Operator Manual
Engineered Systems

Nova-M-K

Nova-L-K

Nova-XL-K

GR-K

GL-K

GL-3-K

www.hetronic.com

YOUR #1 PARTNER IN RADIO REMOTE CONTROLS

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INTRODUCTION

Thank you for purchasing the Hetronic radio remote control system. Hetronic radio remote controls are the highest caliber in remote control value, performance and safety.

Hetronic radio remote controls use the latest frequency synthesizer technology to eliminate the problems typically associated with radio remote control systems.

The Hetronic radio remote control system includes a transmitter and a receiver. These systems operate over the 400-470 MHz radio band range (70 cm band) and are FCC approved.

The transmitter generates the electronic signal that communicates with the receiver. The transmitter and receiver are set with identical address codes and frequency channels. This allows operation of multiple systems within the same area without signal interference.

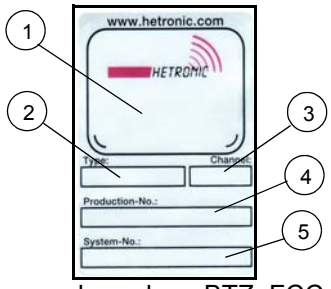
THE MANUAL

Before operation of the crane/machine and remote control system, read your manuals carefully and completely. The contents of this manual will provide you with an understanding of safety instructions and controls during normal operation and maintenance.

PRODUCTION AND SYSTEM NUMBERS

When contacting your dealer or Hetronic about service, repair or replacement parts, know the Production and System numbers of the transmitter and receiver.

The numbers are located on the label that is affixed to the unit itself.



1. Specific approvals such as BTZ, FCC, CE, etc.
2. The type of transmitter or receiver.
3. Frequency and RF unit.
4. **Production Number** - The first digit indicates the manufacturing facility (1=H-Germany, 2=H-Malta, 3=H-US, 4=H-International). The next four digits are the production month and year. The last 6 digits are the manufacturing number.
5. **System Number** - Eleven digit system identification number. Transmitter and receiver must match.

Record the Production and System numbers here:

Transmitter Production Number

Receiver Production Number

System Number

UNAUTHORIZED REPLACEMENT PARTS

Use only Hetronic replacement parts. The replacement of any part with anything other than a Hetronic authorized replacement part may adversely affect the performance, durability, and safety of this system and may void the warranty. Hetronic disclaims liability for any claims or damages, whether warranty, property damage, personal injury or death arising out of the use of unauthorized replacement parts.

BEFORE ATTEMPTING TO OPERATE THIS SYSTEM:

1. Make sure all installation has been properly completed.
2. Understand all Safety Precautions provided in the manuals.
3. Review control functions and operation of the crane/machine and this radio remote control system.
4. Surge suppressors (RC type only) must be used when the receiver is controlling magnetic contactors.
5. When not in use, turn the transmitter off and store in a safe place to prevent unauthorized use.
6. If the crane/machine does not respond properly, stop operation immediately. Turn off the transmitter and report the condition to the appropriate technician or supervisor.
7. Turn off the transmitter key switch and remove the battery before any maintenance work is done.
8. Turn off the transmitter key switch when changing the battery or taking a break.
9. Always have a battery in the battery charger to ensure the availability of a fully charged battery.
10. Installation, setup and service must be performed by authorized personnel only.
11. Use only Hetronic spare parts.

HETRONIC SYSTEM COMPONENTS

The Hetronic radio remote control system consists of a receiver and transmitter. Each system is designed to customer specifications. Some systems contain multiple receivers and transmitters.

Receiver Standard Features

Start relay, horn relay, E-Stop relay, and option relay

- Up to 32 digital outputs
- Up to 8 proportional channels (0 to 10V, 0 to 20 mA, etc.)
- Self-diagnostics
- 48 V, 115 V or 230 V for AC cranes/machines
- 12VDC or 24VDC for DC cranes/machines

Transmitter Types

- Nova-M belly box
- Nova-L belly box
- Nova-XL belly box
- GL belly box
- GL-3 belly box
- GR belly box

Transmitter Standard Features

- E-stop
- Sleep mode
- Removable key
- 100 m (300 ft.) range
- Internal antenna
- Start/Horn pushbutton
- Carrying belt or shoulder strap

SYSTEM OVERVIEW

Theory of Operation

The Hetronic radio remote control system includes a transmitter and receiver. The transmitter electronically generates a carrier frequency which allows it to communicate with the receiver. Each system is programmed with a unique address code. This code allows the operation of multiple systems in the same general vicinity. The receiver only accepts commands from the transmitter with the same address code.

NOTE: The receiver and transmitter have the address code set at the factory.

E-Stop Function

The most important feature of the radio remote control system is the E-Stop. The transmitter sends the E-stop status signal along with the specified crane/machine function. This method confirms that ongoing operations are safe. If the E-stop pushbutton is pressed, the relay module in the receiver causes all crane/machine motions to stop. The receiver goes into Safe mode.

To restart the system, disengage the E-stop button and press the Start/Horn button.

The E-Stop responds faster than any other function. When E-Stop is engaged, the system ignores any other signal that is transmitted. The problem must be corrected before the system will respond to any other signal.

The E-Stop is self-monitoring and redundant in the transmitter and receiver. The system performs a self-test to ensure the E-Stop circuit is working properly. If an error is detected, the system automatically goes into Safe mode.

When the transmitter is turned on, it performs a self-test to be sure that communications are within designated parameters. If an error is detected, the transmitter will not transmit any signals.

Transmitter Sleep Mode

The transmitter sleep mode is designed to prevent accidental operation. If the transmitter is not used for 10 minutes, it turns itself off. The controls are not operational while the transmitter is turned off. To restart the transmitter, turn the key switch off and then back on, and press the Start/Horn button. The sleep mode can be enabled or disabled by the operator.

IMPORTANT: If the transmitter has a selector switch or latching pushbutton that is engaged, the sleep mode will not occur. The engaged selector switch or latched pushbutton is constantly sending a signal to the receiver.

Receiver Safe Mode

The following conditions cause the receiver to go into its Safe mode:

- The transmitter goes into Sleep Mode
- Radio signal interference
- Transmitter out of operating range
- E-Stop button is activated
- E-Stop circuit failure
- Low battery sends E-stop after time out

When the transmitter signal is no longer sensed by the receiver, the Time Out process begins. The Time Out period is set to 450 msec at the factory. If the receiver does not establish contact with the transmitter within that time period, it goes into the Safe Mode. In Safe Mode, the receiver shuts off power to the output modules and activates the E-stop function.

To restart the system, be sure the transmitter signal is active and sensed by the receiver. Then press the Start/Horn pushbutton.

SAFETY

SAFETY ALERTS

Look for this symbol to point out important safety precautions. They mean:

Attention!

Personal Safety Is Involved!

Become Alert!

Obey The Message!

The safety alert symbol is used in decals on the unit and with proper operation procedures in this manual. Understand the safety message. It contains important information about personal safety on or near the unit.

DANGER: IMMINENTLY HAZARDOUS SITUATION! If not avoided, WILL RESULT in death or serious injury.

WARNING: POTENTIALLY HAZARDOUS SITUATION! If not avoided, COULD RESULT in death or serious injury.

CAUTION: POTENTIALLY HAZARDOUS SITUATION! If not avoided, MAY RESULT in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTATIONS

NOTE: General reference information for proper operation and maintenance practices.

IMPORTANT: Specific procedures or information required to prevent damage to unit or equipment.

PRACTICES AND LAWS

Practice usual and customary safe working precautions, for the benefit of yourself and others. Understand and follow all safety messages. Be alert to unsafe conditions and the possibility of minor, moderate, or serious injury or death. Learn applicable rules and laws in your area.

REQUIRED OPERATOR TRAINING

Original purchaser of this unit was instructed by the seller on safe and proper operation. If unit is to be used by someone other than original purchaser; loaned, rented or sold, ALWAYS provide this manual and any needed safety training before operation.

ALWAYS review the operator's manual of any crane/machine to be controlled by radio remote control.

POSSIBLE SOURCES OF DANGER

This system makes remote control via radio signals possible. The transmission of control commands can take place around obstacles and out of the operator's direct sight. To prevent accidental start-up and possible injury or damage:

1. Always engage the E-stop button and switch "OFF" the transmitter when it is not in use. Remove the key if the unit is placed any distance away from the operator.
2. Disconnect the power supply before any assembly, maintenance or repair work is done.
3. Never remove or alter any of the safety features of this system.

OPERATION AND WORK AREA SAFETY

The work area must be free from obstacles, debris or other tripping hazards. Avoid uneven work areas and any rough terrain. Always be sure of your footing.

Be aware of overhead obstacles that may interfere with crane/machine operation.

Always operate the transmitter with its carrying belt or shoulder strap.

PROTECTIVE FEATURES

This radio remote control system is equipped with electronic and mechanical safety features. Processing control signals transmitted from other transmitters is not possible, since transmission coding is unique to each system.

These safety features help protect the operator, as well as others within the work area. The crane/machine functions can be stopped by pushing the emergency stop button on the transmitter control panel (EMERGENCY STOP).

NOTE: The receiver goes into the Safe mode within approximately 0.5 seconds (450 ms) after the transmitter switch is turned to the "OFF" position.

WARNING: Accidental start-up can cause serious injury or death. NEVER remove or modify any safety feature.

TO STOP IN AN EMERGENCY

1. Press the red "EMERGENCY STOP" pushbutton.
2. Turn the key to "OFF".
3. Wait for all moving crane/machine parts to stop.
4. Refer to crane/machine's operator manual for further instructions.

MAINTENANCE

Always shut off power to the crane/machine and the radio remote control system before any assembly, maintenance or repair.

RECEIVER INSTALLATION

WARNING: FAILURE TO FOLLOW INSTRUCTIONS could result in personal injury and/or damage to equipment. Read and understand the safety instructions in all manuals provided.

Initial setup or service work must only be performed by authorized personnel.

DO NOT touch any circuit components on the circuit board while the main AC or DC power is on.

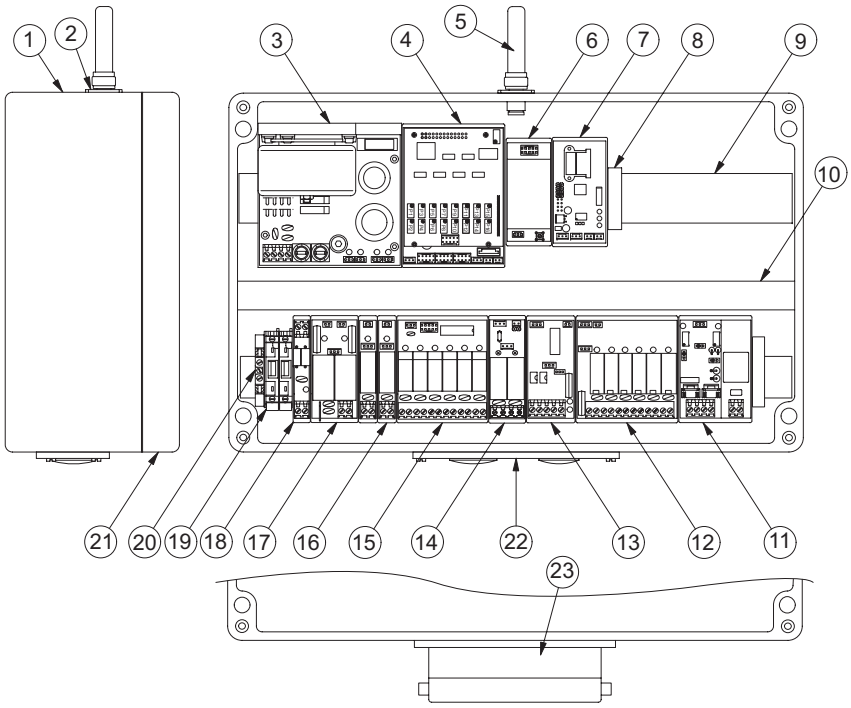
DO NOT run control wires with power wires.

Surge suppressors (RC type) must be used with all magnetic contactors that are controlled by the radio remote control system.

RECEIVER COMPONENTS

The receiver accepts commands from the remote control transmitter and interfaces with the crane/machine controls to activate crane/machine functions. Each receiver is built to customer specifications, but includes common components. A typical receiver layout is shown below.

1. Enclosure
2. Antenna Base
3. Power Pack
4. Decoder Module
5. Miniflex Antenna
6. Standard RF Module
7. E-Stop Decoder Module
8. End Stop
9. DIN Rail
10. Wire Duct
11. ACM-1 Module
12. AD5S Module
13. SYM-2 Module
14. RK-2 Module
15. REL-6 Module
16. N/O or N/C Relay Module
17. SNZ E-Stop Module
18. EMVS-1 Inteference Suppressor Module
19. Line Terminal Block
20. Ground Terminal Block
21. Enclosure Cover
22. Gland Plate
23. Optional Quick-Disconnect Base



RECEIVER LOCATION

Select a position for the receiver that provides protection from violent impact from debris or thrown materials and is easily accessible. The receiver housing is rated IP65 and can withstand direct water jet spray and is protected against penetration of dust. There are different sizes and types of receiver housings. All receivers must be free from metal obstructions on at least 3 sides with the antenna pointing straight up.

- Depending on customer specification, the receiver can be operated with AC, DC or both.
- Receiver must be protected from corrosive gases or liquids
- Receiver must be protected from ambient temperatures outside the range of -18° to 158° F (-25° to +75° C)

Receiver Production Number

Locate the Hetronic Production number decal on the receiver housing. This number is required when Hetronic is called for any service or parts information. Be sure the decal is easily accessible when the receiver is mounted to the equipment. Please make a note of the Production and System numbers in the boxes provided in the Introduction Section of this manual.

MOUNTING THE RECEIVER

1. Determine the receiver position.
2. If the receiver is to be mounted inside a control panel or other enclosure, an external antenna is required.
3. Be sure there is clearance for connectors and components that need to be wired.
4. Drill holes into the mounting surface according to the dimensions shown.

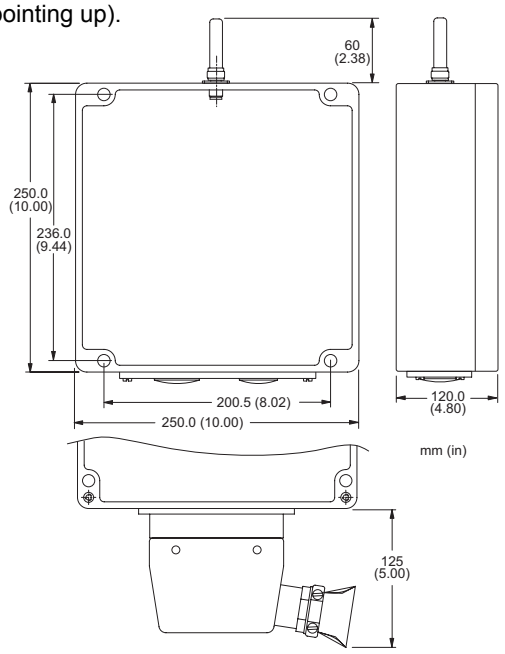
NOTE: Receiver housing dimensions are molded into the back surface of the housing.

5. Remove the cover from the receiver housing (if necessary).
6. Insert the mounting screws through the holes in the receiver housing and tighten into the mounting surface.
7. Please refer to the appropriate illustration for mounting dimensions. Contact Hetronic for more information or if you have questions.
8. Lay out the wire runs. Use #16 AWG (size 1.5 mm^2 metric) minimum for power wiring.
9. If the receiver includes an attached antenna, mount the receiver so that the antenna points straight up. The area around the antenna should be free of obstructions, especially metal.

250 x 250 Receiver

Antenna must be vertical (pointing up).

Area must be free of obstructions

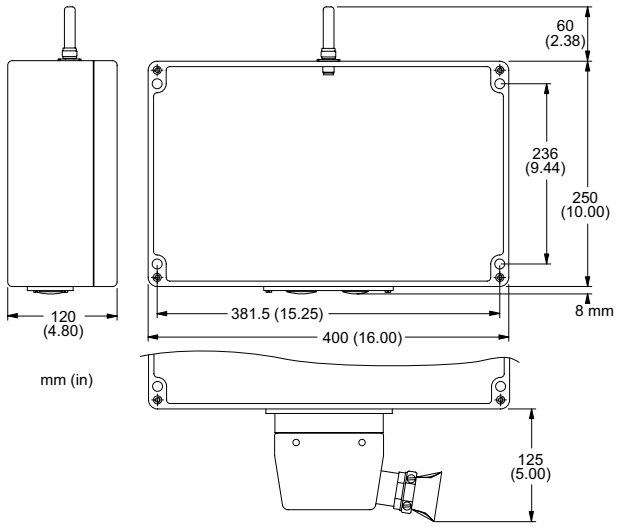


Optional Quick-Disconnect Plug

250 x 400 Receiver

Antenna must be vertical (pointing up).

Area must be free of obstructions

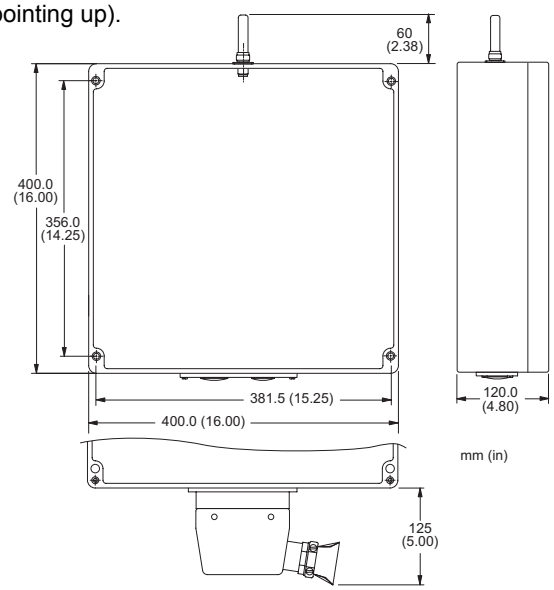


Optional Quick-Disconnect Plug

400 x 400 Receiver

Area must be free of obstructions

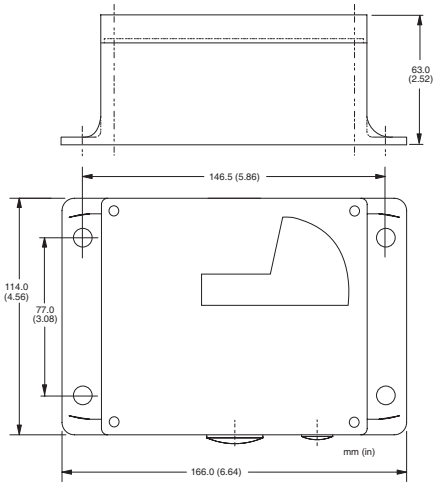
Antenna must be vertical (pointing up).



Optional Quick-Disconnect Plug

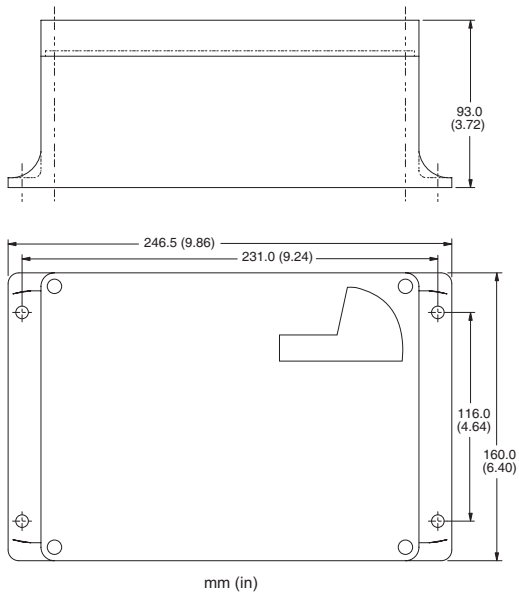
HS-1 Receiver

Surrounding area must be free of obstructions



HS-2 Receiver

Surrounding area must be free of obstructions



NOTE: HS-1 and HS-2 receivers are equipped with an internal antenna.

The receiver wiring is critical for proper system operation. Make all connections with good quality contacts or solder joints to ensure proper electrical contact.

Supply voltage and ground wiring are crucial and must be connected to reliable connecting circuitry. Do not use a chassis ground for this equipment. The ground wire must be connected directly to the crane/machine's ground.

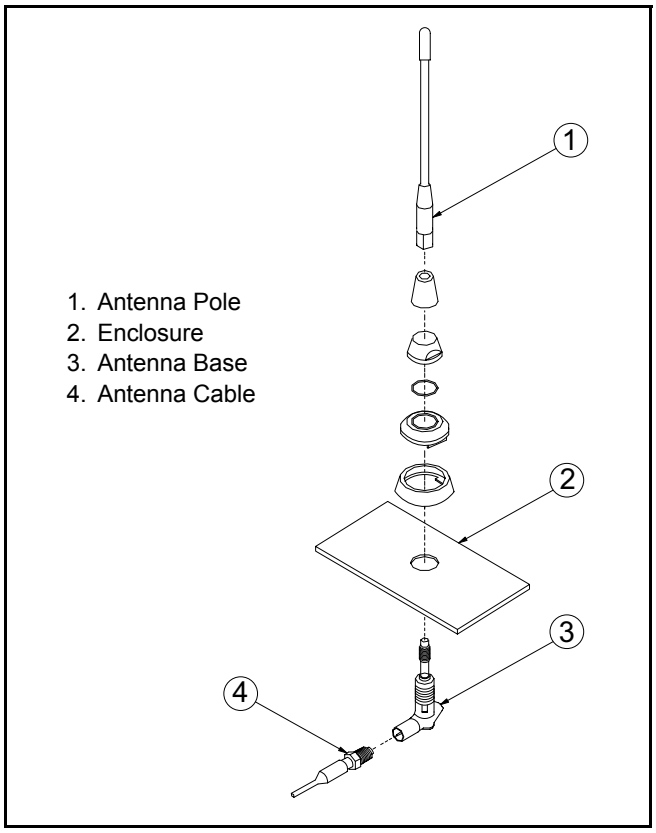
The output control signals to proportional controls should be routed separately from any wiring that could produce transient voltage interference. Interference or "induced voltage spikes" could cause erratic performance of the controls.

Car Antenna Installation

If the receiver must be located inside a control panel or other enclosure, an external car antenna may be required. Mount the antenna onto a metal surface with the same ground as the receiver circuit board. Remove any burrs from the antenna mounting hole and scrape away any paint which may insulate the antenna base from making positive contact.

NOTE: Improper installation of the antenna will cause intermittent signal loss.

1. Drill a hole 14 mm (.56 in.) dia. through the control panel or enclosure at the external car antenna location.
2. Insert the connector base through the hole with the antenna on the outside. Seat the base firmly against the enclosure surface.
3. Assemble the antenna as shown below.



4. Screw the antenna pole onto the antenna base.
5. Remove the Miniflex antenna from the receiver housing by unscrewing it from the antenna base.
6. Connect the external antenna cable to the antenna base on the receiver housing.
7. Bundle any excess antenna cable and secure with tie wraps or equivalent.

IMPORTANT: DO NOT run the antenna cable with power or control wiring. Intermittent signal loss will result.

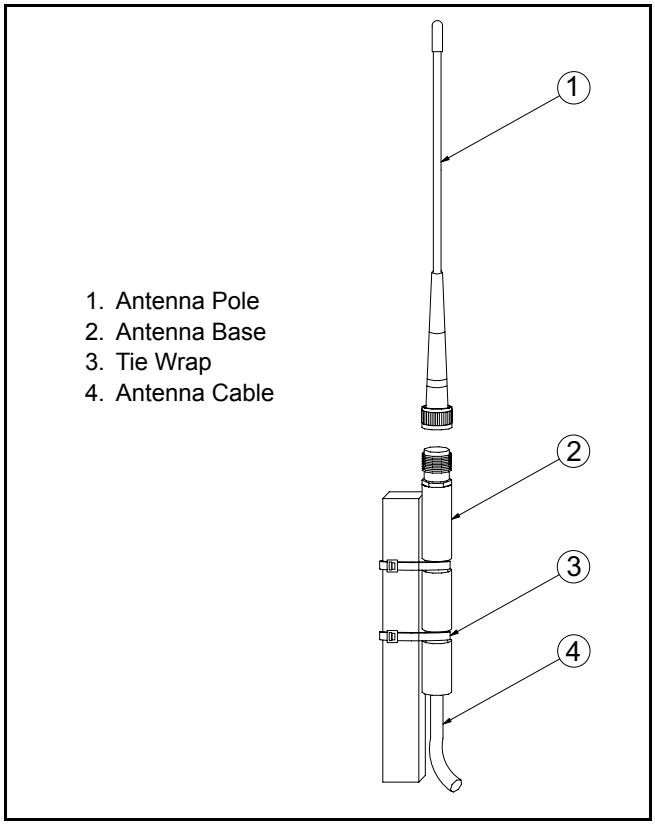
GainFlex Antenna Installation

Your application may require the use of a GainFlex antenna. The GainFlex antenna can extend the range of the radio remote control system up to 300 meters (1000 ft.). It can also be used where a standard antenna is difficult to mount. If you are not sure which antenna is suitable for your application, please contact Hetronic or your dealer.

When using a GainFlex antenna, there must be no metal or conductive materials within 2 meters (6 feet) of the antenna. This material will interfere with the transmitter signal and cause intermittent signal loss. For the best reception, the antenna should point upward.

NOTE: Improper installation of the antenna can cause intermittent signal loss.

1. Secure the GainFlex antenna base to a mounting surface with the tie wraps included. Mount the antenna vertically with the base pointed upward.



2. Screw the GainFlex antenna pole onto the base.
3. Unscrew the Miniflex antenna from the receiver housing.
4. Connect the GainFlex antenna cable connector to the existing antenna base on the receiver housing.
5. Bundle any excess antenna cable and secure with tie wraps or equivalent.

IMPORTANT: DO NOT run the antenna cable with power or control wiring. Intermittent signal loss will result.

CONNECT ELECTRICAL WIRING

Connect all remaining wires (power supply, engine start-stop, etc.) according to the wiring diagram of the crane/machine and the radio remote control.

Quick-Disconnect Plug (Optional)

The Quick-Disconnect plug shown is for the 250 x 250, 250 x 400, and 400 x 400 receivers. Different plugs are provided for the HS-1 and 2 receivers.

The receiver may be equipped with a quick-disconnect plug. The plug contains 24 or 64 pins, according to the number of outputs required. The receiver outputs are connected to the quick-disconnect base. The installer must wire the female quick-disconnect plug and terminate the plug to the crane/machine controls. The 24 pin plug is a screw terminal type. The 64 pin plug requires crimp pin terminations (these are supplied with the plug).

Quick-Disconnect Plug Wire Terminations

1. Connect the single-phase power wires to the female quick-disconnect plug. Refer to the wiring diagram provided with your system.

IMPORTANT: DO NOT combine high voltage power wires and control wiring in the same cable run. Receiver power wires and control signal wires must cross at 90° angles, if they are near to each other.

2. In AC operations, install Resistor/Capacitor (RC) type surge absorbers across the coils of any contactors installed in the crane/machine control circuit. DO NOT use MOV type.

IMPORTANT: Surge suppressors are required on all magnetic contactors controlled by the receiver to prevent uncommanded crane/machine motion and/or serious component damage.

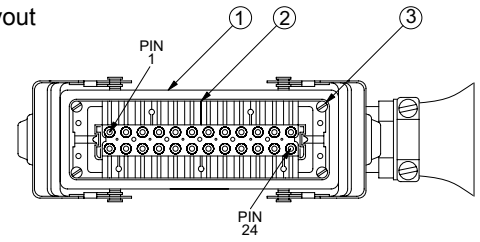
Quick-Disconnect Plug Housing Orientation

The orientation of the female connector housing can be changed to better suit the installation position, if necessary. The male and female connector module pins are labeled. The 24 pin connector uses numeric numbering, i.e. 1, 2, 3, 4, etc. The 64 pin connector is numbered with alpha numeric designations i.e. A1, A2, B1, B2, etc.

To change the housing orientation:

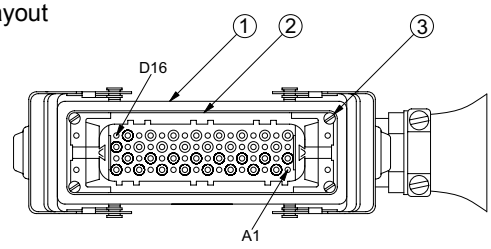
1. Loosen the retaining screws
2. Separate the connector module from the connector housing.
3. Rotate the housing to the desired orientation.
4. Insert the connector module into the housing.
5. Tighten retaining screws.

24 Pin Layout



1. Connector Housing
2. Connector Module
3. Retaining Screw

64 Pin Layout



HETRONIC TRANSMITTERS

Each Hetronic radio remote control system is delivered with two fully charged batteries. One is inserted in the battery compartment located on the bottom of the transmitter. Refer to the Battery and Charger Section for information on charging a discharged battery.

Please note that the actual configuration of each radio remote control system is designed specifically per customer requirements and may vary from the illustrations shown in this manual. Refer to the technical documentation provided with each system for the actual design, layout and components.

The types of transmitters which can be used with the radio remote control system are:

- Nova-M
- Nova-L
- Nova-XL
- GL
- GL-3
- GR

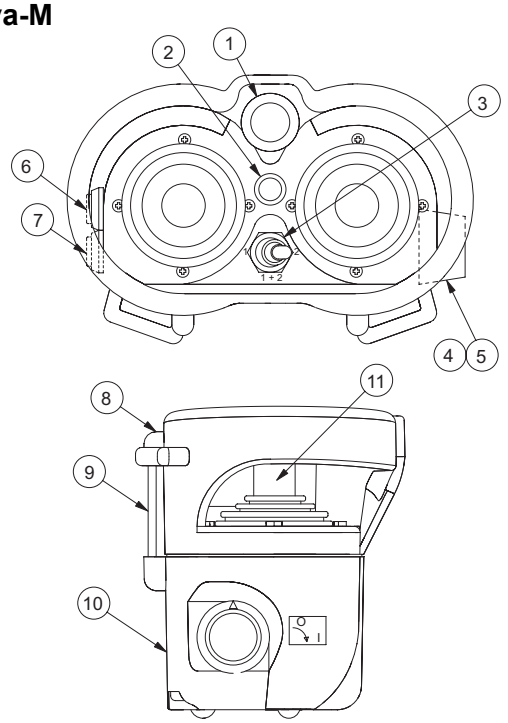
NOVA TRANSMITTER

The Nova transmitter is a "belly box" design. The operator uses joysticks or paddle levers to control crane/machine motions. Standard Nova joysticks and paddle levers have proportional speed control without detents. Optional joysticks provide up to four speeds with detents. The Nova joystick model can combine up to four dual axis joysticks for up to four motion control. The Nova paddle lever model can accommodate up to eight single axis paddle levers for up to eight motion control.

The Nova also offers a Selector toggle switch to control up to seven crane/machine motions for independent/combined control.

Nova-M transmitter components are shown below.

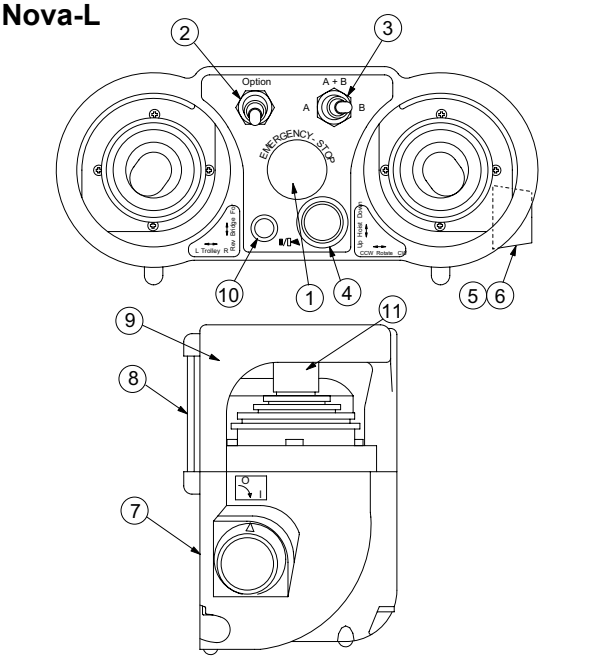
Nova-M



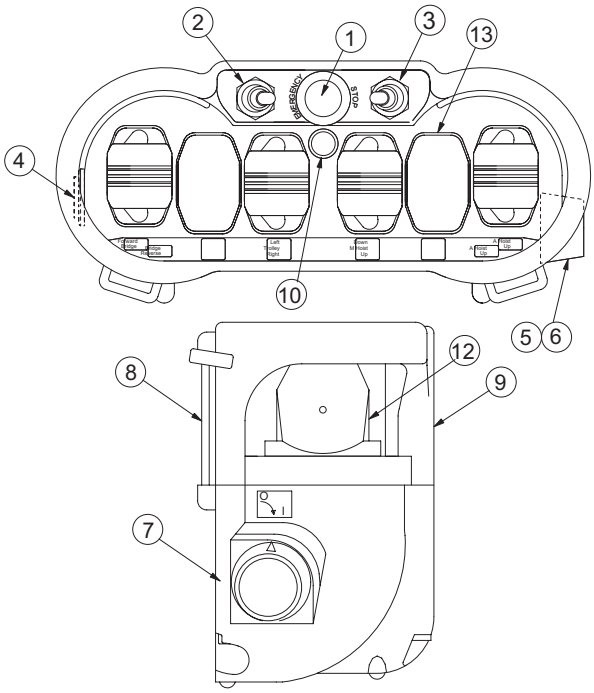
1. E-Stop Pushbutton
2. Power LED
3. Selector Toggle Switch
4. Key Switch
5. Key Cap
6. Option Switch
7. Start/Horn Pushbutton
8. Upper Housing
9. Carrying Belt Retainer
10. Lower Housing
11. Joystick

Nova-L transmitter components are shown below.

Nova-L

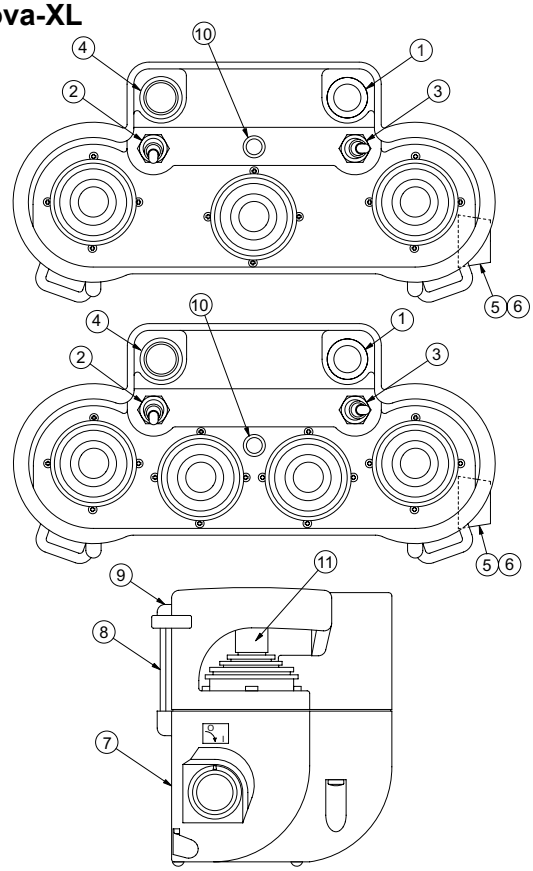


1. E-Stop Pushbutton
2. Option Toggle Switch
3. Selector Toggle Switch
4. Start/Horn Pushbutton
5. Key Switch
6. Key Cap
7. Lower Housing
8. Carrying Belt Retainer
9. Upper Housing
10. Power LED
11. Joystick
12. Paddle Lever
13. Paddle Lever Cap

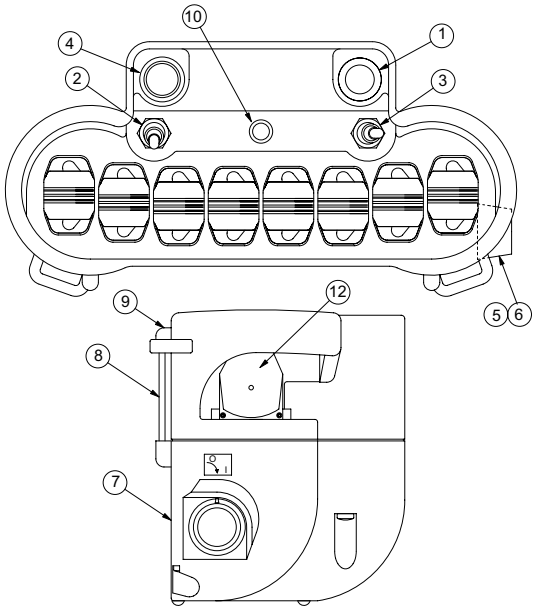


Nova-XL transmitter components are shown below.

Nova-XL



1. E-Stop Pushbutton
2. Option Toggle Switch
3. Selector Toggle Switch
4. Start/Horn Pushbutton
5. Key Switch
6. Key Cap
7. Lower Housing
8. Carrying Belt Retainer
9. Upper Housing
10. Power LED
11. Joystick
12. Paddle Lever



Nova Transmitter Functions

Start/Horn Pushbutton - This pushbutton activates the mainline contactor and sounds the horn (if provided). If the mainline contactor is already on, pushing this button will only sound the horn.

E-Stop Pushbutton - Press the E-Stop pushbutton to place the receiver in the Safe mode. To disengage the E-Stop, rotate the pushbutton. It will spring into the disengaged position. The transmitter will then control crane/machine motions.

IMPORTANT: The E-Stop pushbutton is for emergency stops only. DO NOT use it as an OFF switch. Use the key switch to turn the transmitter on and off.

Power LED - The Nova Power LED flashes once when the transmitter is turned on. The transmitter initiates a self-test to check the software. When the transmitter passes the self-test, the light changes to flashing green. It continues to flash green until the transmitter is turned off.

Key Switch - The key switch turns the transmitter on and off. The switch will only turn with the key cap fully inserted. The switch must be in the OFF position for the key to be removed.

Joysticks - Standard Nova joysticks provide stepless proportional speed control without detents. Optional joysticks have three-stop speed control with detents.

NOTE: Nova transmitters for 5, 6, and 7 motions use two joysticks and a three-position Selector toggle switch.

Paddle Levers - Standard Nova paddle levers provide stepless proportional speed control without detents for up to 8 motions.

Option Toggle Switch - The connected function will be activated when the toggle switch is moved to the ON position. The function will stop when the switch is moved to the OFF position.

Selector Toggle Switch - This three-position switch allows the operator to control multiple cranes/machines from a single transmitter, or multiple crane/machine motions from a single joystick or paddle lever. The selections can be A, B, or A+B.

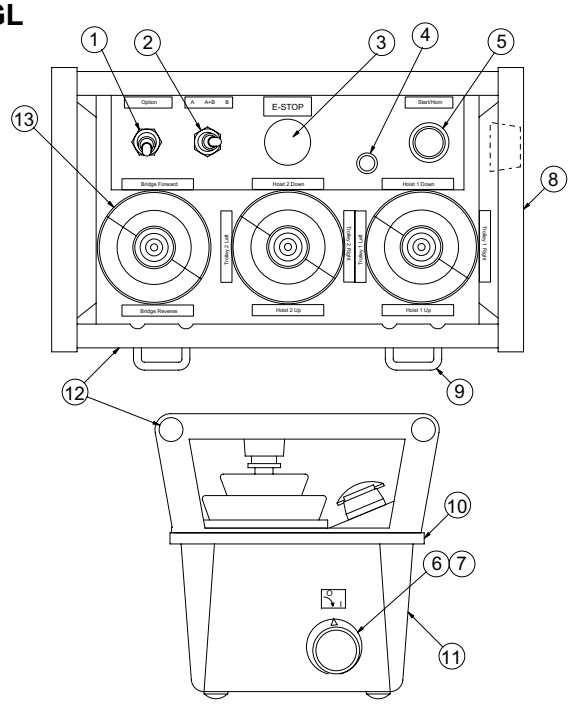
GL AND GL-3 TRANSMITTERS

The GL transmitter is a "belly box" design. The operator uses joysticks or paddle levers to control crane/machine motions. Standard GL joysticks and paddle levers have proportional speed control without detents. Optional joysticks provide up to five speeds with detents. The GL joystick model can combine up to three dual axis joysticks for up to six motion control. The GL paddle lever model can accommodate up to seven single axis paddle levers for up to seven motion control.

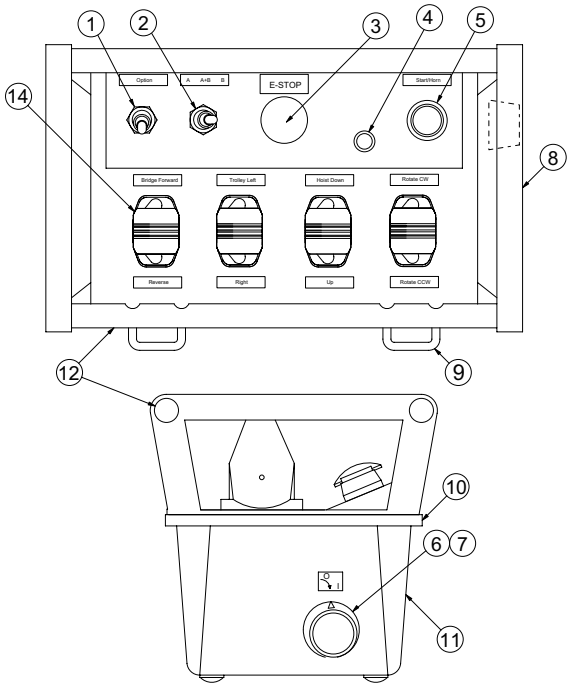
The GL also offers a Selector toggle switch to control up to nine crane/machine motions for independent/combined control.

GL transmitter components are shown below.

GL

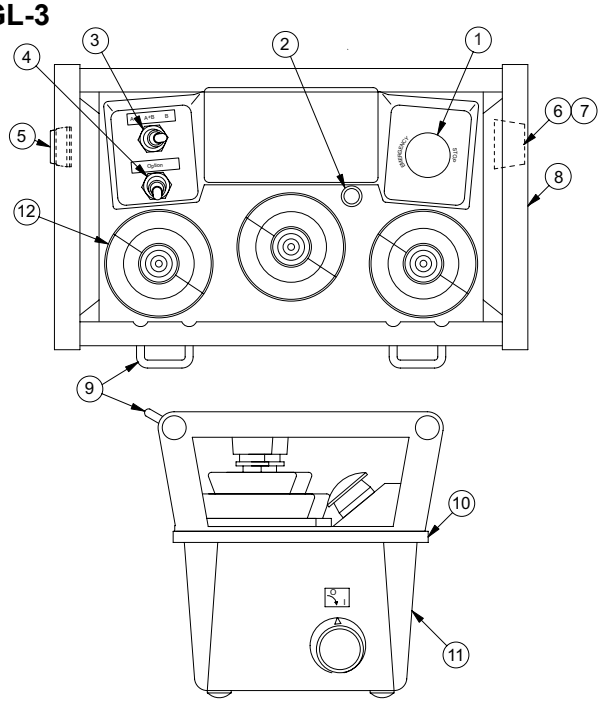


1. Option Toggle Switch
2. Selector Toggle Switch
3. E-Stop Pushbutton
4. Power LED
5. Start/Horn Pushbutton
6. Key Switch
7. Key Cap
8. Handle
9. Belt Retaining Bracket
10. Upper Housing
11. Lower Housing
12. Safety Bar
13. Joystick
14. Paddle Lever



GL-3 transmitter components are shown below.

GL-3



1. E-Stop Pushbutton
2. Power LED
3. Selector Toggle Switch
4. Option Toggle Switch
5. Start/Horn Pushbutton
6. Key Switch
7. Key Cap
8. Handle
9. Belt Retaining Bracket
10. Upper Housing
11. Lower Housing
12. Joystick

GL and GL-3 Transmitter Functions

Start/Horn Pushbutton - This pushbutton activates the mainline contactor and sounds the horn (if provided). If the mainline contactor is already on, pushing this button will only sound the horn.

E-Stop Pushbutton - Press the E-Stop pushbutton to place the receiver in the Safe mode. Pull this pushbutton out to disengage the E-Stop. The transmitter will then control crane/machine motions.

IMPORTANT: The E-Stop pushbutton is for emergency stops only. DO NOT use it as an OFF switch. Use the key switch to turn the transmitter on and off.

Power LED - The GL Power LED flashes once when the transmitter is turned on. The transmitter initiates a self-test to check the software. When the transmitter passes the self-test, the light changes to flashing green. It continues to flash green until the transmitter is turned off.

Key Switch - The key switch turns the transmitter on and off. The switch will only turn with the key cap fully inserted. The switch must be in the OFF position for the key to be removed.

Joysticks - Standard GL joysticks provide stepless proportional speed control without detents. Optional joysticks have five-stop speed control with detents.

NOTE: GL transmitters for 5, 6, 7, and 9 motions use two or three joysticks and a three-position Selector toggle switch.

Paddle Levers - Standard GL paddle levers provide stepless proportional speed control without detents for up to 7 motions.

Option Toggle Switch - The connected function will be activated when the toggle switch is moved to the ON position. The function will stop when the switch is moved to the OFF position.

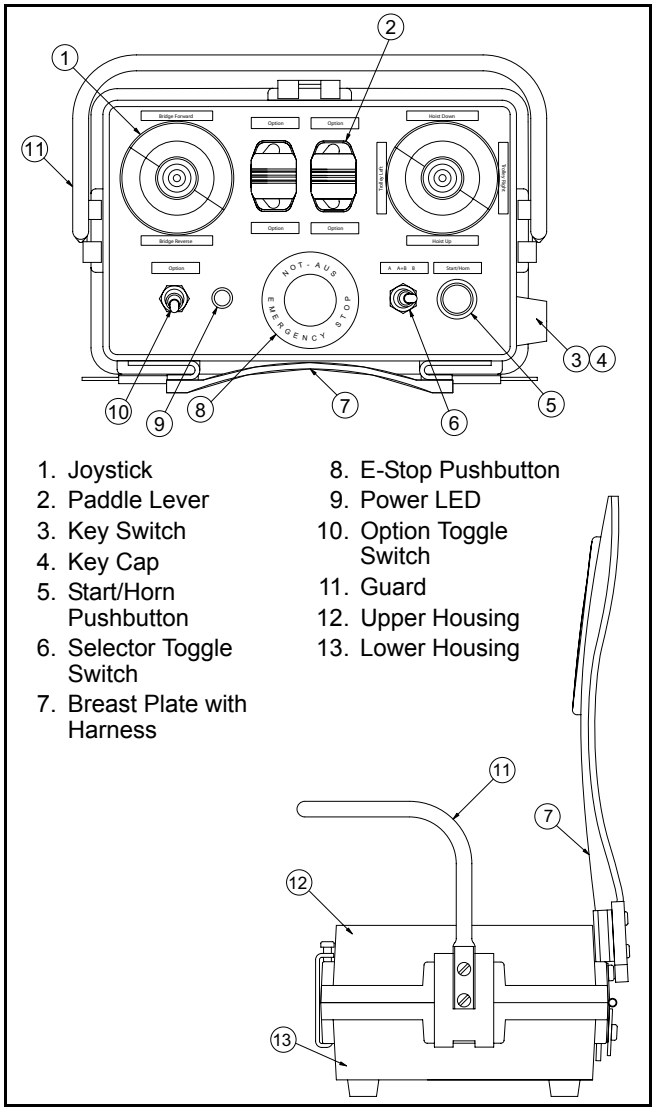
Selector Toggle Switch - This three-position switch allows the operator to control multiple cranes/machines from a single transmitter, or multiple crane/machine motions from a single joystick or paddle lever. The selections can be A, B, or A+B.

GR TRANSMITTER

The GR transmitter is a "belly box" design. The operator uses joysticks or paddle levers to control crane/machine motions. Standard GR joysticks and paddle levers have proportional speed control without detents. Optional joysticks provide up to five speeds with detents. The GR joystick model can combine up to three dual axis joysticks for up to six motion control. The GR paddle lever model can accommodate up to seven single axis paddle levers for up to seven motion control.

The GR also offers a Selector toggle switch to control up to nine crane/machine motions for independent/combined control.

GR transmitter components are shown below.



1. Joystick
2. Paddle Lever
3. Key Switch
4. Key Cap
5. Start/Horn Pushbutton
6. Selector Toggle Switch
7. Breast Plate with Harness
8. E-Stop Pushbutton
9. Power LED
10. Option Toggle Switch
11. Guard
12. Upper Housing
13. Lower Housing

GR Transmitter Functions

Start/Horn Pushbutton - This pushbutton activates the mainline contactor and sounds the horn (if provided). If the mainline contactor is already on, pushing this button will only sound the horn.

E-Stop Pushbutton - Press the E-Stop pushbutton to place the receiver in the Safe mode. Pull this pushbutton out to disengage the E-Stop. The transmitter will then control crane/machine motions.

IMPORTANT: The E-Stop pushbutton is for emergency stops only. DO NOT use it as an OFF switch. Use the key switch to turn the transmitter on and off.

Power LED - The GR Power LED flashes once when the transmitter is turned on. The transmitter initiates a self-test to check the software. When the transmitter passes the self-test, the light changes to flashing green. It continues to flash green until the transmitter is turned off.

Key Switch - The key switch turns the transmitter on and off. The switch will only turn with the key cap fully inserted. The switch must be in the OFF position for the key to be removed.

Joysticks - Standard GR joysticks provide stepless proportional speed control without detents. Optional joysticks have five-stop speed control with detents.

NOTE: GR transmitters for 5, 6, 7, and 9 motions use two or three joysticks and a three-position Selector toggle switch.

Paddle Levers - Standard GR paddle levers provide stepless proportional speed control without detents for up to 7 motions.

Option Toggle Switch - The connected function will be activated when the toggle switch is moved to the ON position. The function will stop when the switch is moved to the OFF position.

Selector Toggle Switch - This three-position switch allows the operator to control multiple cranes/machines from a single transmitter, or multiple crane/machine motions from a single joystick or paddle lever. The selections can be A, B, or A+B.

FREQUENCY AND ADDRESS SETTINGS

Each Hetronic radio remote control system contains a radio frequency (RF) unit. Each system consists of a transmitter RF unit and a receiver RF unit.

CAUTION: AVOID INJURY OR DAMAGE - Operating the transmitter without its antenna could destroy the final stage of the RF module. DO NOT attempt to change the Hetronic pre-set frequency or the 16-bit address. Personal injury and property damage could result from transmission interference and may void the warranty.

The address settings are pre-set at the factory in the ADMO module. However, if the transmitter coder board, the base board, or if the entire transmitter or receiver are replaced, the ADMO address must match the system.

IMPORTANT: If the ADMO settings of the transmitter and receiver do not match, the system will not function.

TEST PROCEDURES

WARNING: FAILURE TO FOLLOW INSTRUCTIONS could result in personal injury and/or damage to equipment. Read and understand the safety instructions in all manuals provided.

Testing or service must be performed by authorized personnel only.

There must be no load on the crane/machine.

Clear the crane/machine operating area of obstructions.

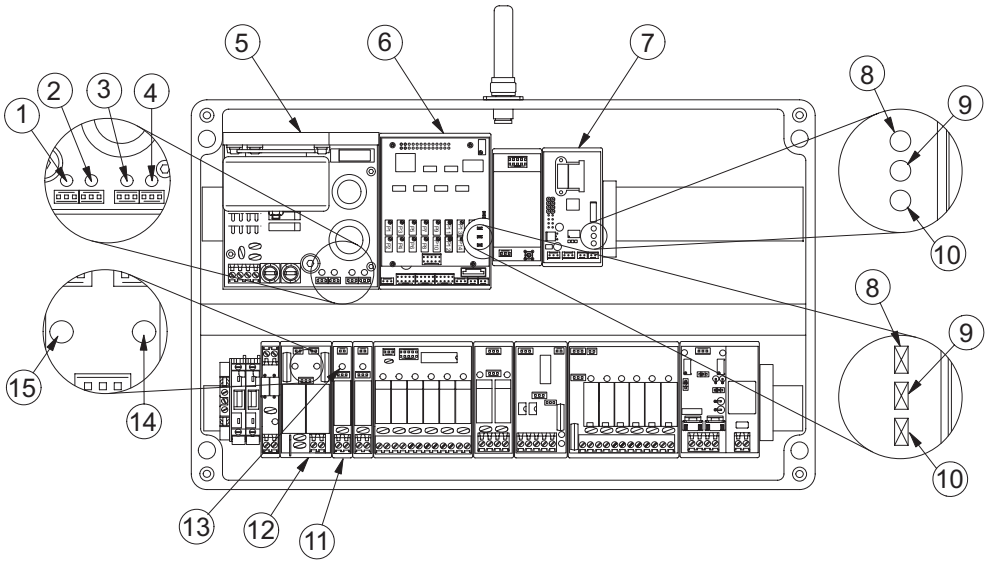
Check the following list before turning the transmitter on.

- Be sure there is a fully charged battery in the transmitter.
- Insert the second battery in the charger and connect the charger to a power source. Be sure the power source is active at all times.
- Push in the E-Stop button.
- Be sure the motion pushbuttons, joysticks and/or paddle levers are in their Off (neutral) positions.

TEST THE RECEIVER

1. Remove the cover from the receiver.
2. Position yourself in front of the receiver so that all LEDs and connections are visible.

1. Power Pack X1 LED
2. Power Pack X2 LED
3. Power Pack X3 LED
4. Power Pack X4 LED
5. Power Pack
6. Decoder Module
7. E-Stop Decoder Module
8. CPU Standby LED
9. Telegram LED
10. E-Stop LED
11. Start Relay
12. SNZ E-Stop Module
13. Start Relay LED
14. E-Stop Decoder E-Stop LED
15. Decoder E-Stop LED



3. Turn on power to the receiver. The CPU Standby LED should flash yellow to indicate the microprocessor is working properly. The LEDs X1, X2, and X3 on the Power Pack should illuminate.
4. Insert the key into the transmitter key switch and turn to the ON position. The buzzer sounds to indicate the diagnostic test in progress.The buzzer sounds a second time to indicate successful diagnostic testing.
5. Immediately following the diagnostic test, the Telegram LED should flash on the Decoder and E-Stop Decoder modules. This indicates that the receiver is detecting a valid signal from the transmitter.
6. Pull out the E-Stop pushbutton. The X4 LED on the Power Pack should illuminate. The E-Stop LEDs on the Decoder module and the E-Stop Decoder module should illuminate.
7. Push in the E-Stop pushbutton. The X4 LED on the Power Pack should go off. The E-Stop LEDs on the Decoder module and the E-Stop Decoder module should also go off.
8. Pull the E-Stop pushbutton out.
9. Press the Start/Horn pushbutton on the transmitter. The Start Relay LED should illuminate and the horn will sound. The main line contactor is activated at this time.
10. Activate the motion pushbuttons, joysticks or paddle levers to test the crane/machine functions.

IMPORTANT: The crane/machine functions will operate during this check. Be certain that there are no obstacles near the crane/machine.

11. Confirm that the crane/machine moves appropriately and that the correct LEDs illuminate for each crane/machine motion. The LEDs are located on the individual motion modules for analog signals or above the discrete relays for digital signals.
12. Activate the Option functions, if supplied, to test optional crane/machine functions.
13. Confirm that the crane/machine moves appropriately and that the correct LEDs illuminate for each crane/machine motion.
14. Turn the key switch to the OFF position. All LEDs in the receiver should turn off.
15. If transmitter and receiver function properly, the system is ready for use.
16. If the receiver or transmitter does not operate properly, or if the crane/machine does not react as directed, shut the entire system down and refer to the Troubleshooting Section of this manual. If necessary, contact Hetronic or an authorized service technician.

OPERATION

WARNING: FAILURE TO FOLLOW INSTRUCTIONS could result in personal injury and/or damage to equipment. Read and understand the safety instructions in all manuals provided.

HOLDING THE TRANSMITTER

Hold the transmitter with the control panel facing you. Be sure that you are able to easily read any text and understand operation symbols. If your transmitter contains a Tilt Sensor Switch, be sure it is not activated or the transmitter will not start.

If a belt or strap is provided with your transmitter, use it at all times. The belt or strap is designed to reduce stress and increase safety.

WARNING: FAILURE TO FOLLOW INSTRUCTIONS could result in personal injury and/or damage to equipment. Always hold the transmitter in the proper orientation. Holding the transmitter improperly while operating the crane/machine could result in unexpected crane/machine response.

The safety checks described in the following paragraphs must be completed before the radio remote control system is activated. These checks must be performed at least once a day, before the start of any operation and at all shift changes.

IMPORTANT: A transmitter drawing is included with each system. Transmitter layout and inscriptions may vary according to customer requests.

WARNING: FAILURE TO FOLLOW INSTRUCTIONS could result in personal injury and/or damage to equipment. Test the "E-STOP" function as described in the crane/machine manufacturer's operator manual before beginning any operation.

VISUAL CHECK

Always check the transmitter for any physical damage before any operation.

- Always keep safety features, guards and controls in good repair, in place and securely fastened.
- Check equipment for wear or damage.
- Check rubber cuffs and pushbutton caps for wear or damage.

IMPORTANT: Never operate a transmitter with worn or damaged parts. Replace immediately with only Hetronic parts. Contact Hetronic or your Dealer.

START-UP PROCEDURE

This procedure must be carefully followed before beginning any operation.

1. Be sure that all safety measures required by the equipment manufacturer have been followed.
2. Be sure that the transmitter battery is fully charged.
3. Push in the transmitter E-stop pushbutton.
4. Be sure that all controls, joysticks or paddle levers are in the Off (neutral) position.

NOTE: If any control, joystick or paddle lever is NOT in the Off (neutral) position when the Start/Horn button is pushed, the transmitter will not turn on.

5. Switch the transmitter "ON". A short buzzer signal will sound.
6. At this time, the transmitter performs a self-test routine.

7. Wait for the second buzzer signal (approx. 3 seconds) to confirm that the self-test was successful.
8. The green LED on the transmitter control panel will flash.This indicates that the transmitter is working and is ready to use.
9. Disengage the E-stop pushbutton.
10. Push the green pushbutton "Start/horn" on the transmitter.
11. Check that the crane/machine functions correspond with the transmitter functions.

IMPORTANT: The crane/machine functions will operate during this check. Be certain that there are no obstacles near the crane/machine.

12. Push the "E-STOP" pushbutton on the transmitter. Be sure that no functions can be activated with the "E-STOP" pushbutton depressed.

IMPORTANT: If any function of the radio remote control activates with the "EMERGENCY STOP" engaged, the radio remote control must not be used until it is repaired by a certified technician.

13. Pull out the "EMERGENCY STOP" pushbutton.
14. Push the green pushbutton "Start/horn" on the transmitter.
15. Both the radio remote control and the crane/machine are now ready for operation.

IMPORTANT: To avoid accidental start-up, always engage the E-stop pushbutton and switch the transmitter "OFF" when not in use. When the transmitter is not attached to the operator, the key switch should be removed and stored in a secure place.

WARNING: TO AVOID SERIOUS INJURY OR DEATH. Switch the crane/machine "OFF" if there is a fault or any problems with the safety check. Contact Hetronic or your dealer immediately to repair the system. NEVER operate the crane/machine when the "EMERGENCY STOP" function does not operate properly.

Improper operation, maintenance or adjustment may cause serious injury or damage to equipment and may void the warranty.

EMERGENCY STOP

For all emergency situations, push the E-Stop pushbutton in. To restart the system, disengage the E-Stop pushbutton and press the Start/Horn pushbutton. Be sure any dangerous conditions are corrected and follow the Start Up Procedure above.

SAFE MODE

When the transmitter battery voltage drops below approximately 3.4 volts, the system automatically goes into Safe Mode. A buzzer will sound to indicate a low battery. At the end of the 30 seconds, the transmitter sends the E-Stop signal and all crane/machine motion commands are stopped.

To restart the system, a fully charged battery must be inserted into the transmitter. Proceed with startup instructions. Always place the discharged battery directly into the charger.

JOYSTICKS OR PADDLE LEVERS

Joysticks and paddle levers are equipped with a spring return to the center (OFF) position. If the crane/machine motion is multi-speed, the farther the lever is pushed, the faster the crane/machine motion will move. Return the lever to the center position to stop the crane/machine motion.

OPTION CONTROLS

Each transmitter can be equipped with a variety of rotary switches, toggle switches or pushbuttons. Each function is labeled. For specific operational instructions, refer to the technical documentation supplied with your transmitter, or contact Hetronic.

TRANSMITTER SHUTDOWN

To shut down the transmitter, turn the key switch to OFF. Remove the key and place it in a secure location to prevent unauthorized or unintentional use.

OPTICAL DISPLAYS AND ACOUSTIC SIGNALS

The radio remote control system uses optical displays and acoustic signals to show current working status.

Transmitter

1. Turn keyswitch to "ON".
2. One long acoustic signal (buzzer) sounds.
3. After the self-test routine, another buzzer sounds to indicate that the system is ready to operate.
4. Then press the Start/Horn button to begin system operation.

NOTE: If the Start/Horn button is pressed before the second buzzer, the system will not start up.

During transmitter operation, a buzzer signal indicates when the battery is nearly discharged. The transmitter will operate for another 30 seconds before going into E-Stop. Use this time to place the crane/machine in a safe position.

Receiver

The receiver uses LEDs to indicate operational status. The cover of the receiver must be removed for the LEDs to be visible. See "Test the Receiver" in the Test Procedures Section of this manual for specific information on LED locations.

TRANSMITTER OPTIONS

Each Hetronic radio remote control system is built to customer specifications. You may have features that are not described in this manual. Some possible options are described below. If you have questions, please contact your dealer or Hetronic.

Back-up Transmitter

Spare transmitters are frequently used in the event that the primary transmitter is damaged or misplaced. Only one transmitter is allowed to be active at any given time.

NOTE: If the primary and back-up transmitter are turned on at the same time, the receiver enters the Safe Mode.

ADMO Address Plugs

If several radio remote control systems are used, address plugs can configure a spare transmitter to be used on any of the cranes/machines. Each address plug corresponds to a specific crane/machine. When a specific crane/machine address plug is inserted into the plug receptacle of the spare transmitter, the transmitter is automatically configured to operate that crane/machine.

Optical Low Battery Indicator

This feature is a LED indicator of the low battery condition. It can be used as an alternative to or in addition to the buzzer signal.

Advanced Low Battery Indication

This feature is basically a timer that indicates a low battery condition 10 minutes before the Safe Mode is entered. This feature is beneficial where placing the crane or machine in a safe position takes more time after the low battery is indicated.

Feedback

This feature allows the transmitter to receive and display information such as crane/machine status, warnings, etc. The feedback can be displayed as visual graphics or buzzers.

RF Booster

This feature boosts the RF transmission power for extended range operation of up to 1 mile. It is to be used only in applications that are safe to operate outside of the operator’s visual range.

Priority Transmitters

This feature is the capability to have several independent cranes/machines controlled by one transmitter. Priority leves can be set to allow the main transmitter to override the control of individual crane/machine transmitters.

RF Units

AUTX - Auto Synthesizer - The function of a transmitter to automatically search a range to find a frequency without interference.

SCRX - Scan Synthesizer - The function of a receiver to respond only to a designated transmitter and finding the frequency that the transmitter is transmitting on.

CRANE/MACHINE CONTROL WITH MULTIPLE TRANSMITTERS

Multiple crane/machine applications may require the use of more than one transmitter. Or a single transmitter may be required to control several cranes/machines simultaneously. The common methods of control for these situations are "Pitch and Catch" and "Independent/Combined Control."

Pitch and Catch

Multiple (usually two) transmitters control one receiver, but not at the same time. All transmitters must be configured with the same address code as the receiver, but set at a different frequency channel.

The first transmitter turned on controls the crane/machine. The operator moves the load to a hand-off location and turns the transmitter off. The second operator turns his transmitter on and takes control of the crane/machine. The receiver only accepts commands from one transmitter at a time.

Independent/Combined Multiple Crane/Machine Control

This configuration is for applications that require multiple (usually two) cranes/machines on a single runway. Each crane/machine can be controlled independently. The cranes/machines may also be operated in tandem by one operator.

The transmitters built for these applications contain Selector switches. These switches select each crane/machine individually or any combination of designated cranes/machines.

With transmitter interlocks, each transmitter contains a different address code and frequency channel. The receivers have a RF module and decoder set for each transmitter. A special module inside the receiver determines which transmitter is requesting control of each crane/machine. The module locks the transmitter signal to the receiver and all other transmitter signals are ignored.

When that transmitter is turned OFF, the cranes/machines are available to be controlled by a different transmitter.

Universal Transmitter

One transmitter is engineered to communicate with several different systems. The transmitter can be quickly modified to control any crane or machine in a designated facility or fleet.

OPTIONAL SAFETY FEATURES

"Press to Operate" (PTO) Safety Switch

To release a crane/machine load, it may be necessary to incorporate a two-handed activation with a "Press to Operate" (PTO) safety switch. The PTO switch must be activated at the same time the load release switch is activated. This feature ensures that the load is not released by incidental activation of the release switch. Typical applications for a PTO switch are magnetic and vacuum lifting devices or grabs of any type.

A PTO safety switch can also be incorporated into a joystick as a button on top of a joystick lever.

"Lift to Operate" (LTO) Joystick

"Lift to Operate" (LTO) joysticks have a mechanical device located near the top of the joystick handle. It must be held and lifted upward to activate the joystick. LTO ensures that the joystick is not accidentally activated. This feature is available on GR transmitters.

"Lift to Operate" (LTO) Toggle Switch

LTO toggle switches must be lifted from their static positions in order for the switch to be activated. LTO toggle switches can be "maintained" or "momentary". This feature is mechanically activated and is available on Nova, GL, and GR transmitters.

Tilt Sensor Switch

The tilt sensor switch activates if the transmitter is tilted more than 30 or 45 degrees from level. The switch has a delay time of 0-5 seconds.The delay time is set at the factory to customer specifications. If this switch senses an unacceptable tilt for as long as the time delay is set, the transmitter either sends the E-stop signal to the receiver or enables/disables certain functions according to customer specifications. This safety device is useful if the operator is in danger of losing his footing or control of the transmitter. It is available on GL and GR transmitters.

Range Limitation

This feature uses a RF signal to restrict operator movement to a predetermined range limit. It can be preset at the factory, or adjusted in the field.

Interlocking Functions

This feature prevents contradictory operator commands from the transmitter. Certain functions can be enabled or disabled when another function is activated or inactive. An example is hoist up and hoist down. Activating both functions would most likely damage the equipment. Therefore, hoist up is interlocked with hoist down so that when one is activated the other can not be. The systems are capable of interlocking any functions.

Magnet Switch

The magnet switch is used mainly in transmitter docking station situations. Its function is to enable certain functions only when the transmitter is secured in a predetermined location.

Corrosion Protection

To resist damage in corrosive environments, all metal components are fabricated of stainless steel. This can include receiver housings, hardware, screws, etc.

Solid State DC Outputs

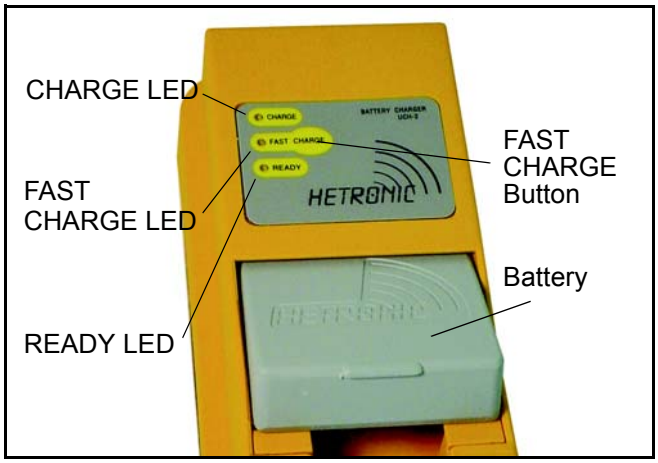
This feature enables Hetronic to eliminate costly intermediate relay panels for DC crane/machine operations. There are no moving parts in the contactors, thereby lowering maintenance costs.

MAINTENANCE

BATTERY CHARGING SYSTEM

The Hetronic UCH-2 is a new and improved battery charging system. It includes upgraded features to better charge and troubleshoot the battery.

Battery and charger contacts are gold-plated and self-cleaning to ensure positive connection. The battery and charger contacts are mechanically cleaned each time the battery is removed from or inserted into the battery compartment.



Features

- **Normal charge or Fast charge** of Hetronic standard batteries
- **Trickle charge** - After charging process is complete, battery can remain in charger without being damaged by over-charge.
- **Battery diagnostics** - Charger determines if battery is damaged.
- **Gold plated contacts** ensure clean, positive contact between battery and charger.
- **LED status lights** indicate charging process as well as battery diagnostics

The Battery Charger

One battery charger is designed for 115/230 VAC and plugs into a typical wall outlet. Another charger is designed for 12/24 VDC and is wired into the constant crane/machine power source.

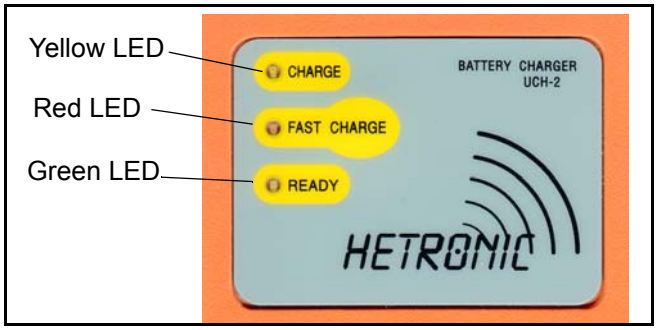
When the battery is inserted into the charger, a flashing “CHARGE” LED lights. The charge process is terminated by detecting peak battery voltage or after 5 hours and the “READY” light goes on. When the “READY” light is lit, the charger continues to "trickle" charge the battery.

NOTE: If the battery is bad and has an open cell, no LEDs will light up. If the battery has a shorted cell, the “CHARGE” LED will blink continuously. In either case, the battery must not be used. Properly dispose of the bad battery.

Battery Charger Technical Specifications

Charging current	Normal: 300 mA Fast charge: 780 mA
Charge time (Standard Hetronic 1200 mAh battery)	Normal: approx. 4 hours Fast charge: less than 2 hours (no damage to battery, or negative effect to duty cycles)
Temperature range	-20C to +75C
Power supply	DC - 12-24 VDC, polarity protected AC - 110-220 VAC, US/Japan or EU plug

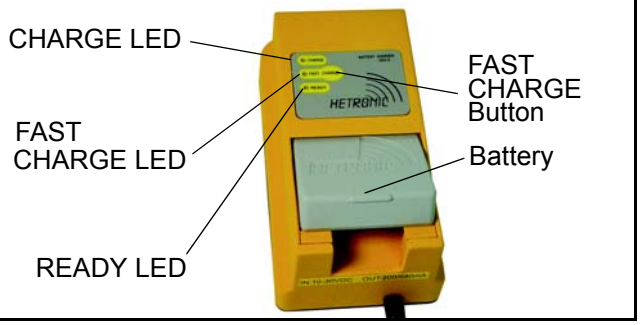
LED Description

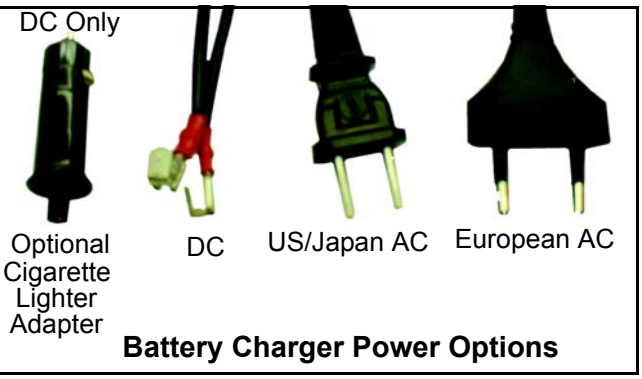


Yellow CHARGE LED	Lights constantly - Charging Continuous flashing - Damaged battery cell (short)
Red FAST CHARGE LED	On - Fast charge in process
Green READY LED	On - Battery fully charged, trickle mode in process
No LED on after battery inserted	Damaged battery cell (open cell)

Charging the Battery

1. Insert the battery with both guide pins in the corresponding guide bars into the battery compartment of the battery charger.
2. Press the battery on the marked spot until it latches into its compartment. The LED labeled “CHARGE” flashes for two seconds, then stays lit during the charging process.
3. When the battery is fully charged, the “READY” LED lights up and the “CHARGE” LED goes off. Charging time could take up to 5 hours, depending on the condition of the battery.
4. Leave the battery in the charger until it is needed. The charger supplies a “trickle” charge but will not over-charge the battery.





Battery Charger Power Options

Fast Charge

1. Insert the battery into the charger as described above. The LED labeled “CHARGE” flashes for two seconds, then stays lit.
2. Press the “FAST CHARGE” button. The FAST CHARGE LED lights also and stays lit during the charge process.
3. When the battery is fully charged, the “READY” LED lights up and the “CHARGE” and “FAST CHARGE” LEDs turn off.

If you have questions or problems operating your battery charger, please contact your dealer or Hetronic.

Hetronic Battery Information

Standard Hetronic rechargeable batteries are the nickel metal hydride type. These batteries have no “memory effect” when charging a battery that is not fully discharged.

Battery Technical Specifications

Battery type	3.6V NiMh (nickel metal hydride)
Capacity (typical)	1200 mAh
Typical operation time	10 - 20 hours with one charge (depending on TX configuration)
Memory effect	None
Duty cycle	Can be recharged at least 500 times (after 500 charges, over 80% of capacity remains and will diminish gradually)

Changing the Battery

The battery voltage is monitored continuously by the transmitter.

A buzzer in the transmitter sounds when the battery is nearly discharged. When the transmitter signals, the battery must be changed immediately.

1. Position the crane/machine into a safe place or safe condition within 30 seconds after hearing the signal.

WARNING: The transmitter will switch to the EMERGENCY STOP condition after 30 seconds.

NOTE: If your transmitter is equipped with Advanced Low Battery Indication, you have up to 10 minutes to place the crane/machine in a safe position. The exact amount of time is determined by customer specifications. Refer to the technical drawings for each radio remote control system.

2. Press the E-stop pushbutton.
3. Switch the transmitter "OFF".
4. Push the discharged battery slightly forward and lift it out of the battery compartment.
5. Insert a fully charged battery.
6. Follow "Start-up Procedure" to begin operation.

BATTERY DISPOSAL

IMPORTANT: AVOID ENVIRONMENTAL POLLUTION. Electronic equipment and components are considered to be hazardous waste. Discarded rechargeable batteries are hazardous waste and must not be disposed of with typical refuse. Contact a professional hazardous waste disposal service.

WARNING: EXPLOSIVE GASES AND FLYING DEBRIS can cause death or serious injury. Use only Hetronic replacement batteries. Use of unauthorized replacement batteries could cause a battery explosion, resulting in injury or death of the operator or other people in the work area.

TROUBLESHOOTING

If the system does not operate after normal start-up as described in the Operation Section of this manual, follow the recommended troubleshooting sequence to help isolate the cause and determine corrective action.

If the system will not respond to the steps below or the LEDs indicate a failure, contact the Hetronic Service Department or your authorized dealer.

If a call to Hetronic Service or your Dealer is required, please have the transmitter and receiver Production and System numbers available. You should also be able to answer the following questions.

Transmitter

- Is the E-Stop pushbutton pulled out?
- Is the key switch in the ON position?
- Did you press the Start/Horn pushbutton?
- Are all the joysticks, paddle levers and switches in their center (neutral) position?
- Did you press the Start/Horn pushbutton while accidentally engaging one of the other controls?
- Is the battery in the transmitter fully charged?
- Is the transmitter inside its operating range?

Receiver

Refer to the receiver drawing that shows the locations of the diagnostic LEDs.

- Is the CPU Standby LED flashing?
- Is the Telegram LED flashing?
- Is the E-Stop LED illuminated on the Decoder module or the E-Stop Decoder module?
- Are the connections/screw terminals tight?
- Is the antenna plug securely connected?
- Is the antenna connection assembly outside the enclosure secure?
- Are the power supply and ground wires securely fastened?
- Are the signal wires separated from the power supply wires?
- Are RC type surge suppressors installed on all magnetic contactors that are controlled by the receiver?

Please check these items and have the transmitter and receiver Production and System numbers available when placing a call to Hetronic or your Dealer.

PROBLEM	PROBABLE CAUSE	CORRECTION
System will not initialize after normal start-up procedure	Joystick, paddle lever or switch not in center position	Ensure that all control devices are in center position when the Start button is activated.
	E-Stop switch engaged	Pull out E-Stop switch. Restart system by pressing Start.
	Battery fully discharged	Check battery to ensure a full charge. Replace with fully charged battery if necessary.
	No power to the receiver	Check the diagnostic LEDs in the receiver to be sure power is applied. Ensure that the system is properly grounded.
The transmitter is turned on, but does not transmit (Power LED not flashing)	Battery is discharged	Replace battery with a fully charged battery.
	Coder board fuse	Check fuse and replace if necessary.
	Broken key switch	Check wiring on key switch. Replace key switch, wiring or contact element.
	Coder board failure	Contact Hetronic or your Dealer.

PROBLEM	PROBABLE CAUSE	CORRECTION
Transmitter is transmitting (Power LED flashing), but crane/machine will not respond	E-Stop switch engaged	Pull out the E-Stop pushbutton and press the Start/Horn pushbutton
	Transmitter out of range	Take the transmitter back into the range of the receiver. Press the Start/Horn pushbutton.
	Joystick, paddle lever or switch not in center position when transmitter turned on	Ensure that all control devices are in center (neutral) position when the Start button is activated.
	Receiver power off	Turn on power to receiver.
	Blown fuse in receiver	Check all fuses. Replace if necessary.
	E-Stop failure in transmitter	Check E-Stop pushbutton for damage. Check wiring to contact element for broken or disconnected wires. Repair or replace E-stop pushbutton or wiring.
	E-Stop failure in receiver. Red E-Stop LED on decoder board is illuminated	Check wiring on E-Stop module, decoder module, E-Stop decoder module. Secure any loose connections.
	E-Stop module failure	Replace E-Stop module.
All crane/machine motions operate intermittently	Receiver antenna loose or missing	Tighten or replace antenna.
	External antenna (if used) has loose connection, poor grounding or interference	Tighten antenna and ground connection. See "Connecting an External Antenna" Section for operational precautions.
	Surge suppressors not installed on contactors	Install RC type surge suppressors on all magnetic contactors that are controlled by the radio remote control system
	Connector wiring too close to power wiring	Control wiring must be run separately from power wiring.
	Connector inside receiver is loose	Check all connectors, reseat if necessary.
Some crane/machine motions operate intermittently	crane/machine motion wiring may be loose.	Check wiring from receiver to plug and from plug to crane/machine motion actuator.
	Connector inside receiver is loose	Check all connectors, reseat if necessary.
	Surge suppressors not installed on contactors	Install RC type surge suppressors on all magnetic contactors that are controlled by the radio remote control system
	Connector wiring too close to power wiring	Control wiring must be run separately from power wiring.

SPECIFICATIONS

SYSTEM	
Operating range	100 m (330 ft.) typical
Frequency range	400 - 470 MHz
Deviation	+/- 2 kHz
HF output power	10 mW max.
Operating temperature range	-25° to +70° C (-18° F to 158° F)
Enclosures	IP65 weatherproof (exceeds NEMA 12/13)
Transmitter antenna	Built-in
Battery charger	115/220 VAC (+/- 20%)

NOVA-XL	
Weight	Less than 4 lbs (incl. battery)
Size (L, W, H)	28.5 x 13.3 x 16.3 cm 11.2 x 5.2 x 6.4 inches
Power supply	3.6 V 1.2 Ah NiMH rechargeable battery
Operation time	Up to 20 hours
Functions	E-Stop pushbutton Up to 8 motions Horn and mainline activation Toggle switch for auxiliary function Selector switch (if applicable)

NOVA-M	
Weight	Less than 2 lbs (incl. battery)
Size (L, W, H)	16.8 x 11.0 x 13.3 cm 6.6 x 4.3 x 5.2 inches
Power supply	3.6 V 1.2 Ah NiMH rechargeable battery
Operation time	Up to 20 hours
Functions	E-Stop pushbutton Up to 5 motions Horn and mainline activation Pushbutton for auxiliary function Selector switch (if applicable)

GL	
Weight	Less than 4.4 lbs (incl. battery)
Size (L, W, H)	29.7 x 17.8 x 10.9 cm 11.7 x 7.0 x 4.3 inches
Power supply	3.6 V 1.2 Ah NiMH rechargeable battery
Operation time	Up to 20 hours
Functions	E-Stop pushbutton 7 or more motions Horn and mainline activation Toggle switch for auxiliary function Selector switch (if applicable) Available LCD remote readout

NOVA-L	
Weight	Less than 3 lbs (incl. battery)
Size (L, W, H)	23.6 x 10.2 x 16.3 cm 9.3 x 4.0 x 6.4 inches
Power supply	3.6 V 1.2 Ah NiMH rechargeable battery
Operation time	Up to 20 hours
Functions	E-Stop pushbutton 6 or more motions Horn and mainline activation Toggle switch for auxiliary function Selector switch (if applicable)

GL-3	
Weight	Less than 4.4 lbs (incl. battery)
Size (L, W, H)	29.7 x 17.8 x 10.9 cm 11.7 x 7.0 x 4.3 inches
Power supply	3.6 V 1.2 Ah NiMH rechargeable battery
Operation time	Up to 20 hours
Functions	E-Stop pushbutton 7 or more motions Horn and mainline activation Toggle switch for auxiliary function Selector switch (if applicable) Available LCD remote readout

GR	
Weight	Less than 12 lbs (incl. battery)
Size (L, W, H)	30.5 x 20.3 x 20.3 cm 12 x 8.0 x 8.0 inches (Overall height with breastplate is 15.5")
Power supply	3.6 V 1.2 Ah NiMH rechargeable battery
Operation time	Up to 20 hours
Functions	E-Stop pushbutton 7 or more motions Horn and mainline activation Toggle switch for auxiliary function Selector switch (if applicable)

RECEIVER	
Operating power	48/110/240 VAC 50/60 Hz (+/- 20%) 12/24 VDC (+/- 50%)
Current	<100 mA
Safety features	Self-monitoring E-Stop circuits Fail-safe, spring forced E-Stop relay Self-test during start-up and operation On-board diagnostic system with indicators for RF communication, power status, active outputs
Outputs	1 E-Stop relay 1 Horn relay 1 Start/Mainline relay Up to 32 digital outputs Up to 8 proportional outputs DC applications up to 250 VDC, 5 Amp

INSTALLATION AND SAFETY TEST DATA

This form must be completed and signed by the person responsible for installation of this radio remote control system.

Hetronic assumes no responsibility for the correct installation of the radio remote control system. The equipment operator must ensure that the radio remote control system and the crane/machine operate correctly together.

The operator must also ensure that all safety devices and features are in place and operating correctly. The operator is responsible for understanding and following all safety precautions in this and other applicable operator manuals.

Crane/machine Data	
Manufacturer	
Model Number	
Serial Number	
Year of Production	
Radio Remote Control Data	
Manufacturer	Hetronic
Model	
System Type	
Transmitter Production Number	
Receiver Production Number	
System Number	
I/We installed the radio remote control system, performed the safety test and inspected the crane/machine. The appropriate instructions and rules of this crane/machine type are followed.	
Place	
Date	
Company	
Name of Installation Technician	
Signature	

DEFINITIONS	
Acoustic signal	A buzzer or other sound intended to be heard as an alert.
Analog signal	Proportional - stepless or infinite control
Belly box	A transmitter that is secured to the front of the operator's body by a belt, strap or breastplate/harness.
Coder	Converts parallel signals into a serial data message
Decoder	Coverts a serial data message into parallel signals
Digital signal	On/off control
Latching control	The function activates when the control is pushed and released. The function stays on until the control is pushed and released again.
Mainline contactor	The primary power supply contactor to the crane/machine controls.
Maintained control	The function activates when the control is placed in the ON position. The function stops when the control is placed in the OFF position.
Momentary control	The function activates when the control is placed in the ON position. The control must be held in place to stay ON. When the control is released, it returns to the OFF position and the function is stopped.
Proportional control	A multi-speed function control that goes faster as the control is pressed further.

AWG - METRIC CONVERSIONS		
AWG	**Metric Equivalent mm sq.**	**Metric Cable Size mm sq.**
20	0.52	0.75
18	0.82	1.0
16	1.32	1.5
14	2.1	2.5
12	3.3	4
10	5.32	6
8	8.5	10
6	13.5	15
4	21.3	25
2	33.7	35
1/0 (0)	53	70.0 (50.0 if current capacity not exceeded)
2/0 (00)	67.6	70
3/0 (000)	84.4	95
4/0 (0000)	107	120

ABBREVIATIONS	
A/D	Analog to digital conversion
AK	Analog channel (German: Analog Kanal)
AMP	Ampere
AWG	American Wire Gauge
BPS	Bits per second
CPU	Central Processing Unit
DK	Digital channel (German: Digital Kanal)
EMC	Electromagnetic compatibility
EMI	Electromagnetic immunity
EPROM	Electrical programmable read-only memory
FM	Frequency modulation
GND	Ground
HF	High frequency
KHz	Kilohertz
LED	Light emitting diode
LTO	Lift to operate
mAH	Milliampere hours
mA	Millampere
msec	Millisecond
MHz	Megahertz
MOV	Metal Oxide Varistor type of surge suppressor
mW	Milliwatt
NiCd	Nickel Cadmium
NiMH	Nickel Metal Hydrite
PLC	Programmable logic controller
PLL	Phased locked loop
PTO	Press to operate
PWM	Pulse width modulation
R/C	Resistor/Capacitor type of surge suppressor
RF	Radio frequency
RMS	Root mean squared
Rx	Receiver
RxD	Receiving data
SMD	Surface mount device
SMT	Surface mount technology
TTL	Transistor transistor logic
Tx	Transmitter
TxD	Transmitting data
Ub	Operating power
Uv	Microvolts
VAC	Volts alternating current
VDC	Volts direct current

CS 458 Frequency & Jumper Settings

Hetronic

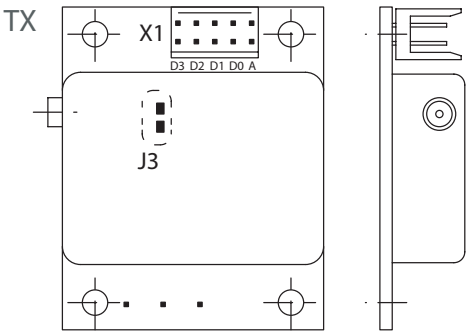
SALS_008.0_CS 458

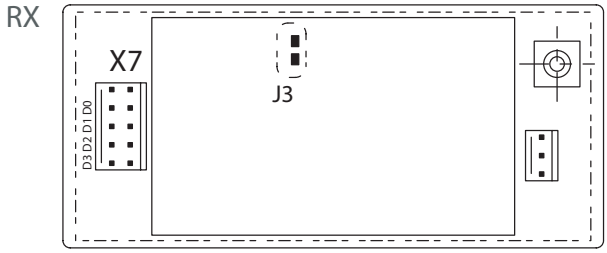
May 2003

The Hetronic Radio Remote Control System address code and frequency channel are set at the factory. The address code and frequency channel may need to be set if you have purchased a replacement or spare transmitter.

- Never change the address code or frequency channel of the original transmitter purchased with your system.
- Never change the address code settings in the receiver.
- Never operate two transmitters at the same time that are set with the same frequency channel and address code.

Group USA - Jumper "J3" Open						Group GB - Jumper "J3" Closed	
Channel	Frequency (MHz)	D0	D1	D2	D3	Frequency (MHz)	Channel
A0	458.800	ON	ON	ON	ON	458.525	B0
A1	458.825	OFF	ON	ON	ON	458.550	B1
A2	458.850	ON	OFF	ON	ON	458.575	B2
A3	458.875	OFF	OFF	ON	ON	458.600	B3
A4	458.900	ON	ON	OFF	ON	458.625	B4
A5	458.925	OFF	ON	OFF	ON	458.650	B5
A6	458.950	ON	OFF	OFF	ON	458.675	B6
A7	458.975	OFF	OFF	OFF	ON	458.700	B7
A8	459.000	ON	ON	ON	OFF	458.725	B8
A9	459.025	OFF	ON	ON	OFF	458.750	B9
A10	459.050	ON	OFF	ON	OFF	458.775	B10
A11	459.075	OFF	OFF	ON	OFF	458.825	B11
A12	459.100	ON	ON	OFF	OFF	458.8375	B12
A13	459.152	OFF	ON	OFF	OFF	458.900	B13
A14	459.150	ON	OFF	OFF	OFF	458.825	B14
A15	459.175	OFF	OFF	OFF	OFF	458.900	B15





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CS 447 Frequency & Jumper Settings

Hetronic

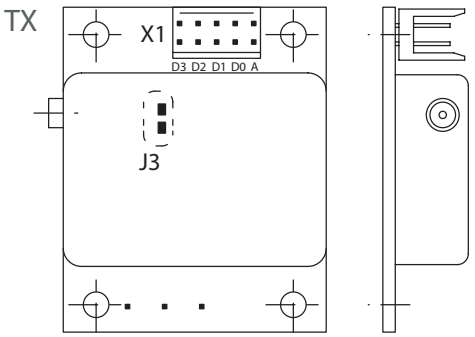
SALS_011.0_CS 447

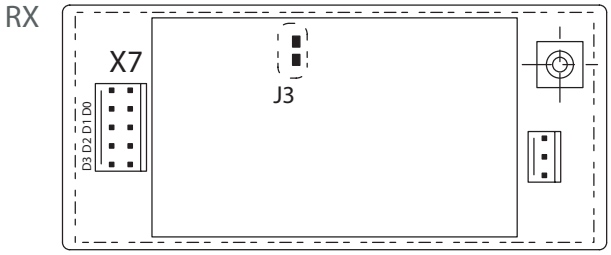
May 2003

The Hetronic Radio Remote Control System address code and frequency channel are set at the factory. The address code and frequency channel may need to be set if you have purchased a replacement or spare transmitter.

- Never change the address code or frequency channel of the original transmitter purchased with your system.
- Never change the address code settings in the receiver.
- Never operate two transmitters at the same time that are set with the same frequency channel and address code.

Group A - Jumper "J3" Closed						Group B - Jumper "J3" Open	
Channel	Frequency (MHz)	D0	D1	D2	D3	Frequency (MHz)	Channel
A1	447.8625	ON	ON	ON	ON	447.275	B1
A2	447.8750	OFF	ON	ON	ON	447.300	B2
A3	447.8875	ON	OFF	ON	ON	447.325	B3
A4	447.9000	OFF	OFF	ON	ON	447.350	B4
A5	447.9125	ON	ON	OFF	ON	447.400	B5
A6	447.9250	OFF	ON	OFF	ON	447.450	B6
A7	447.9375	ON	OFF	OFF	ON	447.500	B7
A8	447.9500	OFF	OFF	OFF	ON	447.550	B8
A9	447.9625	ON	ON	ON	OFF	447.600	B9
A10	447.9750	OFF	ON	ON	OFF	447.650	B10
A11	447.9875	ON	OFF	ON	OFF	447.700	B11
A12	447.8750	OFF	OFF	ON	OFF	447.750	B12
A13	447.9000	ON	ON	OFF	OFF	447.775	B13
A14	447.9250	OFF	ON	OFF	OFF	447.800	B14
A15	447.9500	ON	OFF	OFF	OFF	447.825	B15
A16	447.9750	OFF	OFF	OFF	OFF	447.850	B16





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CS 434 Frequency & Jumper Settings

Hetronic

SALS_009.0_CS 434

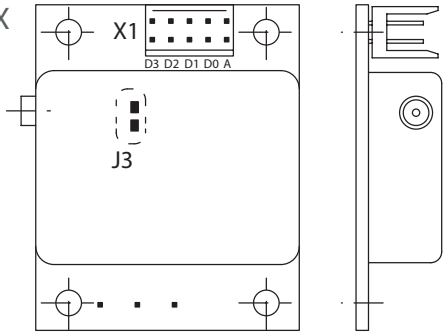
May 2003

The Hetronic Radio Remote Control System address code and frequency channel are set at the factory. The address code and frequency channel may need to be set if you have purchased a replacement or spare transmitter.

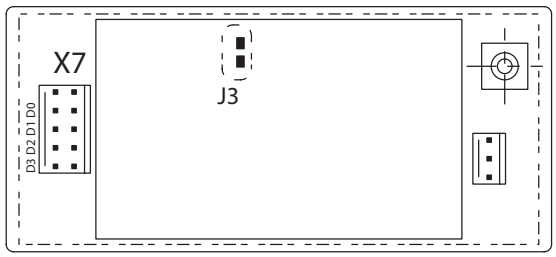
- Never change the address code or frequency channel of the original transmitter purchased with your system.
- Never change the address code settings in the receiver.
- Never operate two transmitters at the same time that are set with the same frequency channel and address code.

Group A - Jumper "J3" Closed						Group B - Jumper "J3" Open	
Channel	Frequency (MHz)	D0	D1	D2	D3	Frequency (MHz)	Channel
A1	433.875	ON	ON	ON	ON	433.900	B1
A2	433.925	OFF	ON	ON	ON	433.950	B2
A3	433.975	ON	OFF	ON	ON	434.000	B3
A4	434.025	OFF	OFF	ON	ON	434.050	B4
A5	434.075	ON	ON	OFF	ON	434.100	B5
A6	434.125	OFF	ON	OFF	ON	434.150	B6
A7	434.175	ON	OFF	OFF	ON	434.200	B7
A8	434.225	OFF	OFF	OFF	ON	434.250	B8
A9	434.275	ON	ON	ON	OFF	434.300	B9
A10	434.325	OFF	ON	ON	OFF	434.350	B10
A11	434.375	ON	OFF	ON	OFF	434.400	B11
A12	434.425	OFF	OFF	ON	OFF	434.450	B12
A13	434.475	ON	ON	OFF	OFF	434.500	B13
A14	434.525	OFF	ON	OFF	OFF	434.550	B14
A15	434.575	ON	OFF	OFF	OFF	434.600	B15
A16	434.625	OFF	OFF	OFF	OFF	434.650	B16

TX



RX



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Limited Warranty and Terms of Sale

Hetronic USA

WRTY_002 Warranty & Terms
April 2003

Price: Subject to Change Without Notice
Terms: Net 30 Days
F.O.B: Hetronic USA, Inc.
Oklahoma City, Oklahoma

Hetronic, Inc., hereafter referred to as Company, guarantees all items manufactured by it against any defects of material and/or workmanship for a period of one year from the date of shipment. Company makes NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AS TO THE MERCHANTABILITY OR FITNESS OF THE ITEMS FOR THEIR INTENDED USE OR AS TO THEIR PERFORMANCE. Any statement, description or specification in Company's literature is for the sole purpose of identification of items sold by the Company and imparts no guarantee, warranty or undertaking by Company of any kind. Components and accessories not manufactured by Hetronic are not included in this warranty and are warranted separately by their respective manufacturers.

Company's sole liability shall to be to repair at its factory, or replace, any item returned to it within one year from date of shipment, which Company finds to contain defective material or workmanship. All items to be repaired or replaced shall be shipped to Company (Note: return authorization by Company is required) within said one year period, freight prepaid, as a condition to repair or replace defective material or workmanship. Company's herein assumed responsibility does not cover defects resulting from improper installation, maintenance, or improper use. Any corrective maintenance performed by anyone other than the Company during the warranty period shall void the warranty. Company shall not be liable for damages of any kind from any cause whatsoever beyond the price of the defective Company supplied items involved. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of the use of any Company supplied items or materials.

List prices or discounts are subject to change without notice. Quoted prices will be honored for a period of 90 days from the date of the written quotation unless otherwise stated.

Orders are not subject to alteration or cancellation except upon written consent of Company and payment of proper cancellation charges, when deemed applicable by Company.

Materials or items may not be returned for credit, without the prior written consent of the Company. Any authorized return of materials or items shall be subject to a restocking charge equal to 20% of the net invoiced amount after Company determines that the material or item is in good condition and may be resold without alteration or service.

Terms of payment are NET 30 days. All materials and items are sold F.O.B. Company's shipping point. Company retains a security interest in all items sold by it so long as they remain in Company's possession to secure all obligations of purchaser to Company. A processing fee will be applied to all invoices for requested prepaid freight charges other than UPS. A service charge will be incurred on past due accounts extending beyond the terms of sale described above, at a rate of 1.5% per month of the net balance extending beyond 30 days.

The buyer should inspect the goods immediately on their arrival and shall within five days of their arrival give written notice to the Company of the claim that the goods do not conform with the terms of the contract. If the buyer shall fail to give such notice, the goods shall be deemed to conform with the terms of the contract. Any claim for material or item shortages must be accompanied by copies of the bill of lading and packing slip.

Delivery schedules or commitments are based upon current production capacities, material or component availability and inventory and may be changed as conditions require. Company shall not be liable for loss or damage of any kind resulting from delay or inability to deliver on account of fire, labor troubles, accident, acts of civil or military authorities, or from any other cause beyond Company's control.

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