

MIGHTY MARINER

ENGINE CONTROLS

INSTALLATION INSTRUCTIONS

ELECTRONIC ENGINE CONTROLS INSTALLATION INSTRUCTIONS

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6506 CONTROL HEADS / 6505-2000 CONTROL PANELS

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1. GENERAL INFORMATION

Kobelt Electronic Control System **The Kobelt Electronic Control System is a high performance system using the latest development in industrial control technology. This system is capable of controlling single engine and twin engine vessels installations, from one or more control stations.**

Available Features **The available features of the system are as follows:**

- **Heavy Duty Indoor and Outdoor Control Heads**
- **Independently Adjustable Shift and Throttle Actuator Outputs**
- **Single or Twin Screw Control**
- **Engine Warm Up**
- **Adjustable Shift and Throttle Delays**
- **Station Lock Out From All Main Stations**
- **Selectable Synchronizers**
- **Shaft Brake/Neutral Safety Switch Outputs**
- **Up to Four Control Stations**
- **Self Monitoring**

Setup And Calibration **The system setup and calibration can be maintained through switches and adjustable trimpots.**

- **The Clutch and Throttle stroke adjustment can be made by adjusting the trimpots on the Actuator.**

See drawing 400932 for the 6527-S Actuator

WARNING: **Always ensure that the electrical power is shut off or disconnected from the Kobelt Electronic Control System before making or adjusting any electrical cable connections.**

WARNING: **When making the installation, pay close attention to matching the wire colours with the correct terminal numbers, as shown in the diagrams. Any incorrect connection can severely damage the system.**

2. SYSTEM COMPONENTS

2.1 THE 6527-S ACTUATOR

Description	The Actuator is the heart of the (Mighty Mariner) Kobelt Electronic Control System. The Actuator monitors all input information from the Control Heads and their associated switch panels, its lever position and the synchronizer inputs. The Actuator also controls and positions its Throttle and its Clutch Levers and communicates with the Control Stations through panel lights and sonalerts.
Purpose	The purpose of an Actuator is to operate the Clutches and Throttles as they all require mechanical positioning.
Circuitry	The Actuator uses standard Microchip Picprocessor circuitry. All of the system adjustments can be maintained through adjustable trimpots and DIP switches.
Housing	The circuitry is housed in a heavy duty enclosure.
WARNING:	All units are not waterproof and therefore should not be immersed in liquid or washed. This unit should also not be welded, beaten, smashed or dropped.
Connections	All connections to the Actuator are hardwired into plugable connectors on the board. <i>See drawing 400932.</i>
Throttle Output	As the Station Control Head Lever is advanced through the Throttle portion of its travel, the Actuator output increases proportionately to increase the engine speed.
Clutch Output	For the Clutch Actuator output, the Station Control Head Lever is moved to the forward or reverse position, and the Actuator repositions the Clutch Lever accordingly.

An Adjustable Synchronizer System

The Synchronizer System is adjustable to designate either the port or starboard Engine as the Main Engine.

Model 6527-S

The 6527-S Actuator is a two function Actuator with a mechanical disconnect function.

Working With the CPU

The Actuator repositions its levers by sending electrical signals to its drive motors. The corresponding movements of the levers are fed back to the Actuator card by a gear operated potentiometer to complete the control loop.

Power Failure:

During a power failure the Actuator levers stays in position.

Override:

The mechanical override can be used to operate the lever during a power failure.

Torque

The 6527-S Actuator can deliver 150 inch-pounds of torque.

Temperature

The operating range of the 6527-S Actuator is -10° to $+55^{\circ}$ Celsius.

WARNING: **This unit, while traditionally mounted in or around the engine room, should not be mounted where excessive heat or moisture is present. Nor should it be mounted next to high power devices such as motors, heaters or transmitters.**

2.2 STATION CONTROL HEADS

Interacting With The Actuator

The Station Control Heads let the operator interact with the Actuator in the following manner:

- The ship's operator sends instructions to the Actuator through control handles and buttons.
- The Actuator sends feedback to the ship's operator through indicator lamps and sonalerts.
- The Control Heads connect to the Actuator over the distributed control network, through a shielded twisted pair data cable.

The Control Heads are manufactured from top quality non-corrosive materials to provide for a long life and an attractive appearance.

Styles

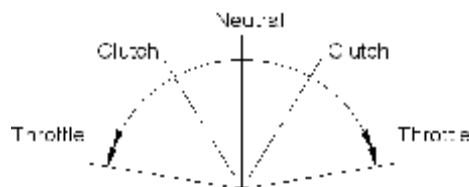
The Station Control Heads are waterproof from the top side only and capable of withstanding wet weather conditions and can be supplied with a chrome or black epoxy finish.

The bottom of the Control Head must be protected from the weather.

Engaging The Clutches And Throttles

The Control Heads operate through approximately 80 degrees of travel from each side of the centre neutral position. The first 30 degrees per side operate the Clutches and the remaining 50 degrees per side operate the Throttles.

This graphic shows the side view of a Control Head and the limits of its clutch and throttle regions.



2.3 SYNCHRONIZER INPUT

Purpose

The Synchronizer is an optional feature which can be added to any new or existing system. The Synchronizer adjusts the speed (shaft RPM) of the Following Engine to match the speed of the Leading Engine.

**Proximity
Sensor**

The Synchronizer input circuitry uses a proximity sensor mounted on the ship's propeller shafts. The propeller shaft speed is monitored, in preference to the engine speed, to ensure that the propellers are synchronized.

2.4 SHAFT BRAKE/NEUTRAL SAFETY SWITCH OUTPUT

Purpose **The operation of Shaft Brake/Neutral Safety Switch is coordinated with the Kobelt electronic Control System. The output from this switch indicates that the system is in the neutral position, helping the operator perform safe engine startups and idling.**

Engine Start Interlock **NOTE: The brake signals can be tied to the engine's starting circuitry. This will prevent the engine from starting unless the Control Head levers are in their neutral positions.**

3. INSTALLATION

3.1 INSTALLATION HIGHLIGHTS

Starting Installation

- 1. Engine start/stop must be installed at every station.**
- 2. Kobelt system power breaker must be installed in the wheel house.**
- 3. Wires must be tinned during installation.**
- 4. Free wheeling diodes (protection diodes) must be installed on all inductive devices such as relays and solenoids.**
- 5. Kobelt neutral safety switches must be able to be bypassed to allow starting of the engines if the control system has failed.**
- 6. A clean power source must be provided.**

3.2 ELECTRICAL POWER

Power Requirements

Power requirements for the Kobelt Electronic Control System are as follows:

- 24 vdc power supply - 10 amps maximum**

Battery charge Regulation - 10% from no load to full load with 10% maximum line variation

**Clean Power
Is Critical**

A reliable and electrically clean power supply for this system is critical.

- **“Main” power should not be taken from an engine starting battery source.**
- **Power should be taken from the ship’s house battery through a circuit breaker.**
- **If there is noise on the ship’s house battery system caused by electronics or inverters, it is recommended that a battery dedicated to the electronic engine controls be installed.**
- **Voltage regulation from the battery charger, inverter or converter should be 10% or better.**

**Power Switch
(Customer
Supplied)**

Two sources of power are recommended: A primary source and a secondary source. A three position switch capable of handling system current must be installed next to the main station, usually the wheelhouse station, to allow the operator to select either the primary power, the secondary power or, in an emergency, the POWER OFF/SYSTEM RESET position.

**Shielding And
Ground
Connections**

All shielding and ground connections for the Kobelt Electronic Control System are made at the Actuator.

- **The Actuator Card is grounded internally, therefore it is best to completely isolate from the ship’s grounding.**

3.3 CONTROL HEADS

Mounting

The Control Head circuitry is subject to the same temperature range as the Actuator. The Control Heads should be mounted so they may be lifted up through their mounting holes with their wiring intact.

DIP Switches The DIP Switches on the printed circuit board are used for assigning an address to each Control Head. The Main Station is assigned number 1. The Second Station is assigned number 2. When the system is powered up, the CPU will automatically default to Station 1.

All Control Heads are set to Station #1 when delivered. For a multi station system, the stations addresses must be set during the installation.

See drawing 400931

Options All standard Control Heads will come with a four-selection membrane switch with LED indicators. These switches will include options for STATION SELECT, STATION LOCK, THROTTLE OVERRIDE, and SYNCHRONIZER.

3.4 ACTUATORS

3.4.1 General

Mounting All Actuators perform best when they are installed on relatively vibration-free foundation plates.

WARNING: Do not mount the Actuator on the engine. All units are not waterproof and therefore should not be immersed in liquid or washed. This unit should also not be welded, beaten, smashed or dropped.

Temperature The operating range of the 6527-S Actuator is -10⁰ to +55⁰ Celsius.

WARNING: This unit, while traditionally mounted in or around the engine room, should not be mounted where excessive heat or moisture is present. Nor should it be mounted next to high power devices such as motors, heaters or transmitters.

Rod Ball End Connections If a push/pull cable is selected, it must be a low friction type, such as the Felsted type 40 series, and should be kept as short and straight as possible.

Mounting Bracket The Actuator's Mounting Bracket should be flat to avoid distortion of the Actuator housing.

WARNING: When installing the Actuator, it is mandatory to place a small flat washer under each of the four mounting feet. This is to ensure that there is no distortion of the case when the unit is mounted.

Electrical Connections Connections at the Actuators are made via removable connectors mounted inside the Actuator just inside the removable panel. Cut the cable to the appropriate length.

WARNING: Do not coil up excess cable.

Check The Diagrams Check the appropriate wiring diagram for the Actuator. The cable specification and wiring diagrams are at the back of this manual.

NOTE: Care must be taken with connections made at the Actuator. Improper wiring connections may result in damage to the Actuator.

FOR ITEMS THAT NEED ACCURATE POSITIONING, A PUSH PULL CABLE IS NOT RECOMMENDED, BECAUSE OF THE LOST MOTION IN PUSH PULL CABLES. A SOLID ROD WITH ROD BALL ENDS IS RECOMMENDED.

3.4.2 6527-S Electronic Actuator

Description The basic control unit on model 6527-S comes with manual override and one trim pot per side to adjust the stroke. The actuator does not have an internal resilient link . The stroke must, therefore, be adjusted precisely to suit the device being controlled. This unit has a high torque of 150 ins. lbs.

3.4.3 Throttle Actuator Operation

Throttle Movement The standard throttle actuator operates in a counter clockwise for more RPM and a clockwise rotation for less RPM

**Electrical
Reversal**

If this movement is reverse to what is desired, the actuator can be electrically reversed by setting DIP switches.

See drawing 400932

3.4.4 Clutch Actuator Operation

Operation

The standard clutch actuator operates in a clockwise rotation for forward and counter clockwise rotation for reverse. The direction can be changed electrically as previously explained.

3.5 CABLE INSTALLATION

WARNING: Do not install any cables until after the Actuators, Control Heads and Synchronizer Inputs have been mounted in their permanent locations.

Cables

All cabling should be firmly fastened, unless housed in conduit. All cables are supplied to the length of 10 meters (33 feet) unless specified.

WARNING: Cut the cables if they are too long, do not coil them.

Power Cable **The power cable supplied is #12 - 2 conductor. The Red is positive power and the Black (Blk) is negative power.**

**Communication
Power Cable** **The Communications/Power Cable provides communications and power from the Actuator to the Station Control Heads.**

See Drawing 400936

WARNING: **This Communications/Power Cable is grounded at the Actuator. Connect the shield to the Control Head terminal but NOT to the case.**

**Synchronizer
Cables** **The Synchronizer cable is 7 conductor #18 AWG.**

See Drawing 400933

**Shaft Brake/
Neutral Safety
Cable** **The Shaft Brake/Neutral Safety Cable is 7 conductor #18 AWG.**

See Drawing 400934 / 400935

**Control Head
Panel Wiring** **All wiring for Control Head panels, between the Control Heads and the push buttons and lights, are factory installed and tested.**

3.6 SYNCHRONIZER

Mounting **The Synchronizer Pickups are mounted near the propeller shafts. These are proximity sensors that send one pulse per shaft revolution to the Actuator.**

Target Size **The target size for the Pickup should be 2-3" long, 1" wide and about 1/8" thick. Depending on the installation, slightly larger Pickups may be required to make the Synchronizer respond properly.**

Material **The recommended material is mild steel. If stainless steel is used, the sensing distance of the Pickup may be less.**

Sensing Gaps The recommended maximum sensing gap for mild steel is approximately 0.050" (1.4mm). If stainless steel is used for a target, the maximum sensing gap will be approximately 0.035" (1mm).

NOTE: Please review the instructions that come with the Sensor. The Pickup should be mounted on a vibration-free bracket that allows for adjustment of the sensing gap.

See Drawing 400933

3.7 SHAFT BRAKE/NEUTRAL SAFETY OUTPUT

Operation The Shaft Brake Output features a set of normally open contacts: These close when the Clutch is in the neutral position. As the Forward or Reverse Clutch is activated, the Brake Relay disconnects and the Brake is deactivated.

Relays The Neutral Safety Switch Output uses the same relay as the Shaft Brake. The relay is operated by the position of the Clutch Actuator.

3.8 PERIODIC SYSTEM MAINTENANCE

Inspection Inspect system wiring:

- Control heads wiring
- Actuators wiring

Inspect and monitor your primary and secondary power sources.

Inspect your push/pull cable connections between actuators and controlled devices. Check cable clamp screws and make sure they are tight.

Perform a system functional test with the engines off and test system operations from all stations and for all functions available (see Kobelt operating instructions).

4. OPERATION

4.1 STATION CONTROL HEAD

4.1.1 Station Select

Purpose	The STATION SELECT button allows you to transfer engine control from one station to another.
Selecting	To select a Station, press the STATION SELECT button. After the Station has been selected, the STATION SELECT lamp will illuminate to <u>indicate that the transfer has been completed</u>. This lamp will not turn off until another Station is selected. When a Station is selected, all operating functions are transferred to that Control Head.
Main Station	When the engine Control System is first activated electrically, the Main Station (Stn. 1 - switch designation) is automatically selected as the Station in control, and the Station Lock function is activated. Push the STATION SELECT button to make the system operational.

4.1.2 Station Lock

Purpose	The Station Lock allows the operator to lock out the other stations. This feature is used to prevent someone from inadvertently switching Station control from the ship's operator at the active Station.
Engaging	It can be engaged by pressing the STATION LOCK button of the active Station. When it is engaged, the STATION LOCK lamp will illuminate and no other Station can be selected. Pressing the button again will release the Station Lock and the STATION LOCK lamp will turn off.

4.1.3 Throttle Override (Engine Warm Up)

Purpose	Throttle Override (engine warm up) mode allows the ship's operator to move the Throttle Actuator independently of the Shift Actuator. This is useful for engine warm up or to increase the engine's speed for external loads (e.g. - hydraulic pump systems). The Neutral Safety Switch will be enabled during engine warm up.
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Shifting To Throttle Override Move the Control Handles to the neutral position, then press the **THROTTLE OVERRIDE** button. After the button has been pressed, the **THROTTLE OVERRIDE** lamp will illuminate. The Throttle Override mode prevents the Shift Actuator from moving out of the neutral position.

Returning To Normal To select the normal operating mode, return the Control Handles to the neutral position, then press the **THROTTLE OVERRIDE** button again.

4.1.4 Synchronizer

Operation Engagement/ disengagement The Port and the Starboard levers must be within 10% of each other to allow engagement / disengagement of the Synchronizer option. The Synchronizer is activated by pressing the **SYNCHRONIZE** button. The Synchronizer circuitry will adjust the position of the Slave Throttle Actuator based on the Port/Stbd propeller shaft speeds. When the **SYNCHRONIZE** light is flashing the Synchronizer is working. When the **SYNCHRONIZE** light is on solid, the shafts are “in sync” within this dead band.

Sensors The Synchronizer Sensors, or Pickups, are proximity sensors mounted on the propeller shafts to transmit the speed of the propeller back to the Actuator. The Actuator compares the pulsed inputs from the propeller shafts of the Auxiliary and Main Engines, then adjusts the speed of the Auxiliary Engine to match the Main Engine.

Gear Operation In the Synchronizer mode the selected Control Head will also operate both gears from the Main Handle.

5. INSTALLATION CHECKLIST

5.1 GENERAL

- G ENGINE EMERGENCY STOPS must be installed at every station**
- G The power source must be clean**
- G The voltage regulation must be within 10% or better of rated battery voltage, e.g. a 24 Volt system should be between 22 and 26 Volts**
- G A POWER switch (customer supplied) must be installed at the Main Station**
- G Do not use an engine starting battery as a power source**
- G Do not install any cables until the Actuators, Control Heads and Synchronizer Inputs have been mounted in their permanent locations**
- G Tin all cables and solder all crimp connectors**
- G The operating temperature range is -10°C to $+55^{\circ}\text{C}$**
- G Double check all voltage polarities (positive/negative), reverse polarities are likely to cause damage**

5.2 ACTUATORS

- G The Actuator's location must be accessible for service**
- G The Actuator must be installed on a relatively vibration-free plate**
- G Do not mount the Actuator on the engine**
- G Do not install Actuator near high-power devices**
- G This unit is not waterproof and, therefore, must not be mounted where excessive heat or moisture is present and it should not be immersed in liquid or washed**
- G The Mounting Bracket must be flat**
- G Place a small flat washer under each of the four mounting feet**
- G If cables are to be used with the Actuators, rather than solid bars, use only low friction push/pull cables such as the Felsted type
40 series and make them as straight as possible to a maximum of 15 feet in length**
- G This unit should also not be welded, beaten, smashed or dropped**

- G Connections are made just inside the removable panel
- G Disconnect all cables/remove components prior to welding

5.3 CONTROL HEADS

- G Mount the Control Heads so that you are able to lift them up entirely through their mounting without having to remove their wiring
- G The Main Station is assigned address number 1, the Second Station is number 2
- G On power up the system will automatically default control to station number 1

5.4 SYNCHRONIZER

- G The Synchronizer Pickups are mounted in close proximity to the propeller shafts
- G The Target size for the Pickups should be approximately 2-3" long, 1" wide and about 1/8" thick. These sizes may be increased if necessary
- G The recommended material is mild steel
- G The recommended maximum sensing gap for mild steel is approximately 0.050"
- G If stainless steel is used for a Target, the maximum sensing gap will be approximately 0.035"
- G The Pickup must be mounted on a vibration-free bracket that allows for adjustment of the sensing gap
- G review the instructions that come with the Sensor

5.5 CABLE INSTALLATION

- G Cut all cables to their appropriate length
- G Do not coil up excess cable
- G All cabling should be firmly fastened
- G Tin all cable ends
- G Refer to the diagrams for specific details regarding all cable connections

G Do not run the low-voltage control cables near high-power cables

6. SYSTEM SETUP AND TEST PROCEDURES

- Pre-Test Checks**
- **Make sure that the system is powered down**
 - **Make sure that all cables are labeled**
 - **Inspect the system wiring in complete detail, unit by unit**
- Disconnect**
- **Disconnect the PUSH/PULL cables or mechanical linkage from all Actuators**
- Power Up**
- **Apply power to the system and observe carefully**
 - **The Main Station sonalert should be beeping and the STATION SELECT lamp should light up**
 - **If not, power down and inspect all of the wiring again. Then repeat the power up procedure until the system is properly powered up**
- Station Select**
- **Once the system is powered up, press the STATION SELECT button to acknowledge control.**
- Levers**
- **Move the Control Head levers and observe whether the actuators are responding to the lever commands.**
- Throttle/Clutch**
- **Determine the Min and Max Throttle positions as well as the forward and reverse Clutch positions and compare these positions to the Actuator's movement**
 - **If you need to reverse an Actuator movement**
- See drawing 400932*
- **Determine the stroke required for Clutch and Throttle. Make any *coarse* adjustments by moving the cable connection up or down on the Actuator lever. Make any *fine* adjustments by turning the Actuator trimpots to obtain the desired position.**

PUSH/PULL Cables

- **With the engine shut down, connect the PUSH/PULL cables to the actuators and fine tune for best results**
- **Adjust Throttle trimpot clockwise to increase the Throttle delay. *The maximum delay is 24 seconds***

See drawing 400932

- **Adjust neutral trimpot clockwise to increase the neutral delay. *The maximum neutral delay is 24 seconds.***

See drawing 400932

Completing The Test

- **Once the system has been thoroughly tested and all of the functions are operational, you may now start the engines and test at the idle RPM.**
- **After everything has been tested and adjusted properly, you may start preparing for a sea trial.**

7. TROUBLESHOOTING

Symptom	Possible Causes	Remedy
The system is dead	<ul style="list-style-type: none"> • The power is off • The polarity is reversed on the DC power input 	<ul style="list-style-type: none"> • Turn the power on • Reverse the connections
There is a continuous sonalert beep	<ul style="list-style-type: none"> • Control Head CPU hangs up 	<ul style="list-style-type: none"> • Reset System
The system is not synchronizing	<ul style="list-style-type: none"> • The synchronizer is not set properly • There is a problem with the synchronizer wiring 	<ul style="list-style-type: none"> • Adjust the distance between the sensor and the target until the LED starts flashing • Check the wiring
All Actuators are moving erratically	<ul style="list-style-type: none"> • There is a ground loop 	<ul style="list-style-type: none"> • Check and make sure the cable shields are isolated
<u>2 Consecutive Beeps</u>	<ul style="list-style-type: none"> • Actuator temperature is above 60° C 	<ul style="list-style-type: none"> • Must provide ventilation

<p><u>3 Consecutive Beeps</u></p> <p>The Actuator will be disabled If the Clutch Actuator fails the Throttle will default to Idle.</p> <p>If the Throttle Actuator fails the Clutch will default to Neutral</p>	<p>The Actuator is jammed</p> <p>The Actuator motor has failed</p>	<ul style="list-style-type: none"> • Check the push pull cable • Check the wiring and the motor
<p><u>4 or 7 Consecutive Beeps</u></p> <p>The control head will become disabled</p> <p>Station Lock will be disabled</p> <p>Control can be transferred to other stations if equipped</p>	<ul style="list-style-type: none"> • One or more communication wires are missing • One or more terminating resistors are missing 	<ul style="list-style-type: none"> • Check the wiring • Install terminating resistors
<p><u>5 Consecutive Beeps</u></p> <p>The Actuator will be disabled.</p> <p>If the Throttle Pot fails the Clutch will default to Neutral</p> <p>If the Clutch Pot fails the Throttle will default to Idle</p>	<ul style="list-style-type: none"> • The Actuator Potentiometer is damaged • One or more of the Pot wires are broken 	<ul style="list-style-type: none"> • Check the Potentiometer and replace if necessary

<p><u>6 Consecutive Beeps</u></p> <p>The Control Head will become disabled</p> <p>Station Lock will be disabled</p> <p>Control can be transferred to other stations if equipped</p>	<ul style="list-style-type: none"> • The Control head Potentiometer is damaged • One or more of the Control head pot wires are broken 	<ul style="list-style-type: none"> • Check the Potentiometer and replace if necessary
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8. MIGHTY MARINER OPERATING INSTRUCTIONS

On Power Up:

- S **System default power to station 1, station lock is enabled**
- S **Regardless of control head levers position, the throttle actuator is preset to idle, and the clutch actuator is preset to neutral, (mid position)**
- S **Sonalert intermittent beep awaiting for operator to acknowledge control.**

Operating Mode:

- S **Put levers in neutral position and press station select switch to acknowledge control**
- S **Sonalert is silent**
- S **System is ready to operate the throttle and the clutch according to lever command**

Engine Warm Up

- S **Press throttle override if engine warm up is desired. Throttle override allows you to control the throttle while the clutch is in neutral position. Levers must be in neutral to enable/disable throttle override.**

Clutch Throttle Operation

- S Once in normal mode, advancing the control lever from neutral to full ahead will cause the clutch actuator to move from neutral to ahead position and a proportional throttle signal from idle to full speed**
- S Moving the lever from neutral to full astern will cause the clutch actuator to move from neutral to astern position and a proportional throttle signal from idle to full speed.**

Synchro Option

- S Press the synchro switch if engine synchronization is desired. The system will allow one lever to control both clutches and engines synchronized.**
- S Both master and slave control levers must be within 10% difference to allow engagement/disengagement of the synchro option.**

Transferring Control to a Secondary Station

- S Disable station lock at the active station**
- S Match the secondary station levers position to the active station levers position and press station select to transfer control**
- S Operate clutch/throttle as per station 1 instructions.**

Transfer between stations can occur at any control lever positions; therefore, operator attention is required.

System Alarm (Sonalert):

A sonalert must be installed at least at the main station. In addition to power up indication, the sonalert will serve the following functions:

Note: You must stop the vessel and take immediate action to rectify the problem if any of the following conditions occur:

- S Two consecutive beeps will occur if the temperature inside the 6527-S Actuator exceeds 60⁰ C. The actuator will stay functional for a few more degrees. Once the temperature drops the alarm will disappear.**
- S Three consecutive beeps will occur if one of the actuator levers is not responding to the control lever command (actuator jam). If the clutch actuator fails the throttle will default to idle. If the throttle actuator fails the clutch will default to neutral. The actuator will become disabled in either condition. In the case of a twin engine system if one actuator fails, the other should remain functional.**

Reset the system power in order to regain control and silence the alarm.

- S Four or seven consecutive beeps will occur if the control head and the actuator are not communicating. The control head will become disabled, the actuator will keep the last position, the system will disable station lock and transfer to another station will be allowed if equipped.**
- S Five consecutive beeps will occur if the actuator feedback pot has a broken wire. If the clutch actuator pot fails the throttle will default to idle. If the throttle actuator pot fails the clutch actuator will default to neutral. The actuator will become disabled in either condition. In the case of twin engine system, if one actuator fails the other should remain functional.**
- S Six consecutive beeps will occur if the control head pot has a broken wire. The control head will become disabled, the actuator will keep the last position, the system will disable station lock and transfer to another station will be allowed if equipped.**
- S A steady alarm will occur if the control head CPU fails. (CPU locks up).
Reset the system power in order to regain control**

For more details see the troubleshooting section in the installation booklet.

9. PERIODIC SYSTEM MAINTENANCE

- C Inspect system wiring:**
 - S Control heads wiring**
 - S Actuators wiring**
- C Inspect and monitor your primary and secondary power sources**
- C Inspect your push/pull cable connections between actuators and controlled devices.**
- C Perform a system functional test with the engines off and test system operation from all stations and for all functions available.**

(See Kobelt operating instructions).

10. CONTROL HEAD CALIBRATION

All Control Heads Are Calibrated When Delivered

Recalibration Is Required Only When The Headboard or The Pot Has Been Changed In The Field

See Drawing 400931 for Jumper J2 Location

There are three calibration operations required for the Control Head unit. These can all be performed without any external equipment except a 24V power supply connected to terminals 1(V+) and 2 (V-) of P1. Calibration can be done with or without other devices connected to the CAN bus as the head produces no CAN bus signals during the calibration routine. In order to enter into the calibration process, a jumper at J2 must be installed. This both enables writes to the internal EEROM as well as causes the software to enter into the calibration routines.

Step No. 1: Pot centering

With the jumper at J2 installed and both handles in the centre indent, rotate each pot until the STATION SELECT lamp (for the left pot) and the SYNCHRO MODE lamp (for the right pot) come on. This indicates that the pot is electrically centered.

Step No. 2: Minimum offset calibration

Move both handles to the reverse limit (towards the operator). Then press the STATION SELECT switch. The STATION LOCK lamp will come on to indicate that the offset calibration for the left hand lever was successful. Then press the SYNCHRO MODE switch and the THROTTLE OVERRIDE lamp will come on to indicate that offset calibration for the right hand lever was successful. At this time both of the inner two lamps will be illuminated.

Step No. 3: Span calibration

Move both handles to the most forward limit (away from the operator). As the handles are moved forward, the two inner lamps will turn off. Again press the STATION SELECT switch and confirm that the STATION LOCK lamp lights. Repeat the process with the SYNCHRO MODE switch and check the THROTTLE OVERRIDE lamp. As in step 2 above, both lamps indicate that the respective calibration constants were written correctly to the EEROM.

When the above steps have been completed, remove the jumper at J2 and the head will return to normal operation.

Installation Of Mechanical Pickup For Engine Synchronization And Tachometers

Kobelco normally supplies a Honeywell proximity sensor for this purpose. Honeywell has written some specification guidelines for this purpose but we are herewith trying to help installation and operation problems in the field.

If a mechanical pickup is installed on a rotating element, it is important to have a sufficient target so that a proximity switch can pick it up. On a fast rotating element the target must be sufficient so that the regular pulse is received. We recommend a target of approximately 2 - 3" long and 1" wide. The target must have a radius that is consistent with the centre of the axis. If the target is not consistent a double pickup might occur. The target must also be installed securely so that it does not become loose and change the intended position. The target should be a minimum of 12mm or 1/2" away from any other solid metal object in order not to receive any interference. The proximity switch must also be installed on a bracket sufficient to withstand vibration and possibly personnel stepping on it. If the proximity switch comes in contact with the rotating target it will be destroyed. A minimum clearance between the target and the proximity switch is usually approximately 1 - 2 mm or 3/32" maximum, the closer the better. It is important, however, that there is no interference between the two items. See attached sketch.

