INSTRUCTION MANUAL

FOR

SPEED CRANE WINCHES

- MAIN HOIST D.C.
- AUXILLIARY HOIST D.C.
- TOPPING WINCH A/C
- SLEWING WINCH A/C
- WHIP HOIST D.C.

Manufactured by:

Pacific Winches Ltd.
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INDEX
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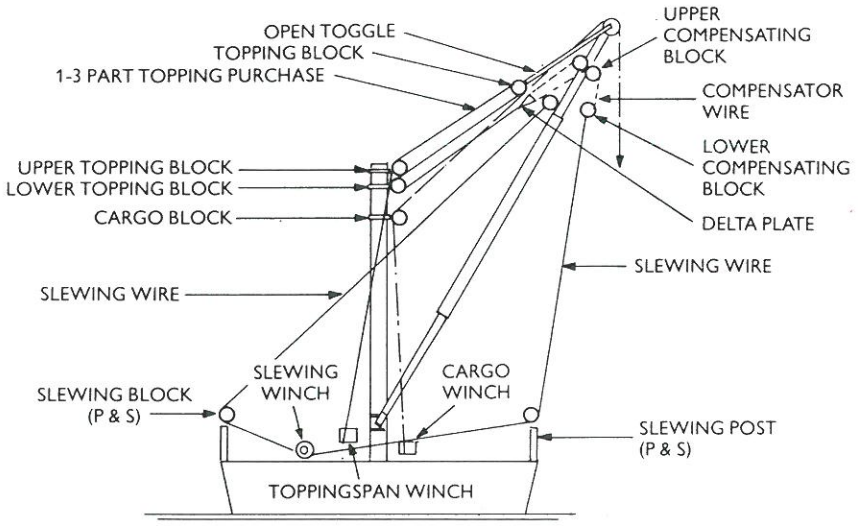
SECTION 1.0
SPEED CRANE DESCRIPTION

How the systems work . . . .

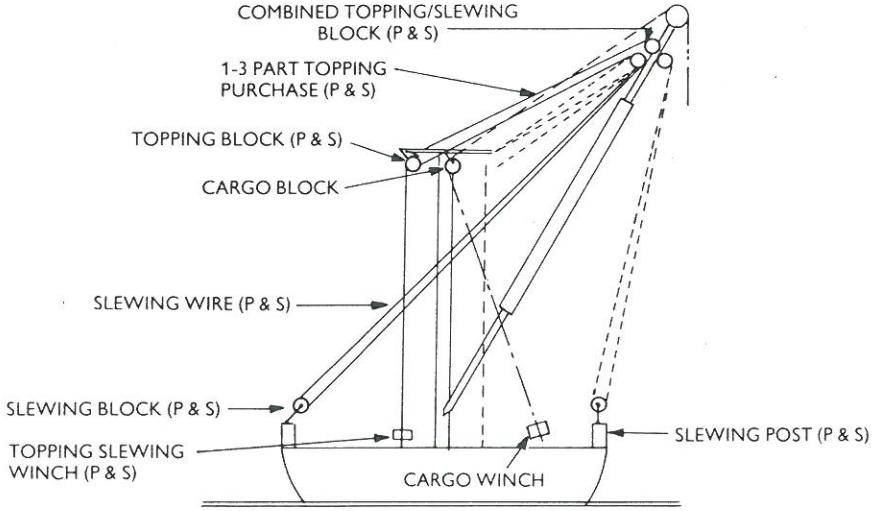
System 1—This is the original system evolved to give stability to derrick cranes. As on most systems three winches are used—one cargo winch, one topping winch and one slewing winch. The slewing winch has a divided barrel and pulls the derrick in and out. In other words, as one side of the barrel is paying 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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INSTRUCTION MANUALS
FOR
SPEEDCRANE DERRICK FITTED ON
THE BRIDGE FRONT OF
NAVAIDS TYPE 1100 VESSELS

When ordering Spare Parts List Please Quote
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INDEX

SECTION 1 GENERAL DESCRIPTION OF 28 TONNE S.W.L. SPEEDCRANE DERRICK

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/mm^2. 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/mm^2.

WINCHES

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

Main Hoist	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)

Auxiliary Hoist	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 availabilty of 60 HP.

Whip Hoist	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.

Topping Winch	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.

Slewing Winch	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 availabity 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

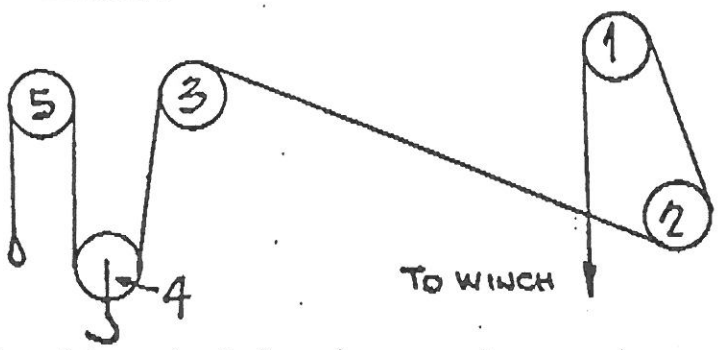
To be read in conjunction with drawings AS1280 and DS1392-1 and 2.

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.

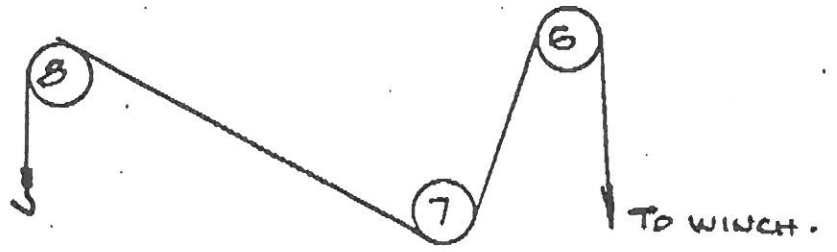
It may be found helpful if a fibre messenger rope is first reeved into the system by hand. The wire rope is then attached to the fibre rope, the fibre rope is then fastened to the winch barrel and the winch then used to pull the heavy wire through the system.

CARGO SYSTEM (MAIN HOIST)



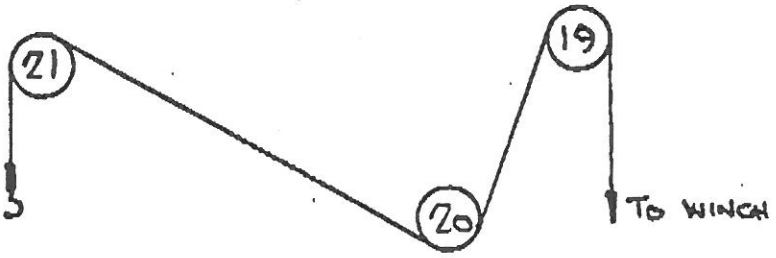
Take the plain end of the wire, pass it up and over the outermost sheave (5) in the derrick head then down to and through the rapid reduction hook block (4). Continue back up to and over the innermost sheave (3) in the derrick head. The wire is then led back to the mast head and round block (2), along 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).

AUXILIARY HOIST (PORT SIDE OF DERRICK)



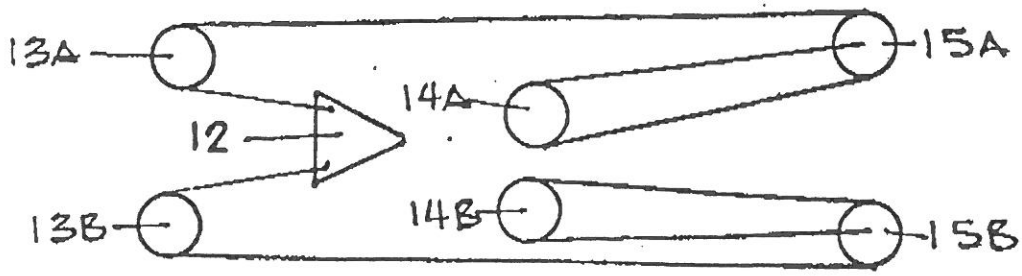
Take the plain end of the wire over sheave (8) at the port side of the derrick head. Lead the wire down parallel with the derrick tube to block (7) mounted at the heel of the derrick. Continue up to block (6) on the mast crossmember then down to the winch. Attach to the winch and wind the wire on to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

WHIP HOIST (STARB. 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

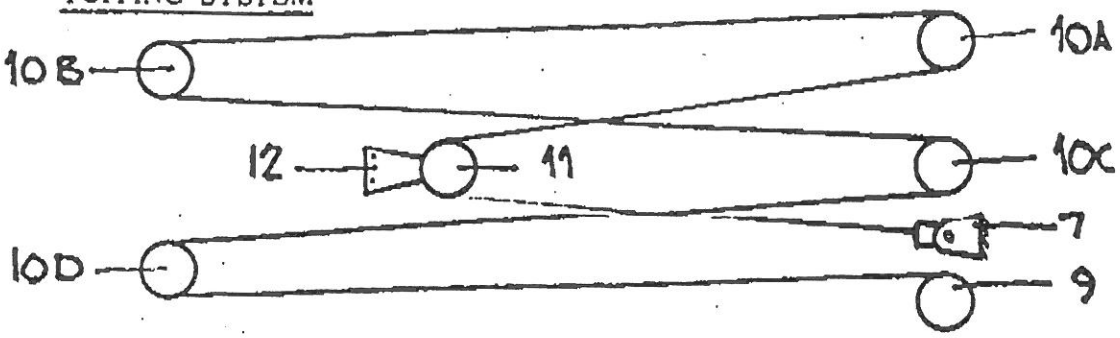
Attach one end of wire rope to Delta Plate (12). Pass other end through block (13A) then to block (15A) (which will be lying on the deck.) Take the wire to block (14A) then back down to block (15A) and attach to the becket on block (15A).

PORT COMPENSATOR SYSTEM

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

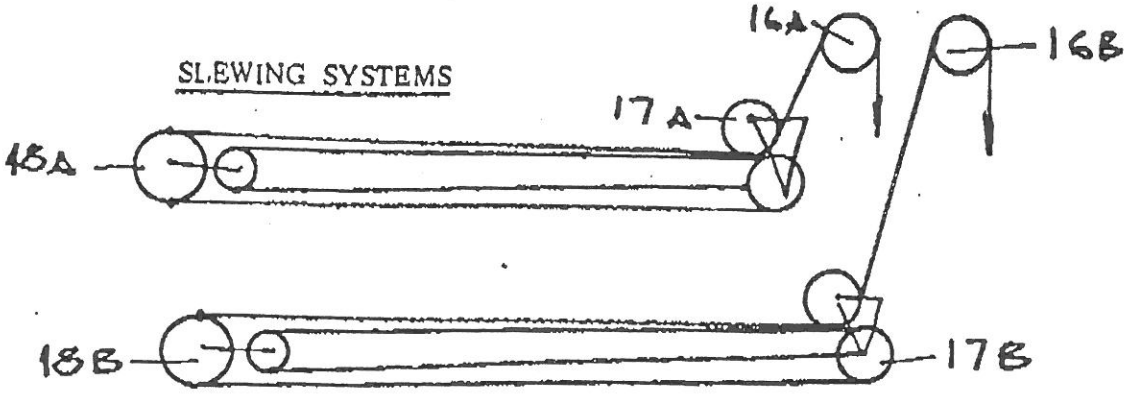
Note — It may be necessary to remove the sheave pins and drop the sheaves on blocks 13, 14 and 15 to enable the thimble end of the rope to pass between the sheave and head fitting collar on the blocks.

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.

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 barrrel. 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 in 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. Derrick shall 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. [illegible] 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 oil seal is incorporated in the cover plate in way of the cable pipe.

10. Refer to /..

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 replace 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

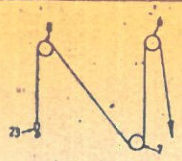
7. Should the derrick be lifted from the crutch, and the topping switches will not work, check that the cross pin lever has engaged in the slot as in 6 above, if not, push the cross pin lever towards the back of the trunnion until it slides home.

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

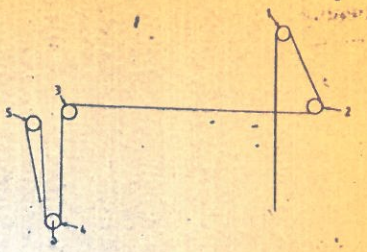
DRAWING No. AS 1222.

THIRD ANGLE

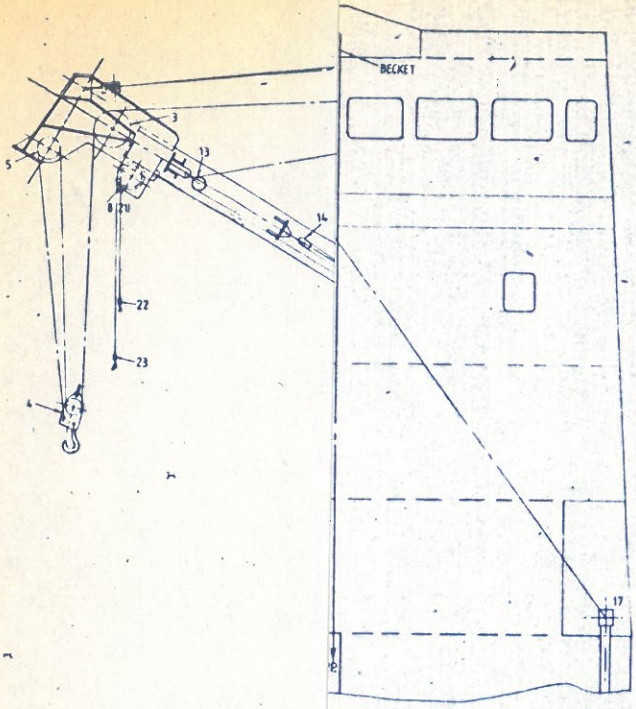
USED ON

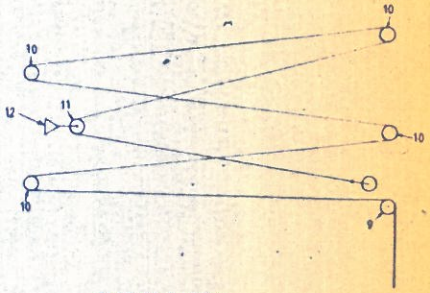


8T AUX. CARGO SYSTEM.

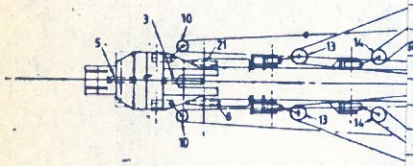


MAIN CARGO SYSTEM.





TOPPING SYSTEM.



GS	BECKET	HEAD FITTING	SHACKLE	HEAD FITTING DIMENSIONS. A	B	D	C	E	REMARKS.
R	—	OVAL EYE		50·8	76·2	76·2	165·1		
	—	SPECIAL							HASTIE DRG No AS1211.
	—	—							
	—	SPECIAL							HASTIE DRG No AS1208.
	—	—							
	—	STRAP & PIN		57·15	66·67	50·8	—	—	
	—	SPECIAL							HASTIE DRG. No. AS1159.
	—	—							
	—	SPECIAL							HASTIE DRG. No. AS 1159.
	—	STUD EYE		120·65	63·5	52·38	171·45	—	
	—	SPECIAL							HASTIE DRG. No. AS 1160.
	—	SPECIAL							HASTIE DRG. No. BS 1324.
R	—	STUD EYE		120·65	63·5	52·38	171·45	—	
	—	STUD EYE		120·65	63·5	52·38	171·45	—	
	YES	STUD EYE		152·4	88·6	73·02	228·6	—	
	—	OVAL EYE		50·8	76·2	76·2	165·1		
	YES	SPECIAL							HASTIE DRG No. AS1155.
	—	DOUBLE LUG		76·2	108	69·85	88·9		—
	—	STRAP & PIN			53·97	38·1	—	—	
	—	SPECIAL							HASTIE DRG. No. AS 1156.
	—	—							
	—	SPECIAL							HASTIE DRG. No. AS1157.
	—	SPECIAL							HASTIE DRG. No. AS 1154.

APPROVED

SUBMITTED

WELD APPD

CHECKED

TRACED

DRAWN RB

HN HASTIE OF GREENOCK LTD. — CLELAIN ENGINE WORKS GREENOCK PA16 ITG.

LOCK LIST & RIGGING DIAGRAM.

DRAWING No. AS 1222

SECTION 2.0
WINCH SPECIFICATIONS

MAIN HOIST

1.0 GENERAL

Reference Drawing 900-400-333. This specification describes a single drum electrically driven hoist winch.

2.0 OPERATING DATA (See Curves)

The winch is capable of the following ratings:

8 tonnes at 44 M/Min. (22.98 RPM)

4 tonnes at 88 M/Min. (45.86 RPM)

Light Line 137 M/Min. (71.55 RPM)
(7½ % torque)

The above rating is at the third layer (630 mm diameter) and is based on the availability of 100 HP.

3.0 DRUM CAPACITY

80 M of 18 mm diameter wire rope in three layers with a minimum of 75 mm free flange.

4.0 COMPONENT PARTS

4.1 Power System

A 95 HP S.C.R. controlled D.C. motor (McClure Frame No. DD 315C) with a base speed of 798 RPM is used to drive through a splined shaft into a triple reduction double spur gear box. Motor has a speed range to allow for a 137 M/Min. light line speed without gear changing.

Motor characteristics:

HP	95
Maximum Speed	2500 RPM
Base Speed	798 RPM
Base Amps	135

4.0 COMPONENT PARTS - continued

4.2 Gears

A fabricated steel gear box houses all gears in an oil tight splash lubricated enclosure. The output shaft is extended to carry the winch drum.

Three reductions are used:

1st - 22 T : 61 T (4 dp)

2nd - 18 T : 71 T (3 dp)

3rd - 28 T : 89 T (2½ dp)

Overall reduction is 34.76.

The box is equipped with oil dams to ensure lubrication of the bearings during periods of non use. Filler breathers and level gauges are fitted to the box.

All gears are manufactured from SAE 4140 or better with machine cut teeth.

4.3 Bearings

Self-aligning spherical roller bearings are used to carry all final gear reduction shafts. Input and intermediate shafts are carried on roller bearings.

4.4 Shafts

All winch shafts are manufactured from alloy steel and are designed such that high stress concentrations are not present under loaded conditions.

4.5 Drum

The drum is of welded steel construction with rope anchor located against the flange and is designed to be keyed to the main shaft.

Dimensions:

533 mm dia. barrel x 330 mm wide x 780 mm dia. flange.

4.0 COMPONENT PARTS - continued

4.6 Outboard Frame

The frame is of all welded steel construction and is designed and built to ensure that all assemblies remain in perfect alignment during the operation of the winch.

Design of the frame incorporates an integral bearing with an oversize housing to allow for high vertical loading.

4.7 Base

A fabricated base structure is provided to carry the gear box, drum, electric motor and outboard frame. The base is designed to be bolted to the ships deck.

4.8 Control System (See S.C.R. drive description Section)

A four quadrant S.C.R. converter of Cortina manufacture is provided for the DC supply to the motor. The converter is designed for below deck installation. Design of the system allows for constant HP operation, i.e. reducing torque with increasing speed.

A field reducing feature will allow for a high motor speed at reduced torque (7½ % of F.L.T.)

4.9 Control Panel

Single station remote control panel is provided to control the winch. The panel will contain a key lock on/off switch hoist control, ammeter and a torque limiting control. Panel is designed for installation in a winch house. Panel also carries the controls for:

(a) Slewing winch
(b) Topping winch
(c) Auxiliary hoist
(d) Auxiliary hydraulic winch
(e) Chain handling reel (option)

4.0 COMPONENT PARTS - continued

4.10 Brake

The input drive shaft is extended to carry the main disc brake. The disc brake is of Simplatrol manufacture (Model No. 54).

Design of the brake is fail safe, i.e. brake applies when power is interrupted.

5.0 PAINTING

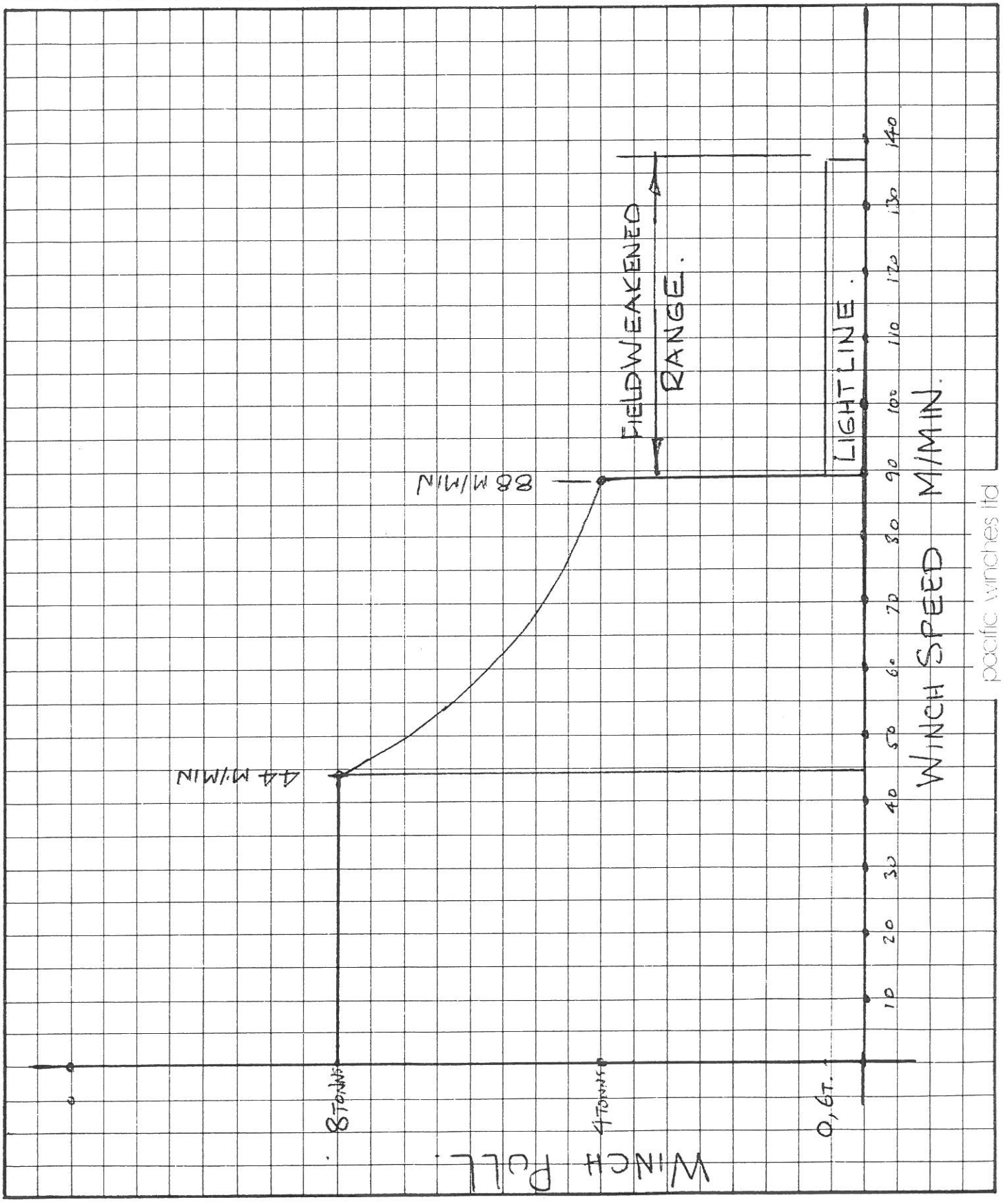
The winch frame will be sand blasted and given two coats of primer and two coats of marine enamel.

CALCULATION SHEET

TITLE/PROJECT .....

DATE .....

MAIN WINCH PERFORMANCE



PAGE ..... of .....

AUXILLIARY HOIST

1.0 GENERAL

Reference Drawing 900-400-377. This specification describes a single drum electrically driven auxiliary hoist winch.

2.0 OPERATING DATA

The winch is capable of the following ratings:

8.5 tonnes at 2.5 M/Min. (1.3 RPM)

8.5 tonnes at 11.5 M/Min. (6.05 RPM)

8.5 tonnes at 23.0 M/Min. (12.10 RPM)

6.5 tonnes at 30.0 M/Min. (15.78 RPM)

The above rating is at the second layer (610 mm dia.) and is based on the availability of 60 HP.

3.0 DRUM CAPACITY

30 M of 26 mm diameter wire rope in two layers with a minimum of 75 mm free flange.

4.0 COMPONENT PARTS

4.1 Power System

A 52.8 HP S.C.R. controlled DC motor (McClure Frame No. DD 250B) with a base speed of 1800 RPM is used to drive through a splined shaft into a quadruple reduction spur gear box.

Motor characteristics:

HP	52.8
Maximum Speed	2400 RPM
Base Speed	1800 RPM
Base Amps	76

4.0 COMPONENT PARTS - continued

4.2 Gears

A fabricated steel gear box houses all gears in an oil tight splash lubricated enclosure. The output shaft is extended to carry the winch drum.

The box is equipped with oil dams to ensure lubrication of the bearings during periods of non use. Filler breathers and level gauges are fitted to the box.

Four reductions are used:

1st - 21 T : 67 T (5 dp)

2nd - 22 T : 61 T (4 dp)

3rd - 18 T : 71 T (3 dp)

4th - 22 T : 95 T (2½ dp)

Overall reduction is 150.67.

All gears are manufactured from SAE 4140 or better with machine cut teeth.

4.3 Bearings

Self-aligning spherical roller bearings are used to carry all final gear reduction shafts. Input and intermediate shafts are carried on roller bearings.

4.4 Shafts

All winch shafts are manufactured from alloy steel and are designed such that high stress concentrations are not present under loaded conditions.

4.5 Drum

The drum is of welded steel construction with a rope anchor at one end and is designed to be keyed to the main shaft.

Dimensions: 533 mm dia. barrel, 406 mm wide with
760 mm dia. flange.

4.0 COMPONENT PARTS - continued

4.6 Outboard Frame

The frame is of all welded steel construction and is designed and built to ensure that all assemblies remain in perfect alignment during the operation of the winch.

Design of the frame incorporates an integral bearing with an oversize housing to allow for high vertical loading.

4.7 Base

A fabricated base structure is provided to carry the gear box, drum, electrical motor and outboard frame. The base is designed to be bolted to the ships deck.

4.8 Control System (See S.C.R. Drive Description Section)

A four quadrant S.C.R. converter of Cortina manufacture is provided for the DC supply to the motor. The converter is designed for below deck installation. Design of the system allows for speed control with constant torque (limited).

4.9 Control Panel

Single station remote control panel is provided to control the winch. The panel will contain a key lock on/off switch, hoist control and ammeter. Panel is designed for installation in a winch house. Panel also carries the controls for:

(a) Slewing Winch
(b) Topping winch
(c) Main hoist
(d) Auxiliary hydraulic winch
(e) Chain handling reel

4.10 Brake

The input drive shaft is extended to carry the main disc brake. The disc brake is of Simplatrol manufacture (model No. 37).

Design of the brake is fail safe, i.e. brake applies when power is interrupted.

5.0 PAINTING

The winch frame will be sand blasted and given two coats of primer and two coats of marine enamel.

SLEWING WINCH

1.0 GENERAL

Reference Drawing 900-400-333. This specification describes a single drum electrically driven slewing winch.

2.0 OPERATING DATA

The winch is designed for the following ratings:

7.0 tonnes at 3.08 M/Min. (1.62 RPM)

7.0 tonnes at 14.14 M/Min. (7.44 RPM)

7.0 tonnes at 28.28 M/Min. (14.88 RPM)

The above rating is at the second layer (605 mm dia.) and is based on the availability of 52.8 HP.

3.0 DRUM CAPACITY (Two Part)

40 M of 22 mm diameter wire rope in two layers with a minimum of 75 mm of free flange (each half).

4.0 COMPONENT PARTS

4.1 Power System

A 52.8HP(38/19/4.1 KW) pole changing motor (McClure Frame No. TS36/250) complete with disc brake with a base speed of 1800 RPM is used to drive through a splined shaft into a quadruple spur gear box.

4.2 Gears

A fabricated steel gear box houses all gears in an oil tight splash lubricated enclosure. The output shaft is extended to carry the winch drum.

The box is equipped with oil dams to ensure lubrication of the bearings during periods of non use. Filler breathers and level gauges are fitted to the box.

4.0 COMPONENT PARTS - continued

4.2 Gears - continued

Four reductions are used:

1st - 20 T : 67 T (5 dp)

2nd - 22 T : 61 T (4 dp)

3rd - 18 T : 71 T (3 dp)

4th - 28 T : 89 T (2½ dp)

Overall reduction is 116.45

All gears are manufactured from SAE 4140 or better with machine cut teeth.

4.3 Bearings

Self-aligning spherical roller bearings are used to carry all final gear reduction shafts. Input and intermediate shafts are carried on roller bearings.

4.4 Shafts

All winch shafts are manufactured from alloy steel and are designed such that high stress concentrations are not present under loaded conditions.

4.5 Drum

The drum is of welded steel construction with rope anchors at each end. Design of the anchors allows each half of the drum to be wound in opposite directions.

One half of the drum is keyed to the shaft, the other half is mounted on bushings to allow for differential alignment. The rotatable part of the drum is secured to the fixed part by countersunk screws.

Dimensions: 533 dia. barrel, 330 mm wide (each half)
750 dia. flange.

4.0 COMPONENT PARTS - continued

4.6 Outboard Frame

The frame is of all welded steel construction and is designed and built to ensure that all assemblies remain in perfect alignment during the operation of the winch.

Design of the frame incorporates an integral bearing with an oversize housing to allow for high vertical loading.

4.7 Base

A fabricated base structure is provided to carry the gear box, drum, electric motor and outboard frame. The base is designed to be bolted to the ships deck.

4.8 Control System

A standard separate contactor and relay panel of Industrial Marine and Switchgear manufacture with necessary accelerating and reversing contactors, overload relays, etc.

4.9 Control Panel

A combination controller of the joystick type is used to control both the topping and slewing winch. The lever is designed for a dual station panel mount.

The panel is complete with on/off key lock switch ammeter. Panel is designed for installation in a winch house. Panel also carries the controls for:

(a) Topping winch
(b) Main hoist
(c) Auxiliary hoist
(d) Auxiliary hydraulic hoist
(e) Chain handling reel (option)

4.0 COMPONENT PARTS continued

4.10 Disc Brake

The input drive shaft is extended to carry the main disc brake. The disc brake is of Simplatrol manfuacture (Model No. 37).

Design of the brake is fail safe, i.e. brake applies when power is interrupted.

5.0 PAINTING

The winch frame will be sand blasted and given two coats of primer and two coats of marine enamel.

TOPPING WINCH

1.0 GENERAL

Reference Drawing 900-400-335. This specification describes a single drum electrically driven topping winch.

2.0 OPERATING DATA

The winch is capable of the following ratings:

9.0 tonnes at 4.0 M/Min. (1.92 RPM)

9.0 tonnes at 17.0 M/Min. (8.17 RPM)

9.0 tonnes at 34.0 M/Min. (16.34 RPM)

The above rating is at the third layer (690 mm dia.) and is based on the availability of 85 HP.

3.0 DRUM CAPACITY

75 M of 26 mm diameter wire rope in three layers with a minimum of 75 mm free flange.

4.0 COMPONENT PARTS

4.1 Power System

An 85 HP (60/30/7.1 KW) pole changing motor (McClure Frame TS 42/315) complete with disc brake with a base speed of 1800 RPM is used to drive through a splined shaft into a quadruple reduction spur gear box.

4.2 Gears

A fabricated steel gear box houses all gears in an oil tight splash lubricated enclosure. The output shaft is extended to carry the winch drum.

The box is equipped with oil dams to ensure lubrication of the bearings during periods of non use. Filler breathers and level gauges are fitted to the box.

4.0 COMPONENT PARTS - continued

4.2 Gears - continued

Four reductions are used:

1st - 21 T : 65 T (5 dp)

2nd - 22 T : 61 T (4 dp)

3rd - 18 T : 71 T (3 dp)

4th - 28 T : 89 T (2½ dp)

Overall reduction is 107.6

All gears are manufactured from SAE 4140 or better with machine cut teeth.

4.3 Bearings

Self-aligning spherical roller bearings are used to carry all final gear reduction shafts. Input and intermediate shafts are carried on roller bearings.

4.4 Shafts

All winch shafts are manufactured from alloy steel and are designed such that high stress concentrations are not present under loaded conditions.

4.5 Drum

The drum is of welded steel construction with a rope anchor at one end and is designed to be keyed to the main shaft.

Dimensions: 533 mm dia. barrel, 406 mm wide
740 mm dia. flange.

4.6 Outboard Frame

The frame is of all welded steel construction and is designed and built to ensure that all assemblies remain in perfect alignment during the operation of the winch.

4.0 COMPONENT PARTS continued

4.6 Outboard Frame - continued

Design of the frame incorporates an integral bearing with an oversize housing to allow for high vertical loading.

4.7 Base

A fabricated base structure is provided to carry the gear box, drum, electric motor and outboard frame. The base is designed to be bolted to the ships deck.

4.8 Control System

A standard separate contactor and relay panel of Industrial Marine Switchgear manufacture with necessary accelerating and reversing contactors, overload relays, etc.

4.9 Control Panel

A combination controller of the joystick type is used to control both the topping and slewing winch. The lever is designed for a dual station panel mount.

The panel is complete with on/off key lock switch ammeter. Panel is designed for installation in a winch house. Panel also carries the controls for:

(a) Slewing winch
(b) Main hoist
(c) Auxiliary hoist
(d) Auxiliary hydraulic hoist
(e) Chain handling reel

4.10 Brake

The input drive shaft is extended to carry the main disc brake. The disc brake is of Simplatrol manufacture (Model No. 54). Design of the brake is fail safe, i.e. brake applies when power is interrupted.

5.0 PAINTING

The winch frame will be sand blasted and given two coats of primer and two coats of marine enamel.

WHIP HOIST

1.0 GENERAL

Reference Drawing 900-400-380. This specification describes a single drum electrically driven whip hoist winch.

2.0 OPERATING DATA

The winch is capable of the following ratings:

6.0 tonnes at 0-35 M/Min. (0-18 RPM)

3.0 tonnes at 0-60 M/Min. (0-30 RPM)

The above rating is at the second layer (610 mm diameter), and is based on the availability of 60 HP.

3.0 DRUM CAPACITY

30 M of 26 mm diameter wire rope in two layers with a minimum of 75 mm free flange.

4.0 COMPONENT PARTS

4.1 Power System

A 52.8 HP S.C.R. controlled DC motor (McClure Frame No. DD 250B) with a base speed of 1800 RPM is used to drive through a splined shaft into a quadruple reduction spur gear box.

Motor characteristics:

HP	52.8
Maximum Speed	2400 RPM
Base Speed	1800 RPM
Base Amps	76

4.2 GEARS

A fabricated steel gear box houses all gears in an oil tight splash lubricated enclosure. The output shaft is extended to carry the winch drum.

...

4.0 COMPONENT PARTS - continued

4.2 Gears continued

The box is equipped with oil dams to ensure lubrication of the bearings during periods of non use. Filler breathers and level gauges are fitted to the box.

Four reductions are used:

1st	-	29 T	:	59 T	(5 dp)
2nd	-	22 T	:	61 T	(4 dp)
3rd	-	18 T	:	71 T	(3 dp)
4th	-	28 T	:	89 T	(2½dp)

Overall reduction is 70, 72.

All gears are manufactured from SAE 4140 or better with machine cut teeth.

4.3 Bearings

Self-aligning spherical roller bearings are used to carry all final gear reduction shafts. Input and intermediate shafts are carried on roller bearings.

4.4 Shafts

All winch shafts are manufactured from alloy steel and are designed such that high stress concentrations are not present under loaded conditions.

4.5 Drum

The drum is of welded steel construction with a rope anchor at one end and is designed to be keyed to the main shaft.

Dimensions: 533 mm dia. barrel, 406 mm wide with
760 mm dia. flange.

4.6 Outboard Frame

The frame is of all welded steel construction and is designed and built to ensure that all assemblies remain in perfect alignment during the operation of the winch. Design of the frame incorporates an integral bearing with an oversize housing to allow for high vertical loading.

4.0 COMPONENT PARTS - continued

4.7 Base

A fabricated base structure is provided to carry the gear box, dru, electrical motor and outboard frame. The base is designed to be bolted to the ships deck.

4.8 Control System (See S.C.R. Drive Description Section)

A four quadrant S.C.R. converter of Cortina manufacture is provided for the DC supply to the motor. The converter is designed for below deck installation. Design of the system allows for speed control with constant torque (limited).

4.9 Control Panel

A single station remote control panel is provided to control the winch. The panel will contain a key lock on/off switch, hoist control and ammeter. Panel is designed for installation in a winch house. Panel also carries the controls for:

a) Slewing Winch
b) Topping Winch
c) Main Hoist
e) Chain Reel (Option)

4.10 Brake

The input drive shaft is extended to carry the main disc brake. The disc brake is of Simplatrol manufacture (Model No. 37).

Design of the brake is fail safe, i.e. brake applies when Power is interrupted.

5.0 PAINTING

The winch frame will be sand blasted and given two coats of primer and two coats of marine enamel.

SECTION 3.0
ELECTRICAL SPECIFICATIONS

SPECIFICATION FOR NAVAIDS CRANE

Composite crane control panel with integral joystick controls and indication with provision for remote joystick controls and indication. The panel contains the following starters:

Topping:	61.6/30.8/7.6KW A.C. Starter
Slewing:	39.9/19/4.1KW A.C. Starter
Main Hoist:	70.8KW D.C. Thyristor Drive
Aux Hoist No.1:	40.2KW D.C. Thyristor Drive
Aux Hoist No. 2:	39.3KW D.C. Thyristor Drive

The A.C. starters will be used for crane position control and will comprise 3 speed pole changing forward and reversing direct on line.

The D.C. starters will be used for crane hoist and will comprise 3 phase, 6 pulse, 4 quadrant thyristor drive with torque limiting device.

Control of these starters would be by means of (a) pedestal or deck type console(s) remotely sited.

The composite panel will be built to IP42 and will comprise five cubicles, each of which would house the drive components, access to which will be via doors hinged on the front. The panel is manufactured from zinc coated (zintec) sheet steel which is cut, formed and seam welded to produce a robust unit. The metal surfaces are prepared, degreased and primed and finished in a two pack polyurethane paint, Admiralty Grey in colour unless an alternative to BS4800 is requested on your order.

Composite Dimensions (mm)

Height:	1800
Width:	3000
Depth:	600
Main Electrical Supply:	600 volt 3 phase 60 hz
Control Electrical Supply:	120 volt via an internal double wound transformer with earth screen

Crane Positioning

the motors will comprise:

Topping Motor Data — Frame Size T42/315

Output	Full Load Current	Speed
61.6KW	75 amp	1800 rpm
30.8KW	59 amp	900 rpm
7.6KW	33 amp	225 rpm

Slewing Motor Data — Frame Size T36/250

Output	Full Load Current	Speed
39.9KW	38 amp	1800 rpm
19.0KW	33 amp	900 rpm
4.1KW	22 amp	225 rpm

Each starter is mounted in its own enclosure and will comprise: (Mounted within the enclosure)

1 - Door interlocked circuit breaker.
3 - Low speed motor circuit protection breaker.
2 - 1800 rpm mechanically and electrically interlocked contactors.
1 - 1800 rpm overload relay.
2 - 900 rpm mechanically and electrically interlocked contactors.
1 - 900 rpm overload relay.
2 - 450 rpm mechanically and electrically interlocked contactors.
1 - 450 rpm overload relay.
1 - Pole change contactor.
1 - Current transformer for use with the remote mounted ammeter.
1 - Double wound control transformer 600 volt primary, 120 volt secondary.
1 - Set control circuit fuse links mounted in fuse holders.
6 - Control timers.
1 - Set control relays.
1 - Brake contactor.
1 - Brake transformer-rectifier.
1 - Panel anti-condensation heater and thermostat.

1 - 110V A.C 2 pin socket for inspection lamp

1 - Set control terminals

The control panels would accept signals from limit switches mounted on the crane to limit its movement.

Mounted on the panel door would be:-

1 - Supply on lamp

1 - Ready lamp

1 - Lock off stop pushbutton - key reset

The panel will be complete with all main and control interconnectors having all cables terminated with crimped lugs and identified with internationally colour coded cable numbers.
A pocket will be provided in the inner side of the door to hold the necessary equipment drawings.

Crane Hoist

Motor data:

Main Hoist	Frame Size	DD315
Output	Armature Current	Speed
70.8KW	265 amp	800 rpm
70.8KW	135 amp	1600 rpm
Field Weakening To		2500 rpm

Aux Hoist No.1 Motor Data	Frame Size	DD280
Output	Armature Current	Speed
40.2KW	78 amp	958 rpm
0-958 Constant Torque		
Field Weakening To		2500 rpm

Aux Hoist No.2 Motor Data	Frame Size	DD250
Output	Armature Current	Speed
39.5KW	77 amp	1320 rpm
0-1320 Constant Torque		
Field Weakening To		2250 rpm

Each D.C drive will be mounted in its own enclosure and will comprise:-
Mounted within the enclosure

1 - Door interlocked circuit breaker

1 - Suitably rated triple pole main line A.C contactor

1 - Motor cooling fan starter comprising contactor, thermal overload, fuses

3 - High speed fuses complete with tripped fuse interlocks arranged to stop the drive in the event of a high speed fuse failure

6 - Limb chokes for fault limitation and transient voltage protection

2 - Fully controlled, anti parallel connected, suppressed half, 3 phase, 6 pulse thyristor converter bridges rated continuously for use in an ambient temperature to BS587 (max 40°C with average 35°C) each bridge complete with device suppression networks, cooling fans and over-temperature protection circuit

1 - Brake transformer rectifier

1 - Panel anti-condensation heater and thermostat

1 - 110V A.C 2 pin socket for inspection lamp

1 - Transducer for current feedback purposes and indication purposes

Electronic Modules

1 - Set electronic control modules consisting of:-

Regulator Board incorporating:

Speed control circuit containing the speed error amplifier, speed setting reference and current limiting circuitry.

Current control circuit containing the current amplifier stability circuits and current suiciding networks.

Electronic instantaneous overload circuit offering sub cycle protection against high levels (the instantaneous overload provides firing circuit pulse suppression and does not rely on the main contactor clearing the high level fault current).

Comprehensive forward and reverse bridge protection and inhibit circuits.

"S Law" Ramp Board incorporating:

Acceleration control circuit providing controlled rate of change of tachometer generator voltage for accelerating the drive to the required speed.

Four Quadrant DCVT providing:

Forward and Reverse Current Feedback.

Twin Firing Circuit Boards providing:

The 6 block pulses which control the conduction of each fully controlled armature bridge.

Auxiliary Components Board incorporating:

Preset potentiometers to allow the setting up of the following control parameters:

Reverse Current Stability

Reverse Current Limit

Forward Current Limit

Forward Current Stability
Speed Stability
Set Minimum Speed
Set Maximum Speed
Ammeter Trim

Main Components of Field Circuit

1 - Single phase field supply transformer complete with secondary resistors for fixed field weakening
1 - Set interlocked field voltage selection contactors
1 - Full wave, single phase diode bridge rectifier
1 - Set field failure protection equipment

CONTROL CIRCUIT

1 - 600/110V centre tapped, double wound control circuit transformer
1 - Set suitably rated HRC fuses for protection of control circuit wiring

Provision is made for reception of following remote operator controls:-

Raise/Lower Speed
High Speed
Start
Stop
} All on a Joystick Control

Emergency Stop

Mounted on the panel door is be:-
Lock Off Stop Pushbutton - key reset
Ready Lamp
Supply Available Lamp
Reset Pushbutton

Monitoring

Armature current and voltage
Test meter and flying lead
Alarm indication and tripping of drive will occur in event of:-

Motor Field Failure
Stack Overtemperature
Electronic Overload
External Interlocks
Motor Overtemperature
Phase Rotation Wrong/Loss

Protection

Phase Loss
Undervoltage
Electronic Current Limit
Limb Harmonic Suppression Reactor
Field Failure
A.C. Internal Overload
D.C. Overload
Converter Ventilation Failure

The panel is complete with all main and control interconnections having all cables terminated with crimped lugs and identified with internationally colour coded cable numbers. A pocket is in the inner side of the door to hold the necessary equipment drawings.

A.C. & D.C. MOTORS FOR CRANE WINCH DRIVES

Al machines offered conform to the relevant British Standards and Lloyd's Unrestricted Requirements, being wound with class 'F' insulation 1 hour rated and suitable for use on the supplies specified.

D.C. MOTORS

The D.C. Motors are totally enclosed, deck watertight, shunt wound interpoler, horizontal C flange mounting type have 2 end plate mounted grease lubricated bearings and a bare splined shaft extension at the driving end. A terminal box is provided suitable for cable termination. Radio interference suppressors are fitted internally. A tacho generator is fitted for speed control.

Motor Data:

Main Hoist	Frame Size DD315	
Output	Armature Current	Speed
70.8KW	265 amp	800 rpm
70.8KW	135 amp	1600 rpm
Field Weakening to		2500 rpm

Aux Hoist No.1 Motor Data		Frame Size DD280
Output	Armature Current	Speed
40.2KW	78 amp	958 rpm
0-958 Constant Torque		
Field Weakening to		2500 rpm

Aux Hoist No.2 Motor Data		Frame Size DD250
Output	Armature Current	Speed
39.5KW	77 amp	1320 rpm
0-1320 Constant Torque		
Field Weakening to		2250 rpm

A.C. MOTORS

The A. C. motors are totally enclosed, deck watertight, squirrel cage induction, 3 speed horizontal speed foot mounting type having 2 end plate mounted grease lubricated bearing and a bare splined shaft extension at the driving end.
A terminal box are provided suitable for cable termination.

Topping Motor Data		Frame Size T42/315
Output	Full Load Current	Speed
61.6KW	75 amp	1800 rpm
30.8KW	59 amp	900 rpm
7.6KW	33 amp	225 rpm

Slewing Motor Data		Frame Size T36/250
Output	Full Load Current	Speed
39.9KW	48 amp	1800 rpm
19.0KW	33 amp	900 rpm
4.1KW	22 amp	225 rpm

BRAKES

Electromagnetic brakes are supplied separately for each drive. The brakes are spring loaded fail-safe protected against seawater to IP65.

Topping

Type 41 Standard 55mm bore with keyway Static Torque 690 Nm

Slewing

Type 37 Standard 48mm bore with keyway Static Torque 440 Nm

Main Hoist

Type 54 Standard 70mm bore with keyway Static Torque 1760 Nm

Aux Hoist No.1

Type 41 Standard 55mm bore with keyway Static Torque 690 Nm

Aux Hoist No.2

Type 47 Standard 60mm bore with keyway Static Torque 1100 Nm

CONTROL CONSOLE

This will comprise a 6mm aluminium plate set into a pedestal structure and inclined for ease of operation.

The console will consist of:

1 - 4 direction joystick for slewing and topping control
1 - Long scale topping ammeter
1 - Long scale slewing ammeter
1 - Raise/lower joystick for main hoist
1 - Raise/lower joystick for aux hoist no.1
1 - Raise/lower joystick for aux hoist no.2
1 - Long scale main hoist ammeter
1 - Long scale aux hoist no.1 ammeter
1 - Long scale aux hoist no.2 ammeter
1 - Port/Starboard duty switch (only required on dual control systems)
5 - Motor overtemperature lamps
3 - Fault lamps
3 - Overtravel lamps
1 - Power available lamp
1 - Port selected lamp - optional
1 - Starboard selected lamp - optional
1 - Override limit pushbutton for crane parking
1 - Emergency stop lock off mushroom head pushbutton
1 - Set terminals

Each raise/lower joystick has a high speed request pushbutton in the top of the joystick.

Each joystick is fully screened from others by aluminium barrier plates which also serve to strengthen the unit.

D. C. TEST CERTIFICATE

Client INDUSTRIAL & MARINE SWITCHGEAR

Serial No. 38139/1

Order No. SM18828/1422/6

Job No. ..... Date 5.7.84

B.H.P./KW 95/95/22.38	Rating 1 HOUR	R.P.M. Loaded 800/1600/2500
Size DD315C	Enc. T.E.D.W. (IP56)	R.P.M. Light –
Volts 290/575/575	Type DC MOTOR	Conn. SHUNT INT SEP EXC
Amps 265/135/31.5	Spec. I.E.E. & BS4999	Class of Insulation 'F'

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input
SHUNT	COLD			4.45	250	
REV 'N'	100	290	707	4.45	250	
	100	290	704	4.45	250	
10.10	265	290	706	4.45	250	76.85
TEMPS 11.10	265	290	783	3.5	250	76.85
FL	135	575	1550	3.5	250	77.6
	203	575	1573	3.5	250	116.7
	31.5	575	2500	1.62	103	18.1
	63	575	2500	1.62	103	36.2
WINDING RES FIGS ARM 0.0217/.0264						
COLD/HOT INTERPOLES 0.0103/0.014						
	SHUNT 56 / 71.4					
HEATERS	110/1/60 HTZ					
OVERLOADS						

Rotation looking on Drive End REVERSING

Atmosphere °C 20

	Temprise THERMO	
Armature	76	56
Commutator	51	31
Shunt	57	37
Series	–	–
Interpole	85	65
Brake		

Brake D.C.	Cold	Warm
Volts		
Amps		
Watts		

BRAKING TORQUE

lbs. ft.

% F.L.T.

EFFICIENCY READINGS MS BS

Loading of Machine	1/2	3/4	4/4	5/4
Efficiency %		91.2	91.9	

REGULATOR

Type:

No.:

Remarks HEATER CCT CHECKED FOR CONTINUITY
63 OHMS, THERMO-STATS CHECKED N/C
TACHO O/P VOLTS CHECKED
VIBRATION TO BS4999 N GRD

Ins. Res. Hot Meg Ω

2 K.V. A.C. Test for One Minute O.K.

AIR GAP MP 0.14
IP 0.14

Test Engineer E.H. & S.H. Date of Test 6.11.84

per pro DAVID McCLURE LTD

MAIN HOIST-TYPICAL

DAVID McCLURE LTD, STOCKPORT

D. C. TEST CERTIFICATE

Client .....

Serial No. 38139/1

Order No. .....

Job No. ..... Date .....

B.H.P./K.W.	Rating	R.P.M. Loaded
Size	Enc.	R.P.M. Light
Volts	Type	Conn.
Amps	Spec.	Class of Insulation

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input
	NO	LOAD	READINGS			
	6.0	290	773	3.5	250	
	6.0	295	783	3.5	250	
	8.4	575	1540	3.5	250	
	8.4	580	1550	3.5	250	
	7.2	575	2522	1.62	103	
	7.4	570	2500	1.62	103	

OVERLOADS

EFFICIENCY READINGS

Loading of Machine	1/2	3/4	4/4	5/4
Efficiency				

Remarks .....

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Rotation looking on Drive End

Atmosphere °C

Temprise

Armature	
Commutator	
Shunt	
Series	
Interpole	
Brake	

Brake D.C.	Cold	Warm
Volts		
Amps		
Watts		

BRAKING TORQUE

lbs. ft.

% F.L.T.

REGULATOR

Type:

No.:

Ins. Res. Hot Meg Ω

2 K.V. A.C. Test for One Minute O.K.

AIR GAP

Test Engineer ..... Date of Test .....

per pro DAVID McCLURE LTD .....

DAVID McCLURE LTD, STOCKPORT

D. C. TEST CERTIFICATE

Client INDUSTRIAL & MARINE SWITCHGEAR

Serial No. 38139/10

Order No. SM18828/1422/6

Job No. ..... Date 5.7.84

B.H.P. 54/54	Rating 1 HOUR	R.P.M. Loaded 0/958/2500
Size DD.280B	Enc. T.E.D.W. IP56	R.P.M. Light –
Volts A 575	Type HOR-FLG-MTG	Conn. SHUNT SEP EXC 250 VOLTS
Amps 78	Spec. IEE & BS.4999	Class of Insulation 'F'

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input
	COLD	SHUNT		4.25	250	
REVERSE 'N'	70	450	625	4.25	250	
	70	450	629	4.25	250	
	78	575	820	4.25	250	
11.20	78	575	2500	0.85	50	44.85
11.50	78	575	2500	0.85	52	44.85
12.20	78	575	2500	0.84	53	44.85
			TEMPS			
BS FL	78	575	958	2.6	180	44.85
NL BS	1.9	575	828	4.25	250	1.09
N TS	2.7	575	2490	0.85	57	1.55
WINDING RES FIGS	ARM	0.173	INT/POLES		0.085	
	SHUNT	58.8 OHMS				

OVERLOADS 60% FOR 15 SECS OK

Rotation looking on Drive End

Atmosphere °C 23

Temprise		
Armature	78	55
Commutator	68	45
Shunt	33	10
Series	–	–
Interpole	79	56
Brake	–	–

Brake D.C.	Cold	Warm
Volts		
Amps		
Watts		

BRAKING TORQUE

lbs. ft.

% F.L.T.

EFFICIENCY READINGS

Loading of Machine	1/2	3/4	4/4	5/4
Efficiency				

REGULATOR

Type:

No.:

Remarks HEATER CCT CHECKED FOR CONTINUITY 50 OHMS
TACHO O/P VOLTS CHECKED COMMUTATION & VIBRATION
LEVELS SATISFACTORY

Ins. Res. Hot 200 Meg Ω

2 K.V. A.C. Test for One Minute O.K.

AIR GAP MP 0.13

IP 0.13

Test Engineer E.H & S.H Date of Test 12.12.84

per pro DAVID McCLURE LTD

AUX HOIST - TYPICAL

DAVID McCLURE LTD, STOCKPORT

D. C. TEST CERTIFICATE

Client INDUSTRIAL & MARINE SWITCHGEAR

Serial No. 38139/9

Order No. SM18828/1422/6

Job No. ..... Date 5.7.84

B.H.P./~~KW~~ 54/54	Rating 1 HOUR	R.P.M. Loaded 0/958/2500
Size DD.280B	Enc. T.E.D.W. IP56	R.P.M. Light -
Volts A 0.575 F 250	Type HOR-FLG-MTG	Conn. SHUNT SEP EXC
Amps 78	Spec. IEE & BS.4999	Class of Insulation 'F'

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input
	COLD	SHUNT		4.25	250	
REVERSE 'N'	70	500	698	4.25	250	
	70	500	708	4.25	250	
	78	575	812	4.25	250	
11.05	78	575	958	2.7	170	44.85
11.35	78	575	958	2.7	185	44.85
12.05	78	575	958	2.7	190	44.85
			TEMPS			
FL TS	78	575	2500	0.81	55	44.85
NL BS	2.3	575	831	4.25	250	1.32
NL TS	3.3	575	2500	0.81	53	1.89
WINDING RES	FIGS	ARM 0.166 OHM				
		INTERPOLES 0.085 OHM				
		SHUNT 58.8 OHMS				

OVERLOADS 60% 15 SECS OK

Rotation looking on Drive End REV

Atmosphere °C 22

Temprise		
Armature	80	58
Commutator	60	38
Shunt	57	35
Series	-	-
Interpole	81	59
Brake	-	-

Brake D.C.	Cold	Warm
Volts		
Amps		
Watts		

BRAKING TORQUE

lbs. ft.

% F.L.T.

EFFICIENCY READINGS

Loading of Machine	1/2	3/4	4/4	5/4
Efficiency				

REGULATOR

Type:

No.:

Remarks HEATER CCT CHECKED FOR CONTINUITY
50 OHMS TACHO O/P VOLTS CHECKED COMMUTATION
& VIBRATION LEVELS SATISFACTORY

Ins. Res. Hot	200 Meg Ω
2 K.V. A.C. Test for One Minute	O.K.
AIR GAP MP	0.13
IP	0.13

Test Engineer E.H. & S.H. Date of Test 12.12.84

per pro DAVID McCLURE LTD

DAVID McCLURE LTD, STOCKPORT

D. C. TEST CERTIFICATE

Client INDUSTRIAL & MARINE SWITCHGEAR

Serial No. 38139/3

Order No. SM18828/1422/6

Job No. ..... Date 5.7.84

B.H.P./KW. 0/56/53	Rating 1 HOUR	R.P.M. Loaded 0/1320/2500
Size DD.250B	Enc. T.E.D.W. IP56	R.P.M. Light –
Volts A 0-575 F 250	Type DC MOTOR	Conn. SHUNT SEP EXC
Amps 82/77	Spec. IEE & BS.4999	Class of Insulation 'F'

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input
	COLD	FIELD		2.95	250	
REVERSE 'N'	50	575	1175	2.9	250	
	50	575	1185	2.9	250	
3.05	77	575	2500	0.91	79	44.27
4.05	77	575	2500	0.91	83	44.27
			TEMPS			
TS NL	2.9	585	2500	0.91	82	1.69
BS FL	82	575	1280	2.6	250	47.2
BS NL	2.4	575	1270	2.6	250	1.38

WINDING RES FIGS ARM = 0.122 OHM

INTERPOLES = 0.074 OHM

SHUNT = 85 OHMS

OVERLOADS 60% 15 SECS OK

Rotation looking on Drive End REV

Atmosphere °C 19

	Temprise	THERMO
Armature	72	53
Commutator	59	40
Shunt	38	19
Series	–	–
Interpole	71	52
Brake	–	–

Brake D.C.	Cold	Warm
Volts		
Amps		
Watts		

BRAKING TORQUE

lbs. ft.

% F.L.T.

EFFICIENCY READINGS

Loading of Machine	1/2	3/4	4/4	5/4
Efficiency				

REGULATOR

Type:

No.:

Remarks HEATER CCT CHECKED FOR CONTINUITY

125 OHMS E & V TANDEM TACHO FEK 6/3

60V/1000RPM CHECKED FOR O/P VOLTS

Ins. Res. Hot 200 Meg Ω

2 K.V. A.C. Test for One Minute O.K.

AIR GAP MP 0.090

IP 0.120

Test Engineer E.H. & S.H. Date of Test 12.11.84

per pro DAVID McCLURE LTD

AUX HOIST - TYPICAL

DAVID McCLURE LTD, STOCKPORT

D. C. TEST CERTIFICATE

DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/4

Client INDUSTRIAL & MARINE SWITCHGEAR

Order No. SM18828/1422/6

Job No. ..... Date 5.7.84

B.H.P./KW. 56/53	Rating 1 HOUR	R.P.M. Loaded 0/1320/2500
Size DD.250B	Enc. T.E.D.W. IP56	R.P.M. Light –
Volts A 0-575	Type DC MOTOR	Conn. SHUNT SEP EXC 250 VOLTS
Amps 82/77	Spec. IEE & BS.4999	Class of Insulation 'F'

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input
	COLD	FIELD		3.0	250	
REVERSE 'N'	50	575	1176	3.0	250	28.75
	50	575	1184	3.0	250	28.75
9.10	82	575	1180	3.0	250	47.15
9.40	82	575	1270	2.5	250	47.15
10.10	82	575	1300	2.35	250	47.15
			TEMPS			
50% O.L	123	575	1283	2.35	250	70.72
	77	575	2500	0.92	85	44.2
	115	575	2500	0.91	84	66.12
BS NL	2.3	575	1270	2.45	250	1.322
TS NL	3.2	575	2425	0.92	85	1.84
TS NL	2.9	586	2500	0.92	85	

WDG RES FIGS ARM 0.123 INT/POLES 0.072 SHUNT 83.3 OHMS

OVERLOADS 60% FOR 15 SECS OK

Rotation looking on Drive End REV

Atmosphere °C 20

	Temprise	THERMO
Armature	80	60
Commutator	55	35
Shunt	46	26
Series	–	–
Interpole	75	55
Brake		

Brake D.C.	Cold	Warm
Volts		
Amps		
Watts		

BRAKING TORQUE

lbs. ft.

% F.L.T.

EFFICIENCY READINGS

Loading of Machine	1/2	3/4	4/4	5/4
Efficiency				

REGULATOR

Type:

No.:

Remarks HEATER CCT CHECKED FOR CONTINUITY 120 OHMS
E & V TANDEM TACHO FEK 6/3 60V/1000 RPM
CHECK FOR O/P VOLTS

Ins. Res. Hot 200 Meg Ω

2 K.V. A.C. Test for One Minute O.K.

AIR GAP MP 0.090"
IP 0.120"

Test Engineer E.H. & S.H Date of Test 12.11.84

per pro DAVID McCLURE LTD D. McC

DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/8

A. C. TEST CERTIFICATE

Client INDUSTRIAL MARINE SWITCHGEAR LTD	O/No. SM18828/1422/6	Date 5.7.84

B.H.P. 53.5/25.5/5.5	Volts 600	Hertz 60	Enc. T.E.D.W.
Size TS36/250	Amps 48/33/22	Conn. TAPPED & Y3	Type AC SCR
Rtg. 1 HOUR	Phases 3	R.P.M. 1775/885/210	Class of Insulation 'F'

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW/KVA
HIGH	SPEED	4	POLE	WINDING	TAPPED	2	CCT	Y3
8.10	600	45.6	1767	60	17.6	26.4	44	0.93
9.10	600	46	1763	60	18.1	26.9	45	0.94
				TEMPS				
NL	600	10.5	1800	60	-1.9	4.0	2.1	0.19
Pull-Out								
Locked Rotor	348	210	0	60	-2.0	62	60	0.474

Atmosphere °C — Temprise

Stator	69
Stator Iron	
Rotor	
Rotor Iron	
Slip Rings	
Brake Coil	

Flash Test at 2.2 K.V. O.K.

Ins. Res. to Frame 200 Meg Ω

Rotor Volts

Rotor Amps

AIR GAP 0.035

Loads	1/2	3/4	4/4	5/4
Efficiency			89.9	
P.F.			0.94	

STARTING TORQUE

46 lbs. at 2 ft. RAD. on 348 Volts

with 210 AMPS gives 172 % F.L.T.

with 754 % F.L.C. on Full Volts

MECHANICAL BALANCE O.K.

ROTATION REV Looking on Drive End

Res. per Phase	Stator HS	Rotor	Ins. Res. per Phase Stator	Ins. Res. per Phase Rotor
20 Cold	0.168Ω	Ω	Meg Ω	Meg Ω
22 Hot	0.215Ω	Ω	Meg Ω	Meg Ω
%Inc.	28			

BRAKING TORQUE lbs. ft.

% F.L.T.

Brake D.C.	Volts	Amps	Watts
Cold			
Hot			

Remarks THERMOSTATS AND HEATERS FITTED

Test Engineer E.H. & S.H.

Date of Test 7.11.84

p.p. DAVID McCLURE LTD.

I GW.

SLEWING WINCH

DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/8

A. C. TEST CERTIFICATE

Client	O/No.	Date

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

KW

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW/KVA
READINGS	8 POLE TAPPED MESH 3							
FL	600	32	888	60	4.4	17.6	22	0.66
NL	600	22	900	60	-5.4	7.5	2.1	0.092
Pull-Out								
Locked Rotor	268	110	0	60	-2.0	24	22	0.431

Atmosphere °C

Temprise

Stator	
Stator Iron	
Rotor	
Rotor Iron	
Slip Rings	
Brake Coil	

Flash Test at K.V. O.K.

Ins. Res. to Frame Meg Ω

Rotor Volts

Rotor Amps

AIR GAP

Loads	1/2	3/4	4/4	5/4
Efficiency			0.86	
P.F.			0.66	

STARTING TORQUE

46 lbs. at 2 ft. RAD. on 268 Volts

with 110 AMPS gives 304 % F.L.T.

with 746 % F.L.C. on Full Volts

MECHANICAL BALANCE O.K.

ROTATION REV Looking on Drive End

Res. per Phase	Stator	Rotor
20 Cold	0.672 Ω	Ω
Hot	Ω	Ω
%Inc.		

Ins. Res. per Phase	Stator	Rotor
	Meg Ω	Meg Ω
	Meg Ω	Meg Ω

BRAKING TORQUE lbs. ft.

% F.L.T.

Brake D.C.	Volts	Amps	Watts
Cold			
Hot			

Remarks .....

Test Engineer .....

Date of Test .....

p.p. DAVID McCLURE LTD.

RG W

DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/8

A. C. TEST CERTIFICATE

Client	O/No.	Date
INDUSTRIAL MARINE SWITCHGEAR LTD		

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW/KVA
	LOW SPEED STAR 3 SEP WINDING							
	600	22.5	213	60	-3.04	9.54	6.5	0.28
	600	24	203	60	-1.9	11.2	9.3	0.37
	600	24.5	200	60	-1.7	11.6	9.9	0.39
	600	26	195	60	-1.44	12.4	10.96	0.406
	600	28	185	60	-1.2	13.6	12.4	0.426
	600	30	174	60	-1.2	14.4	13.2	0.423
	600	31.8	158	60	-1.2	15.2	14	0.423
	600	21.75	225	60	-4.8	7.8	3.0	0.132
Pull-Out								
Locked Rotor	408	25.6	0	60	-1.2	8.0	6.8	0.38

Atmosphere °C

Temprise

Stator	
Stator Iron	
Rotor	
Rotor Iron	
Slip Rings	
Brake Coil	

Flash Test at K.V. O.K.

Ins. Res. to Frame Meg Ω

Rotor Volts

Rotor Amps

AIR GAP

Loads	1/2	3/4	4/4	5/4
Efficiency				
P.F.				

STARTING TORQUE

59 lbs. at 2 ft. RAD. on 408 Volts

with 25.6 AMPS gives 185 % F.L.T.

with 171 % F.L.C. on Full Volts

MECHANICAL BALANCE O.K.

ROTATION REV Looking on Drive End

Res. per Phase	Stator	Rotor	Ins. Res. per Phase Stator	Ins. Res. per Phase Rotor
20 Cold	1.15Ω	Ω	Meg Ω	Meg Ω
Hot	Ω	Ω	Meg Ω	Meg Ω
%Inc.				

BRAKING TORQUE lbs. ft.

% F.L.T.

Brake D.C.	Volts	Amps	Watts
Cold			
Hot			

Remarks .....

Test Engineer .....

Date of Test 7.11.84

p.p. DAVID McCLURE LTD.

NCW

DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/5

A. C. TEST CERTIFICATE

Client	O/No.	Date
INDUSTRIAL MARINE SWITCHGEAR LTD	SM18828/1422/6	

B.H.P. 82.7/41.3/10.3	Volts 600	Hertz 60	Enc. T.E.D.W.
Size T842/315	Amps 75/59/33	Conn. TAPPED & Y3	Type AC SCR
Rtg. 1 HOUR	Phases 3	R.P.M. 1775/885/210	Class of Insulation 'F'

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW/KVA
HIGH	SPEED	4	POLE	WINDING	TAPPED	2	CCT	Y3
3.45	600	72	1775	60	28	40	68	0.91
4.45	600	72	1765	60	27.6	40.4	68	0.91
				TEMPS				
NL	600	15.75	1800	60	-3.0	6.1	3.1	0.19
Pull-Out								
Locked Rotor	240	235	0	60	-4.0	48	44	0.45

Atmosphere °C 21C

Temprise

Stator	84
Stator Iron	-
Rotor	-
Rotor Iron	-
Slip Rings	-
Brake Coil	-

Flash Test at 2.2 K.V. O.K.

Ins. Res. to Frame 200 Meg Ω

Rotor Volts

Rotor Amps

AIR GAP 0.045

Loads	1/2	3/4	4/4	5/4
Efficiency			90	
P.F.			0.91	

STARTING TORQUE

38 lbs. at 2 ft. RAD. on 240 Volts

with 235 AMPS gives 193 % F.L.T.

with 783 % F.L.C. on Full Volts

MECHANICAL BALANCE O.K.

ROTATION REV Looking on Drive End

Res. per Phase	Stator	Rotor
20c Cold	0.105Ω	Ω
21c Hot	0.14Ω	Ω
%Inc.	33	

Ins. Res. per Phase	Stator	Rotor
20c Cold	Meg Ω	Meg Ω
21c Hot	Meg Ω	Meg Ω

BRAKING TORQUE lbs. ft.

% F.L.T.

Brake D.C.	Volts	Amps	Watts
Cold			
Hot			

Remarks THERMOSTATS AND HEATERS FITTED

Test Engineer E.H. & S.H

Date of Test 7.11.84

p.p. DAVID McCLURE LTD.

TOPPING WINCH.

DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/5

A. C. TEST CERTIFICATE

Client	O/No.	Date

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2 (KW)	KW/KVA
	READINGS 8	POLE	TAPPED	MESH	3			
FL	600	46	885	60	11.2	26.4	37.6	0.79
NL	600	27	900	60	-6.8	8.8	2.0	0.071
Pull-Out								
Locked Rotor	214	123	0	60	-2.0	22	2.0	0.44

Atmosphere °C 20

Temprise	
Stator	
Stator Iron	
Rotor	
Rotor Iron	
Slip Rings	
Brake Coil	

Flash Test at 2.2 K.V. O.K.

Ins. Res. to Frame 200 Meg Ω

Rotor Volts

Rotor Amps

AIR GAP

Loads	1/2	3/4	4/4	5/4
Efficiency			90	
P.F.			0.79	

STARTING TORQUE

40 lbs. at 2 ft. RAD. on 214 Volts

with 123 AMPS gives 256 % F.L.T.

with 584 % F.L.C. on Full Volts

MECHANICAL BALANCE O.K.

ROTATION REV Looking on Drive End

Res. per Phase	Stator	Rotor
20 c Cold	0.42 Ω	Ω
Hot	Ω	Ω
%Inc.		

Ins. Res. per Phase	Stator	Rotor
	Meg Ω	Meg Ω
	Meg Ω	Meg Ω

BRAKING TORQUE lbs. ft.

% F.L.T.

Brake D.C.	Volts	Amps	Watts
Cold			
Hot			

Remarks VIBRATION DE V = 0.50 T = 0.40 A = 0.70 VELOCITY
NDE V = 0.50 T = 0.40 A = 0.55 RMS MM/SEC

Test Engineer

Date of Test

p.p. DAVID McCLURE LTD.

DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/5

A. C. TEST CERTIFICATE

Client	O/No.	Date
INDUSTRIAL MARINE SWITCHGEAR LTD		

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW/KVA
	LOW	SPEED	STAR	3 SEP	WDG			
	600	33.6	212	60	-3.6	14.8	11.2	0.32
FL	600	36	206	60	-2.8	16.8	14	0.37
	600	38	201	60	-2.4	17.84	15.44	0.39
	600	40	194	60	-2.0	19.20	17.20	0.41
	600	42	188	60	-2.0	20.16	18.16	0.42
	600	43	184	60	-2.0	20.64	18.64	0.42
NL	600	31	225	60	-7.2	10.8	3.6	0.11
Pull-Out								
Locked Rotor	272	25.6	0	60	-1.0	5.28	4.28	

Atmosphere °C

Temprise

Stator	
Stator Iron	
Rotor	
Rotor Iron	
Slip Rings	
Brake Coil	

Flash Test at 2.2 K.V. O.K.

Ins. Res. to Frame 200 Meg Ω

Rotor Volts

Rotor Amps

AIR GAP

Loads	1/2	3/4	4/4	5/4
Efficiency				
P.F.				

STARTING TORQUE

40 lbs. at 2 ft. RAD. on 272 Volts

with 25.6 AMPS gives 151 % F.L.T.

with 171 % F.L.C. on Full Volts

MECHANICAL BALANCE O.K.

ROTATION REV Looking on Drive End

Res. per Phase	Stator	Rotor
20c Cold	0.668Ω	Ω
Hot	Ω	Ω
%Inc.		

Ins. Res. per Phase	Stator	Rotor
	Meg Ω	Meg Ω
	Meg Ω	Meg Ω

BRAKING TORQUE lbs. ft.

% F.L.T.

Brake D.C.	Volts	Amps	Watts
Cold			
Hot			

Remarks .....

Test Engineer .....

Date of Test .....

p.p. DAVID McCLURE LTD.

DLW

SECTION 4.0
D.C. CONTROL DESCRIPTION

CORTINA ELECTRIC

MANUAL FOR IMS

C2472

CONTENTS

C2472

CORTINA ELECTRIC

SECTION 1

GENERAL DESCRIPTION OF HOIST DRIVE

C2472

CORTINA ELECTRIC

GENERAL DESCRIPTION OF HOIST DRIVE

The Hoist Drive System compises a four quadrant DC thyristor converter, a shunt wound DC motor with tachogenerator, and a joystick controller.

The motor is controlled such that it can run in either direction, and can exert torque in either direction.

The motor speed is infinitely variable either from zero to base speed or zero to maximum speed when high speed (low torque) is selected.

C2472

CORTINA ELECTRIC

SECTION 2

THYRISTOR POWER CIRCUITS DC

A thyristor is a three terminal semiconductor device with characteristics related to those of a rectifier diode, i.e. it will pass current in one direction only (from anode to cathode). Unlike the diode it has the ability to block current in both directions. If the thyristor is biased in the forward direction it will not pass current until a small signal is applied to its third terminal, the gate. When this happens the thyristor will continue to pass current even if the original gate signal is removed it "latches on".
This situation will persist until such time as the forward current is reduced to zero by external means. At this point the thyristor will revert to its blocking characteristic. This behaviour is explained diagramitically in Fig 1 (a)(d).

If the DC supply in Fig. 1 is replaced by an AC supply then the current will stop at the end of each positive half cycle when the voltage reverses. If the signal to the gate is made a pulse timed to coincide with all or part of the positive half cycle then it is possible to vary the voltage to the lamp. The diagrams in Fig. 2 explain this mode of operation.

From Fig. 2 it can be seen that by advancing the leading edge of gate pulse the thyristor "fires" earlier and the output voltage becomes greater.

Clearly the control by this means can be infinitely variable or stepless control. The gate pulse is shown to extend for the full time that the thyristor is conducting. From the earlier explanation it was stated that, once conducting, the thyristor latches on until the current goes to zero at the end of the half cycle. On this basis it might be thought that a short pulse would be satisfactory, however it is known that Ac supplies, particularly where thyristor drives are used, may have small gaps where the voltage dips to zero. Under these circumstances the thyristor can switch off when a gap appears, bringing about a premature end of conduction. It is for this reason that a pulse the full length of the conduction period is used.

The thyristor circuit in Fig. 2 is not a circuit commonly used because of the "lumpy" output it produces. A practical and commonly used circuit is shown in Fig. 3. It is a "fully controlled single phase" thyristor bridge and may be used for small motor armature regulators, field regulators for DC machines, or as the DC section on inverters.

Several points are immediately evident from Fig. 3. On resistive load the output from the full wave bridge is similar to the single thyristor circuit shown in Fig.2, but with double the number of output pulses.

On inductive load the output of the full wave bridge differs greatly from its output on resistive load. This is because with an inductive load the current cannot be reduced to zero immediately it will continue to flow and this means that there are always two thyristors conducting, even though the voltage is reversed. (it is when the current goes to zero that a thyristor stops conducting).

The single phase bridge can also be used to invert i.e. power can be taken from the load and put back into the AC supply. This property can be used to convert mechanical power into electrical power which then goes back into the supply. Regenerative braking is possible by this means. Inversion may also be used to allow rapid changes in field currents. The inductive energy which is stored in the field is inverted and put back into the supply. The waveforms for this are shown in Fig.4.

The thyristor bridge arrangement used for the majority of Cortina drives is the three phase fully controlled bridge, also known as a "six pulse" convertor. The arrangement of this circuit is shown in Fig. 5 together with "typical waveforms". One important point to note about this waveform is that there are six pulses every full cycle of the mains supply. The waveforms shown

are typical of those which might be seen on any six pulse converter supplying an inductive load. It is worth noting that the current waveform shown can be seen across the ACCT burden, where ACCT's are used for feedback purposes and fed into a rectifier. This has the advantage that the hazards of connection to high voltage are avoided.

Like the single phase bridge considered earlier, the three phase full wave bridge can be used to invert or regenerate. If a voltage is applied to the output of the bridge of opposite polarity to that shown in Fig. 5, then current will flow in the same direction, but with the voltage being negative this represents negative power i.e. power flowing back into the supply.

This inversion mode of control can be used where regenerative.

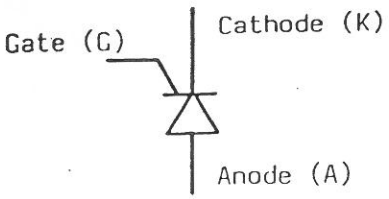
The circuit diagram and typical waveforms are shown in Fig. 6. The drawing of the thyristor bridge has deliberately been drawn upside down but the current is still in the same direction as in Fig. 5. The circuit shown in Fig. 6 can be used for electrical "regenerative" braking in one direction, or motoring in the other direction.

If the circuits of Fig. 5 and Fig. 6 are combined as

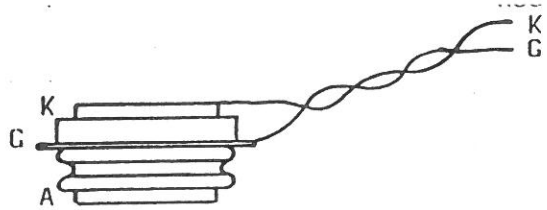
shown in Fig. 7 then it is possible to have motoring or braking in either direction. This is commonly known as four quadrant control.

The circuitry which produces the firing pulses for the thyristor gates is known as a "firing circuit".

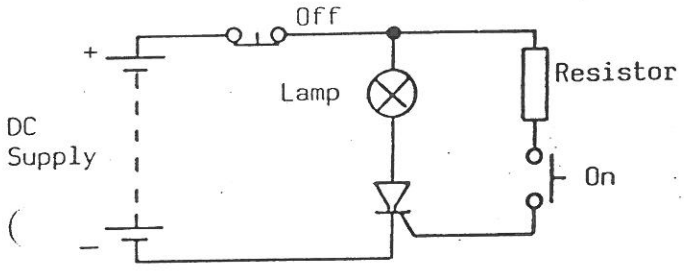
Thyristors are small compared with the amount of power they control and their protection is quite critical. To offer transient protection, capacitors, chokes and resistors are used. If any of these components have to be replaced, only the type and value specified by Cortina Electric may be used.



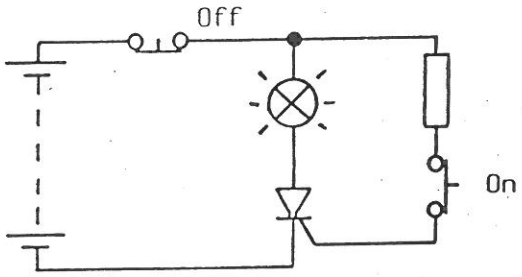
ELECTRICAL SYMBOL



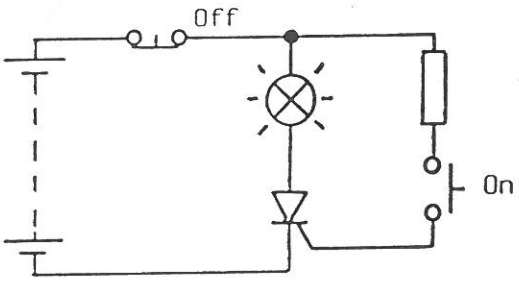
PRESSURE MOUNTED THYRISTOR



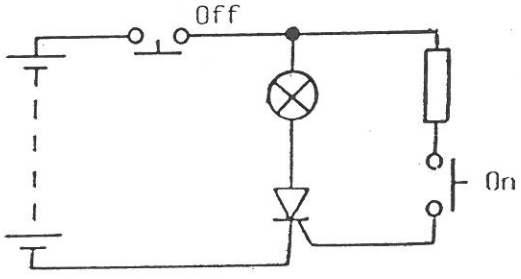
(a) Neither pushbutton operated the lamp is off.



(b) "On" pushbutton closed and the lamp is illuminated.



(c) "On" pushbutton released and the lamp remains lit.



(d) "Off" pushbutton opened and the lamp goes off. When the "off" pushbutton is released the lamp remains off.

FIG 1.
PERTAINING TO THYRISTOR OPERATION

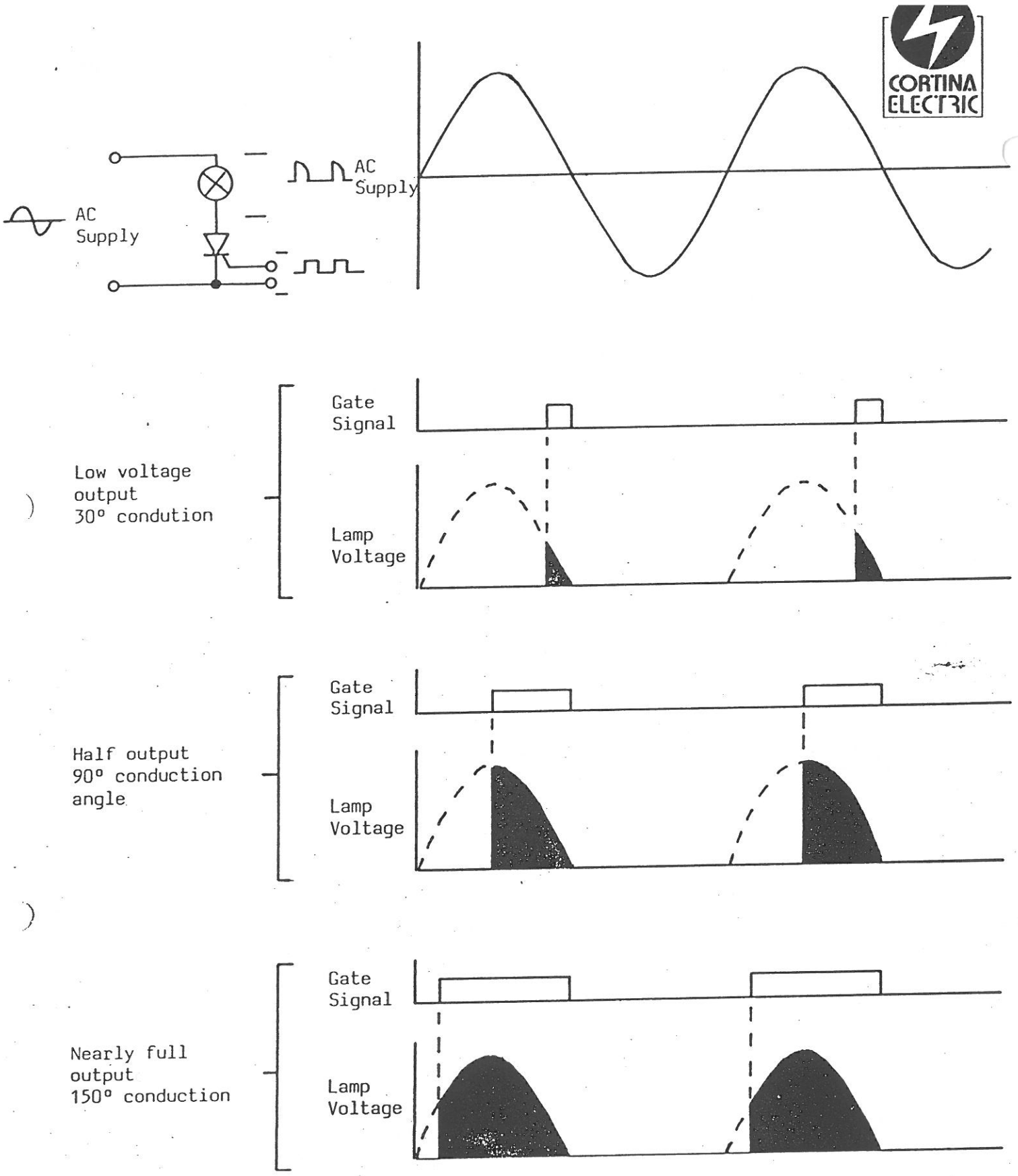
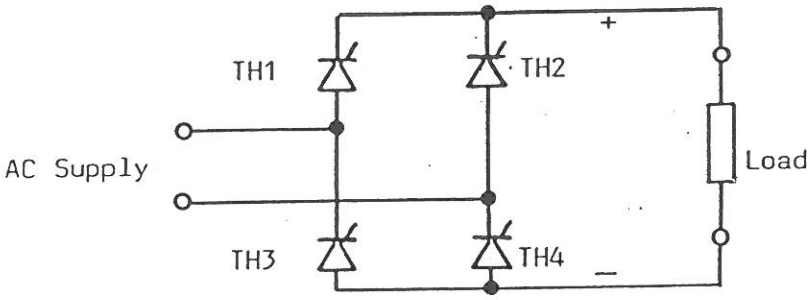


FIG 2.
THYRISTOR OPERATION



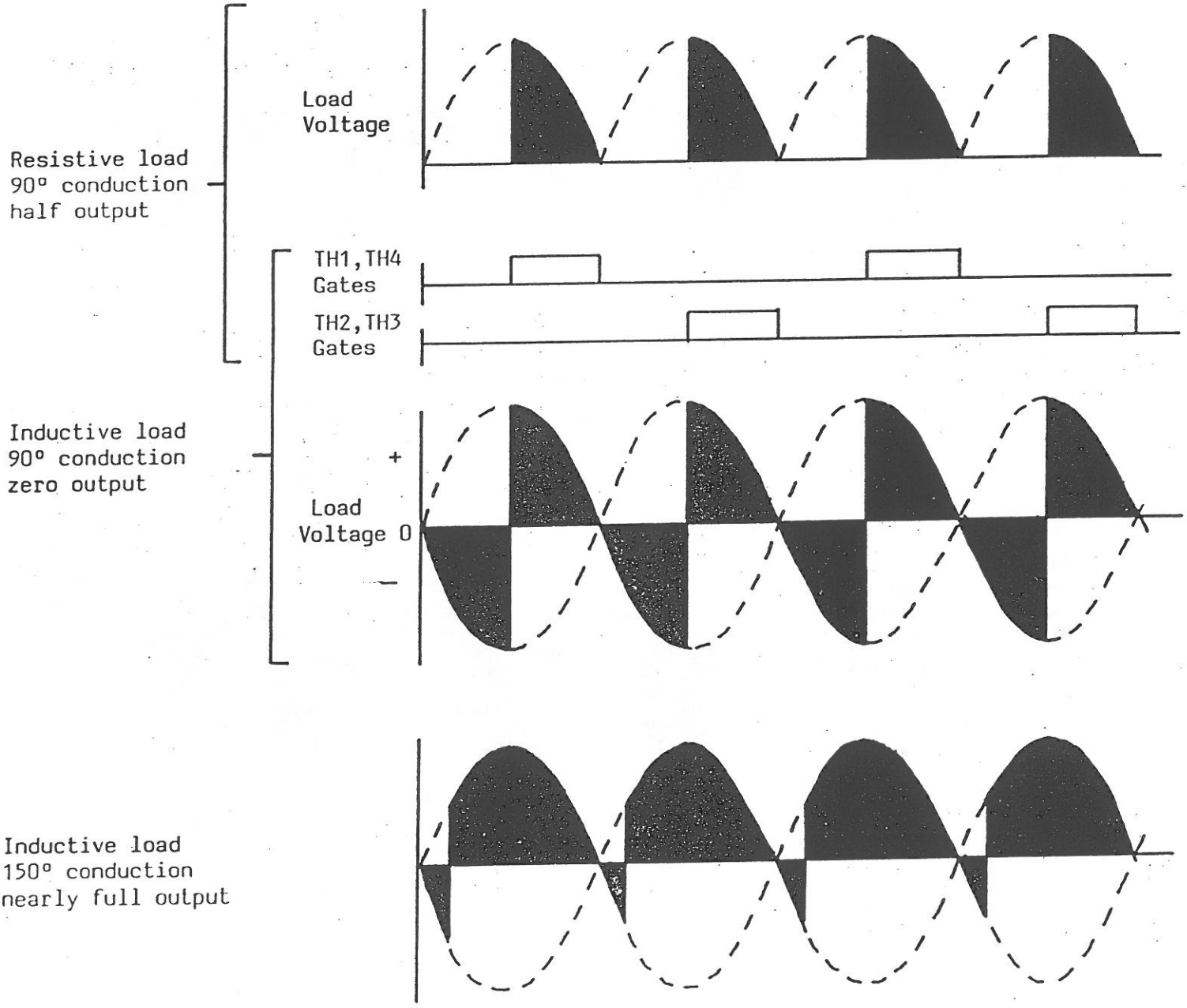
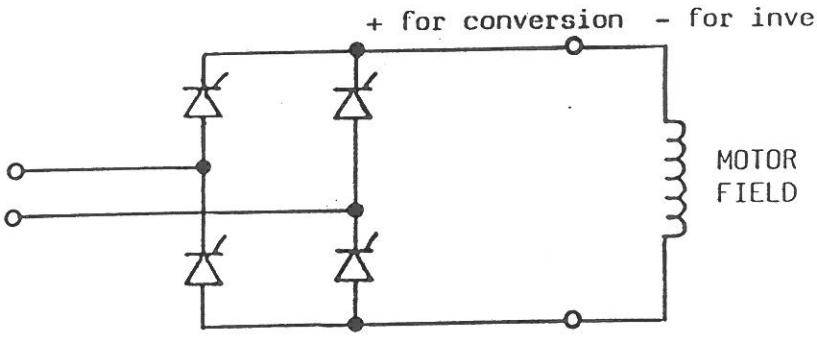
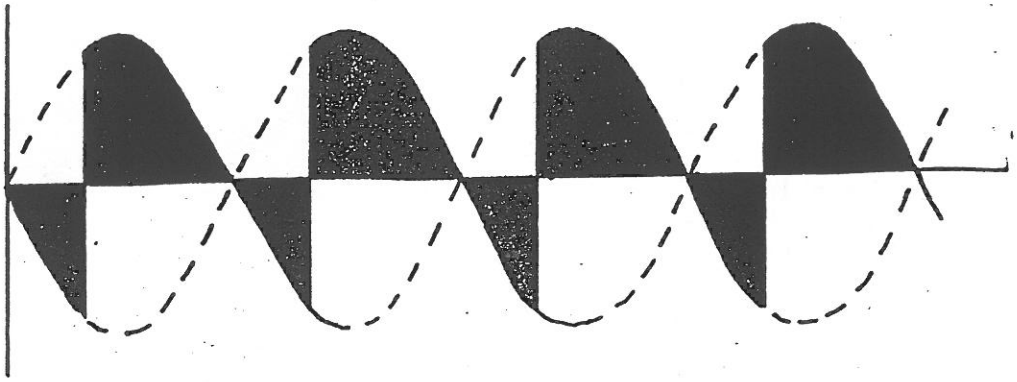


FIG 3.
SINGLE PHASE THYRISTOR BRIDGE



Field Voltage
Showing conversion
Power is taken from the supply, indicated by the positive area being greater than the negative area



Field Voltage
Showing inversion
Power is returned to the supply indicated by the positive area being less than the negative area

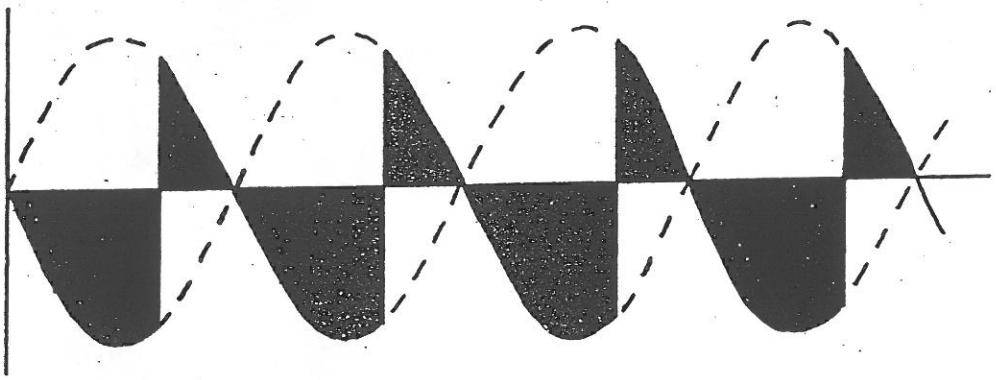
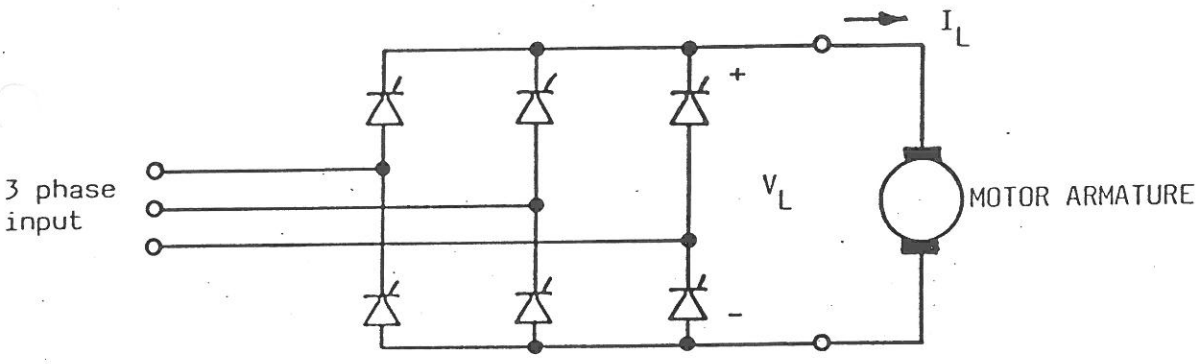


FIG 4

INVERSION



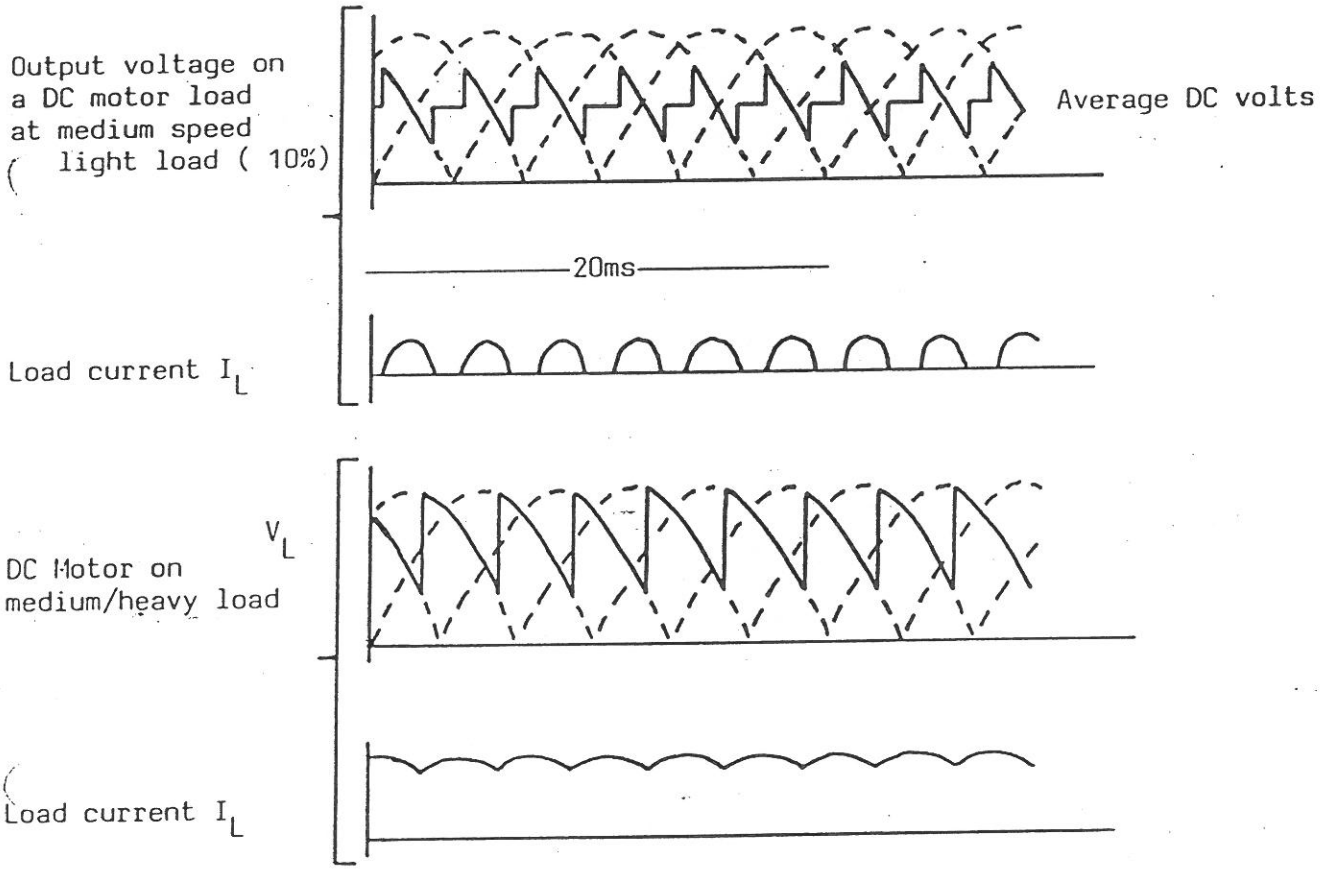
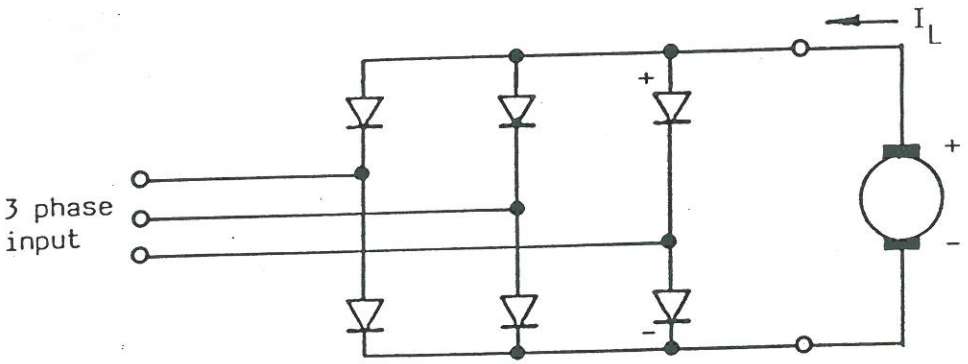
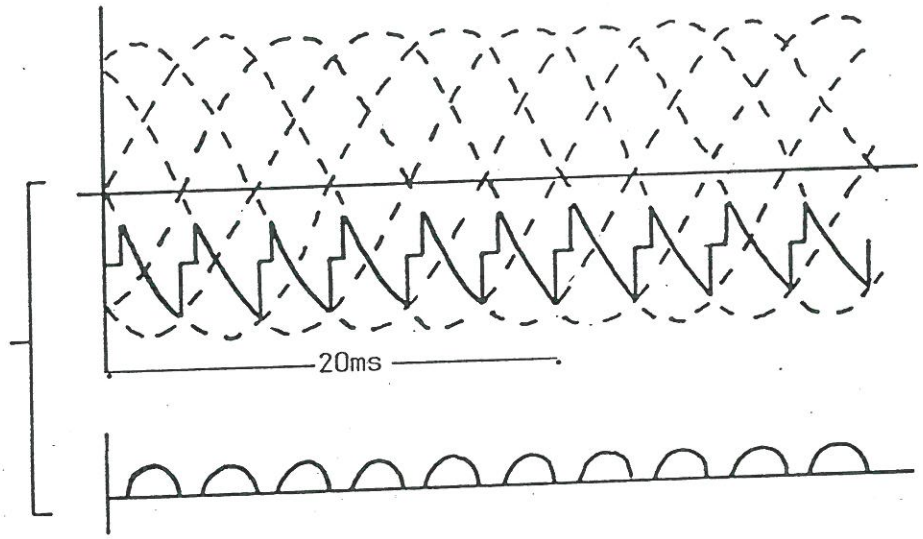


FIG 5

SIX PULSE CONVERTOR



DC Motor in regeneration with light load (10%)



DC Motor in regeneration with medium/heavy load

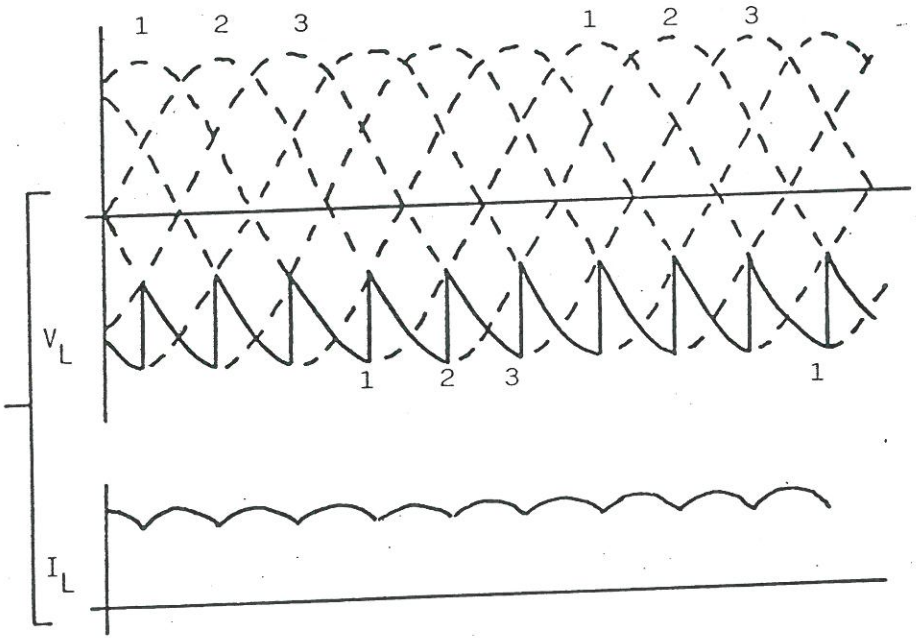
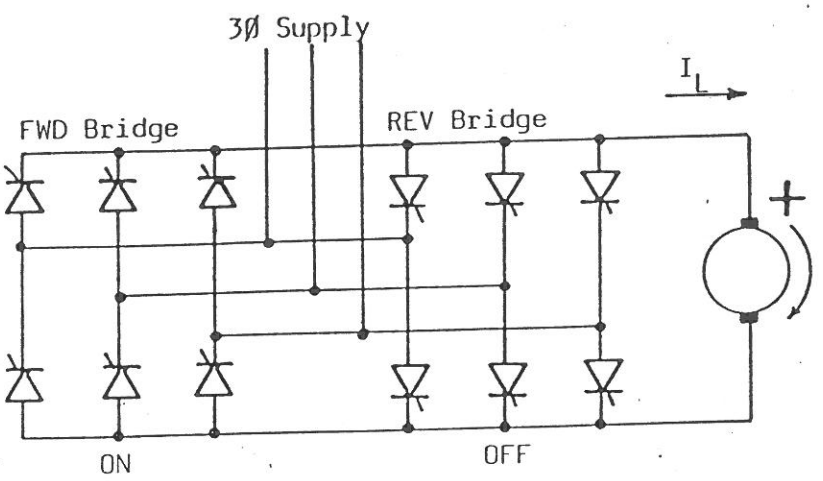
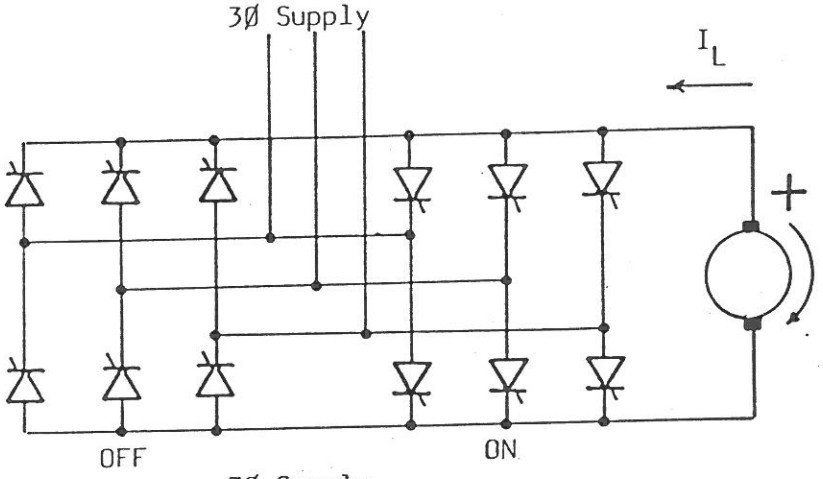


FIG 6

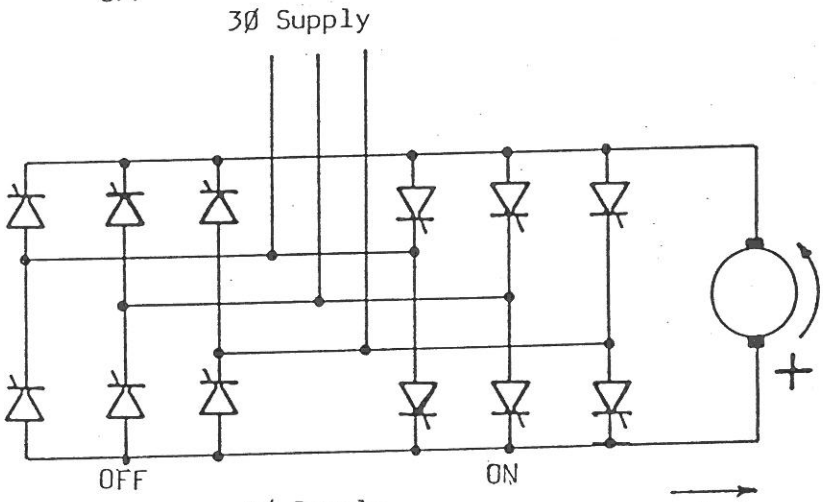
SIX PULSE INVERSION OR REGENERATION



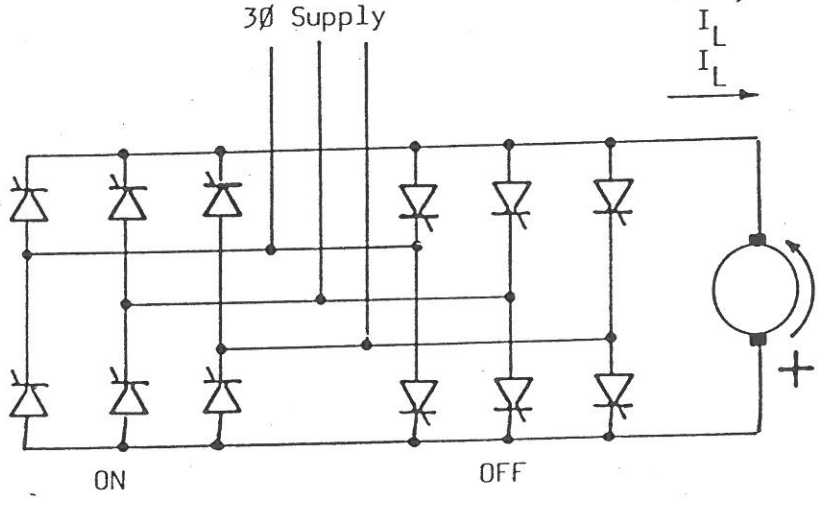
(a) Forward Motoring



(b) Forward Regeneration



(c) Reverse Motoring



(d) Reverse Regeneration

FIG. 7

CORTINA ELECTRIC

SECTION 3

SOME BASIC PRINCIPLES OF DC DRIVES

C2472

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SOME BASIC PRINCIPLES OF DC DRIVES

DC drives are in common use throughout industry and although there are several types of drive, only thyristor controlled drives will be considered here.

The motors used in conjunction with these drives are generally DC shunt would (or slightly compounded). Several modes of control are available with these machines.

(a) Speed control can be achieved by varying the armature voltage and keeping the field current fixed. Increasing the armature voltage increases the speed and the relationship is linear e.g. doubling the armature voltage will double the speed. This means of speed control can be used over a wide speed range extending from zero speed up to "base speed" of the motor. It is the most common type of speed control used, and may be referred to as constant torque control.

(b) Speed control over a limited range normally above base speed is possible by controlling the motor field current. Decreasing the motor field current allows it to run at increased speed. This mode of operation is known as constant horsepower. It is quite common to employ methods (a) and (b) together to give operation over a very wide speed range.

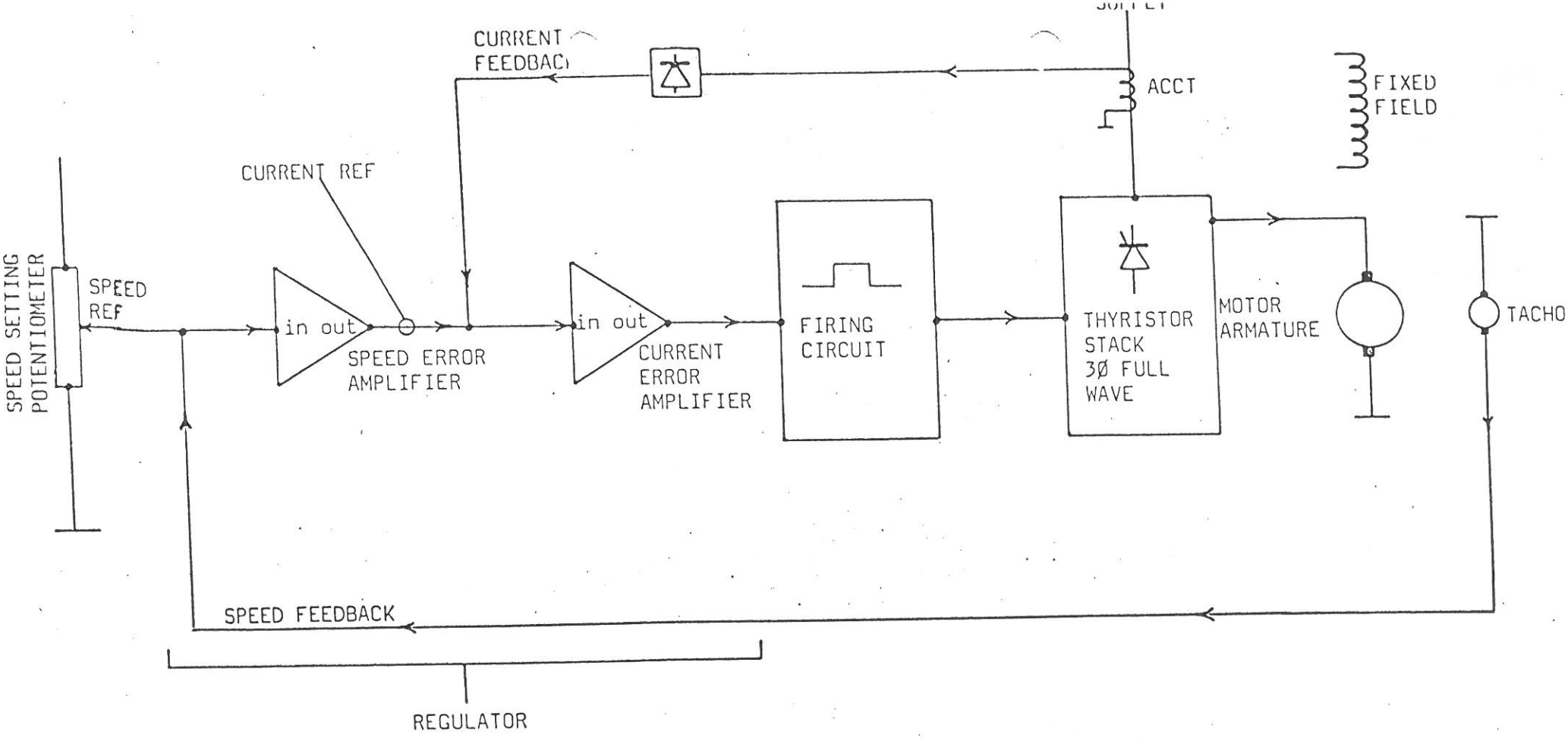

FIG. 1
BLOCK DIAGRAM OF
SPEED CONTROL SYS

CORTINA ELECTRIC

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(c) The torque developed by the motor depends on the armature current, increased current giving increased torque, and relationship is linear so that an increase of 50% in armature current will give a 50% increase in torque. Therefore by controlling the armature current it is possible to control the torque of the machine. This is equally applicable whether the machine runs as a motor or is driven as a generator.

A simplified block diagram of a speed control thyristor drive is shown in Fig. 1, consider first the firing circuit and thyristor stack. The thyristor stack consists of six power thyristors which control the output voltage to the motor. The thyristors are in turn controlled by tate pulses generated by the firing circuit. The output voltage from the thyristor stack is determined by the relative position of the pulses from the firing circuit, and this depends on the input voltage to the firing circuit. Taken as a whole the output voltage from the stack depends on the input voltage to the firing circuit - this part of the system can be considered simply as a voltage amplifier.

The current and speed amplifiers determine the voltage which will be fed to a firing circuit. Each of these amplifiers has two signals arriving at its input, a reference and a feedback. The two signals are compared and the output of the amplifier is proportional to the difference between the two signals, provided this is small. If the difference is not small the amplifier output will go to its saturation level.

Suppose that the drive is started up with a speed reference of say 50%. Initially there will be no speed and therefore no feedback voltage from the tachogenerator. In this case the speed amplifier will sit in saturation and give maximum reference signal to the current amplifier. This in turn will send a signal to the firing circuit which will shift the pulses to the thyristor stack causing it to "phase on" producing volts on the motor. The motor will take current from the thyristor stack which gets its supply from the AC line input. The current taken by the motor (and therefore the AC lines) will increase until the signal from the current feedback circuit equals the current reference signal. At this point the current will remain constant under current limit conditions. The current in the motor armature will cause it to accelerate thus producing speed feedback. When the speed feedback signal is equal to the speed reference signal the output of the speed amplifier will be reduced. This in turn will reduce the current reference and hence the current to such a level as to just maintain the motor running at preset speed, 50% in the case considered.

If the motor is now subjected to an increase in mechanical load it will slow down very slightly. This speed reduction results in less speed feedback and consequently an increase in the output of the speed amplifier. The increased output from the speed amplifier is an increase in current reference resulting in additional current into the motor armature. This increase in the motor current prevents the motor from slowing down significantly.

The above relates to normal speed control. If the mechanical load on the motor is such that the motor can never reach preset speed it will remain in current limit, producing a fixed torque. Replacing the speed amplifier with a potentiometer would give a means of controlling the current reference, hence the current and torque could be controlled.

In Fig. 1 the thyristor stack used is a three phase full wave bridge. When this type of bridge is used the current can flow in one direction only. As a result, if the speed reference is suddenly reduced the current will go to zero and the motor will coast down to its new preset speed. In some applications it is necessary to be able to have control during deceleration, or rapid deceleration for emergency stopping. Such applications require the use of a regenerative or four quadrant controller. This will allow controlled braking rather than coasting, and can also be made use of where the load is overhauling or driving the motor.

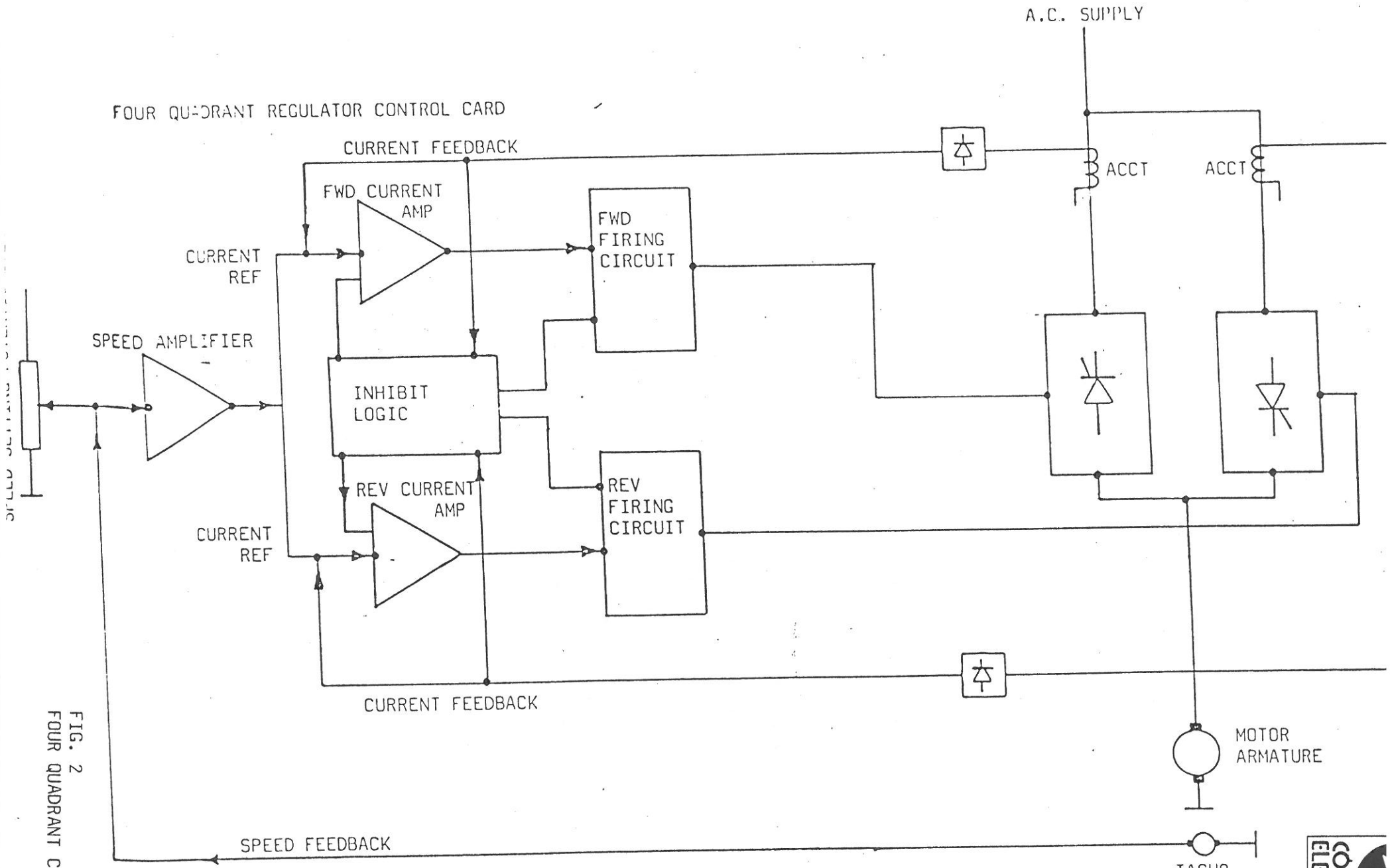


FIG. 2
FOUR QUADRANT CONVERTER

The thyristor stack arrangement for four quadrant operation is dealt with in Section 2.1. The block diagram of a four quadrant regulator is shown in Fig. 2. This is almost like two of the systems as shown in Fig. 1 - i.e. two current amplifiers, two firing circuits, two thyristor stacks, two current feedback circuits. Common elements are the speed loop motor and tachogenerator.

As in the simple speed control system, the speed reference is compared with the speed feedback. When the difference is positive the output of the speed amplifier will be of the correct polarity to send a current reference for the forward current amplifier. Assuming there is no inhibit operating, this current amplifier will give an input signal to the forward firing circuit and forward bridge calling for forward current in the motor.

The difference between the speed reference and speed feedback will be positive for two conditions:- the first is when the motor is driving in the forward direction, the second is when the motor is being pulled backwards by the load.

If the difference between the speed reference and feedback is negative the operation of the circuit follows the same sequence as above but all of the reverse elements come into operation, resulting in reverse current in the motor.

The reverse thyristor stack comes into operation if the motor drives in reverse or is pulled in the forward direction.

The inhibit circuitry is included to prevent the reverse bridge being phased on while the forward bridge is passing current or vice versa. This means that if the forward bridge is conducting the reverse current amplifier has an inhibit signal sent to it which will override its reference from the speed amplifier, even if this reference is of the correct polarity to turn the reverse bridge on. In addition the inhibit is fed into the reverse firing circuit to give further protection against the possibility of both thyristor bridges being on at the same time. In the event of this happening there will be a path between two phases through two thyristors which will then latch on. The conduction will be terminated when fuse failure occurs.

As in the control system shown in Fig. 1, the four quadrant system can be used to control current or torque, this feature being available in both clockwise and counter-clockwise rotations.

CORTINA ELECTRIC

SECTION 4

DESCRIPTION OF 1500 CARD

CORTINA ELECTRIC

6 - PULSE CONTROL ELECTRONICS DRG 1500/A1

1. GENERAL

The 1500/A1 PCB is designed to provide the control and firing circuit for all six-pulse thyristor control systems, e.g. dc drives, dc stage of voltage fed inverters, anodising and plating rectifiers, etc.

2. SPECIFICATION

POWER INPUT:- 3 phase, 415V, 45-65 Hz, 60VA.

REFERENCE INPUTS:- 0 to -10V 10mA into firing circuit.

0 to +10V 1mA into ramp.

0 to +10V into speed/voltage regulator, or may be programmed to set other values.

0 to 20V 1mA or 0 to -150V 1mA into voltage feedback circuit.

0 to - 10V 1mA into current regulator.

0 to +5V 1mA into current feedback.

OUTPUTS Firing Pulse outputs 60° to 120° E duration 0° to 180° shift 14V 0.5A, pulses at 60° intervals to give symmetrical displacement round 360°.

Power Supply Outputs:-

+/-25V at 0.5A unregulated.

+/-14V at 2A unregulated.

+/-12V at 0.1A regulated.

Regulator outputs:-

Ramp. 0 to 10V 10mA.

Voltage/Speed error. -10V to 0V to +0.7V at 10mA.

Current error. +10V to 0 to -10V. 10mA.

Inverter. -10V to 0 to +10V. 10mA.

3. OPERATION

3.1 POWER SUPPLIES

A three phase supply is applied to terminals 5, 3, and 1 in that sequence. This supply is fed to transformers TX1, TX2 and TX3 which have outputs of 0-50V, 0-12V and 0-20V, the latter two being used to provide low voltage dc supplies.

The 12V windings are connected in delta and rectified by a three phase bridge (D11 - D16). The resulting dc (approx 14V) is available as an output from terminal 2. It is normally used to power the output stages of the firing circuit(s).

The 20V windings are star connected and rectified by D17, D18 and D19 to give +25V unregulated w.r.t. the star point which is used as the zero volt rail. A large electrolytic capacitor C4 is used for smoothing, and +25V is available as an output from terminal 46. The negative 25V rail is

produced by diodes D40, D41 and D42 with C10 as the smoothing capacitor. Terminal 52 connects with the -25V supply. A further -25V supply is generated by diodes D20 to D22; this supply is used for phase loss detection and is dealt with in another section.

Regulated supplies of +12V and -12V are derived from the 25V supplies by means of voltage regulator IC's, 7812 for +12V and 7912 for -12V. The status of these supplies is indicated by light emitting diodes L4 and L5.

3.2 RELAY LOGIC

Four 24V dc relays are used to interface with external command signals.

The fault relay, RL1, picks up in the event of incorrect phase sequence, phase loss or overcurrent. A link or a normally closed "RESET" pushbutton connected between terminals 46 and 47 feeds power to RL1 coil. When thyristor TH2 is triggered it latches RL1 on. The operation of the fault circuits is described in detail in another section. The +25V supply is fed, via a normally closed contact of RL1, to terminal 51 where it is generally used to power RL2 and RL3, thus ensuring that RL2 and RL3 are de-energised if RL1 picks up.

Independently of relay operation, an "instantaneous" shut down function is operated by TR7. As well as local interlocking an extra "voltage free" changeover contact of RL1 connected to terminals 48, 49 and 50, can be used for remote indication or interlocking.

When relay RL2 is de-energised all the control amplifiers are biased to the "off" condition, and when RL2 is picked up the amplifiers are allowed to come into control. If RL2 is picked up but not RL3 the "CRAWL" function will be selected. When relay RL3 is picked up the run function is selected, and RL2 is held in via D25. A hold in contact for RL2 is connected to terminal 68 and likewise for RL3 to terminal 45.

Relay RL4 is normally used to detect zero speed but maybe used to detect other parameters. The signal to be detected is connected to the inputs of amplifier A3b via terminal 71. When the output of this amplifier goes positive transistor TR8 turns on and RL4 becomes energised. A normally open contact of RL4 is connected to terminals 64 and 65.

The output of A3b is connected to terminal 72 therefore this amplifier maybe used for other functions.

3.3 PHASE SEQUENCE/PHASE LOSS/OVERLOAD CIRCUIT

Thyristor TH1 is used to detect phase sequence. The blue phase is applied to its anode and the red phase delayed by 60° (using R23/C5) to its gate so that anode and gate are out of phase by 180° when normal phase sequence prevails. With incorrect sequence TH1 anode and gate signals will be nearly in phase and TH1 will turn on causing TH2 to fire. When TH2 fires it latches, energising fault relay RL1.

Diodes D20, D21 and D22 are used in the phase loss circuit. When all three phases are present the common anodes sit at -25Vdc and the junction of potential divider R22-R31 assumes a negative level thus reverse biasing D25. If one phase is absent even for one cycle (C6 being small) the -25V supply from D20-22 will collapse and D25 will conduct as R22-R31 junction goes positive. As a consequence TH2 will be fired and fault relay RL1 will be energised.

Resistors R64 and R65 form a potential divider between the current feedback signal (which is positive) from terminal 43 and the -12V supply. In the event of excessive current even for one pulse the potential of R64-R65 junction will become positive and TH2 will be fired via D39, and fault relay RL1 will be energised.

In the event of RL1 being energised by any of the above fault conditions relay logic is used to stop the drive. Additionally, when RL1 is energised transistor TR7 (normally conducting) is simultaneously cut off and this instantly removes the firing pulses. This gives a very fast shut-down procedure which is not dependent on any relay operating times.

3.4 RAMP CIRCUIT

The purpose of the ramp circuit is to provide a controlled rate of acceleration regardless of the rate at which the input reference is changed.

The ramp utilizes two op amps A2a and A2b (which are housed in the same package) and timing components R46 with capacitors C14-C16. The input signal to the ramp is fed to A2a inverting input via R42 or R43 depending on the status of RL3. The output is fed from A2b to terminal 59, and also back to A2a non-inverting input.

To understand the operation of this circuit first assume that A2b output is at zero and a step input of say +5V is presented to A2(a) input. The output of A2(a) will go to negative saturation at about -10V and the integrator comprising A2(b) R46 and C14-C16 will ramp linearly to a positive value. When the output of A2(b) reaches +5V then

both inverting and non-inverting inputs to A2(a) will be at the same level and its output will go to zero. At this point A2(b) integration will stop and the output will remain fixed. Any tendancy for A2(b) to drift will result in a difference into A2(a) which will send a signal to A2(b) integrator such as to correct the drift.

The ramp rate can be adjusted by altering RV5 which varies the strength of signal into the integrator. The range of adjustment can be changed by adding or removing capacitors in the C14-C16 bank. More capacitors give a slower rate. The fastest setting can be calculated from the relationship.

t.min = CR with C in Farads
and R in ohms
(R46 on 1500/A1)

For reliable operating the maximum time should not be set at more than ten times the minimum time. When the equipment is not in operation the output of the ramp can be quickly brought to zero by discharge resistor R47 and RL2 contact.

3.5 SPEED/VOLTAGE REGULATOR

Amplifier A3 functions as an error signal amplifier. The reference is fed in via R48 and ***R49 from terminal 31, and the feedback*** which may

be voltage or a speed signal from a dc tachogenerator is fed into the summing junction via the chain R50, R51, RV6. Potentiometer RV6 can be used to trim top speed on dc drives or V/Hz ratio on inverters. Components R54, R53 and C18 set the system gain and stability. Capacitors C17 and C19 are used to filter noisy signals. Zener diode Z3 limits the negative excursions of A3 output to -10V max. The purpose of this is to put a defined limit on A3 output which normally acts as a current reference for the current regulator. The zener diode also serves to clamp the positive output of A3 to 0.7V. The output of A3 controls only in the negative region and it is generally undesirable for A3 to go far out of control in the positive region.

When the equipment is not in operation a strong -12V signal is fed via RL2, 047 and R52 to A3 input, causing its output to go to the positive "off" state.

3.6 CURRENT REGULATOR

Amplifier A4(a) functions as a current error amplifier. The reference (which is normally A3 output as described in section 3.5) is fed in via R55 to the summing junction. Current feedback is formally derived from two ACCT's. The secondaries

of these CT's are connected to terminals 61,62 and 63. It is then rectified by diodes D50 to D55. R72 and R73 are connected across this bridge and are used as burden resistors. The positive side of the rectifier is connected to terminal 43 and is fed via R59 and R60 to A4(a) input. The current feedback signal is also used to operate the instantaneous overload circuit described in section 3.3.

Components R58, R57, C20 and C21 set the gain and stability of the current loop.

Amplifier A4(b) is used as a unity gain inverter following the current amplifier to give correct polarity to the firing circuit. When the equipment is in the stop condition contacts of RL2 send strong +12V and -12V signals to A4(a) and A4(b) respectively to bias them to the "off" state.

3.7 FIRING CIRCUIT

The firing circuit is designed to produce firing pulses to control all configuration of six pulse thyristor stacks. It accepts a dc input signal and produces output pulses from 6 channels.

The circuit for each of the six channels is identical and each channel produces a series of

output pulses, one every 20ms or 360°E, whose leading edges are used to fire thyristors. The six outputs are phase displaced from each other such that an output pulse is produced every 60°E. The pulse width varies from zero (or 60° if R12 is fitted) to 120°E maximum and its phase relationship with the supply can be shifted by 180°E.

Consider the R+ channel which is at the top of drg. 1500/A1. The operational amplifier A1 is the heart of the phase shifting circuit. Three signals are fed into A1 input. A fixed dc bias (VB) is fed via R4 from R67, R68 attenuator (TR7 is normally in the "ON" state during running). The second input signal is a variable dc reference (Vdc) from terminal 28 via R3 and RV1 if fitted. The third input is a cosine wave (Vsync) derived from TX1 output via filter R21-C2 and input resistor R5 and RV2 if fitted.

Amplifier A1 adds the three signals together and at its output produces the inverted sum, i.e. if the sum is positive the output of A1 is negative and vice versa.

The result of adding the three signals together is shown in Fig. 1. Because the gain of amplifier A1

signal is also fed into the amplifier A1 input thus providing an additional means of suppressing the pulses.

In some applications it is not desirable to allow the pulses to disappear. An "end stop" pulse is produced by TR3 when it is in the "off" state. This pulse overrides the output from A1 but is overridden by TR3.

4. TESTING AND FAULTFINDING

4.1 GENERAL

If it is suspected that the card is faulty the normal procedure is to replace it with a spare. For most applications production down time dictates this course of action. However it is worth making a few checks to ensure that it is the card at fault and not an apparent fault induced by a malfunction in the external circuitry.

Check that the three phase supply is present on terminals 1, 3 and 5. This should be done carefully because the presence of transformers can artificially produce volts on a line where the supply is not made. Check all low voltage power supplies and ensure that they are within the spec given earlier. If they are not within the spec disconnect any external loading and recheck. If external loading is causing the supplies to change the fault is probably external to the card. Check all the terminal screws to ensure that all the connections are tight.

Inspect both sides of the card for physical damage, broken components and particularly for any foreign bodies touching the tracks or shorting to earth. Strands trimmed off cable ends, cable armour and drops of solder are likely culprits.

It is also worth testing the firing circuit section of the card in situ as this will often pinpoint faults elsewhere in the equipment, e.g. faulty thyristor, pulse transformers, current feedback. For this test it is necessary to have a load connected to the thyristor stack. If the test is done carefully the normal motor can be used, otherwise a resistive load capable of passing 5A or more should be used. The procedure is detailed in section 4.5.

If it is decided that the card is faulty and it is removed from the equipment then a number of bench tests can be carried out. It is necessary to have available a three phase 415V supply, a high impedance multimeter, and if possible a general purpose oscilliscope.

4.2 POWER SUPPLIES

(a) +14V supply. This may be slightly high in the unloaded condition. If it is otherwise out of spec check the 12Vac from TX1, TX2 and TX3. If any output is low it may be because one of the diodes D11 to D16 is faulty or C3 short circuit. Check and replace these components (including the transformers) as necessary.

(b) +/- 12V and +/-25V supplies. Since the +/-12V

is very high the sum is seen as either positive or negative with no intermediate values, and therefore A1 output is a square-wave. With the dc level shown the output pulse from A1 is a 180° pulse. Clearly the pulse will start earlier and last longer if Vdc is increased (made more negative). The leading edge of the pulse varies in accordance with the phase shift requirements of firing the thyristor but a pulse length of more than 120°E is not permissible. Transistor TR3 is used to bring about the termination of the pulse after 120°E. The Y+ channel (the second from the top of 1500/A1) produces a pulse which will commence 120° after the R+ channel. A signal from the Y+ channel via R18 is fed into TR3 base, turning it on and thus shorting the signal on TR4 base 120° after the start of the R+ pulse from A1. Similar inhibit signals are sent from B+ to V+ and from R+ to B+. A "ring of three" circuit is formed which ensures that no pulses can extend beyond 120°. (The same conditions apply to R-, Y- and B- channels).

Under fault conditions when TR7 is no longer conducting a strong positive signal is applied to TR3 base via R8 from R67, R68 junction. In this situation the output pulses are suppressed. In addition to operating on TR3 base the positive

supplies are derived from the +/-25V supplies then it is worth first checking the 25V if the 12V malfunctions.

To test the +/- 25V proceed generally as in (a) above noting that in this case the supply is derived from a star connected 20V winding. If necessary the effect of any fault on the +/- 12V supplies reflecting back into the +/- 25V can be isolated by removing R36 and R38.

Checking the +/- 12V supplies is not so straightforward because it is not practical to disconnect the load. If either supply is high the voltage regulator is the most likely faulty component. If the supply is low again it may be excessive loading causing the regulator to sit down in current limit. Generally this fault is caused either by tracks shorting together with some conductive material or faulty components. The former requires careful inspection and the latter can be checked by touch to find any component which is overheating.

4.3 RAMP CIRCUIT

A functional check of the ramp circuit can be made by connecting a positive voltage signal into terminal 57 and energising RL3. The positive

voltage signal should be in the range 0 to +/- 12V and can be obtained from RV4 via terminal 55. Prior to energising RL3 the ramp output (terminal 59) should be at zero volts. Energising RL3 (which also energises RL2) should cause the ramp output to increase to a level about 20% less than the input at terminal 57. The exact proportions depend on the ratio of potential devider R40, R41. When RL3 is released the ramp output should go back to zero volts - quickly if R47 is fitted.

4.4 VOLTAGE/SPEED AND CURRENT REGULATORS

These circuits form part of a closed loop system and without the remainder of the system (which may include a motor and mechanical load) it is clearly not possible to perform a full and conclusive test. The following bench tests should prove that the circuits are healthy statically but not necessarily dynamically.

With RL2 de-energised A3 output should be + 0.7V, A4a output -10V and A4(b) output +10V. These values are approximate. For the rest of the tests RL2 should remain energised.

(a) VOLTAGE/SPEED REGULATOR

Connect +12V to terminal 31 and A3 output should go to -10V. Connect -12V to terminal 31 and A3

output should go to +0.7V. Carry out the same test using terminal 32 as the input and the same output voltages should be obtained.

(b) CURRENT REGULATOR

Connect +12V to terminal 39 and A4b output should go to +10V. Connect -12V to terminal 39 and A4b output should go to -10V. Carry out the same test using terminal 43 as an input and the same output voltages should be obtained. Note that when +12V is fed into terminal 43 the overload may trip. If it does not trip then connect +25V to terminal 43 and this should trip the overload, otherwise there is a malfunction of the overload.

4.5 FIRING CIRCUIT

A test potentiometer, RV3, is provided to enable operation of the firing circuit and associated thyristor stack to be tested "open loop" i.e. independently of the regulator system. The test procedure is straightforward.

1. Switch off
2. Remove the external wire from terminal 28
3. Link 28 to 29
4. Turn RV3 fully anti clockwise
5. Switch on and energise RL2 or otherwise ensure that TR7 is biased into the conducting state. Operating the start pushbutton for the

equipment normally energises RL2. The status of RL3 is not important but RL1 must not be energised.

6. Slowly phase on the thyristors by turning RV2 clockwise. Observe the thyristor stack output or current feedback using an oscilliscope. There should be six equal pulses every 20ms. If this test proves satisfactory this indicates that the firing circuit and thyristor stack are healthy, and together these normally represent a considerable part of the total equipment.

7. If an incorrect result is obtained in 6 above then check, with the stack phased on, the output voltage from each channel. This should be approx. 4.3Vdc and all channels should be equal. If they are not equal then disconnect all six outputs and check again. If the outputs are now equal the fault lies with the pulse transformers or associated wiring. It should be noted that a faulty pulse transformer may cause damage to the firing circuit.

4.6 PHASE ROTATION/PHASE LOSS

This circuit can be readily checked by removing a phase for phase loss and by reversing two phases for phase rotation. In either case RL1 should be energised and L1 extinguished.

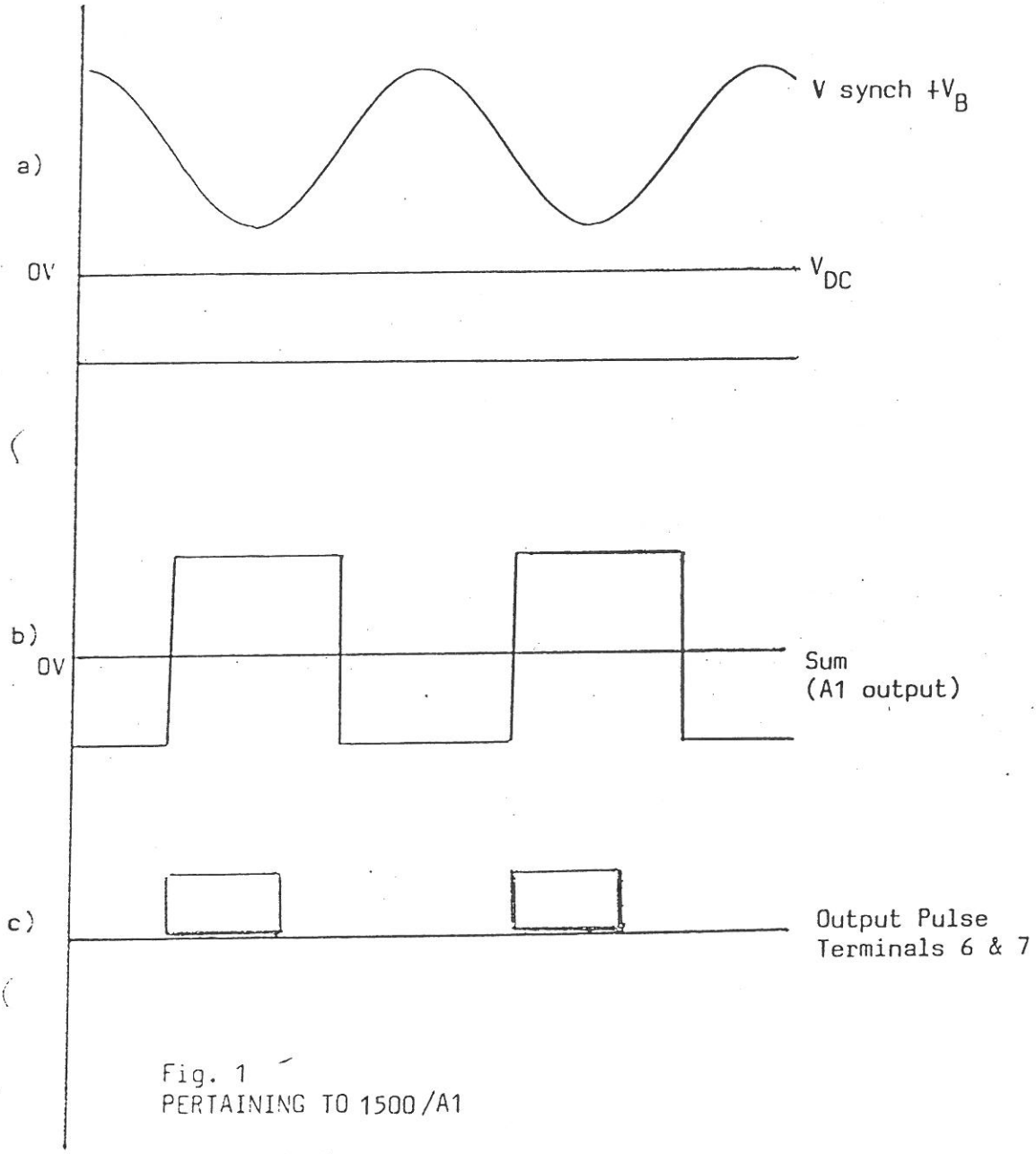


Fig. 1
PERTAINING TO 1500/A1

FIRING CIRCUIT

CORTINA ELECTRIC

SECTION 5

DESCRIPTION OF 669 CARD

REGULATOR 669/A1

This circuit is intended to provide the necessary controls for a fully regenerative drive system.

The circuit comprises the following sections:-

(i) Speed amplifier.

(ii) Acceleration amplifier.

(iii) Forward current amplifier.

(iv) Reverse current amplifier.

(v) Forward inhibit.

(vi) Reverse inhibit.

(vii) Zero speed detector.

(viii) Power supply.

(xi) Trip circuit.

(i) Speed Amplifier

The speed amplifier comprises amplifier A1 and associated components. A speed reference is fed into A1 via R1, R2 and R3 in series from terminal 33. For forward control the reference will be positive. Speed feedback (normally from a tachogenerator) is connected to terminal 32 and is negative for forward running. Potentiometer RV2 is used to set the correct strength of speed feedback and therefore set top speed. Transistors TR2 and TR3 are used to boost the current output of A1. Components RV1, R7 and C1 form the stability network round A1. In some cases these components may not be fitted when external stability

components are fitted, (usually on printed circuit 746/A3). The steady state gain of the speed amplifier is set by R5 or an external resistor connected electrically in the same position. When the drive is not in the run condition TR1 assumes minimum resistance state and therefore set A1 to a low gain. (When A1 has a low gain its output is held to a low value). In the run mode a negative signal is applied to terminal 15 and this biases TR1 to the high resistance state. The negative "GO" signal on terminal 15 is normally applied via relay RL3 on the relay logic card 608/2. If L1 is on it indicates that a "GO" signal is not present, i.e. inhibit conditions prevail.

(ii) Acceleration Amplifier

If the tachogenerator signal is applied to terminal 31 then A2 and associated components will control the rate of acceleration. Capacitors C4 and C5 form a differentiating circuit and therefore pass a current proportioned to rate of change of tacho voltage, i.e. rate of change of speed. This current is balanced against the current in R15 which is proportional to RV3 setting. When the two currents are equal A2 comes into control and its output, if more positive than that of A1 will forward bias D8 and reverse bias D4. In this situation the voltage on terminal 27 is a function of the acceleration amplifier output rather than the speed amplifier output. Terminal 27 may be used as the current reference.

When the acceleration amplifier is not in use RV3 may be used as a crawl speed potentiometer or other positive bias, its output being taken to terminal 10.

(iii) Forward Current Amplifier

The current amplifiers take their input from terminal 16. Except in the case of a current controlled drive this reference will be derived from the speed amplifier output on either 27 or 28. The forward current amplifier comprises A7 and associated components. The reference is fed in via R48 and is negative when the forward current amplifier is in operation, i.e. forward motoring or regeneration when the motor is running in the reverse direction. Current feedback, applied to terminal 24, is positive under all conditions. The strength of current feedback is adjusted by RV6 which therefore sets the current limit. The stability network comprises RV5, R90 and C14, and, as in the case of the speed amplifier, they may be fitted externally. The gain of the current amplifier (and therefore its output) can be set to a low value by biasing TR11 to the conducting state. This circuit allows the current amplifier to be inhibited. Following the current amplifier is an inverter, A8, which is used to achieve correct polarity output for the 290/A1 firing circuit. The output is taken from terminal 22.

(iv) Reverse Current Amplifier

The reverse current amplifier gets its reference from

terminal 16 via inverting amplifier A9. Because of this inverter the reverse current amplifier accepts from terminal 16 a positive reference, i.e. regeneration when the motor is running forward (braking from speed) or motoring in the reverse direction. Apart from the current reference inverter, the operation of the reverse current amplifier is the same as the forward current amplifier. The output for the reverse firing circuit is teken from terminal 19.

(v) Forward Inhibit

In order to prevent both forward and reverse current amplifiers coming into control at the same time it is necessary to include inhibit circuitry.

The forward inhibit employs A12 whose output feeds TR11 which, as described in (iii) can be used to de-gain the forward current amplifier. This will be the case when A12 output goes positive. Amplifier A14 provides the reverse inhibit.

Prior to starting, when there is not negative signal on terminal 15 a positive signal is fed into the non inverting inputs of both A12 and A14 via R10 and D38, R69 for forward and D35, R83 for reverse. This ensures that both A12 and A14 outputs sit at positive saturation. In this condition L7 and L8 are both lit (indicating inhibit for forward and reverse), TR11 and TR12 are biased into conduction and TR7

and TR9 are cut off. Transistors TR7 and TR9, when in the cut off state, inhibit the operation of the firing circuits. With switches SW1 and SW2 in the "UP" position TR7 and TR9 assume the cut-off condition (high resistance) permanently thus inhibiting the operation of the firing circuits. The switches are for test procedures to allow one firing circuit at a time to be brought into operation. They must not be moved when there is power on the drive.

When the drive is started a negative signal is applied to terminal 15. This removes the clamp from the speed amplifier, the acceleration amplifier and both inhibit amplifiers. If a positive speed reference is applied to the speed amplifier its output will go negative (assuming the motor is initially stationary). This negative signal is inverted by A9 and sends a positive signal to A12 inverting input, causing its output to go negative.

The negative output from A12 turns TR7 on, TR11 off, extinguishes L7 and sends an inhibit signal to A14 via R73 and D27.

With TR7 conducting and TR11 cut off, A7 (forward current amplifier) comes into control and the drive starts in the forward direction. When forward current flows the current feedback signal arriving at terminal 24 sends the output of the forward current sensing amplifier A13 positive. This positive signal is fed via D29 to reverse inhibit amplifier A14 non-inverting input where it acts as a very strong

inhibit signal overriding all other inputs. The output of A13 also feeds into the inverting input of A12 to keep it in the released condition as long as there is forward current. This release can be overriden by the trip circuit or the absence of a "GO" signal on terminal 15.

(vi) Reverse Inhibit

The reverse inhibit circuit, A14 and associated components are identical in operation to the forward inhibit, but is released by a positive signal from the speed amplifier output. The following conditions must prevail to release the reverse inhibit:-

There must be no forward current.

Terminal 15 must be negative.

Forward inhibit must be on (inhibited).

The trip circuit must be healthy.

The speed amplifier output fed into terminal 16 must be positive.

When the reverse inhibit is released I8 will be extinguished and the reverse current amplifier will come into operation.

(vii) Zero Speed Detector

The zero speed detector circuit uses tachogenerator feedback as means of detecting speed. The tacho feedback is applied to terminal 9, where, after passing through R20 it is clipped by Z1 and Z22. The resulting voltage goes to

A3 non-inverting input and A4 inverting input. If it is a positive voltage A3 output goes positive, and if it is a negative voltage A4 output goes positive. In either case L2 is lit and TR5 conducts. When TR5 conducts it can energise an external relay, normally RL1 on the relay logic PCB 608/A2. The relay is energised if there is tacho feedback of either polarity and dropped out when there is no feedback. The actual level at which the detector operates is very low, much lower than normal crawling or jog speeds.

(viii) Power Supply

The power for the regulator card may be either three phase AC 35V L-L and neutral connected to terminals 1,2,3 and 5 or +24V,0, -24V connected to terminals 7,5 and 4. In the case of the AC supply it is rectified by the bridge comprising D41 to D46, which produces a 24-0-24V DC supply. The regulator chips 7812 and 7912 step the voltage down to +12V and -12V respectively. These regulated 12V supplies are used to power all the amplifier circuits. The unregulated 24V supplies are generally used for relays.

(xi) Trip Circuit

Amplifiers A5 and A6 together with THY1 and associated components make up the trip circuit, which offers protection against low power supplies and overcurrent.

In the healthy condition THY1 is switched off. This is

ensured at start up by a negative pulse on TR6 base causing it to conduct momentarily thus shunting any current from THY1 allowing it to turn off. THY1 may be on when power is first applied to the card. The negative pulse for TR6 comes from the "GO" signal applied on terminal 15.

The +/- 24V supplies are monitored by A5. With normal voltages the junction of R32 and D41 sits at or near zero volts. A positive bias from RV4 therefore ensures that A5 output sits in negative saturation. If the +/- 24V supply goes low R32-D41 junction will go positive sending A5 output positive, which will then turn on THY1. A similar circuit comprising R42, D13 and A6 monitors the low voltage supply, but in this case a fixed positive bias is generated by D14. If the supplies go low A6 output goes positive feeding into the forward and reverse inhibit circuits, this initiating a trip. The output of A6 will also go positive if THY1 conducts since this will remove the positive bias from A6 inverting input. Thyristor THY1 can be triggered into conduction by A5 output going positive as stated above or by an excessive current feedback signal from either forward or reverse current feedback. The current feedback signals via D39 or D40 and R38 are balanced against the normally negative output of A5.

If the signal on R38 exceeds the signal from A5 then THY1 will be triggered into conduction, operating the trip circuit. When the trip is operated L6 is lit and the drive is inhibited. If this occurs when the motor is running it

will coast to a stop (except in the case of a motor which is being driven by the load, e.g. paper machine drying section on heavy grade product). No contactors or relays will trip except the zero speed relay when the motor comes to rest.

To clear the trip the drive has be have "STOP" selected and then re-started. Before re-starting some attempt should be made to ascertain the cause of the trip, e.g.

Loss of volts during regeneration.

Loss of current feedback.

Faulty firing circuit.

For a full list of possible faults consult the troubleshooting section of the manual.

C2472

CORTINA ELECTRIC

SECTION 6

DESCRIPTION OF CONTROL CIRCUIT

Drg. 1665/A1 Sheets 1 & 2

CORTINA ELECTRIC

6.1 OVERALL SHEMATIC

The three phase supply is connected to a high speed circuit breaker. All the circuits in the drive panel (except the anti-condensation heaters and socket) are supplied from this circuit breaker.

The main power for the armature circuit is fed to the four quadrant thyristor controller, TH1-TH12, via the main contactor MC and a motor protection relay MCOL. One leg of the DC output to the motor is fitted with a high speed fuse to protect the thyristor stack in the event of a motor fault (eg earth fault or commutation failure). The other leg of the DC output has a current transducer to provide current feedback for control and indication purposes. Provision is made for the connection of an external armature voltage voltmeter.

The three phase supply is transformed down to 415V by TX3 to provide a supply for the electronics and down to 110V by TX1 to provide a supply for the control relays.

6.2 Electronic Controls

The electronic controls are contained on two main PCB's, the 1500/A1 and the 669/A1. Detailed descriptions of these cards are given elsewhere in this manual. The 1500/A1 performs the following major functions:-

a) Produces all the low voltage power supplies.

b) Produces the thyristor firing pulses.

c) Provides a ramp interface between the joystick controller and the speed control circuit.

The 669/A1 performes the following major functions:-

a) Speed Control.

b) Current limit control.

c) Selection of forward or reverse thyristor stacks.

d) Zero speed detection.

In addition to the two main cards there are two auxilliary cards. The first (1701/A3) is a switching circuit which will direct the firing pulses to the forward or reverse thyristor stacks according to the selection made by the 669/A1. The other card, the 746/A3 card contains the components for the stability networks for the speed and current amplifiers and the trimming components for the reference and feedback circuits.

One particular feature is the non-linear feedback circuit from the tachogenerator which gives very fine control at low speeds.

Adjustment of the potentiometer on the electronic cards may only be carried out by a qualified thyristor drive expert in liason with Cortina Electric.

zero speed. In the event of an emergency stop the brake is applied immediately.

RR This is the run relay. It is automatically energised by operation of the joystick.

MCP This is the main contactor pilot relay and is brought in by RR and held in by ZSR until the drive has remained stationary for a short period. This is to allow time for the brake to operate before disabling the drive. It should be noted that if the motor runs for any reason ZSR will pick up, this will energise MCP and the drive will start but attempt to run at zero speed so if, for example, the brake starts to slip ZSR will detect this and the drive will assist the brake in preventing further slip.

INH When the is de-energised it inhibits operation of the thyristor converter.

MC Main line contactor.

TFR This monitors the status of the high speed fuses and it interlocked with the drive fault circuit.

ESR Emergency stop relay.

VF1 This monitors the drive speed to ensure that strong field is not available at high speed.

VF2 This detects when the drive has high current and prevents weak field being selected unless weak field already

exists.

Both VR1 and VR2 have hysteresis to prevent mal-operation of the control circuit near the operating levels of VR1 and VR2.

JSR1) These detect which joystick is being used and lock out
JSR2) the other.

HSRR This relay allows high speed (weak field) to be selected if the drive current is not too high. See VR2.

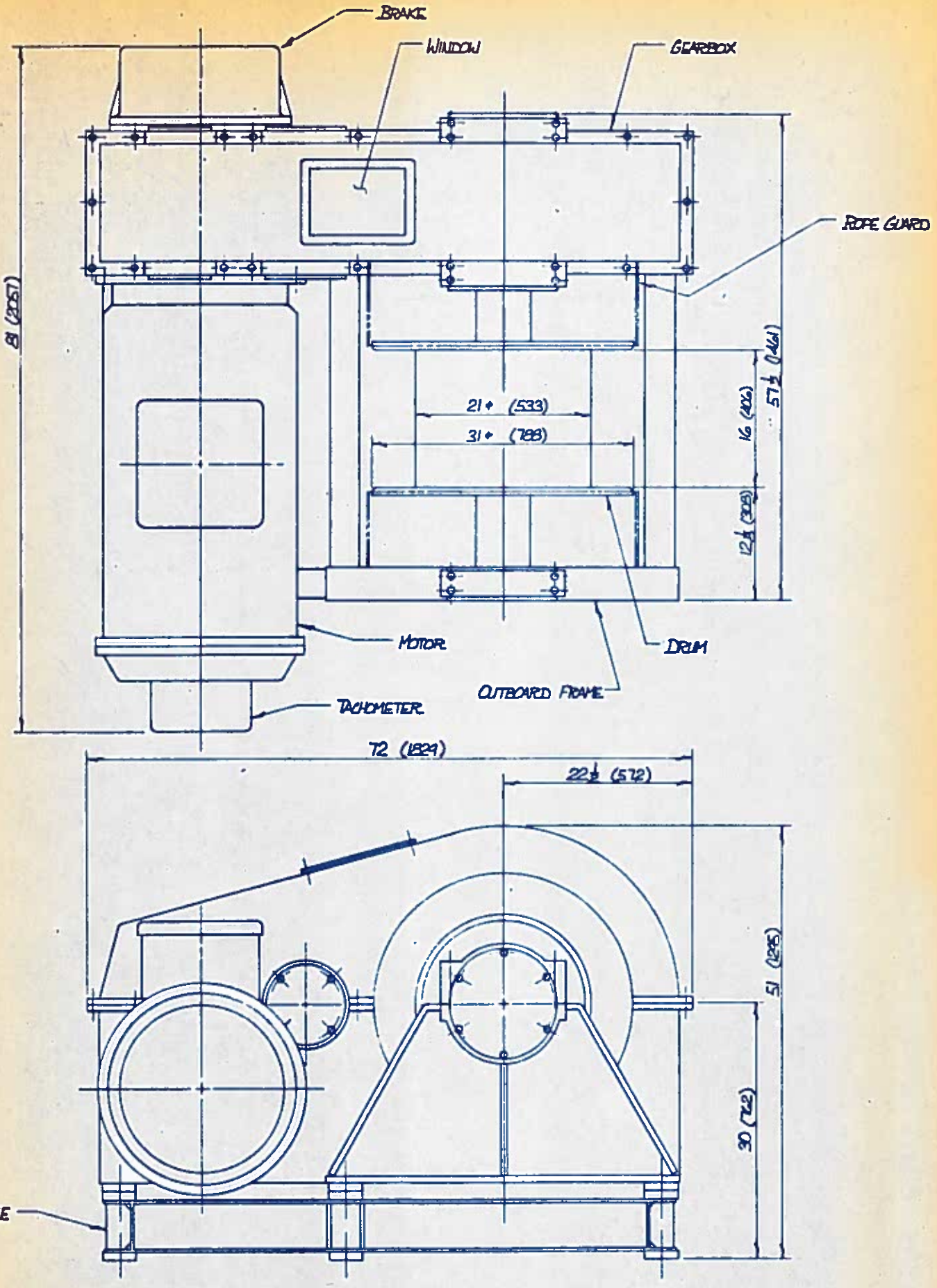
HSR This relay selects weak field and high speed reference when high speed is selected and the current is not excessive. Weak field will remain selected even when HSRR is de-energised until the voltage falls below a safe level (detected by VR1) for strong field to be applied.

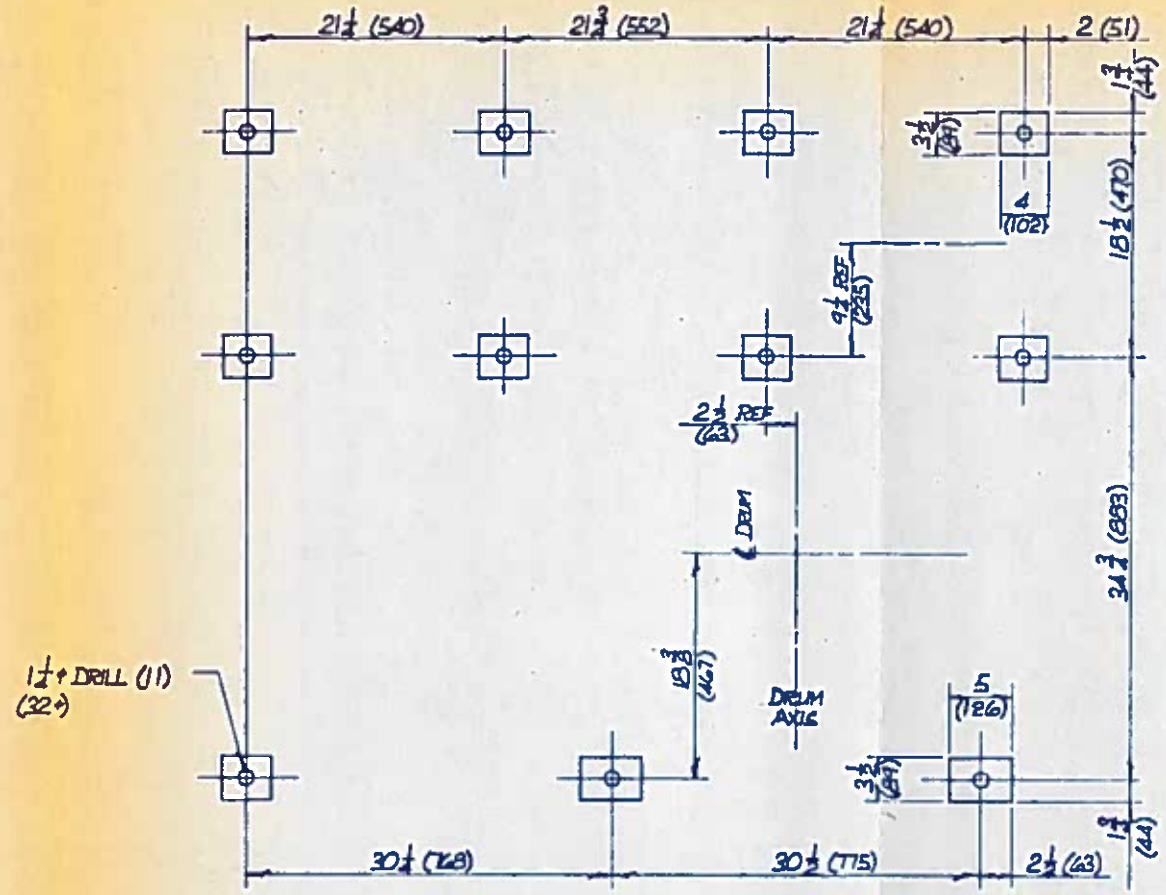
Undervoltage.

If the system voltage drops to such a low level that regenerative operation of the thyristor converter would be unsafe relay RL1 on the undervoltage detector operates and shuts the drive down immediately.

SECTION 5.0
SECTIONAL DRAWINGS

SECTION 5.0
SECTIONAL DRAWINGS





SETTING PLAN

REFERENCE DRAWING : BURRARD YARROWS N° H-30-80, ITEM N° 1

ITEM	DWG. NO.	QTY.	TITLE OR MATERIAL	A.I.S.I./S.A.E. NO.
20				
19				
18				
17				
16				
15				
14				
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3				
2				
1				

UNLESS OTHERWISE STATED TOLERANCES ARE
FRACTIONS = ±
DECIMALS = ±
ANGLES = ±
SURFACE FINISH AS AN ENGLISH

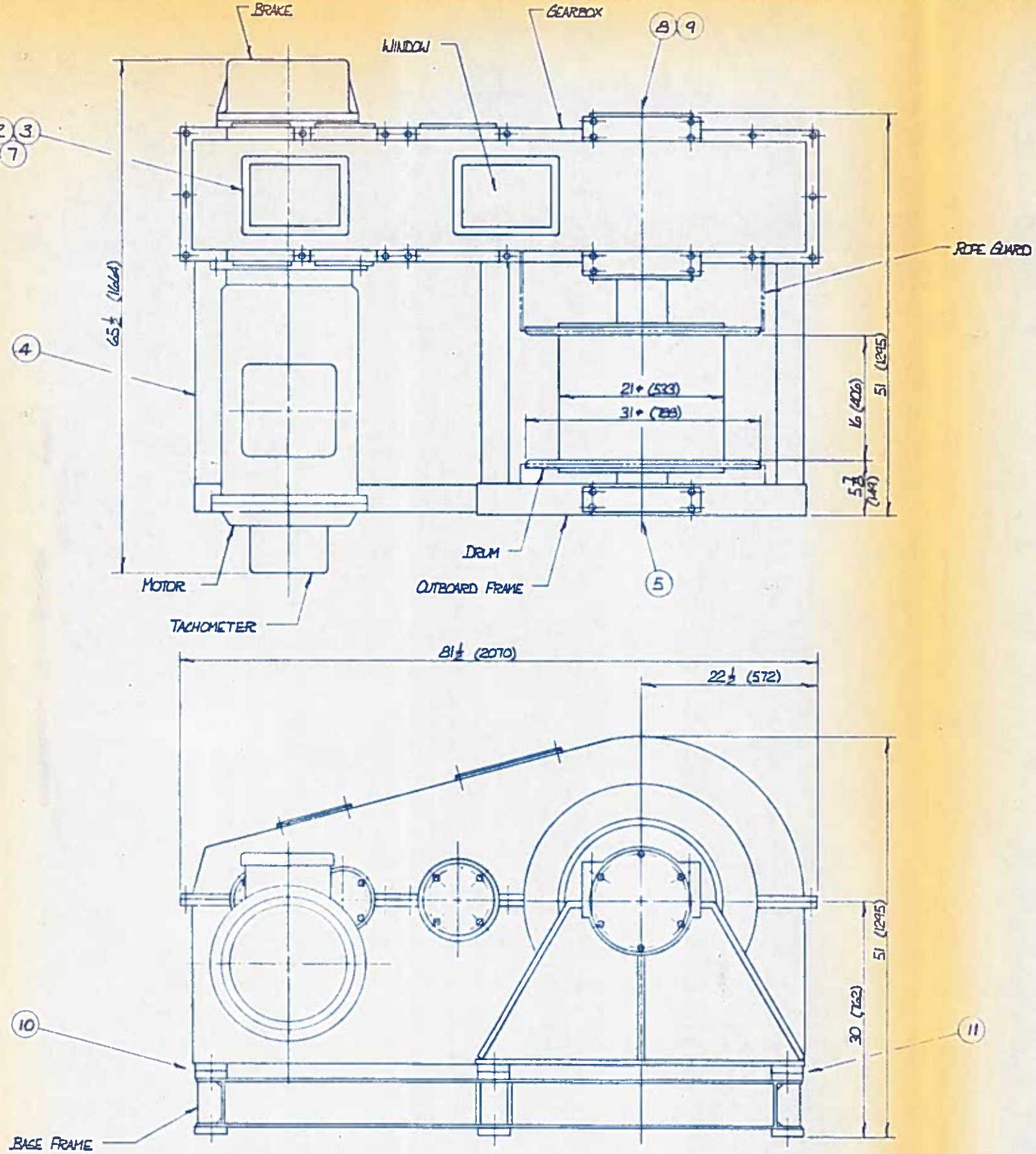
HOIST ASSEMBLY NO.

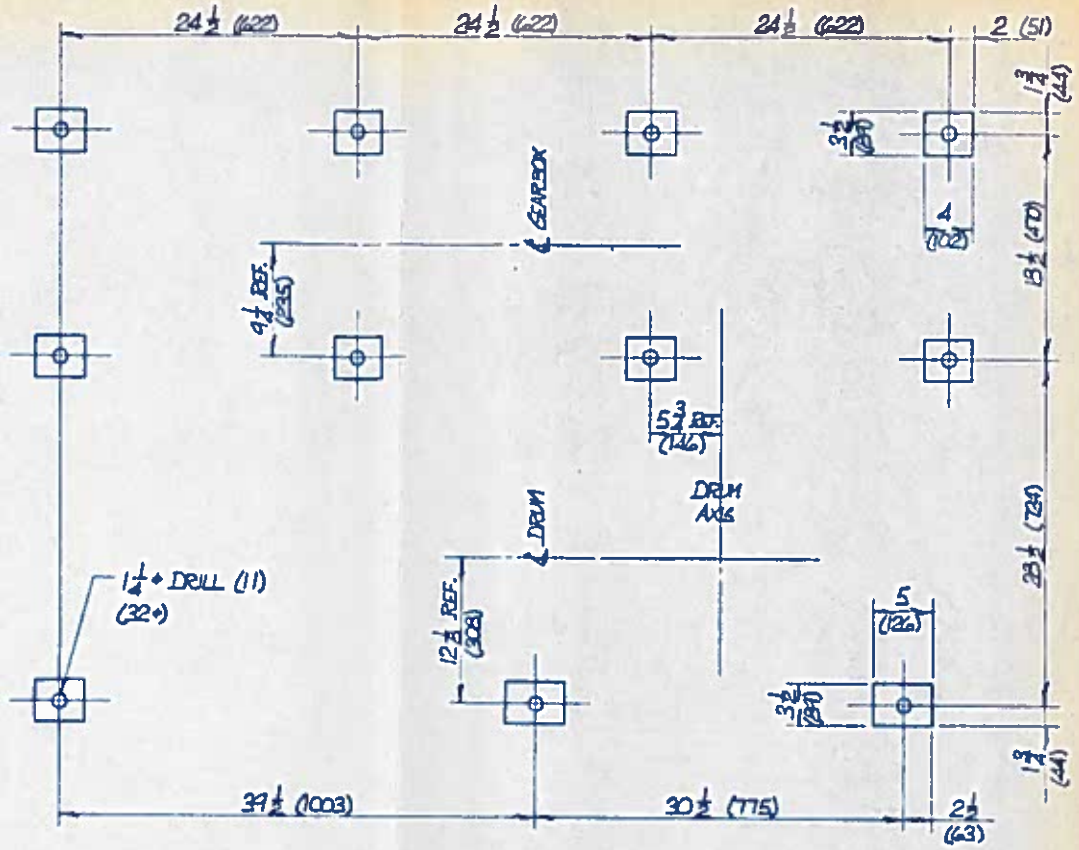
pacific winches ltd.
VANCOUVER, CANADA

TITLE: MAIN HOIST WINCH

DRWN. SS 11/VAR | SCALE | DWG. NO. 900-400-295 C
DSNED.
APPVD.

BURRARD REV C DEC 84 DWG UPDATED T.S.





SETTING PLAN

REFERENCE DWG : BURRARD YARROWS N° H-30-80 , ITEM N° 4 P

ITEM	DWG. NO.	QTY.	TITLE OR MATERIAL	A.I.S.I./S.A.E. NO.
11	000-201-709	2	FIXED BLOCK (OUTBOARD FRAME)	
10	000-201-708	6	RISER BLOCK (GEARBOX)	
9		1	LEVEL/TEMP GAUGE (UCC FLT-1210)	
8		1	HEATER (CHROMALOX AHMTD-330 W.)	
7		28	⅝" LOCKWASHER	
6		28	⅝ NC × 1 LG HHCS	
5		1	JUNCTION BOX (SLEEPTITE # JB 664)	
4	000-400-317	1	BASE FRAME	
3	000-201-630	2	WINDOW	
2	000-201-632	2	GASKET	
1	000-201-631	2	WINDOW FRAME	

UNLESS OTHERWISE STATED TOLERANCES ON: FRACTIONS = ±; DECIMALS = ±; ANGLES = ±; SURFACE FINISH 250 AA UNLESS

pacific winches ltd. VANCOUVER CANADA

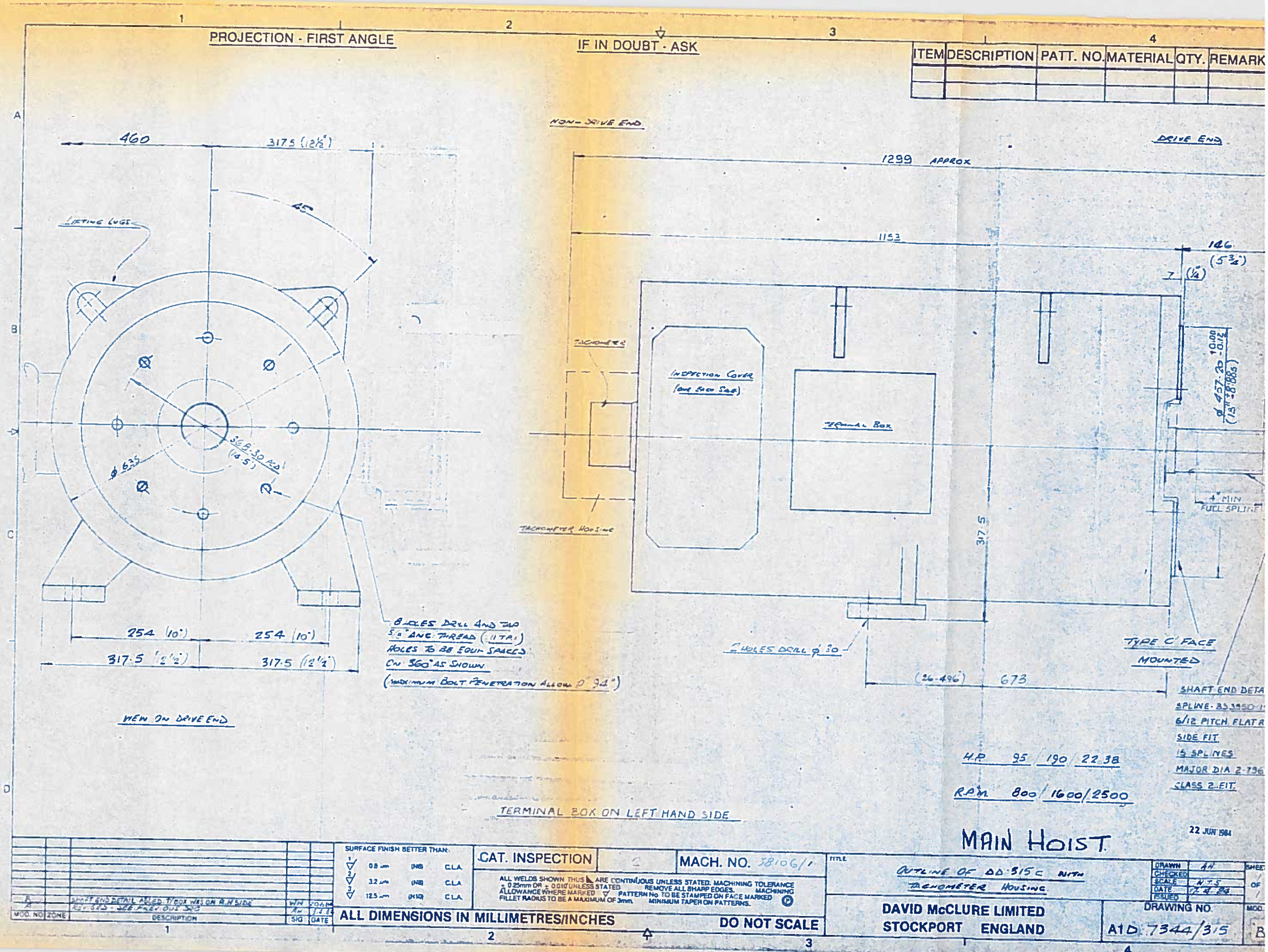
TITLE: AUXILIARY HOIST WINCH

DRWN. SS APR.85 | DES. | APPD. | SCALE

DWG. NO. 900-400-307 C

REV C. APR.85. ITEM N°⁵ ADDED . TS

BURRARD MIL. HALIFAX COUNCILLOR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IF IN DOUBT - ASK
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MATERIAL
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REMARK
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DRIVE END
460
317.5 (12½")
1299 APPROX
1153
146
(5¾")
7 (¼")
45°
LIFTING LUGS
⌀ 635
368.30 P.C.D. (14.5")
TACHOMETER
TACHOMETER HOUSING
INSPECTION COVER (ONE EACH SIDE)
TERMINAL BOX
⌀ 457.20 +0.00 -0.12 (18" +0 -.005)
+ MIN FULL SPLINE
317.5
254 (10")
254 (10")
317.5 (12½")
317.5 (12½")
8 HOLES DRILL AND TAP 5/8" UNC THREAD (11 TPI) HOLES TO BE EQUI-SPACED ON 360° AS SHOWN
(MAXIMUM BOLT PENETRATION ALLOW ⌀ 3/4")
4 HOLES DRILL ⌀ 30
(26.496)
673
TYPE 'C' FACE MOUNTED
SHAFT END DETA
SPLINE - BS 3550
6/12 PITCH FLAT R
SIDE FIT
15 SPLINES
MAJOR DIA 2.796
CLASS 2 FIT
VIEW ON DRIVE END
H.P. 95 / 190 / 22.38
R.P.M. 800 / 1600 / 2500
TERMINAL BOX ON LEFT HAND SIDE
MAIN HOIST
22 JUN 1984
SURFACE FINISH BETTER THAN:
0.8 µm (N6) C.L.A.
3.2 µm (N8) C.L.A.
12.5 µm (N10) C.L.A.
CAT. INSPECTION
MACH. NO. 38106/1
ALL WELDS SHOWN THUS ARE CONTINUOUS UNLESS STATED. MACHINING TOLERANCE ± 0.25mm OR ± 0.010" UNLESS STATED. REMOVE ALL SHARP EDGES. ALLOWANCE WHERE MARKED PATTERN No. TO BE STAMPED ON FACE MARKED. FILLET RADIUS TO BE A MAXIMUM OF 3mm. MINIMUM TAPER ON PATTERNS.
TITLE
OUTLINE OF DD 315 C WITH TACHOMETER HOUSING
DRAWN AH
CHECKED
SCALE N.T.S.
DATE
ISSUED
SHEET 1 OF 1
DAVID McCLURE LIMITED
STOCKPORT ENGLAND
DRAWING NO.
A1D 7344/315
MOD. B
SHAFT END DETAIL ADDED TYPE WAS ON R.H. SIDE
MOD. NO.
ZONE
DESCRIPTION
SIG
DATE
ALL DIMENSIONS IN MILLIMETRES/INCHES
DO NOT SCALE

SECTION 6.0

pacific winches ltd
vancouver canada

MAIN HOIST WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 1 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
	900-400-332 900-400-205	MAIN HOIST WINCH ASSEMBLY		000-201-792		
1	000-400-299	GEARBOX	1			
2	000-201-749	DRUM SHAFT	1			
3	000-201-619	INTERMEDIATE SHAFT	1			
4	000-201-618	INTERMEDIATE SHAFT	1			
5						
6	000-201-658	INPUT PINION (22T)	1			
7	000-201-609	MAIN GEAR (89T)	1			
8	000-201-600	PINION (28T)	1			
9	000-201-611	INTERMEDIATE GEAR(71T)	1			
10	000-201-604	PINION (18T)	1			
11	000-201-601	INTERMEDIATE GEAR(61T)	1			
12						
13						
14	000-201-593	KEY	2			
15	000-201-594	KEY	1			
16	000-201-595	KEY	1			
17	000-201-596	KEY	1			
18	000-201-597	KEY	1			
19						
20						
21	000-201-675	KEY	1			
22	000-201-617	SPACER	1			
23	000-201-616	SPACER	1			
24	000-201-614	SPACER	1			
25	000-201-615	SPACER	1			

PARTS LIST

pacific winches ltd vancouver canada				MAIN HOIST WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 2 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
26	000-201-613	SPACER	1			
27	000-201-612	SPACER	1			
28	000-201-622	SPACER	1			
29	000-201-620	SPACER	1			
30						
31						
32						
33						
34	000-400-306	BRAKE MOUNTING PLATE (54)	1			
35	000-400-296	MOTOR ADAPTOR PLATE (315)	1			
36	000-201-626	BEARING COVER	1			
37	000-201-625	BEARING COVER	1			
38	000-201-627	BEARING COVER	2			
39	000-201-629	BEARING COVER	2			
40						
41	000-201-631	WINDOW FRAME	2			
42	000-201-632	GASKET	2			
43	000-201-630	WINDOW	2			
44	000-400-309	MOTOR TRANSITION PLATE	1			
45						
46	000-400-318	BASE FRAME	1			
47						
48	000-201-677	ROPE CLAMP	1			
49	000-201-678	ROPE CLAMP SLEEVE (18 mm)	1			
50	000-400-298	OUTBOARD FRAME	1			
51	000-201-653	BEARING COVER	1			

PARTS LIST

pacific winches ltd
vancouver canada

MAIN HOIST WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 3 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
52	000-201-635	BEARING COVER	1		ULSTEIN	
53						
54	000-201-649	DRUM	1			
55						
56						
57	000-201-640	KEY	4			
58						
59						
60						
61						
62						
63	000-400- 313	ROPE GUARD (INNER)	2			
64	000-400- 349	ROPE GUARD (OUTER)	1			
65		OIL SEAL (455480)	1			
66		OIL SEAL (456011)	1			
67		OIL SEAL (416156)	1			
68		OIL SEAL (415683)	1			
69						
70						
71						
72		BEARING (160SD30)	2			
73		BEARING (100SD22)	2			
74		BEARING (6316)	3			
75		BEARING (150SD30)	1			
76						
77		BEARING (6024)	1			

PARTS LIST

pacific winches ltd vancouver canada				MAIN HOIST WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 4 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
78						
79		JUNCTION BOX	1			
80		GO SWITCH	1			
81		BRAKE (54)	1			
82		MOTOR (315)	1			
83		LEVEL TEMPERATURE GAUGE	1			
84		HEATER	1			
85	000-201-790	FINGER	4			
86	000-201-787	BRACKET	L			
87		5/16 NC X 1 LG HHCS	28			
88		5/16 LOCKWASHER	28			
89		½ NC X 1 LG FHSHCS	12			
90		½ NC X 1½ LG HHCS	36			
91		½ LOCKWASHER	36			
92		5/8 NC X 1 3/4 LG HHCS	14			
93		5/8 NC X 7 LG HHCS	4			
94		5/8 LOCKWASHER	18			
95		3/4 NC X 2½ LG SHCS	7			
96		3/4 NC X 2½ LG FHSHCS	7			
97						
98						
99		1 NC X 4 LG HHCS	10			
100		1 NC X 7 LG HHCS	6			
101		1 LOCKWASHER	16			
102		5/8 NC X 2½ LG STUD	8			
103		5/8 NC HEX NUT	8			
						PARTS LIST NUMBER

pacific winches ltd
vancouver canada

AUXILIARY HOIST WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 1 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
	900-400-307 900-400-[illegible]	AUXILIARY HOIST WINCH ASSEMBLY		000-201-792		
1	000-400-304	GEARBOX	1			
2	000-201-656	DRUM SHAFT	1			
3	000-201-619	INTERMEDIATE SHAFT	1			
4	000-201-618	INTERMEDIATE SHAFT	1			
5	000-201-592	INTERMEDIATE SHAFT	1			
6	000-201-687	INPUT PINION (29T)	1			
7	000-201-610	MAIN GEAR (95T)	1			
8	000-201-602	PINION (22T)	1			
9	000-201-611	INTERMEDIATE GEAR (71T)	1			
10	000-201-604	PINION (18T)	1			
11	000-201-689	INTERMEDIATE GEAR (58T)	1			
12	000-201-688	PINION (25T)	1			
13	000-201-606	INTERMEDIATE GEAR (59T)	1			
14	000-201-593	KEY	2			
15	000-201-594	KEY	1			
16	000-201-595	KEY	1			
17	000-201-596	KEY	1			
18	000-201-597	KEY	1			
19	000-201-598	KEY	1			
20	000-201-599	KEY	1			
21	000-201-674	KEY	1			
22	000-201-617	SPACER	1			
23	000-201-616	SPACER	1			
24	000-201-614	SPACER	1			
25	000-201-615	SPACER	1			

PARTS LIST

pacific winches ltd
vancouver canada

AUXILIARY HOIST WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 2 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
26	000-201-613	SPACER	1			
27	000-201-612	SPACER	1			
28	000-201-622	SPACER	1			
29	000-201-620	SPACER	1			
30	000-201-605	SPACER	1			
31	000-201-591	SPACER	1			
32	000-201-621	SPACER	1			
33						
34	000-400- 329	BRAKE MOUNTING PLATE (47)	1			
35	000-400-307	MOTOR ADAPTOR PLATE (250)	1			
36	000-201-626	BEARING COVER	1			
37	000-201-625	BEARING COVER	1			
38	000-201-627	BEARING COVER	2			
39	000-201-629	BEARING COVER	2			
40	000-201-628	BEARING COVER	2			
41	000-201-631	WINDOW FRAME	2			
42	000-201-632	GASKET	2			
43	000-201-630	WINDOW	2			
44	000-400-310	MOTOR TRANSITION PLATE	1			
45						
46	000-400-317	BASE FRAME	1			
47						
48						
49						
50	000-400-298	OUTBOARD FRAME	1			
51	000-201-653	BEARING COVER	1			

PARTS LIST

pacific winches ltd
vancouver canada

AUXILIARY HOIST WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 3 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
52	000-201-635	BEARING COVER	1			
53						
54	000-201-677	ROPE CLAMP	1			
55	000-201-679	ROPE CLAMP SLEEVE (26mm)	1			
56	000-201-649	DRUM	1			
57	000-201-640	KEY	4			
58						
59						
60						
61						
62						
63	000-400-313	ROPE GUARD (INNER)	2			
64	000-400-311	ROPE GUARD (OUTER)	2			
65						
66		OIL SEAL (456011)	1			
67		OIL SEAL (416156)	1			
68		OIL SEAL (415683)	1			
69						
70	000-201-708	RISER BLOCK (GEARBOX)	8			
71	000-201-709	RISER BLOCK (OUTBOARD FRAME)	2			
72		BEARING (160SD30)	2			
73		BEARING (100SD22)	2			
74		BEARING (6316)	3			
75		BEARING (150SD30)	1			
76		BEARING (6316)	2			
77		BEARING (6024)	1			

PARTS LIST

pacific winches ltd vancouver canada				AUXILIARY HOIST WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 4 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
78						
79		JUNCTION BOX				
80		GO SWITCH				
81		BRAKE (41)	1			
82		MOTOR - (280)	1			
83		LEVEL/TEMPERATURE GAUGE	1			
84		HEATER	1			
85	000-201-790	FINGER	4			
86	000-201-787	BRACKET	1			
87		5/16 NC X 1" LG HHCS	28			
88		5/16 LOCKWASHER	28			
89		½" NC X 1 LG FHSHCS	20			
90		½" NC X 1½ LG HHCS	36			
91		½ LOCKWASHER	36			
92		5|8 NC X 1 3|4 LG HHCS	18			
93		5/8 NC X 6 LG HHCS	2			
94		5/8 LOCKWASHER	20			
95		3/4 NC X 2½ LG SHCS	7			
96		3/4 NC X 2½ LG FHSHCS	7			
97						
98						
99		1 NC X 4 LG HHCS	10			
100		1 NC X 7 LG HHCS	6			
101		1 LOCKWASHER	16			
102		5/8 NC X 2½ LG STUD	8			
103		5/8 NC HEX NUT	8			

PARTS LIST

pacific winches ltd
vancouver canada

WHIP HOIST WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 1 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
	900-400-313 900-400-296	WHIP HOIST WINCH ASSEMBLY		000-201-792		
1	000-400-304	GEARBOX	1			
2	000-201-656	DRUM SHAFT	1			
3	000-201-619	INTERMEDIATE SHAFT	1			
4	000-201-618	INTERMEDIATE SHAFT	1			
5	000-201-592	INTERMEDIATE SHAFT	1			
6	000-201-676	INPUT PINION (29T)	1			
7	000-201-609	MAIN GEAR (89T)	1			
8	000-201-600	PINION (28T)	1			
9	000-201-611	INTERMEDIATE GEAR (71T)	1			
10	000-201-604	PINION (18T)	1			
11	000-201-601	INTERMEDIATE GEAR (61T)	1			
12	000-201-603	PINION (22T)	1			
13	000-201-606	INTERMEDIATE GEAR (59T)	1			
14	000-201-593	KEY	2			
15	000-201-594	KEY	1			
16	000-201-595	KEY	1			
17	000-201-596	KEY	1			
18	000-201-597	KEY	1			
19	000-201-598	KEY	1			
20	000-201-599	KEY	1			
21	000-201-673	KEY	1			
22	000-201-617	SPACER	1			
23	000-201-616	SPACER	1			
24	000-201-614	SPACER	1			
25	000-201-615	SPACER	1			

PARTS LIST

pacific winches ltd vancouver canada				WHIP HOIST WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 2 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
26	000-201-613	SPACER	1			
27	000-201-612	SPACER	1			
28	000-2201-622	SPACER	1			
29	000-201-620	SPACER	1			
30	000-201-605	SPACER	1			
31	000-201-591	SPACER	1			
32	000-201-621	SPACER	1			
33						
34	000-400-. 305	BRAKE MOUNTING PLATE (37)	1			
35	000-400-307	MOTOR ADAPTOR PLATE (250)	1			
36	000-201-626	BEARING COVER	1			
37	000-201-625	BEARING COVER	1			
38	000-201-627	BEARING COVER	2			
39	000-201-629	BEARING COVER	2			
40	000-201-628	BEARING COVER	2			
41	000-201-631	WINDOW FRAME	2			
42	000-201-632	GASKET	2			
43	000-201-630	WINDOW	2			
44	000-.00-310	MOTOR TRANSITION PLATE	1			
45						
46	000-400-314	BASE FRAME	1			
47						
48						
49						
50	000-400-298	OUTBOARD FRAME	1			
51	000-201-653	BEARING COVER	1			

pacific winches ltd
vancouver canada

WHIP HOIST WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 3 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
52	000-201-635	BEARING COVER	1			
53						
54	000-201-677	ROPE CLAMP	1			
55	000-201-683	ROPE CLAMP SLEEVE (22mm)	1			
56	000-201-649	DRUM	1			
57	000-201-640	KEY	4			
58						
59						
60						
61						
62						
63	000-400-313	ROPE GUARD (INNER)	2			
64	000-400-311	ROPE GUARD (OUTTER)	2			
65		OIL SEAL (455480)	1			
66		OIL SEAL (456011)	1			
67		OIL SEAL (416156)	1			
68		OIL SEAL (415683)	1			
69						
70						
71						
72		BEARING (160SD30)	2			
73		BEARING (100SD22)	2			
74		BEARING (6316)	3			
75		BEARING (150SD30)	1			
76		BEARING (6316)	2			
77		BEARING (6024)	1			

pacific winches ltd vancouver canada				WHIP HOIST WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 4 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
78						
79		JUNCTION BOX				
80		GO SWITCH				
81		BRAKE (37)	1			
82		MOTOR - 250	1			
83		LEVEL/TEMPERATURE GAUGE	1			
84		HEATER	1			
85	000-201-790	FINGER	4			
86	000-201-787	BRACKET	1			
87		5/16 NC X 1" LG HHCS	28			
88		5/16 LOCKWASHER	28			
89		½ NC X 1" LG FHSHCS	20			
90		½ NC X 1½ LG HHCS	36			
91		½ LOCKWASHER	36			
92		5|8 NC X 1.3/4 LG HHCS	18			
93		5/8 NC X 6 LG HHCS	2			
94		5/8 LOCKWASHER	20			
95		9/4 NC X 2½ LG SHCS	7			
96		3/4 NC X 2½ LG FHSHCS	7			
97						
98						
99		1 NC X 4 LG HHCS	10			
100		1 NC X 7 LG HHCS	6			
101		1 LOCKWASHER	16			
102		5/8 NC X 2½ LG STUD	8			
103		5/8 NC HEX NUT	8			

PARTS LIST

pacific winches ltd
vancouver canada

TOPPING WINCH

HULL 5-55
NAVAIDS 110C

VERSATILE PACIFIC

SHEET 1 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
	900-400-335 900-400-298	TOPPING WINCH ASSEMBLY				
1	000-400-304	GEARBOX	1			
2	000-201-656	DRUM SHAFT	1			
3	000-201-619	INTERMEDIATE SHAFT	1			
4	000-201-618	INTERMEDIATE SHAFT	1			
5	000-201-592	INTERMEDIATE SHAFT	1			
6	000-201-657	INPUT PINION (21T)	1			
7	000-201-609	MAIN GEAR (89T)	1			
8	000-201-600	PINION (28T)	1			
9	000-201-611	INTERMEDIATE GEAR (71T)	1			
10	000-201-604	PINION (18T)	1			
11	000-201-601	INTERMEDIATE GEAR (61T)	1			
12	000-201-603	PINION (22T)	1			
13	000-201-607	INTERMEDIATE GEAR (65T)	1			
14	000-201-593	KEY	2			
15	000-201-594	KEY	1			
16	000-201-595	KEY	1			
17	000-201-596	KEY	1			
18	000-201-597	KEY	1			
19	000-201-598	KEY	1			
20	000-201-599	KEY	1			
21	000-201-673	KEY	1			
22	000-201-617	SPACER	1			
23	000-201-616	SPACER	1			
24	000-201-614	SPACER	1			
25	000-201-615	SPACER	1			

PARTS LIST

pacific winches ltd
vancouver canada

TOPPING WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 2 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
26	000-201-613	SPACER	1			
27	000-201-612	SPACER	1			
28	000-201-622	SPACER	1			
29	000-201-620	SPACER	1			
30	000-201-605	SPACER	1			
31	000-201-591	SPACER	1			
32	000-201-621	SPACER	1			
33						
34	000-400-305	BRAKE MOUNTING PLATE (41)	1			
35	000-400-296	MOTOR ADAPTOR PLATE (315)	1			
36	000-201-626	BEARING COVER	1			
37	000-201-625	BEARING COVER	1			
38	000-201-627	BEARING COVER	2			
39	000-201-629	BEARING COVER	2			
40	000-201-628	BEARING COVER	2			
41	000-201-631	WINDOW FRAME	2			
42	000-201-632	GASKET	2			
43	000-201-630	WINDOW	2			
44	000-400-309	MOTOR TRANSITION PLATE	1			
45						
46	000-400-315	BASE FRAME	1			
47						
48						
49						
50	000-400-298	OUTBOARD FRAME	1			
51	000-201-653	BEARING COVER	1			

pacific winches ltd
vancouver canada

TOPPING WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 3 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
52	000-201-635	BEARING COVER	1			
53						
54	000-201-677	ROPE CLAMP	1			
55	000-201-679	ROPE CLAMP SLEEVE (26mm)	1			
56	000-201-649	DRUM	1			
57	000-201-640	KEY	4			
58						
59						
60						
61						
62						
63	000-400-313	ROPE GUARD (INNER)	2			
64	000-400-311	ROPE GUARD (OUTER)	2			
65		OIL SEAL (455480)	1			
66		OIL SEAL (456011)	1			
67		OIL SEAL (416156)	1			
68		OIL SEAL (415683)	1			
69						
70						
71						
72		BEARING (160SD30)	2			
73		BEARING (100SD22)	2			
74		BEARING (6316)	3			
75		BEARING (150SD30)	1			
76		BEARING (6313)	2			
77		BEARING (6024)	1			

PARTS LIST

pacific winches ltd vancouver canada				TOPPING WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 4 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
78						
79		JUNCTION BOX				
80						
81		BRAKE (41)	1			
82		MOTOR (315)	1			
83		LEVEL/TEMPERATURE GAUGE	1			
84		HEATER	1			
85						
86						
87		5/16 NC X 1 LG HHCS	28			
88		5/16 LOCKWASHER	28			
89		½ NC X 1 LG FHSHCS	20			
90		½ NC X 1½ LG HHCS	36			
91		½ LOCKWASHER	36			
92		5/8 NC X 1 3/4 LG HHCS	18			
93		5/8 NC X 6 LG HHCS	2			
94		5/8 LOCKWASHER	20			
95		3/4 NC X 2½ LG SHCS	7			
96		3/4 NC X 2½ LG FHSHCS	7			
97						
98						
99		1 NC X 4 LG HHCS	10			
100		1 NC X 7 LG HHCS	6			
101		1 LOCKWASHER	16			
102		5/8 NC X 2½ LG STUD	8			
103		5/8 NC HEX NUT	8			

PARTS LIST

pacific winches ltd
vancouver canada

SLEWING WINCH

HULL 5-55
NAVAIDS 1100

VERSATILE PACIFIC

SHEET 1 OF 4

ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
	900-400-297 900-400-378	SLEWING WINCH ASSEMBLY				
1	000-400-304	GEARBOX	1			
2	000-201-633	DRUM SHAFT	1			
3	000-201-619	INTERMEDIATE SHAFT	1			
4	000-201-618	INTERMEDIATE SHAFT	1			
5	000-201-592	INTERMEDIATE SHAFT	1			
6	000-201-659	INPUT PINION (20T)	1			
7	000-201-609	MAIN GEAR (89T)	1			
8	000-201-600	PINION (28T)	1			
9	000-201-611	INTERMEDIATE GEAR (71T)	1			
10	000-201-604	PINION (18T)	1			
11	000-201-601	INTERMEDIATE GEAR (61T)	1			
12	000-201-603	PINION (22T)	1			
13	000-201-608	INTERMEDIATE GEAR (67T)	1			
14	000-201-593	KEY	2			
15	000-201-594	KEY	1			
16	000-201-595	KEY	1			
17	000-201-596	KEY	1			
18	000-201- 597	KEY	1			
19	000-201- 598	KEY	1			
20	000-201- 599	KEY	1			
21	000-201- 674	KEY	1			
22	000-201-617	SPACER	1			
23	000-201-616	SPACER	1			
24	000-201-614	SPACER	1			
25	000-201-615	SPACER	1			

PARTS LIST

pacific winches ltd vancouver canada				SLEWING WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 2 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
26	000-201-613	SPACER	1			
27	000-201-612	SPACER	1			
28	000-201-622	SPACER	1			
29	000-201-620	SPACER	1			
30	000-201-605	SPACER	1			
31	000-201-591	SPACER	1			
32	000-201-621	SPACER	1			
33						
34	000-400-300	BRAKE MOUNTING PLATES (37)	1			
35	000-400-307	MOTOR ADAPTOR PLATES (250)	1			
36	000-201-626	BEARING COVER	1			
37	000-201-625	BEARING COVER	1			
38	000-201-627	BEARING COVER	2			
39	000-201-629	BEARING COVER	2			
40	000-201-628	BEARING COVER	2			
41	000-201-631	WINDOW FRAME	2			
42	000-201-632	GASKET	2			
43	000-201-630	WINDOW	2			
44	000-400-310	MOTOR TRANSITION PLATE	1			
45						
46	000-400-339	BASE FRAME (OFFSET)	1			
47						
48	000-201-677	ROPE CLAMP	2			
49	000-201- 682	ROPE CLAMP SLEEVE (20mm)	2			
50	000-400- 340	OUTBOARD FRAME	1			
51	000-201-653	BEARING COVER	1			

PARTS LIST

pacific winches ltd vancouver canada				SLEWING WINCH	HULL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 3 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
52	000-201-635	BEARING COVER	1			
53						
54	000-201-655	FIXED DRUM	1			
55	000-201-661	ADJUSTABLE DRUM	1			
56	000-201-637	DRUM BUSHING	2			
57	000-201-640	KEY	4			
58						
59						
60						
61						
62						
63	000-400-312	ROPE GUARD (INNER)	2			
64	000-400-311	ROPE GUARD (OUTER)	1			
65		OIL SEAL (455480)	1			
66		OIL SEAL (456011)	1			
67		OIL SEAL (416156)	1			
68		OIL SEAL (415683)	1			
69						
70	000-201-770	RISER BLOCK (GEARBOX)	8			
71	000-201-769	RISER BLOCK (OUTBOARD FRAME)	2			
72		BEARING (160SD30)	2			
73		BEARING (100SD22)	2			
74		BEARING (6316)	3			
75		BEARING (150SD30)	1			
76		BEARING (631 3)	2			
77		BEARING (6024)	1			

PARTS LIST

pacific winches ltd vancouver canada				SLEWING WINCH	HLLL 5-55 NAVAIDS 1100	VERSATILE PACIFIC SHEET 4 OF 4
ITEM	DRG No	TITLE	NoREQ	MATERIAL / DESCRIPTION	SUPPLIER	REMARKS
78						
79		JUNCTION BOX				
80						
81		BRAKE (37)	1			
82		MOTOR - 250	1			
83		LEVEL/TEMPERATURE GAUGE	1			
84		HEATER	1			
85						
86						
87		5/16 NC X 1 LG HHCS	28			
88		5/16 LOCKWASHER	28			
89		½ NC X 1 LG FHSHCS	20			
90		½ NC X 1½ LG HHCS	36			
91		½ LOCKWASHER	36			
92		5|8 NC X 1 3|4 LG HHCS	18			
93		5|8 NC X 6 LG HHCS	2			
94		5|8 LOCKWASHER	20			
95		3|4 NC X 2½ LG SHCS	7			
96		3/4 NC X 2½ LG FHSHCS	7			
97						
98						
99		1 NC X 4 LG HHCS	10			
100		1 NC X 7 LG HHCS	6			
101		1 LOCKWASHER	16			
102		5/8 NC X 2½ LG STUD	8			
103		5/8 NC HEX NUT	8			
104		5/8 NC x 2 LG FHSHCS	12			PARTS LIST

SECTION 7.0
ELECTRICAL SCHEMATICS

INDUSTRIAL & MARINE SWITCHGEAR
AMSTERDAM ROAD, SUTTON FIELDS INDUSTRIAL ESTATE,
HULL, ENGLAND. TELEX 52237

CUSTOMER:

SYSTEM:

"CANADIAN COAST GUARD"

TYPICAL

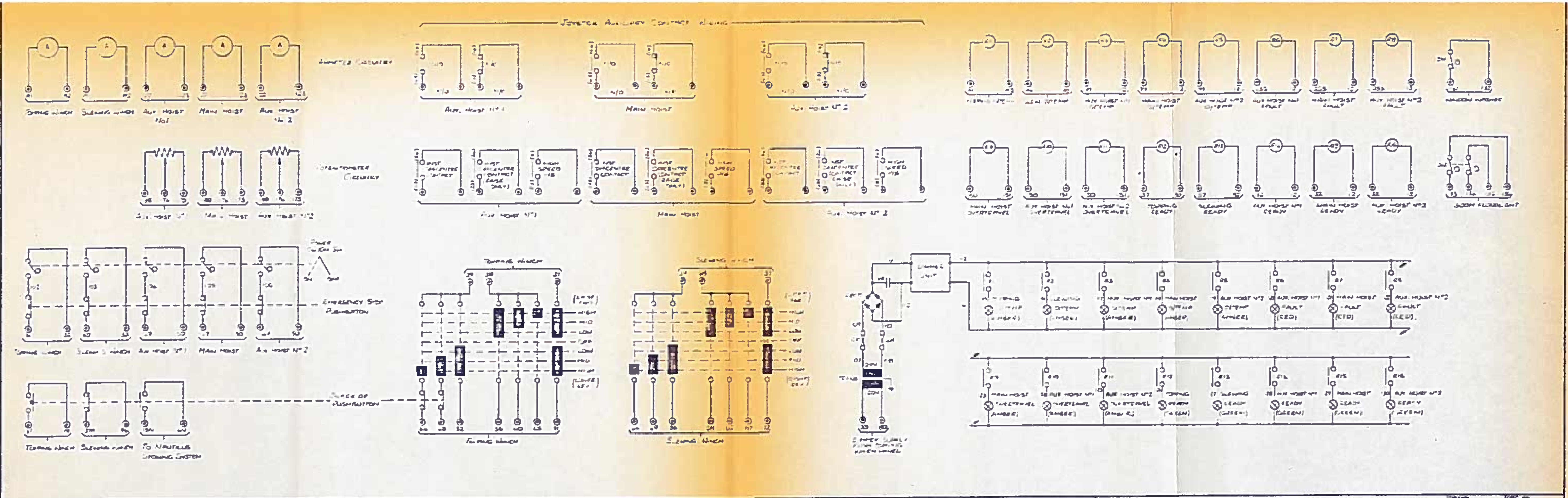
INDUSTRIAL & MARINE SWITCHGEAR
AMSTERDAM ROAD, SUTTON FIELDS INDUSTRIAL ESTATE,
HULL, ENGLAND. TELEX 52237

CUSTOMER:

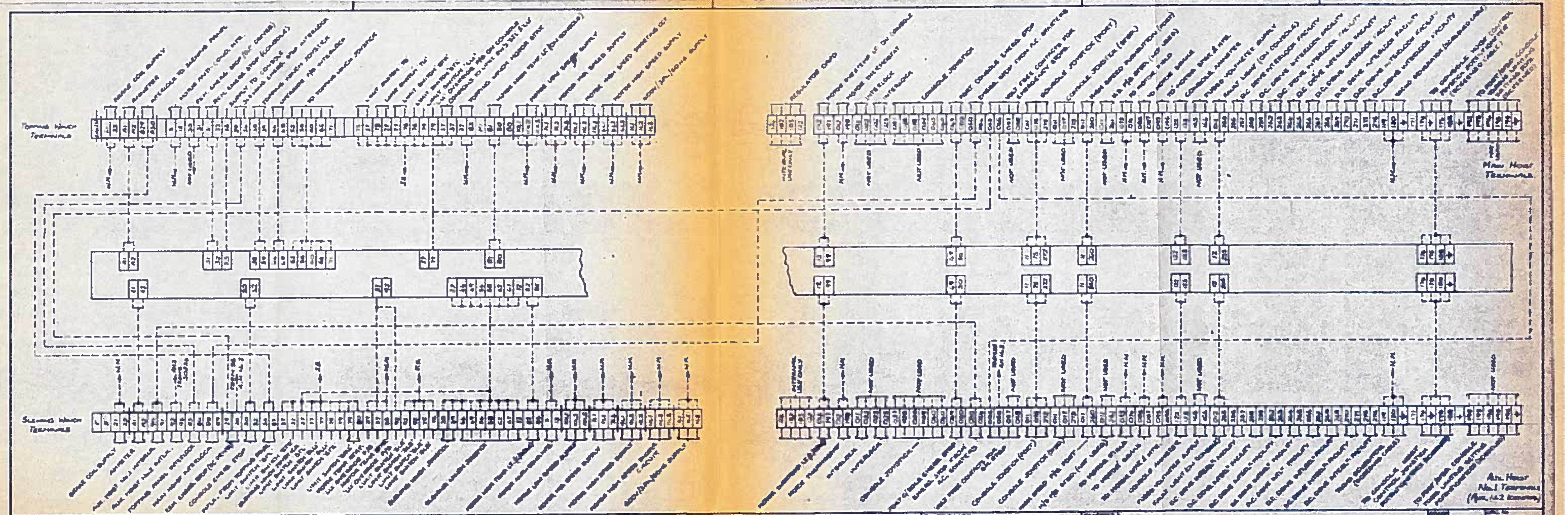
SYSTEM:

"CANADIAN COAST GUARD"

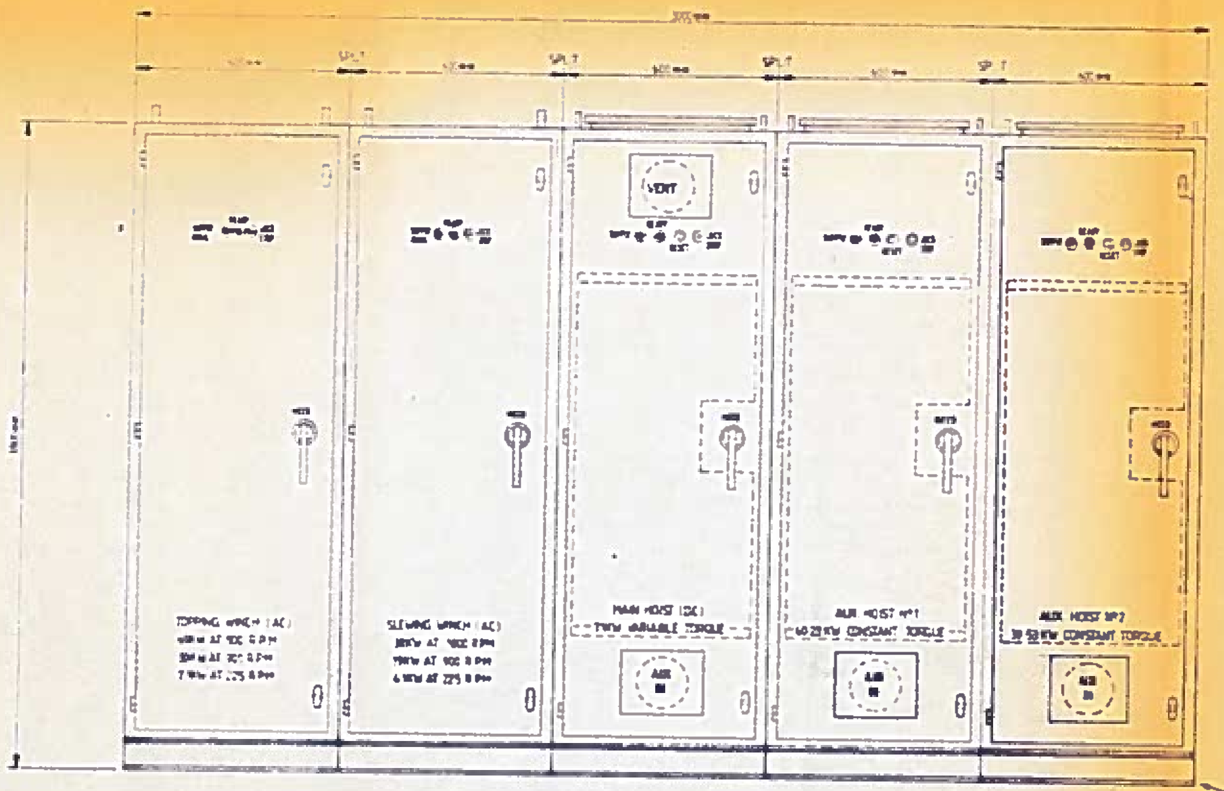
TYPICAL



SCALE				INDUSTRIAL & MARINE SWITCHGEAR	CUSTOMER:	SYSTEM:		
N/A				AMSTERDAM ROAD, SUTTON FIELDS INDUSTRIAL ESTATE HULL, ENGLAND. TEL 0482 831222 TELEX 52237			DATE 15/3/85	CHECKED



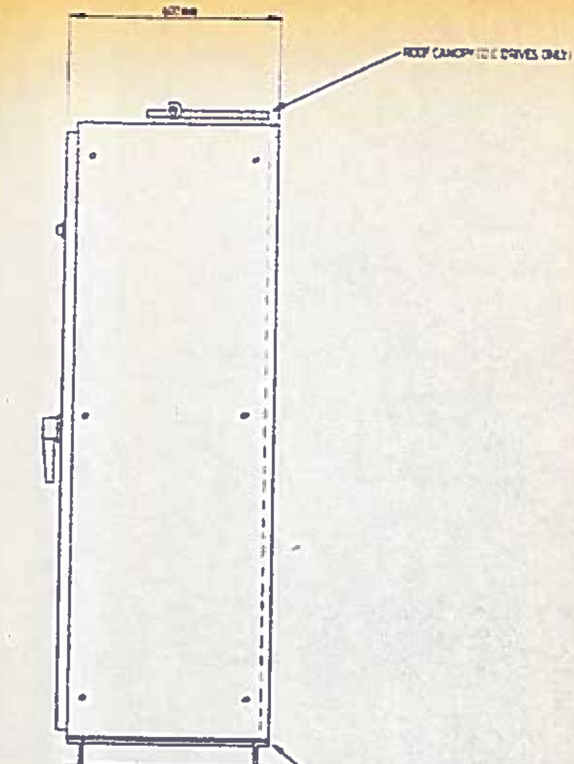
SCALE	Note - Key to abbreviations	INDUSTRIAL & MARINE SWITCHGEAR	CUSTOMER:	SYSTEM:	
N/A	JB - Junction Box WM - Winch Motor HM - Hoist Motor AH2 - Aux. Hoist No.2 Panel AH1 - Aux. Hoist No.1 Panel	AMSTERDAM ROAD, SUTTON FIELDS INDUSTRIAL ESTATE, HULL, ENGLAND. TEL 0482 831222 TELEX 52237	Pacific Winches Ltd.	Interconnection Diagram - Single Console Control	G.R. Thomas



FRONT ELEVATION

75 x 38mm CHANNEL IRON PLINTH

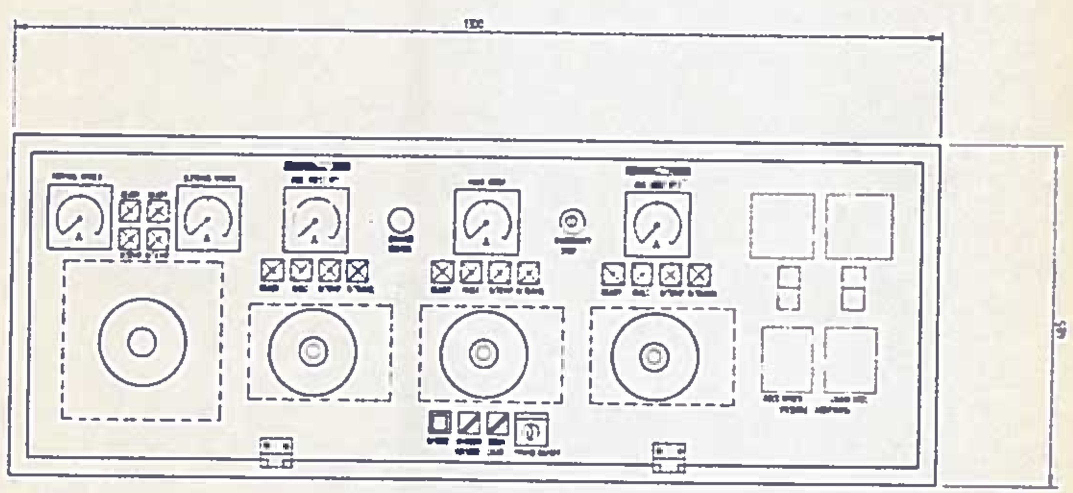
NOTES
1) STARTER PANELS WILL BE SPLIT WHERE SHOWN
2) INDIVIDUAL CABINETS TO BE MANUFACTURED WITH FACILITY TO BOLT TOGETHER
3) PANELS TO BE MANUFACTURED USING 16SWG ZINTEC SHEET STEEL
4) PANELS TO BE FRONT ACCESS ONLY
5) HANDLES TO BE EMKA TYPE.
6) HINGES TO BE CHROME LIFT OFF TYPE.
7) COLOUR TO BE LIGHT ADMIRALTY GREY
8) MAX SIZE LEAFTRAYS & BASE GLANDPLATES TO BE FITTED
9) DC ENCLOSURES TO BE FITTED WITH RAISED ROOF CANOPY AS SHOWN
10) ——————— INTERNAL SIDE GEARTRAYS.



END ELEVATION

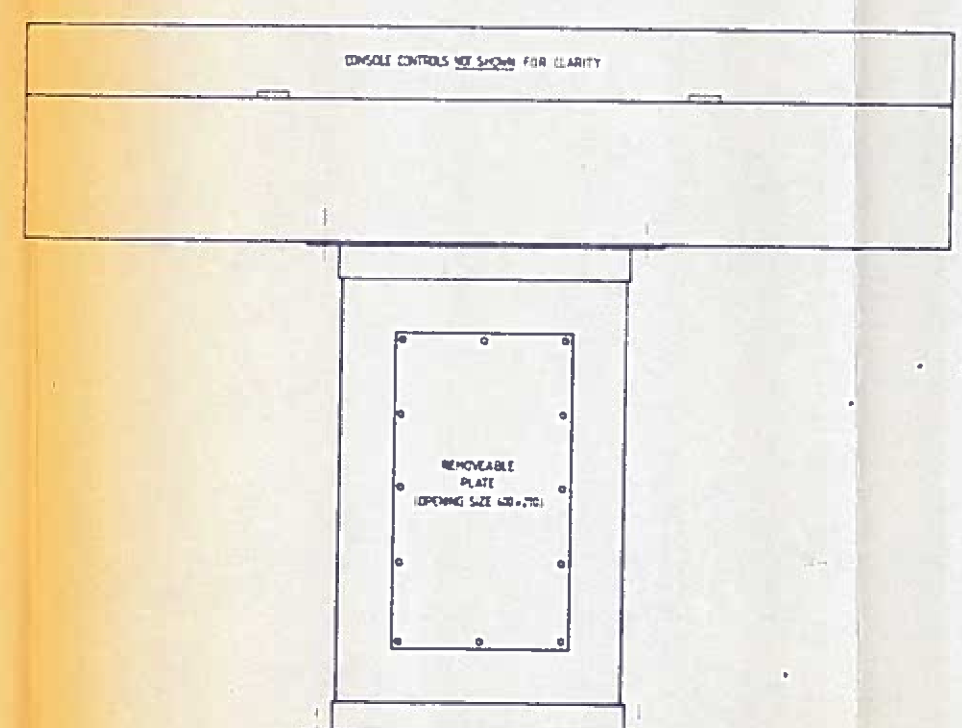
FEED BAR

SCALE		REV 3	REV 2	REV 1	INDUSTRIAL & MARINE SWITCHGEAR AMSTERDAM ROAD, SUTTON FIELDS INDUSTRIAL ESTATE, HULL, ENGLAND. TEL 0482 831222 TELEX 82237	CUSTOMER- PACIFIC WINCHES LTD (BURRARD)	SYSTEM- GENERAL ARRANGEMENT OF SPEED CRANE STARTER PANELS	DRAWN S.P THOMAS DATE 4/10/84	DWG. No.
1:10									

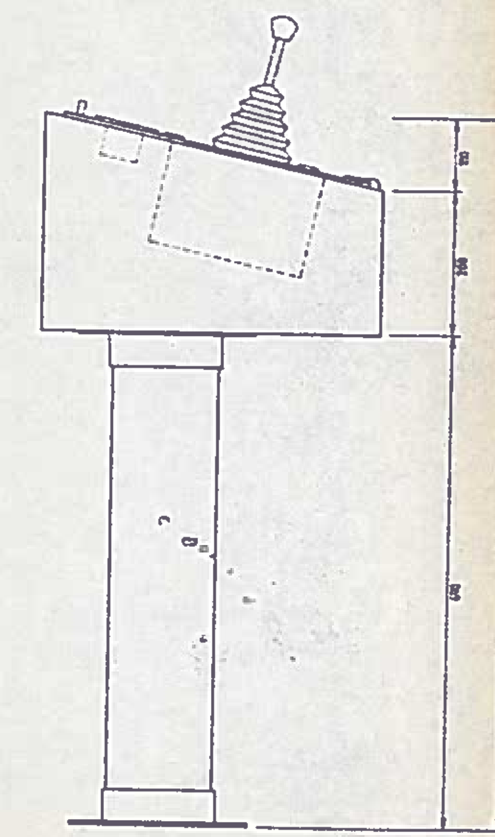


PLAN VIEW

NOTES
1 ALL CONTROL EQUIPMENT IS MOUNTED ON 10SWG STEEL CONSOLE FACIA
2 BARRIER PLATES ARE RUN BETWEEN JOYSTICK CONTROLLERS TO ACT AS INTERFERENCE SCREENING
3 TORQUE LIMITING SETTING POTENTIOMETER IS MOUNTED IN DC DRIVE PANEL
4 MAIN/AUX HOIST HIGH SPEED PUSHBUTTONS ARE MOUNTED IN THE JOYSTICK HANDLES
5 CONSOLE FACIA MAY BE HINGED FORWARD FOR ACCESS TO WIRING.

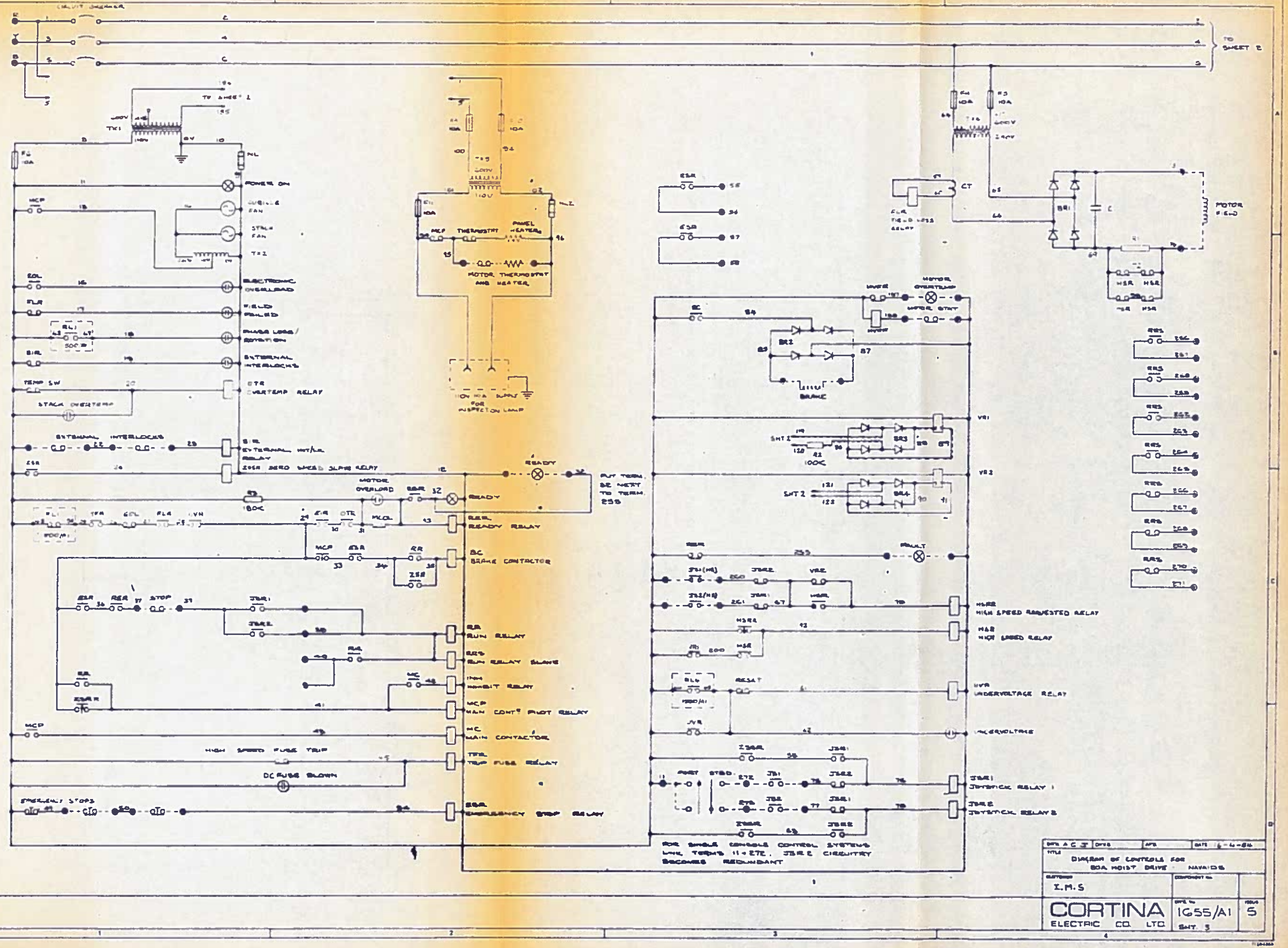


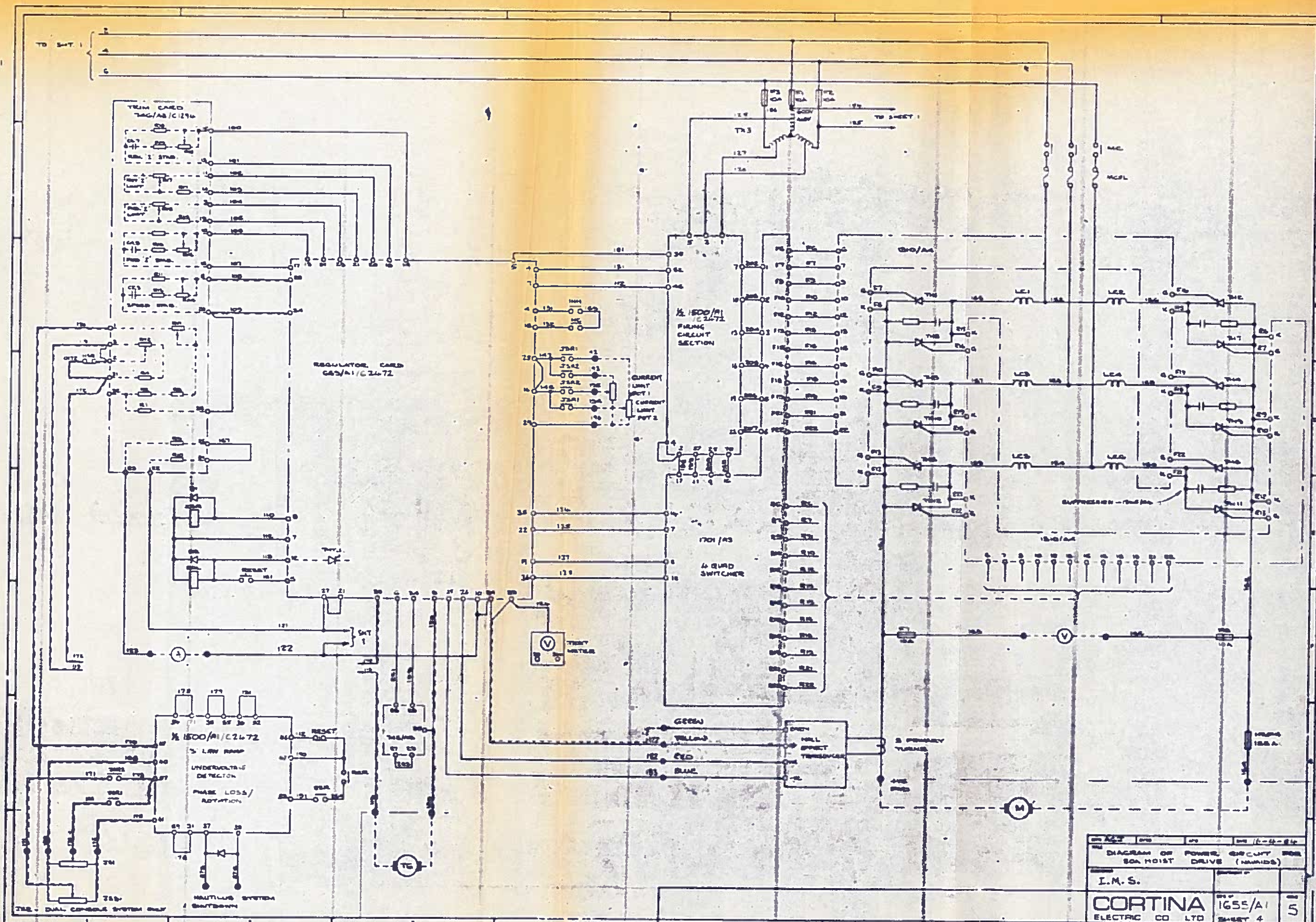
FRONT ELEVATION

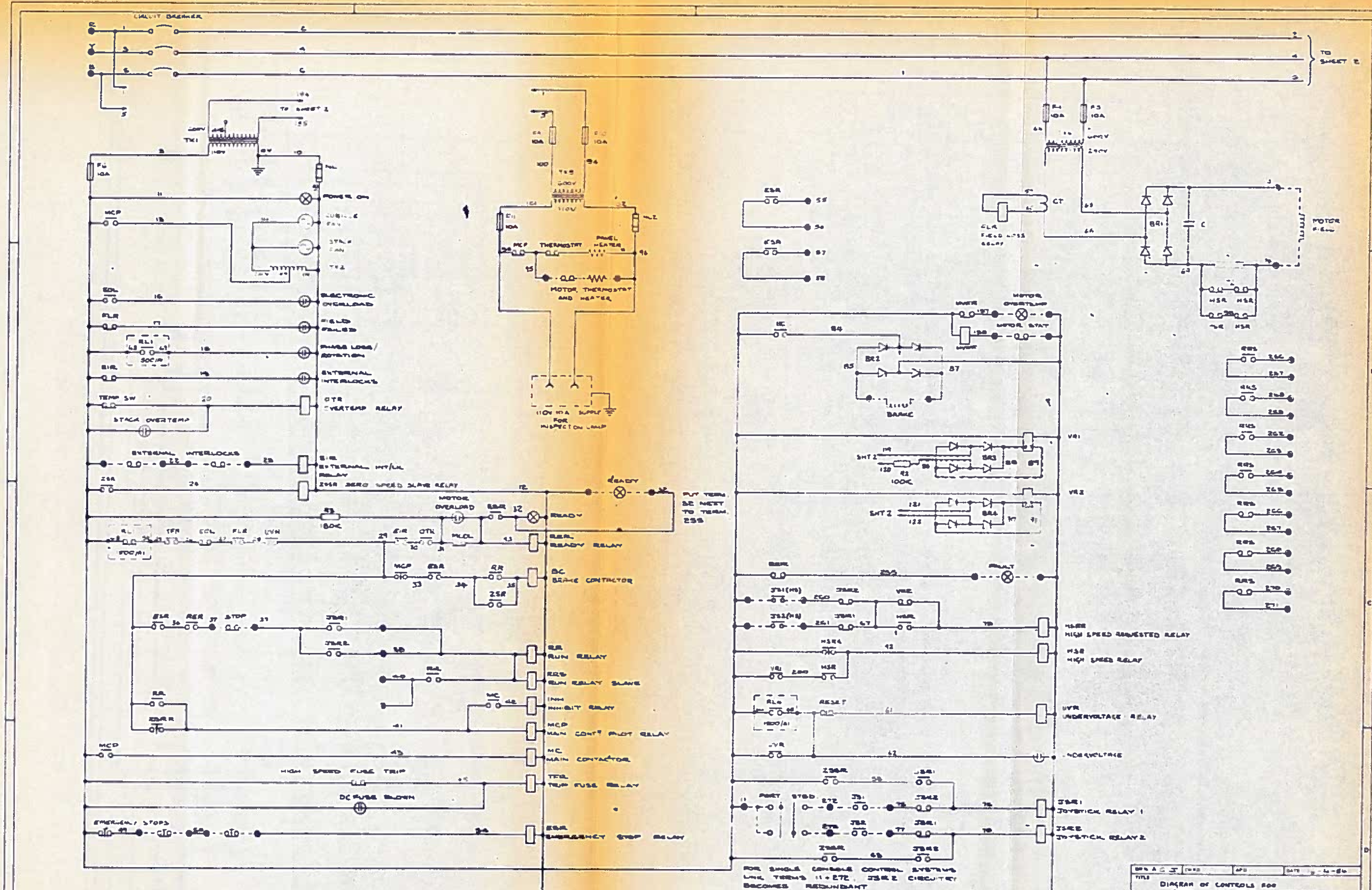


END ELEVATION

SCALE		REV 3	REV 2	REV 1	INDUSTRIAL & MARINE SWITCHGEAR AMSTERDAM ROAD, SUTTON FIELDS INDUSTRIAL ESTATE, TEL 0482 831222	CUSTOMER: PACIFIC WINCHES LTD	SYSTEM: GENERAL ARRANGEMENT OF PEDESTAL TYPE CONTROL CONSOLES	DRAWN S.P THOMAS	DWG. No.
1:5									


TO SHEET 2
TO SHEET 1
POWER ON
BLOWER FAN
STACK FAN
ELECTRONIC OVERLOAD
FIELD FAILED
BRAKE LOSS / ROTATION
EXTERNAL INTERLOCKS
OTR OVERTEMP RELAY
STACK OVERTEMP
TEMP SW
EXTERNAL INTERLOCKS
ESR ZERO SPEED SLAVE RELAY
MOTOR OVERLOAD
READY
RRR READY RELAY
BC BRAKE CONTACTOR
RUN RELAY
RUN RELAY SLAVE
INHIBIT RELAY
MCP MAIN CONT PILOT RELAY
MC MAIN CONTACTOR
TFR TRIP FUSE RELAY
HIGH SPEED FUSE TRIP
DC FUSE BLOWN
EMERGENCY STOPS
ESR EMERGENCY STOP RELAY
MOTOR THERMOSTAT AND HEATER
PANEL HEATER
THERMSTAT
ON HEA SUPPLY FOR INSPECTION LAMP
CT
FIELD FAILED RELAY
MOTOR FIELD
HSR HSR
BRAKE
MOTOR OVERLOAD
MOTOR START
FAULT
HSRR HIGH SPEED RAMPRESTED RELAY
HSR HIGH SPEED RELAY
UVR UNDERVOLTAGE RELAY
UNDERVOLTAGE
JSR1 JOYSTICK RELAY 1
JSR2 JOYSTICK RELAY 2
FLT TERM SEE NEXT TO TERM 259
FOR SINGLE CONSOLE CONTROL SYSTEMS LINK TERMS 11 + 27E. JSR 2 CIRCUITRY BECOMES REDUNDANT
DIAGRAM OF CONTROLS FOR 80A HOIST DRIVE NAVAIDS
I.M.S
CORTINA ELECTRIC CO. LTD.
1655/A1
SHT 5
ISSUE 5


TO SHT. 1
TRIM CARD
745/A8/C1294
REGULATOR CARD
685/A1/C2472
½ 1500/A1/C2472
FIRING CIRCUIT SECTION
CURRENT LIMIT POT 1
CURRENT LIMIT POT 2
1701/A3
4 QUAD SWITCHER
TX3
TO SHEET 1
MC
MCFL
RESET
TEST METER
TG
½ 1500/A1/C2472
S LAW RAMP
UNDERVOLTAGE DETECTOR
PHASE LOSS/ROTATION
NAUTILUS SYSTEM SHUTDOWN
DUAL CONSOLE SYSTEM ONLY
GREEN
YELLOW
RED
BLUE
HALL EFFECT TRANSDUCER
3 PRIMARY TURNS
SUPPRESSION
M
DIAGRAM OF POWER CIRCUIT 50A HOIST DRIVE (NAVAIDS)
I.M.S.
CORTINA ELECTRIC CO LTD
1655/A1
SHEET 4
5



DRN A C J	CHKD	APD	DATE 9-4-84

TITLE: DIAGRAM OF CONTROLS FOR 275A HOIST DRIVE - NAVAIDS

CUSTOMER: I.M.S

COMPONENT No.

CORTINA ELECTRIC CO LTD

DRG No. 1665/A1 SHT. 3

ISSUE 5

SECTION 8.0
ELECTRICAL PARTS LISTS

PARTS LIST

DESCRIPTION	SUPPLIER MANUFACTURER	PART No.	ORDER No.	No. OFF
MAIN CIRCUIT BREAKER	TERASAKI	TG TYPE		1
10.3HP CIRCUIT BREAKER	"	" "		1
LOW SPEED CONTACTOR/REVERSE	BBC	B30+VB30		2
MED " " "	"	B65+VB85		2
HI " " "	"	B105		2
POLE CHANGE CONTACTOR	"	B65		1
O/L RELAYS	MTE	01/156/0		3
CONTROL TRFR	TRANILAMP	400VA		1
ANTI-COND TRFR	"	500VA		1
BRAKE TRFR	"	200VA		1
BRAKE RECTIFIER	R.S	RECT		1
SUPPRESSOR	"	VDR		1
BRAKE CONTACTOR	BBC	BC		1
SLAVE RELAY	"	R1, R2		3
TIMERS	ELTIME	T1 - T4		4
ANTI-COND HEATER	ELDON			1
READY LAMP	BBC	30mm		1
POWER ON	"	30mm		1
ENG STOP PB	"	30mm		1
FUSE LINK + BASE	GEC	RS32		14
LIMIT RELAYS	BBC	R3-R5		3
EMG STOP RELAY	"	R		
PANEL THERMOSTAT	SATCHWELL	STAT		
CONSOLE COMPONENTS:-				
AMMETER	CROMPTON	FIESTA L/S		1
JOYSTICK (TOPPING)	T.E	XKM		1
" (HYD/CHAIN HANDLING)	"	XKB		2
" (MAIN/AUX HOISTS)	"	XKM		2
EM STOP PB	BBC	30mm		1
LIGHTS/PUSHBUTTONS & SWITCHES	T.E	22.5 SQUARE		21
POTENTIOMETER	PANNY & GILES	SYNCHRO 15		4
TRANSFORMER	CARROLL & MEYNELL	150VA		1
CONSOLE PORT/STBD C/O SWITCH	U K SOLENOID	C TYPE		1

CUSTOMER:- PACIFIC WINCHES
Constant Torque
82.7HP DOL Topping Winch

INDUSTRIAL & MARINE SWITCHGEAR
AMSTERDAM ROAD, SUTTON FIELDS IND. EST.
HULL, ENGLAND.

DRG. No. IMS 1356
DATE 22.3.84

PARTS LIST

DESCRIPTION	SUPPLIER MANUFACTURER	PART No.	ORDER No.	No. OFF
MAIN CIRCUIT BREAKER	TERASAKI	TG TYPE		1
5.5HP CIRCUIT BREAKER	"	" "		1
LOW SPEED CONTACTOR/REVERSE	BBC	B25 + VB30		2
MED " " "	"	B45 + VB85		2
HIGH " " "	"	B65		2
POLE CHANGE CONTACTOR	"	B45		1
O/L RELAYS	MTE	01/156/0		3
CONTROL TRANSFORMER	TRANILAMP	400VA		1
ANTI-COND TRFR	"	500VA ()		1
BRAKE TRFR	"	200VA		1
BRAKE RECTIFIER	R.S	RECT		1
SUPPRESSOR	"	VDR		1
BRAKE CONTACTOR	BBC	BC		1
SLAVE RELAY	"	R1, R2		4
TIMERS	ELTIME	T1-T4		4
ANTI-COND HEATER	ELDON			1
READY LAMP	BBC	30mm		1
POWER ON	"	30mm		1
ENG STOP PB	"	30mm		1
FUSE LINK & BASE	GEC	RS32		14
LIMIT RELAYS	BBC	R3-R6		4
PANEL THERMOSTAT	SATCHWELL	STAT		
CONSOLE COMPONENTS:-				
AMMETER	CROMPTON	FIESTA L/S		1
JOYSTICK (SLEWING)	T.E	XKM		1
" (HYD/CHAIN HANDLING)	"	XKB		2
" (MAIN/AUX HOISTS)	"	XKM		2
EM STOP PB	BBC	30mm		1
LIGHTS/PUSHBUTTONS & SWITCHES	T.E	22.5mm SQUARE		21
POTENTIOMETERS	PENNY & GILES	SYNCHRO 15		4
TRANSFORMER	CARROLL & MEYNELL	150VA		1
CONSOLE PORT/STBD C/O SIWTCH	U K SOLENOID	C TYPE		1

CUSTOMER:- PACIFIC WINCHES

CONSTANT TORQUE
53.54HP DOL SLEWING WINCH

INDUSTRIAL & MARINE SWITCHGEAR
AMSTERDAM ROAD, SUTTON FIELDS IND. EST.
HULL, ENGLAND.

DRG. No. IMS 1356

DATE 22.3.84

HG

RTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1665/A1	SHEET 1 OF 1
TLE HOIST DRIVE 80A		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2
HER NOTES 1 MS 4Q				

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	4Q SWITCHER CARD		1701/A3				
1	4Q REGULATOR CARD (EXTERNAL POTS)		669/A1/C2472				
1	FIRING CIRCUIT		1500/A1/C2472				
2	PULSE TRANSFORMER CARD		1310/A4				
1	AUX. COMPONENTS CARD		746/A3/C1294				
1	SUPPRESSION CARDS		1345/A4				
1	CURRENT TRANSDUCER	HEME LC 600					
6	TT121N 1800V		TH1-12				
1	HIGH SPEED FUSES	110 EETI	HSF1,				
4	MICROSWITCHES FOR HSF1-4						
1	70°C THERMAL SWITCH	RS339-308	TEMP SW				
1	300mm SG125 HEATSINK						
	C/W 110V COOLING FAN						

RTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1665/A1	SHEET 2 OF 7
TLE HOIST DRIVE 80A		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2
HER NOTES 1M S 4Q				

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
			1				
2	AMMETER CROMPTON TYPE FIESTA LONG SCALE		A				
	1mA-0-1mA SCALED 100-0-100 A						
1	TESTMETER	RS259-779	TESTMETER				
1	MOUNTING PANEL TO 787/A4		4				
2	INSULATED SOCKETS.	RS444-668	11				
1	COILED TWIN CORE	RS377-912	11				
1	RED PROBE	RS423-633	11				
1	PLUG	RS440-220	11				
1	TRANSFORMER	RS 207-093	TX2				

RTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1665/A1	SHEET 3 OF 7
TLE HOIST DRIVE	80A	ENG. DK	ISSUE DATE 2-5-84	ISSUE 1 2
HER NOTES 1 MS	4Q			

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	SINGLE PHASE DOUBLE WOUND TRANSFORMER		TX1				
	PRI. 0-415-575V						
	SEC. 0-110V 750VA 50/60 Hz						
8	RED NEONS	RS 576-024					
1	FAULT INDICATION PANEL—MOUNTED INTERNALLY						
	(11) STACK OVERTEMP						
	(11) STACK FUSE BLOWN						
	(11) MOTOR OVERLOAD						
	(11) ELECTRONIC OVERLOAD						
	(11) FIELD FAILED						
	(11) PHASE LOSS/ROTATION						
	(11) EXTERNAL INTERLOCK						
	(11) UNDERVOLTAGE.						

RTINA ELECTRIC CO. LTD | COMPONENT SCHEDULE | JOB NO. C2472 | DRAWING NO. 1665/A1 | SHEET 4 OF 11

TLE HOIST DRIVE 80A 4Q | ENG. DK | ISSUE DATE 2-5-84 | ISSUE 2

HER NOTES 1 MS

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
11	NS10 FUSES		F1-				
11	NSH FUSEHOLDERS BLACK	GEC	F1-11				
2	" " WHITE	GEC	NL1-2				
2	ELECTROMATIC VOLTAGE RELAYS 2-20V	170-354	VR1,2				
1	RESISTOR ½ W		R2				
14	RELAYS K31E, 110V, 60Hz	BBC	EIR, RER, RR, INH JSR1, JSR2, BC HSRR, MCP, ESR, TFR, OTR, ZSSR				
3	N/O CONTACT CA7-10	BBC	ESR, JSR1, JSR2				
3	N/C CONTACT CA7-01	BBC	ESR, HSR				
11	DIN RAIL MOUNTING BASE FOR ITEMS F, G						
1	CONTACTOR B85-30-22, 110V, 60Hz	BBC	MC				
1	OVERLOAD RELAY FOR ABOVE T85, 60-100A	BBC	MCOL				
	SUPPRESORS FOR ITEMS F, G, L, M	RS238-463					
1	TIMER HEAD TP40D	BBC	MCP, HSRR				
1	" TP401	BBC	ZSRR				
1	RELAY K22E, 110V, 60Hz	BBC	HSR				

ORTINA ELECTRIC CO. LTD | COMPONENT SCHEDULE | JOB NO. C2472 | DRAWING NO. 1665/A1 | SHEET 5 OF 7

TITLE HOIST DRIVE 80A 4Q | ENG. DK | ISSUE DATE 2-5-84 | ISSUE 2

OTHER NOTES 1 MS

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	KMK 2P 6V DC RELAY		FLR				
2	KMK 3P 24V DC RELAY		ZSR, EOL				
3	BASES FOR ITEMS A, B (DIN RAIL MOUNTING)						
1	EM. STOP PB GHV 8810900R1	BBC	EM. STOP				
	(WITH CES CYLINDER LOCK RFB2)		"				
2	CONTACT BLOCK GHV872 2211 R1	BBC					
1	PB GHV881 01 01 R1	BBC	RESET				

ORTINA ELECTRIC CO. LTD | COMPONENT SCHEDULE | JOB NO. C2472 | DRAWING NO. 1665/A1 | SHEET 6 OF 7

TITLE HOIST DRIVE 80A 4Q | ENG. DK | ISSUE DATE 2-5-84 | ISSUE 2

OTHER NOTES 1 M 3

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	RESISTOR 165Ω 1A		R1				
1	CT 40:1 2·5VA		CT				
4	DIODE BRIDGE PM7A12Q OR EQ.	AEI	BR1-4				
2	IN4002 DIODES		D1, D2				
1	1MF 63V CAPACITOR	WIMA	C4				
1	1MF 440V CAPACITOR	RIC	C1				
6	40×20×20×0·5MM PERMAX F CORES		LC1-6				
1	THERMOSTAT	RS335-592					
1	PANEL HEATER - CUSTOMER TO SUPPLY.						
1	SINGLE PHASE DOUBLE WOUND TRANSFORMER		TX4				
	PRI. 575V SEC. 286V 500VA						
	50/60 HZ						

RTINA ELECTRIC CO. LTD | COMPONENT SCHEDULE | JOB NO. C2412 | DRAWING NO. 1665/A1 | SHEET 7 OF 7

TLE HOIST DRIVE 80A | ENG. DK | ISSUE DATE 2-5-84 | ISSUE 2

HER NOTES IMS

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	CIRCUIT BREAKER TL100E -100A I_{TH}						
	WITH TFH RESET OPEN HANDLE CLOCKWISE. TERESAKI						
1	3Ø AUTO TRANSFORMER 300VA		TX3				
	575V STAR WITH TAPPINGS AT 415V						
1	TRANSFORMER DOUBLE WOUND		TX5				
	PRI. 575V SEC 230V 300VA						
1	INDICATING LIGHT GHV8819013 R1	BBC	POWER ON				
1	" " GHV8819115 R1	BBC	READY				
2	LAMP SOCKET FOR DIRECT CONNECTION GHV8792291 R1	BBC	POWER ON/READY				
2	FILAMENT LAMP 110V, 1.2W BA9s	BBC	" "				

MG

ORTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1655/A1	SHEET 1 OF 7
TLE HOIST DRIVE 275A		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2
HER NOTES 1 MS 4Q				

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	4Q SWITCHER CARD		1701/A3				
1	4Q REGULATOR CARD C2472 MOD		669/A1/C2472				
1	FIRING CIRCUIT 1500/A1 MOD		1500/A1/C2472				
2	PULSE TRANSFORMER CARD		1310/A4				
1	SNUBBER CARD		1345/A4				
1	AUX. COMPONENTS CARD		746/A3/C1294				
1	CURRENT TRANSDUCER	HEME LC 600					
12	THYRISTORS T388 1800V		TH1 - 12				
1	HIGH SPEED FUSES 350 MMTI		HSF1				
4	MICROSWITCHES FOR HSF1-4						
2	70°C THERMAL SWITCH	RS339-308	TEMP SW				
2	599/A2 HEATSINK						
6	754/A2 HEATSINK						
2	598/A2 MOUNTING PLATE						
6	CLAMPS 230-1-D (OR 230-1-E)						
6	COPPER SPACERS/CONNECTORS FOR STACK						

RTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1655/A1	SHEET 2 OF 7
TLE HOIST DRIVE 275A		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2

HER NOTES 1M S 4Q

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
2	AMMETER CROMPTON TYPE FIESTA LONG SCALE		A				
	1mA-0-1mA SCALED 400-0-400A						
1	TESTMETER	RS259-779	TESTMETER				
1	MOUNTING PANEL TO 787/A4		"				
2	INSULATED SOCKETS	RS444-668	"				
1	COILED TWIN CORE	RS377-912	"				
1	RED PROBE	RS423-633	"				
1	PLUG	RS440-220	"				
1	AUTO TRANSFORMER	RS 207-087	TX2				

ORTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1655/A1	SHEET 3 OF 7
TLE HOIST DRIVE 275A		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2
CHER NOTES 1 MS 4Q				

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	SINGLE PHASE DOUBLE WOUND TRANSFORMER		TX1				
	PRI. 0-415-575V						
	SEC. 0-110V 750VA 50/60Hz						
8	RED NEONS	RS 576-024					
1	FAULT INDICATION PANEL—MOUNTED INTERNALLY						
	(11) STACK OVERTEMP						
	(11) STACK FUSE BLOWN						
	(11) MOTOR OVERLOAD						
	(11) ELECTRONIC OVERLOAD						
	(11) FIELD FAILED						
	(11) PHASE LOSS/ROTATION						
	(11) EXTERNAL INTERLOCK						
	(11) UNDERVOLTAGE						

ORTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1656/A1	SHEET 4 OF 7
ITLE HOIST DRIVE 275A 40		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2
THER NOTES IMS				

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
11	NS10 FUSES		F1-15				
11	NSH FUSEHOLDERS BLACK	GEC	F1-15				
2	" " WHITE + LINK	GEC	NL1-2				
2	ELECTROMATIC VOLTAGE RELAY 2-20V 170-354		VR1, 2				
1	RESISTOR 1/2 W		R2				
14	RELAYS K31E, 110V, 60Hz	BBC	EIR, RER, RR, INH JSR1, JSR2, 3C HSRR, MCP, ESR, TFR, OTR, ZSSR				
3	N/O CONTACT CA7-10	BBC	ESR, JSR1, JSR2				
3	N/C CONTACT CA7-01	BBC	ESR, HSR				
13	DIN RAIL MOUNTING BASE FOR ITEMS F, G						
1	CONTACTOR B250-30-22, 110V, 60Hz	BBC	MC				
1	OVERLOAD RELAY FOR ABOVE T250, 160-250A	BBC	MCOL				
15	SUPPRESORS FOR ITEMS F, G, L, M	RS238-463					
2	TIMER HEAD TP40D	BBC	MCP, HSRR				
1	" TP401	BBC	ZSRR				
1	RELAY K22E, 110V, 60Hz	BBC	HSR				

ORTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1655/A1	SHEET 5 OF 7
ITLE HOIST DRIVE 275A 4Q		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2

OTHER NOTES 1 MS

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	KMK 2P 6V DC RELAY		FLR				
2	KMK 3P 24V DC RELAY		ZSR, EOL				
3	BASES FOR ITEMS A, B (DIN RAIL MOUNTING)						
1	EM. STOP PB GHV 8810900R1	BBC	EM. STOP				
	(WITH CES CYLINDER LOCK RFB2)		"				
2	CONTACT BLOCK GHV872 2211 R1	BBC					
1	PB GHV 881 01 01 R1	BBC	RESET				

ORTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1655/A1	SHEET 6 OF 7
ITLE HOIST DRIVE	275A. 4Q	ENG. DK	ISSUE DATE 2-5-84	ISSUE 2

THER NOTES 1 M S

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	VARIABLE RESISTOR 50Ω 4A.		R1				
1	CT 40:1 2·5VA		CT				
1	DIODE BRIDGE PM7A12Q OR EQ.	AEI	BR1-4				
2	IN4002 DIODES		D1, D2				
1	1MF 63V CAPACITOR	WIMA	C4				
1	1MF 440V CAPACITOR	RIC	C1				
6	40×20×20×0·5MM PERMAX F CORES		LC1-6				
1	THERMOSTAT	RS335-592					
1	PANEL HEATER - CUSTOMER TO SUPPLY.						
1	SINGLE PHASE DOUBLE WOUND TRANSFORMER		TX4				
	PRI. 575V SEC. 286V 1100VA						
	50/60 Hz						

ORTINA ELECTRIC CO. LTD	COMPONENT SCHEDULE	JOB NO. C2472	DRAWING NO. 1655/A1	SHEET 7 OF 7
ITLE HOIST DRIVES - 4 QUAD		ENG. DK	ISSUE DATE 2-5-84	ISSUE 2

THER NOTES IMS

QTY	TYPE & DESCRIPTION	MANUFACTURER	DRAWING REF.	STOCK B/O	DLY NOTE	ORDER	PRICE
1	CIRCUIT BREAKER TL400E-300A I_{TH}						
	WITH TFH RESET OPEN HANDLE CLOCKWISE. TERESAKI						
1	3Ø AUTO TRANSFORMER 300VA		TX3				
	575V STAR WITH TAPPINGS AT 415V						
1	TRANSFORMER DOUBLE WOUND		TX5				
	PRI. 575V SEC. 230V 400VA 50/60Hz						
1	INDICATING LIGHT GHV8819013R1	BBC	POWER ON				
1	" " GHV8819115R1	BBC	READY				
2	LAMP SOCKET FOR DIRECT CONNECTION GHV8792291R1	BBC	POWER ON/READY				
2	FILAMENT LAMP 110V, 1·2W BA9s	BBC	" "				

SECTION 9.0

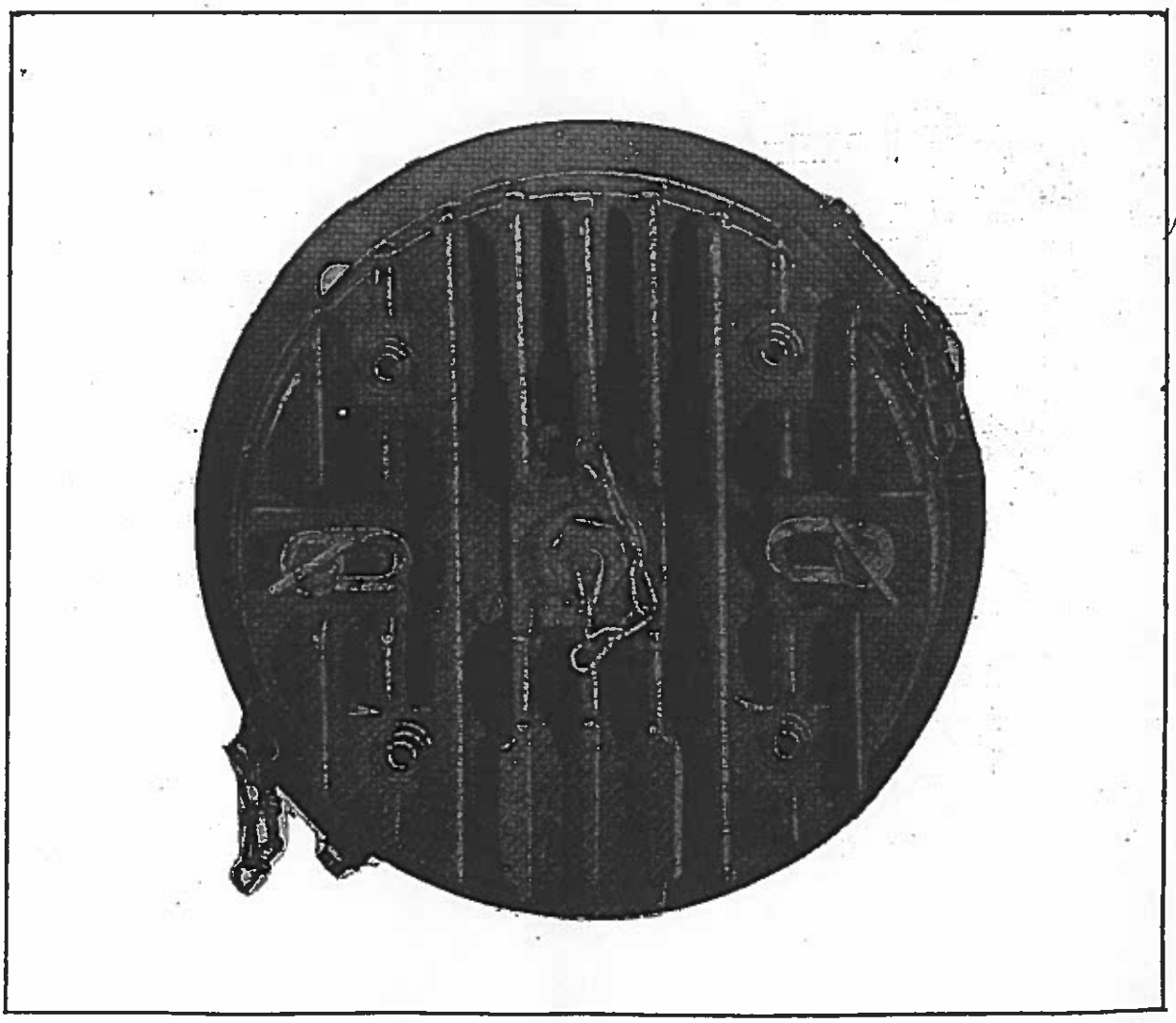
Simplatroll

Spring loaded fail-safe brake with seawater protectio

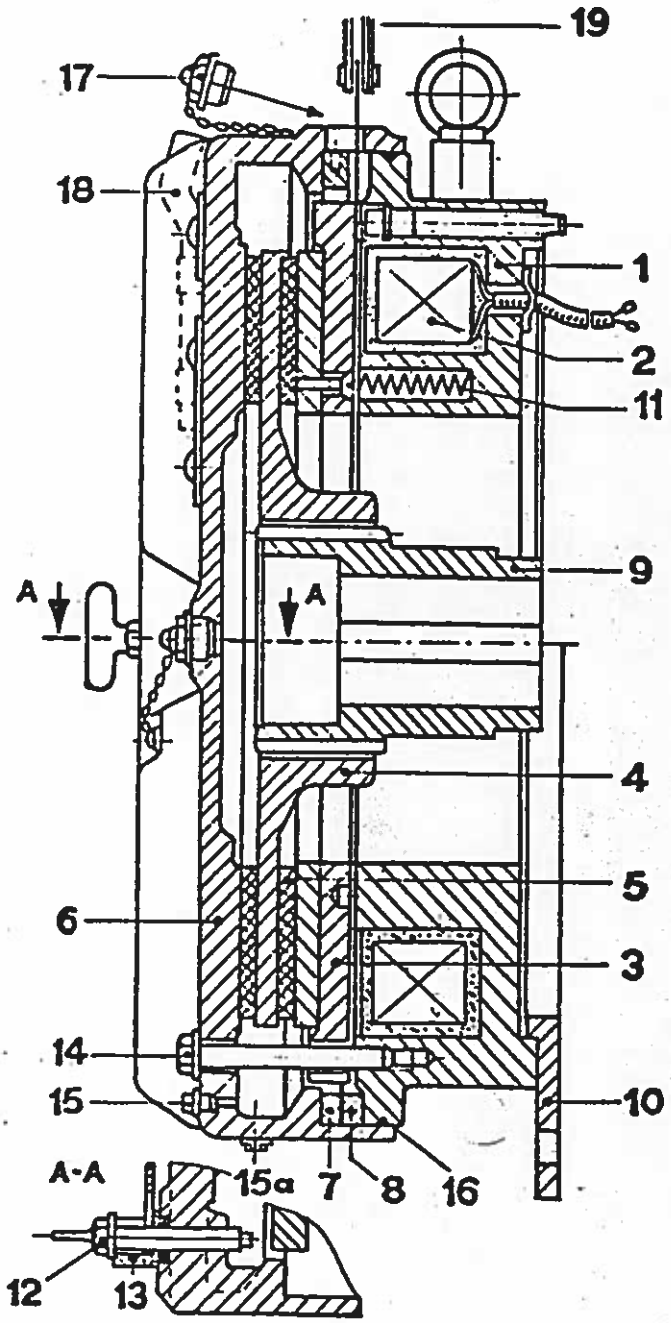
Type 14.441.□□.1.3

Simplatroll Ltd.

Simplatroll Ltd., Caxton Road, Bedford, UK
MK 41 OHT, Tel. (0234) 46161, Telex 825308



Operating and Maintenance Instructions



1. Coil Body
2. Coil
3. Armature
4. Rotor
5. Friction Material
6. Brake Cover
7. Adjustment Ring
8. Spacer
9. Hub
10. Flange
11. Braking Spring
12. Manual Release Screw (wing type) used on sizes up to 33
13. Slotted Spacer
14. Cover Retaining Screw
15. Condensation Drainage Screw used on sizes up to 33

15a. Condensation Drainage Screw used on sizes 37-51

16. Seal
17. Plug
18. Wrench for Manual Release Screws used on sizes 37-51
19. Feeler for checking Airgap

METHOD OF OPERATION

The Simplatroll corrosion-proof failsafe brake type 14.441 operates in a similar fashion to our series 14.438 brakes. The armature plate (3) presses the rotor (4) against the cover (6) using the compression springs (11). This is the state when no current is flowing in the coil and thus the brake is engaged. When the coil (2) is energised, the armature plate (3) is attracted to it against the pressure of the springs (11) thus releasing the rotor (4) and permitting it to rotate.

Should the electricity supply fail, the brake can be released mechanically by loosening the two manual release screws (12) and their associated slotted spacers should be moved over to their thinner parts and then the manual release screws tightened alternately which will force the armature plate away from the rotor. This will permit the rotor to rotate freely.

Sizes 27-33 utilise winged screws to released the brake whereas all larger sizes use two retained wrenches (18).

INSTALLATION

A. It is important that the braked shaft and the surface to which the brake is to be mounted, should be properly aligned with each other.

(1) The shaft must be square with the mounting surface.

(2) Maximum permissible run-out of the shaft is:
up to size 33 ..... 30 um from size 37 ..... 60 um
when measured between shaft and brake mounting surface at a radius approximating that of the brake.

B. The cover ribbing should be arranged as perpendicularly as possible to give the best heat dissipation and to prevent accumulation of dirt. The name plate should be on top.

C. Any grease, proprietary corrosion protection compound or paint should be removed from the mounting flange, internal parts and from the hub. The hub can then be fitted to the shaft and secured axially with circlips or an axial tightening screw.

D. To permit the rotor to slide freely on the hub, the splines should be very lightly greased with a high temperature grease containing Molybdenum Disulphide. This can most easily be done with a brush.

E. The brake can then be slid over the hub so that the splines engage in the rotor and the housing finally located on the inner register of the flange.

SERVICING

Regular servicing of these brakes is simple and is confined principally to adjustment. In addition, the condensation drainage screw (15) should be removed at certain intervals depending on the duty and conditions of use. Any condensation should be allowed to run out. After approximately 200-300 operating hours, the interior of the brake should be cleaned to remove abraded friction material.

The brake can be dismantled as follows: (Care when performing this operation! Certain parts can reach a maximum temperature of 150°C.)

1. Release all the cover retaining screws evenly (14).
2. Remove the cover together with the adjustment ring (7).
3. Pull off the rotor (4).
4. Remove the armature plate (3).

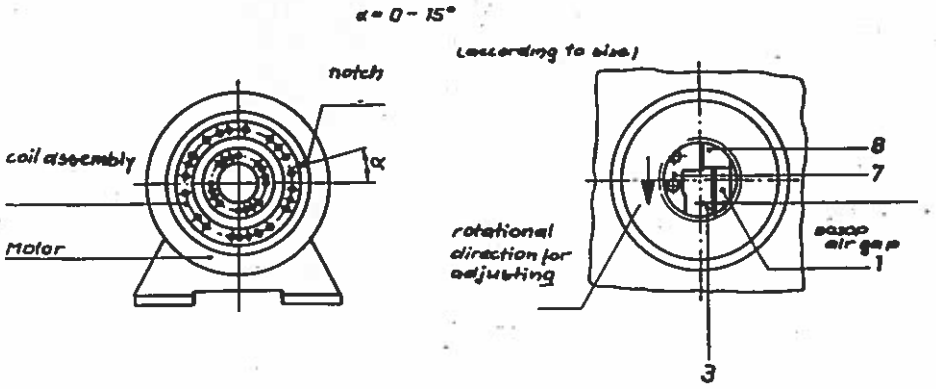
To reassemble, reverse the above procedure.

ADJUSTMENT

The brake should be adjusted when it has been fitted and also when the maximum airgap has been reached. The nominal airgap to which the brake should be adjusted is given on the plate fitted on the outside of all brakes.

For the initial adjustment, any airgap between the maximum and minimum permissible figures can be set. When this has been done, the brake should be run in and then readjusted.

The first adjustment step can therefore be regarded as a run-in step. The airgap can be checked by using a feeler to measure the gap between the armature and coil body when the coil is <u>not</u> energised. This gap can be accessed by removing the plug-cum-locking screws (17). On slightly releasing the cover fixing screws (14) the adjusting ring (7) can be turned with a suitable instrument inserted into the holes in the ring. This adjustment ring is made so that it operates in steps, each step adjusting the brake from its maximum permissible airgap to the correct nominal value. This value is given on the name plate and is known as 'Aus min'. It is important to turn the adjusting ring one full step at a time so that the spacers (8) sit squarely on the steps of the ring. The cover fastening bolts should then be retightened evenly and the airgap setting checked. When correct, the plugs (17) should be replaced.



Note: Wear of the friction material is much higher in the first few hours of use than it is after this initial running-in period. The frequency of checking and readjustment of the airgap must be individually determined according to the brake loading.

There may be an airgap between the armature plate and the coil when the coil is energised. The value of this airgap is fixed by the assembly bolts and will remain constant. Tolerance +0.1 to -0.15 mm.

The maximum permissible airgap is that airgap at which the brake will still function. Any further enlargement may prejudice the operation of the brake. Therefore if this value has been reached the brake must be adjusted. This value is given on the name plate and may be known as 'Aus max'.

FAULT FINDING

If the brake does not release electrically, then the fault may be as follows:-

1. Maximum airgap has been exceeded.

   Rectify by adjustment or replacement of the rotor.

2. Electrical cable or terminal block has been damaged.

3. Coil has been damaged.

4. Abraded particles have accumulated between the magnetic pole faces and the armature plate.

   Rectify by cleaning the brake.

If the brake appears to perate correctly but there is too little torque, then the fault may be as follows:-

1. Lubricant has come into contact with the friction material.

2. Springs may have broken.

3. The mechanical release screws have not been returned to their normal position.

Rubbing of the rotor even when the brake is released may be caused by:-

1. The brake is not exactly square with the shaft because of particles such as fillings or turnings under the flange face.

2. The machine or motor face to which the brake is fixed is not square with the shaft.

TECHNICAL DATA

Normal Voltage: 110 volts d.c.

Protection: IP 56.

Coil manufactured to insulation class E (insulation class F is also available).

The brake has been manufactured to the specifications of the following organisations:-

Det Norske Veritas

Bureau Veritas

Lloyds Register of Shipping

Germanischer Lloyd

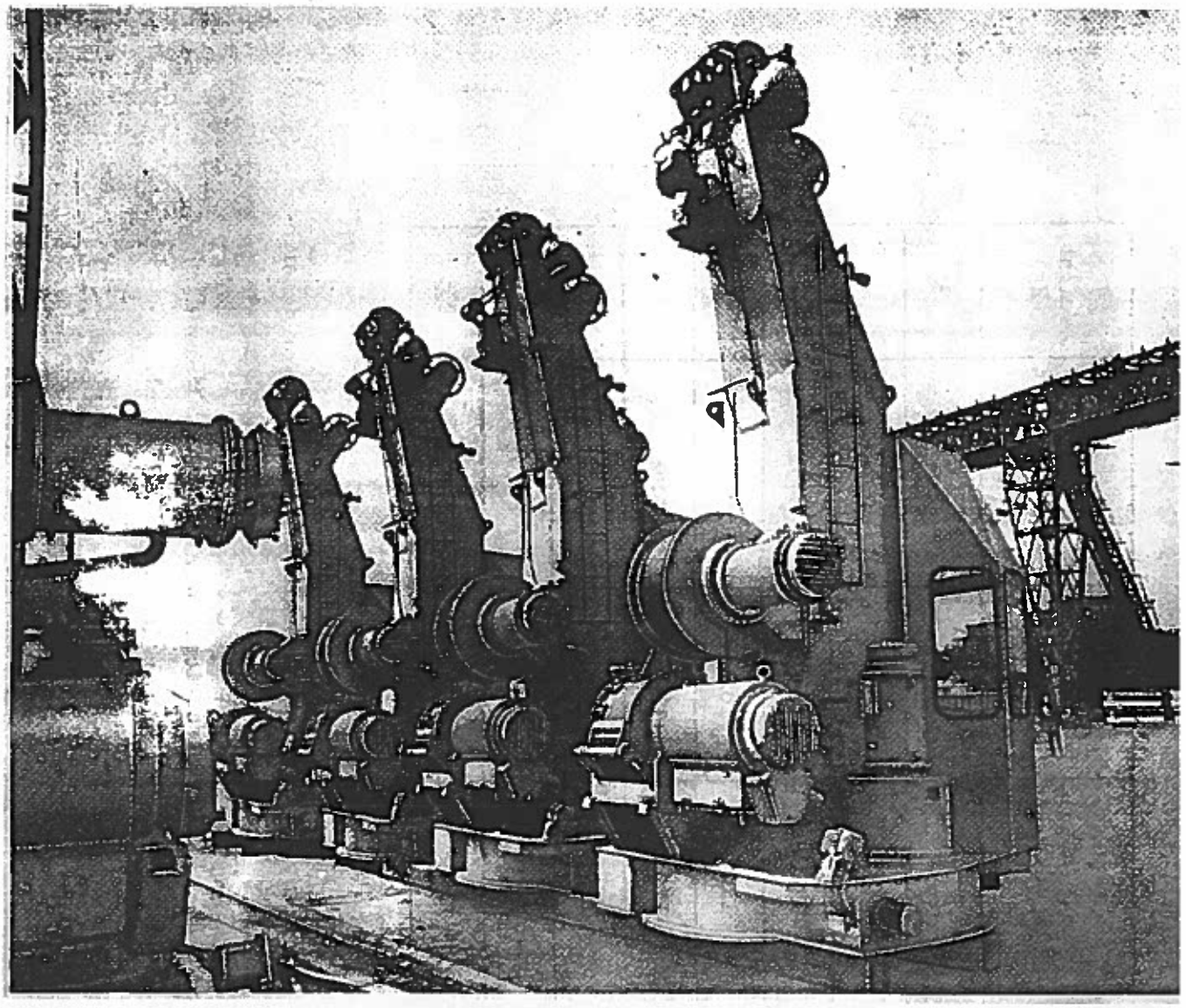
TECHNICAL PARAMETERS FOR BRAKE TYPE 14.441

Size	M_{dyn} (Nm)	M_{stat} (Nm)	1. n_r (rpm)	n_{max} (rpm)	Coil Volts (V d.c.)	Coil Power (W)	2. Power Dissipation (kW)	Weight (kg)
27	73·7 fib 100	110	1430	3500	110	120	0.21	30
30	117 160	180	1220	3500	110	129	0.25	40
33	184 250	275	1050	3500	110	138	0.31	54
37	294 400	440	905	3500	110	162	0.38	72
41	464 630	690	775	3500	110	189	0.46	95
47	737 1000	1100	665	3500	110	196	0.57	128
54	1179 1600	1760	570	3000	110	259	0.70	180
61	1843 2500	2750	490	3000	110	283	0.85	235

Notes

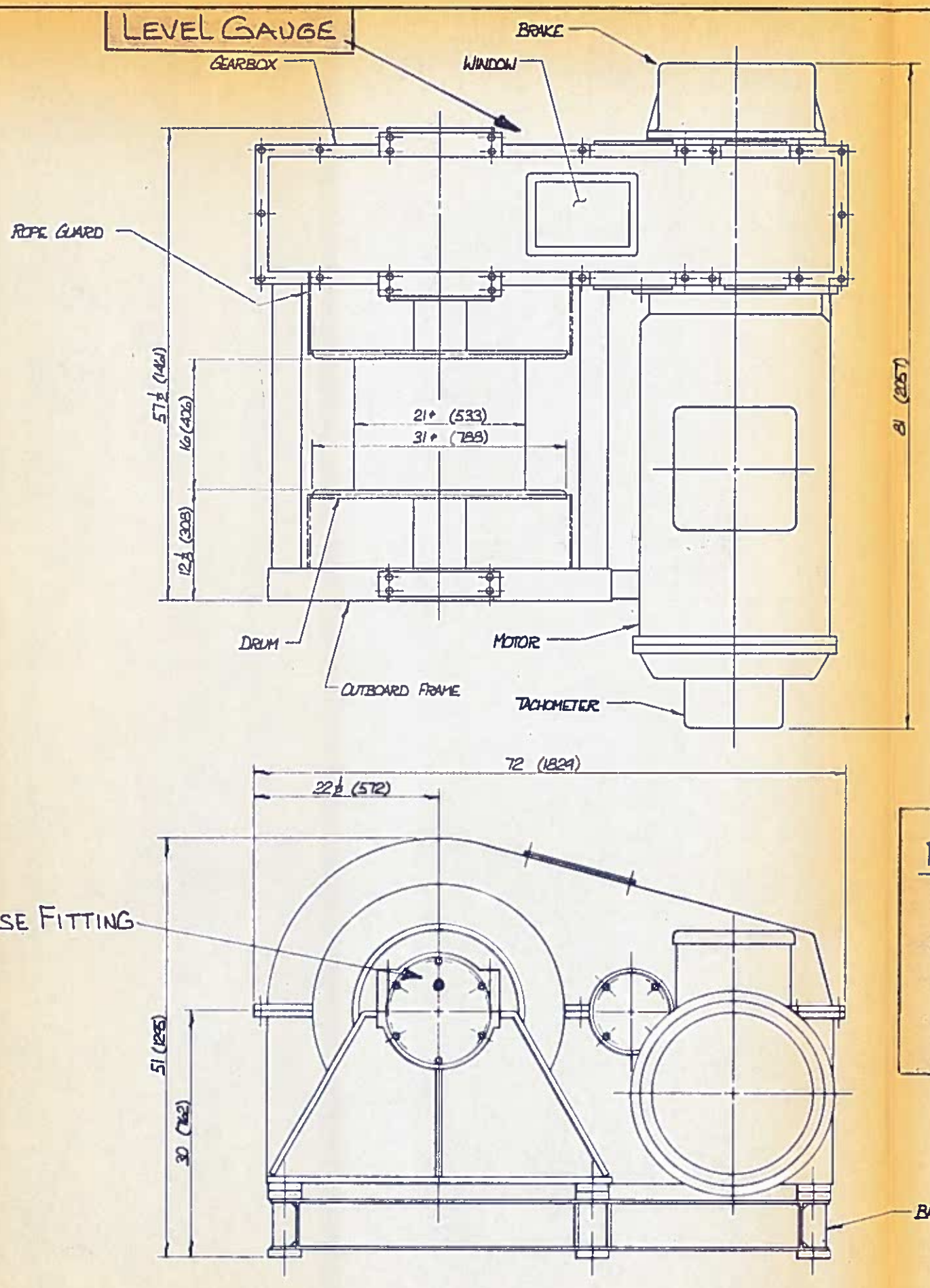
1. n_r:-Engagement speed - a reference speed in r.p.m. to which the dynamic torque and power dissipation are referred.

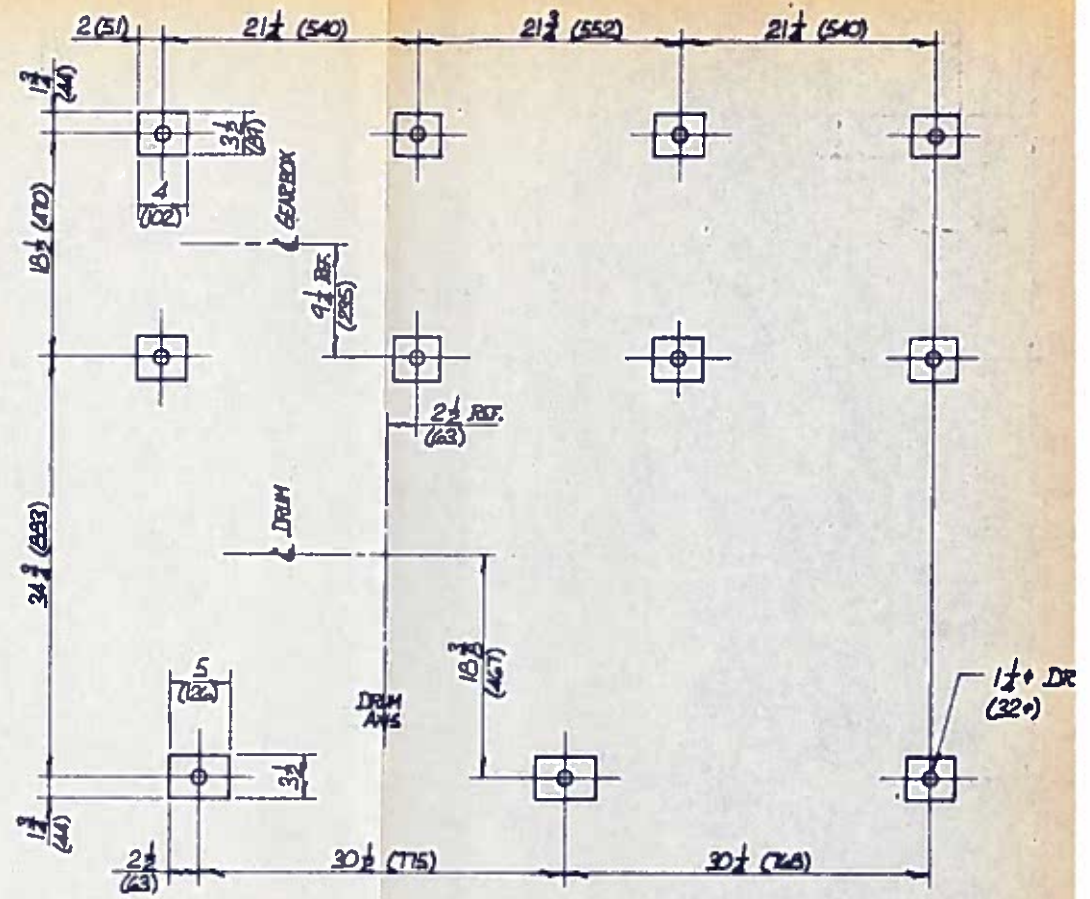
2. Power Dissipation: $P = 3{:}8 \times 10^{-10}$. $J. n^2 Z$ (kW), where electrical duty cycle is 40%. J is inertia Wk^2 in kgm^2. Z is operating frequency in ops/hr. n is rotational speed.



Simplatroll Ltd.

SECTION 10.0





SETTING PLAN

NOTE:

FOR CORRECT OIL LEVEL GAUGE GLASS MUST BE FULL

CAPACITY — 3-8 cuft

GRADE —GULF 120. SP.

"LUBRICATION"

ITEM	DWG. NO.	QTY.	TITLE OR MATERIAL	A.S.M.E. CLASS
20				
19				
18				
17				
16				
15				
14				
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3				
2				
1				

pacific winches ltd.
VANCOUVER, CANADA

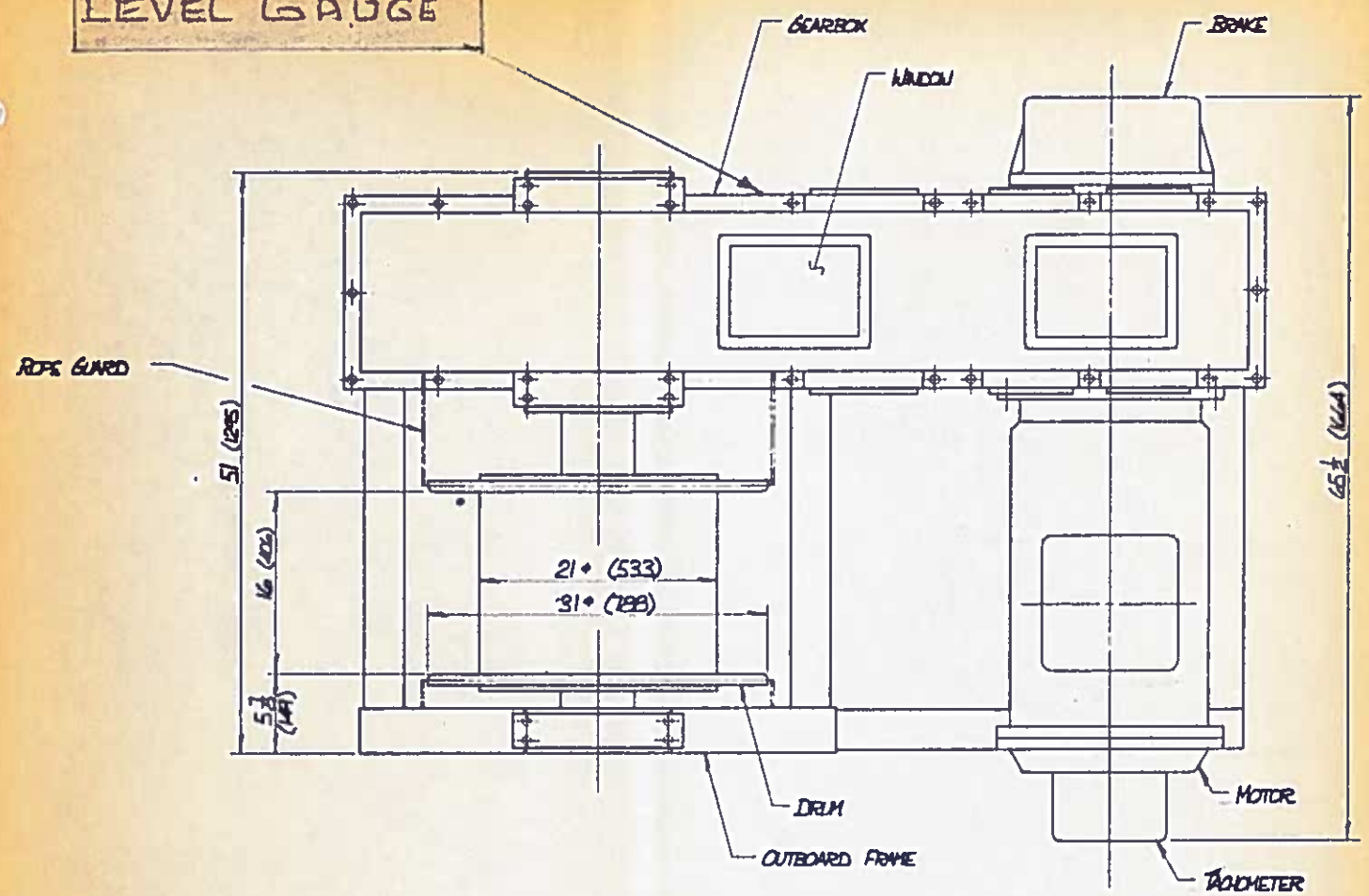
TITLE: MAIN HOIST WINCH

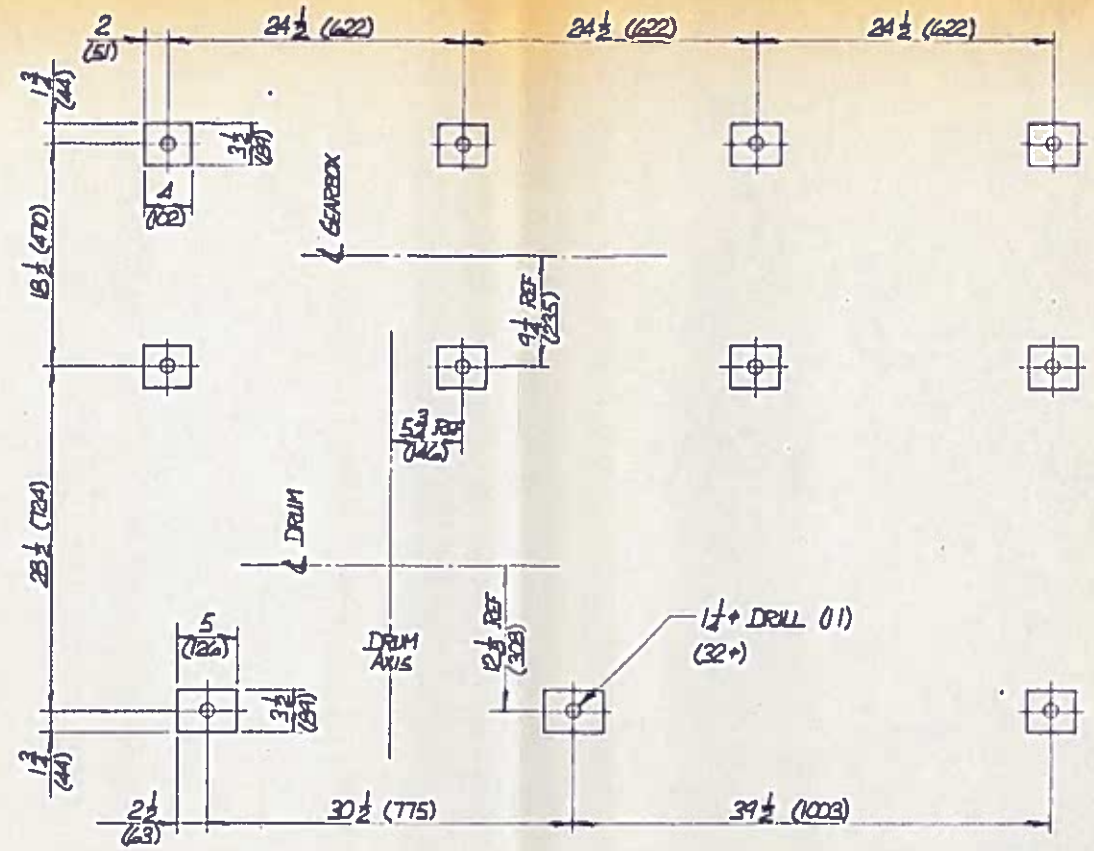
DRAWN	SS	APR 64	SCALE
CHECKED			
APPROVED			

MIL. HALIFAX

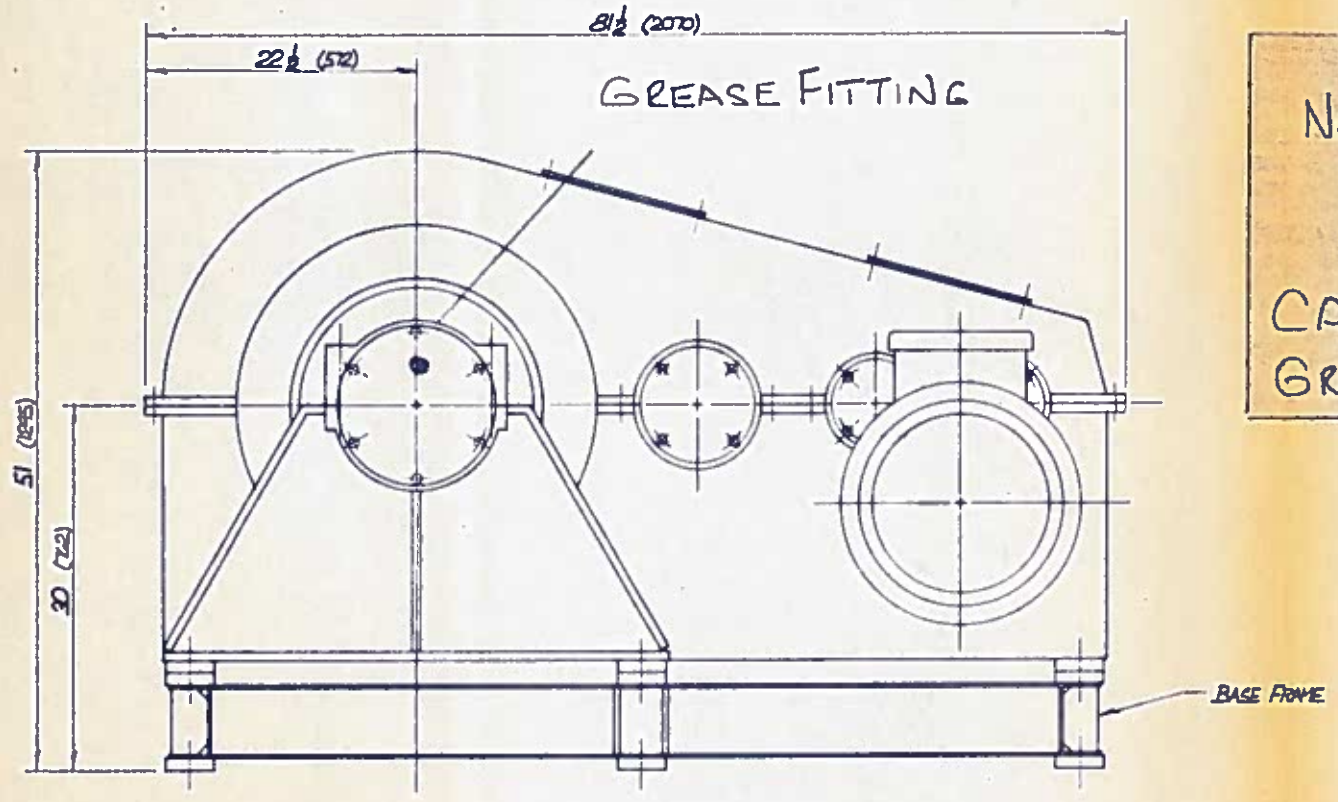
REV. B. DEC. 64. DIS [illegible]

LEVEL GAUGE





SETTING PLAN



NOTE! FOR CORRECT OIL LEVEL GAUGE GLASS MUST BE FULL

CAPACITY - 5.4 cuft

GRADE - GULF 120SP

LUBRICATION

REFERENCE DWG: BURRARD YARROWS N° H-30-80, ITEM N

REV C, JULY 84. 5½ WAS 7

ITEM	DWG. NO.	QTY.	TITLE OR MATERIAL	A.I.S.I./S.A.E.
20				
19				
18				
17				
16				
15				
14				
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3				
2				
1				

UNLESS OTHERWISE STATED TOLERANCES ON: FRACTIONS ± ; DECIMALS ± ; ANGLES ± ; SURFACE FINISH 250 AS SHOWN

NEXT ASSEMBLY NO.

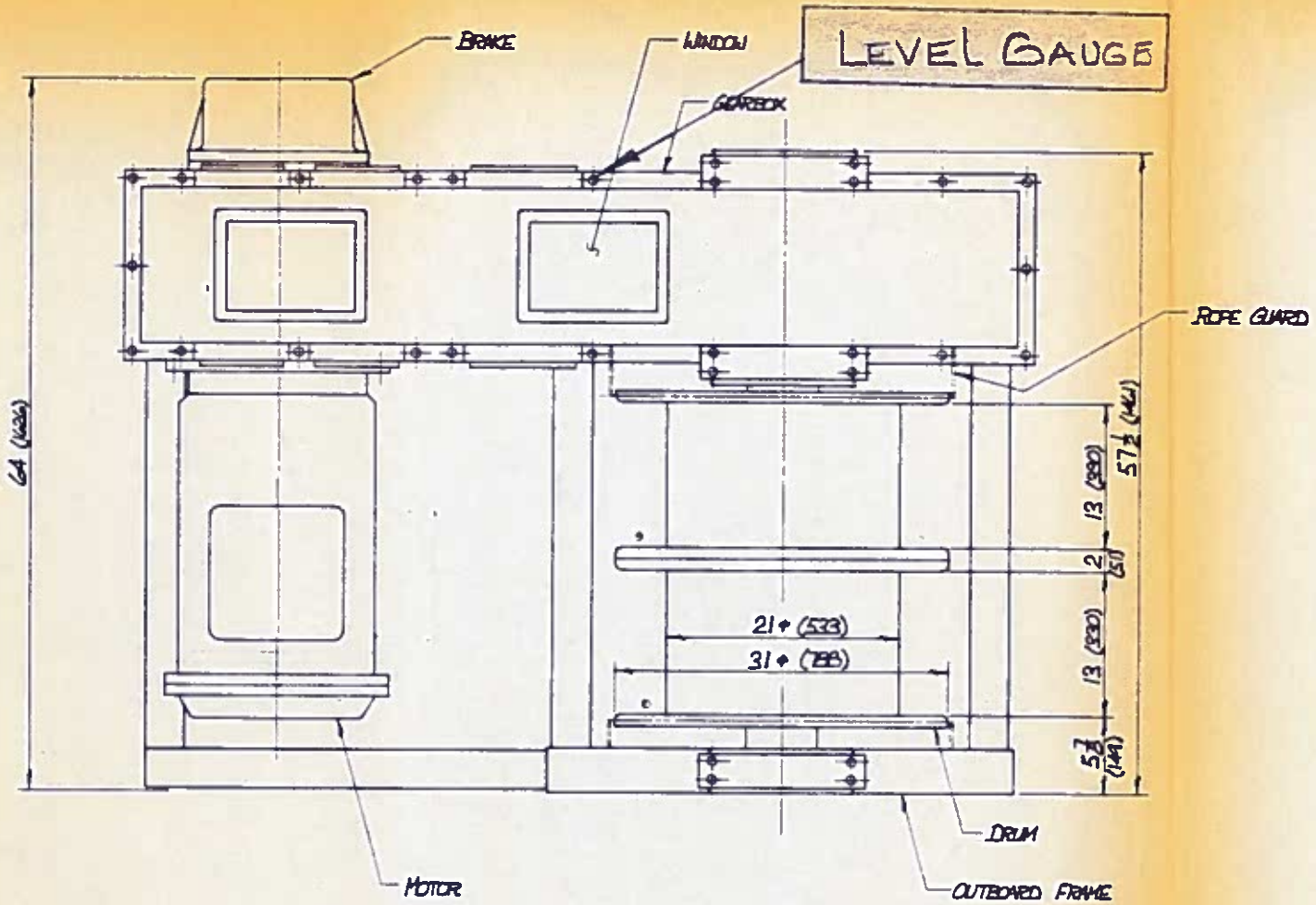
pacific winches ltd.
VANCOUVER, CANADA

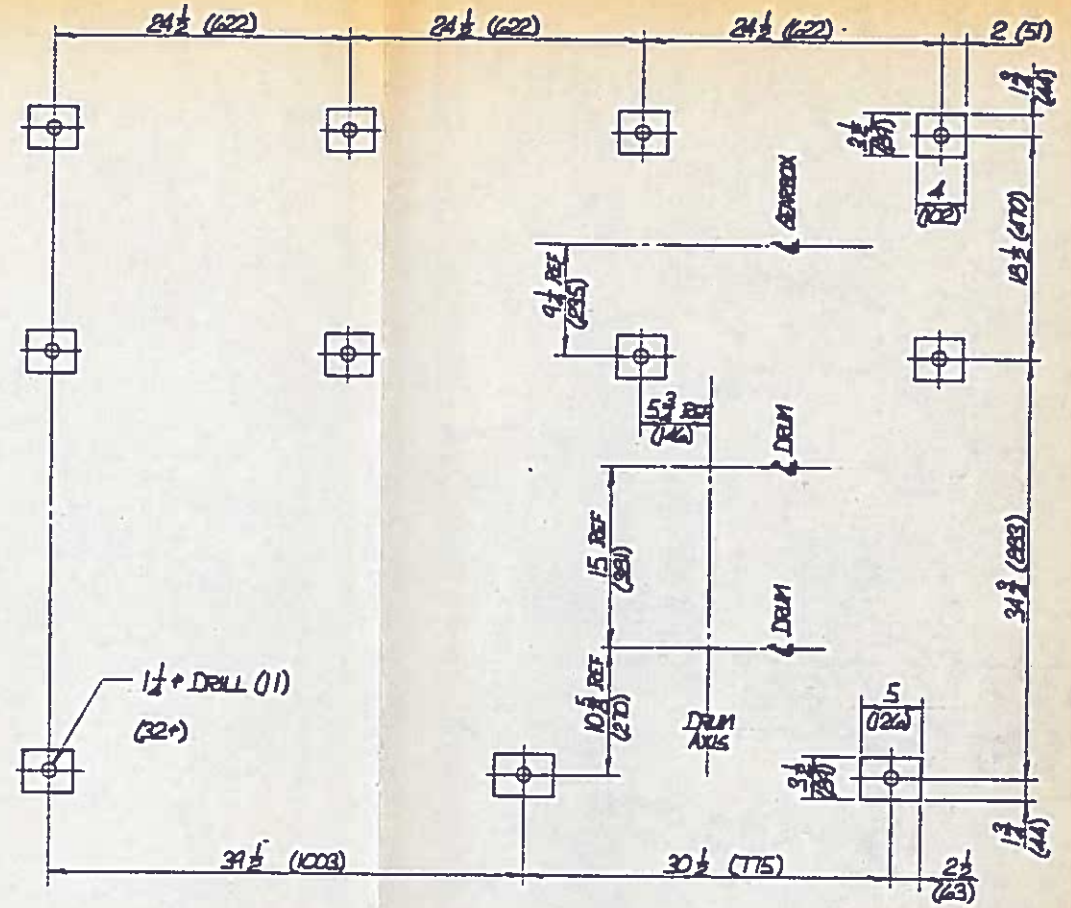
TITLE: AUXILIARY HOIST WINCH

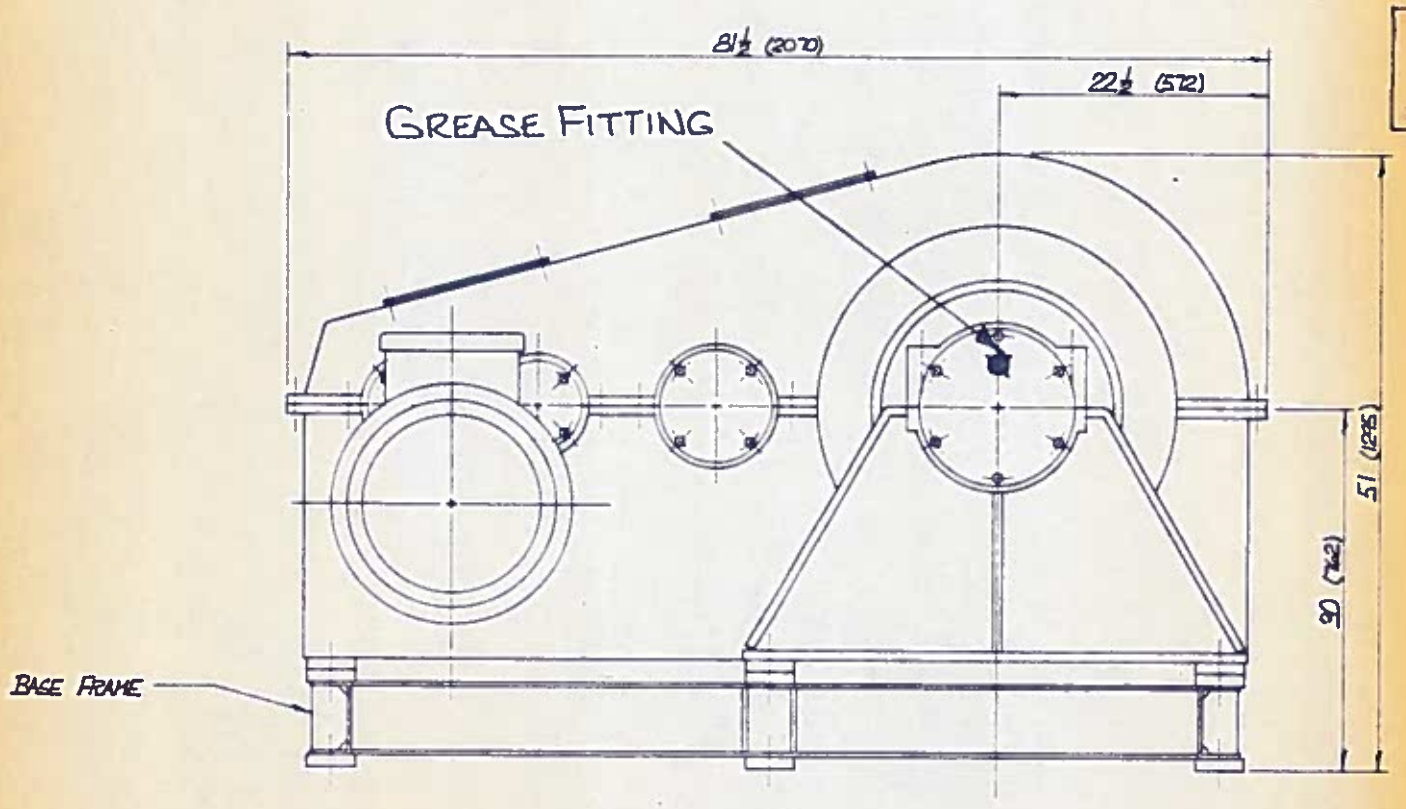
DRWN.	T.S.	FEB/84	SCALE
CHKD.			
APPVD.			

BURRARD, HALIFAX, NIL

LEVEL GAUGE







NOTE!

FOR CORRECT OIL LEVEL
GAUGE GLASS MUST BE FULL

CAPACITY – 5.4 cuft
GRADE – GULF 120 SP

SETTING PLAN

"LUBRICATION"

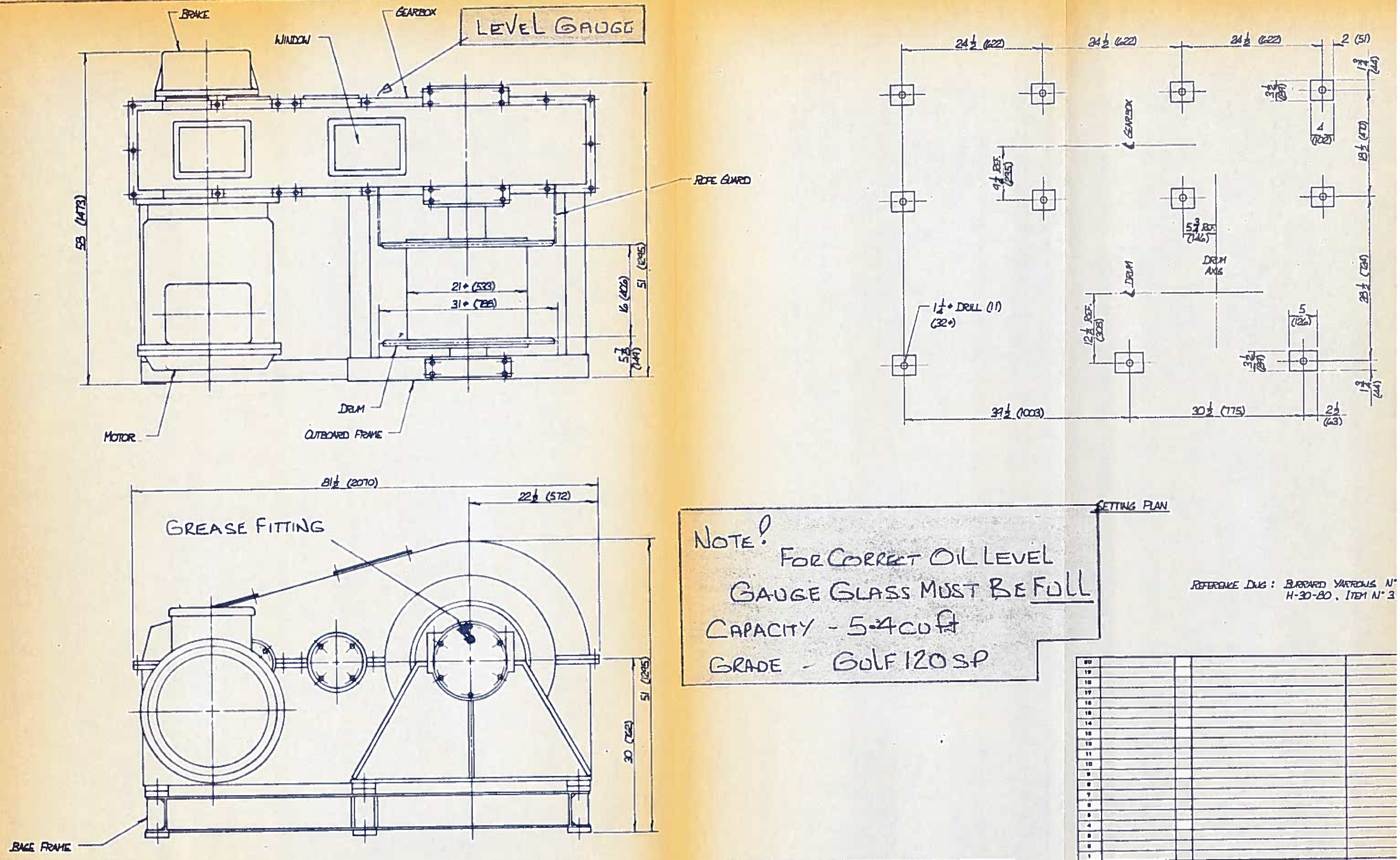
REV B. APR 84. DIMS UPDATED

pacific winches ltd.
VANCOUVER, CANADA

TITLE: SLEWING WINCH

TS FEB 84

MIL & HALIFAX



NOTE! FOR CORRECT OIL LEVEL GAUGE GLASS MUST BE FULL
CAPACITY - 5.4 cu ft
GRADE - GULF 120 SP

REFERENCE DWG: BURRARD YARROWS N° H-30-80, ITEM N° 3

"LUBRICATION"

REV B. JULY 84. 5 7/8 WAS 7

pacific winches ltd.
VANCOUVER CANADA

TITLE: TOPPING WINCH

DRWN. SS APR/84

BURRARD, HALIFAX