

**ELECTRONIC**  
**ENGINE CONTROLS**  
**(Model 6525)**  
**INSTALLATION MANUAL**

**November 2013**

# ELECTRONIC ENGINE CONTROLS INSTALLATION INSTRUCTIONS

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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, twin and three engine vessel 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
- Port and Starboard Engine Warm Up
- Adjustable Shift and Throttle Delays
- Station Lock Out From All Main Stations
- Factory Selectable Synchronizers
- Trolling Valve Operation
- Shaft Brake/Neutral Safety Switch Outputs

**Setup And Calibration** The system setup and calibration can be maintained through adjustable trimpots (for the 6525) or a software interface (for the 6525 Advanced).

The Clutch and Throttle stroke adjustment can be made by adjusting the trimpots on the Actuators.

See drawing 6525-0004 for the 6524 Actuator, drawing 6525-0018 for the 6531 Actuator, drawing 400144 for the 6527 Actuators, and drawing 400575 for the 6528 Actuators.

**Pay Attention To The Diagrams** The document text provides a general overview of the installation and operation processes. All of the warnings, product tolerances and limitations discussed in this manual are valid for every model 6525 Kobelt Electronic Control System.

**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 CPU.

**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.

## 2 SYSTEM COMPONENTS

### 2.1 CENTRAL PROCESSING UNIT (CPU)

**Description** The CPU is the heart of the Kobelt Electronic Control System. The CPU monitors all input information from the Control Heads and their associated switch panels, the Actuator position indicators and the Synchronizer inputs. The CPU also controls and positions the Actuators and communicates with the Control Stations through panel lights and Sonalerts.

**Circuitry** The CPU uses standard Motorola 6800 microprocessor circuitry. All of the system adjustments can be maintained through adjustable trim pots (for the 6525) or a software interface (for the 6525 Advanced).

**Housing** The circuitry is housed in a heavy duty enclosure designed to prevent dust and moisture intrusion.

**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 CPU are hardwired into pluggable connectors on the CPU board. *See drawing 6525-0001.*

**Throttle Output** The CPU has three different Throttle outputs: an Electro/mechanical Actuator, 4 - 20 mA or PWM.

As the Station Control Head Lever is advanced through the Throttle portion of its travel, the CPU output increases proportionately to increase the engine speed.

**Clutch Output** The CPU has two standard Clutch outputs: an Electro/mechanical Clutch Actuator or an Electric Clutch.

For the Clutch Actuator output, when the Station Control Head Lever is moved to the forward or reverse position, the CPU repositions the Actuator accordingly.

The Electric Clutch, in turn, controls the clutch solenoids.

**An Adjustable Synchronizer System** The Synchronizer System, when shipped, is adjustable to let you designate either the port or starboard Engine as the Main Engine.

## 2.2 STATION CONTROL HEADS

### Interacting With The CPU

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

- The ship's operator sends instructions to the CPU through control handles and buttons
- The CPU sends feedback to the ship's operator through indicator lamps and sonalerts
- The Control Heads connect to the main controller, 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

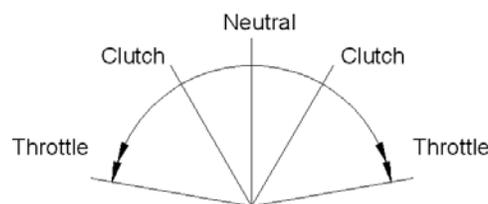
The Station Control Heads are available in several styles. The indoor Control Heads can be illuminated and installed with a chrome or black epoxy finish. The outdoor Control Heads are waterproof on the top side only, capable of withstanding wet weather conditions and can be supplied with a chrome or 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 ACTUATORS

### Purpose

The purpose of an Actuator is to operate the Clutches, Throttles or Trolling Valves, as they all require mechanical positioning.

### Model 6531/6528

The **6531** and **6528** Actuators are single function actuators that can be fitted with a spring return if desired.

<b>Model 6524/6527</b>	The <b>6524</b> and <b>6527</b> Actuators are dual function actuators that have a mechanical disconnect function.
<b>Working With the CPU</b>	The CPU repositions the Actuators by sending electrical signals to their drive motors. The corresponding movements of the Actuators are fed back to the CPU by a gear operated potentiometer to complete the control loop.
<b>Power Failure: 6531/6528</b>	During a power failure, the <b>6531</b> releases the clutches and the actuator returns to the spring return position.
<b>Power Failure: 6524/6527</b>	During a power failure, both the <b>6524</b> and <b>6527</b> stay in position.
<b>Override:</b>	The mechanical override can be used to operate the lever during a power failure.
<b>Torque</b>	The <b>6531/6527</b> Actuators can deliver 150 inch-pounds of torque while <b>6524</b> delivers a torque of 90 inch-pounds. The <b>6528</b> Actuator can deliver up to 600 inch-pounds of torque.

## 2.4 SYNCHRONIZER INPUT

<b>Purpose</b>	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 Trailing Engine in order to match the speed of the Leading Engine.
<b>Proximity Sensor</b>	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.

## 2.5 SHAFT BRAKE/NEUTRAL SAFETY SWITCH OUTPUT

<b>Purpose</b>	<p>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.</p> <p>For ships with braking systems, the time delays for the braking operations are adjustable (neutral delay). For those without braking systems, this switch's neutral indication output acts as a useful safety feature.</p>
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**Engine Start  
Interlock**

NOTE: The Shaft Brake/Neutral Safety Switch 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 switches 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 for starting of the engines if the control system has failed.
6. Two independent clean power sources 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.
- Maximum 3 hours of backup power.
- 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 must be provided - a primary source and a secondary source. A three position switch capable of handling the 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.

Also an automatic power selection module similar to the model APS-70 from Newmar® can be used as an alternative so that power to the control system will be provided from one of the two sources. A RESET switch must also be installed in order to reset the control system in case of failure

by pressing and holding the switch for a few seconds.

### **Shielding And Ground Connections**

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

- The CPU Card is grounded internally, therefore it is best to completely isolate it from the ship's grounding.
- If the hull of the boat is made of a metallic material such as aluminum or steel, the CPU must be completely isolated from it.
- Shielding on cables connected to the Actuators should be left open to prevent circulating ground current.

## **3.3 CENTRAL PROCESSING UNIT (CPU)**

### **Mounting**

The electronic circuitry of the CPU is mounted in a die-cast silicon bronze housing. This enclosure is not waterproof.

**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.

### **Cables**

The cables from the CPU to the Actuators have a maximum length of 30 ft (10 m), therefore the CPU must be centrally located between the Actuators.

### **Temperature**

The operating range of the CPU is -10° to +50° Celsius.

**WARNING:** This unit, while traditionally mounted in or around the engine room, should not be mounted where excessive heat or moisture is present. Never should it be mounted close to high power devices such as motors, heaters or transmitters.

### **Connections**

All connections to the CPU are hardwired to removable connectors on the CPU board.

## **3.4 CONTROL HEADS**

### **Mounting**

The Control Head circuitry is subject to the same temperature range as the CPU. 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. When the system is powered up, the CPU will automatically default to Station 1. These addresses are factory set.

**NOTE:** If a station is removed from a system the CPU must be reprogrammed to reflect the number of control stations used, otherwise the system response will be very slow.

If a station is added, you must reprogram the CPU to recognize the new station.

## 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.

*See drawing*    6525-0002  
                  6525-0052 → 6509  
                  6525-0059 → 6508  
                  400541    → 6505

## 3.5 ACTUATORS

### 3.5.1 General

#### Mounting

The **6531/6528** Actuators should be mounted horizontally with their feet either up or down. Do not mount them sideways.

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.

#### Rod Ball End Connections

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

**MUST:** Please follow cable manufacturer specifications when installing push/pull cable.

#### 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**

All of the electrical connections come from the CPU. The maximum length of cable between the Actuator and the CPU is 30 ft. (10 m). Connections at the Actuators are made by a terminal strip 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 terminal strips. Improper wiring connections may result in damage to the Actuator and/or the CPU. The Actuator cables from the CPU are 18 AWG braided cables. These wire ends should be crimped with fork or eye terminals.

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.

### 3.5.2 6527 Electronic Actuator

**Description**

The basic control unit on model **6527** comes with manual override and one trimpot per side to adjust the stroke. The actuator does not have an internal resilient link like model **6524**. The stroke must, therefore, be adjusted precisely to suit the device being controlled. This unit has a high torque of 150 in.-lbs.

### 3.5.3 6531 Throttle Actuator

**Throttle Movement**

The standard throttle actuator comes with a return spring installed to return the drive shaft to the counter-clockwise position.. If this movement is reverse to what is desired, the lever and cable clamp can be repositioned 180 degrees, to reverse the linear direction.

**Electrical Reversal**

If rotating the lever is not practical, the actuator can be electrically reversed.

*See drawing 6525-0017*

**Return Spring**

The purpose of the return spring is to mechanically rotate the actuator shaft back to the idle position in the event of loss of power. If the actuator is

electrically reversed, this spring must also be reversed. This is done by removing the round plate on the clutch housing, and reversing the spring geometry and moving the stop from the 2 o'clock to the 10 o'clock position. Ensure that there is adequate lubrication in the spring chamber.

If the actuator is to be used with an emergency set of push-pull controls, this spring should be removed.

### 3.5.4 6531 Clutch Actuator

#### Operation

The standard clutch actuator operates in a clockwise rotation for forward and counter clockwise rotation for reverse. The lever and clamp can be rotated 180 degrees to change the linear directions. The direction can be changed electrically as previously explained. The springs do not require changing when the clutch is electrically reversed.

If this actuator is used with push-pull cables, remove the springs.

### 3.5.5 Trolling Valve Actuator

#### Description

The trolling valve actuator is similar to a throttle actuator in its construction. However, the spring return operates in the opposite direction.

#### Working With the CPU

When the controls are in the normal throttle operation mode, the trolling valve actuator is in the "non-slip" position of the gear.

This actuator position is maximum clockwise. When the trolling valve mode is selected, the CPU moves the trolling valve actuator to the "maximum slip" position of the gear. The actuator position is now fully counter-clockwise. As the active control head is advanced forward, the trolling valve actuator rotates in the clockwise direction, moving the gear towards the "minimum slip" position.

**NOTE:** Care must be taken to ensure that the actuator is adjusted properly to return the trolling valve to the "non-slip" position when operating in the normal throttle mode. Failure to do so could cause severe damage to the main shift gear.

## 3.6 CLUTCH DRIVE OUTPUT

#### Purpose

The clutch drive unit provides the output for electric solenoid gear drives. The clutch drive unit receives the data information from the selected control head and the CPU, and operates the clutch drive output relays which provides a closed contact to operate the gear solenoid circuitry.

*See Drawing 6525-0013.*

### 3.7 ELECTRONIC THROTTLE

**Purpose** The throttle output can be selected to provide a 4 to 20mA or a PWM signal for electronic governor systems. The output will be preset at the factory. The wire used is 2 conductor #18 AWG shielded. The white wire is positive and the black wire is negative. The shield is connected at the CPU.

### 3.8 CABLE INSTALLATION

**WARNING:** Do not install any cables until after the CPU, Clutch Drive, 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 CPU to the Station Control Heads.

*See Drawing 6525-0005*

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

**Actuator Cable** The actuator cables are #18AWG - 4 pair shielded. The cable shield is connected at the CPU and should be left open at the Actuator end.

If the standard 10 metres cable length is not sufficient, contact the factory for advise.

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

*See drawing 6525-0005*

**Electric Clutch Cable** The electric clutch cable is 3 conductor #18 AWG

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

**Safety Cable**

*See drawing 6525-0005*

**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.

**4-20 mA/PWM Cable** The electronic throttle cable is a 2 conductor #18 AWG shielded cable.

### 3.9 SYNCHRONIZER

**Mounting**

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

**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" (1.4 mm). If stainless steel is used for a target, the maximum sensing gap will be approximately 0.035" (1 mm).

**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 6525-0003*

### 3.10 SHAFT BRAKE/NEUTRAL SAFETY OUTPUT

**Operation**

The Shaft Brake Output features two sets of normally open contacts. These close when the Clutch is in the neutral position. As the Forward or Reverse Clutch is activated, the Brake Relays disconnect and the Brakes are deactivated. The timing of the Shaft Brakes is set by adjusting the neutral time delay.

**Relays**

The Neutral Safety Switch Output uses the same relays as the Shaft Brake. By selecting the Neutral Safety Switch feature, the relays are operated by the Control Head lever positions rather than by the position of the Clutch Actuators. The neutral window is adjustable via the software set up in the CPU. The standard factory setting on the handles is approximately five (5) degrees.

**Fail Relay Contacts**      The Fail Relay Contacts are available for alarm panels if desired.

The Fail Relay Contacts will be closed if power to the CPU is available and the CPU is operating properly. Contacts will open upon CPU failure or power loss.

### **3.11 PERIODIC SYSTEM MAINTENANCE**

#### **Inspection**

Inspect system wiring:

- Control heads wiring
- CPU internal wiring
- Actuator 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**

<b>Purpose</b>	The STATION SELECT button allows you to transfer engine control from one station to another.
<b>Selecting</b>	To select a Station, press the STATION SELECT button. After the Station has been selected, the STATION SELECT lamp will illuminate and the Sonalert will beep to indicate that the transfer has been completed. 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.
<b>Main Station</b>	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. Press the STATION SELECT button to make the system operational.
<b>If the Actuator Becomes Jammed</b>	The STATION SELECT push button serves an additional function. If the Actuator becomes mechanically jammed, the CPU will continue to drive it for an additional length of time determined by the system adjustments. The CPU will then alarm at the Control Station in command and the Sonalert will sound.
<b>Resetting</b>	By pressing the STATION SELECT button the CPU will retry the Actuator. If the Actuator does not move, it should be checked for mechanical obstruction. If two Actuators jam at the same time, the STATION SELECT button will have to be pressed twice.

#### **4.1.2 Station Lock**

<b>Purpose</b>	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.
<b>Engaging</b>	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)**

<b>Purpose</b>	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).
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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 Trolling Valve**

**Purpose** For ships equipped with Trolling Valves, this feature transfers the Throttle adjustment from the Control Head handle to the Trolling Valve Actuator on the gear. The engine speed will remain at the idle or move to a preset idle during this operation.

**Operation** When the TROLLING VALVE button is pressed, the Trolling Valve Actuator will move from the “non-slip” position to the “maximum slip” position. As the Control Head lever is advanced through the normal Throttle range, the Trolling Valve Actuator moves from “maximum slip” to “minimum slip”.

**Returning to Non-Slip** When the TROLLING VALVE button is pressed again, the Trolling Valve function switches off. The Trolling Valve Actuator drives back into the non-slip” position.

#### **4.1.5 Synchronizer**

**Operation** The Synchronizer is activated by pressing the SYNCHRONIZE button. The Synchronizer circuitry will match the Actuator from the port and starboard propeller shafts. When the SYNCHRONIZE light is flashing the Synchronizer is working. When the SYNCHRONIZE light is on solid, the shafts are “in sync” within the 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 CPU. The CPU 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.

**Factory Selected Main** The starboard engine is factory selected as the Main Engine during synchronization.

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

The synchronizer system cannot be used during the trolling valve mode of

operation.

#### **4.1.6 Dimmer Control**

**Purpose**

A Dimmer Control is available on the Model 6555, and other illuminated Control Heads, to control the illumination of the dome lights.

## **5 INSTALLATION CHECKLIST**

### **5.1 GENERAL**

- ENGINE EMERGENCY STOPS must be installed at every station
- The primary and secondary power sources must be clean
- 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
- A POWER switch (customer supplied) must be installed at the Main Station
- Do not use an engine starting battery as a power source
- Do not install any cables until the CPU, Clutch, Actuators, Control Heads and Synchronizer Inputs have been mounted in their permanent locations
- Tin all cables and solder all crimp connectors
- Leave the cable shielding open on cables going to the Actuators to prevent circulating ground current
- The operating temperature range is -10°C to +50°C
- Double check all voltage polarities (positive/negative), reverse polarities are likely to cause damage

### **5.2 CENTRAL PROCESSING UNIT (CPU)**

- The CPU location must be accessible for service
- The CPU must be centrally located to the Actuators (10 metre cables)
- Do not install the CPU near high-power devices
- 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
- This unit should also not be welded, beaten, smashed or dropped
- Disconnect all cables / remove components prior to welding.

### **5.3 CONTROL HEADS**

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

### **5.4 ACTUATORS**

- The 6531/6528 Actuator's location must be mounted with their feet up or down - not sideways
- The Actuators must be installed on a relatively vibration-free plate
- This unit should also not be welded, beaten, smashed or dropped
- Do not mount the Actuator on the engine
- Do not install Actuator near high-power devices
- 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

- The Mounting Bracket must be flat
- Place a small flat washer under each of the four mounting feet
- 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
  - MUST:** Please follow cable manufacturer specifications when installing push/pull cable
- All the electrical connections come from the CPU
- Connections are made just inside the removable panel
- Disconnect all cables/remove components prior to welding

## **5.5 SYNCHRONIZER**

- The Synchronizer Pickups are mounted in close proximity to the propeller shafts
- 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
- The recommended material is mild steel
- The recommended maximum sensing gap for mild steel is approximately 0.050"
- If stainless steel is used for a Target, the maximum sensing gap will be approximately 0.035"
- The Pickup must be mounted on a vibration-free bracket that allows for adjustment of the sensing gap
- Review the instructions that come with the Sensor

## **5.6 CABLE INSTALLATION**

- Cut all cables to their appropriate length
- Do not coil up excess cable
- All cabling should be firmly fastened
- Tin all cable ends
- Refer to the diagrams for specific details regarding all cable connections
- Do not run the low-voltage control cables near high-power cables

## 6 SYSTEM SETUP AND TEST PROCEDURES

<b>Pre-Test Check</b>	<ul style="list-style-type: none"> <li>• Make sure that the system is powered down</li> <li>• Make sure that all cables are labeled</li> <li>• Inspect the system wiring in complete detail, unit by unit</li> </ul>
<b>Disconnect</b>	<ul style="list-style-type: none"> <li>• Disconnect the PUSH/PULL cables or mechanical linkage from all Actuators</li> </ul>
<b>Power Up</b>	<ul style="list-style-type: none"> <li>• Apply power to the system and observe carefully</li> <li>• The Main Station Sonalert should be beeping and the STATION SELECT lamp should light up</li> <li>• If not, power down and inspect all of the wiring again. Then repeat the power up procedure until the system is properly powered up.</li> </ul>
<b>Station Select</b>	<ul style="list-style-type: none"> <li>• Once the system is powered up, press the STATION SELECT button to acknowledge control</li> </ul>
<b>Levers</b>	<ul style="list-style-type: none"> <li>• Move the Control Head levers and observe whether the actuators are responding to the lever commands</li> </ul>
<b>Throttle/Clutch</b>	<ul style="list-style-type: none"> <li>• Determine the Minimum and Maximum Throttle positions as well as the forward and reverse Clutch positions and compare these positions to the Actuator's movement.</li> <li>• If you need to reverse an Actuator movement, rotate the lever and the clamp 180° to change the linear direction. <i>see relevant drawings</i></li> <li>• Determine the stroke required for Clutch and Throttle. Make any <i>coarse</i> adjustments by moving the cable connection up or down on the Actuator lever. Make any <i>fine</i> adjustments by turning the Actuator trimpots to obtain the desired position.</li> </ul>
<b>PUSH/PULL Cables</b>	<ul style="list-style-type: none"> <li>• With the engine shut down, connect the PUSH/PULL cables to the actuators and fine tune for best results.</li> <li>• Adjust trimpot VR1 clockwise to increase the throttle delay. <i>The maximum delay is 15 seconds. (Basic 6525)</i></li> <li>• Adjust trimpot VR2 clockwise to increase the neutral delay. <i>The maximum neutral delay is 7 seconds. (Basic 6525)</i></li> </ul>
<b>Completing The Test</b>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• After everything has been tested and adjusted properly, you may start preparing for a sea trial.</li> </ul>

## 7 TROUBLESHOOTING

Symptom	Possible Causes	Remedy
The system is dead	<ul style="list-style-type: none"> <li>The power is off</li> <li>A fuse has blown</li> <li>The polarity is reversed on the DC power input</li> </ul>	<ul style="list-style-type: none"> <li>Turn the power on</li> <li>Replace any blown fuse</li> <li>Reverse the connections</li> </ul>
There is a continuous sonalert beep	<ul style="list-style-type: none"> <li>CPU hangs up</li> <li>One or more communication wire are missing</li> <li>The STATION SELECT switch is not set properly</li> </ul>	<ul style="list-style-type: none"> <li>Reset system</li> <li>Check the wiring</li> <li>Set the switch to the correct station number</li> </ul>
There is an intermittent sonalert beep	<ul style="list-style-type: none"> <li>The Actuator is jammed in the hardover position</li> <li>The Actuator has failed</li> </ul>	<ul style="list-style-type: none"> <li>Reset the Actuator</li> <li>Check the wiring</li> <li>Check the potentiometer</li> </ul>
Variable Sonalert beep	<ul style="list-style-type: none"> <li>CPU temperature is above 55°C</li> </ul>	<ul style="list-style-type: none"> <li>Must provide ventilation or relocate CPU</li> </ul>
The system is not synchronizing	<ul style="list-style-type: none"> <li>The synchronizer is not set properly</li> <li>There is a problem with the synchronizer wiring</li> </ul>	<ul style="list-style-type: none"> <li>Adjust the distance between the sensor and the target until the LED starts flashing</li> <li>Check the wiring</li> </ul>
Actuators are moving erratically	<ul style="list-style-type: none"> <li>There is a ground loop</li> <li>The potentiometer is damaged</li> </ul>	<ul style="list-style-type: none"> <li>Check and make sure the cable shields are isolated</li> <li>Check the potentiometer and replace it if necessary</li> </ul>

## 8 SYNCHRONIZER OPERATION

### Synchronizer Operation of the 6525 Kobelt Electronic Control System

Using the synch mode via the Kobelt system will allow the operator to use one lever to control both engines and gear boxes.

Port or starboard lever can be selected as master lever and can be easily changed by altering the system setting in software.

By default, the starboard lever is always set to master.

While in the synch mode, moving the Control Lever to ahead position will cause port and starboard clutches to engage in ahead position. Further Control Lever movement will increase port and starboard engine RPM from idle to full speed.

Moving Control Lever to neutral will reduce engine RPM to idle and disengage both clutches. Moving the Control Lever to astern position will cause port and starboard engine to engage in astern position. Moving the Control Lever to full astern will increase the port and starboard engine RPM from idle to full speed.

As you can see, the gears and the engines can be safely operated while in synch mode.

### **ATTENTION: Caterpillar Synch Operation:**

If the vessel is equipped with the Caterpillar synch switch you could operate both engines via one control lever either port or starboard as selected via the switch, though one of the gear boxes would still be independent from the control lever.

For example, if the port lever was used to control both engines and the lever was set to full speed, then the port clutch would be engaged in ahead and the port engine would be running at full speed. The starboard engine would be at full speed too but the clutch of that starboard engine is independent and could be engaged/disengaged via the starboard lever disregarding engine speed.

Another example, assuming you have a control system operating in synch mode where one lever is controlling both engines and clutches. If the starboard lever is the master and you are using the Caterpillar synch where the port lever was selected to control the engines, we would have a situation where we could have both engines running at full speed via port lever and both clutches are operated via starboard lever, thereby creating a potential problematic situation.

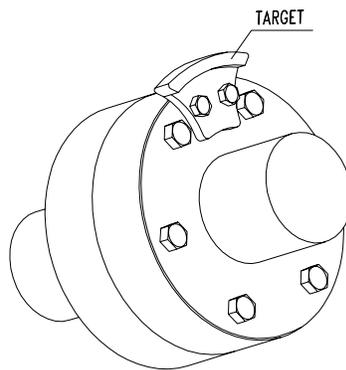
This is the reason why it is NOT advisable to have the synch option provided from two systems.

**IMPORTANT:** Only one method can be used for synchronizing multiple engines.

## Installation Of Mechanical Pickup For Engine Synchronization And Tachometers

Kobelco normally supplies a Pepperl+Fuchs proximity sensor for this purpose. P+F 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 changes the intended position. The target should be a minimum of 12mm or 1/2" away from any other solid metal object to avoid any interference. The proximity switch must also be installed on a bracket sufficient to withstand the 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 sketch below.*



# KOBELT MANUFACTURING CO. LTD.

## **Periodic Inspection Notes**

All mechanical and electronic components should be inspected at regular intervals, once every 6 – 12 months is recommended depending on the operating environment and frequency of use. Some Kobelt components are equipped with inspection covers which can be removed for examination of internal parts.

The following serves as a general inspection guideline for Kobelt engine control and steering control system components. All deficiencies have to be fixed and defective parts be replaced by a certified technician to ensure a reliable and safe operation.

1. Inspect all mechanical linkages for proper movement and the bolts and nuts are tight for their functions.
2. Inspect all push / pull cable connections for free movement, adjust if necessary.
3. Check for corrosion and excessive wear at all moving parts that could cause problem in normal operation.
4. Apply lubricating oil / grease to mechanical parts at all available greasing points. Make sure that no oil or grease will come into contact with any electronic parts. For gears and rotating shafts, use of graphite-base grease is recommended.
5. Check for signs of moisture ingress or condensation that could cause short-circuit or corrosion problem to electrical / electronic components. Surfaces of all electronic parts should be free from moisture, dust or foreign particles.
6. Check seals and holding screws on housings for damage and tightness.
7. Verify that primary and secondary power sources are at normal values.
8. Inspect system wiring for insulation breakdown, loose connections or potential for short-circuit failure.
9. Check limit switches and potentiometers for corrosion, smooth operation and correct positioning. It is recommended that these components be replaced at least every five years or more frequently when working in hot and humid environment.
10. With the engine stopped, perform functional test for each system – refer to individual component operating and test procedures.