ELECTRONIC ENGINE CONTROLS

INSTALLATION INSTRUCTIONS

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THE DRAWINGS

1. GENERAL INFORMATION

Kobelt Electronic Control System

The Kobelt Electronic Control System is a high performance system using the latest in industrial control technology. This system is capable of controlling single engine, twin, and three engine 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 and drawing 6525-0018 for the 6531 Actuator.*

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 here are valid for every model 6525 Kobelt Electronic Control System.

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 CPU.

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 68000 microprocessor circuitry. All of the system adjustments can be maintained through adjustable trimpots (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: **The enclosure is not waterproof**.

Connections All connections to the CPU are hardwired into plugable connectors on the CPU board. *See drawing 6525-0001*.

Throttle Output The CPU has three different Throttle outputs an Electro/Mechanical Actuator, 4 - 20mA 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, the Station Control Head Lever is moved to the forward or reverse position, and the CPU repositions the Actuator. The Electric Clutch, in turn, control the clutch solenoids.

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

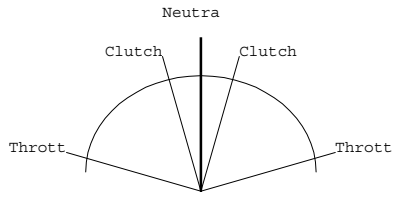
Styles

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 and capable of withstanding wet weather conditions and can also be installed with a chrome or black epoxy finish.

Engaging The Clutches And Throttles

The Control Heads operate through approximately 80 degrees of travel from each side of the center 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 and Trolling Valves, as they all require mechanical positioning.

Model 6531 The **6531** is a single function actuator that can be fitted with a spring return if desired.

Model 6524 The **6524** is a two function Actuator that has a mechanical disconnect function.

Working With the CPU 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.

Power Failure: 6531 During a power failure, the **6531** releases the clutches and the actuator returns to the spring return position.

Power Failure: 6524 During a power failure, the **6524** stays in position.

Override Use the mechanical override to operate the lever during a power failure.

Torque The 24 volt Actuators can deliver 150 inch/pounds of torque.

2.4 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 in order 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 synchronization occurs at the propellers.

2.5 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.

For those ships with braking systems, the time delays for the Brake operations are adjustable (neutral delay). For those without braking systems, this switch's neutral indication output acts as a useful safety feature.

Engine Start NOTE: The brake signals can be tied to the

Interlock

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 ELECTRICAL POWER

Power Requirements

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

- 24 vdc power supply - 10 amps

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.

- 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

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 CPU.

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

3.2 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: **This unit should not be immersed in liquid, washed, welded, beaten, smashed or dropped.**

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

Temperature **The operating range of the CPU is -10 to +40 degrees Celsius**.

WARNING: **This unit, while traditionally mounted in or around the engine room, should not be mounted where excessive heat or moisture is present.**

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

3.3 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 at the top of 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.

Connections 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.

3.4 ACTUATORS

3.4.1 General

Mounting

The Actuators should be mounted horizontally with their feet either up or down. Do not mount them sideways. The Actuators perform best when they are installed on relatively vibration-free foundation plates.

WARNING: **Do not mount the Actutator on the engine.**

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

All of the electrical connections come from the CPU. The maximum length of cable between the Actuator and the CPU is 30' (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 Actutator and/or the CPU.

The Actuator Cables from the CPU are 18 gauge braided cable. These wire ends should be crimped with fork or eye terminals.

3.4.2 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 by changing connections to terminals 3 and 5, and terminals 6 and 7, in the actuator.

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.

3.4.3 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 direction. 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.

3.4.4 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.

3.5 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.

3.6 ELECTRONIC THROTTLE

Purpose

The throttle output can be selected to provide a 4 to 20 mA or a PWM signal for electronic governor systems. This output is ordered from 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.

3.7 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 the positive power and the Black (Blk) is the negative.

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. Do not connect the shield to the Control Head case.**

Actuator Cables

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

If the standard 10 metre length of cable is not long enough, contact the factory.

Synchronizer Cables

The port and starboard Synchronizer cable is 7 conductor #18 AWG.
See Drawing 6525-0005.

Shaft Brake/ Neutral Safety Cable

The Shaft Brake/Neutral Safety Cable is 7 conductor #18 AWG.
See Drawing 6525-0005.

Control Head Panel Wiring

All wiring for Control Head panels, between the Control Heads and the push buttons and lights, is factory installed and tested.

Electric Clutch Cable

The electric clutch cable is 3 Conductor #18 AWG.

4 - 20mA/PWM Cable

The Electronic Throttle Cable is a 2 Conductor #18 AWG shielded.

3.8 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 approximately 3/4" square (18mm) and about 1/16" 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 have to 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 6525-0003.

3.9 SHAFT BRAKE/NEUTRAL SAFETY OUTPUT AND FAIL RELAY

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 Brakes. 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 5 degrees.

Fail Relay Contacts

The Fail Relay Contacts, Common - Normally Open, are available for alarm panels if desired. In the event of a major failure to the CPU, the Fail Relay is closed.

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 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.

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.

If the Actuator Becomes Jammed

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.

Resetting

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 pressed twice.

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 ships' operator to move the Throttle Actuator independently of the Shift Actuator. This is useful for warming up the engines when they are first started or to increase the engine's speed for external loads (e.g. - hydraulic pump systems).

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 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 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 illuminated Control Heads, to control the illumination of the indicator lights.

5. INSTALLATION CHECKLIST

5.1 GENERAL

- ☐ ENGINE EMERGENCY STOPS must be installed at every station
- ☐ The power source must be clean
- ☐ The voltage regulation must be 10% or better
- ☐ A POWER switch 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 Actutators and Control Heads, to prevent circulating ground current
- ☐ The operating temperature range is -10°C to +40°C
- ☐ Double check all polarities, reverse polarities are likely to cause damage

5.2 CENTRAL PROCESSING UNIT (CPU)

- ☐ The CPU's location must be central to the Actuators (10 metre cables)
- ☐ Do not install CPU near high-power devices.
- ☐ This unit is not waterproof and, therefore, must not be mounted where excessive heat or moisture is present
- ☐ All controls must be disconnected prior to any 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
- ☐ The CPU will automatically default to station number 1

5.4 ACTUATORS

- ☐ The Actuators must be mounted with their feet up or down - not sideways
- ☐ The Actuators must be installed on a relatively vibration-free plate
- ☐ **Do not mount the Actuator on the engine**
- ☐ 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 and make them as straight as possible to a maximum of 15 feet in length
- ☐ All the electrical connections come from the CPU
- ☐ Connections are made just inside the removable panel

5.5 SYNCHRONIZER

- ☐ The Synchronizer Pickups are mounted in close proximity to the propeller shafts
- ☐ The Target size for the Pickups should be approximately 3/4" square and about 1/16" 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 contol 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 labelled.
- Inspect the system wiring in complete detail, unit by unit.

Disconnect

- Disconnect the PUSH/PULL cables or mechanical linkage from all Acuators.

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 contol.

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 postions 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, rotate the lever and the clamp 180° to change the linear direction. *See drawing 6525-0004.*
- 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 trimpot VR1 clockwise to increase the Throttle delay. *The maximum delay is 15 seconds.*
- Adjust trimpot VR2 clockwise to increase the neutral delay. *The maximum neutral delay is 7 seconds.*

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.	• The power is off. • A fuse has blown. • The polarity is reversed on the DC power input.	• Turn the power on. • Replace any blown fuse(s). • Reverse the connections.
There is a continuous sonalert beep.	• One or more communication wires are missing. • The STATION SELECT switch is not set properly.	• Check the wiring. • Set the switch to the correct station number.
There is an intermittent sonalert beep.	• The Actuator is jammed in the hardover position. • The Actuator has failed.	• Reset the Actuator. • Check the wiring. • Check the potentiometer.
The Actuator is moving erratically.	• The potentiometer is damaged.	• Check the potentiometer and replace it if necessary.
The system is not synchronizing.	• The synchronizer is not set properly. • There is a problem with the synchronizer wiring.	• Adjust the synchronizer to where the LED starts flashing. • Check the wiring.
All Actuators are moving erratically.	• There is a ground loop.	• Check and make sure the cable shields are isolated from the actuator.