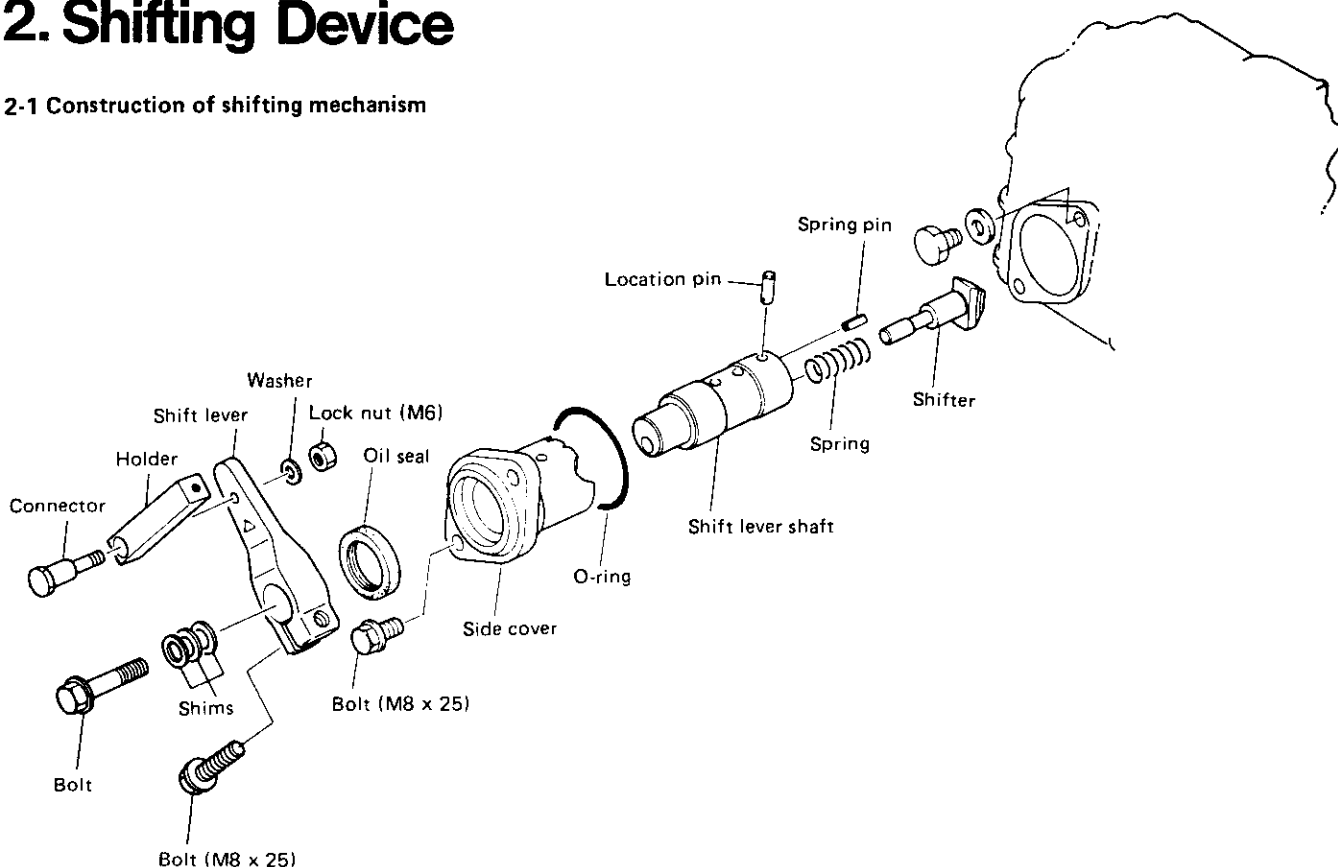
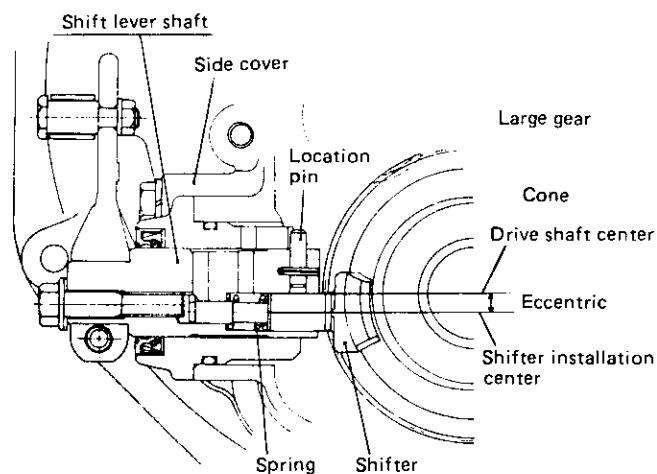


2. Shifting Device

2-1 Construction of shifting mechanism

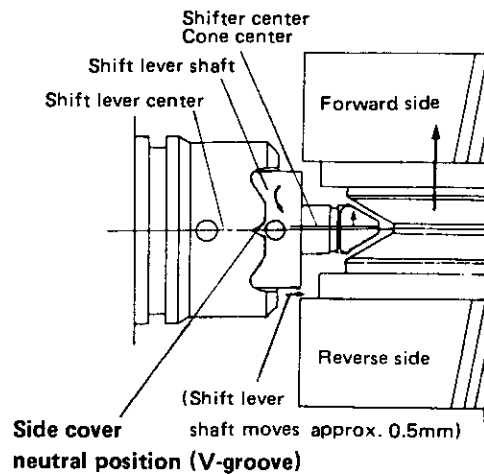


The shift lever shaft is installed on the side cover with neutral, forward and reverse positions provided on this cover. The neutral, forward and reverse location pins of the shift lever shaft are constantly inserted into their respective grooves on the shift lever by the tension of the shifter spring. The shifter is set on the eccentric hole of the shift lever shaft and moves the drive cone in the neutral position either to the forward or reverse positions, and then back to the neutral position. (The shift lever shaft moves slightly to the shift lever or drive cone side when the shift lever is placed in the forward or reverse positions.)

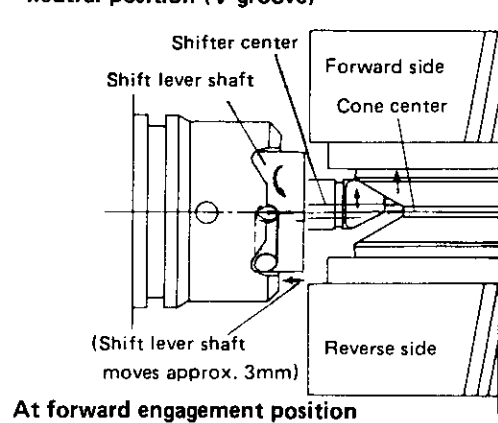


2-2 Forward and reverse clutch operation
(Neutral ⇒ Forward; Neutral ⇒ Reverse)

When the shift lever is moved to the forward position from the neutral position, the shift lever shaft starts to revolve, and the location pin disengages from the neutral V-groove position of the side cover. (Shift lever moves approx. 0.5mm to the drive cone side.) At this time the shifter which is set on the eccentric hole of the shift lever shaft, moves the drive cone's V-groove to the forward large gear.

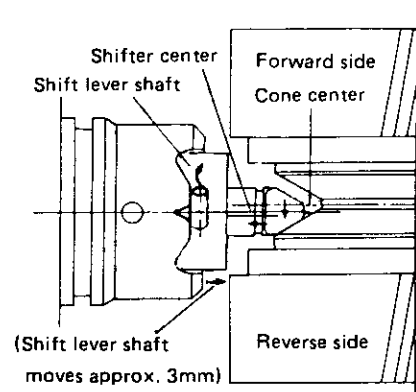


When the location pin of the shift lever shaft falls in the forward position groove of the side cover, (the shift lever shaft moves to the shift lever side approx. 3mm), and the shifter starts to press the drive cone V-groove to the forward large gear side through the spring force.

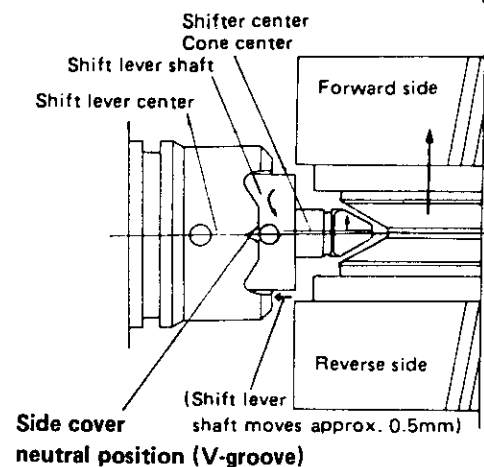


2-3 Engagement and disengagement of clutch
(Forward ⇒ Neutral; Reverse ⇒ Neutral)

When the shift lever is moved to the forward position from the neutral position, the shift lever shaft starts to revolve, and the location pin disengages from the forward position groove of the side cover. (The shift lever shaft moves approx. 3mm to the drive cone side.) At this time, the shifter which is set on the eccentric hole of the shift lever shaft is moved to the neutral side (reverse large gear side). The drive cone, however, is engaged with the forward large gear through the torque force produced by the revolving centrifugal force.

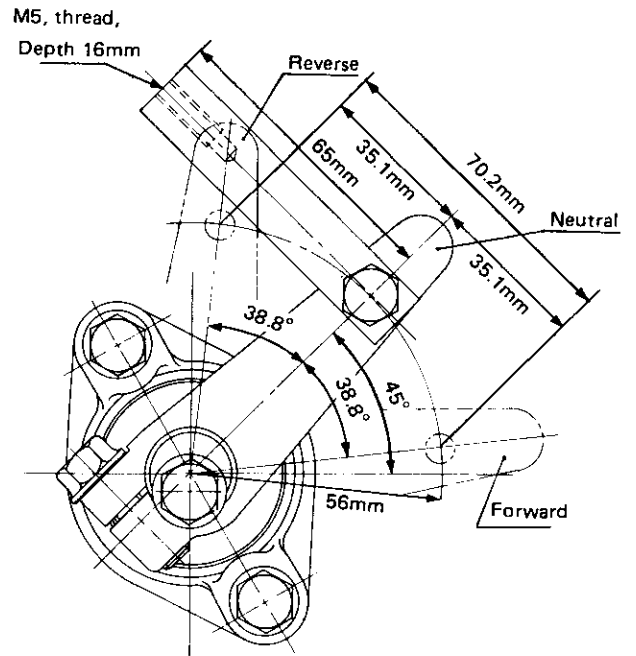


Further, when the shift lever shaft starts to revolve, and the positioning pin falls in to the neutral V-groove position of the side cover (the shift lever shaft travels approx. 5mm to the shift lever side), the shifter moves to the shift lever side (to the spring side) while moving the V-groove of the drive cone to the reverse large gear side. The movement of the shifter to the shift lever side, however, is stopped when the shifter end contacts the stopper bolt. The shifter only works to press the V-groove of the drive cone to the reverse large gear side. Thus, the drive cone is disengaged from the forward large gear. After this disengagement, the transmission torque of the drive cone is decreased to zero and the shift lever is returned to the neutral position by the spring force.



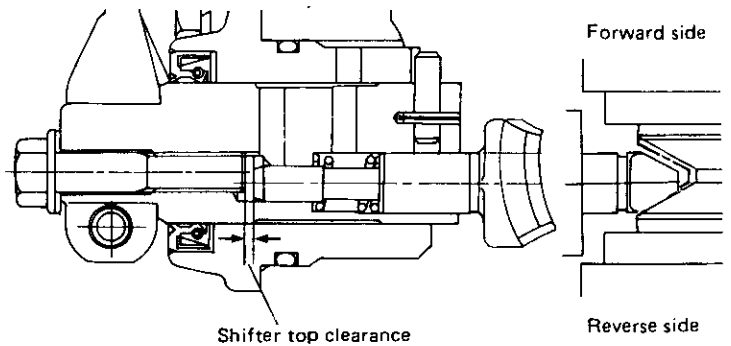
2-4 Clutch shifting force

Shifting position Shifting direction	Shift lever position at 56mm	Remote control handle position at 170mm (Cable length, 4m)
Engaging force at 1000 rpm	3 ~ 4 kg (6.6 ~ 8.8 lbs)	4 ~ 5 kg (8.8 ~ 11.0 lbs)
Disengaging force at 1000 rpm	3.5 ~ 5 kg (7.7 ~ 11.0 lbs)	4 ~ 6 kg (8.8 ~ 13.2 lbs)



2-5 Adjustment of shifting device

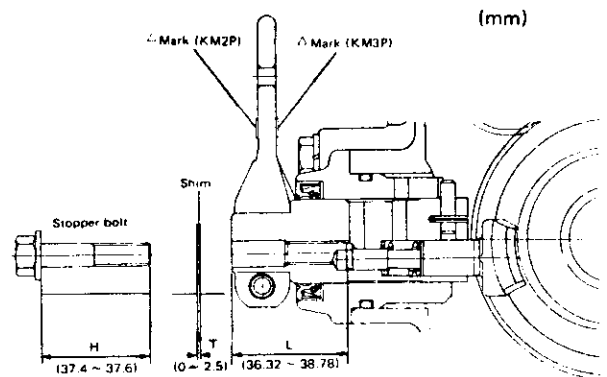
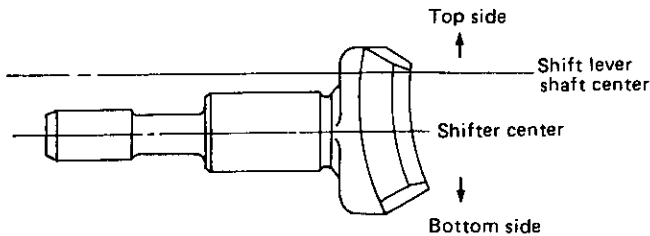
Whenever the side cover, shift lever shaft, shifter, stopper bolt or drive cone is replaced, be sure to adjust the clearance between the shifter end and the stopper bolt by using shims. When the adjustment of this clearance is not proper the drive cone may not be properly fitted when the shift lever is moved to the neutral position either from the forward or reverse position.



2-5.1 Measurement and adjustment of clearance

(a) Assemble the shifting mechanism (without installing the stopper bolt of the shifter) to the marine gear case.

NOTE: Ensure the correct direction of the shifter before assembly.



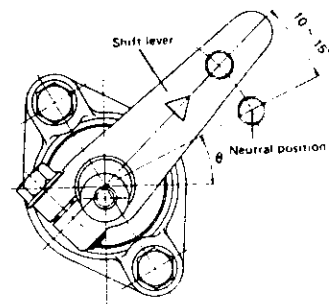
- (b) Turn the shift lever 10 ~ 15 degrees either to the forward or reverse position from the neutral position.
- (c) Measure the L-distance between the shift lever shaft end surface and the shifter's end.
- (d) Measure the H-distance (the distance from the neck of the stopper bolt to its end).
- (e) Obtain the shim thickness "T" by the following formula.

$$T = (H - L + 1.25) \pm 0.1\text{mm} (0.004\text{in.})$$

NOTE: Shim set includes one piece each of 1mm, 0.4mm, 0.3mm, 0.25mm shims.
(YANMAR Part No.177088-06380)

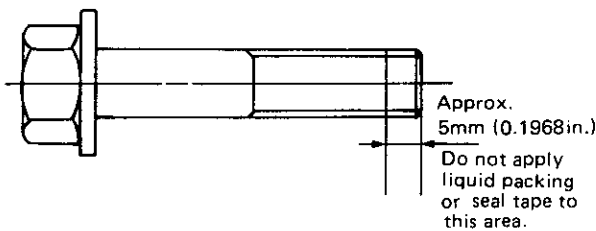
(f) Insert shim (s) of proper thickness to the stopper bolt side and tighten it to the shift lever shaft.

NOTE: When tightening the stopper bolt, apply either a non-drying type liquid packing (TREE BOND No.1215), or a seal tape around the bolt threads.



NOTE. Shift lever must be installed in the direction of the Δ-mark ensuring the specified installation angle (θ).

θ =	KM2P	KM3P
	40°	45°

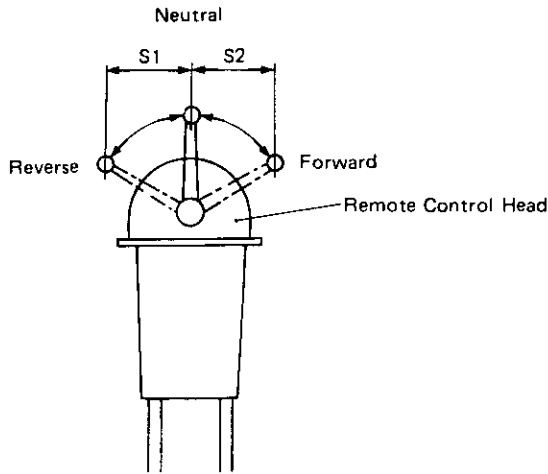


2-5.2 Inspect for the following points
(to be inspected every 2-3 months)

- (1) Looseness at the connection of the cable connector and the remote control cable.
- (2) Looseness of the attaching nut of the cable connector and the shift lever.

2-6 Adjustment of the remote control head
Marine gearbox control side

(1) Equal distribution of the control lever stroke.

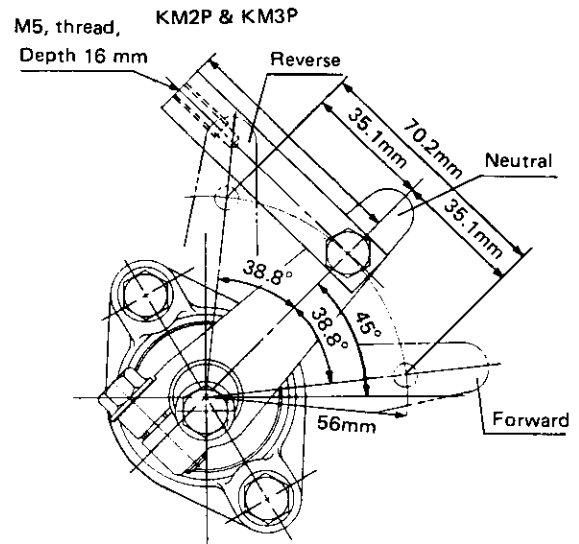
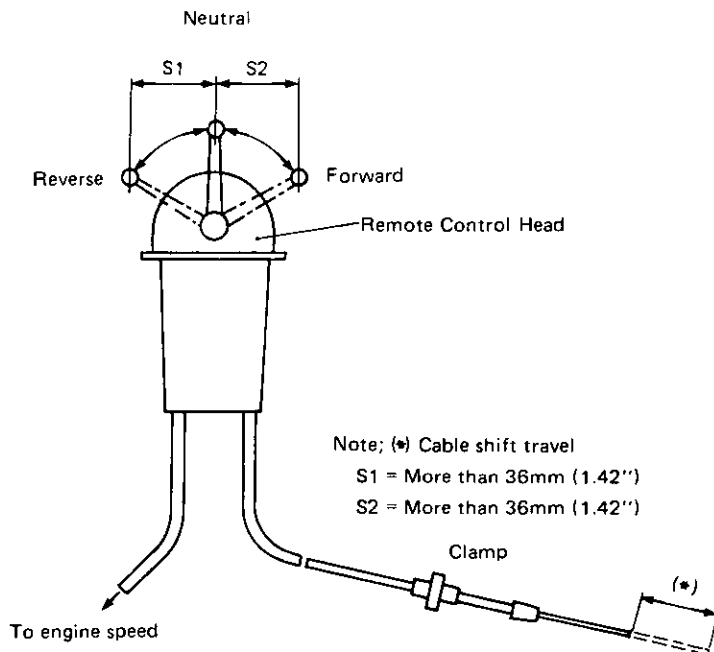


The stroke between the neutral position → forward position (S2), and the neutral position → reverse position (S1) must be equalized.

When either stroke is too short, clutch engagement becomes faulty.

(2) Equalizing the travel distance of the control cable.

After ensuring the equal distribution of the stroke described in (1), connect the cable to the control head. Adjust that the cable shift travel of the S1 and S2 control lever strokes becomes identical.



2-7 Cautions

- (1) Always stop the engine when attaching, adjusting, and inspecting.
- (2) When conducting inspection immediately after stopping the engine, do not touch the clutch. The oil temperature is often raised to around 90°C (194°F).
- (3) Half-clutch operation is not possible with this design and construction. Do not use with the shift lever halfway to the engaged position.
- (4) Set the idling engine speed at between 750 and 800 rpm.

NOTE: The dual(Two) lever remote control device cannot be used.