



300 SVTAH Installation Manual

Issue B

LEWMAR®

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INTRODUCTION

The thrust force created by a Lewmar Bow Thruster will cause a considerable suction on one side of the vessel and turbulence on the other.

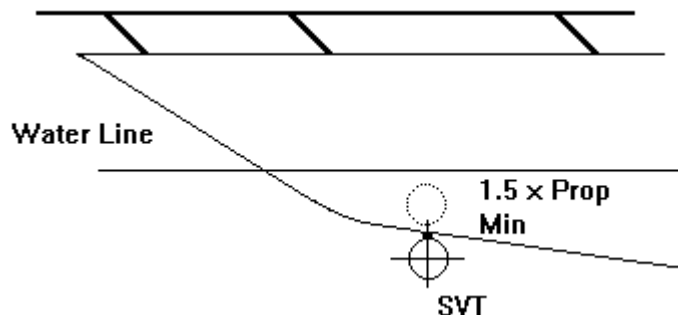
Care should be taken to ensure that there are no swimmers or divers in the vicinity of the vessel when the Thruster is operated. Also check that there is no visible floating rope, mooring lines, or timber etc, which could possibly be ingested into the Thruster potentially damaging the Thruster unit.

The effectiveness of the bow Thruster is largely dependant on the following :

The position of the installation within the hull.
Depth of immersion achieved when fully deployed.
The power source available at the Thruster motor.

The position of the installation within the hull.

The Thruster should be installed as far forward as possible. The centre line of the hub must be a minimum of 1.5 x propeller diameter below the water line.



Hydraulic power source.

Ensure the correct pipe bore sizes / pressure ratings are installed as per hydraulic circuit drawing.

Keep the use of bends and elbow fittings to a minimum. Ensure the correct oil type / grade is used (see separate data sheet ' Recommended Oils ').

The running time of the hydraulic Thruster is typically longer than the electric version, and is largely dependent on the hydraulic system, tank size etc. Continuous rating can be achieved with the use of oil coolers, larger oil reservoirs etc.

INTRODUCTION

Noise considerations.

Because of the considerable power generated by a Lewmar Bow Thruster and the construction of most vessels there will be noise generated.

It is also possible that the noise level will differ depending on the direction of thrust. Adhering to the installation instructions stated earlier will reduce the amount of noise generated.

CLEANLINESS

Contamination in hydraulic systems is the most frequent cause of malfunction or failure of hydraulic equipment. Depending upon the nature, size and amount of contamination it can lead to malfunction or serious loss of efficiency and reduced life of equipment.

Particle contamination can be of metal, rubber, dirt, sand, paint etc. This is more likely if poor standards of cleanliness are observed when fitting hydraulic hoses and pipe work or when filling the hydraulic oil tank.

Fluid degradation can cause deposits to form, which clog and impair the smooth operation of valve spools, etc. This is due to the combined effects of particle, wear, air entrapment, and excessive temperatures. If strict cleanliness is observed this condition should not occur.

When installing pipes and fittings, ensure that they are absolutely clean and free from dirt, scale, and other contaminants. Pipes should be supplied plugged at either end and these should not be removed until just before the hoses are installed. Hoses should be blown through with clean compressed air then installed immediately.

Ensure that the hoses are in good condition, the correct bend radii for the hoses are observed and that the hoses are of the correct pressure rating (As specified on the hydraulic drawing).

Threads should be inspected for burrs, which must be removed before hydraulic hoses are installed. (The use of Teflon, putty, etc for **sealing** threads must be avoided). All ports in hydraulic equipment, hoses, pipe work, which is not immediately connected, should be kept sealed with plugs to prevent the ingress of dirt.

The hydraulic oil tank should be filled with an ISO 32 grade hydraulic oil which must be clean and poured through a fine filter to eliminate the possibility of contamination from the can or from the atmosphere.

CORROSION

Sea water is both corrosive and conductive, so care should be taken to protect the underwater components of the Thruster.

Under no circumstances should any equipment be electrically connected to the Thruster.

The Thruster must not be used as an earth return and it should be noted that most hydraulic hoses contain wire braid reinforcement and are therefore conductive. Consequently, the Thruster, hydraulic valves, hydraulic pump and the prime mover which drives the pump may be inadvertently electrically connected. For this reason, it should be ascertained that all equipment connected by the hydraulics hoses have insulated returns or the hoses contain insulated sections (eg small lengths of Kevlar reinforced hose).

It will be necessary to fit sacrificial anodes. Consult a cathodic protection specialist, follow specialists recommendations on materials, fitting of anodes and electrical checks. The anodes are usually fitted inside the propeller shroud and are in strip form. It is vital that they are electrically bonded to the metal of the Thruster by their fixing bolts. It is the responsibility of the owner / builder of the boat to ensure that adequate and effective anodic protection is in place.

The underwater part of the Thruster must be anti - fouled and a primer compatible with the anti - fouling should be applied first. It is essential that the primer and the anti - fouling paint is compatible with the Thruster materials.

In the case of a vertically retracting Thruster, it is essential that no paint is applied to the stainless retracting leg.

Retracting and swing Thrusters should **not** be left in the " Down " position when not in use.

The inboard components of the Thruster are normally supplied unpainted, and these should not be painted. Certain hydraulic components, such as pipe / hose fittings, and the bodies of some control valves, motors and pumps are made of mild steel and it is recommended that these are painted after all hydraulic connections have been finally made and tested.

RECOMMENDED HYDRAULIC OIL

<u>MANUFACTURER</u>	<u>REFERENCE</u>
AGIP	OSO 32
ARAL	VITAM GF32 VITAM DE32
AVIA	AVILUB RSL32
BP	ENERGOL HLP32 ENERGOL HLP-D32
CASTROL	HYSPIN AWS32
CHEVRON	EP HYD. OIL 32
DEFROL	HLP22
ESSO	NUTO H 32
FINA	HYDRAN 32
FUCHS	RENOLIN MR10 RENLOIN B10
OPTIMOL	HYDRO 5035
MOBIL	DTE 24 HYD. OIL HLPD 32
OMV	HLP 32
SHELL	TELLUS OIL 32
TEXACO	RANDO OIL HD A-32
VALVOLINE	ETC 25

RECOMMENDED LUBRICATION OIL FOR THRUSTER HUB.

SHOULD MEET OR EXCEED API GL5

CASTROL	EPX 80W / 90
MOBILUBE	HD 80W / 90
SHELL SPIRAX	HD80W / 90

THRUSTER INSTALLATION

The 300 SVT is supplied on an aluminium base plate ready for mounting. The installer is responsible for the watertight integrity of the installation. As a general rule, the Thruster is installed with the propeller facing to starboard.

When lifting the Thruster unit from its packing case, ensure that adequate lifting strops are used, and the unit is not lifted by its lead screw assembly or propeller shroud. When moving the Thruster, ensure that the base plate surfaces are protected against potential damage.

Once the Thruster seating support has been fabricated and a suitable hole has been cut in the hull, the Thruster can be installed. Seat the unit down on a thin gasket of closed cell neoprene or a suitable sealing compound, and bolt down using M10 bolts.

The 300 SVT Thruster is supplied in the retracted position for ease of transportation. The Thruster will have to be lowered once located, to have the hull fairing fitted. To lower the Thruster, either energise the raise / lower motor or by using the mechanical lead screw. To lower mechanically, remove the lead screw lower locking bolts (M6) from the base plate, and wind the top of the lead screw with a suitable socket or spanner. Taking care not to damage the limit switches (Please see Manual Raise & Lower of Thruster).

At the stage of the installation, the raise and lower power is unlikely to be connected. When raising and lowering the unit, take care not to 'Bottom Out' the limit switches potentially damaging them.

The lower limit switch is factory set to stop the Thruster just before it hits its mechanical end stop, and should not be adjusted. However, the upper limit switch can be set once the hull fairing piece has been fitted to the shroud.

Usually, the hull piece that has been cut out, would be re-used to provide the Thruster closing plate. This can be glassed using webs, directly onto the propeller shroud to form a solid structure. If additional bolts are being used, ensure that the bolt heads do not foul the propeller tips inside the shroud. A landing or register should be moulded into the hull cut out, to allow the hull closing piece to 'locate' when the Thruster is fully retracted. This will also eliminate water flooding the box at high pressure potentially damaging the gasket / seal when the vessel is pounding at sea.

THRUSTER INSTALLATION

The upper limit switch can be finally set to isolate power to the raise mechanism as the hull closing plate seats. Ensure that the limit switch actually 'makes' when the Thruster is fully retracted, otherwise power will be left on the valve / motor applying unnecessary stress to the shroud / closing plate assembly.

WARNING THE INSTALLATION OF BARS OR GRIDS ACROSS THE TUNNEL ENTRANCE WILL HAVE A DETRIMENTAL EFFECT ON THRUSTER PERFORMANCE

INSTALLATION

Hydraulic

Ensure that all pipe sizes / specifications conform to the information supplied on drawing No 51000099.

Equipment should be accessible to allow for routine maintenance, oil changes etc. Keep tight bends and hose couplings to a minimum where ever possible. Where hoses pass through bulkheads or near sharp edges, ensure pipe clamps or additional shielding of the hose is undertaken to reduce the risk of chaffing.

The hydraulic oil reservoir, valve assembly and return filter all have visual indicators of oil level and pressure. Please ensure that these gauges are easily visible once installed.

Hydraulic Electric Circuit

This manual contains 4 different electrical circuits for the 200SVTAH Thruster. Please refer to the correct drawings for your installation.

- 58400170 This circuit is used if you are using a proportional joystick panel (58400141) and your main engine has a speed trip fitted.
Refer to Speed Sensor installation details.
- 58400174 This circuit is used if you are using a switch control panel (58400140) or a non proportional joystick panel (58400139) and your main engine has a speed trip fitted.
Refer to Speed Sensor installation details.
- 58400175 This circuit is used if you are using a proportional joystick panel (58400141).
- 58400176 This circuit is used if you are using a switch control panel (58400140) or a non proportional joystick panel (58400139) and your main engine has a speed trip fitted.

FLUSHING PROCEDURE GUIDELINES

Flushing of the hydraulic system prior to start up is the single most important operation of the installation process. Failure to carry out sufficient system flushing will inevitably lead to rapid wear of components, contamination of valves and other hydraulic components which in turn may lead to product break down and failure as well as performance loss.

A few hours spent flushing the system at the installation stage may mean that many hours or days are not spent later trying to fix a contaminated or damaged system.

Ideally the system should be flushed using a flushing rig specifically designed to flush hydraulic systems at the highest pressure and flow as is conveniently possible. If a flushing rig is not available then the system pump may be used

Prior to flushing

All rigid and flexible pipes, hoses and components should be supplied clean and capped. The caps should not be removed until they are ready for assembly. If pipes, hoses or components are not clean, they should be suitably cleaned and blown through with clean, dry compressed air and capped until ready for use.

Care must be taken when assembling the pipes, hoses and components that no contamination be allowed into the system.

Flushing Procedure

- 1 Fill the system with clean fluid through a filter, allow the oil to settle for half an hour to allow bubbles to disperse. The filter should be of a rating as specified on the filter component of hydraulic circuit drawing.
- 2 Before starting the pump ensure that it has been primed and that the outlet pressure is low.
- 3 As the system is flushed the level in the reservoir will fall, filling should continue until the level becomes stable.

FLUSHING PROCEDURE GUIDELINES

- 4 If possible the system should be flushed as a number of smaller sections by by - passing parts of the system using other lengths of tube and suitable adapters. Each section should be flushed for as long as possible.
 - a The pipe work should be flushed on its own by by - passing the valve groups and other components.
 - b The valve groups should then be connected into the system and these flushed in turn.
 - c The pipe work from the valve groups to the functions should be by - passed and flushed.
 - d The functions should be connected and flushed last of all. The functions if possible should be run under no load. If the function is a bi - directional motor it should be flushed in both directions.
- 5 The direction of flow should be changed as often as possible, but care must be taken not to flush equipment out of sequence.
- 6 All filter condition indicators (Filter element gauges) should be monitored, any filter elements that start to become clogged should be replaced.
- 7 Once all flushing has been completed, the whole system should be checked as a complete system, reservoir oil level checked and filter elements should be renewed.

Note :- These procedures are only meant as a basic guide to flushing, more information can be obtained from the British Fluid Power Association.

The British Fluid Power Association (BFPA)
Cheriton House, Cromwell Business Park
Banbury Road, Chipping Norton
Oxfordshire
OX7 5SR
Tel :- 01608 644114
Fax :- 01608 643738
Publication number :-

BFPA A / P9 1992

INSTALLATION INSTRUCTIONS FOR PLC BASED SPEED SENSORS

Oscillatory sensors are types of proximity detector. A transistor oscillator stops oscillating when metal objects approach the front of the sensor. This causes a change to the internal resistance of the sensor, which is detected by the electronics.

Non-ferrous metals, such as aluminium, brass and copper, may be used as poles, but measurement gaps are closer than with Ferro-magnetic materials.

The measurement gap can be adjusted using a gauge if there is insufficient accessibility. In other cases the gap is set by adjusting the sensor until it is in contact with a stationary pole tooth, then back off by a specific number of turns as a function of thread pitch. It has been our experience that the optimum gap will be in the range of 1 to 1.5mm. This gap will correspond to 1 to 1 ½ full turns on the sensor. Care must be taken to set the sensor at a high point and not a low point on the pole wheel.

The sensor must be mounted rigid and vibration free, and locked in place by means of the locking nuts.

Oscillatory sensors are insensitive to electrical interference and it is usually unnecessary to use a screened connecting cable. Under conditions of extreme interference re-routing the cable may be required. Total cable length should not exceed 100 meters.

The correct polarity must be applied to the sensor wires.

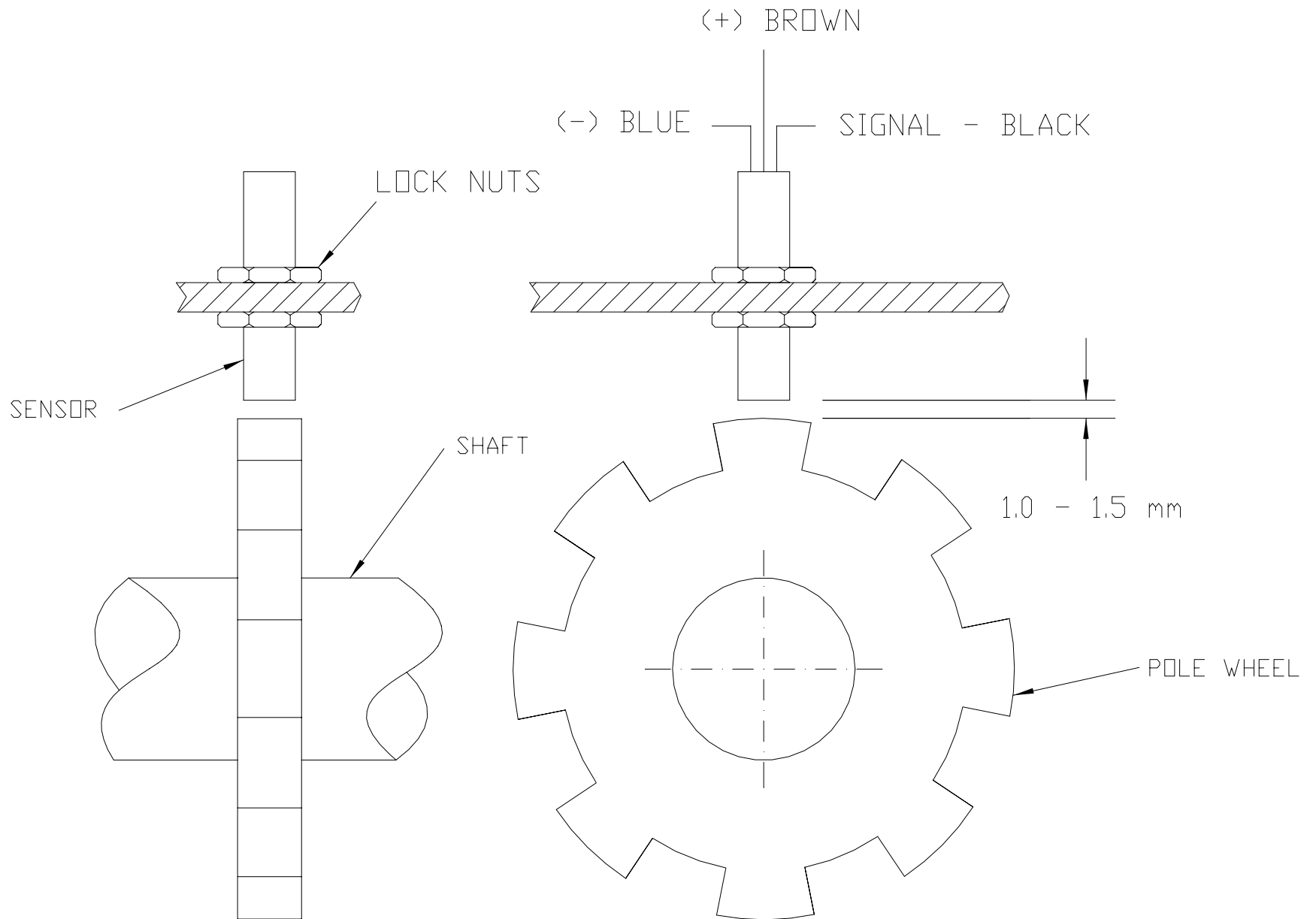
The sensor is supplied complete with cables. Markings at cable ends are: -

Brown Lead 1	- Positive
Blue lead	- Negative
Black Lead	- Signal

Warning

Damage to the sensor will result if the sensor touches the pole wheel while it is in motion.

POLE WHEEL AND SPEED SENSOR MOUNTING



OPERATION

If there is a main circuit breaker fitted, ensure the breaker is closed.

Switch on (enable) the system by pressing the main On / Off latching switch (Green), the switch will then be illuminated.

The system will be live until the On / Off switch is unlatched by re-pressing the switch or the main power is removed. In the case of the hydraulic Thruster, the On / Off switch will energise / de-energise the pump clutch and or the control valve.

If the Thruster is not to be used for a period of time, or the vessel moored, switch the system off at the main circuit breaker. The Thruster must not be left in the down position.

WARNING The Thruster must only be run whilst submerged under water, damage may occur if it is run in free air.

Hydraulic

(PLC Control Version, electric circuits 58400170 & 58400174)

The Thruster is deployed by pressing the down button and raised by pressing the up button, while the Thruster is in motion, the appropriate button will flash, once the Thruster is fully up or fully down the appropriate button will stay illuminated. If both the up and down buttons flash simultaneously, the Thruster is lost (i.e. neither up nor down), press either the up or down button to correct.

If the On / Off button starts to flash, there is an under / overspeed condition or there is an low oil condition. Either adjust the speed of the engine or fill the hydraulic reservoir with hydraulic oil.

The Thruster can only be activated once it is fully deployed. The Thruster is operated by moving the joystick or pressing the port or starboard buttons. When changing direction eg from port to starboard, return the joystick to the centre or release the button and pause for approximately 1 second before thrusting in the opposite direction. This is to allow the motor to come to a rest before rotating in the other direction, thus reducing the strain on the Thruster hub gears.

OPERATION

Hydraulic

(Non PLC Control Version, electric circuits 58400175 & 58400176)

The Thruster is deployed by pressing and holding the down button and raised by pressing holding the up button, while the Thruster is in motion the button is extinguished. Once the Thruster is fully deployed or retracted the button will illuminate.

The Thruster can only be activated once it is fully deployed. The Thruster is operated by moving the joystick or pressing the port or starboard buttons. When changing direction eg from port to starboard, return the joystick to the centre or release the button and pause for approximately 1 second before thrusting in the opposite direction. This is to allow the motor to come to a rest before rotating in the other direction, thus reducing the strain on the Thruster hub gears.

MAINTENANCE

In general very little maintenance of the Thruster is required.

There are two grease nipples which supply grease to the raise / lower mechanism. One is located on the top plate, and one is on the main Thruster body. Apply 3 or 4 pumps from a grease gun every four to six months dependant on the Thruster usage, to ensure trouble free operation.

When applying grease to the Thruster main body grease nipple, first remove the exit plug located on the opposite side to the grease nipple, this will ensure that no pressure is generated in the Thruster main body, which would cause the Thruster to stick. Once sufficient grease has been applied, re-fit the exit plug.

Lightly greasing the lead screw at the same time interval, will enhance operation.

(Hydraulic system)

The hydraulic oil will normally last for many years, but it is advisable to replace the filter element annually. The filter is fitted with a pressure gauge which indicates the level of contamination within the element. If the reading starts to rise above the normal level, it means that the filter element is becoming clogged and must be replaced. Hydraulic oil will break down over a period of time irrespective of usage, and therefore should be replaced every two years.

The oil in the gearbox (hub) of the unit should be changed annually. There is both a filler and a drain provided for this purpose. It is important to wrap two or three turns of PTFE tape around the plugs before refitting them. The plugs have a tapered thread and therefore care should be taken in order to avoid cross threading them when refitting. The oil level should be filled to the level of the fill hole with one of the following oils or an equivalent (approximately 150 ml).

CASTROL	EPX 80W / 90
MOBILUBE	HD 80W / 90
SHELL SPIRAX	HD 80W / 90

MAINTENANCE

CATHODIC PROTECTION SYSTEM

When the boat is first commissioned it is important that the anodes are checked frequently at one month intervals. Check for signs of excessive corrosion. If the anode has corroded significantly, then renew immediately. If the anodes/unit shows signs of corrosion shortly after commissioning then it is important that the vessels electrical system is checked for earth leaks, or other electrical faults that are possibly accelerating the corrosion process.

(Refer to Corrosion data sheet 023)

Recommended anode inspection plan.

First six (6) months	- One	(1) month intervals.
Six (6) months to one (1) year	- Three	(3) month intervals.
One (1) year plus	- Six	(6) month intervals.

WARNING Anodes are fitted to stop the corrosion of the Thruster hub and propeller, failure to change the anodes will cause serious damage to your Thruster

TROUBLE SHOOTING

No Power at Thruster

Check main circuit breaker (if fitted) is on, reset or replace if blown.

Check the control circuit fuses are not blown, replace if necessary. In the above cases when the On / Off switch is operated the switch will not illuminate.

If power is available to the motor but the propeller will not turn, check the propeller is not fouled / obstructed with rope or timber etc.

The motor runs, but the propeller is not rotating. Check the shear coupling has not sheared / slipped caused by ingestion of foreign matter in the tunnel tube.

Replace the shear coupling, by removing the Nyloc propeller nut, and the propeller. The inner bush will slide from the propeller shaft with the propeller, but may have separated from the rubber outer. Remove all broken / damaged shear coupling components and replace. Lightly grease new shear coupling, and press into existing hub. Taking care not to damage the drive lobes.

Thruster operated with excessive noise / vibration and in once direction the thrust has noticeably become less powerful.

Propeller damaged due to rope / timber hitting the propeller.
Remove propeller, replace, check that propeller shaft has not been damaged / bent, check seal.

Sea water in the hub. Check and replace seals as required.

1. No power at Thruster
Check pump drive clutch is engaged, and associated wiring is functional.
Check oil level in hydraulic reservoir, and tank level switch associated wiring is functional.
Thruster valve plug wiring has correct signals and has good contacts.
2. Loss of power at Thruster
Pump drive clutch slippage, check for ingress of oil or physical damage to clutch surfaces.
Check pressure gauge reading against specified pressure, and adjust relief valve to suit.
Valve manual override handle jamming on ships structure.

TROUBLE SHOOTING

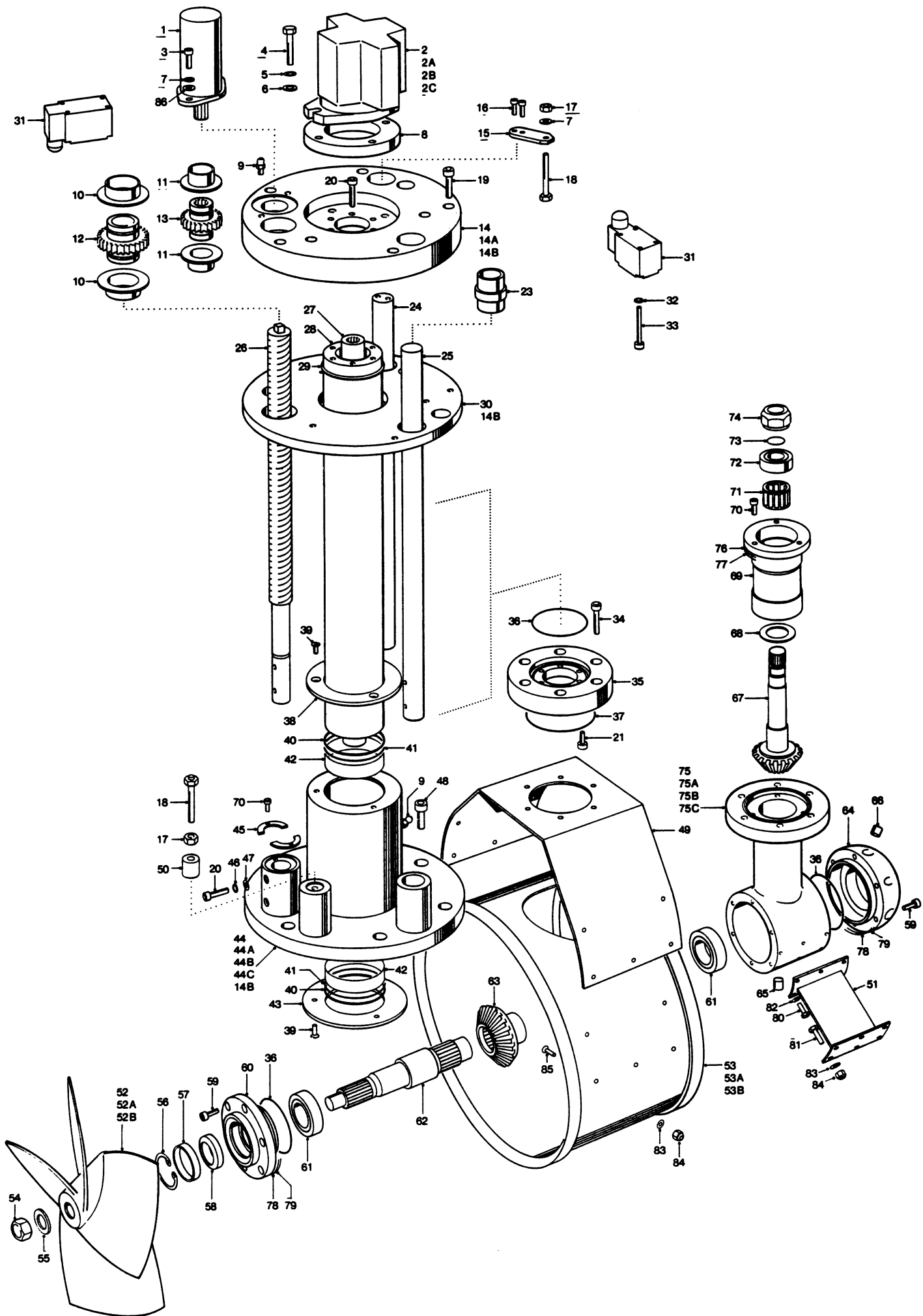
- 3 Raise / Lower system non operative]
Check hydraulic power to the raise / lower motor.
Ensure there is no mechanical obstructions inside or externally restricting movement.

All SVT Thrusters have a manual override to the raise / lower system (See Manual Raise / Lower Data Sheet). If the Thruster cannot be retracted / deployed mechanically, there may be a serious problem caused by external impact.

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300 SVT THRUSTER TECHNICAL DATA

Thruster	Type:-	300 SVTAH
	HP:-	15,20,25 & 30 hp
Stroke Length	Length :-	350 mm
Main Hydraulic Motor	Type:-	Reversible Gear Motor
	Capacity :-	15hp = 23 cc / rev 20hp = 27 cc / rev 25hp = 31 cc / rev 30hp = 33 cc / rev
Raise / Lower Hydraulic Motor	Type:-	Reversible Gear Motor
	Capacity :-	20 cc / rev
Transmission	Gears :-	Spiral Bevel Gear.
	Lubrication :-	Oil Bath
Transmission Oil	Types :-	CASTROL EPX 80W/90 MOBILUBE HD 80W/90 SHELL SPIRAX HD 80W/90
Gearbox Housing	Material :-	Aluminium LM 25
Propeller	Diameter :-	294 mm
	Blades :-	4 off
	Material :-	LM 25
	Pitch :-	15hp = 254 20hp = 286 25hp = 356 30hp = 356



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<u>ITEM NO</u>	<u>PART NO</u>	<u>DESCRIPTION</u>	<u>QTY</u>
1	B7729	Hyd Motor (Raise & Lower)	1
2	B7738	Hyd Motor (15hp)	1
2a	B7735	Hyd Motor (20hp)	1
2b	B7736	Hyd Motor (25hp)	1
2c	B7734	Hyd Motor (30hp)	1
3	B0686	M8 x 20 Skt Hd Cap Screw	2
4	B8033-A4	M10 x 45 Skt Hd Bolt	2
5	B1232	M10 Spring Washer	2
6	B1208	M10 Washer	2
7	B1228	M8 Spring Washer	3
8	55000866	Adapter Ring	1
9	B6009	Grease Nipple	2
9a	B9587	Bleed Plug	1
10	55000832	Sleeve	2
11	55000861	Sleeve	2
12	55000721	Drive Gear	1
13	55000865	Drive Gear	1
14	55000962	Motor Mounting Plate	1
14a	B2424	M10 Helicoil	2
14b,75b	B2423	M8 Helicoil	24
15	55000730	Trip Plate	1
16	B0679	M6 x 16 Skt Hd Cap Screw	8
17	B1016	M8 Std Nut	2
18	B0096	M8 x 35 Hex Hd Bolt (Top Limit Switch)	1
18a	B0116	M8 x 110 Hex Hd Bolt (Bottom Limit Switch)	1
20	55000978	M6 Wire Bolts	6
21	B0680	M6 x 20 Skt Hd Cap Screw	6
21a	B1357	M6 Washer	6
23	55000937	Guide Bush	2
23a	B7773	Circlip	2
24	55000795	Guide Bar	1
25	55000867	Guide Bar	1
26	55000794	Lead Screw	1
27	58000115	Drive Shaft	1
28	55000938	Thruster Leg	1
29	B0678	M6 x 12 Skt Hd Cap Screw	2
29a	B1357	M6 Washer S/S Nordlock	2
30	55000936	Gear Retaining Plate	1
30a	B0689	M8 x 40 Skt Hd Cap Screw	3
30b	40000432	Hollow Dowel	2
31	B9117	Limit Switch	2
32	B1210	M5 Washer	8
33	B0650	M5 x 40 Skt Hd Cap Screw	8
34	B0700	M8 x 30 Skt Hd Cap Screw	6
34a	B1358	M8 Washer S/S Nordlock	6
35	55000800	Adapter Plate	1
36,37	B2529	O Ring	2
38	55000729	Bump Ring	1
39	B0530	M5 x 12 Slot Csk Hd Screw	6
40	B8980	Wiper Ring	2
41	B8982	O Ring	2
42	55000939	O Ring / Wiper Housing	1
42a	B3741	O Ring	1
43	55000792	Bump Ring	1
44	55000791	Main Housing	1
	B7883	O Ring	1

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<u>ITEM NO</u>	<u>PART NO</u>	<u>DESCRIPTION</u>	<u>QTY</u>
44a	B7883	O Ring	1
44b,75a	B2419	M6 Helicoil	17
44c	55000940	Spacer	1
44d	55000941	Plain Bearing	2
44e	55000840	Mounting Plate	1
45	55000862	Retaining Collets	2
46	B1230	M6 Spring Washer	6
47	B1201	M6 Flat Washer	6
48	B0687	M8 x 25 Skt Hd cap Screw	6
49	55000802	Shroud Plate	1
51	55000083	Shroud Support Strut	2
52	55000813	Propeller (15hp)	1
52a	55000814	Propeller (20hp)	1
52b	55000815	Propeller (25 & 30hp)	1
53	58000098	Shroud (Complete Items 53a-d)	1
53a	55000153	Shroud Less Flow Rings	1
53b	55000098	Flow Rings	2
53c	B0560	M4 x 12 Slot Csk Hd Screw A4	8
53d	B2415	M4 x 1 1/2d Helicoil Insert	8
54	B1080-A4	M12 Nyloc Nut	1
55	55000583	Washer Prop Shaft	1
56	B2344	Circlip	1
57	55000106	Spacer Hub	1
58	B2576	Seal	1
59	B0679-A4	M6 x 14 Skt Hd Cap Screw	12
60	55000063	Front Cap	1
61	B3433	Taper Bearing 25 x 52	2
62	55000809	Drive Shaft	1
63	55000808	Spiral Bevel Gear	1
64	55000062	Rear End Cap	1
65	B9877	Drain Plug	1
66	B9891	Filler Plug	1
67	55000807	Spiral Bevel Drive Shaft	1
68	B7434	Thrust Bearing	1
69	55000804	Sleeve	1
70	B0678	M6 x 12 Skt Hd Cap Screw	3
71	B9131	Roller Bearing	1
72	B9130	Bearing 20 x 42 x 12	1
73	55000855	Spacer Ring	1
74	B1026	Locknut M20	1
75	55000824	Hub Body	1
76	55000836	Shim	As Req
76	55000837	Shim	As Req
77	55000859	Shim 005	As Req
77	55000870	Shim 0.13	As Req
77	55000988	Shim 0.5	As Req
77	55000989	Shim 0.5	As Req
80	B0077-A4	M5 x 12 Hex Hd Screw	12
81	B0054-A4	M6 x 20 Hex Set Bolt	12
82	B1233-A4	M5 Spring Washer	12
83	B1214-A4	M6 Washer	18
84	B1103-A4	M6 Nut Aerotight	18
85	B5331-A4	M6 x 20 Csk Screw	6
86	B1207	M8 Form B Washer	6
---	58000126	Complete Hub Assembly	1

MANUAL RAISE & LOWER OF THRUSTER

If the Thruster cannot be raise or lowered using Electrical or Hydraulic power, it is possible to raise or lower the unit mechanically.

- 1) Remove the 2 x M6 leadscrew locking bolts from the base plate using a 5 mm allen key.
These can be found where the leadscrew enters the base plate.
- 2) Place a suitable spanner or socket drive (1/2") onto the top of the leadscrew.
- 3) Turn the leadscrew clockwise to raise and anti clockwise to lower, taking care not to damage the limit switches at the top and bottom of the stroke.
- 4) Replace the 2 x M6 leadscrew locking bolts before Electric or Hydraulic power is reapplied.

1/2 INCH DRIVE

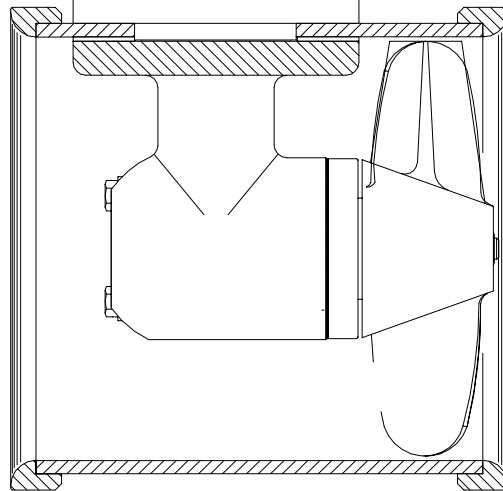
LEADSCREW

TURN CLOCKWISE TO RAISE
ANTI CLOCKWISE TO LOWER

CARE MUST BE TAKEN NOT
TO DAMAGE LIMIT SWITCHES

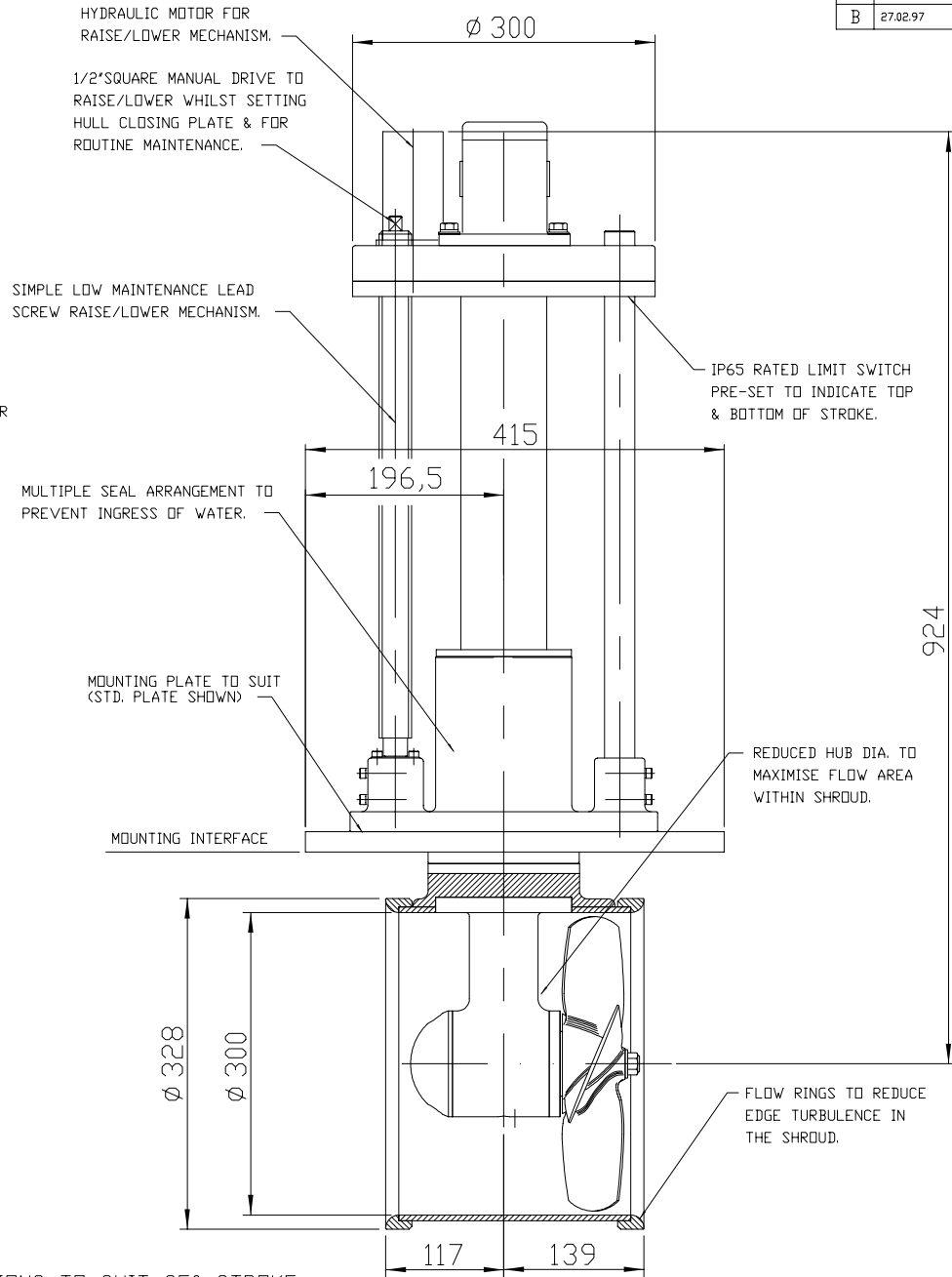
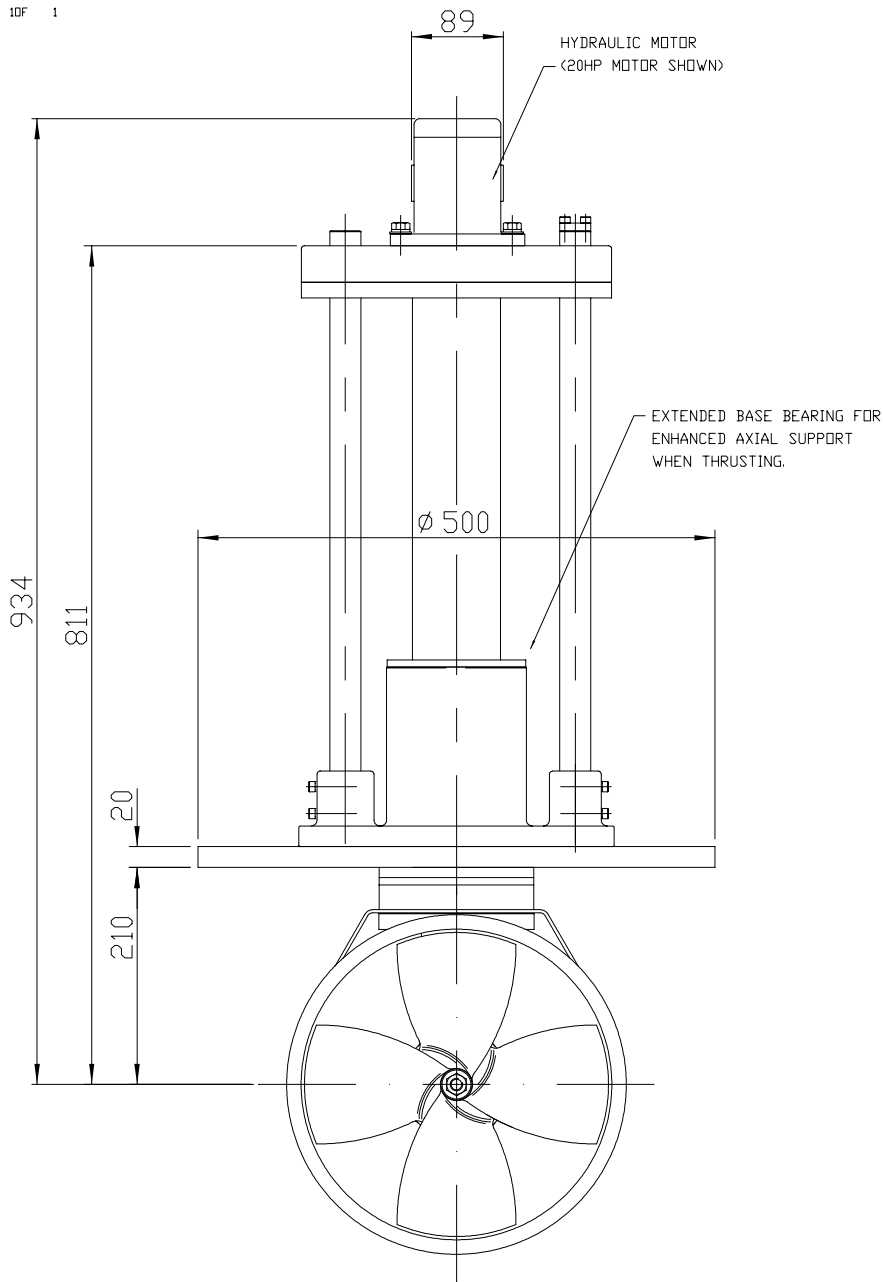
REMOVE 2 X
M6 BOLTS

USE 5mm
ALLEN KEY



MANUAL RAISE & LOWER OF THRUSTER

ISSUE	DATE / NAME	MOD No.
B	27.02.97 L.MOORE.	N/A



DIMENSIONS TO SUIT 350 STROKE

300SVTAH RETRACT THRUSTER

DRN	L.MOORE.
DATE	17.10.95

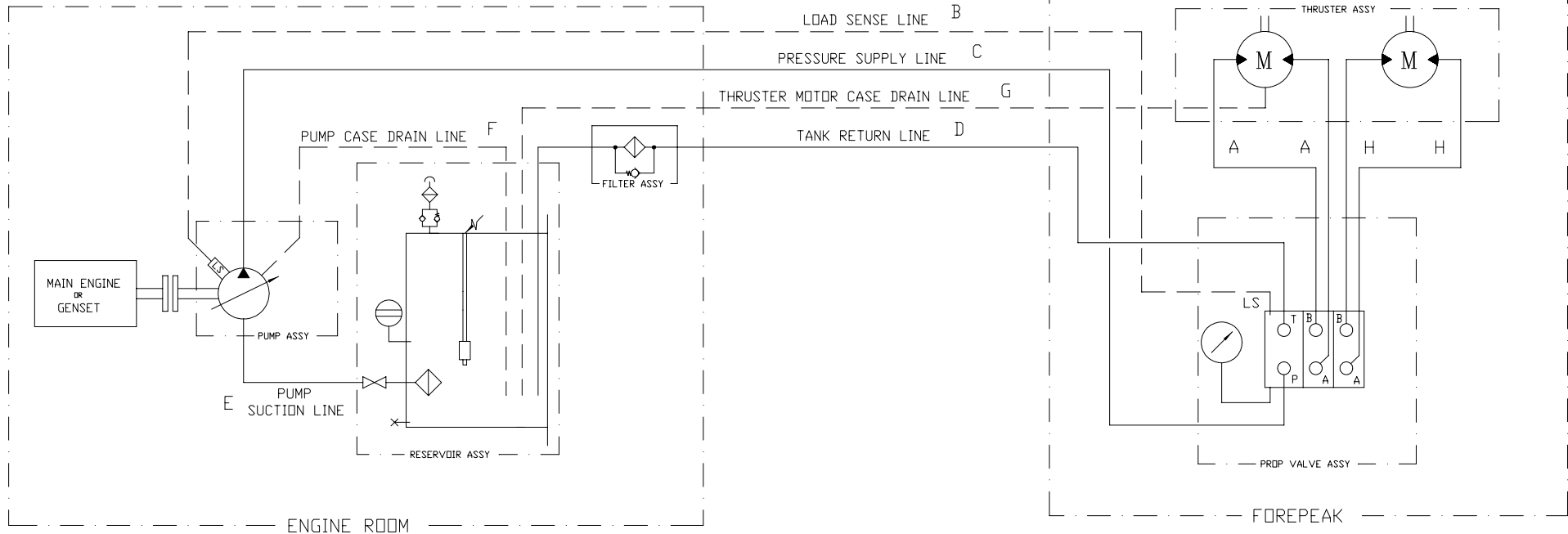
DRG. No
WSD0636

LEWMAR

ISSUE	REVISIONS	MOD No.
B	01.07.98 D.J.P	7212
A	28.03.96 D.J.P	N/A

THRUSTER MODEL	PIPE SIZE/PRESSURE RATING							
	A SEE NOTE 1	B	C SEE NOTE 2	D SEE NOTE 2	E SEE NOTE 3	F	G	H SEE NOTE 1
200SVT	3/4" BORE 150 BAR	3/8" BORE 150 BAR	3/4" BORE 170 BAR	3/4" BORE 10 BAR	1-1/4" BORE SUCTION	1/2" BORE 1 BAR	1/2" BORE 5 BAR	3/8" BORE 50 BAR
300SVT	3/4" BORE 155-210 BAR *	3/8" BORE 155-210 BAR *	1" BORE 175-230 BAR *	1" BORE 10 BAR	1-1/2" BORE SUCTION	1/2" BORE 1 BAR	1/2" BORE 5 BAR	3/8" BORE 50 BAR

* DEPENDANT UPON THRUSTER KW OUTPUT



NOTES

- PIPE SIZES BASED ON A MAXIMUM LENGTH OF 3 METRES FOR LENGTHS GREATER THAN 3 METRES IT IS RECOMMENDED THAT A LARGER BORE DIAMETER PIPE IS USED TO MINIMISE PRESSURE DROP LOSSES AND ANY RESULTANT NOISE.
- PIPE SIZES BASED ON A MAXIMUM LENGTH OF 15 METRES FOR LENGTHS GREATER THAN 15 METRES IT IS RECOMMENDED THAT A LARGER BORE DIAMETER PIPE IS USED TO MINIMISE PRESSURE DROP LOSSES AND ANY RESULTANT NOISE.
- PUMP SUCTION LINE PIPE SIZES ARE BASED ON THE FOLLOWING:
 - MAXIMUM PIPE LENGTH 2 METRES
 - RESERVOIR IS POSITIONED TO PROVIDE A NEUTRAL OR POSITIVE HEAD (PRESSURE) TO THE PUMP
 - FOR NEGATIVE HEAD APPLICATIONS OR LONG PIPE LENGTH CONSULT LEWMAR MARINE LTD
- HYDRAULIC FLUID - MINERAL OIL TO ISO 6743/4 TYPE HM - VISCOSITY TO ISO 3448 GRADE VG32

SHEET NO. 1 OF 1

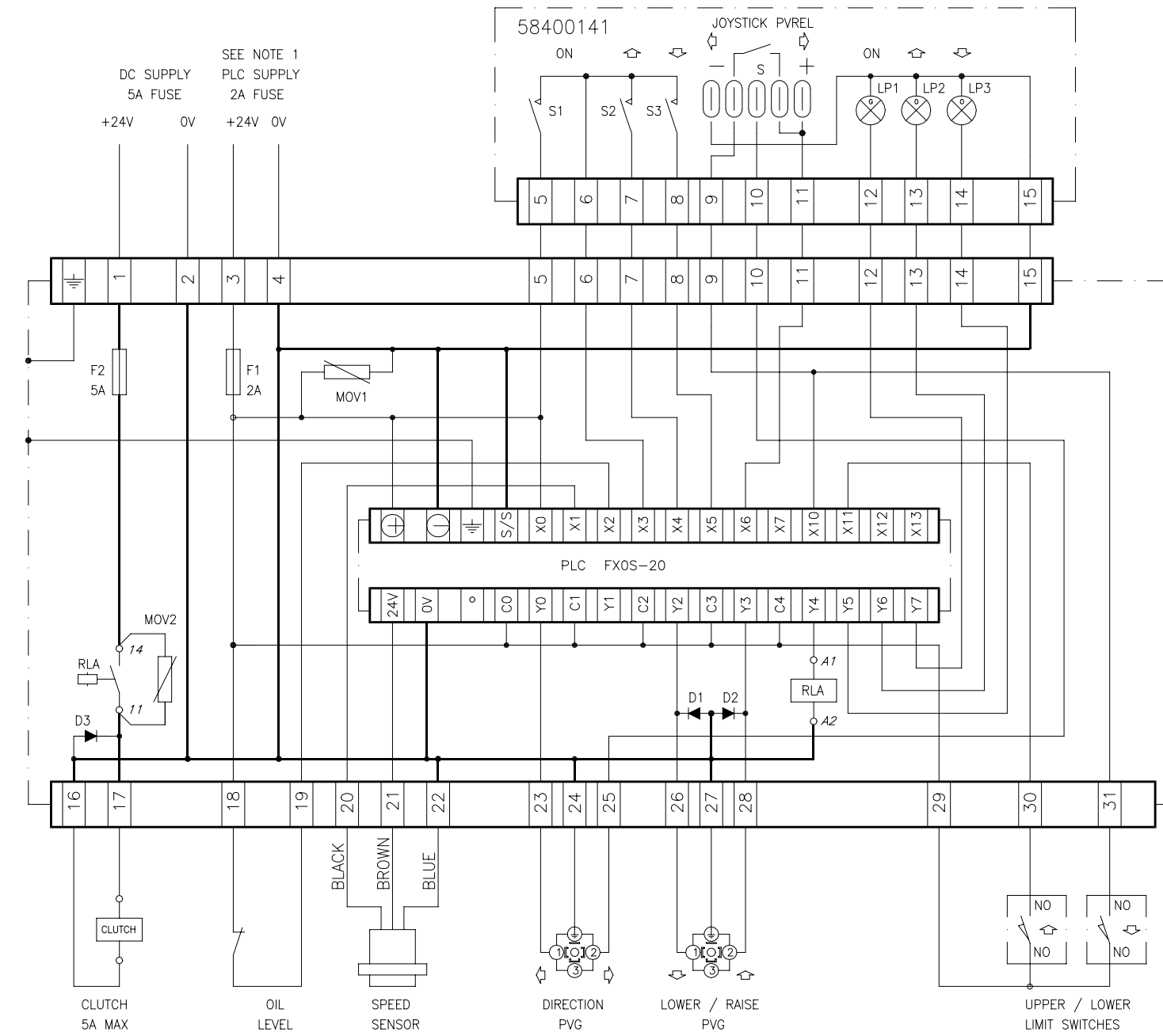
DRN	D.J.P	TITLE	200/300 SVT
CHD.	-	PRODUCT	HYDRAULIC CIRCUIT
DATE	28.03.96	PART No	51000099
SCALE	1:1	LEWMAR	

PART No 51000099

ORIGINAL SIZE A2

Unauthorised use, manufacture or reproduction in whole or in part is prohibited

ISSUE	REVISIONS		MOD No.
A	08.02.96	NB	N/A
B	08.03.96	NB	6029
C	10.05.96	NB	6106
D	05.04.00	GFS	8053



NOTE 1
TO ENSURE CORRECT OPERATION OF THE PLC, ITS SUPPLY MUST NOT EXCEED 26.5 VDC.

NOTE 2
PLC OUTPUT Y1 IS NOT USED.

NOTE 3
SEE 58400188 FOR TEST INFO.

NOTE 4
SEE 58000151 FOR PLC PROGRAMME.

PART No
58400170

Unauthorised use, manufacture or reproduction in whole or in part is prohibited

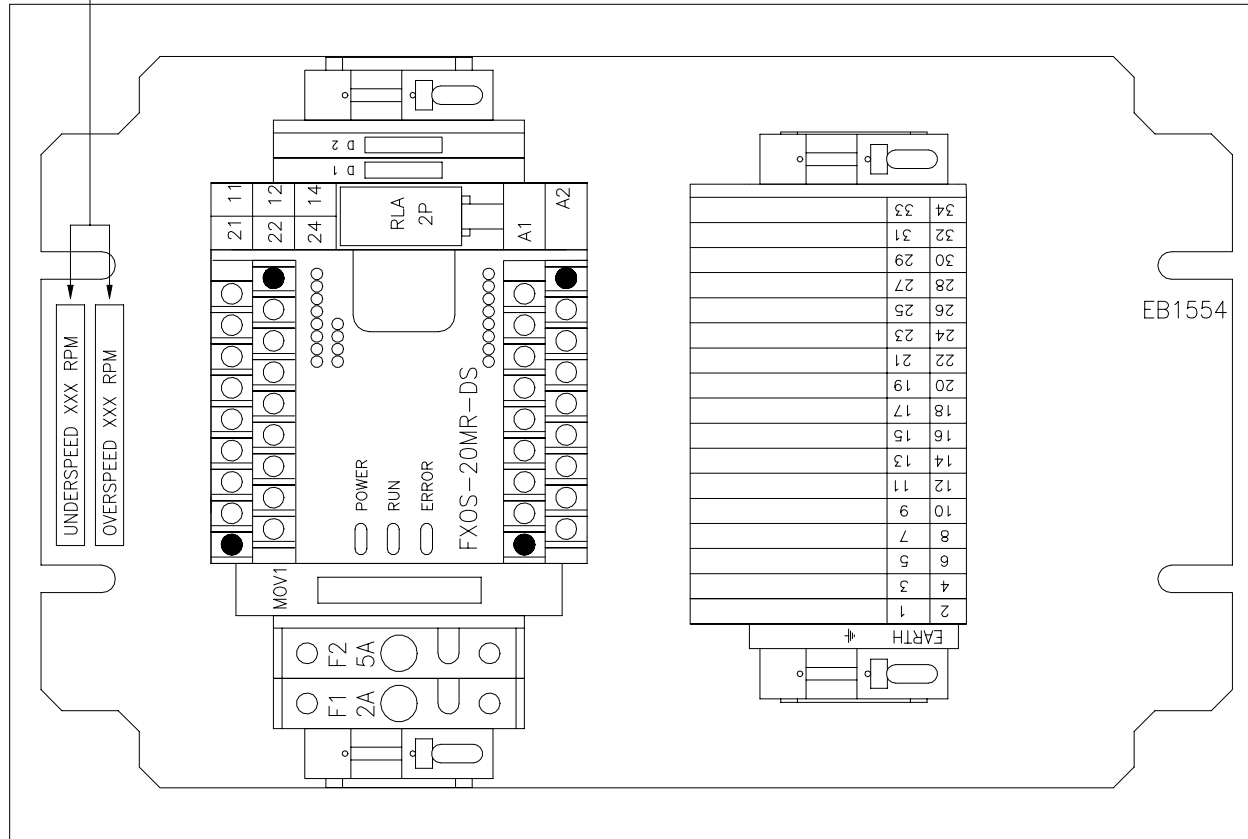
SVTH PROPORTIONAL THRUSTER WITH SPEED TRIP.

SHEET 1 OF 3

DRN	NB	TITLE	SVTH PRO ST CONTROL BOX
CHD.	-	PRODUCT	
DATE	08.02.96	PART No	58400170
SCALE			LEWMAR

ISSUE	REVISIONS		MOD No.
A	08.02.96	NB	N/A
B	08.03.96	NB	6029
C	10.05.96	NB	6106
D	05.04.00	GFS	8053

SPEED LABELS WHERE XXX = THE REQUIRED SPEED (INFO PROVIDED BY PROJECT ENGINEER)
TO BE MANUFACTURED IN HOUSE.



B No	QTY	DESCRIPTION
B8941	1	ENCLOSURE EB1554
B10786	1	PLC FX0S 20MR-DS
B8152	1	RELAY
B8153	1	BASE
B9358	1	MOV1
B6080	2	TERMINAL DIODE
B7005	1	TERMINAL COVER
B3691	17	TERMINAL DOUBLE
B7005	1	TERMINAL COVER
B9421	1	TERMINAL EARTH
B8955	2	FUSE HOLDER
B8960	1	FUSE COVER
B9356	2	FUSE IDENT
B9184	1	FUSE 2A F1
B9339	1	FUSE 5A F2
B7006	4	ENDSTOP

58400141	1	PANEL ASSY
----------	---	------------

58400188		TEST PROCEDURE
----------	--	----------------

58000151		PLC PROGRAMME
----------	--	---------------

SHEET 2 OF 3

DRN	NB	TITLE	200SVTH PRO ST CONTROL BOX
CHD.	-	PRODUCT	
DATE	08.02.96	PART No	58400170
SCALE	NTS		

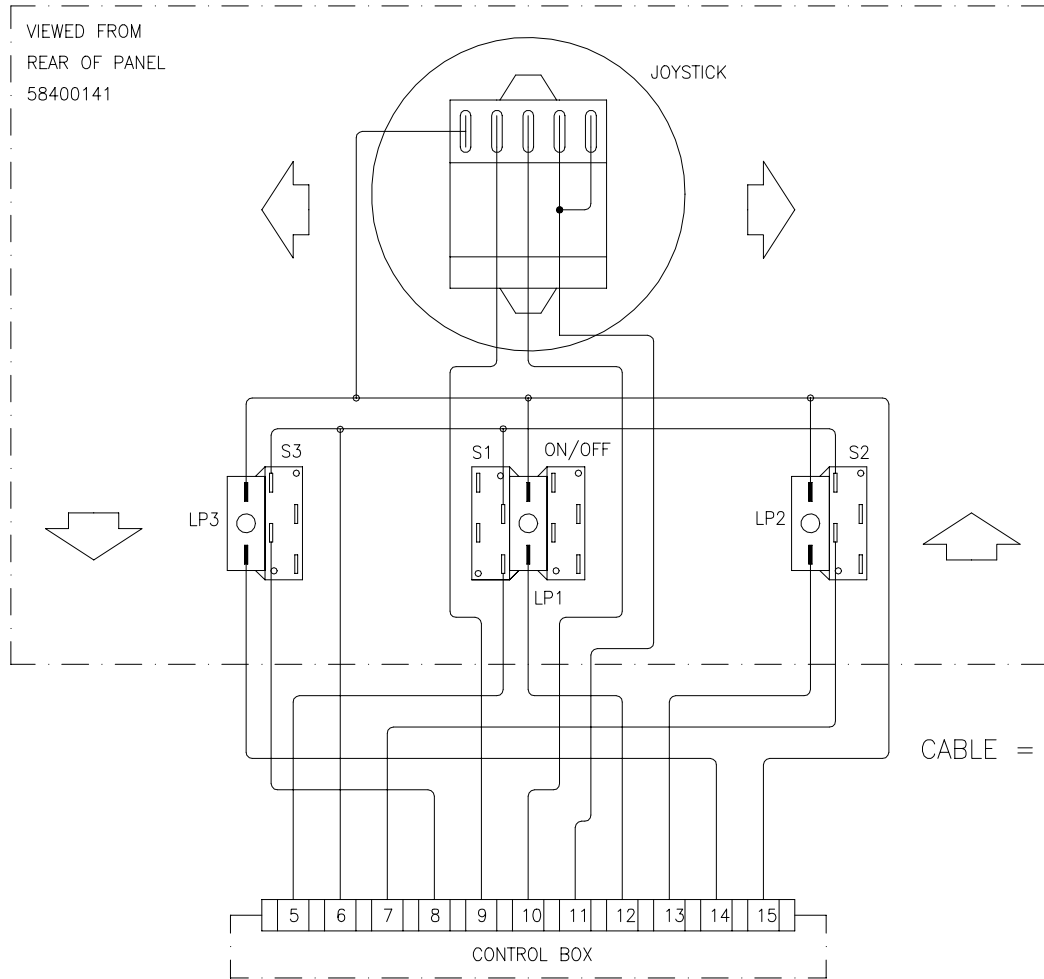
LEWMAR

2/300 SVTH PROPORTIONAL THRUSTER
WITH SPEED TRIP.

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited

PART No
58400170

ISSUE	REVISIONS	MOD No.
B	08.03.96 NB	N/A
C	10.05.96 NB	6106
D	05.04.00 GFS	8053



CABLE = 3 AMP MIN.

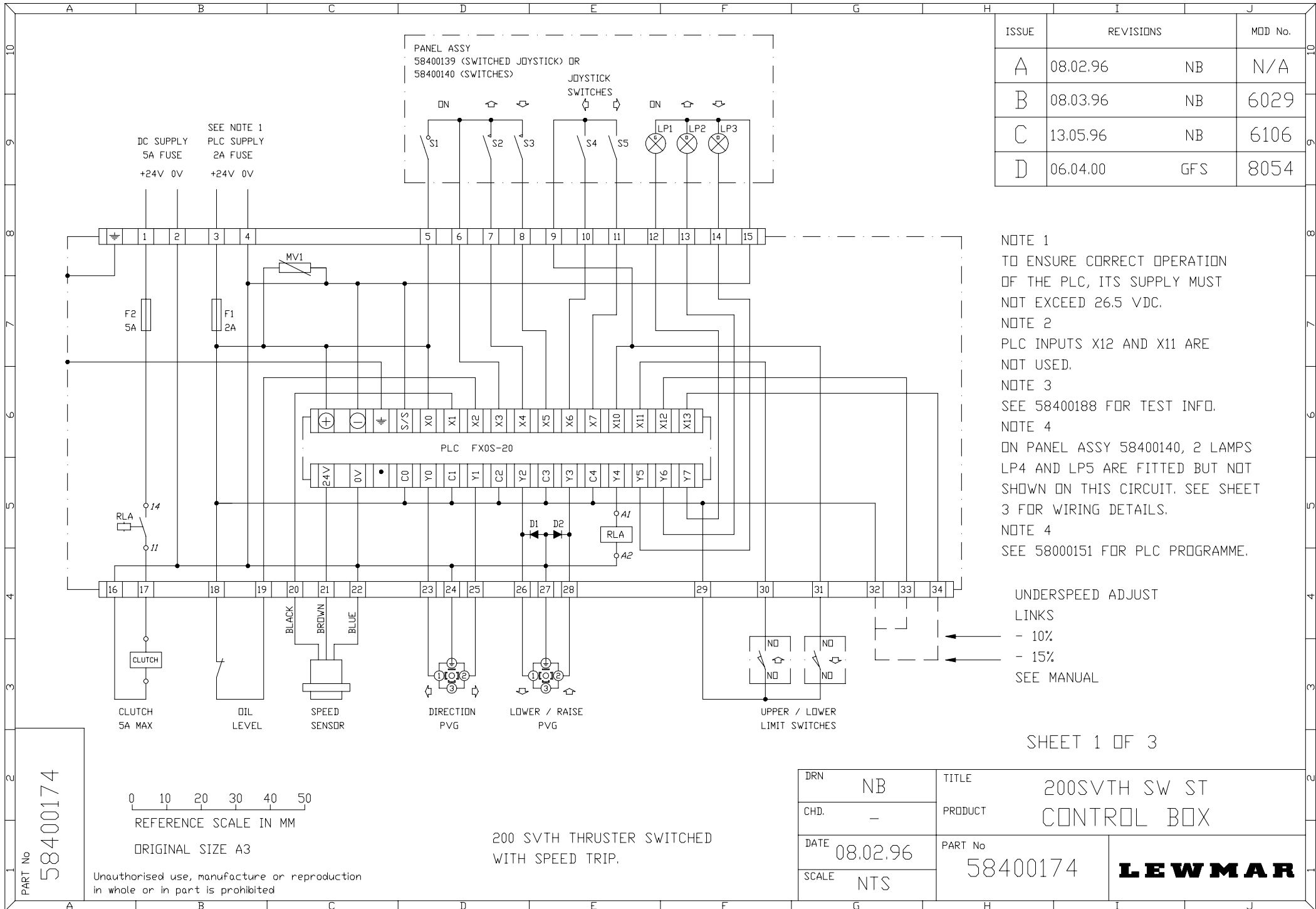
PANEL WIRING

SHEET 3 OF 3

DRN	NB	TITLE	200SVTH PRO ST
CHD.	-	PRODUCT	CONTROL BOX
DATE	08.03.96	PART No	58400170
SCALE			LEWMAR

PART No
58400170

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited



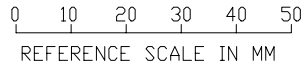
ISSUE	REVISIONS		MOD No.
A	08.02.96	NB	N/A
B	08.03.96	NB	6029
C	13.05.96	NB	6106
D	06.04.00	GFS	8054

- NOTE 1
TO ENSURE CORRECT OPERATION OF THE PLC, ITS SUPPLY MUST NOT EXCEED 26.5 VDC.
- NOTE 2
PLC INPUTS X12 AND X11 ARE NOT USED.
- NOTE 3
SEE 58400188 FOR TEST INFO.
- NOTE 4
ON PANEL ASSY 58400140, 2 LAMPS LP4 AND LP5 ARE FITTED BUT NOT SHOWN ON THIS CIRCUIT. SEE SHEET 3 FOR WIRING DETAILS.
- NOTE 4
SEE 58000151 FOR PLC PROGRAMME.

SHEET 1 OF 3

DRN	NB	TITLE	200SVTH SW ST CONTROL BOX
CHD.	-	PRDDUCT	
DATE	08.02.96	PART No	58400174
SCALE	NTS	LEWMAR	

PART No
58400174

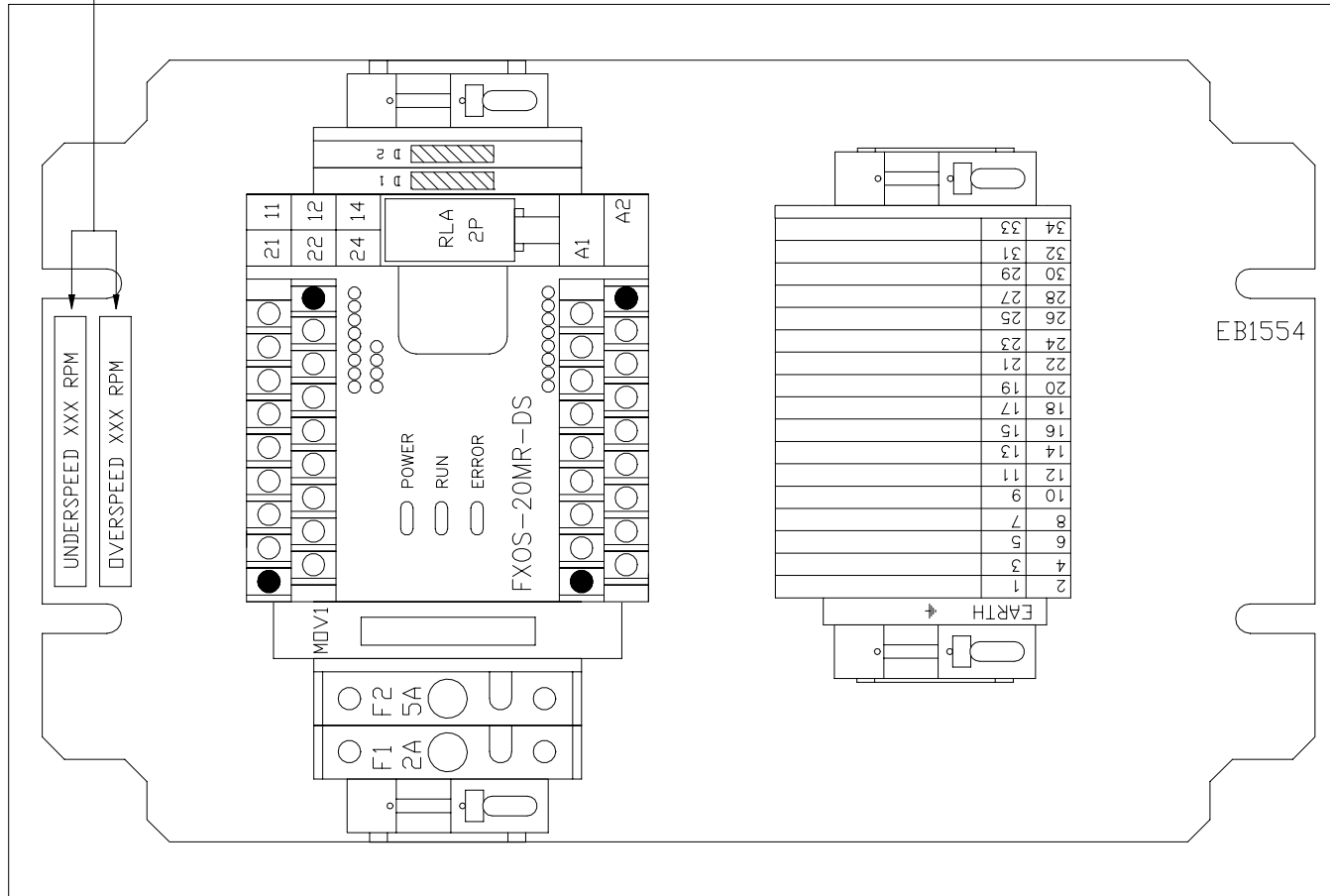


ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction in whole or in part is prohibited

200 SVTH THRUSTER SWITCHED WITH SPEED TRIP.

SPEED LABELS WHERE XXX = THE REQUIRED SPEED (INFO PROVIDED BY PROJECT ENGINEER)
TO BE MANUFACTURED IN HOUSE.



ISSUE	REVISIONS		MOD No.
A	08.02.96	NB	N/A
B	08.03.96	NB	6029
C	13.05.96	NB	6106
D	06.04.00	GFS	8054

B No	QTY	DESCRIPTION
B8941	1	ENCLOSURE EB1554
B10786	1	PLC FX0S 20MR-DS
B8152	1	RELAY
B8153	1	BASE
B9358	1	MOV1
B6080	2	TERMINAL DIODE
B7005	1	TERMINAL COVER
B3691	17	TERMINAL DOUBLE
B7005	1	TERMINAL COVER
B9421	1	TERMINAL EARTH
B8955	2	FUSE HOLDER
B8960	1	FUSE COVER
B9356	2	FUSE IDENT
B9184	1	FUSE 2A F1
B9339	1	FUSE 5A F2
B7006	4	ENDSTOP

58400139	1	PANEL ASSY
OR		
58400140	1	PANEL ASSY
58400188		TEST PROCEDURE
58000151		PLC PROGRAMME

SHEET 2 OF 3

PART No
58400174

0 10 20 30 40 50

REFERENCE SCALE IN MM

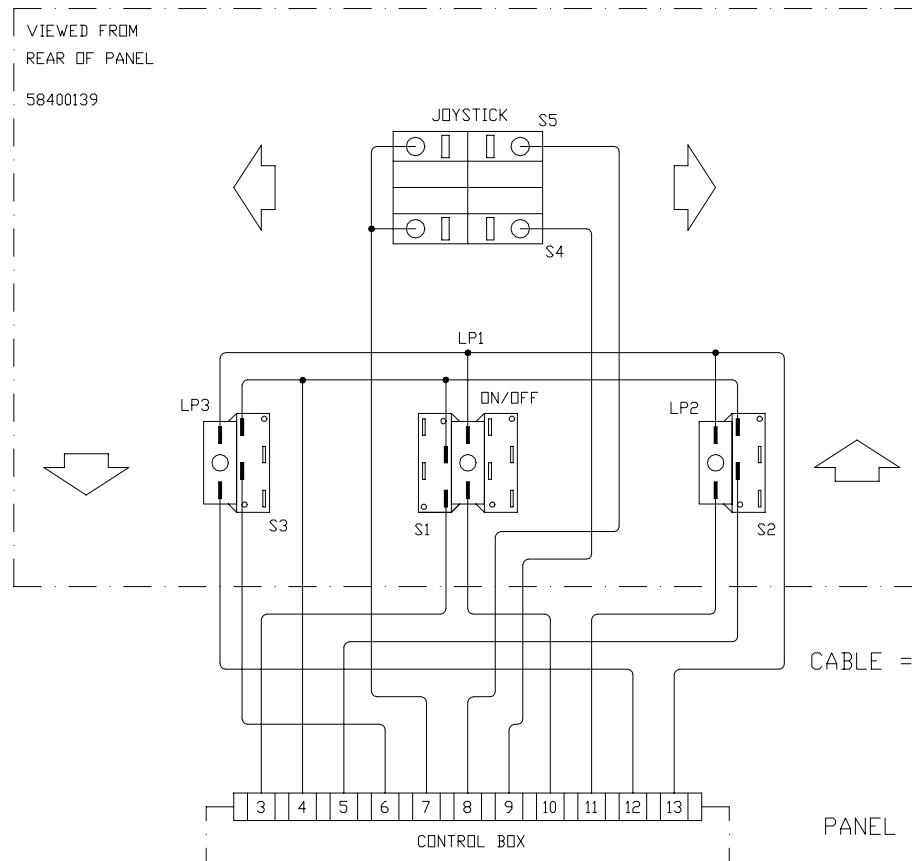
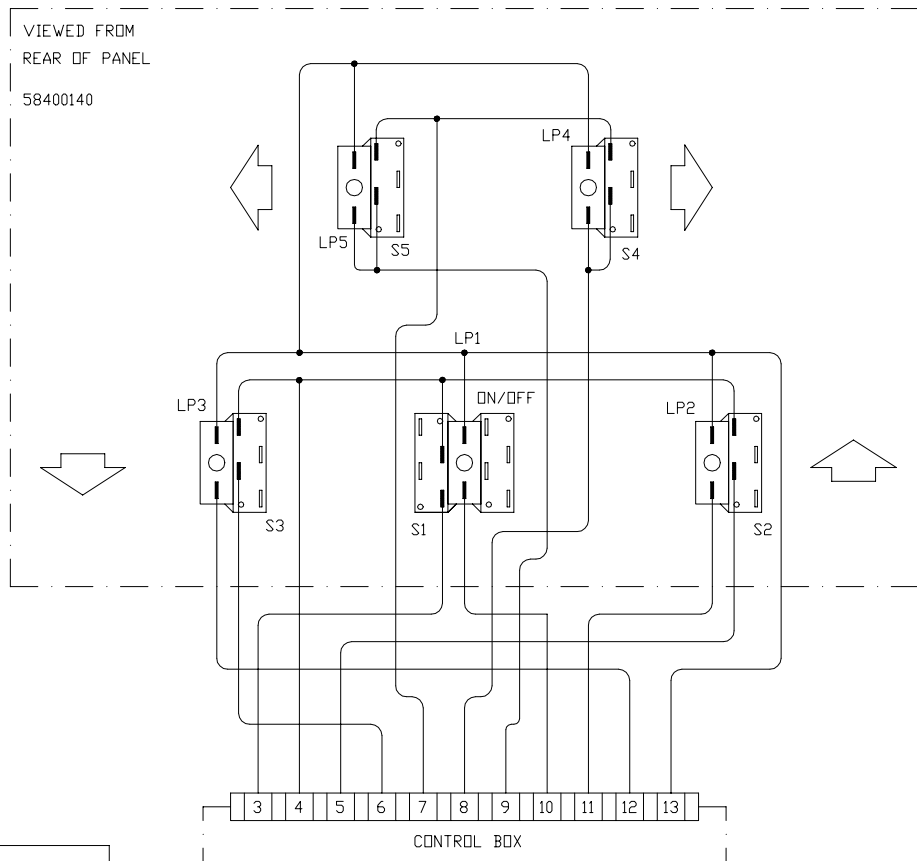
ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited

200 SVTH THRUSTER WITH SWITCHED
DIRECTION AND SPEED TRIP.

DRN	NB	TITLE	200SVTH SW ST CONTROL BOX
CHD.	-	PRODUCT	
DATE	08.02.96	PART No	58400174
SCALE	NTS		LEWMAR

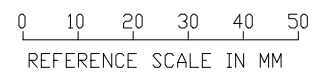
ISSUE	REVISIONS		MOD No.
B	08.03.96	NB	N/A
C	13.05.96	NB	6106
D	06.04.00	GFS	8054



CABLE = 3 AMP MIN.

PANEL WIRING
SHEET 3 OF 3

PART No
58400174

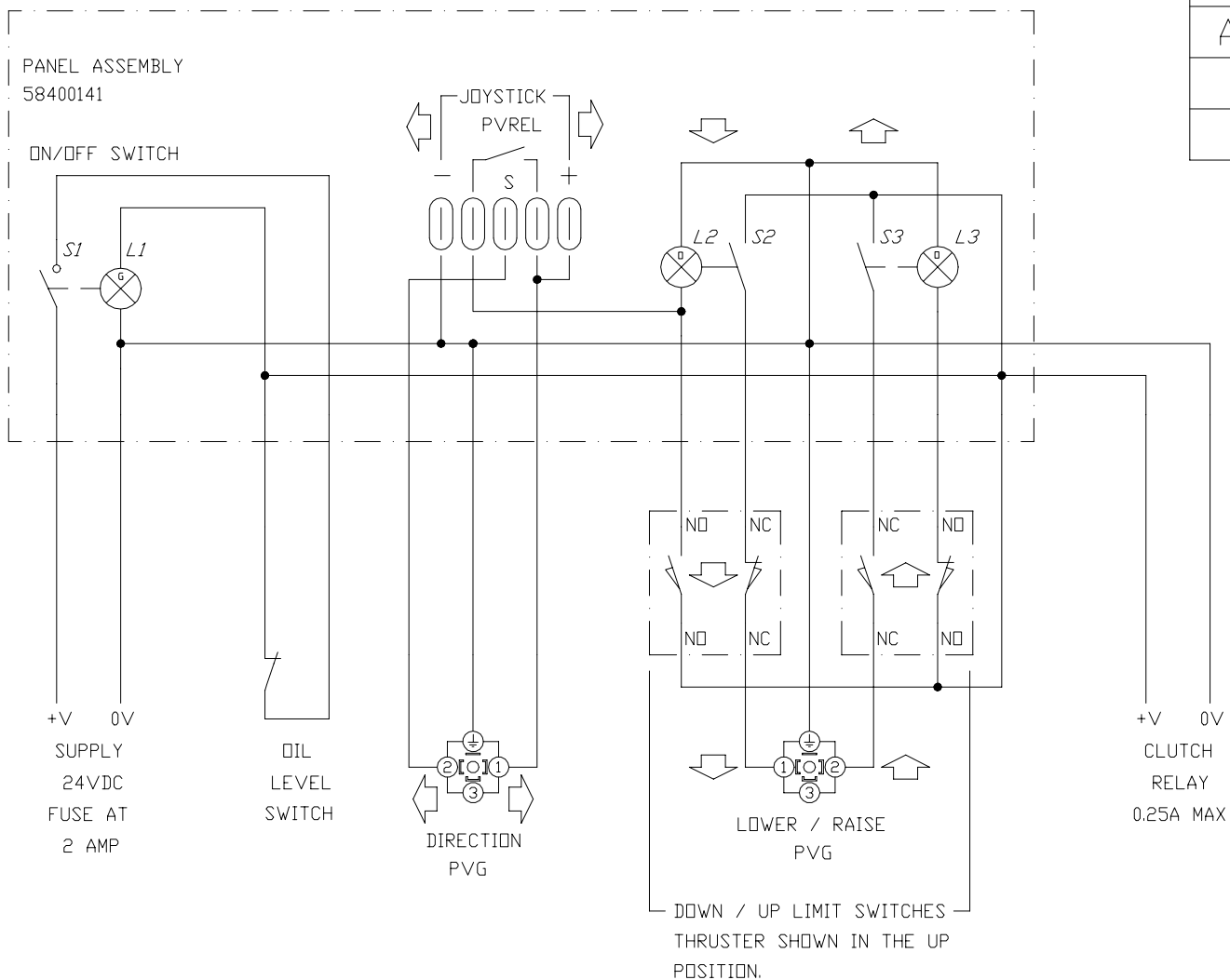


ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited

DRN	NB	TITLE	200SVTH SW ST CONTROL BOX
CHD.	-	PRDDUCT	
DATE	08.03.96	PART No	58400174
SCALE	1:1		LEWMAR

ISSUE	REVISIONS	MOD No.
B	11.03.96 NB	6029
A	08.02.96 NB	N/A



SHEET 1 OF 2

PART No
58400175

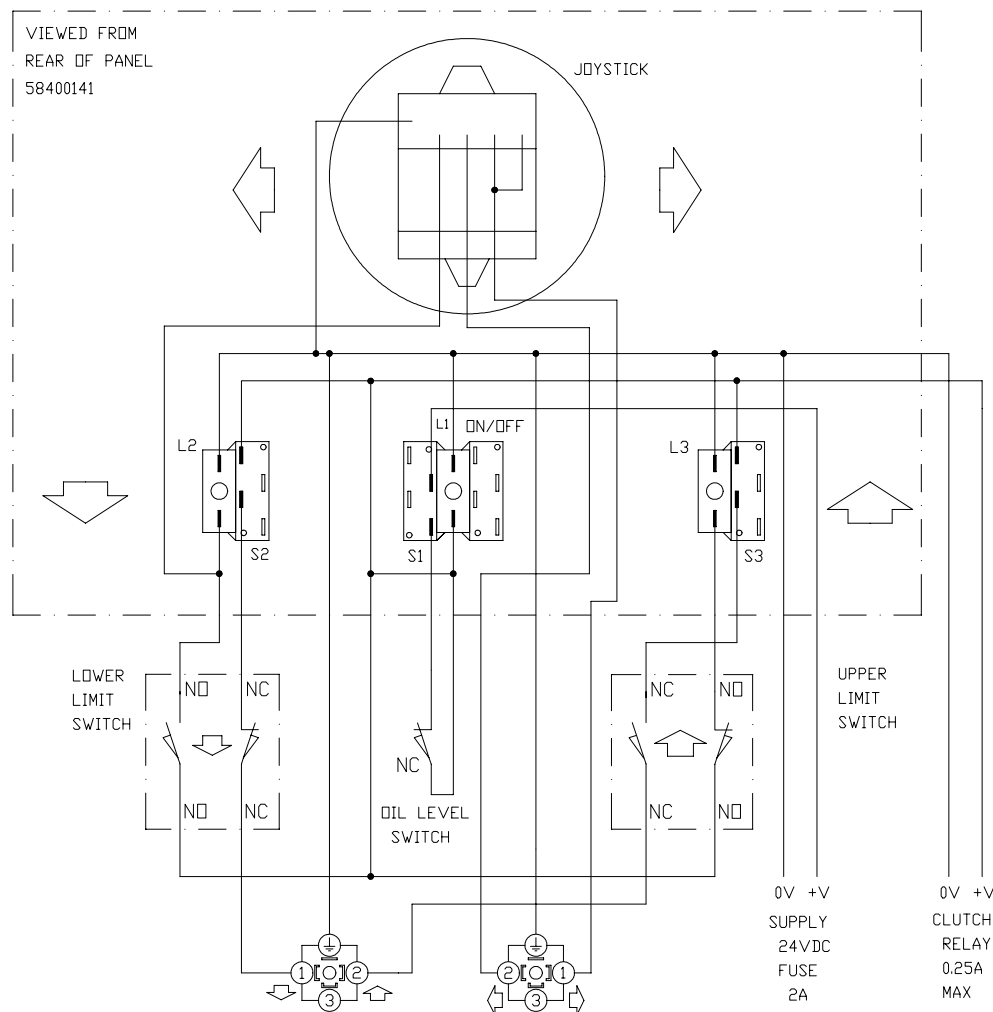
0 10 20 30 40 50
REFERENCE SCALE IN MM

ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited

DRN	NB	TITLE	200SVTH THRUSTER
CHD.	-	PRDDUCT	
DATE	08.02.96	PART No	58400175
SCALE	NTS		LEWMAR

ISSUE	REVISIONS	MOD No.
B	18.03.96 NB	N/A



NOTE :
THRUSTER SHOWN IN THE
FULLY RAISED POSITION.

PANEL WIRING

SHEET 2 OF 2

CABLE = 3 AMP MIN.

DRN	NB	TITLE	200SVTH THRUSTER
CHD.	-	PRDDUCT	
DATE	18.03.96	PART No	58400175
SCALE	1:1		LEWMAR

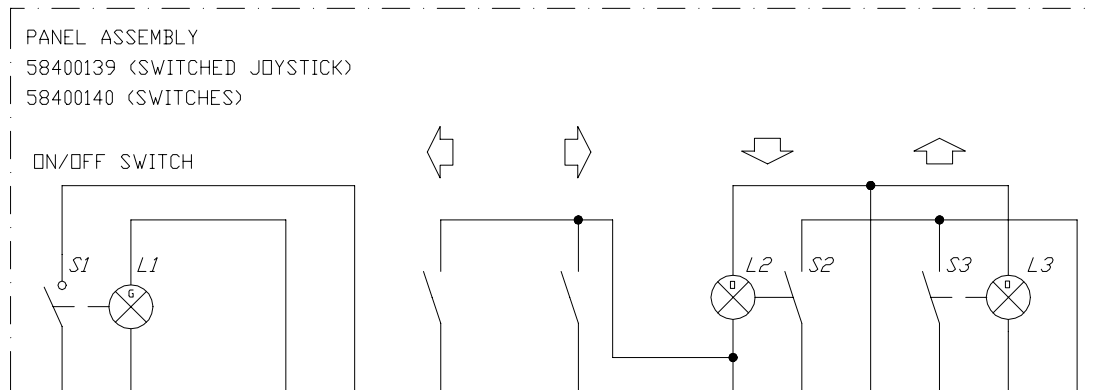
0 10 20 30 40 50
REFERENCE SCALE IN MM

ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited

PART No
58400175

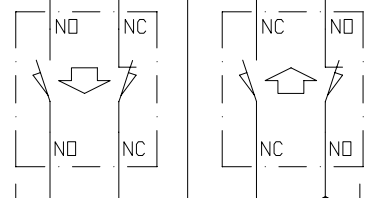
ISSUE	REVISIONS	MDD No.
B	18.03.96 NB	6029
A	08.02.96 NB	N/A



+V 0V
SUPPLY
24VDC
FUSE AT
2 AMP

OIL
LEVEL
SWITCH

1 2 3
DIRECTION
PVG



1 2 3
LOWER / RAISE
PVG

DOWN / UP LIMIT SWITCHES
THRUSTER SHOWN IN THE UP
POSITION.

+V 0V
CLUTCH
RELAY
0.25A MAX

SHEET 1 OF 2

PART No
58400176

0 10 20 30 40 50

REFERENCE SCALE IN MM

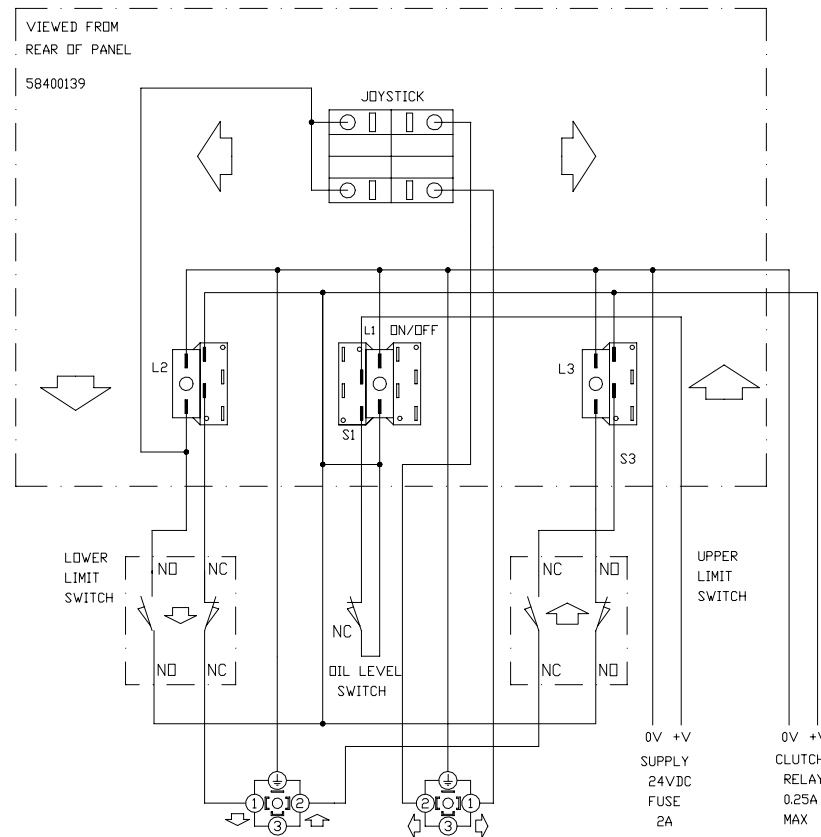
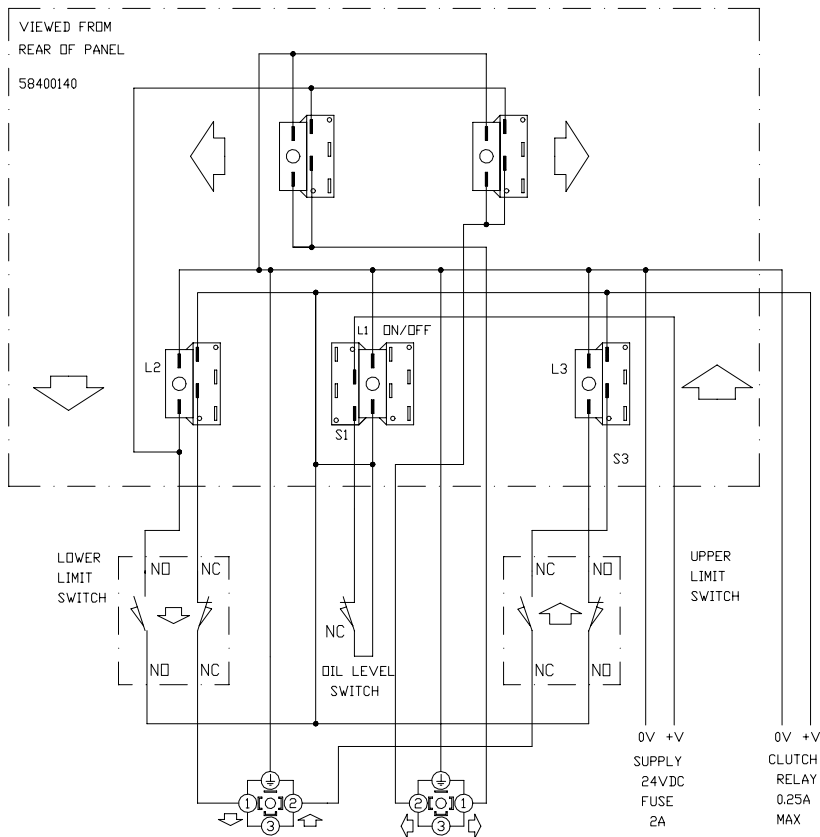
ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited

PANEL ASSEMBLIES FOR THIS CIRCUIT =
58400139 FOR SWITCHED JOYSTICK CONTROL OF DIRECTION PVG.
58400140 FOR SWITCHED CONTROL OF DIRECTION PCB.

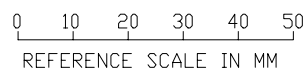
DRN	NB	TITLE	200SVTH THRUSTER
CHD.	-	PRDDUCT	
DATE	08.02.96	PART No	58400176
SCALE	NTS		LEWMAR

ISSUE	REVISIONS	MOD No.
B	18.03.96 NB	N/A



SHEET 2 OF 2

NOTE :
THRUSTER SHOWN IN THE FULLY RAISED POSITION.



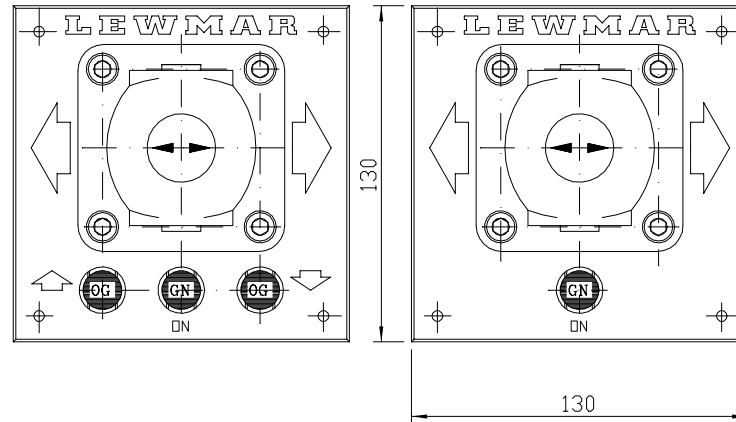
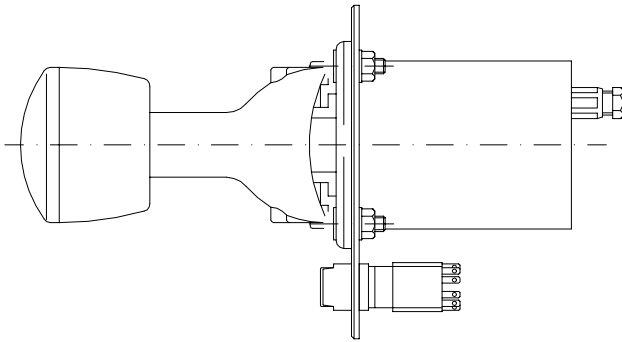
ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction in whole or in part is prohibited

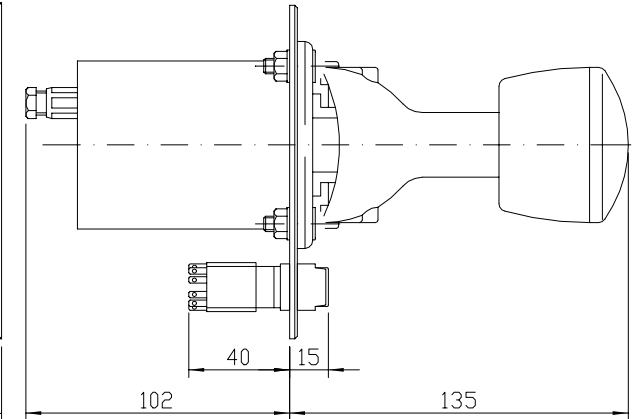
PART No
58400176

DRN	NB	TITLE	200SVTH THRUSTER
CHD.	-	PRDDUCT	
DATE	18.03.96	PART No	58400176
SCALE	1:1		LEWMAR

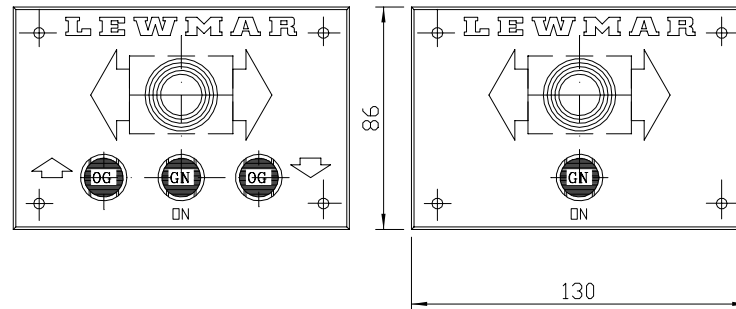
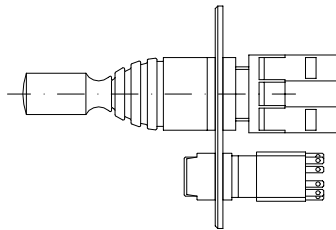
58400141 200SVTH JOYSTICK PANEL



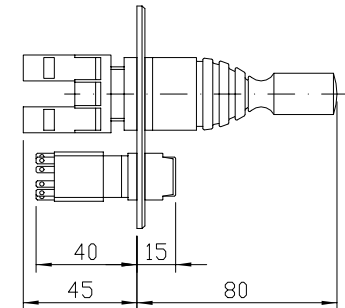
58400138 200TH PROP JOYSTICK PANEL



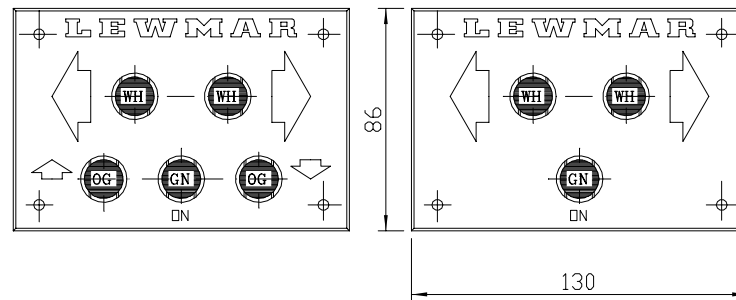
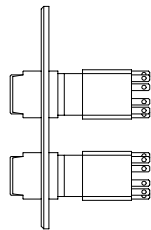
58400139 200SVTE JOYSTICK PANEL 24V



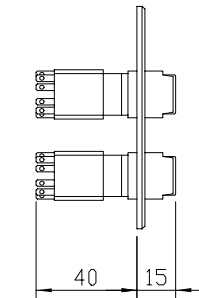
58400136 200TE JOYSTICK PANEL 24V



58400140 200SVTE BUTTON PANEL 24V

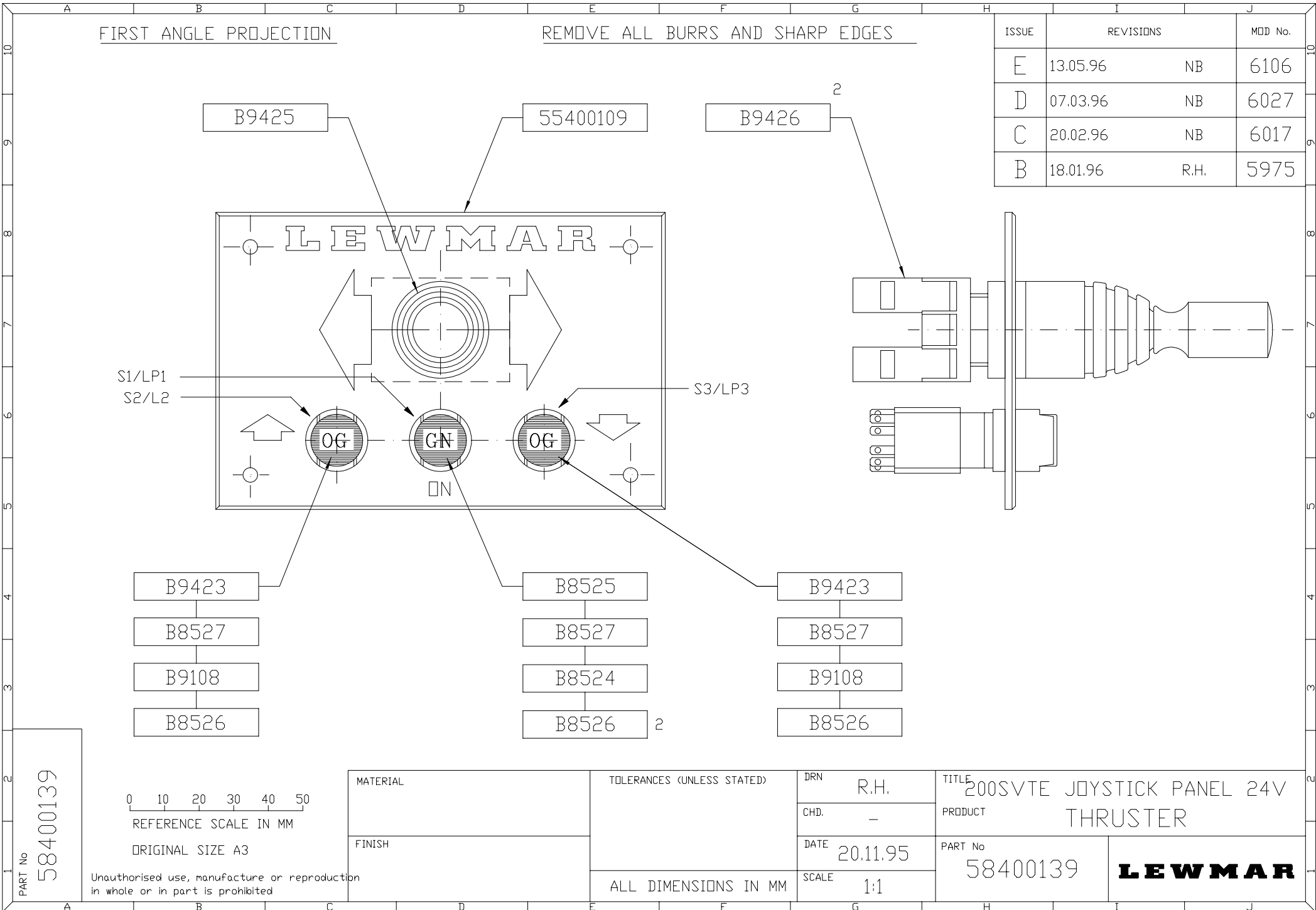


58400137 200TE BUTTON PANEL 24V



THRUSTER CONTROL PANELS

DRN	R.H.	DRG. No	LEWMAR
DATE	22.11.95	WSD0641	



FIRST ANGLE PROJECTION

REMOVE ALL BURRS AND SHARP EDGES

ISSUE	REVISIONS		MDD No.
E	13.05.96	NB	6106
D	07.03.96	NB	6027
C	20.02.96	NB	6017
B	18.01.96	R.H.	5975

S1/LP1
S2/L2

S3/LP3

- B9423
- B8527
- B9108
- B8526

- B8525
- B8527
- B8524
- B8526 2

- B9423
- B8527
- B9108
- B8526

0 10 20 30 40 50

REFERENCE SCALE IN MM

ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction
in whole or in part is prohibited

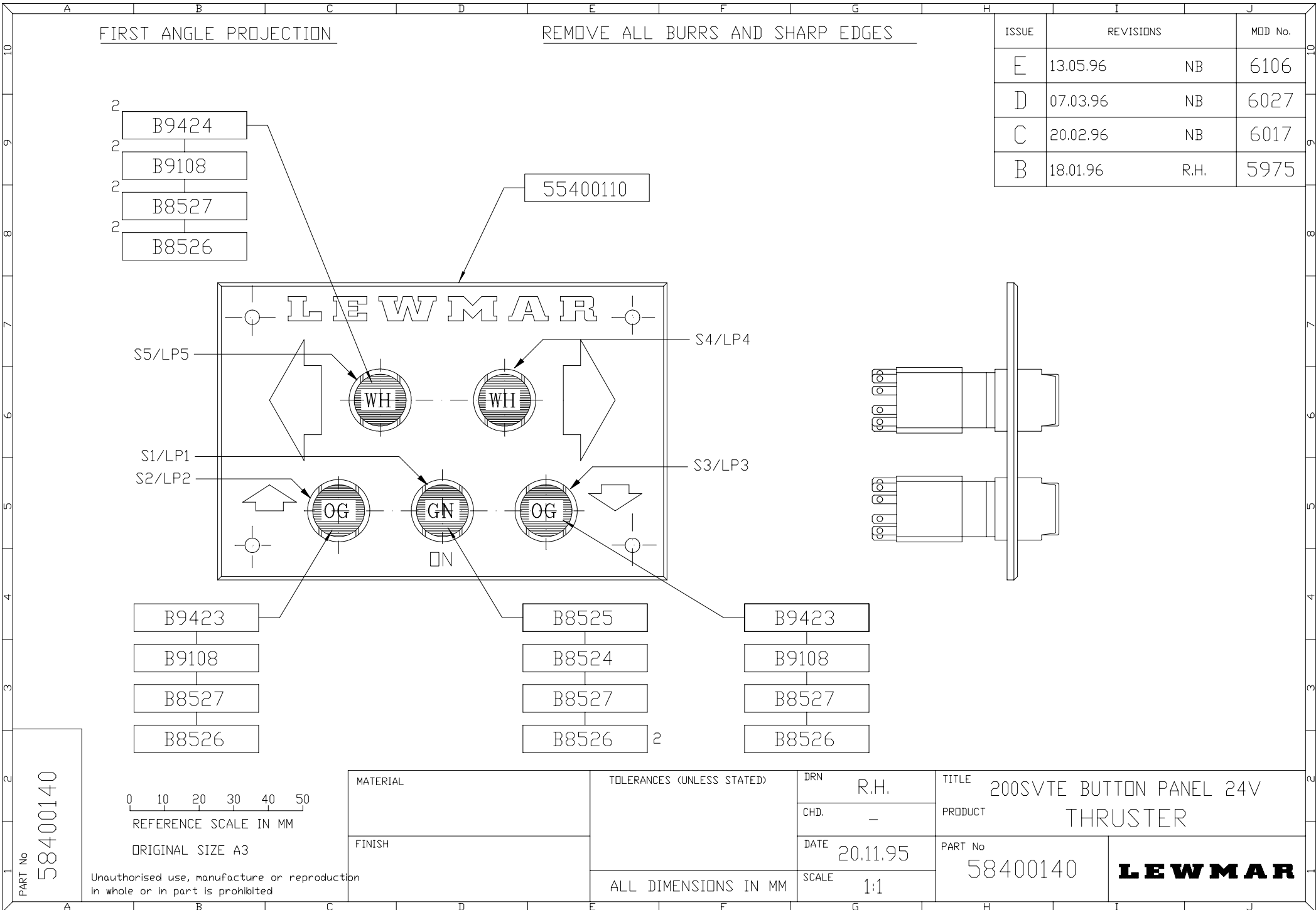
MATERIAL
FINISH

TOLERANCES (UNLESS STATED)
ALL DIMENSIONS IN MM

DRN	R.H.
CHD.	-
DATE	20.11.95
SCALE	1:1

TITLE	200SVTE JOYSTICK PANEL 24V THRUSTER	
PRODUCT		
PART No	58400139	LEWMAR

PART No
58400139



FIRST ANGLE PROJECTION

REMOVE ALL BURRS AND SHARP EDGES

ISSUE	REVISIONS		MOD No.
E	13.05.96	NB	6106
D	07.03.96	NB	6027
C	20.02.96	NB	6017
B	18.01.96	R.H.	5975

- 2 B9424
- 2 B9108
- 2 B8527
- 2 B8526

55400110

S5/LP5

S4/LP4

S1/LP1
S2/LP2

S3/LP3

- B9423
- B9108
- B8527
- B8526

- B8525
- B8524
- B8527
- B8526 2

- B9423
- B9108
- B8527
- B8526

0 10 20 30 40 50
REFERENCE SCALE IN MM

ORIGINAL SIZE A3

Unauthorised use, manufacture or reproduction in whole or in part is prohibited

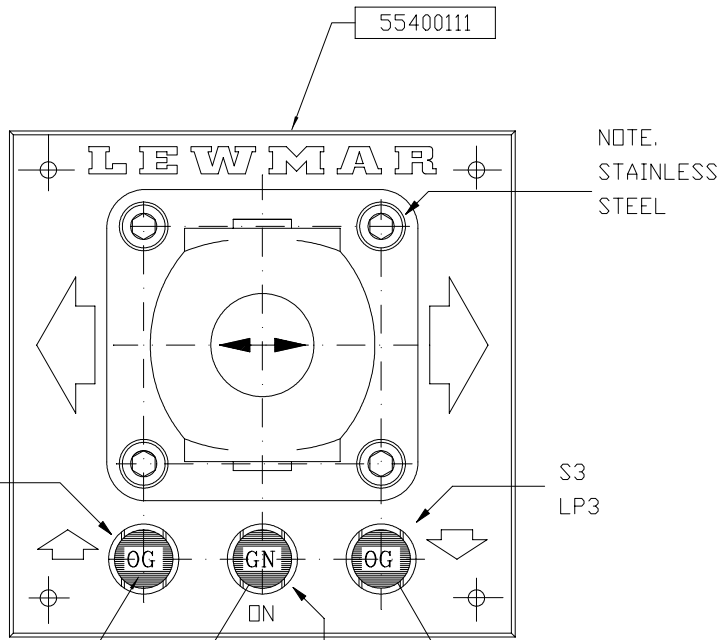
MATERIAL	TOLERANCES (UNLESS STATED)		DRN	R.H.	TITLE	
	FINISH		CHD.	-	200SVTE BUTTON PANEL 24V THRUSTER	
ALL DIMENSIONS IN MM			DATE	20.11.95	PART No	58400140
			SCALE	1:1	LEWMAR	

PART No
58400140

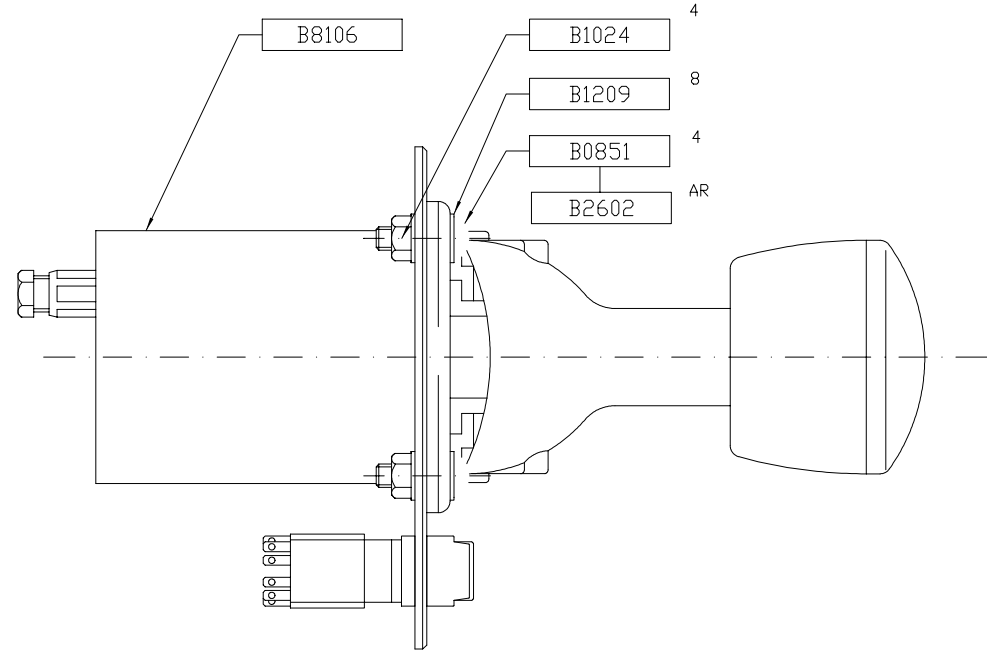
FIRST ANGLE PROJECTION

REMOVE ALL BURRS AND SHARP EDGES

ISSUE	REVISIONS		MOD No.
E	10.05.96	NB	6106
D	07.03.96	NB	6027
C	19.02.96	NB	6017
B	18.01.96	R.H.	5975



- | | | | |
|-------|--------------------|--------|-------|
| B9423 | B8524 | S1 LP1 | B9423 |
| B9108 | B8525 | | B9108 |
| B8527 | B8527 | | B8527 |
| B8526 | B8526 ² | | B8526 |



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PART No
58400141

0 10 20 30 40 50
REFERENCE SCALE IN MM
ORIGINAL SIZE A2

MATERIAL	TOLERANCES (UNLESS STATED)	DRN	R.H.	TITLE	200SVTH JOYSTICK PANEL
		CHD.	-	PRODUCT	THRUSTER
FINISH	ALL DIMENSIONS IN MM	DATE	14.11.95	PART No	58400141
		SCALE	1:1	LEWMAR	

LEWMAR LIMITED WARRANTY

Lewmar warrants its products in normal usage to be free of defects in materials and workmanship for a period of three years from date of purchase by the original purchaser, subject to the conditions, limitations and exceptions listed below. Any part, which proves to be defective in normal usage during that three-year period, will be repaired or at Lewmar's option, replaced by Lewmar.

A CONDITIONS AND LIMITATIONS

- i Lewmar's liability shall be limited to repair or replacement of the goods or parts defective in materials or workmanship.
- ii Determination of the suitability of the material for the use contemplated by the buyer is the sole responsibility of the buyer and Lewmar shall have no responsibility in connection with such suitability.
- iii Lewmar shall not be liable in any way for:
 - a Failures, loss or damage due to use of products in applications for which they are not intended.
 - b Failures, loss or damage due to corrosion, ultra violet degradation, wear and tear or improper installation.
 - c Failures, loss or damage due to incorrect maintenance.
 - d Failures, loss or damage due to conditions that exceed the product's performance specifications.
- iv Product subject to warranty claim must be returned to Lewmar for examination unless otherwise agreed by Lewmar in writing.
- v Lewmar shall not be responsible for shipping charges nor installation labour associated with any warranty claim.
- vi Service by anyone other than authorised Lewmar representatives shall void this warranty unless it accords with Lewmar guidelines and standards of workmanship.
- vii Lewmar's products are intended for use only for marine purposes. Buyers intending to use them for any other purpose should seek advice from Lewmar, and Lewmar shall be under no liability arising from use, which Lewmar has not approved.

B EXCEPTIONS

Warranty is limited to a period of one year from the date of purchase in the case of the following:

- Bow thrusters
- Electric motors and electrical equipment
- Electronic controls
- Hydraulic pumps, valves and actuators
- Weather seals
- Products used in "Grand Prix" racing applications

C LIABILITY

- i Lewmar's liability under this warranty shall be to the exclusion of all other warranties or liabilities (to the extent permitted by law). In particular (but without limitation):
 - a Lewmar shall not be liable for:
 - Any indirect or consequential loss including (without limitation) any loss of anticipated profits, damage to reputation or goodwill, loss of expected future business, damages, costs or expenses payable to any third party or any other indirect losses.
 - Any damage to yachts or equipment.
 - Death or personal Injury (unless caused by Lewmar's negligence).
 - b Lewmar grants no warranties regarding the fitness for purpose, use, nature or satisfactory quality of the goods.
- ii Where the laws of the country do not permit a warranty to be excluded, then such warranty, if permitted by that country's law, shall be limited to a period of one year.

LEWMAR CONTACT DETAILS

LEWMAR SALES OFFICES

Lewmar UK/Rest of World

Lewmar Ltd, Southmoor Lane, Havant, Hampshire PO9 1JJ. UK

Tel (+44) 23 92 485700 Fax (+44) 23 92 485710

e-mail info@uk.lewmar.com

Lewmar USA

Lewmar Inc, New Whitfield Street, Guilford, CT 06437, USA

Tel (+1) 203 458 6200 Fax (+1) 203 453 5669

e-mail info@usa.lewmar.com

Lewmar Mid Europe

Lewmar Ltd, Branderweg 19, 8042 PD Zwolle, The Netherlands

Tel (+31) 38 427 34 90 Fax (+31) 38 421 56 42

e-mail info@holland.lewmar.com

Lewmar Southern Europe

Lewmar Ltd, Place Bernard Moitessier, 17000 La Rochelle, France

Tel (+33) 5 46 50 50 46 Fax (+33) 5 46 50 59 04

e-mail info@france.lewmar.com

Lewmar Southern Europe (Cannes)

Lewmar Ltd, Allée Charles Nungesser, Parc D'Activités de la Siagne 06210 Mandelieu, France

Tel (+33) 4 93 48 80 48 Fax (+33) 4 93 48 37 50

e-mail info@france.lewmar.com

Lewmar Southern Europe (Spain)

Lewmar Ltd, Sucursal en Espana, Joan de Borbó 92,

08039 Barcelona, Spain

Tel (+34) 93 221 94 37 Fax (+34) 93 225 19 49

e-mail info@spain.lewmar.com

Lewmar Northern Europe

Lewmar Marin AB, Argongatan 8, S-431 53, Mölndal, Sweden

Tel (+46) 31 277130 Fax (+46) 31 273116

e-mail info@sweden.lewmar.com

Lewmar Northern Europe (Finland)

Lewmar Marin AB (Finland), Laaksoitie 10 A-B, 02700 Kauniainen, Finland

Tel (+358) 9 5489 5110 Fax (+358) 9 5489 5111

e-mail info@finland.lewmar.com