KE-4 Installation/Operation Instruction Manual



FT033

Electronic Control System

Trolling Module

Thumb Tab Guide

Handheld Control

Engine Synchronization

Electronic Control System Trolling Module Handheld Control Engine Synchronization

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INTRODUCTION

This manual has been prepared to ensure your correct operation of the KE-4 system. Be sure to read this manual thoroughly to understand the contents to prevent injury or damage to the property through abuse. Always keep the manual within your reach during operation.

This product controls the shift (clutch) and throttle (governor). It is recommended therefore to read the manual of engine and clutch.

The specifications may be subject to change without notice in view of improvement, resulting in more or less difference between the content of the manual and the product. In case of ambiguity or questions concerning the product or the manual, consult with your dealer.

SAFETY PRECAUTIONS

This manual contains precautions under the following headers, which, if not observed, may result in injury or damage to the property. Pay particular attention to these precautions.



Failure to comply with a Warning may result in an accident or death or heavy injury.



Failure to comply with a Caution may result in an accident of light injury or damage to the product or properties.

BASIC PERFORMANCE

Electronic Control System

1. Electric Performance

a. Supply voltage

For DC12V model:DC9V~16V For DC24V model:DC16V~30V

- **b.** Max. current of actuator:16A or less(at 49N{5kgf}load)
- c. Current consumption at stop of actuator: 0.5A or less

2. Performance of Actuator

a. Thrust

Maximum operating thrust:147N{15kgf} Constraint load :343N{35kgf}

- **b.** Stroke
 - Shift: Forward stroke 26 30 34 40mm
 - : Reverse stroke $26 \cdot 30 \cdot 34 \cdot 40$ mm
 - : Forward and reverse strokes can be set separately.
 - Throttle: Max. 80mm

3. Temperature Range

- a. Operating temperature:-20~+75°C
- **b.** Storage temperature :-40~+100°C

4. Principal Functions

- a. Shift: Forward/reverse operation
- **b.** Throttle: Acceleration/deceleration
- c. Neutral throttle: Only the throttle is activated to warm up the engine.
- d. Control Station:Max.4 stations
- e. Neutral safety switch: Enables engine start up only when the shift is in the neutral position.
- f. Dim display:Decreases illuminance of the lamp on the control head at night.
- **g.** Fault indication: Detect system faults and indicate by the frequency of flashing of the pilot lamp of the control head.
- **h.** Mechanical back-up: Enables mechanical operation of the actuator when the system failure makes operation from the control head impossible.

NAME OF EACH PART

The figure below shows an example of two engines/two control station system.



COMPONENTS

			Required								
			Single Engine		Two Engines			Note:			
			No. of Station		No. of Station			n			
No.	Name	Part No.	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	
1	Control Head	NM0511-00	1	2	3	4					
		NM0510-00					1	2	3	4	
2	Control Unit										
	24 V Model	NM0478-00	1	1	1	1	2	•	•	2	
	12V Model	NM0477-00	1	I	I	I	2	2	2	2	
3	Actuator	NM0165-00	1	1	1	1	2	2	2	2	
4	Communication	NIN 10610 05					1	1	1	1	
	Harness 5m	INIVI0619-03					1	1	1	1	
5	Remote Control										
	Harness										
	4m	NM0616-04									
	6m	NM0616-06									
	8m	NM0616-08									
	10m	NM0616-10									
	12m	NM0616-12									
	14m	NM0616-14									
	16m	NM0616-16	1	2	3	4	2	4	6	8	
	18m	NM0616-18									
	20m	NM0616-20									
	24m	NM0616-24									
	30m	NM0616-30									
	38m	NM0616-38									
	40m	NM0616-40									
	50m	NM0616-50									
6	Power Supply										
	Harness 10m	NM0414-33	2	2	2	2	4	4	4	4	
\bigcirc	Circuit Breaker										
	20A	NJ0514-00	2	2	2	2	4	4	4	4	
8	Buzzer										
	12V Model	NJ0251-00									
	24V Model	NJ0515-00	1	2	3	4	2	4	6	8	Option
9	Cable	CC633XX									Specify
		33C Supreme	2	2	2	2	4	4	4	4	length
10	Mechanical	Use standard									
	Control Head	control head	1	1	1	1	2	2	2	2	Option
1	Cable (for	CC633XX									Option
	manual	33C Supreme	2	2	2	2	4	4	4	4	specify
	operation)										length

Refer to the name of each part on page 3. Note: 1 meter = 39 inches

NAME AND FUNCTION OF CONTROL UNIT COMPONENTS

Note: The Control Unit is available in two types, one for 24V and the other for 12V. Select the appropriate one for your power supply.



NAME AND FUNCTION OF CONTROL HEAD COMPONENTS



NAME AND FUNCTION OF ACTUATOR COMPONENTS



Never operate the Selector Knob except in case of emergency.



• The Actuator includes a throttle actuator and shift actuator

Note: Actuator harness cannot be extended or changed.

HOW TO OPERATE

1. Initial operation after power ON

With power ON, the throttle actuator is fully closed and the shift actuator is set to neutral.

2. When the control head connected to R/C-l is to be used first

- **a.** Set the hand lever to the neutral position.
- **b.** The neutral lamp goes ON and the control head becomes operative.

3. When the control head connected to others than R/C-l is to be used first

- **a.** Set the hand lever to the neutral position.
- **b.** Open the switch cover and press the selector switch.
- c. The neutral lamp goes ON and the control head becomes operative.

4. Shift and throttle operation



Never operate the hand lever while the engine is stopped. Otherwise, the actuator, cable and engine may be damaged.



Never attempt sudden hand lever operation at high engine speed. It may cause damage to the clutch or transmission.

a. Shifting the hand lever from the neutral position to the forward detent causes the shift actuator to operate in the forward direction.

(Forward lamp ON) Shifting the lever further in the forward direction causes the throttle actuator to accelerate.

b. Shifting the hand lever from the neutral position to the reverse detent causes the shift actuator to operate in the reverse direction. (Reverse lamp ON)

Shifting the lever further in the reverse direction causes the throttle actuator to accelerate.



5. Neutral throttle operation

How to set

- **a.** Set the hand lever to the neutral position.
- **b.** Open the switch cover and shift the hand lever to the forward position while pressing the selector switch.
- **c.** The neutral lamp flashes and the neutral throttle operation can be made.

How to cancel

- **a.** Set the hand lever to the neutral position.
- **b.** Open the switch cover and press and release the selector switch.
- c. The neutral lamp goes ON and shift and throttle operations can be made.

6. Station transfer

a. Set the hand lever(s) of the desired control head to the neutral position, when transferring control station. The hand lever(s) of the active station may be in any position.

When transferring control station, both the port and starboard hand lever of the desired control head must be in the neutral position in dual engine system.

- **b.** Open the switch cover and press the selector switch.
- **c.** The light(s) goes ON and the desired control head is ready to use. At the same time, the throttle and shift actuator return to the neutral position at 4 seconds from the full throttle position. This allows the operator to move the hand levers to match the new position as the actuator moves back to that position.

DETERMINATION OF CABLE LENGTH



Do not bend the cable less than the specified radius. Otherwise, the cable or actuator may suffer early damage.

Measure the distance from the shift and throttle actuator to the engine's shift and throttle connection position, measuring as straight as possible while avoiding any obstruction which may cause bending of less than the specified radius.

This distance becomes a guideline to determine the cable length.

For the outboard motor

Determine the cable length as determined above plus 1-1.5m (4 feet) to make up a loop shown below.



INSTALLING THE CONTROL HEAD



Install the control head in an accessible place where the engine can be stopped anytime.

Select a flat place convenient for operation and installation.

- **a.** Drill mount holes by using an attached template.
- **b.** Install with attached washer and nut.



INSTALLING THE CONTROL UNIT



CAUTION

Ingress of water into the unit may cause failure

- **1. Install so that the harness comes from the bottom side.**
- 2. Install in a place free from effect of the sea breeze and seawater.

Avoid a place where the ambient temperature rises above 75° C.

Note: Actuator harness cannot be lengthened or changed. Note: Install the control unit so that the cover comes in front.

- 1. The actuator harness is 2m in length. Select the control unit location so that its distance from the actuator is 2m or less.
- 2. Drill the mount hole by using an attached template.
- 3. Install with attached pan head machine screw or tapping screw.

Installation with pan head machine screw

Installation plate thickness: $3 \sim 20$ mm Mount hole dia: \emptyset 7 mm

Tightening torque: $4.9 \sim 7.8$ N•m { $5.0 \sim 80$ kgf •c m}

Installation with tapping screw

Installation plate thickness: 15mm Min. Pilot hole dia : \emptyset 3 mm



INSTALLING THE ACTUATOR



Ingress of water into the unit may cause failure.

Install in a place free from effect of the sea breeze and seawater. Avoid a place where the ambient temperature rises above 75°.

- 1. Install the actuator in a place convenient for operation of manual selector knob.
- 2. The actuator harness is 2m in length. Select the control unit location so that its distance from the actuator is 2m or less. (The actuator harness cannot be lengthened or changed.)
- 3. Drill the mount hole by using an attached template.
- 4. Install with four attached screws and washers as shown below left (A).

Installation plate thickness: 20mm Min

Pilot hole dia : \emptyset 5mm

Note: Another installation is available using suitable M6 machine screw or M6 tapping screw and washer as shown below right (B).

• Screws and washers for this installation are not attached.



CONNECTING THE CONTROL HEAD AND CONTROL UNIT

CAUTION

Connect the coupler firmly.

These units may fail to operate when the coupler is not connected firmly.

1. Connection of the first control head

- Connect the harness remote control to the red-taped harness of the control head and connect it to the R/C-l of the port control unit.
- Connect the harness remote control to the green-taped harness of the control head and connect it to the R/C-l of the starboard control unit.

Note: Be sure to connect the control head to the R/C-I of the each control unit.

- 2. Connection of the second control head if applicable
 - Carry out connection to the R/C-2 the each control as described in (1).
- 3. Connection of the third control head if applicable
 - Carry out connection to the R/C-3 the each control as described in (1).

4. Connection of the third control head if applicable

• Carry out connection to the R/C-4 the each control as described in (1).



CONNECTING THE ACTUATOR AND CONTROL UNIT

Connect a 12 - pole coupler of the actuator to that of the control unit.



CONNECTING THE NEUTRAL SWITCH HARNESS

Connect the neutral switch harness between the starter circuit.

Note: Use a thick (2mm or more) and short extension for the neutral switch harness. Long extension may cause voltage drop, resulting in failure of engine start.



CONNECTING THE POWER SUPPLY HARNESS



To ensure safety, the duplex power line system is provided. Be sure to connect both lines.

The display panel shows an alarm message when only one power line is connected.

Do not disconnect the power harness from the control unit after connected the power harness with battery (power supply).

Use circuit breaker or battery switch to turn off the power.

- 1. Connect the Power Harness with the control unit before connecting each power harness with battery (power supply).
- 2. Connect each black wire of the power harness directly to (-) of battery (power supply).
- **3.** Connect each white wire of the power harness via a 20 amp circuit breaker or fuse to (+) of battery (power supply).

Note: If two or more batteries are provided, connect each power switch.



CONNECTING THE COMMUNICATION HARNESS



Turn off circuit breaker or battery switch before connecting or disconnecting the communication harness to the control unit.

Connect the two control units by the communication harness, which has 10-pole couplers at both ends, in dual engine system.



CONNECTING THE DIM HARNESS

- **1.** Connect the Dim Harness yellow line to the (+) wire of navigation light.
- 2. Connect the Dim Harness green line to the (-) wire of navigation light.

Note: The Dim Harness connection is not mandatory.



OVERALL WIRING DIAGRAM

The diagram below shows a case with two engines operated from two control heads.



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CABLE INSTALLATION

1. Cable installation to the actuator

Cable installation method is similar for both shift and throttle.

a. Install an attached rod end to the rod and fix with lock nut.



Tightening torque:2. $9 \sim 4$. $4N \cdot m \{30 \sim 45 \text{kgf} \cdot \text{cm}\}$

b. Remove eight actuator screws shown with arrow and remove the cover.



c. Install waterproof grommet to the cable. Install the rod end, hub, waterproof grommet to the actuator mount groove as shown below.



d. Install the cover to the actuator with screws.

Tightening torque: 1. $2 \sim 1.8$ N • m { $12 \sim 18$ kgf • cm}



Note: Carry out cable installation when connection of all harnesses is completed.

- **a.** Carry out positioning of the actuator as follows: Positioning the actuator
 - Turn ON power.
 - Set the control head connected to R/C-1 to the neutral position.
 - The throttle actuator is fully closed and the shift actuator comes to the neutral position.
 - Positioning is completed when the neutral lamp goes ON.
- **b.** Install the cables according to the engine instruction manual.



ADJUSTING THE TROLLING UNIT



When the actuator operation is not matched with the trolling valve, adjust by the switch in the trolling unit as follows.

Remove the cover, and the switch can be operated.



List of switch functions



1. Setting the throttle actuator operation mode

Set whether the trolling valve is shifted to the disengage by pushing out the cable or by pulling in the cable. (Confirm on the rolling valve side).

Set with SW2-1.

SW2 — 1	FUNCTION				
OFF	Pull to open Throttle				
ON	Push to open Throttle				

* Before shipment, the switch is set to OFF (Pull to open throttle).

2. Setting the forward throttle actuator stroke

The throttle actuator stroke when the hand lever is operated from the forward detent to the forward full open position can be set from 31mm to 73mm in a 3mm interval and 80mm. Set with $SW1-1 \cdot 2 \cdot 3 \cdot 4$.

SW1-1	SW1-2	SW1-3	SW1-4	STROKE
ON	OFF	ON	ON	31mm
ON	OFF	OFF	ON	34 mm
ON	OFF	ON	OFF	37mm
ON	OFF	OFF	OFF	40mm
OFF	ON	ON	ON	43mm
OFF	ON	OFF	ON	46mm
OFF	ON	ON	OFF	49 mm
OFF	ON	OFF	OFF	52mm
OFF	OFF	ON	ON	55mm
OFF	OFF	OFF	ON	58mm
OFF	OFF	ON	OFF	61mm
OFF	OFF	OFF	OFF	64mm
ON	ON	ON	ON	67mm
ON	ON	OFF	ON	70mm
ON	ON	ON	OFF	73mm
ON	ON	OFF	OFF	80mm

* Before shipment, the switch is set to OFF (64mm stroke).

3. Setting the throttle actuator stroke opening

This function facilitates fine throttle adjustment over range from idle to low RPM range. This setting also allows decrease in the shock after shift in when the hand lever is operated suddenly.

a. Setting the forward throttle opening Set with SW2-2.

SW2-2	FUNCTION
OFF	Forward throttle opening 1
ON	Forward throttle opening 2



* Before shipment, the switch is set to OFF (**Opening 1**).

b. Setting the reverse throttle opening Set with SW2-3.

SW2—3	FUNCTION
OFF	Reverse throttle opening 1
ON	Reverse throttle opening 2



* Before shipment, the switch is set to OFF (**Opening 1**).

4. Setting the reverse throttle actuator stroke

Set the throttle actuator stroke when the hand lever is operated from the reverse detent to the reverse full open position.

Set with SW2-4.

SW2—4	FUNCTION
OFF	60% of the forward full open stroke
ON	80% of the forward full open stroke

* Before shipment, the switch is set to OFF (60% of the forward full open stroke).

5. Setting the shift actuator operation mode

Set whether the clutch is shifted to the forward position by pushing out the cable or by pulling in the cable (Confirm on the clutch side).

Set with SW4-1.

SW4-1	FUNCTION
OFF	Pull to go forward
ON	Push to go forward

* Before shipment, the switch is set to OFF (Pull to go forward).

6. Setting the shift actuator stroke

Set the shift actuator stroke separately on the forward and reverse side.

a. Setting the stroke on the forward side Set with SW3-1 and 2.

SW3 - 1	SW3 - 2	STROKE
ON	OFF	26mm
OFF	ON	30mm
OFF	OFF	34mm
ON	ON	40mm

- * Before shipment, both the switches are set to OFF (34mm stroke).
 - **b.** Setting the stroke on the reverse side Set with SW3-3 and 4.

SW3 - 1	SW3 - 2	STROKE
ON	OFF	26mm
OFF	ON	30mm
OFF	OFF	34mm
ON	ON	40mm

* Before shipment, both the switches are set to OFF (34mm stroke).

5. Setting the throttle delay

This is to delay the opeartion start of the throttle actuator when the hand lever is shifted suddenly from neutral to throttle operation range.

Delay time: 1 second Set with SW4-4.

SW 4 - 4	FUNCTION
OFF	No throttle delay
ON	Throttle delay

* Before shipment, the switch is set to OFF (no throttle delay).

3. Setting the shift pause

This is to set the time from the end of throttle actuator operation to start of the shift actuator operation when the hand lever is suddenly shifted from the throttle operation range to neutral.

The set time can be varied with the hand lever position.

Shift pauses of 0, 2, 4 and 6 seconds for rapid hand lever operation from forward full throttle can be selected.

Set with SW4-2 and 3.

SW4 - 2	SW4 - 3	FUNCTION
OFF	OFF	No shift pause
ON	OFF	2 seconds
OFF	ON	4 seconds
ON	ON	6 seconds

* Before shipment, both switches are set to OFF (no shift pause).

OPERATION CHECK

Carry our operation check as follows when the installation work is over.



1. Shift and throttle operation check

Step	Hand Lever Operation	Description (engine side)
1	Neutral \rightarrow Forward	Shift arm shifted from neutral to forward
2	Forward \rightarrow Forward full open	Throttle arm shifted from fully closed to full open
3	Forward full open \rightarrow Neutral	Throttle arm shifted from full open to fully closed
		Shift arm shifted from forward to neutral
4	Neutral \rightarrow Reverse	Shift arm shifted from neutral to reverse
5	Reverse \rightarrow Reverse full open	Throttle arm shifted from fully closed to full open
6	Reverse full open \rightarrow Neutral	Throttle arm shifted from full oepn to fully closed
		Shift arm shifted from reverse to neutral

When the correct operation can not be made, change the operation mode. (See "ADJUSTING THE CONTROL UNIT" on page 23)

When the forward/neutral/reverse lamp flashes, refer to "ALARM INDICATION" on page 29.

2. Confirmatiuon of the engine start

Step	Description	OK	Countermeasure if NG
1	Set the hand lever to NEUTRAL	Engine starts.	Shorten the neutal switch
	and start the engine		harness. (See page 16)
2	Shift the hand lever to	Engine does not	Connect the neutral switch
	FORWARD and start the engine	start.	harness. (See page 16)

MANUAL OPERATION METHOD (OPTIONAL MECHANICAL BACK-UP)

WARNING

Never attempt manual operation unless in case of emergency.

- 1. The actuator can be operated manually when there is an optional mechanical control head and 33C cable.
 - **a.** Install the mechanical control head and 33C cable according to the instruction manual of the mechanical control head. (Optional)
 - **b.** Install a ball joint socket to the output end of 33C cable and fix it temporarily to the actuator.



2. Changeover to the manual mode is similar for both the shift and throttle. Select the manual mode as follows:

Method

- **a.** Remove the black cover and expose the ball stud.
- **b.** Tilt the selector knob in the arrow direction to the end.
- **c.** Remove the cable from the position, and install the ball joint socket onto the ball stud and the hub onto the clamp.



Note: Reset the knob to the original position after end of manual operation.

ALARM INDICATION

In the case of a system fault, the failure point is indicated with forward/neutral/reverse lamp flashing frequency and optional buzzer. All of forward, neutral and reverse lamps flash simultaneously.

Flashing Frequency	Cause	Countermeasure	Reference
Once	1. Shift actuator and control unit are not connected correctly.	1. Reconnect the shift actuator and control unit.	page 15
	2. Shift actuator set to the manual operation.	2. Set the actuator to NEUTRAL and set the selector knob to "Electronic Operation."	page 28
	3. Shift actuator harness with wire breakage or shorting.	3. Consult your dealer.	
	4. Harness actuator with wire breakage or shorting.	4. Replace the actuator.	page 15
	5. 12-pole coupler harness of the control unit with wire breakage or shorting.	5. Consult your dealer.	
Twice	1. Throttle actuator and control unit are not connected correctly.	1. Reconnect the throttle actuator and control unit.	page 15
	2. Throttle actuator set to the manual operation.	2. Set the actuator to a middle point and set the selector knob to "Electronic Operation."	page 28
	3. Throttle actuator harness with wire breakage or shorting.	3. Consult your dealer.	
	4. Harness actuator with wire breakage or shorting.	4. Replace the actuator.	page 15
	5. 12-pole coupler harness of the control unit with wire breakage or shorting.	5. Consult your dealer.	
Three Times	 Control head not connected to R/C-1 of control unit. 	1. Reconnect the control head to R/C-1.	page 14
	2. Control head and control unit not connected correctly.	2. Reconnect the control head and control unit.	page 14
	3. Three-pole coupler of control head disconnected.	3. Connect the three-pole coupler.	page 14
	4. Control head harness with wire breakage or shorting.	4. Consult your dealer.	
	5. Harness remote control with wire breakage or shorting.	5. Replace the remote harness.	page 14
	6. R/C-1, 2, 3 and 4 harnesses of control unit wire breakage or shorting.	6. Consult your dealer.	

Flashing Frequency	Cause	Countermeasure	Reference
Four Times	1. Cable installed without positioning of the shift actuator.	1. Install cable after positioning of the actuator.	page 22
	2. Shift actuator stroke exceeding the stroke of clutch.	2. Reduce the stroke of shift actuator.	page 23
	3. Shift actuator set to the manual operation.	3. Set the actuator to the neutral position and set the knob to "Electronic Operation".	page 28
	4. Loose cable end of the shift actuator.	4. Fix the cable end.	page 21
	5. Loose nut of the clutch connection.	5. Retighten the clutch connection nut.	page 22
	6. Shift actuator harness with wire breakage or shorting.	6. Consult your dealer.	—
	7. Harness actuator with wire breakage or shorting.	7. Replace the harness actuator.	page 15
	8. 12-pole coupler harness of control unit with wire breakage or shorting.	8. Consult your dealer.	
	9. Heavy clutch load, resulting in failure of smooth shift actuator operation	9. Reduce the clutch side load.	
Five Times	1. Cable installed without positioning of the throttle actuator.	1. Install cable after positioning of the actuator.	page 22
	2. Cable not correctly installed to the throttle actuator.	2. Install the cable correctly.	page 21
	3. Throttle actuator set to the manual operation.	3. Set the actuator to the middle point and set the knob to "Electronic Operation".	page 28
	4. Loose cable end of the throttle actuator.	4. Fix the cable end.	page 21
	5. Loose nut of the engine connection.	5. Retighten the engine connection nut.	page 22
	6. Throttle actuator harness with wire breakage or shorting.	6. Consult your dealer.	—
	7. Harness actuator with wire breakage or shorting.	7. Replace the harness actuator.	page 15
	8. 12-pole coupler harness of control unit with wire breakage or shorting.	6. Consult your dealer.	—
Cause	Countermeasure	Reference	
---	---	-----------	
1. One of duplex power lines is disconnected.	1. Connect both lines.	page 17	
2. Either circuit breaker is OFF.	2. Turn ON both breakers.	page17	
3. Harness power supply coupler not connected correctly.	3. Reconnect the coupler of harness power supply.	page 17	
4. Battery voltage beyond the operating voltage range.	4. Use the battery within the operating voltage range.	page 2	
5. Harness power supply with breakage.	5. Replace the harness power supply.	page 17	
6. 24 or 12V harness of the trolling unit broken.	6. Consult your dealer.	_	
1. Trolling switch kept pressed.	1. Reset the trolling switch in a free state.	page 6	
2. Trolling switch harness shorting.	2. Consult your dealer.	_	
3. Trolling harness shorted.	3. Replace the trolling harness.	page 14	
4. R/C-1, 2, 3 and 4 harnesses of Trolling Unit with shorting.	4. Consult your dealer.	_	
1. Communication/power harness with wire breakage of shorting.	1. Replace the communication/ power harness.	page 18	
2. One of the control units has no power.	2. Turn ON both breakers.	_	
1. Com./power harness with wire breakage or shorting, and trolling	1. Replace the com./power harness and engage trolling	_	

valve.

Flashing Frequency

Six Times

Seven

Times

Eight

Times

Nine

Times

valve disengaged.

Electronic Control System

CHECK POINTS IN CASE OF TROUBLE

Always consult this table	first if any trouble is	s observed during	operation
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Symptom	Cause	Countermeasure
Not operating even when power supply is ON.	1. Harness power not connected correctly.	1. Connect the harness power correctly. (See page 17)
	2. Circuit breaker OFF.	2. Turn ON circuit breaker.
Forward/neutral/ reverse lamps flashing simultaneously.	1. Abnormality in the system.	1. Refer to "Alarm Indication" on page 29.
No forward/neutral/ reverse lamp ON.	1. Hand lever not in neutral during initial operation	 Set the hand lever to NEUTRAL with power ON. (See page 8)
	2. R/C-1 of the control unit not connected with the control head.	2. Connect the control head to R/C-1. (See page 14)
Any one of forward/ neutral/reverse lamps not ON.	1. Wire breakage in control head harness.	1. Consult your dealer.
	2. Wire breakage in remote control harness.	2. Replace the remote control harness. (See page 14)
	3. Lamp failure.	3. Consult your dealer.
Forward/neutral/ reverse lamps are ON correctly, but the clutch cannot be engaged.	1. Cable to the shift actuator damaged.	1. Replace the cable. (See page 21)
Forward/neutral/ reverse lamps are ON correctly, but the engine speed does not rise.	 Throttle actuator cable damaged. 	 Replace the cable. (See page 21)
Engine does not start.	1. Low battery voltage.	1. Charge the battery.
	2. Neutral switch harness too long.	 Shorten the neutral switch harness extension wire. (See page 16)
Neutral throttle operation cannot be	 Neutral throttle operation is not set correctly. Eaulty selector switch 	 Carry out setting correctly. Congult your dealer.
made.	 Faulty selector switch. 	2. Consult your dealer.
Operation position cannot be selected.	 Hand lever in the neutral position. Faulty selector switch. 	 Set the hand lever to NEUTRAL. Consult your dealer.

MAINTENANCE AND SERVICE

Repair or replace any damaged part.

Control Head

- 1. After use, wash with fresh water to prevent corrosion.
- 2. Never use grease because this contains electronic components.

Control Unit

- 1. After use, wash with fresh water to prevent corrosion.
- 2. Never use grease because this contains electronic components.

Actuator

- 1. After use, wash with fresh water to prevent corrosion.
- 2. Wipe screw and metallic parts with marine grease.
- 3. Check screws for looseness periodically.

Harness

- 1. Check for wire breakage and damage periodically.
- 2. Check the coupler, etc. for disconnection periodically.

Cable

- 1. Check the cable and actuator connection (cable end) for looseness periodically.
- 2. Check the cable and trolling valve connection for looseness periodically.
- 3. Check the cable for damage, wear, and corrosion periodically.
- **4.** Grease the engine end of the control cable with a waterproof marine lithium grease twice a year.





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INTRODUCTION

This manual has been prepared to ensure your correct operation of the KE-4 Trolling Control module.

Be sure to read through this manual thoroughly to understand its contents to prevent injury or damage to the property through abuse. Always keep the manual within your reach during operation.

This module is to be a part of the KE-4 engine control system. It is recommended therefore to read the manual of KE-4 Electronic Control System.

The specifications may be subject to change without notice in view of improvement, resulting in more or less difference between the content of the manual and the product. Any questions concerning the product or the manual, consult with your dealer.

SAFETY PRECAUTIONS

This manual contains precautions under the following headers, which, if not observed, may result in injury or damage to the property. Pay particular attention to these precautions.



Failure to comply with a Warning may result in an accident of death or heavy injury.



Failure to comply with a Caution may result in an accident of light injury or damage to the product or properties.

APPLICABLE CONTROL UNIT

Trolling Module must be used with the KE-4 system (Basic Module) with the Control Unit(s) listed below.

NM0477-00	(12V model)
NM0478-00	(24V model)

BASIC PERFORMANCE

1. Electric Performance

(1) Supply voltage

For DC12V model:DC9VN16V For DC24V model:DC16VN3OV

- (2) Max. current of actuator:16A or less(at 49N{5kgf}load)
- (3) Current consumption at stop of actuator: 0.5A or less

2. Performance of Actuator

(1) Thrust

Maximum operating thrust:147N{15kgf} Constraint load :343N{35kgf}

- (2) Stroke Max. 80mm
- 3. Temperature Range
 - (1) Operating temperature:-20~+75°C
 - (2) Storage temperature :-40~+100°C

4. Principal Functions

- (1) Trolling valve control: engage~disengage
- (2) Control Station:Max.4 stations
- (3) Lo Idle or Hi Idle selective
- (4) Dim display: Decreases illuminance of the lamp on the Trolling Switch at night.
- (5) Fault indication: Detect system faults and indicate by the frequency of flashing of the pilot lamp of the Trolling Switch.
- (6) Mechanical back-up: Enables mechanical operation of the actuator when the system failure makes operation from the control head impossible.

NAME OF EACH PART

The figure below shows an example of two engines/two control station system.



COMPONENTS

		Required									
			Single Engine Two Engines			Note:					
			No. of Station		No. of Station		n				
No.	Name	Part No.	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	
1	Trolling Switch	NM0228-00	1	2	3	4	1	2	3	4	
2	Trolling Unit										
	24V Model	NM0480-00	1	1	1	1	1	1	1	1	
	12V Model	NM0479-00	1	1	1	1	1	1	1		
3	Trolling Actuator	NM0170-00	1	1	1	1	2	2	2	2	
4	Harness	NM0170-01	1	1	1	1					
	Trolling	NM0170-02					1	1	1	1	
	Actuator										
5	Com./Power										
	Harness										
	1m	NM0611-01									
	2m	NM0611-02									
	3m	NM0611-03	1	1	1	1	1	1	1	1	
	4m	NM0611-04									
	5m	NM0611-05									
6	Trolling										
	Harness 20m	NM0618-20	1	2	3	4	1	2	3	4	
$\overline{\mathcal{T}}$	Tralling										
	Slave Harness	NM0621-00					1	1	1	1	
8	Cable	CC633XX					1	1	1	1	Specify
	Cubie	33C Supreme	1	1	1	1	2	2	2	2	the length
		55C Supreme	1	1	1	1	2	-	-		the length

Note: Refer to the name of each part on page 3 for the number. Note: 1 meter = 39 inches

NAME AND FUNCTION OF TROLLING UNIT COMPONENTS

Note: The Trolling Unit is available in two types: one for 24V and the other for 12V. Select the appropriate one for your power supply.



NAME AND FUNCTION OF TROLLING SWITCH COMPONENTS





- 1. Set both the hand lever(s) of the Control Head in use to the neutral position and press and release the Trolling Switch beside the Control Head.
- 2. The Lo-Idle lamp goes ON and the trolling valve goes to the disengage position. and trolling operation(s) can be made.
- Hi-Idle can be obtained by pressing and releasing the Trolling Switch. Lo-Idle and Hi-Idle alternate by pressing and releasing the Trolling Switch.
 * Hi-Idle can be set to 5%, 10%, 15%, or 20% of the full throttle travel.
- **4.** Press and release the Select Switch on the Control Head to return to the normal operation mode.
- 5. Station can be transferred by the same procedure as normal operation. But trolling mode is automatically canceled and returned to the normal operation mode when a station is transferred.



- **6.** Shift and Trolling operation
 - ① Shifting the hand lever from the neutral position to the foward detent causes the shift actuator to operate in the forward direction shifting the lever further in the forward direction causes the trolling actuator to engage.
 - ② Shifting the hand lever from the neutral position to the reverse detent causes the shift actuator to operate in the reverse direction shifting the lever further in the reverse direction causes the trolling actuator to engage.



6

DETERMINATION OF CABLE LENGTH



Do not bend the cable more than the specified radius. Otherwise, the cable or actuator may suffer premature damage.

Measure the distance from the trolling actuator to the valve connection position, as straight as possible, avoiding any obstruction which may cause bending of greater than the specified radius. This distance becomes a guideline to determine the cable length.

INSTALLING THE TROLLING SWITCH

Select a flat place convenient for operation and installation.

- 1. Drill mount holes by using an attached template.
- 2. Install the trolling switch with attached tapping screw.



INSTALLING THE TROLLING UNIT



Note: Install the trolling unit so that the Cover comes in front.

- 1. The actuator harness in 2m in length. Select the trolling unit location so that its distance from the actuator is 2m or less.
- 2. Drill the mount hole by using an attached template.
- 3. Install with attached pan head machine screw or tapping screw.

Installation with pan head machine screw

Installation plate thickness: 3~20mm

Mount hole dia: Ø7mm

Tightening torque: 4.9~7.8N.m

Installation with tapping screw

Installation plate thickness: 15mm Min. Pilot hole dia: \emptyset 3mm



INSTALLING THE TROLLING ACTUATOR



CAUTION

Ingress of water into the unit may cause failure.

Install in a place free from effect of the sea breeze and seawater. Avoid a place where the ambient temperature rises above 75°C.

- **1.** Install the actuator in a place convenient for operation of manual selector knob.
- 2. The actuator harness is 2m in length. Select the troll ing unit location so that its distance from the trolling actuator is 2m or less.
- 3. Drill the mount hole by using an attached template.
- 4. Install with bolt or tapping screw and washer.

Installation with bolt

Installation plate thickness: 3~25mm

Mount hole dia: Ø9mm

Tightening torque: 3.9~5.9N.m

Installation with tapping screw

Installation plate thickness: 15mm Min.

Pilot hole dia: Ø3mm



CONNECTING THE TROLLING SWITCH & TROLLING UNIT



Connect the coupler firmly.

These units may fail to operate when the coupler is not connected firmly.

- 1. Connection of the first trolling switch. Connect the trolling harness of the trolling switch and connect it to the R/C-l of the Trolling Unit.
- 2. Connection of the second trolling switch if applicable. Connect the trolling harness of the trolling switch and connect it to the R/C-2 of the Trolling Unit.
- **3.** Connection of the third trolling switch if applicable. Connect the trolling harness of the trolling switch and connect it to the R/C-3 of the Trolling Unit.
- Connection of the fourth trolling switch if applicable. Connect the trolling harness of the trolling switch and connect it to the R/C-4 of the Trolling Unit.



CONNECTING THE TROLLING ACTUATOR & TROLLING UNIT

- 1. Connect a 12-pole coupler of the Trolling Actuator Harness to the Trolling Unit
- 2. Connect a 6-pole coupler of the Trolling Actuator Harness to the Trolling Actuator.



CONNECTING THE COM./POWER HARNESS



1. Single engine system. Connect the Com./Power Harness between the control unit and the Trolling Unit.



CONNECTING THE COM./POWER HARNESS



CAUTION

Turn off circuit breaker or battery switch before connecting or disconnecting the Com./Power Harness with the Trolling Unit.

To ensure the safety, the duplex power line system is provided. Be sure to connect both lines.

The display panel shows an alarm message when only one power line is connected.

1. Dual engine system.

Remove the 10-pole female coupler from the Com./Power Harness. The removed female couple is unnecessary. Connect the Com/Power Harness Green tape side between the starboard Control Unit and the Communication Harness using 10 pole coupler. Then, connect 2 power lines between Harness Power Supply and the starboard Control Unit using 2 pole connector.

Connect the other side of the Com./Power Harness to the Trolling Unit.

Connect the Trolling Slave Harness between the port control unit and the Communication Harness.



Trolling Module

CONNECTING THE DIM HARNESS

- **1.** Connect the Dim Harness yellow line to the (+) wire of the navigation light.
- 2. Connect the Dim Harness green line to the (-) wire of the navigation light.

Note: The Dim Harness connection is not mandatory.



OVERALL WIRING DIAGRAM

The diagram below shows a case with two engines operating from two Trolling Switches.



- 1. Cable installation to the actuator
 - **a.** Install an attached rod end to the rod and fix with lock nut.



b. Remove from actuator screws shown with arrow and remove the cover.



c. Install waterproof grommet to the cable. Install the rod end, rod clamp, hub and waterproof grommet to the actuator mount groove as shown below.



d. Install the cover to the actuator with screws.

Tightening torque: 1.2~1.8N.m

2. Cable installation to the trolling valve.



Note: Carry out cable installation when connection of all harnesses is completed.

- **a.** Turn power ON, the trolling actuator automatically becomes engaged.
- **b.** Install the cable according to the trolling valve instruction manual.



ADJUSTING THE TROLLING UNIT



When the actuator operation is not matched with the trolling valve, adjust by the switch in the trolling unit as follows.

Remove the cover, and the switch can be operated.



List of switch functions



Setting the port actuator operation mode 1.

Set whether the trolling value is shifted to the disengage by pushing out the cable or by pulling in the cable. (Confirm on the trolling valve side). Set with SW2-1.

SW2 — 1	FUNCTION
OFF	Pull to disengage a trolling valve
ON	Push to disengage a trolling valve

* Before shipment, the switch is set to OFF (Pull to disengage a trolling valve).

2. Setting the port actuator stroke

The port actuator stroke can be set from 31mm to 73mm in a 3mm interval and 80mm. Set with SW1-1 \cdot 2 \cdot 3 \cdot 4.

SW1-1	SW1-2	SW1-3	SW1-4	STROKE	
ON	OFF	ON ON 31		31mm	
ON	OFF	OFF	ON	34 mm	
ON	OFF	ON	OFF	37mm	
ON	OFF	OFF	OFF	40mm	
OFF	ON	ON	ON	43mm	
OFF	ON	OFF	ON	46mm	
OFF	ON	ON	OFF	49 mm	
OFF	ON	OFF	OFF	52mm	
OFF	OFF	ON ON S		55mm	
OFF	OFF	OFF ON :		58mm	
OFF	OFF	ON OFF 6		61mm	
OFF	OFF	OFF	OFF	64mm	
ON	ON	ON	ON	67mm	
ON	ON	OFF	ON	70mm	
ON	ON	ON	OFF 73mm		
ON	ON	OFF	OFF	80mm	

* Before shipment, the switch is set to OFF (64mm stroke).

Setting the starboard actuator operation mode 3.

Set whether the trolling clutch is shifted to the disengage by pushing out the cable or by pulling in the cable (Confirm on the trolling valve side). Set with SW4-1.

SW4 — 1	FUNCTION			
OFF	Pull to disengage a trolling valve			
ON	Push to disengage a trolling valve			

* Before shipment, the switch is set to OFF (Pull to disengage a trolling valve).

4. Setting the starboard actuator stroke

The starboard actuator stroke can be set from 31mm to 73mm in a 3mm interval and 80mm. Set with SW3-1 \cdot 2 \cdot 3 \cdot 4.

SW3-1	SW3-2	SW3-3	SW3-4	STROKE	
ON	OFF	ON	ON ON		
ON	OFF	OFF	ON	34 mm	
ON	OFF	ON	OFF	37mm	
ON	OFF	OFF	OFF	40mm	
OFF	ON	ON	ON	43mm	
OFF	ON	OFF	ON	46mm	
OFF	ON	ON	OFF	49 mm	
OFF	ON	OFF	OFF	52mm	
OFF	OFF	ON ON		55mm	
OFF	OFF	OFF ON		58mm	
OFF	OFF	ON	OFF	61mm	
OFF	OFF	OFF	OFF	64mm	
ON	ON	ON	ON ON 67		
ON	ON	OFF ON 7		70mm	
ON	ON	ON OFF 7.		73mm	
ON	ON	OFF	OFF	80mm	

* Before shipment, the switch is set to OFF (64mm stroke).

5. Setting the throttle actuator Hi-Idle stroke.

Set the throttle actuator stroke in the Hi-Idle mode. Set with SW2-2 and 3.

SW2 — 2	SW2 — 3	FUNCTION
ON	OFF	5% of the forward full open stroke
OFF	ON	10% of the forward full open stroke
OFF	OFF	15% of the forward full open stroke
ON	ON	20% of the forward full open stroke

* Before shipment, both the switches are set to OFF (**15% of the forward full open stroke**). SW2 - 4, SW4 - 2, SW4 - 3, SW4 - 4 are out of use.

OPERATION CHECK

Carry out operation check as follows when the installation work is over.



Trolling operation

Step	Operation (Lever or Switch)	Description
1	Press the trolling switch	Trolling valve goes to the disengage Lo-Idle
		lamp ON
2	Neutral \Rightarrow Forward	Shift arm goes to the forward
3	Forward \Rightarrow Forward full open	Trolling valve goes to the engage
4	Forward full open \Rightarrow Neutral	Trolling valve goes to the disengage
		Shift arm goes to the neutral
5	Neutral \Rightarrow Reverse	Shift arm goes to the reverse
6	Reverse \Rightarrow Reverse full open	Trolling valve goes to the engage
7	Reverse full open \Rightarrow Neutral	Trolling valve goes to the disengage
		Shift arm goes to the neutral
8	Press the trolling switch	Throttle arm goes to the Hi-Idle
		Hi-Idle lamp ON
9	Press the trolling switch	Throttle arm goes to the Lo-Idle
10	Press the select switch	Trolling lamp OFF
		Trolling valve goes to the engage

When the correct operation cannot be made, change the operation mode. (See "ADJUSTING THE TROLLING UNIT" on page 19) When the Hi-Idle/Lo-Idle lamp flashes, refer to "ALARM INDICATION" on page 24.

MANUAL OPERATION METHOD



1. The actuator can be operated manually.

METHOD

- **a.** Tilt the selector knob in the arrow direction to the end.
- **b.** The actuator can be manually operated by using the emergency handle.



NOTE: Reset the knob to the original position after end of manual operation.

ALARM INDICATION

In the case of a system fault, the failure point is indicated by Hi -Idle and Lo - Idle lamps flashing. The Hi -Idle and Lo - Idle lamps flash simultaneously.

Flashing Frequency	Cause	Countermeasure	Reference
Once	1. Starboard Trolling Actuator and Trolling Unit not connected correctly.	1. Reconnect the starboard Trolling Actuator and Trolling Unit.	page 12
	2. Starboard Trolling Actuator set to the manual operation.	2. Set the actuator to a middle point and set the selector knob to "Electronic Operation."	page 23
	3. Starboard Trolling Actuator harness with breakage or shorting.	3. Consult your dealer.	
	4. Harness Trolling Actuator with wire breakage or shorting.	4. Replace the Harness Trolling Actuator.	page 12
	5. 12-pole coupler harness of the Trolling Unit with wire breakage or shorting.	5. Consult your dealer.	
Twice	1. Port Trolling Actuator and Trolling Unit are not connected correctly.	1. Reconnect the Trolling Actuator and Trolling Unit.	page 12
	2. Port Trolling Actuator set to the manual operation.	2. Set the actuator to a middle point and set the selector knob to "Electronic Operation."	page 23
	3. Port Trolling Actuator harness with wire breakage or shorting.	3. Consult your dealer.	—
	4. Harness Trolling Actuator with wire breakage or shorting.	4. Replace the Harness Trolling Actuator.	page 12
	5. 12-pole coupler harness of the Trolling Unit with wire breakage or shorting.	5. Consult your dealer.	

Flashing Frequency		Cause		Countermeasure	Reference
Four Times	1.	Cable installed without positioning of the starboard Trolling Actuator.	1.	Install cable after positioning of the actuator.	page 18
	2.	Starboard Trolling Actuator stroke exceeding the stroke of trolling valve.	2.	Reduce the stroke of starboard Trolling Actuator.	page 19
	3.	Starboard Trolling Actuator set to the manual operation.	3.	Set the actuator to a middle point and set the selector knob to "Electronic Operation."	page 23
	4.	Loose cable end of the starboard Trolling Actuator.	4.	Fix the cable end.	page 17
	5.	Loose nut of the trolling valve connection.	5.	Retighten the trolling valve connection nut.	page 18
	6.	Starboard Trolling Actuator harness with wire breakage or shorting.	6.	Consult your dealer.	—
	7.	Harness Trolling Actuator with wire breakage or shorting.	7.	Replace the Trolling Harness Actuator.	page 12
	8.	12-pole coupler harness of control unit with wire breakage or shorting.	8.	Consult your dealer.	—
	9.	Heavy valve load, resulting in failure of smooth shift actuator operation.	9.	Reduce the valve side load.	—
Five Times	1.	Cable installed without positioning of the port Trolling Actuator.	1.	Install cable after positioning of the actuator.	page 18
	2.	Port Trolling Actuator stroke exceeding the stroke of trolling valve.	2.	Reduce the stroke of port Trolling Actuator.	page 19
	3.	Port Trolling Actuator set to the manual operation	3.	Set the actuator to a middle position and set the selector knob to "Electronic Operation."	page 23
	4.	Loose cable end of the port Trolling Actuator.	4.	Fix the cable end.	page 17
	5.	Loose nut of the trolling valve connection.	5.	Retighten the trolling valve connection nut.	page 18
	6.	Port Trolling Actuator harness with wire breakage or shorting.	6.	Consult your dealer.	—
	7.	Harness Trolling Actuator with wire breakage or shorting.	7	Replace the Harness Trolling Actuator.	page 12
	8.	12-pole coupler harness of control unit with wire breakage or shorting.	8.	Consult your dealer.	—
	9.	Heavy valve load, resulting in failure of smooth shift actuator operation.	9.	Reduce the valve side load.	—

Flashing Frequency	Cause	Countermeasure	Reference
Six Times	1. One of duplex power lines is disconnected.	1. Connect both lines.	page13
	2. Either circuit breaker is OFF.	2. Turn ON both breakers.	page 13
	3. Harness power supply coupler not connected correctly.	3. Reconnect the coupler of harness power supply.	page 13
	4. Battery voltage beyond the operating voltage range.	4. Use the battery within the operating voltage range.	page 2
	5. Harness power supply with breakage.	5. Replace the harness power supply.	page 13
	6. 24 or 12V harness of the trolling unit broken.	6. Consult your dealer.	
Seven Times	1. Trolling switch kept pressed.	1. Reset the trolling switch in a free state.	page 6
	2. Trolling switch harness shorting.	2. Consult your dealer.	
	3. Trolling harness shorted.	3. Replace the trolling harness.	page 11
	4. R/C-1, 2, 3 and 4 harnesses of trolling unit with shorting.	4. Consult your dealer.	
Eight Times	1. Communication/power harness with wire breakage of shorting.	1. Replace the communication/ power harness.	page 13, 14

* Return the hand lever to neutral position if all the lamps on the Control Head would flash 7, 8 or 9 times, so that the trolling mode will be cancelled and return to normal operation mode.

CHECK POINTS IN CASE OF TROUBLE

Always consult this table first when any problems are observed during operation.

Symptom	Cause	Countermeasure
Not operating even	1. Harness power not connected	1. Connect the harness power
when power supply	correctly.	correctly. (See page 13)
ON.	2. Circuit breaker is OFF.	2. Turn ON circuit breaker.
Hi-Idle and Lo-Idle lamps flashing simultaneously.	1. Abnormality in the system.	1. Refer to "Alarm indication" on page 24.
Any one of Hi-Idle/ Lo-Idle lamps not ON.	1. Wire breakage in Trolling Switch harness.	1. Consult your dealer.
	2. Wire breakage in Trolling Harness.	2. Replace the Trolling Harness. (See page 11)
	3. Lamp failure.	3. Consult your dealer
Operation trolling position can not be selected.	1. Hand lever in the neutral position.	1. Set the hand lever to NEUTRAL.
	2. Faulty trolling switch	2. Consult your dealer.
MAINTENANCE AND SERVICE

Repair or replace any damaged part.

Trolling Switch

- 1. After use, wash with fresh water to prevent corrosion.
- 2. Never use grease because this contains electronic components.

Trolling Unit

- 1. After use, wash with fresh water to prevent corrosion.
- 2. Never use grease because this contains electronic components.

Actuator

- 1. After use, wash with fresh water to prevent corrosion.
- 2. Wipe screw and metallic parts with marine grease.
- 3. Check screws for looseness periodically.

Harness

- 1. Check for wire breakage and damage periodically.
- 2. Check the coupler, etc. for disconnection periodically.

Cable

- 1. Check the cable and actuator connection (cable end) for looseness periodically.
- 2. Check the cable and trolling valve connection for looseness periodically.
- 3. Check the cable for damage, wear, and corrosion periodically.



Trolling Module



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INTRODUCTION

This manual has been prepared to ensure your correct operation of the KE-4a handheld control. Be sure to thoroughly read this manual to understand its content, in order to prevent injury or damage to the property through abuse. Always keep the manual within your reach during operation.

This product works as an additional control station for KE-4/KE-4a electronic control system. It is recommended therefore to read the manual of KE-4/KE-4a electronic control system together. The specifications may be subject to change without notice in view of improvement, resulting in more or less difference between the content of the manual and the product. In case of ambiguity or questions concerning the product or the manual, consult with your dealer.

SAFETY PRECAUTIONS

This manual contains precautions under the following headers, which, if not observed, may result in injury or damage to the property. Pay particular attention to these precautions.



Failure to comply with a Warning may result in an accident or death or heavy injury.



Failure to comply with a Caution may result in an accident of light injury or damage to the product or properties.

APPLICABLE CONTROL UNIT

The control unit for handheld control must be selected from the list below.

NM0433-00, NM0 450-00, NM0453-00, NM0477-00, NM0485-00 (12V model)

NM0434-00, NM0451-00, NM0454-00,

NAME OF EACH PART

The figure below shows an example of two engines/two control station system.



				REQ	UIRED	
No.	Name P	art No.		Engine	Engine	Note
1	Handheld Control Kit		NM0906-00		1	
			NM0907-00	1		
2	Remote Control	4m	NM0616-04			
	Harness	6m	NM0616-06			
		8m	NM0616-08			
		10m	NM0616-10			
		12m	NM0616-12			
		14m	NM0616-14			
		16m	NM0616-16			Sold
		18m	NM0616-18			Separately
		20m	NM0616-20	1	2	1 2
		24m	NM0616-24			
		30m	NM0616-30			
		38m	NM0616-38			
		40m	NM0616-40			
		50m	NM0616-50			
3	Relay Kit	12V	NM0542-42			
		24V	NM0542-43	1	2	Option
						1

Note: Refer to the NAME OF EACH PART on page 2 for the No. Note: 1 meter = 39 inches

NAME AND FUNCTION OF HANDHELD CONTROL COMPONENTS



Initial Control Operation After Power Is Applied "ON".

- **1.** With power "ON", and the hand lever in the "Neutral" position, the system will be in the neutral idle condition.
- 2. The handheld control connected to remote control connector one (R/C-I) is considered the master control station and will become operational first.
 - **a.** Set the hand lever to the "Neutral" position.
 - **b.** The select lamp (s) lights indicating the control is operational.

NOTE:

IF the hand lever(s) are moved to a forward or reverse gear position while power is not applied to the control system, and then power is applied, control system will not become operational until the hand lever(s) are moved into the neutral position. The select lamp(s) then lights indicating the control is operational.

- **3.** When other control stations are required for operation that are connected to R/C-2, R/C-3 and R/C-4 perform the following actions.
 - **a.** Set the hand lever to the "Neutral" position.
 - **b.** Press and release the select switch.
 - **c.** The select lamp(s) then lights indicating the control is operational.

Hand Lever Operation



2. Moving hand lever past the Forward or reverse detent moves actuator into throttle operation and the boat will accelerate.



Handheld Control

1.

Neutral Throttle Operation

- 1. Set the hand lever to the "NEUTRAL" position.
- 2. Move the hand lever to the forward gear position while pressing the select switch.
- **3.** The select lamp flashes (slow flash) and the neutral throttle operation is activated. Neutral throttle operation will remain active until properly deactivated.

To Cancel Neutral Throttle Operation

- 1. Set the hand lever to the "NEUTRAL" position.
- 2. Press and release the select switch. After the release of the select switch, select lamp will stop flashing indicating deactivation of the neutral throttle operation.

Station Transfer for 2, 3 and 4 Station Operation From A Neutral Position

1. Set the hand lever(s) of the selected control to the neutral position, and then press and release the select switch. A continues select lamp(s) indicates the control station is active.

Station Transfer for 2,3 and 4 Station Operation From A Forward Throttle Position

- 1. Set the hand lever(s) of the selected control to the neutral position, and then press and release the select switch. A continues select lamp(s) indicates the control station is active.
- 2. The operator has 4 seconds to move the hand levers and match the throttle position of the last active control station. Continues select lamp(s) indicates the control station is active.

NOTE

Keeping the hand lever of the last active control station in the neutral position, will result in control system automatically returning the control system to a neutral idle condition.

Continues select lamp(s) indicates the control station active.

Emergency Stop Switch

To stop the engine(s)

- 1. Press the red knob of the emergency stop switch.
- or
- 2. Pull off the red lanyard from the emergency switch.

NOTE

The emergency switch lanyard must be in place at all times to run the engines.

INSTALLING THE SOCKET HARNESS



1. Drill mount holes by using an attached template.

2. Install with attached tapping screws.

Installation plate thickness: 10mm Min.

Pilot hole dia: Ø4mm Min.



Cut Out Dimensions

INSTALLING THE HOLDER



- 1. Drill mount holes by using an attached template.
- **2.** Install with attached tapping screws.

Installation plate thickness: 10mm Min.

Pilot hole dia: Ø4mm Min.



Cut Out Dimensions

CONNECTING THE HANDHELD CONTROL AND CONTROL UNIT



- 1. Connect the remote control harness to the red-taped harness of the socket harness and connect it to one of the R/C-1, 2, 3 or 4 of the port unit.
- 2. Connect the harness remote control to the green-taped harness of the socket harness and connect it to the connector with the same mark (R/C-1, 2, 3 or 4) of the starboard control unit.



WIRING THE EMERGENCY STOP SWITCH USING THE RELAY (CONNECTING THE RELAY)

- **NOTE: 1.** Consult with the engine manufacturer for which type of engine stop switch is equipped for your engine, "Normal Open Type" or "Normal Close Type".
 - 2. 1.25mm² (AWG16) lead wire is recommended for wiring.



- 1. Connect the white lead wire of the Socket Harness with the port A of the relay connector using the attached bullet terminals and flat terminals.
- 2. Connect the power line (12V or 24V, positive) with the port B of the relay connector using the attached flat terminals.
- 3. Connect the relay connector with the engine stop circuit using the attached flat terminal.
 - **a.** In the case that the engine is equipped with "Normal Open Type" engine stop switch. Connect the port N.0 and COM of the relay connector wih the engine stop circuit so as to be parallel with the engine stop switch.



b. In the case that the engine is equipped with "Normal Close Type" engine stop switch. Connect the port N.C and COM of the relay connector with the engine stop circuit so as to be parallel with the engine stop switch.



4. Connect the relay connector to the relay.



Circuit Inside The Relay (Bottom View)

OPERATION CHECK

Carry out operation check as follows when the installation work is completed.



Never operate the hand lever with the engine stopped. Otherwise, the actuator, cable and engine may be damaged.

1. Shift and throttle operation check

Step	Hand Lever Operation	Description (Engine Side)
1	Neutral \rightarrow Forward	Shift arm shifted from neutral to forward
2	Forward \rightarrow Forward full open	Throttle arm shifted from fully closed to full open
3	Forward full open \rightarrow Neutral	Throttle arm shifted from full open to fully closed
		Shift arm shifted from forward to neutral
4	Neutral \rightarrow Reverse	Shift arm shifted from neutral to reverse
5	Reverse \rightarrow Reverse full open	Throttle arm shifted from fully closed to full open
6	Reverse full open \rightarrow Neutral	Throttle arm shifted from full open to fully closed
		Shift arm shifted from reverse to neutral

When the correct operation cannot be made, change the operation mode. (See "Adjusting the control Unit" of the KE-4/KE4a manual.

When the lamp flashes fast, refer to "Alarm Indication" of the KE-4 manual.

2. Confirmation of the engine stop

Step	Description	ОК	Countermeasure if NG
1	Press the emergency stop	Engine does not	Connect the relay kit.
	switch and start the engine.	start	(See page 10)

ALARM INDICATION

In the case of system fault, the failed point is indicated with the lamp fast flashing frequency. Please refer to "Alarm Indication" of a KE-4 control system instruction manual.

CHECK POINTS IN CASE OF TROUBLE

Always consult this table first when any operationa problems are observed.

Symptom	Cause	Countermeasure
Lamp fast flashing	1. Abnormality in the system.	1. Refer to "Alarm Indication"
simultaneously.		(See page 12)
No select lamp ON.	1. Hand lever not in neutral	1. Set the hand lever to NEUTRAL
	during initial operation.	with power ON. (See page 5)
	2. R/C-1 of the control unit not	2. Connect the control head to
	connected with the control head.	R/C-1. (See page 9)
Neutral throttle	1. Neutral throttle operation is	1. Carry out setting correctly.
operation cannot	not set correctly.	(See page 6)
made.	2. Faulty select switch.	2. Consult your dealer.
Operation position	1. Hand lever in the neutral	1. Set the hand lever to NEUTRAL.
can not be	position.	
selected.	2. Faulty select switch.	2. Consult your dealer.

MAINTENANCE AND SERVICE

Repair or replace any damaged part.

Handheld control

- 1. After use, wash with fresh water to prevent corrosion.
- 2. Never use grease because this contains electronic components.

Harness

- 1. Check for wire breakage and damage periodically.
- 2. Check the coupler, etc. for disconnection periodically.

Handheld Control



Handheld Control



Engine Synchronization TABLE OF CONTENTS

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INTRODUCTION

This manual has been prepared to ensure your correct operation of the KE-4 engine synchronization. Be sure to read this manual thoroughly to prevent injury or damage to the property through abuse. Always keep the manual within your reach during operation.

This kit is to add the KE-4 twin engine control system engine synchronization. It is recommended therefore to read the manual of KE-4 Electronic Control System.

When setting up synchronization you must first have your control handles matching your tachometer readings.

The specifications may be subject to change without notice in view of improvement, resulting in more or less difference between the content of the manual and the product. Any questions concerning the product or the manual, consult with your dealer.

APPLICABLE CONTROL UNIT

The control units for engine synchronization must be selected from the list below.

NM0453-00, NM0477-00	
NM0454-00, NM0478-00	

(12 V model) (24V model)

No.	Name		Part No.	REQUIREDTwo enginesSingle234	Note
1	Sync Master Harness		NM0605-01	1	
2	Sync Slave Harness		NM0605-02	1	
3	Sync Switch		NJ0524-00	1	
4	Switch Harness	5m	NM0617-05		
		10m	NM0617-10		
		15m	NM0617-15		
		20m	NM0617-20		
		25m	NM0617-25	1	
		30m	NM0617-30		
		35m	NM0617-35		
		40m	NM0617-40		
		45m	NM0617-45		
		50m	NM0617-50		

PARTS REQUIRED

Note: Refer to the page 2 "NAME OF EACH PART" Note: 1 meter = 39 inches

HOW TO OPERATE

- 1. Set both hand levers in the NEUTRAL position.
- 2. Turn the Sync Switch "ON"
- **3.** Once the Sync Switch is tuned "ON", the KE-4 synchronization is fully automatic. When both engines are in forward throttle range and the port and starboard hand levers are within 10° of alignment, the engines will synchronize.

Moving either hand lever beyond 10° of alignment will inactivate synchronization.

NAME OF EACH PART

The figure below shows an example of two engines/two control station system.



INSTALLING THE SYNC SWITCH

Select a flat place convenient for operation and installation.

- 1. Drill mount holes by using an attached template.
- 2. Install the sync switch with attached tapping screw.



CONNECTING HARNESS

- **1.** Connect the Sync Master Harness between the starboard control unit and the Communication Harness.
- **2.** Connect the Sync Slave Harness between the port control unit and the Communication Harness.
- 3. Connect the Switch Harness between the Sync Master Harness and the Sync Switch.

Note: The lightgreen lead wire may be connected to the skyblue lead wire directly, if automatic synchronization is desired at all times.

4. Connect the yellow lead wire from the Sync Master Harness to the starboard engine RPM output and the yellow lead wire from the Sync Slave Harness to the port engine RPM output.

Note: Either engine can be "master engine". The above setting is to make the starboard engine "master" and the port engine "slave".



4

Engine Synchronization

SETTING FOR ENGINE SYNC SIGNALS

Note: This setting is required only for use of the engine sync function.

Connect the Blue and Skyblue lead wires in the wire harness marked "COM" from the control unit as follows to read engine sync signals properly.

- 1. Connect the same colored lead wires with each other ("Blue" with "Blue" and "Skyblue" with "Skyblue") for signals from a Ignition Coil or an Alternator. (as shipping from factory).
- 2. Connect the different colored lead wires to each other ("Blue" with "Skyblue" and "Skyblue" with "Blue") for signals from a Magnetic Pickup.



When setting up your KE-4a, your handles and tachometers should be set as closely as possible.

The way you do this is put the control in the neutral warm up mode (throttle only). With your control handles even, check your tach reading at idle then at 1/4 throttle, then at 3/4 throttle.

The tachometer should read very close to the same on each engine at all three throttle ranges. If they don't, adjust the control cable ends at the engine - not at the actuator.



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