

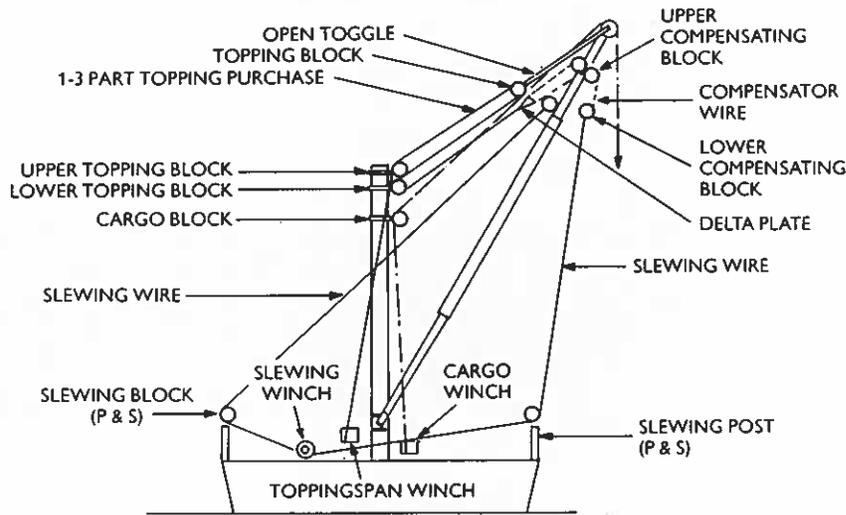
How the systems work

System 1—This is the original system evolved to give stability to derrick cranes. As on most systems three winches are used—one cargo winch, one topping winch and one slewing winch. The slewing winch has a divided barrel and pulls the derrick in and out. In other words, as one side of the barrel is paying out the other side is pulling in. To compensate for the difference in length of rope between inboard and outboard the guys are connected to the topping system. Where Speedcranes differ from other systems is in the ability to increase the static load on the guys, therefore stopping the possibility of topping the derrick while slewing, and stopping 'Jack-knifing' of the derrick. Stability is always maintained as the derrick is always held in three planes.

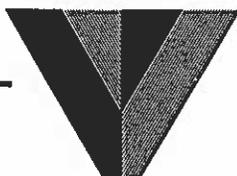
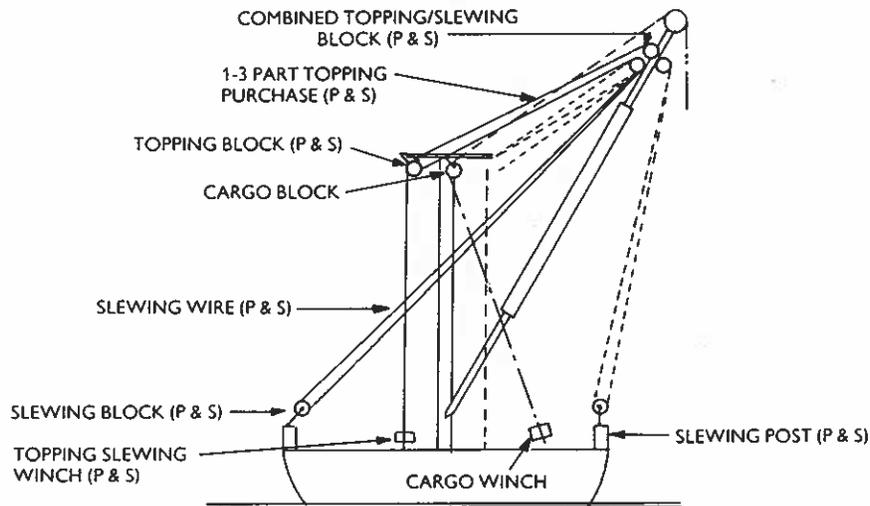
System 2—This system was developed at the request of an owner who had difficulty in controlling a top span derrick crane. Again three winches are used—one cargo and two combined topping and slewing winches. The

problem is that nearly all top span derricks depend on a form of T type mast or Goal Post Mast with two topping spans to give the spread required for slewing—the force of gravity providing the other impetus. To overcome this problem the Speedcranes system again uses part of the topping system to give a positive pull. This is achieved by linking a loop from the topping down to fixed slewing posts. Because the recovery angle of the derrick from the outboard position is increased the large outrigger on top of the mast is no longer needed. The stability of the derrick is therefore increased and the top weight of the mast reduced. This system is ideal for heavy lift work as the derrick will recover from very heavy list with no increase in power requirement. This is achieved by slackening the wire on the winch nearest to the derrick when outboard, resulting in the boom swinging inboard.

System 1



System 2



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of Greenock**

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**INSTRUCTION MANUALS
FOR
SPEEDCRANE DERRICK FITTED ON
THE BRIDGE FRONT OF
NAVAIDS TYPE 1100 VESSELS**

**When ordering Spare Parts List Please Quote
Job No. 1DG 6030-33**

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GENERAL DESCRIPTION

Speedcrane Derrick with a 3 part rapid reduction head, capable of lifting 7.5 tonnes on a single wire, 15 tonnes on 2 falls of wire and 20 tonnes on 3 falls of wire. The derrick is also capable of lifting 8 tonnes simultaneously on the auxiliary hoist.

At the lower working angle of 20 degrees above the horizontal the working radius of the main hook will be approximately 17.5 metres. At the upper working angle of 75 degrees the hook radius will be approximately 5.0 metres.

The derrick will work to an outboard angle of 70 degrees on either side of the ship's centre line. At the lower working angle this will give an outreach clear of the ship's side of approximately 8.4 metres. The working radius of the auxiliary hook and whip hoist will be approximately 1.0 metres less than the main hook when working at the lower working angle.

The derrick is fitted with limit switches which ensure that it does not operate outside its design and test capabilities. These switches are fitted in a sealed box on the trunnion top.

All blocks have taper roller bearings fitted to sheaves. They are also fitted with 'Nilos' grease seals which minimise lubrication.

The winches which power the derrick are manufactured by Pacific Winches Ltd of Vancouver B.C. For duties see under "Description of Main Items."

The derrick is designed to work with a ship list of 10 degrees and trim by the stern of 2 degrees. The winch pulls are based on these parameters.

The derrick is designed to operate with its full load in sea state 2-3.

SECTION 2 DESCRIPTION OF MAIN ITEMS

DERRICK

Approximately 20 metres long comprising a derrick tube complete with fabricated head and double blade heel fitting. All steel used in the manufacture is suitable for an environment temperature of minus 40 degrees centigrade.

TRUNNION

Cast steel top and bottom castings with taper roller bearings, pre-loaded to prevent brinelling. These bearings are grease lubricated. The trunnion crosspin runs on bronze bushes and is oil bath lubricated.

LIMIT SWITCHES

Are of Burgess type C.Q.R. and have CT2-A2 actuators. These switches are mounted in a watertight box on the trunnion top casting. The switches control the luffing and slewing motions of the derrick.

BLOCKS

All blocks are fabricated from steel. The sheaves are fitted with taper roller bearings and Nilos Grease seals.

ROPES

The main cargo hoist wire is 'Dyform 34LR' manufactured from steel having an M.B.L. of 220 kg/mm². The remainder of the ropes are galvanised steel wire rope 6 x 36 construction with a fibre core. They are right hand ordinary lay and manufactured from steel having an M.B.L. of 200 kg/mm².

WINCHES

Supplied by Pacific Winches Ltd, the duties are as follows:

<u>Main Hoist</u>	Capable of 8 tonnes at 44 m/min
	Capable of 4 tonnes at 88 m/min
	Light Line (7½ torque) 137 m/min

The above ratings are on the 3rd layer of wire and based on an availability of 100 HP.

SECTION 2 (CONTD)

<u>Auxiliary Hoist</u>	Capable of 8.5 tonnes at 23 m/min
	Capable of 8.5 tonnes at 11.5 m/min
	Capable of 8.5 tonnes at 2.5 m/min

30

The above ratings are on the second layer of wire and based on an availability of 60 HP.

<u>Whip Hoist</u>	Capable of 5 tonnes at 35 m/min
	Capable of 3 tonnes at 60 m/min

The above ratings are on the 3rd layer of wire and based on an availability of 50 H.P.

<u>Topping Winch</u>	Capable of 9.0 tonnes at 34 m/min
	Capable of 9.0 tonnes at 17.0 m/min
	Capable of 9.0 tonnes at 4.0 m/min

The above ratings are on the 3rd layer of wire and based on an availability of 85 HP.

<u>Slewing Winch</u>	Capable of 6.0 tonnes at 33 m/min
	Capable of 6.0 tonnes at 16.5 m/min
	Capable of 6.0 tonnes at 3.6 m/min

The above ratings are on the 2nd layer of wire and based on an availability of 52 H.P. The slew winch is fitted with a dividing flange on the centre of the barrel.

Controls

All winch controls supplied by Pacific Winches.

SECTION 3

RIGGING INSTRUCTIONS

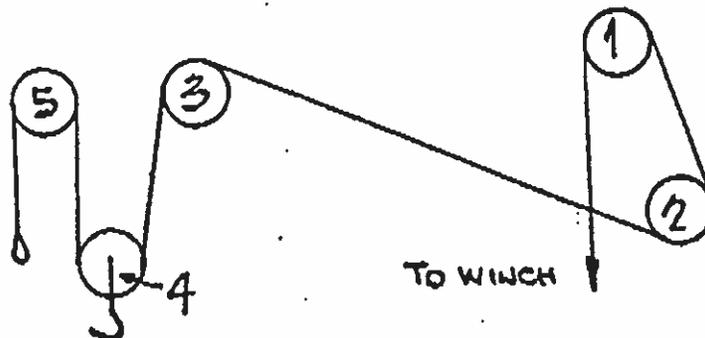
To be read in conjunction with drawings AS1280 and DS1392-1 and 2.

The derrick should be on the fore and aft centre line of the ship and all blocks should be attached at their respective positions as shown on drawing number AS1280.

It is essential that the rope has been properly unreeved from its wire rope reel or coil. The rope should be taken off a wire rope reel using a spinner or, if in a coil it should be flaked out on the deck to ensure that there are no kinks in the wire.

It may be found helpful if a fibre messenger rope is first reeved into the system by hand. The wire rope is then attached to the fibre rope, the fibre rope is then fastened to the winch barrel and the winch then used to pull the heavy wire through the system.

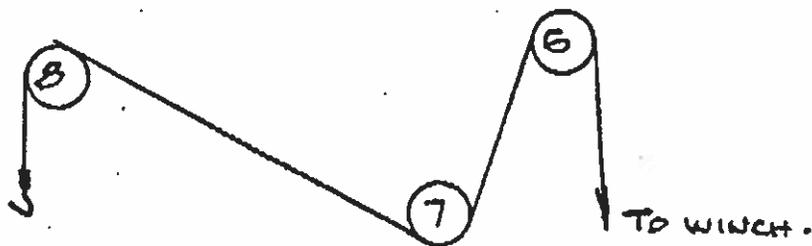
CARGO SYSTEM (MAIN HOIST)



Take the plain end of the wire, pass it up and over the outermost sheave (5) in the derrick head then down to and through the rapid reduction hook block (4). Continue back up to and over the innermost sheave (3) in the derrick head. The wire is then led back to the mast head and round block (2), along the face of the mast to block (1). It is then led down to the winch and fastened. Wind the wire on to the winch barrel until the thimble end of the rope can be secured to the front of the rapid reduction block (4).

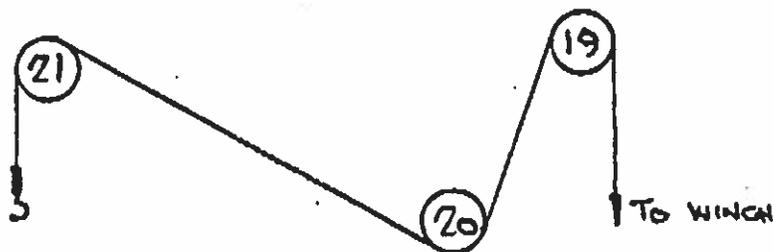
SECTION 3 CONTD

AUXILIARY HOIST (PORT SIDE OF DERRICK)



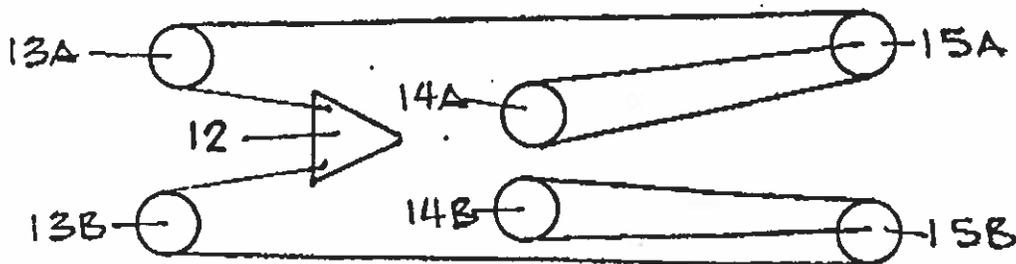
Take the plain end of the wire over sheave (8) at the port side of the derrick head. Lead the wire down parallel with the derrick tube to block (7) mounted at the heel of the derrick. Continue up to block (6) on the mast crossmember then down to the winch. Attach to the winch and wind the wire on to the barrel. Attach the ball weight and hook to the thimble end of the wire.

WHIP HOIST (STARBOARD SIDE OF DERRICK)



Take the plain end of the wire over sheaves (21) at the starboard side of the derrick head. Lead the wire down parallel with the derrick tube to block (20) mounted at the heel of the derrick. Continue up to block (19) on the mast crossmember then down to the winch. Attach the wire to the winch and wind on to the barrel. Attach the ball weight and hook (22) to the thimble end of the wire.

COMPENSATOR SYSTEMS



The starboard side compensator system blocks are suffixed 'A' and the port system blocks are suffixed 'B'.

Temporarily lash the Delta Plate (12) to the top of the derrick tube approximately 4 metres back from blocks 13A and 13B.

STARBOARD COMPENSATOR SYSTEM

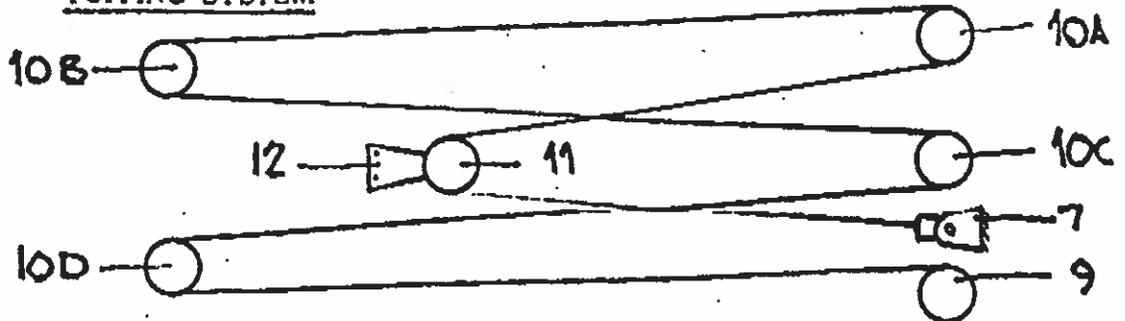
Attach one end of wire rope to Delta Plate (12). Pass other end through block (13A) then to block (15A) (which will be lying on the deck.) Take the wire to block (14A) then back down to block (15A) and attach to the becket on block (15A).

PORT COMPENSATOR SYSTEM

Repeat the sequence as used in rigging the Starboard System but substitute block numbers (13B), (14B) and (15B).

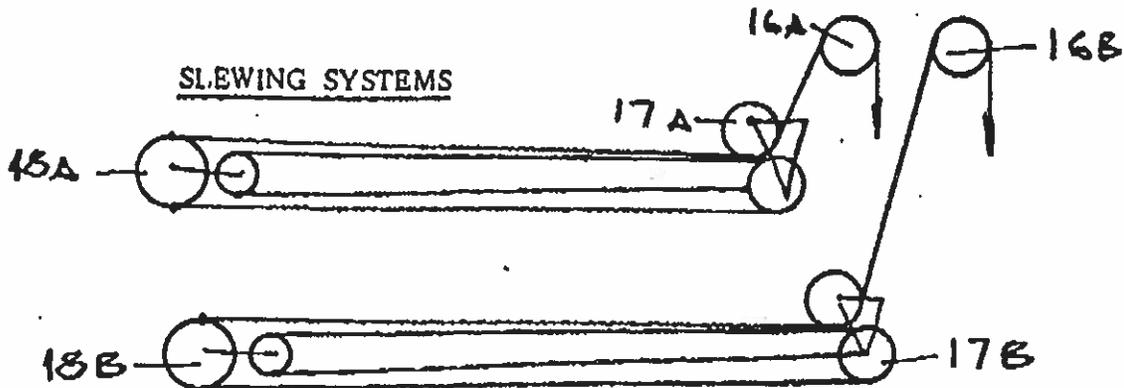
Note It may be necessary to remove the sheave pins and drop the sheaves on blocks 13, 14 and 15 to enable the thimble end of the rope to pass between the sheave and head fitting collar on the blocks.

TOPPING SYSTEM



Attach block (11) to Delta Plate. Pass plain end of wire through block (11) and lead back to block (10A) on the starboard side of the mast crossmember through block (10A) and lead to block (10B) on the starboard side of the derrick head. Lead back to block (10C) on top of the crossmember then to block (10D) on the port side of the derrick head. Lead the wire back to the mast head topping 'Dee' block (Item number 9) on the mast head and from there down to the topping winch. Attach the wire to the winch and spool on to the barrel until there is just sufficient left to allow attachment of the thimble end of the topping wire to the becket swivel on bracket (7) on the mast crossmember. Release the lashing holding the delta plate to the derrick tube.

SLEWING SYSTEMS



1 off starboard system having blocks suffixed 'A' and 1 off port system having blocks suffixed 'B'.

Before commencing to rig the slew systems, connect upper slew blocks, Items 18A and 18B to lower compensator blocks items 15A & B respectively.

SECTION 3 CONTD

STARBOARD SYSTEM

The following rigging sequence is described with all the blocks having their sheaves in the vertical plane.

Feed plain end of wire through outermost sheave (bottom side) on block (18A) (See drawing number DS 1392-1) and lead back to block (17A) entering between the sheaves, down and round the bottom sheave (See drawing number DS 1392-1). Take the wire back to block (18A) again entering the wire at the bottom of the sheave and coming off the top. The wire is then led to block item 17A entering between the sheaves but coming off the top sheave this time. Carry on up to block (16A) on the underside of the crossmember then take the wire down to the winch. Continue pulling wire through the system until there is just enough wire left to allow the thimble end of the wire to be connected to the becket on block (17A). (See drawing number DS 1392-1). Do not attach the wire to the winch barrel until the starboard system has been reeved.

PORT SYSTEM

Repeat the rigging sequence using blocks (16B) (17B) and (18B). Attach the port wire to the aft side of the adjustable half of the slew winch barrel. Wind on the wire until all the slack has been taken up in the port side slew system. Uncouple the adjustable half of the winch barrel from the fixed half of the barrel by means of 12 countersunk screws on the barrel flange. Using an external means, prevent the adjustable half barrel from turning. Now attach the starboard wire to the forward side of the fixed half barrel and wind on the wire until all slack is taken up in the starboard system. Check that both half barrels contain the same amount of wire, if not, unwind wire from the drum that holds most wire until a similar amount is on both half barrels. Reconnect the two half barrels by refitting the 12 countersunk screws in the drum flange. Any remaining slack can be taken up by pulling in the topping wire.

The derrick is now ready for use.

SECTION 4

TRUNNION
DESCRIPTION, GENERAL ARRANGEMENT & PARTS LIST

The trunnion is the link between the derrick and the ships structure. It is capable of taking all the static and dynamic loadings imposed by the derrick while working within its normal designed operating conditions. It also houses the electric switches which control the derrick within its designed operating parameters, i.e. when slewing and topping (luffing).

LUBRICANTS REQUIRED

TRUNNION: For the tapes roller bearings use British Petroleum Grease, grade L.S.2 or equivalent. Bearings to be greased every 3 months until grease emerges from the release hole at the rear of the trunnion. See drawing number DS 1394.

SHEAVES: Grease as per trunnion. Sheaves to be greased every 3 months or as required.

SECTION 5

TRUNNION

INSTRUCTIONS FOR DISMANTLING TRUNNION
REFER TO DRAWING NUMBERS DS 1394 AND DS 1395

1. Derricks to be in the stowed position and suitably supported at
2. Slacken off all the wire rope systems so that no static load is being imposed on the derrick by the winches.
3. ~~Remove the crosspin from the trunnion top cover plate. The~~
crosspin is replaced in the same position (operation of the topping limit switches depend on this.)
4. Remove cover from limit switch box on trunnion top.
Please Note To remove cover proceed as follows:
Release holding down bolts, lift box clear of locating pins, turn box 45 degrees to the right or left and lift clear of switches.
5. Refer to drawing number DS 1395 and carefully note dimension 'A'.
6. Before removing limit switches check that the wiring connections are numbered to respective switches. If this is not the case, do so - It will save a lot of time in the end.
7. Disconnect wiring to switches.
8. Refer to drawing number DS 1395 and remove items 1,2 and 3 complete with switches from stainless steel cable pipe. Also remove bobbin item 6.
9. Remove countersunk screws from trunnion top cover plate, carefully slide cover plate up and off the cable pipe. The seal is incorporated in the cover plate in way of the cable pipe.
10. Refer to /..

SECTION 5 CONTD

- 10. Refer to drawing numbers DS 1394 and drain oil from the reservoir by removing plug item 26.
- 11. Remove end cap from crosspin by releasing central set screw.
- 12. Remove the crosspin. Note: There are 'O' rings between the fork ends and the trunnion casting.
- 13. The derrick heel can now be lifted clear of the trunnion.
- 14. Remove the bolts holding the trunnion base to the trunnion seat and lift clear.
- 15. Refer to drawing number DS 1394. Remove cap screws, item (20) and remove cover plate item (8) complete with cable pipe.
- 16. Remove cap screws item (19) then pressure plate item (4).
- 17. Remove cap screws item (21) and push item (6) split ring retainer towards the bearings, this allows the split rings item (5) which is in two halves to be removed. Lift off item (6) split ring retainer.
- 18. Trunnion top item (2) can now be withdrawn from trunnion base item (1) and the bearings examined. Re-assembly is the reverse of above, however, refer to drawing DS 1395. After trunnion crosspin has been replaced, ensure that item (13) crosspin lever engages with the slot in the crosspin. Operation of the topping limit switches depends on this.

SECTION 6

LIMIT SWITCHES

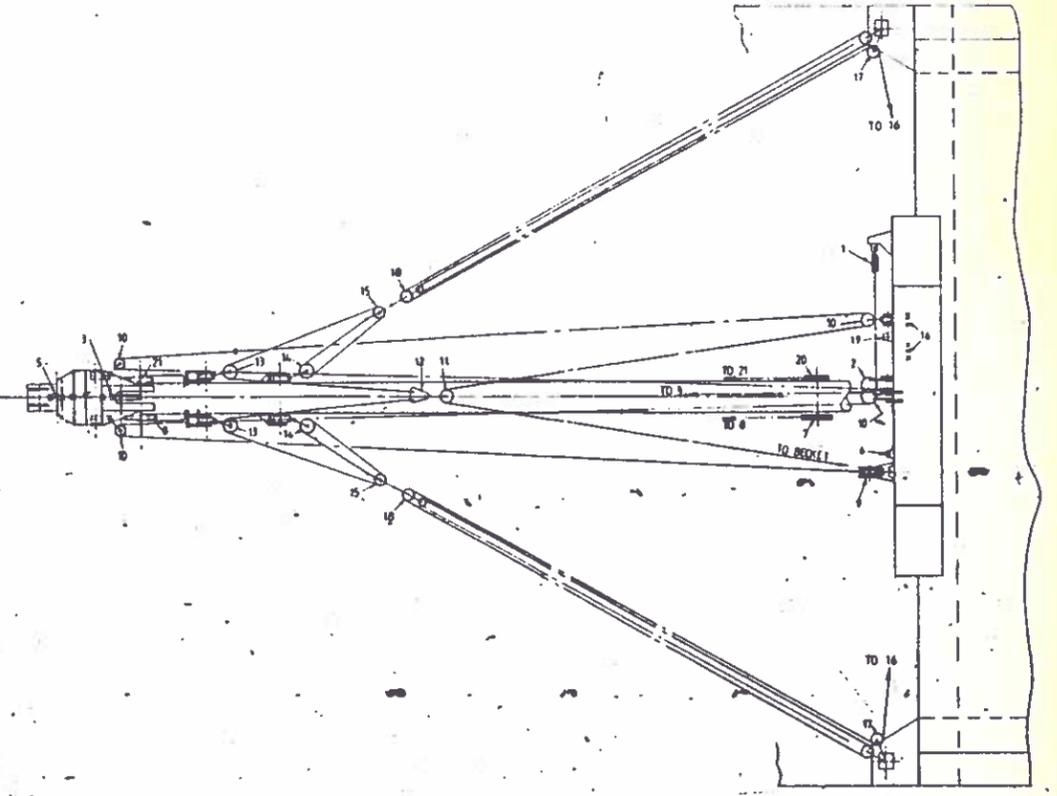
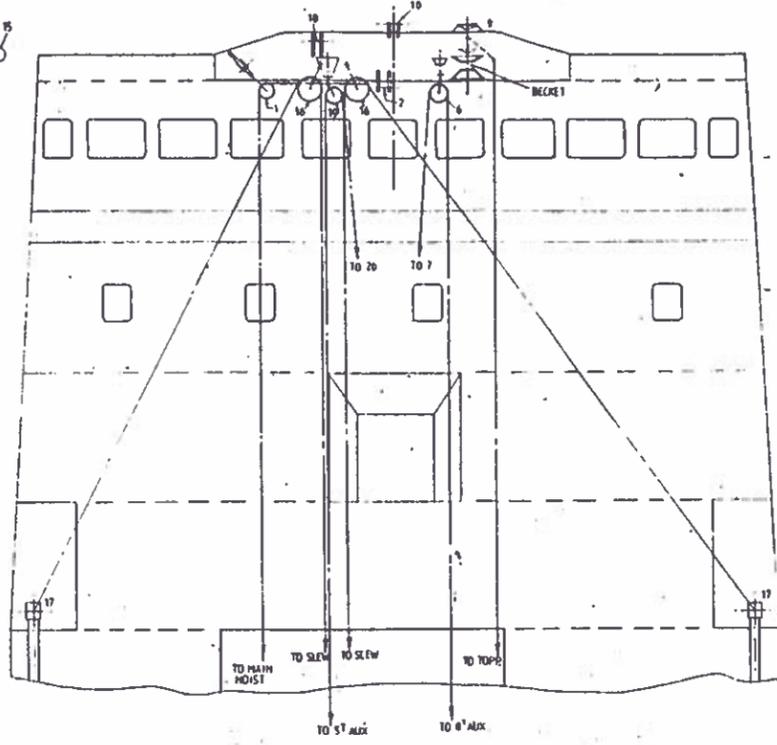
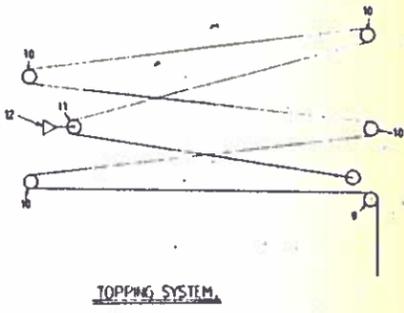
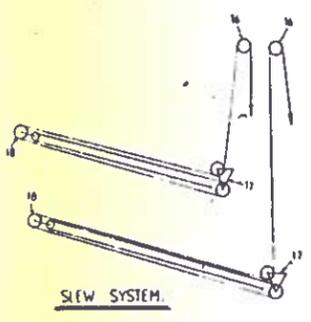
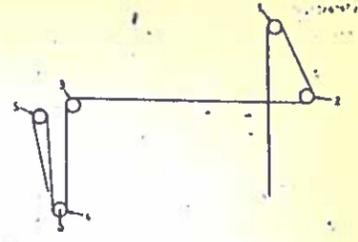
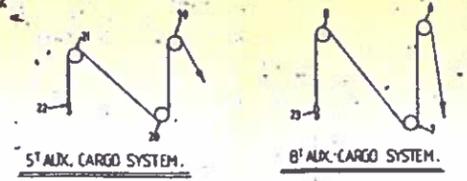
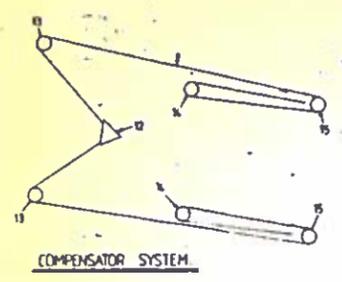
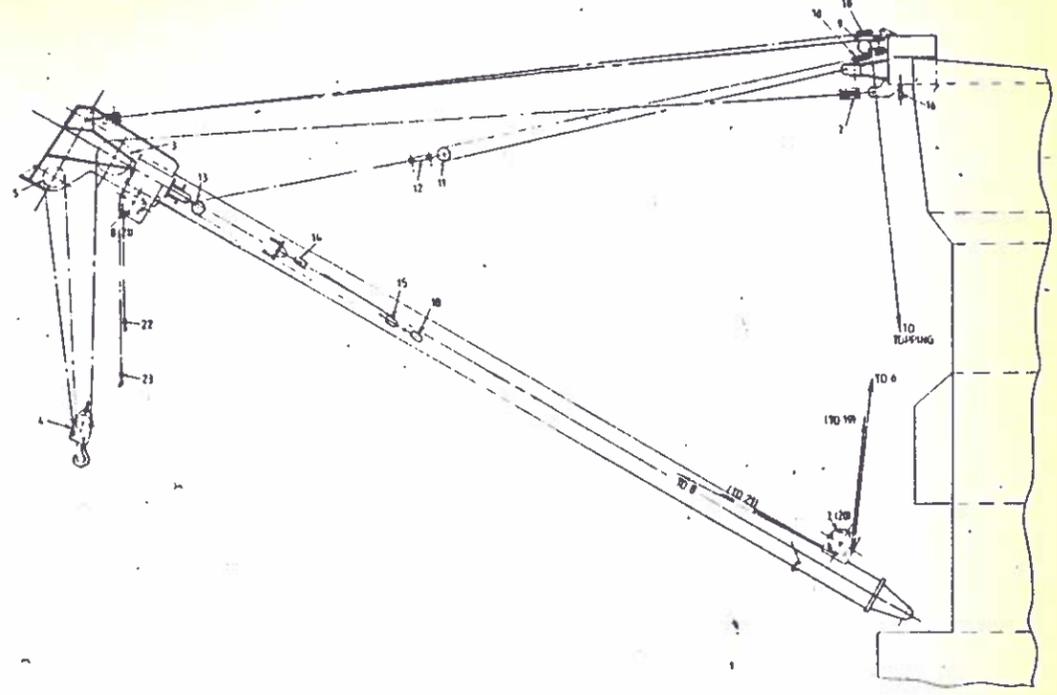
FAULT FINDING INSTRUCTIONS FOR LIMIT SWITCHES

1. Should the derrick halt in mid-operation, land the load, (this can be done as the cargo winch is not affected by the switches) then using the override switch/button release the derrick in its crutch.
2. Take off the limit switch box. Please note, when taking off the box lid proceed as follows:
 - Release holding down bolts
 - Lift box lid clear of locating pins
 - Turn box 45° to right or left
 - Lift clear of switches
3. Check for disconnected or loose wires.
4. Should the connections be in order, check the electrical circuit of the switch with a test meter as follows:
 - Disconnect wires, break circuit (or make circuit) by depressing actuator wheel. The terminals are numbered on the switches, refer to drawing DS 1395. If a switch circuit is faulty, replace the switch. This can be done quite simply by disconnecting from the actuator, again refer to drawing DS1395.
5. Should the electrical connection of the switch be in order, check the mechanical operation by depressing the actuator wheel. This should produce an audible 'click'. Check that the wheel "returns", that is, it does not stay inside the brass tube. Should this be so, dismantle the switch and lightly file the edges of the wheel recess until adequate clearance is achieved.
6. Should the derrick operate normally, but the lower limit, upper limit, etc., seems to operate at a higher angle (say 5° above its normal operating position) open the inspection plate, Item (16) on drawing DS 1395 and check that the crosspin lever, Item (13) has engaged properly with the slot on the crosspin.
7. Should the derrick /...

SECTION 6 CONTD

7. Should the derrick be lifted from the crutch, and the topping switches will not work, check that the cross pin lever has engaged in the slot as in 6 above, if not, push the cross pin lever towards the back of the trunnion until it slides home.

8. Before replacing the box cover ensure that there are no loose items left inside as these can prevent the mechanism from working.



ITEM No	No OFF	DESCRIPTION	No OFF SHEAVE	HEAD FITTING LOAD	SAFE WORKING LOAD	TEST LOAD	ROPE DIA.	SHEAVE DIA. B.O.G.	BEARINGS	BECKET	HEAD FITTING	SHACKLE	HEAD FITTING DIMENSIONS					REMARKS
													A	B	D	C	E	
1	1	CARGO LEAD BLOCK	1	14.3	7.15	20.6	10	350	TAPER ROLLER	—	OVAL EYE	—	50.0	26.2	76.2	165.1	—	
2	1	" " " " " "	1	14.02	7.01	20.04	"	"	"	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1211.
3	1	JIB HEAD SHEAVE (INNER)	1	—	—	—	—	300	—	—	—	—	—	—	—	—	—	HASTIE DRG No AS 1208.
4	1	HOOK BLOCK	1	20	10	40	—	350	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1208.
5	1	JIB HEAD SHEAVE (OUTER)	1	—	—	—	—	450	—	—	—	—	—	—	—	—	—	HASTIE DRG No AS 1208.
6	1	AUX CARGO LEAD BLOCK (8")	1	16.0	8.4	33.4	26	500	—	—	STRAP & PIN	—	57.15	66.67	50.8	—	—	HASTIE DRG No AS 1159.
7	1	JIB HEAD AUX CARGO SHEAVE (8")	1	16.4.8	8.24	32.96	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1159.
8	1	JIB HEAD AUX CARGO SHEAVE (8")	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	HASTIE DRG No AS 1159.
9	1	MAST HEAD TOPPING TIE BLOCK	1	16.05	16.05	33.7	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1159.
10	6	TOPPING BLOCKS	1	16.17	8.33	33.94	—	—	—	—	STUD EYE	—	120.65	63.5	52.30	171.45	—	
11	1	" " " " " "	1	15.27	7.63	30.54	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1160.
12	1	DELTA PLATE	—	15.87	15.27	30.54	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No BS 1328.
13	2	UPPER COMPENSATOR BLOCKS	1	20.6	10.3	43.2	26	500	TAPER ROLLER	—	STUD EYE	—	120.65	63.5	52.30	171.45	—	
14	2	MIDDLE " " " "	1	20.6	10.3	43.2	—	—	—	—	STUD EYE	—	120.65	63.5	52.30	171.45	—	
15	2	LOWER " " " "	2	31	15.5	62	—	—	—	—	STUD EYE	—	158.4	80.6	73.02	270.6	—	
16	2	SLEW LEAD BLOCKS	1	15.5	7.75	31	—	—	—	—	OVAL EYE	—	50.0	26.2	76.2	165.1	—	
17	2	SLEWPOST BLOCKS	2	36.95	18.475	63.95	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1158.
18	2	UPPER SLEW BLOCKS	2	31	15.5	62	—	—	—	—	DOUBLE LUG	—	26.2	10.8	69.05	88.9	—	
19	1	AUX CARGO LEAD BLOCKS (15")	1	16.5	8.25	33	22	450	—	—	STRAP & PIN	—	53.97	38.1	—	—	—	
20	1	JIB HEAD BLOCK (15")	1	16.3	8.15	32.6	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1158.
21	1	JIB HEAD AUX CARGO SHEAVE (15")	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	HASTIE DRG No AS 1159.
22	1	S ¹ AUX HOOK ASSY.	—	—	—	—	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1154.
23	1	B ¹ " " " "	—	—	—	—	—	—	—	—	SPECIAL	—	—	—	—	—	—	HASTIE DRG No AS 1154.

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MATERIAL		TOLERANCES		JOHN HASTIE OF GREENOCK LTD.	
PROTECTIVE FINISH		SURFACE FINISH		BLOCK LIST & RIGGING DIAGRAM	
REMARKS		DIMENSIONS		DRAWING No. AS 1222	