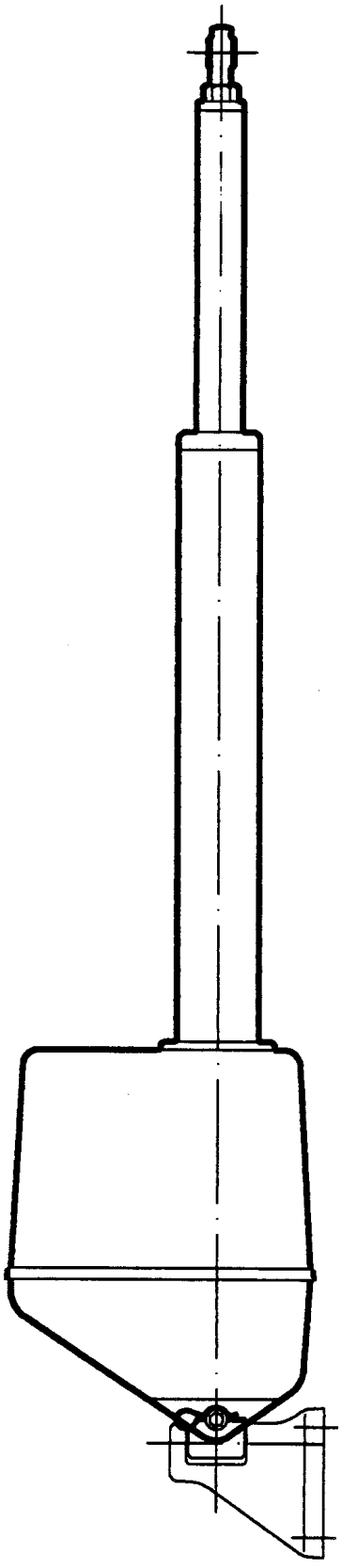
Autohelm Inboard Autopilots
(ST6000 and ST7000 systems)

Service Manual

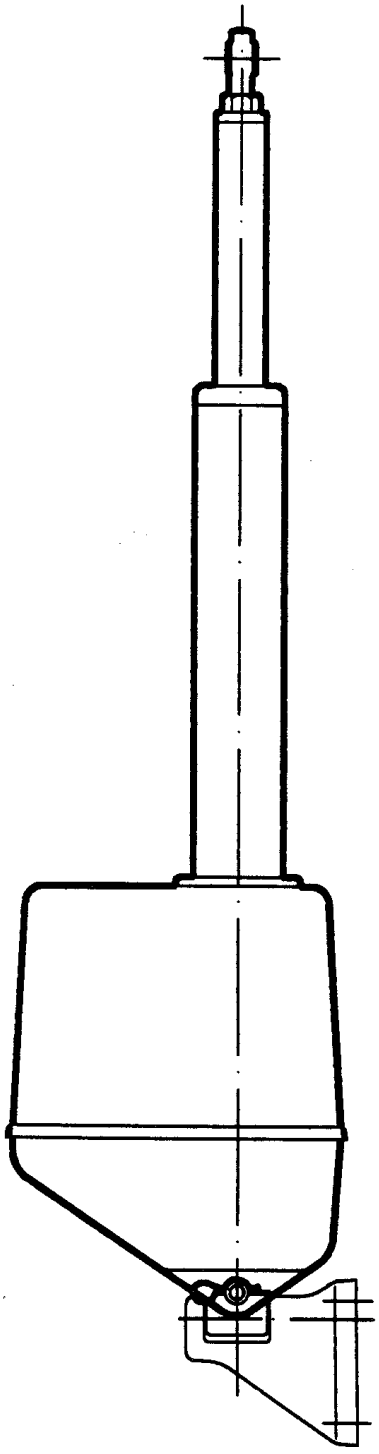
Tom Green 11/02

Linear Drive Units

Service Procedures



Linear Drive Unit (Z029, Z032)



Linear Drive Unit (Z029, Z058, Z059)

Autohelm

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1. Linear Drive Unit

The linear drive unit comprises a belt drive reduction stage from the motor, a single epicyclic gearbox and a two start recirculating-ballscrew to provide linear motion. An electromagnetic clutch locks the outer ring of the epicyclic gearbox when drive is required. The drive is unique in providing efficient drive combined with very smooth backdrive at extremely low loads.

2. Inspection

Before stripping down or testing the drive unit, a close visual inspection should be made to establish if the cause of the problem is external.

Poor mechanical installation where the unit can foul obstructions, particularly at the end of stroke, can distort the drive module and lead to rough operation and high backdrive loads. The drive module is assembled at Nautech in a dirt free environment to precise limits. If disturbed, rough operation and high backdrive loads will result.

3. Dismantling

After removing the unit from the boat and to gain access to drive motor, drive belt, clutch rotor or drive module the following steps apply:

a) Unscrew and remove the two caphead screws which secure the plastic dust cover to the main unit (use 'M3' alien key). Slide the dust cover off the girdle tube.

b) Unscrew and remove the four M6 caphead screws with washers and the two long hexagonal studs at the centre-sides of the master plate. Separate the mounting cover assembly from the master plate assembly, after feeding the cables through the grommet.

c) If servicing the clutch rotor assembly, remove it from the mounting plate by unscrewing the central caphead screw which secures the assembly to the casting. Note that the assembly is sprung loaded and care should be taken when removing.

d) If replacing the drive belt, loosen the three M6 caphead screws with washers which secure the motor to the masterplate. With the tension taken off the belt it can be slipped off both pulleys.

e) If replacing the drive motor unscrew and remove the three M6 caphead screws as above and take the weight of the motor as it is released. Note that the power cables are extended and passed through grommets in the masterplate. Remove the drive belt.

f) If servicing the drive module, follow steps a) b) d) and e) above. Then remove the circlip at the front of the clutch plate/ring gear assembly and withdraw the assembly. Locate the leadscrew journal and carrier on a firm block to prevent bending the journal and drive out the roll pin securing the carrier to the leadscrew (general assembly).

Slide off the carrier assembly and the four planet gears. Finally withdraw the driven pulley assembly from the drive module.

4. Re-assembly

In all cases rebuilding the unit is a straight reversal of the above procedures, but the following points should be noted:-

a) If replacing a drive motor, first ensure that the drive pulley is fitted in the correct orientation (general assembly). Ensure that the motor spindle is degreased and dried thoroughly before bonding the pulley to the shaft with Loctite 601 or equivalent anaerobic adhesive. After bonding, the unit should not be put under power for at least one hour.

b) If replacing the clutch rotor assembly, ensure the rotor can be pulled forward along the two dowels against the spring and when released returns hard against the mounting cover. If this is not done, the assembly will jam the drive train when the unit is rebuilt. Also after the unit is completely rebuilt check for a metallic click when the clutch voltage is applied and removed showing the clutch is operating correctly.

c) When rebuilding from the drive module stage, ensure that the driven pulley, planet gears, washers and carrier are all correctly located and turning freely before and after the roll pin securing the carrier to the leadscrew is refitted. Note that extreme care must be taken to fully support the leadscrew journal when driving the roll pin back into the carrier. This prevents the leadscrew journal from being bent. Check for free movements of the ram tube in and out before proceeding further. When refitting the clutch plate assembly ensure that it is engaged correctly with the planet gears before refitting the washer and circlip. Check again for free ram tube movement before refitting the mounting cover.

d) Ensure that all cables are correctly routed, secured and pulled through away from moving parts.

e) Check the correct length drive module, drive motor and product label have been used.

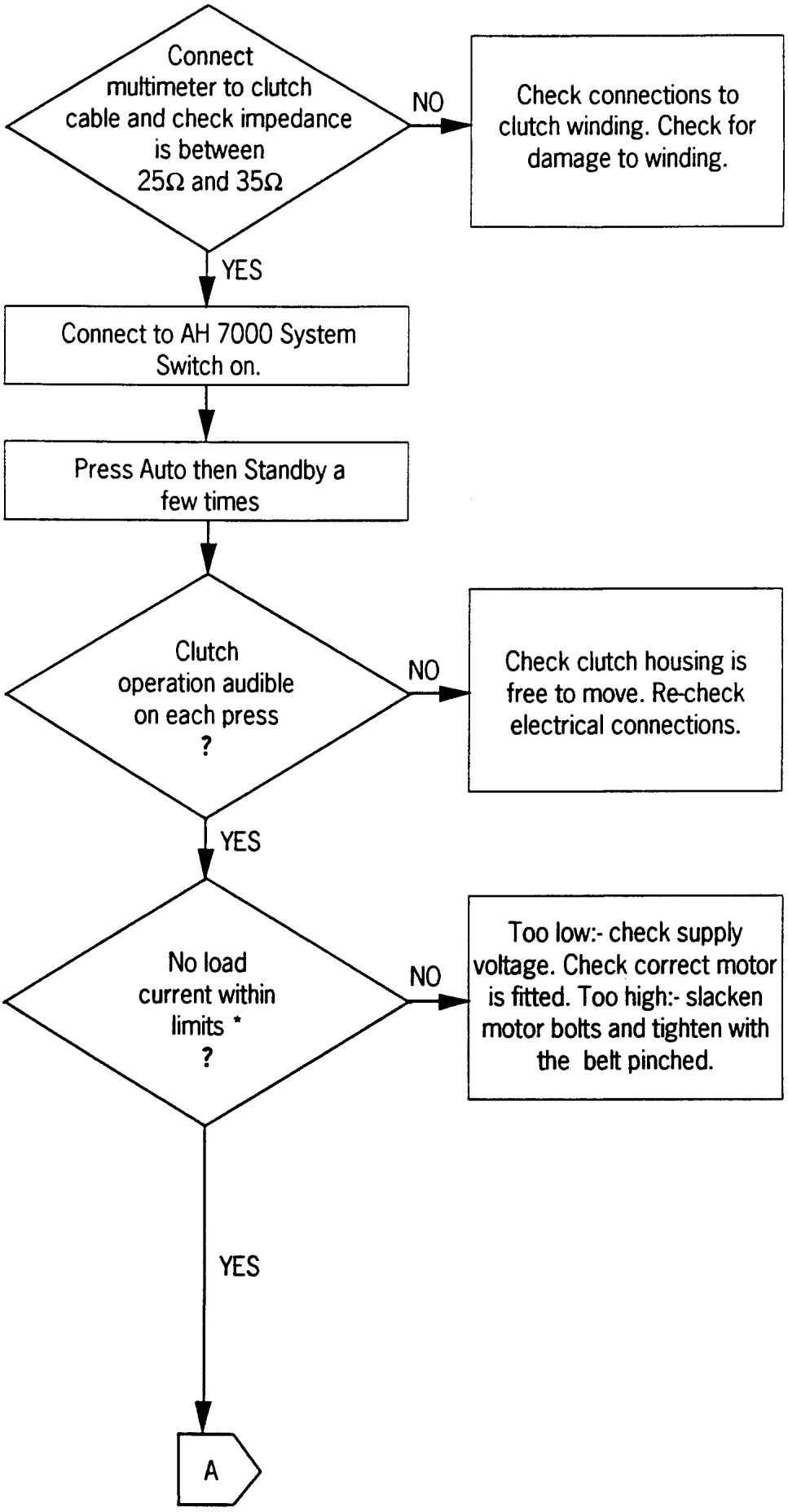
5. Operation with non Autohelm Autopilots (24v systems)

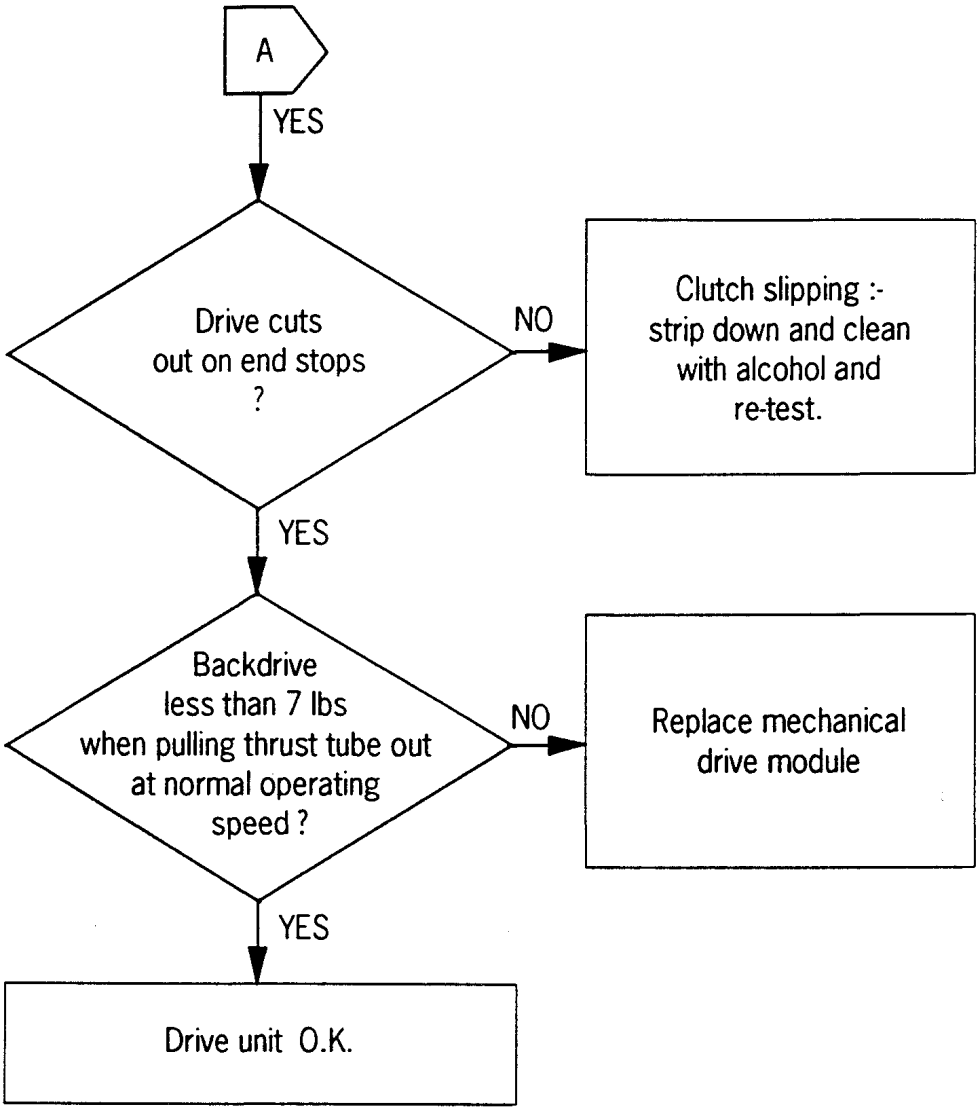
It should be noted that the 24V version of the Autohelm linear drive requires a 12V clutch signal. If used with other manufacturers autopilots, steps should be taken to limit the voltage supplied to the clutch.

6. Functional Test

Having reassembled the drive unit the following functional test (Fig.2) must be completed.

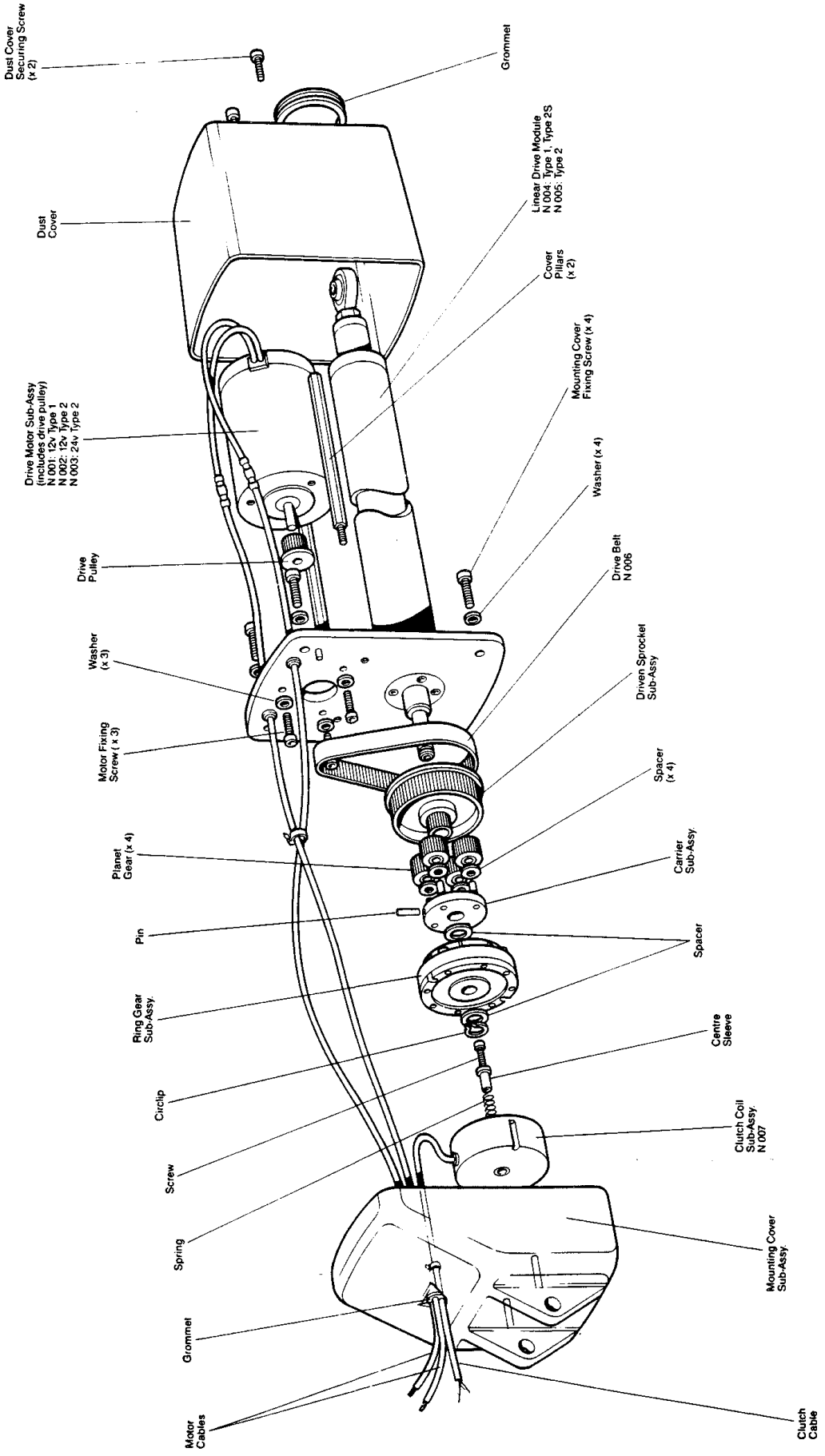
Linear Drive Unit - Functional Test Procedure (Z029, Z032, Z039, Z085, Z059)





* No load current limits :-		Minimum (A)	Maximum (A)
Type 1	(Z039)	2.0	3.0
Type 2 12V	(Z029, Z058)	2.5	3.5
Type 2 24V	(Z032, Z059)	1.0	2.5

Fig. 1. Linear Drive Unit (Z029, Z032, Z039, Z058, Z059) General Assembly



7. Product History Type 2 Linear Drive Actuators (Long Stroke) (Z029 & Z032)

Change	Serial Number	Comments
Introduction	470001	
Fracmo Motors introduced	780042	
Girdle Buffer/Stop material changed	790045	Extended high temperature use caused rubber buffer to swell giving higher back drive
Rockford Leadscrew introduced	100002	

8. Product History Type 1 Linear Drive Actuators (Z039)

Change	Serial Number	Comments
Introduction	470003	
Fracmo Motors introduced	680086	
Girdle Buffer/Stop material changed	790068	Extended high temperature use caused rubber buffer to swell giving higher back drive
Rockford Leadscrew introduced	100002	

9. Product History Type 2 Linear Drive Actuators (Short Stroke) (Z058 & Z059)

Change	Serial No.	Comments
Introduction	470001	
Fracmo Motors introduced	780042	
Girdle Buffer/Stop material changed	790045	
Rockford Leadscrew introduced	100002	Extended high temperature use caused rubber to swell giving higher backdrive.

10. Spares Numbers - Linear Drive Unites (Z029, Z032, Z039 Z058 & Z059)

Item	Catalogue No.
Drive Motor (Z039)	N001
Drive Motor (Z058 & Z029)	N002
Drive Motor (Z032 & Z059)	N003
Short Stroke drive module	N004
Long Stroke drive module	N005
Drive Belt	N006
Clutch/Rotor	N007