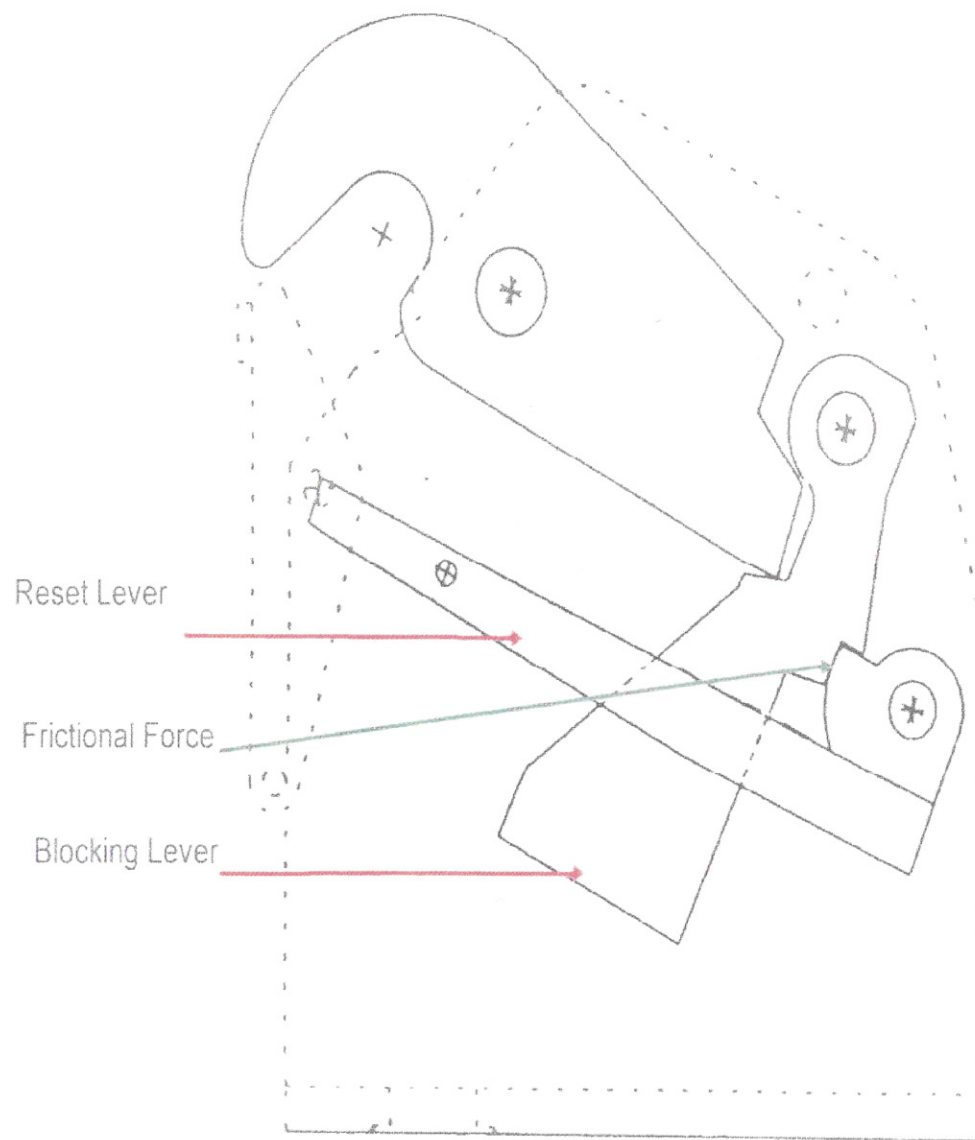
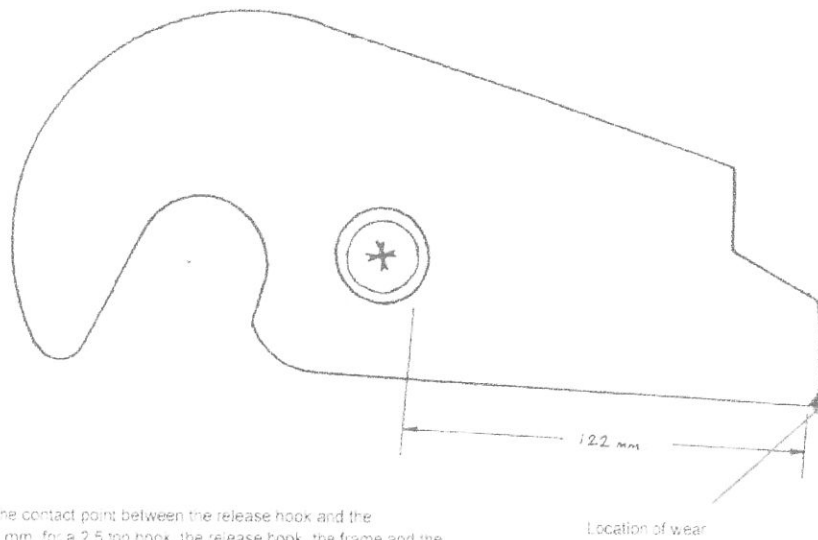


Figure 1. Hook Assembly

REPLACEMENT STANDARD FOR 2.5 TON HOOK



When the wear at the contact point between the release hook and the frame reaches 122 mm, for a 2.5 ton hook, the release hook, the frame and the lever should be replaced.

Fig.3

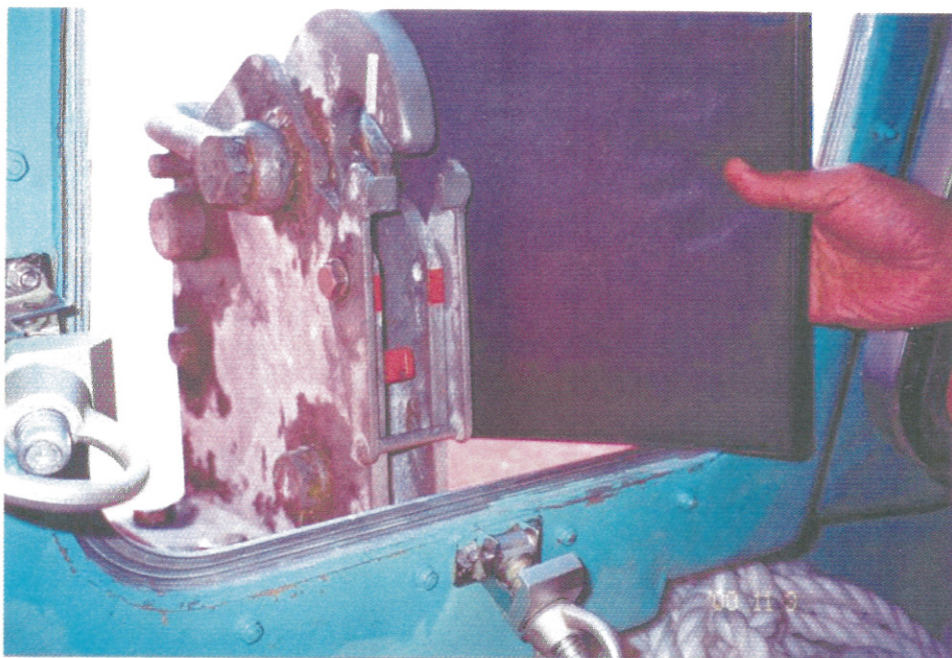


Photo 1. Forward hook partly released. Light indicating fully engaged

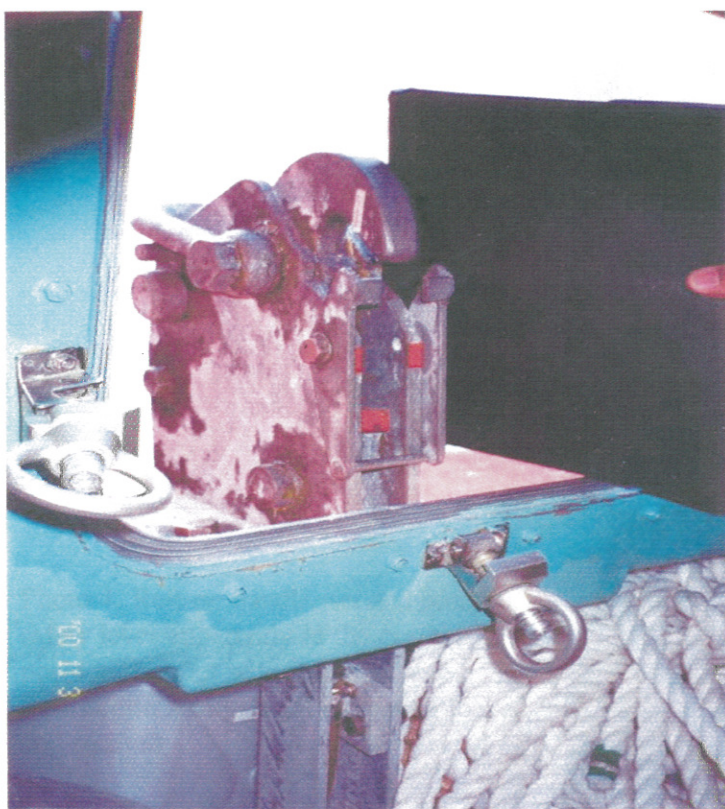


Photo 2. Position where light changes to reset

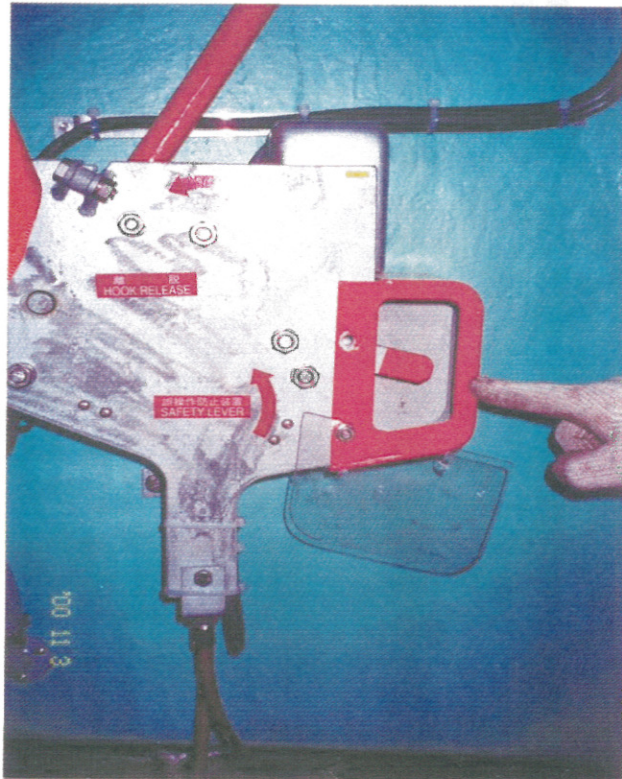


Photo 3. Release handle set and secured. Safety Lever in correct position.

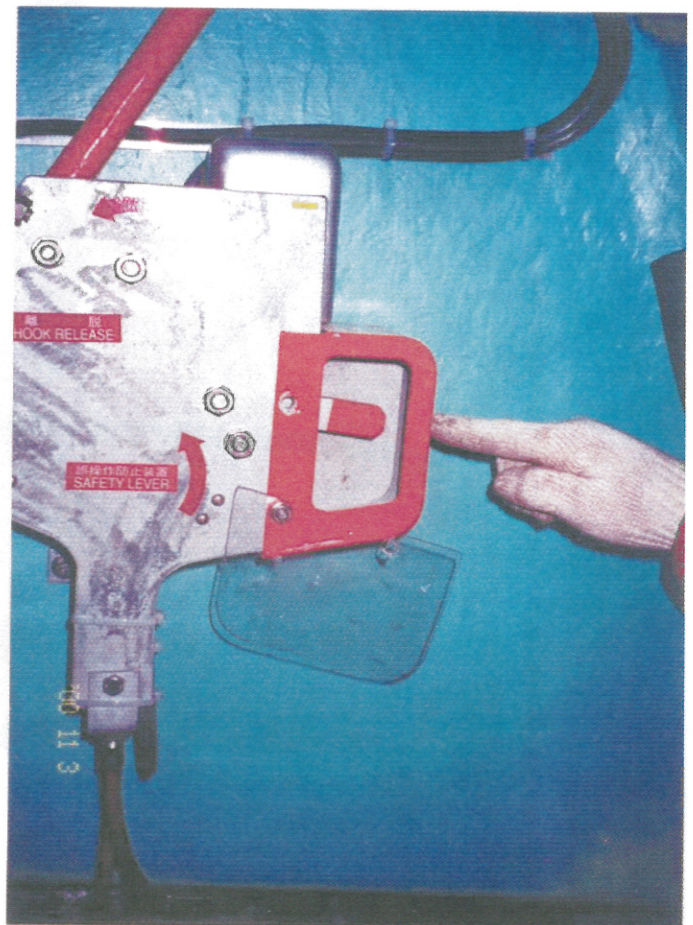


Photo 4. Release handle set and secured, safety lever apparently in the correct position, but not securing the Cable Connection Arm. Light indicating locked and secured



Photo. 5 & 6 Hook assembly



Photo. 7 Damage to after hook latches

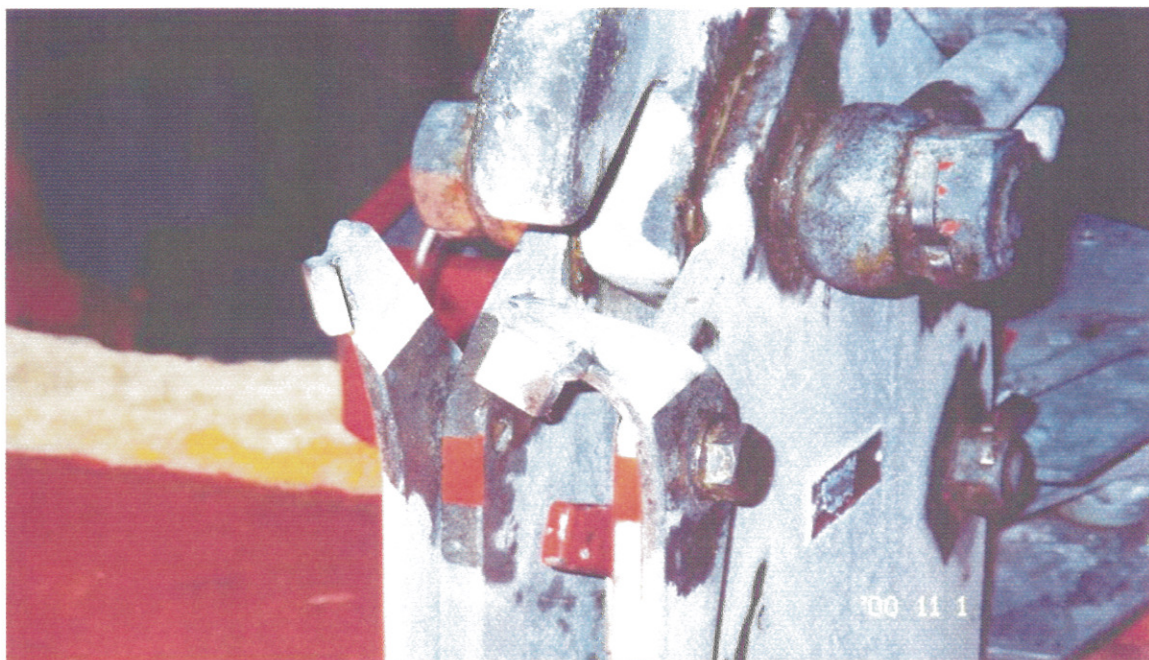


Photo 8. Damage to aft hook latches

Annex III

Manufacturers Release Mechanism Instruction Book

NS - HOOK

RELEASE MECHANISM

INSTRUCTION BOOK

取扱説明書

NISHI-NIPPON F. R. P. SHIP BUILDING CO., LTD.

Instruction manual of a lifeboat release mechanism
(with hydro-electrically operated interlock system)

1- GENERAL

This release mechanism consists of fore and aft lifeboat hooks and centralised release control associated with a hydro-electrically operated interlock.

For Vessels fitted with this system, lifeboats can be easily and quickly launched featuring;

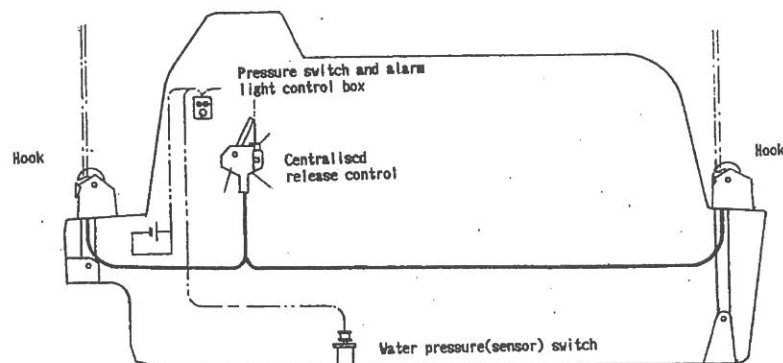
- 1) When a lifeboat is waterborne, the hook release interlock system is disengaged automatically by water pressure activating an electric circuit.
- 2) Emergency release (on load release) can be made before a lifeboat is waterborne by manually overriding the interlock lever.

There are great dangers to be considered before using this emergency mode.

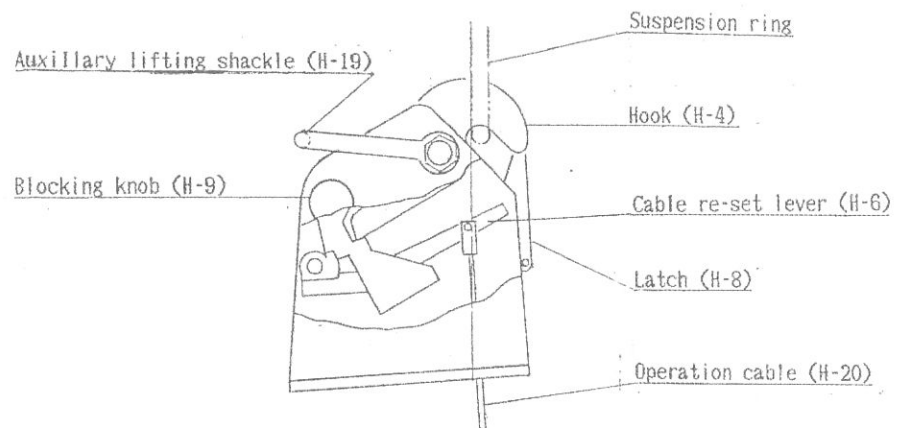
- 3) Reset operation for both fore and aft lifeboat hooks by one person can be made for recovering a lifeboat.

However two persons plus helmsman would normally be a minimum crew for boat recovery.

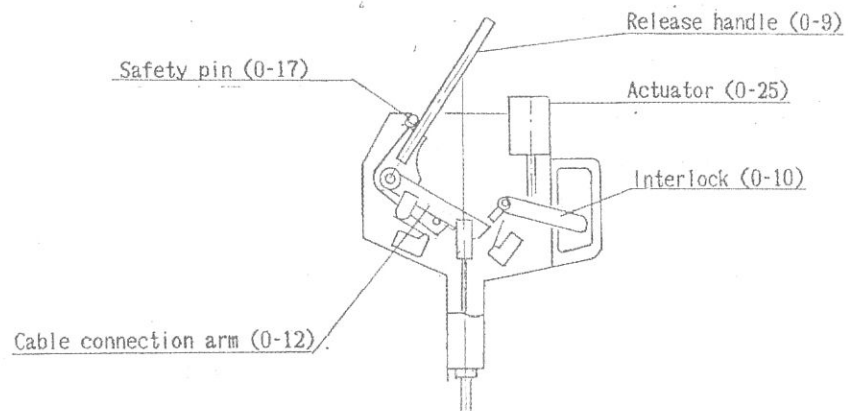
2- ARRANGEMENT and FUNCTIONING PARTS



Release Hook

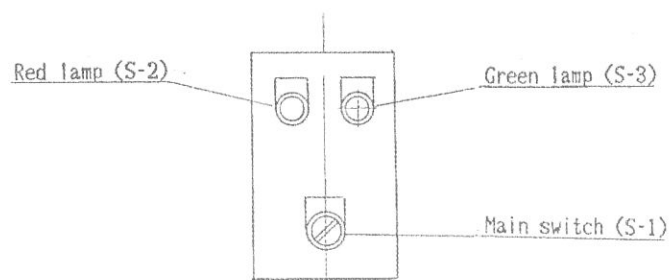


Central Release Control



Pressure Switch and Alarm

Light Control Box



3- OPERATION PROCEDURE

3-1) Hook Release

A. Normal "off load" release (when boat is waterborne)

(1) Before launching the boat turn on main switch(S-1).

Red lamp(S-2) is lit signifying that boat is not afloat and that is not safe to release.

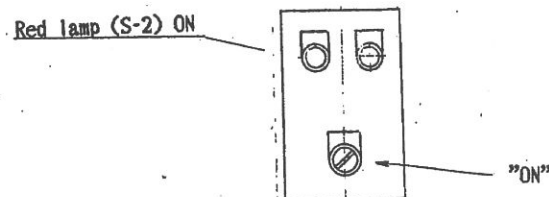


Fig. 1

(2) Once the boat is waterborne, a water pressure switch fitted in the bottom of the boat is operated to "ON" condition.

Interlock(0-10) is disengaged by being pulled upward and the red lamp(S-2) in the control box goes out and a green lamp(S-3) is then shown to confirm that release is now safe.

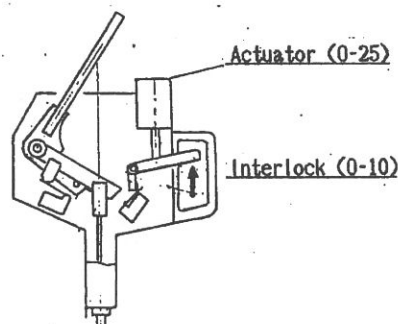
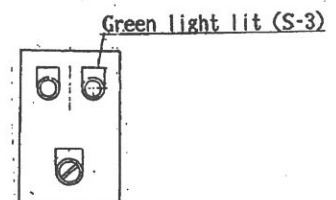


Fig. 2



the green light should remain illuminated all time that the boat is afloat and the hooks are ready to be released.

Fig. 3

- (3) Pull out a safety pin(0-17) as shown and then quickly the release handle(0-9) as shown. (The boat is released as the fore and aft hooks(11-4) open and release the suspension rings)

The red light will illuminate as the green light goes out.

The red light will remain on until the hooks are properly re-set, when boat cable connection arms(0-12) again activate their switches at re-set procedure 3.

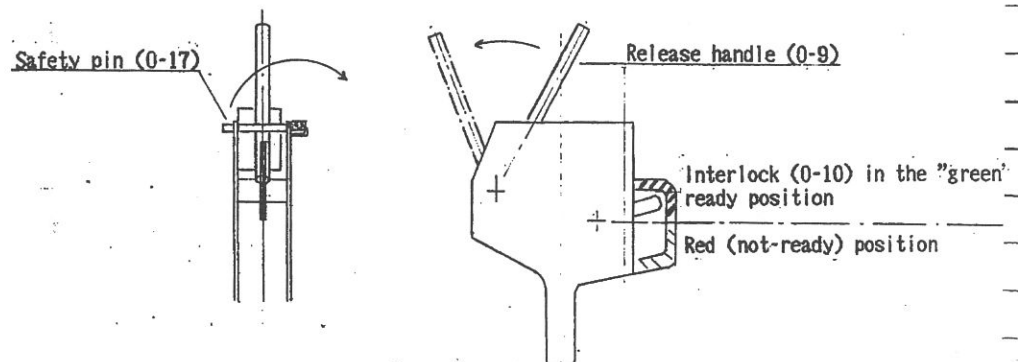


Fig. 4

CAUTION!

In case of the interlock not being disengaged automatically and the boat is waterborne:-

- 1) Visually check that the interlock is not in the green position
- 2) If the interlock remain in the red position check the system for faults and repair if possible
- 3) If repair not possible afloat, return on board ship and repair

Only in a real emergency and not in a "drill" or other non-emergency situation could you proceed to "Emergency On-load Release" on the next page.

B. Emergency hook release ("on-load" release)

CAUTION!

This "On-load" operation may cause injury and death of persons onboard due to the excessive shock of the boat dropping into the water-or deck, or quayside.

Do not use this operation except when absolutely necessary to save life such as a ship being sunk etc.

- 1) Break Glass access panel(0-26) of the interlock.
- 2) Pull out safety pin(0-17).
- 3) Lift up the interlock(0-10) and keep holding it in the green position.
- 4) Pull the release handle(0-9) quickly.

The boat will be released from the falls and if not already afloat, will drop instantly.

VERY SERIOUS CONSEQUENCE will result.

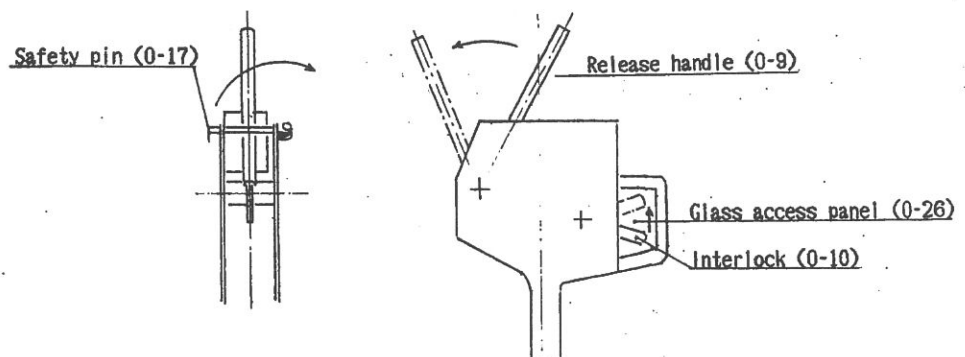


Fig. 5

3-2) Re-setting Procedure

The first essential is for the helmsman to return the release handle(0-9) to it's original position.

Do not replace the safety pin(0-17) yet.

The re-setting operation can be made sequentially by one person at fore and aft hooks as follows but it is better to be carried out by two. Each person re-sets his own hook and he must report to the helmsman the operation is complete.

- (1) Return each hook(H-4) to the "tall-tale" alignmant mark(A) and hold it using the right hand.

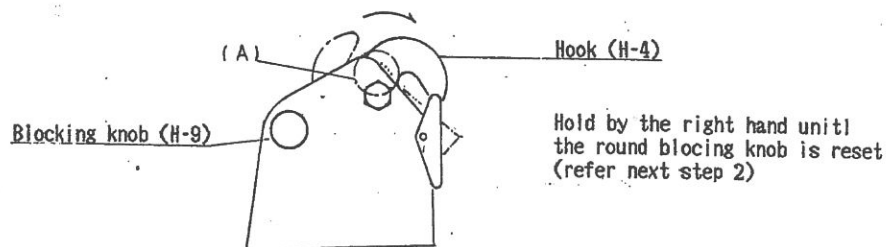


Fig. 6

- (2) Turn the round blocking knob anticlockwise unit the "tell-tale" mark fitted on the opposite to this knob(Fig.8) is aligned and the hook is blocked.

Hold it using the left hand.

Note: The hook is now secured and your right hand is free.

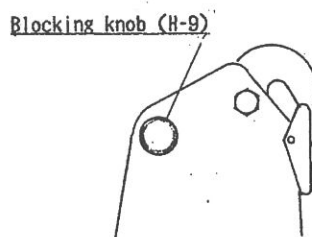


Fig. 7



Hook 'blocked'

Fig. 8

- (3) Lift up the cable re-set lever until the red marks are aligned as shown.

When both hooks are re-set, the red light will go out and the green light will come on again to show that it is safe to lift (or released again).

If not check and double check that the hooks are safe before attempting to lift the boat

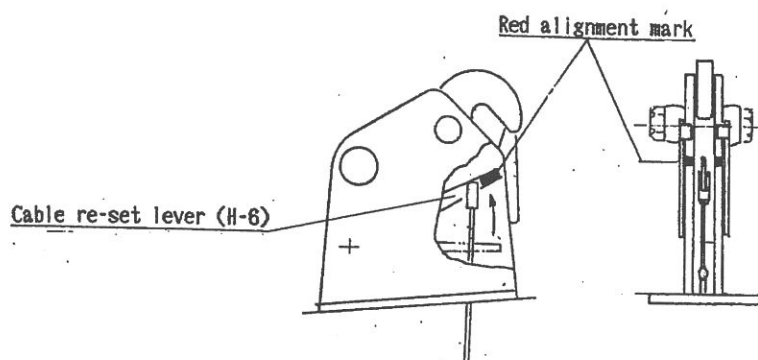


Fig. 9

- (4) Visually check that both cable connection arms are correctly reset.
Insert the safety pin(0-17).

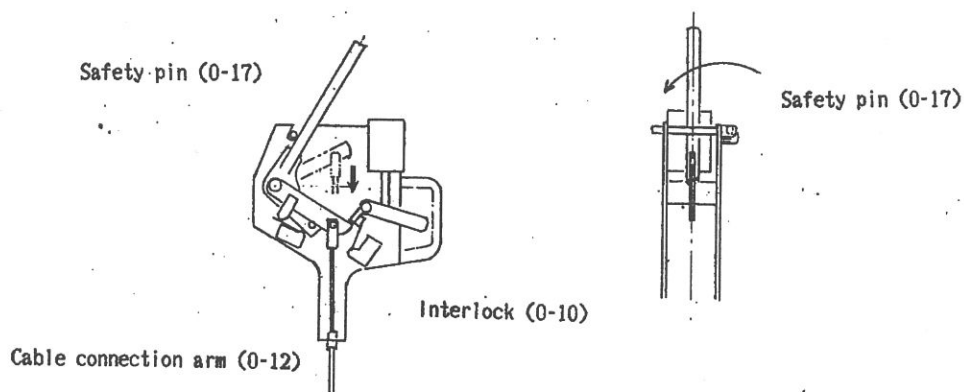


Fig. 10

EMERGENCY LIFTING PROCEDURE

If for ANY REASON there is doubt whether a hook has been re-set properly or there is any other doubt that the boat can be lifted safely:-

- 1) Check and double-check the system looking for a mechanical fault which can be corrected there and then, safely.
- 2) If no fault can be found, or is one that cannot be corrected safely then NEITHER HOOK CAN BE USED and full recovery of the boat is impossible until the system is repaired and is checked to confirm it is again in FULL WORKING ORDER.
- 3) The boat can however be hoisted clear of the water for checks and repairs to be made by fitting a suitable shackle of SWL 3 tonnes (or more) to the link ring of the falls to attach to the Auxiliary Lifting Shackle(H-19)

4- PRECAUTION ITEMS

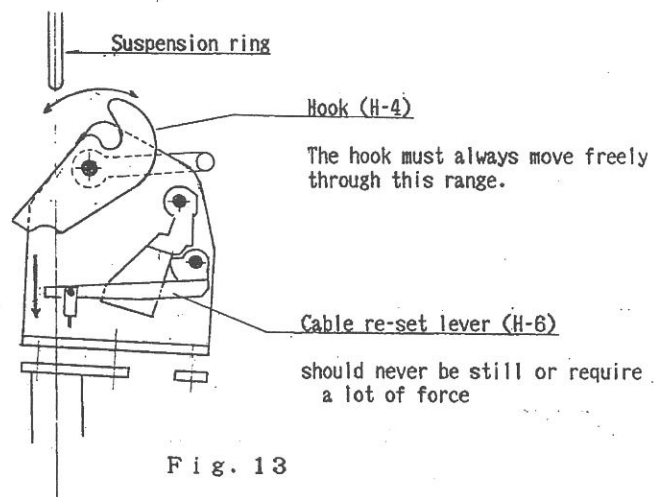
This unit not only makes release easy and quick but has been designed with safety in mind.

For this reason the hooks and operation unit have many moving parts, so if the movement of these parts becomes difficult it will have a negative impact on release.

You must pay attention to the following points and carry out full maintenance and inspections.

! Do not apply paint thickly to the moveable parts to prevent corrosion.
(Especially to the hooks outside the lifeboat.)

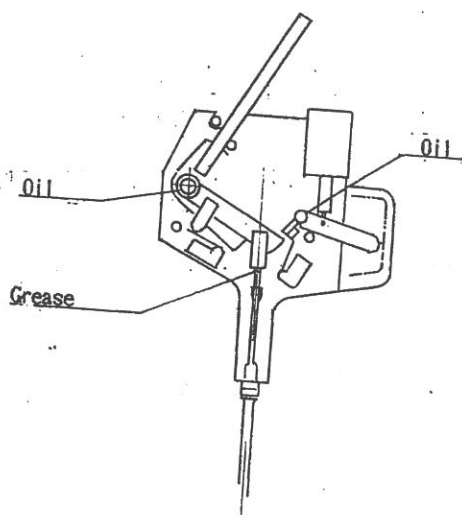
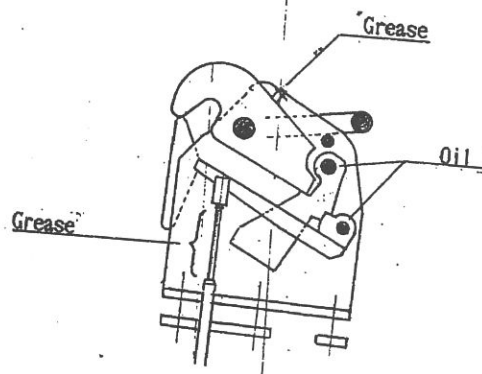
- 1) The hook(H-4) must freely swing back and forth when the suspension rings are not attached when the cable re-set lever(H-6) is in the down position.
If the paint in Fig.13 is thick this movement will be still and may seize.
YOUR LIFE WILL BE AT RISK.
- 2) When corrosion has been found after long-term use, remove the corrosion and then apply an anti-corrosion oil or, if painting, apply the paint thinly by using a spray, etc.



! When the release handle(0-9) is hard to move when releasing.
Do not apply extra effort, find out the cause of the problem and repair it immediately.

[On normal operation, its handle can be moved with one hand only,
extra effort will only make the problem worse by jamming or breaking cable.]

Greasing and Oiling



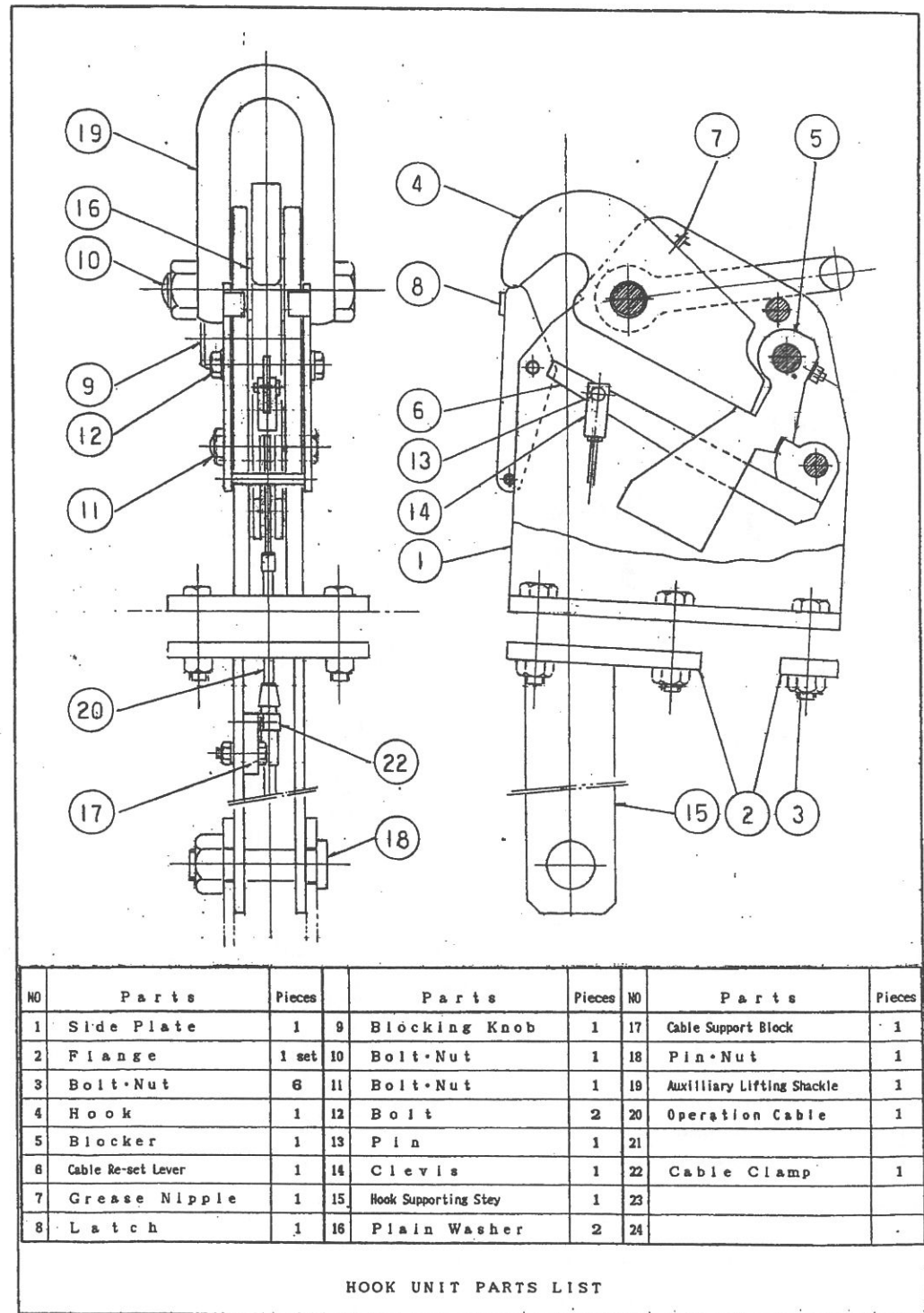
INSPECTION

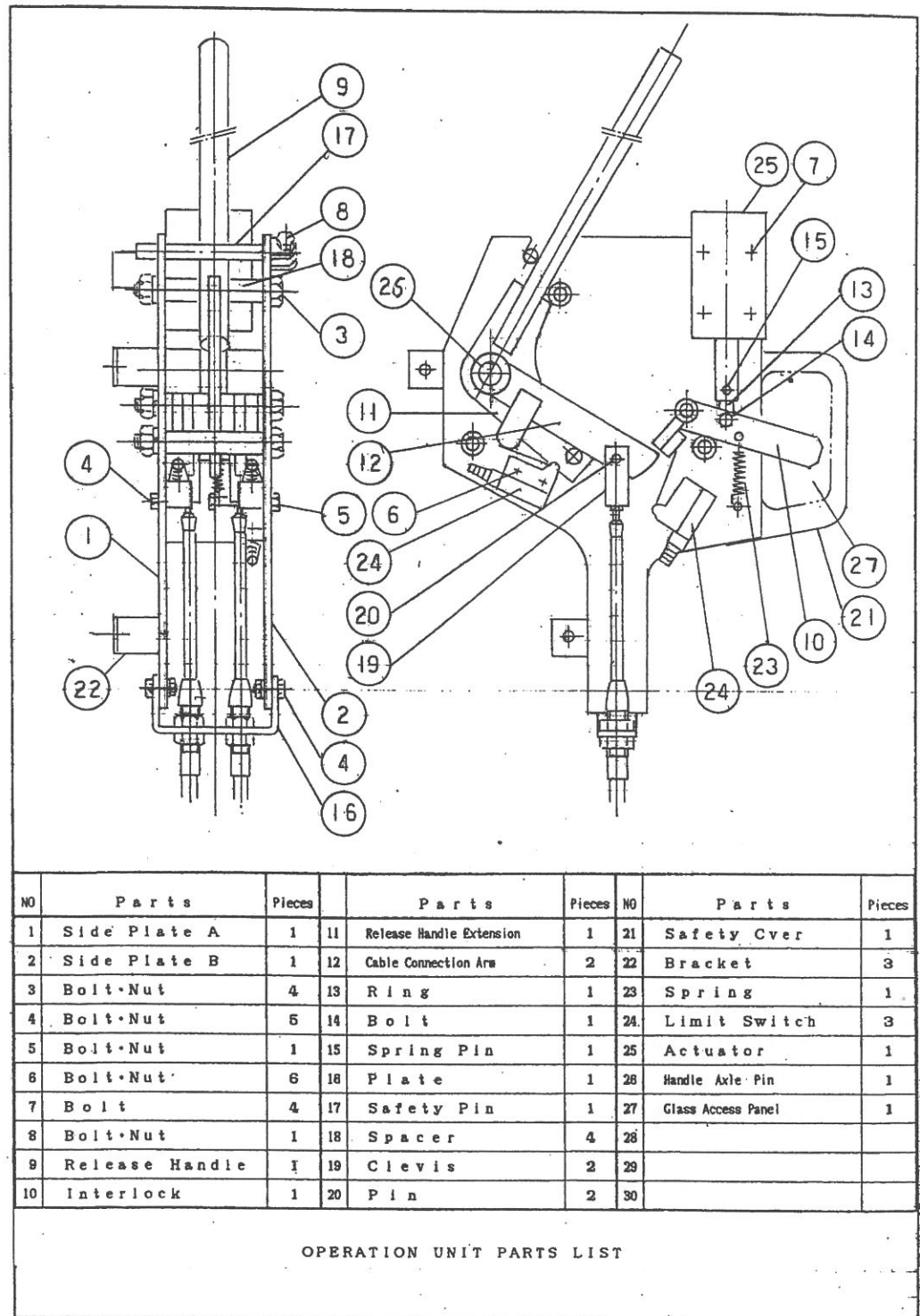
(1) HOOK UNIT

Inspection Item	Periodical Inspection				
	1/day	1/week	1/month	1/3month	1/5 year
Confirm correct setting of the suspension ring in the hook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confirm no disengaging of hook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confirm red arrow opposite to the blocking knob(H-9) is clearly visible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confirm position of the end of the cable re-set lever(H-6) inside the side plates with red mark on the side plate (H-1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Check for no loosening of bolts and pins		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Check for no loosening of operation cables(H-20) in their mounting brackets		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lubrication of moving parts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking the wear limit of hook			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking the hook tail wear limit				<input type="radio"/>	<input type="radio"/>
Checking the wire stretch limit			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(1) OPERATION UNIT

Inspection Item	Periodical Inspection				
	1/day	1/week	1/month	1/3month	1/5 year
Confirm safe locking of release handle (0-9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking for loosening of bolts and pins		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Check for no loosening of brackets on the end of operation cable		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lubrication of moving parts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

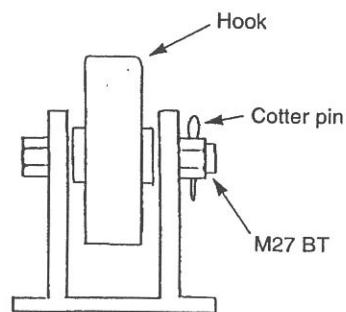




Procedure for Opening the Hook

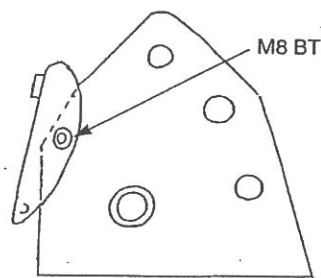
<p>(1)</p>	<p>(a) Remove the cotter pin. After the round pin ⑬ is pushed up and removed, the cable clevis ⑭ can then be removed.</p> <p>(b) After the cotter pin NT of the M18 BT ⑪ is removed, the lever ⑥ can then be removed toward the left.</p>
<p>(2)</p>	<p>(c) Remove the crown washer and M8 BT in the direction of the arrow.</p>
<p>(3)</p>	<p>(d) First, turn the M8 lock nut once to loosen it, then use an Allen wrench to turn the hollow BT about 6 mm to loosen it. The round handle ⑨ can now be pulled off and the frame ⑤ removed.</p>

(4)



(e) After the cotter pin is pulled out and the NT and BT are removed, the hook ④ can then be removed.

(5)

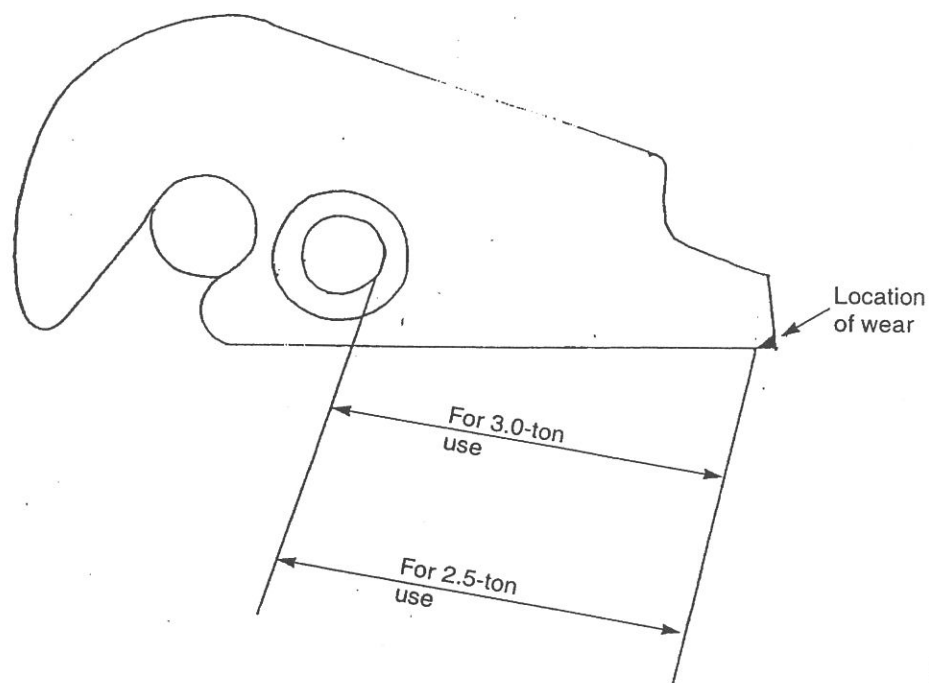


(f) The outside stop contains a 10A x 7mm pipe.



After the M8 BT ⑫ on the right and left and the round washer are removed, the outside stop containing the 10A pipe can then be removed.

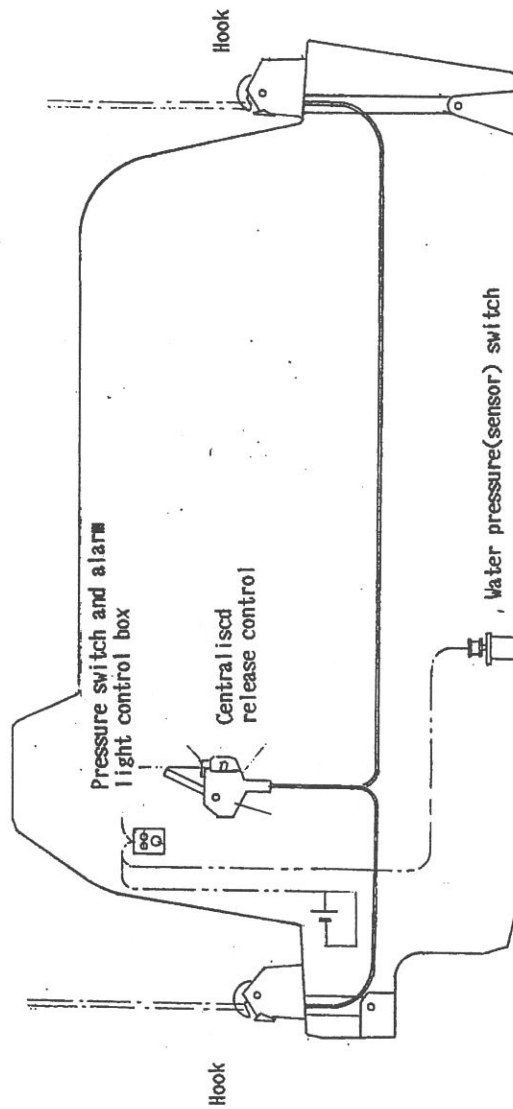
Replacement Standard



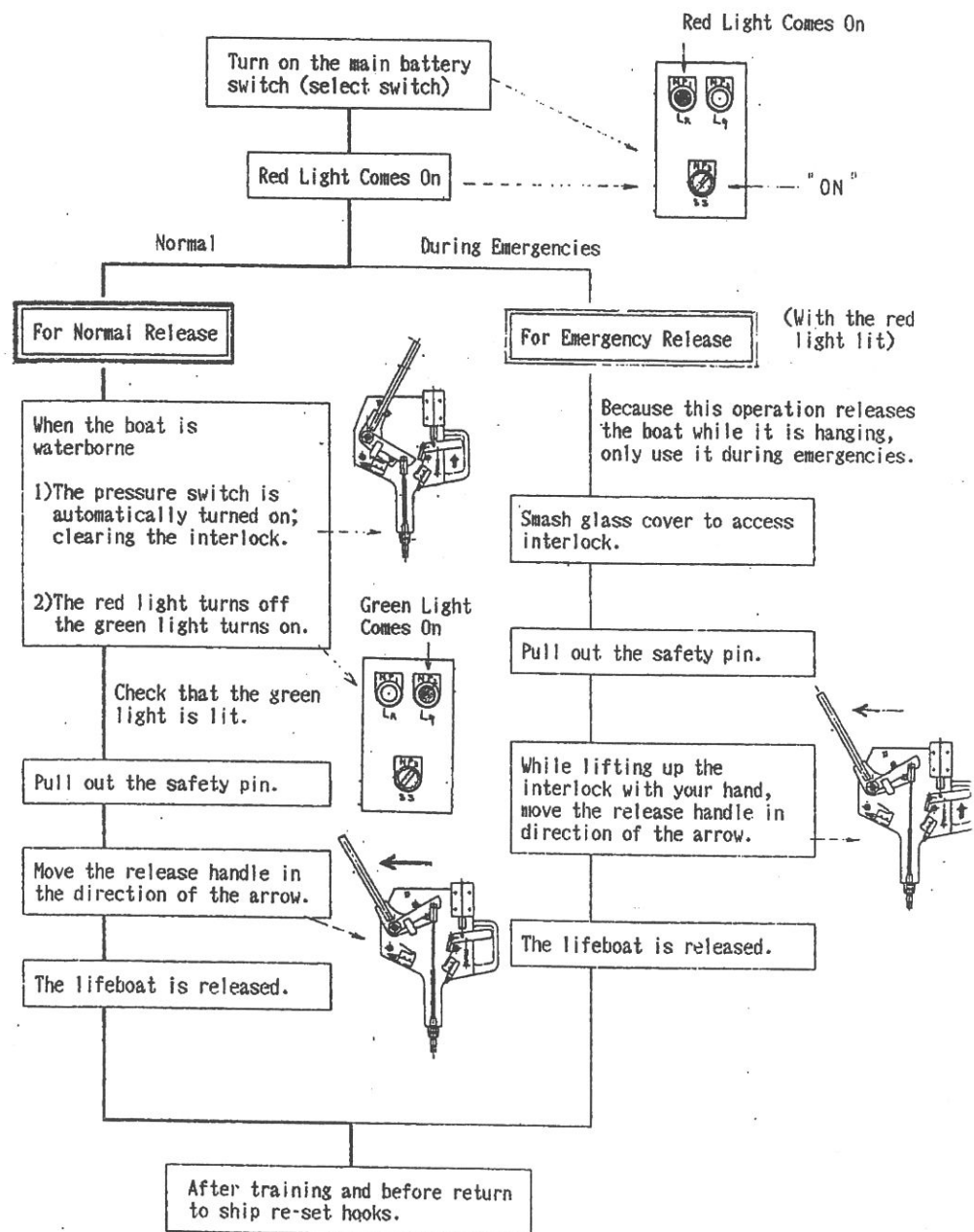
When the wear at the contact point between the release hook and the frame reaches:

156mm for 3-ton use or
122mm for 2.5-ton use,
the release hook, the frame and the lever should be replaced.

Water Level Detection Unit's Electric Components Wiring Diagram



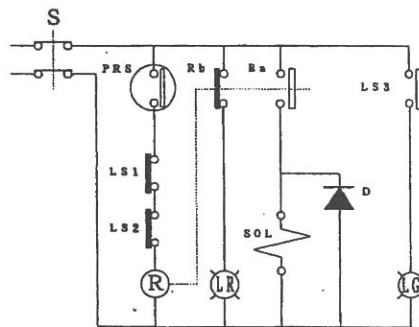
Simultaneous Release Unit Operation Procedures Manual
(With hydraulic interlock release system)



Explanation of Sequence Operation

1. Select Switch On State

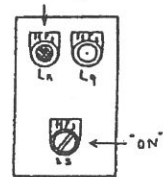
* The thick line shows the flow of electricity.



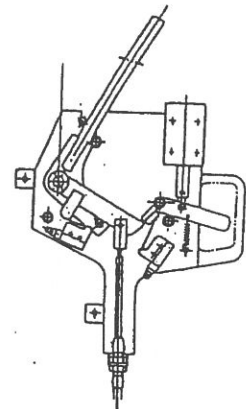
1) The LR (red light) comes on.

Operation Box State

Red Light Comes On.

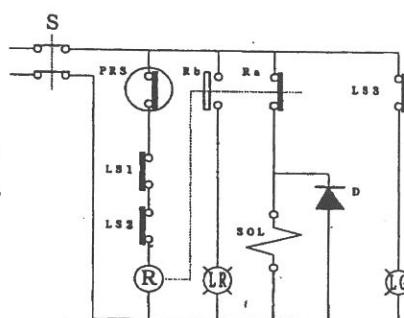


Operation Handle State



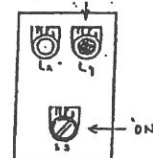
2. [1] In the Select Switch On State
[2] When Floating on the Water Level

* The thick line shows the flow of electricity.

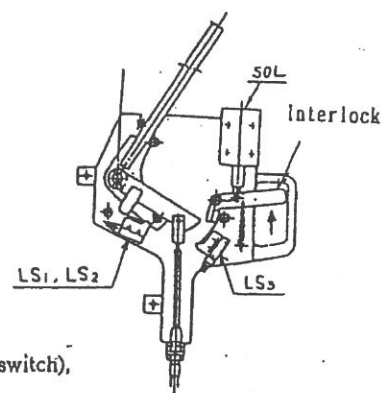


Operation Box State

Green Light Comes On



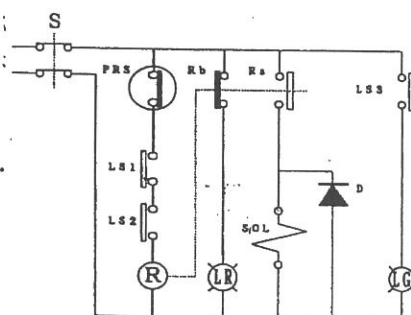
Operation Handle State



- 1) Turning the PRS (pressure switch) on turns on the R (auxiliary relay).
- 2) When R (auxiliary relay) comes on the SOL (solenoid) comes on causing the LR (red light) to turn off when the Interlock is raised (lock is released).
- 3) Raising the Interlock turns on the LS3 (limit switch), which turns on the LG (green light).
- 4) When the LG (green light) comes on the boat is floating on the ocean surface.

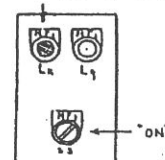
3. [1] In the Select Switch On State
- [2] When Floating on the Water Level
- [3] When the Release Handle Is Operated After the Safety Pin Is Removed

* The thick line shows the flow of electricity.



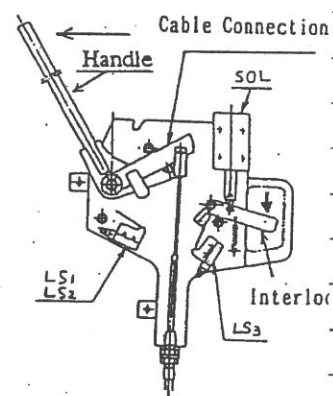
Operation Box State

Red Light Comes On



Operation Handle State

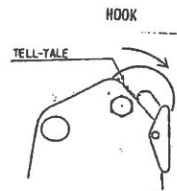
- 1) Operating the release handle (release operation) turns off the LS1 and LS2 (limit switch) that contact two cable connection arms and this turns off the R (auxiliary relay).
- 2) When the R (auxiliary relay) turns off the LR (red light) comes on while at the same time the SOL (solenoid) turns off allowing the Interlock to be pulled down by the spring.
- 3) When the lock handle is pulled down the LS3 (limit switch) is also turned off and then the LG (green light) is turned off and the LR (red light) remains on to show that it is no longer safe to lift the boat.



RE-SETTING of THE HOOKS

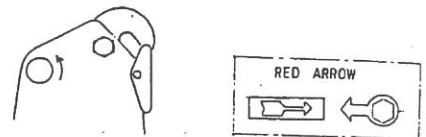
Re-setting of the hooks will involve the following steps;

1. HOOK

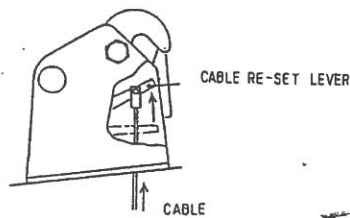


2. BLOCKING KNOB

BLOCKING KNOB



3. CABLE RE-SET LEVER



4. SAFETY PIN

