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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.

WARNING

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

CAUTION

Failure to comply with a Caution may result in an accident of light injury or damage to the product or properties.
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 • 30 • 34 • 40mm
      - : 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.
The figure below shows an example of two engines/two control station system.

- Indicates identification
- Indicates the destination of connection

1. Control Head
2. Control Unit
3. Remote Control Harness
4. Communication Harness
5. Dim Harness
6. Power Supply Harness
7. Circuit Breaker (20A)
8. Buzzer
9. Control For Mechanical Back Up (Option)
10. Cable For Mechanical Back Up (Option)

Neutral Switch Harness
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Part No.</th>
<th>Required</th>
<th>Note:</th>
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<td></td>
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<td>2nd</td>
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<td>operation)</td>
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</tr>
</tbody>
</table>

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.

![Diagram of Control Unit Components]

- **Cover**
- **12V Model**
- **24V Model**
- **Neutral Switch Harness**
- **Dim Harness**
- **R/C-1**
- **R/C-2**
- **R/C-3**
- **R/C-4**

**To the fourth control head via the Remote Control Harness**

**To the third control head via the Remote Control Harness**

**To the second control head via the Remote Control Harness**

**To the first control head via the Remote Control Harness**

**To the power supply via Power Supply Harness**

**Note:** When the power supply is turned ON, the Control Head connected to R/C-1 is the first one to become operative. Be sure to connect the Control Head to R/C-1. When the Control Head is connected to R/C-2 and or R/C-3 and or R/C-4 only, it does not become operative.

**Note:** Connect two Power Supply Harnesses. The alarm is indicated on the display panel when only one Power Supply Harness is connected.

- **To the (-) terminal of navigation light switch**
- **To the (+) terminal of navigation light switch**
  -- Selects the darkness of the display panel lamp in an interlock with the navigation light switch.

**Note:** The lamp remains bright when these are not connected.

**To the second control unit via the communication harness in dual engine systems.**

**Note:** This port is not used in single engine system.

**To the actuator**

- **To the starter circuit**
  - Output terminal of the neutral safety switch.
  - Connected between the ignition switch and starter circuit to prevent engine start up when not in neutral.
**NAME AND FUNCTION OF CONTROL HEAD COMPONENTS**

1. **Indication Panel**
   - Forward Lamp
   - Neutral Lamp
   - Reverse Lamp
   - Select Switch
     - Use to select the station
     - Use to set or cancel the neutral throttle operation
     - Use to stop the buzzer

2. **Hand Lever - Starboard**
3. **Hand Lever - Port**
4. **Indication Panel**
5. **To The Buzzer**
6. **To the starboard Control Unit via Remote Control Harness**
7. **To the port Control Unit via Remote Control Harness**
WARNING
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.

Select Knob
For manual operation

Ball Joint Socket
For cable for manual operation

Temporary Hub Clamp
For cable for manual operation

THROTTLE

SHIFT

To the Control Unit

Electronic Control System
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-I 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-I 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**

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

   **WARNING**
   *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

**CAUTION**

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.
INSTALLED THE CONTROL HEAD

**CAUTION**

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.

Tightening torque: 2.9~4.4N•m {30~45kgf • cm}

![Diagram of control head installation](image)
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: 3~20mm
Mount hole dia: \( \phi 7 \) mm
Tightening torque: \( 4.9 \sim 7.8 \text{N}\cdot\text{m} \{50 \sim 80 \text{kgf}\cdot\text{cm}\} \)

Installation with tapping screw
Installation plate thickness: 15mm Min.
Pilot hole dia: \( \phi 3 \) mm
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 : Ø 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.
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-1 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-1 of the starboard control unit.

   **Note:** Be sure to connect the control head to the R/C-1 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

**CAUTION**
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

**CAUTION**

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.
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.

   ![Diagram of rod end, rod, hub, and lock nut.]

   **Tightening torque:** 2.9~4.4 N·m (30~45 kgf·cm)

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

   ![Diagram of actuator with screws and cover.]

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

   ![Diagram of grommet, rod end, hub, and cable.]

   d. Install the cover to the actuator with screws.

   **Tightening torque:** 1.2~1.8 N·m (12~18 kgf·cm)
2. Cable installation to the engine

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.

CAUTION
Install the cable first to the actuator, then to the engine.

CAUTION
Be sure to turn OFF power supply to the control unit before installation of the cable to the engine.
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:
- Forward throttle actuator stroke (page 24)
- Reverse throttle actuator stroke (page 25)
- Reverse throttle opening (page 25)
- Forward throttle opening (page 24)
- Throttle delay (page 26)
- Shift pause (page 26)
- Shift actuator operation mode (page 25)
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.

<table>
<thead>
<tr>
<th>SW2 — 1</th>
<th>FUNCTION</th>
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<tbody>
<tr>
<td>OFF</td>
<td>Pull to open Throttle</td>
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<tr>
<td>ON</td>
<td>Push to open Throttle</td>
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* 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 • 2 • 3 • 4.

<table>
<thead>
<tr>
<th>SW1-1</th>
<th>SW1-2</th>
<th>SW1-3</th>
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<td>80mm</td>
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* 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.

<table>
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<th>SW2—2</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Forward throttle opening 1</td>
</tr>
<tr>
<td>ON</td>
<td>Forward throttle opening 2</td>
</tr>
</tbody>
</table>

* Before shipment, the switch is set to OFF *(Opening 1).*
b. Setting the reverse throttle opening
   Set with SW2-3.

<table>
<thead>
<tr>
<th>SW2—3</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Reverse throttle opening 1</td>
</tr>
<tr>
<td>ON</td>
<td>Reverse throttle opening 2</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>SW2—4</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>60% of the forward full open stroke</td>
</tr>
<tr>
<td>ON</td>
<td>80% of the forward full open stroke</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>SW4-1</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Pull to go forward</td>
</tr>
<tr>
<td>ON</td>
<td>Push to go forward</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>SW3 - 1</th>
<th>SW3 - 2</th>
<th>STROKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>26mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>30mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>34mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>40mm</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>SW3 - 1</th>
<th>SW3 - 2</th>
<th>STROKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>26mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>30mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>34mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>40mm</td>
</tr>
</tbody>
</table>

* Before shipment, both the switches are set to OFF (34mm stroke).
5. **Setting the throttle delay**
   This is to delay the operation 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.

<table>
<thead>
<tr>
<th>SW 4 - 4</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>No throttle delay</td>
</tr>
<tr>
<td>ON</td>
<td>Throttle delay</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>SW4 - 2</th>
<th>SW4 - 3</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>No shift pause</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>2 seconds</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>4 seconds</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>6 seconds</td>
</tr>
</tbody>
</table>

* 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.

![Throttle Diagram]

**CAUTION**

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

1. **Shift and throttle operation check**

<table>
<thead>
<tr>
<th>Step</th>
<th>Hand Lever Operation</th>
<th>Description (engine side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neutral → Forward</td>
<td>Shift arm shifted from neutral to forward</td>
</tr>
<tr>
<td>2</td>
<td>Forward → Forward full open</td>
<td>Throttle arm shifted from fully closed to full open</td>
</tr>
</tbody>
</table>
| 3    | Forward full open → Neutral | Throttle arm shifted from full open to fully closed  
Shift arm shifted from forward to neutral |
| 4    | Neutral → Reverse    | Shift arm shifted from neutral to reverse |
| 5    | Reverse → Reverse full open | Throttle arm shifted from fully closed to full open |
| 6    | Reverse full open → Neutral | Throttle arm shifted from full oepn 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” on page 23)
When the forward/neutral/reverse lamp flashes, refer to “ALARM INDICATION” on page 29.

2. **Confirmation of the engine start**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>OK</th>
<th>Countermeasure if NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the hand lever to NEUTRAL and start the engine</td>
<td>Engine starts.</td>
<td>Shorten the neutral switch harness. (See page 16)</td>
</tr>
<tr>
<td>2</td>
<td>Shift the hand lever to FORWARD and start the engine</td>
<td>Engine does not start.</td>
<td>Connect the neutral switch harness. (See page 16)</td>
</tr>
</tbody>
</table>
MANUAL OPERATION METHOD
(OPTIONAL MECHANICAL BACK-UP)

![Warning]

**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.

<table>
<thead>
<tr>
<th>Flashing Frequency</th>
<th>Cause</th>
<th>Countermeasure</th>
<th>Reference</th>
</tr>
</thead>
</table>
| **Once**           | 1. Shift actuator and control unit are not connected correctly.  
                   2. Shift actuator set to the manual operation.  
                   3. Shift actuator harness with wire breakage or shorting.  
                   4. Harness actuator with wire breakage or shorting.  
                   5. 12-pole coupler harness of the control unit with wire breakage or shorting. | 1. Reconnect the shift actuator and control unit.  
                                                               2. Set the actuator to NEUTRAL and set the selector knob to “Electronic Operation.”  
                                                               3. Consult your dealer.  
                                                               4. Replace the actuator.  
                                                               5. Consult your dealer. | page 15  
| **Twice**          | 1. Throttle actuator and control unit are not connected correctly.  
                   2. Throttle actuator set to the manual operation.  
                   3. Throttle actuator harness with wire breakage or shorting.  
                   4. Harness actuator with wire breakage or shorting.  
                   5. 12-pole coupler harness of the control unit with wire breakage or shorting. | 1. Reconnect the throttle actuator and control unit.  
                                                               2. Set the actuator to a middle point and set the selector knob to “Electronic Operation.”  
                                                               3. Consult your dealer.  
                                                               4. Replace the actuator.  
                                                               5. Consult your dealer. | page 15  
| **Three Times**    | 1. Control head not connected to R/C-1 of control unit.  
                   2. Control head and control unit not connected correctly.  
                   3. Three-pole coupler of control head disconnected.  
                   4. Control head harness with wire breakage or shorting.  
                   5. Harness remote control with wire breakage or shorting.  
                   6. R/C-1, 2, 3 and 4 harnesses of control unit wire breakage or shorting. | 1. Reconnect the control head to R/C-1.  
                                                               2. Reconnect the control head and control unit.  
                                                               3. Connect the three-pole coupler.  
                                                               4. Consult your dealer.  
                                                               5. Replace the remote harness.  
                                                               6. Consult your dealer. | page 14
<table>
<thead>
<tr>
<th>Flashing Frequency</th>
<th>Cause</th>
<th>Countermeasure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Four Times</strong></td>
<td>1. Cable installed without positioning of the shift actuator.</td>
<td>1. Install cable after positioning of the actuator.</td>
<td>page 22</td>
</tr>
<tr>
<td></td>
<td>2. Shift actuator stroke exceeding the stroke of clutch.</td>
<td>2. Reduce the stroke of shift actuator.</td>
<td>page 23</td>
</tr>
<tr>
<td></td>
<td>3. Shift actuator set to the manual operation.</td>
<td>3. Set the actuator to the neutral position and set the knob to “Electronic Operation”.</td>
<td>page 28</td>
</tr>
<tr>
<td></td>
<td>4. Loose cable end of the shift actuator.</td>
<td>4. Fix the cable end.</td>
<td>page 21</td>
</tr>
<tr>
<td></td>
<td>5. Loose nut of the clutch connection.</td>
<td>5. Retighten the clutch connection nut.</td>
<td>page 22</td>
</tr>
<tr>
<td></td>
<td>6. Shift actuator harness with wire breakage or shorting.</td>
<td>6. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>7. Harness actuator with wire breakage or shorting.</td>
<td>7. Replace the harness actuator.</td>
<td>page 15</td>
</tr>
<tr>
<td></td>
<td>8. 12-pole coupler harness of control unit with wire breakage or shorting.</td>
<td>8. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>9. Heavy clutch load, resulting in failure of smooth shift actuator operation</td>
<td>9. Reduce the clutch side load.</td>
<td>—</td>
</tr>
<tr>
<td><strong>Five Times</strong></td>
<td>1. Cable installed without positioning of the throttle actuator.</td>
<td>1. Install cable after positioning of the actuator.</td>
<td>page 22</td>
</tr>
<tr>
<td></td>
<td>2. Cable not correctly installed to the throttle actuator.</td>
<td>2. Install the cable correctly.</td>
<td>page 21</td>
</tr>
<tr>
<td></td>
<td>3. Throttle actuator set to the manual operation.</td>
<td>3. Set the actuator to the middle point and set the knob to “Electronic Operation”.</td>
<td>page 28</td>
</tr>
<tr>
<td></td>
<td>4. Loose cable end of the throttle actuator.</td>
<td>4. Fix the cable end.</td>
<td>page 21</td>
</tr>
<tr>
<td></td>
<td>5. Loose nut of the engine connection.</td>
<td>5. Retighten the engine connection nut.</td>
<td>page 22</td>
</tr>
<tr>
<td></td>
<td>6. Throttle actuator harness with wire breakage or shorting.</td>
<td>6. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>7. Harness actuator with wire breakage or shorting.</td>
<td>7. Replace the harness actuator.</td>
<td>page 15</td>
</tr>
<tr>
<td></td>
<td>8. 12-pole coupler harness of control unit with wire breakage or shorting.</td>
<td>6. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td>Flashing Frequency</td>
<td>Cause</td>
<td>Countermeasure</td>
<td>Reference</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Six Times</strong></td>
<td>1. One of duplex power lines is disconnected.</td>
<td>1. Connect both lines.</td>
<td>page 17</td>
</tr>
<tr>
<td></td>
<td>2. Either circuit breaker is OFF.</td>
<td>2. Turn ON both breakers.</td>
<td>page 17</td>
</tr>
<tr>
<td></td>
<td>3. Harness power supply coupler not connected correctly.</td>
<td>3. Reconnect the coupler of harness power supply.</td>
<td>page 17</td>
</tr>
<tr>
<td></td>
<td>4. Battery voltage beyond the operating voltage range.</td>
<td>4. Use the battery within the operating voltage range.</td>
<td>page 17</td>
</tr>
<tr>
<td></td>
<td>5. Harness power supply with breakage.</td>
<td>5. Replace the harness power supply.</td>
<td>page 17</td>
</tr>
<tr>
<td></td>
<td>6. 24 or 12V harness of the trolling unit broken.</td>
<td>6. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td><strong>Seven Times</strong></td>
<td>1. Trolling switch kept pressed.</td>
<td>1. Reset the trolling switch in a free state.</td>
<td>page 6</td>
</tr>
<tr>
<td></td>
<td>2. Trolling switch harness shorting.</td>
<td>2. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>3. Trolling harness shorted.</td>
<td>3. Replace the trolling harness.</td>
<td>page 14</td>
</tr>
<tr>
<td></td>
<td>4. R/C-1, 2, 3 and 4 harnesses of Trolling Unit with shorting.</td>
<td>4. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td><strong>Eight Times</strong></td>
<td>1. Communication/power harness with wire breakage of shorting.</td>
<td>1. Replace the communication/power harness.</td>
<td>page 18</td>
</tr>
<tr>
<td></td>
<td>2. One of the control units has no power.</td>
<td>2. Turn ON both breakers.</td>
<td>—</td>
</tr>
<tr>
<td><strong>Nine Times</strong></td>
<td>1. Com./power harness with wire breakage or shorting, and trolling valve disengaged.</td>
<td>1. Replace the com./power harness and engage trolling valve.</td>
<td>—</td>
</tr>
</tbody>
</table>
# CHECK POINTS IN CASE OF TROUBLE

Always consult this table first if any trouble is observed during operation.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Countermeasure</th>
</tr>
</thead>
</table>
| Not operating even when power supply is ON. | 1. Harness power not connected correctly.  
2. Circuit breaker OFF. | 1. Connect the harness power correctly. (See page 17)  
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  
2. R/C-1 of the control unit not connected with the control head. | 1. Set the hand lever to NEUTRAL with power ON. (See page 8)  
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.  
2. Wire breakage in remote control harness.  
2. Replace the remote control harness. (See page 14)  
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. | 1. Throttle actuator cable damaged. | 1. Replace the cable. (See page 21) |
| Engine does not start. | 1. Low battery voltage.  
2. Neutral switch harness too long. | 1. Charge the battery.  
2. Shorten the neutral switch harness extension wire. (See page 16) |
| Neutral throttle operation cannot be made. | 1. Neutral throttle operation is not set correctly.  
2. Consult your dealer. |
| Operation position cannot be selected. | 1. Hand lever in the neutral position.  
2. Faulty selector switch. | 1. Set the hand lever to NEUTRAL.  
2. 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.
CONTROL UNIT TEMPLATE

Drill 4 - Ø 3mm (for attached tapping screws) .118"

Drill 4 - Ø 7mm (for attached machine screws) .275"

Actual Size

162mm 6.37"

5.7"
Trolling Module

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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.

**WARNING**

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

**CAUTION**

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)
1. Electric Performance
   (1) Supply voltage
       For DC12V model: DC9V-16V
       For DC24V model: DC16V-30V
   (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°C to +75°C
   (2) Storage temperature: -40°C to +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.

- : Indicates identification
- ←: Indicates the destination of connection

1. Trolling Switch
2. Trolling Unit
3. Trolling Actuator
4. Harness Trolling Actuator
5. Com./Power Harness
6. Trolling Harness
7. Trol. Slave Harness
8. Cable

Basic Module
## COMPONENTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Part No.</th>
<th>Required</th>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single Engine</td>
<td>Two Engines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>①</td>
<td>Trolling Switch</td>
<td>NM0228-00</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>②</td>
<td>Trolling Unit</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>24V Model</td>
<td>NM0480-00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12V Model</td>
<td>NM0479-00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>③</td>
<td>Trolling Actuator</td>
<td>NM0170-00</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>④</td>
<td>Harness</td>
<td>NM0170-01</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Trolling Actuator</td>
<td>NM0170-02</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>⑤</td>
<td>Com./Power Harness</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1m</td>
<td>NM0611-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2m</td>
<td>NM0611-02</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3m</td>
<td>NM0611-03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4m</td>
<td>NM0611-04</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5m</td>
<td>NM0611-05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑥</td>
<td>Trolling Harness 20m</td>
<td>NM0618-20</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>⑦</td>
<td>Trolling Slave Harness</td>
<td>NM0621-00</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>⑧</td>
<td>Cable</td>
<td>CC633XX</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>33C Supreme</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.

- To the fourth Trolling Switch via the Trolling Harness
- To the third Trolling Switch via the Trolling Harness
- To the second Trolling Switch via the Trolling Harness
- To the first Trolling Switch via the Trolling Harness
- To the power supply via com./power harness

Note: Connect two power supply harnesses. The alarm is indicated on the display panel when only one power supply harness is connected.

- To the (-) terminal of navigation light switch
- To the (+) terminal of navigation light switch
  - Selects the darkness of the display panel lamp in an interlock with the navigation light switch.

Note: The lamp remains in the bright state when these are not connected.

- To the control unit (The starboard control unit for twin engine application) via the com./power harness.

- To the trolling actuator

Out of use
NAME AND FUNCTION OF TROLLING SWITCH COMPONENTS

Hi-Idle Lamp
Lo-Idle Lamp

Trolling Switch

* Use to select the trolling operation.
* Use to select the Hi-Idle and Lo-Idle throttle operation.

* All lamps flash when the alarm is given.

To the Trolling Unit via Trolling Harness

NAME AND FUNCTION OF TROLLING ACTUATOR COMPONENTS

WARNING

Never operate the Selector Knob except in case of emergency.

Select Knob for manual operation

Emergency handle

To the Trolling Unit via Trolling Actuator Harness
HOW TO OPERATE

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.

3. 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 forward 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.
Determining the Cable Length

**CAUTION**

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 is 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: ∅7mm
- Tightening torque: 4.9~7.8N.m

Installation with tapping screw
- Installation plate thickness: 15mm Min.
- Pilot hole dia: ∅3mm

![Diagram of installation with pan head machine screw and tapping screw]
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 trolling 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

---

![Diagram of installation process]
CONNECTING THE TROLLING SWITCH & TROLLING UNIT

CAUTION
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-1 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.

4. 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

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. 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.
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**

   a. Install an attached rod end to the rod and fix with lock nut.
   
   ![Diagram of rod end installation](image)
   
   **Tighten torque: 2.9~4.4N.m**

   b. Remove from actuator screws shown with arrow and remove the cover.
   
   ![Diagram of cover removal](image)

   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.
   
   ![Diagram of cable installation](image)

   d. Install the cover to the actuator with screws.
   
   **Tightening torque: 1.2~1.8N.m**
2. Cable installation to the trolling valve.

![CAUTION]

Install the cable first to the actuator, then 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.

![CAUTION]

Be sure to turn OFF the power to the trolling unit before installing the cable to the trolling valve.
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

- Port actuator stroke (page 20)
- Throttle actuator Hi-idle stroke (page 21)
- Out of use
- Starboard actuator stroke (page 21)
- Starboard actuator operation mode (page 20)
- Port actuator operation mode (page 20)
1. **Setting the port 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 trolling valve side).
Set with SW2-1.

<table>
<thead>
<tr>
<th>SW2 — 1</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Pull to disengage a trolling valve</td>
</tr>
<tr>
<td>ON</td>
<td>Push to disengage a trolling valve</td>
</tr>
</tbody>
</table>

* 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 • 2 • 3 • 4.

<table>
<thead>
<tr>
<th>SW1-1</th>
<th>SW1-2</th>
<th>SW1-3</th>
<th>SW1-4</th>
<th>STROKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>31mm</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>34 mm</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>37 mm</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>40 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>43 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>46 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>49 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>52 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>55 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>58 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>61 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>64 mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>67 mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>70 mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>73 mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>80 mm</td>
</tr>
</tbody>
</table>

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

3. **Setting the starboard actuator operation mode**
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.

<table>
<thead>
<tr>
<th>SW4 — 1</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Pull to disengage a trolling valve</td>
</tr>
<tr>
<td>ON</td>
<td>Push to disengage a trolling valve</td>
</tr>
</tbody>
</table>

* 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 • 2 • 3 • 4.

<table>
<thead>
<tr>
<th>SW3-1</th>
<th>SW3-2</th>
<th>SW3-3</th>
<th>SW3-4</th>
<th>STROKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>31mm</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>34 mm</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>37mm</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>40mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>43mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>46mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>49 mm</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>52mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>55mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>58mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>61mm</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>64mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>67mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>70mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>73mm</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>80mm</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>SW2 — 2</th>
<th>SW2 — 3</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>5% of the forward full open stroke</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>10% of the forward full open stroke</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>15% of the forward full open stroke</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>20% of the forward full open stroke</td>
</tr>
</tbody>
</table>

* 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 Module Diagram]

<table>
<thead>
<tr>
<th>Step</th>
<th>Operation (Lever or Switch)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press the trolling switch</td>
<td>Trolling valve goes to the disengage Lo-Idle lamp ON</td>
</tr>
<tr>
<td>2</td>
<td>Neutral ⇒ Forward</td>
<td>Shift arm goes to the forward</td>
</tr>
<tr>
<td>3</td>
<td>Forward ⇒ Forward full open</td>
<td>Trolling valve goes to the engage</td>
</tr>
<tr>
<td>4</td>
<td>Forward full open ⇒ Neutral</td>
<td>Trolling valve goes to the disengage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shift arm goes to the neutral</td>
</tr>
<tr>
<td>5</td>
<td>Neutral ⇒ Reverse</td>
<td>Shift arm goes to the reverse</td>
</tr>
<tr>
<td>6</td>
<td>Reverse ⇒ Reverse full open</td>
<td>Trolling valve goes to the engage</td>
</tr>
<tr>
<td>7</td>
<td>Reverse full open ⇒ Neutral</td>
<td>Trolling valve goes to the disengage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shift arm goes to the neutral</td>
</tr>
<tr>
<td>8</td>
<td>Press the trolling switch</td>
<td>Throttle arm goes to the Hi-Idle Hi-Idle lamp ON</td>
</tr>
<tr>
<td>9</td>
<td>Press the trolling switch</td>
<td>Throttle arm goes to the Lo-Idle</td>
</tr>
<tr>
<td>10</td>
<td>Press the select switch</td>
<td>Trolling lamp OFF Trolling valve goes to the engage</td>
</tr>
</tbody>
</table>

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

WARNING

Never attempt manual operation except in the case of an emergency.

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.

<table>
<thead>
<tr>
<th>Flashing Frequency</th>
<th>Cause</th>
<th>Countermeasure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Once</strong></td>
<td>1. Starboard Trolling Actuator and Trolling Unit not connected correctly.</td>
<td>1. Reconnect the starboard Trolling Actuator and Trolling Unit.</td>
<td>page 12</td>
</tr>
<tr>
<td></td>
<td>2. Starboard Trolling Actuator set to the manual operation.</td>
<td>2. Set the actuator to a middle point and set the selector knob to “Electronic Operation.”</td>
<td>page 23</td>
</tr>
<tr>
<td></td>
<td>3. Starboard Trolling Actuator harness with breakage or shorting.</td>
<td>3. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>4. Harness Trolling Actuator with wire breakage or shorting.</td>
<td>4. Replace the Harness Trolling Actuator.</td>
<td>page 12</td>
</tr>
<tr>
<td></td>
<td>5. 12-pole coupler harness of the Trolling Unit with wire breakage or shorting.</td>
<td>5. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td><strong>Twice</strong></td>
<td>1. Port Trolling Actuator and Trolling Unit are not connected correctly.</td>
<td>1. Reconnect the Trolling Actuator and Trolling Unit.</td>
<td>page 12</td>
</tr>
<tr>
<td></td>
<td>2. Port Trolling Actuator set to the manual operation.</td>
<td>2. Set the actuator to a middle point and set the selector knob to “Electronic Operation.”</td>
<td>page 23</td>
</tr>
<tr>
<td></td>
<td>3. Port Trolling Actuator harness with wire breakage or shorting.</td>
<td>3. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>4. Harness Trolling Actuator with wire breakage or shorting.</td>
<td>4. Replace the Harness Trolling Actuator.</td>
<td>page 12</td>
</tr>
<tr>
<td></td>
<td>5. 12-pole coupler harness of the Trolling Unit with wire breakage or shorting.</td>
<td>5. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td>Flashing Frequency</td>
<td>Cause</td>
<td>Countermeasure</td>
<td>Reference</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Four Times</td>
<td>1. Cable installed without positioning of the starboard Trolling Actuator.</td>
<td>1. Install cable after positioning of the actuator.</td>
<td>page 18</td>
</tr>
<tr>
<td></td>
<td>2. Starboard Trolling Actuator stroke exceeding the stroke of trolling valve.</td>
<td>2. Reduce the stroke of starboard Trolling Actuator.</td>
<td>page 19</td>
</tr>
<tr>
<td></td>
<td>3. Starboard Trolling Actuator set to the manual operation.</td>
<td>3. Set the actuator to a middle point and set the selector knob to “Electronic Operation.”</td>
<td>page 23</td>
</tr>
<tr>
<td></td>
<td>4. Loose cable end of the starboard Trolling Actuator.</td>
<td>4. Fix the cable end.</td>
<td>page 17</td>
</tr>
<tr>
<td></td>
<td>5. Loose nut of the trolling valve connection.</td>
<td>5. Retighten the trolling valve connection nut.</td>
<td>page 18</td>
</tr>
<tr>
<td></td>
<td>6. Starboard Trolling Actuator harness with wire breakage or shorting.</td>
<td>6. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>7. Harness Trolling Actuator with wire breakage or shorting.</td>
<td>7. Replace the Trolling Harness Actuator.</td>
<td>page 12</td>
</tr>
<tr>
<td></td>
<td>8. 12-pole coupler harness of control unit with wire breakage or shorting.</td>
<td>8. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>9. Heavy valve load, resulting in failure of smooth shift actuator operation.</td>
<td>9. Reduce the valve side load.</td>
<td>—</td>
</tr>
<tr>
<td>Five Times</td>
<td>1. Cable installed without positioning of the port Trolling Actuator.</td>
<td>1. Install cable after positioning of the actuator.</td>
<td>page 18</td>
</tr>
<tr>
<td></td>
<td>2. Port Trolling Actuator stroke exceeding the stroke of trolling valve.</td>
<td>2. Reduce the stroke of port Trolling Actuator.</td>
<td>page 19</td>
</tr>
<tr>
<td></td>
<td>3. Port Trolling Actuator set to the manual operation</td>
<td>3. Set the actuator to a middle position and set the selector knob to “Electronic Operation.”</td>
<td>page 23</td>
</tr>
<tr>
<td></td>
<td>4. Loose cable end of the port Trolling Actuator.</td>
<td>4. Fix the cable end.</td>
<td>page 17</td>
</tr>
<tr>
<td></td>
<td>5. Loose nut of the trolling valve connection.</td>
<td>5. Retighten the trolling valve connection nut.</td>
<td>page 18</td>
</tr>
<tr>
<td></td>
<td>6. Port Trolling Actuator harness with wire breakage or shorting.</td>
<td>6. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>7. Harness Trolling Actuator with wire breakage or shorting.</td>
<td>7. Replace the Harness Trolling Actuator.</td>
<td>page 12</td>
</tr>
<tr>
<td></td>
<td>8. 12-pole coupler harness of control unit with wire breakage or shorting.</td>
<td>8. Consult your dealer.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>9. Heavy valve load, resulting in failure of smooth shift actuator operation.</td>
<td>9. Reduce the valve side load.</td>
<td>—</td>
</tr>
</tbody>
</table>
### CHECK POINTS IN CASE OF TROUBLE

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

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Countermeasure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not operating even when power supply ON.</td>
<td>1. Harness power not connected correctly.</td>
<td>1. Connect the harness power correctly. (See page 13)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Circuit breaker is OFF.</td>
<td>2. Turn ON circuit breaker.</td>
<td></td>
</tr>
<tr>
<td>Hi-Idle and Lo-Idle lamps flashing</td>
<td>1. Abnormality in the system.</td>
<td>1. Refer to “Alarm indication” on page 24.</td>
<td></td>
</tr>
<tr>
<td>simultaneously.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any one of Hi-Idle/Lo-Idle lamps not ON.</td>
<td>1. Wire breakage in Trolling Switch harness.</td>
<td>1. Consult your dealer.</td>
<td></td>
</tr>
<tr>
<td>Operation trolling position can not</td>
<td>2. Wire breakage in Trolling Harness.</td>
<td>2. Replace the Trolling Harness. (See page 11)</td>
<td></td>
</tr>
<tr>
<td>be selected.</td>
<td>3. Lamp failure.</td>
<td>3. Consult your dealer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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.
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 SWITCH TEMPLATE

Actual Size

Tear on the perforated line
# Handheld Control

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- **Components** ..................................................................... 3
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  2. When The Handheld Control Connected To R/C-1 Is To Be Used First .................. 5
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     Than R/C-1 Is To Be Used First ........................................ 5
  4. Shift Throttle Operation .................................................. 5
  5. Neutral Throttle Operation ............................................... 6
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- **Connecting The Handheld Control And Control Unit** ...... 9
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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.

WARNING

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

CAUTION

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

- Indicates identification
- Indicates the destination of connection
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Part No.</th>
<th>REQUIRED</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>①</td>
<td>Handheld Control Kit</td>
<td>NM0906-00</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0907-00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>②</td>
<td>Remote Control</td>
<td>NM0616-04</td>
<td>1</td>
<td>Sold Separately</td>
</tr>
<tr>
<td></td>
<td>Harness</td>
<td>NM0616-06</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-08</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-14</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-18</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-20</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-24</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-30</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-38</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-40</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0616-50</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>③</td>
<td>Relay Kit</td>
<td>NM0542-42</td>
<td>1</td>
<td>Option</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NM0542-43</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**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

- The lamp ON during the handheld control in use.
- The lamp flashes slow during neutral throttle operation.
- The lamp flashes fast during warnings.
- To select the stations.
- To set or cancel the neutral throttle operation.
- Press to stop the buzzer.

Pull off the lanyard or press the red knob to stop the engine(s).
HOW TO OPERATE

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-1) 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

CAUTION
Never move the hand lever(s) while engine is not running. Otherwise actuator, cables, engine or shift mechanism could be damaged.

WARNING
DO NOT ATTEMPT sudden forward to reverse hand lever(s) operation. Sudden acceleration/ deceleration may cause damage to the boat or cause operator or passengers to be ejected from the boat.

1. Moving the hand lever from the neutral position to the forward or reverse detent causes the actuator to shift to forward or reverse gear.

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

Ingress of water into the unit may cause failure

1. Install in a place free from effect of the sea breeze and seawater.
2. Cover the socket when the Handheld Control is removed.

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.
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 with the engine stop circuit so as to be parallel with the engine stop switch.

   Engine Stop Switch At Engine Side
   Engine Stop Circuit
   N.0
   B
   Power + (12V or 24V)
   A
   N.C
   COM
   The White Lead Wire Of The Socket Harness
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.
OPERATION CHECK

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

CAUTION

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

1. Shift and throttle operation check

<table>
<thead>
<tr>
<th>Step</th>
<th>Hand Lever Operation</th>
<th>Description (Engine Side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neutral → Forward</td>
<td>Shift arm shifted from neutral to forward</td>
</tr>
<tr>
<td>2</td>
<td>Forward → Forward full open</td>
<td>Throttle arm shifted from fully closed to full open</td>
</tr>
<tr>
<td>3</td>
<td>Forward full open → Neutral</td>
<td>Throttle arm shifted from full open to fully closed Shift arm shifted from forward to neutral</td>
</tr>
<tr>
<td>4</td>
<td>Neutral → Reverse</td>
<td>Shift arm shifted from neutral to reverse</td>
</tr>
<tr>
<td>5</td>
<td>Reverse → Reverse full open</td>
<td>Throttle arm shifted from fully closed to full open</td>
</tr>
<tr>
<td>6</td>
<td>Reverse full open → Neutral</td>
<td>Throttle arm shifted from full open to fully closed Shift arm shifted from reverse to neutral</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>OK</th>
<th>Countermeasure if NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press the emergency stop switch and start the engine.</td>
<td>Engine does not start</td>
<td>Connect the relay kit. (See page 10)</td>
</tr>
</tbody>
</table>
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.

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

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.
Tear on the perforated line

Ø 42mm
1.65"}

44mm
1.73"

44mm
1.73"

4 - Ø 4mm
.157"

Actual Size
Tear on the perforated line

Actual Size
# Engine Synchronization

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<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Parts Required</td>
<td>1</td>
</tr>
<tr>
<td>How To Operate</td>
<td>1</td>
</tr>
<tr>
<td>Name Of Each Part</td>
<td>2</td>
</tr>
<tr>
<td>Installing The Sync Switch</td>
<td>3</td>
</tr>
<tr>
<td>Connecting Harness</td>
<td>4</td>
</tr>
<tr>
<td>Setting For Engine Sync Signals</td>
<td>5</td>
</tr>
<tr>
<td>Sync Switch Template</td>
<td>7</td>
</tr>
</tbody>
</table>
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 (12 V model)
NM0454-00, NM0478-00 (24 V model)

PARTS REQUIRED

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Part No.</th>
<th>REQUIRED</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Two engines</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single</td>
<td>2</td>
</tr>
<tr>
<td>①</td>
<td>Sync Master Harness</td>
<td>NM0605-01</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>②</td>
<td>Sync Slave Harness</td>
<td>NM0605-02</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>③</td>
<td>Sync Switch</td>
<td>NJ0524-00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>④</td>
<td>Switch Harness 5m</td>
<td>NM0617-05</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15m</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>20m</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>25m</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30m</td>
<td>1</td>
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<td></td>
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<td>35m</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>40m</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45m</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50m</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

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

- : Indicates identification
- : Indicates the destination of connection

**NAME OF EACH PART**

**Engine Synchronization**
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.

Cut Out Dimensions
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”.

![Diagram of engine synchronization](image)
**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 an 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.

**Connections for signals from Ignition Coil or Alternator.**

**Connections for signals from 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.