



*User's Manual*

***RX-MFS-ESCAN-HS1A***

## Introduction and Functional Description

We congratulate you on the purchase of your new Hetronic RX-ES-CAN-HS1A Receiver. You have chosen a high-quality product. Familiarize yourself with the unit before using it for the first time. In addition, please carefully refer to the operating instructions and the safety advise given in this manual. Only use the product as instructed and only for the intended field of application. Keep these instructions in a safe place. If you pass the product on to anyone else, please ensure that you also pass on all the documentation with it.

## Production and System Numbers

Before contacting your dealer or Hetronic about service, repair or replacement parts, note the equipment Production and System numbers. These numbers are located on the silver label affixed to the unit.

## Before Operating Your Wireless Control Unit

Confirm that installation of all your system components has been properly completed. Before start up, **ALWAYS** confirm that the machine and radio remote control Stop functions work properly.

Understand all Safety Precautions provided in the manuals and review control functions and operation of the machine and this radio remote control system. When not in use, turn the receiver off and disconnect all power sources to prevent unauthorized use.

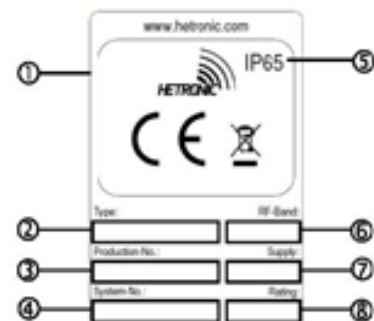
Ensure that the USB Dongle (which acts as a security key to program the receiver) is kept in a separate but safe and secure place. If the machine does not respond properly, immediately stop operation. Turn off the unit and report the condition to your supervisor.

Turn off the receiver and disconnect all power sources before any maintenance work is done. Installation, setup, and service must be performed by authorized and qualified personnel only.

## Unit Labels

### Product Rating Plate

1. Specific approvals, such as CE, FCC, IC, etc.
2. Type of receiver
3. Eleven-digit production number
4. Eleven-digit system Number
5. Ingress protection rating
6. Frequency information
7. Supply voltage
8. Current rating



*Product Rating Plate*

## DESCRIPTION

RX-MFS-ESCAN-HS1A is an MFS 2.4GHz receiver with 2 CAN Interfaces, 2 independent E-Stop Relay Outputs, 2 Application Relay Outputs, 4 optional 0~10V, 0~20mA analog or 0~30V digital inputs, a USB and an optional RS232 interface. It shall be equipped with RTC and SD card for data logging capability. It is designed for applications using CAN bus topology to integrate a number of devices and operating on 12 or 24V battery.

The function of this device is to provide a bidirectional RF control to CAN bridge in a machine control application, along with standard Main Contact safety functionality. Receiver and CAN settings shall be H-Link configurable and are saved to an on-board EEPROM.

RX-MFS-ESCAN-HS1A uses the MFS 2.4GHz communication protocol. The decoder receives control packets at a 1%-10% duty cycle to the receiver and transmits one feedback packet for every control packet. The feedback packets are sent on one of the sixteen IEEE 802.15.4 ISM-band channels, ranging from 2.405-2.480GHz. The channels and duty cycle are configured with the H-Link software. The packets are DSSS O-QPSK modulated using an on-board surface-mount transceiver and then amplified through an on-board surface-mount bi-directional RF Front End. The RF signal goes through a surface-mounted SMA connector, through a 50-ohm coaxial cable to an external antenna for transmission/reception. The external antenna is a Hetronic Gainflex 2.4GHz antenna (Hetronic Part Number 56506605) with a nominal gain of 3dB.

- The antenna is **Model:** 56506605 – **Manufacturer:** APEX - Gainflex Type GK 442TF R Half wave flexible dipole – maximum power 10W – TNC Plug Reverse Polarity
- Antenna Gain: 3 dB

## TECHNICAL SPECIFICATION

Operating Temperature	-20° to +70° Celsius
Storage Temperature	-40° to +85° Celsius
Environmental Protection	IP65
Supply Voltage Range	9-24 VDC, 3A Max
Jumpers	J1, 2: Relay1,2 unswitched coil supply select J3: RS232 Bootloader Select J4: CAN1 termination resistor enable J5: Main controller RTC backup battery connect J7: CAN2 termination resistor enable J10: Internal 5V or External Supply for digital outputs
Outputs	2x Main Contact Safety Relay (250VAC/8A max) 2x Relay Output (SPDT, 250VAC/30VDC/8A max) 4x Digital Output (24VDC/15mA max) 1x Optional Output Supply (5VDC/750mA max) 1x DK31 Safety Signal (5VDC/15mA max) 1x DK32 Safety Signal (5VDC/15mA max) 1x RS232 Interface 1x USB Device Interface 2x CAN Bus (1.5kV isolation optional)
Inputs	2x Main Contact Relay Input (250VAC/8A max) 2x Relay Input (250VAC/30VDC/8A max) 4x Analog Inputs (0-10V, 0-20mA Analog or 0-24V Digital) 1x Optional Input Supply (5-24VDC/750mA max) 1x RS232 Interface 1x USB Device Interface 2x CAN Bus
Serial Interfaces	1x RS232 Interface 1x USB Device Interface 2x CAN Bus

All specifications assume a 50 $\Omega$  input and load.

## **FUNCTIONAL DESCRIPTION**

### **Operation**

As a standard Hetronic MFS receiver, this module is equipped with 2 microcontrollers, Main and Stop, for safety and redundant control of E-Stop Relay outputs. The Stop controller is common to standard 2.4GHz MFS receivers. The Main controller will have full control of RF, analog inputs, digital outputs, USB, RS232 and CAN interfaces.

There are 2 CAN interfaces, namely CAN1 and CAN2, with optional isolated supplies, RS232 interface with a 4-pin Dubox header and a USB interface that can be used for firmware update and H-Link configurations.

CAN2 will be dedicated to J1939 protocol for possibility of controlling and monitoring other devices on the truck using J1939 protocol. CAN1 will be used as a CAN Master on CAN open protocol to control and monitor other Hetronic Slave devices.

RTC with a back-up battery shall be used to keep time for data logging of different possible events such as abnormal conditions and operating times.

Nominal operating voltage range will be 9 to 24Vdc. Electronic control unit will remain operational within 6 to 36Vdc.

## **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 features 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.

## 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.

## **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.

## **Installation**

### **Pre-Installation Precautions**

1. Make sure the transmitter and receiver have identical ADMO numbers and channels.
2. Make sure the receiver is not set to the same channel as any other systems in use in the surrounding area.
3. Make sure that the controller or equipment is working properly prior to radio remote control installation.
4. Make sure the power source to the receiver is set correctly.
5. Switch off the main power source to the controller or equipment prior to installation.

## Step-By-Step Installation

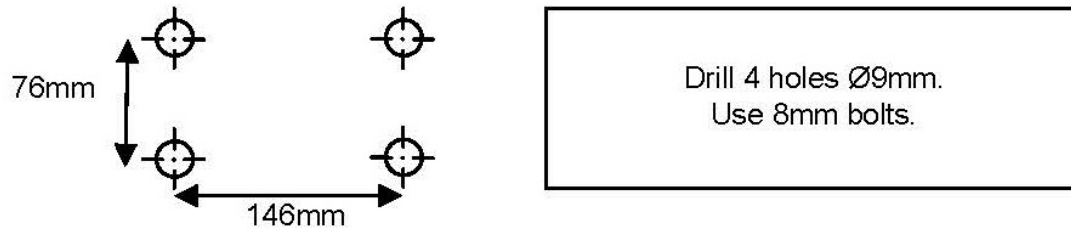
1. For the Radio Remote Control to operate smoothly, the receiver should be installed in such a position as to allow the maximum reception of radio waves from the antenna. Thus, for best reception the location of the receiver should be such that it is visible to the operator at all times.
2. The location selection should not be exposed to high levels of electric noise and should not be surrounded by metal or other conductive materials. Mounting the receiver next to an unshielded variable frequency device may cause interference. The metallic parts of the machine to be controlled that surround the receiver create a barrier that interferes with reception of the transmitter signal. Always locate the receiver as far away from variable frequency drives as possible. Sometimes, however, in extreme cases and if the space is inadequate, installation needs to be carried out inside the electrical boards or in areas of the machine that are not ideal for good radio reception. Should this kind of installation be necessary, then the equipment must be provided with an additional antenna using an extension to be placed on the outside. Your dealer will be able to provide further detailed information regarding the most appropriate items specific to the application.
3. Ensure the selected location has adequate space to accommodate the receiver. Always locate the receiver so as to avoid the possibility of damaging the antenna. In most cases, the receiver can be housed on any side of the machine or, if necessary, for installations on vehicles even inside the glass cabin. It is also necessary to place the receiver where it is accessible and safe to work both for those who carry out the installation of the electrical connections and for those who will carry out future maintenance.
4. Depending on the application, the receiver should possibly be installed in such a manner that any connectors or cable plug holes face downwards. Consult with a Hetriconic expert for best antenna mounting orientation on your application





5. Should such an installation be performed on board mobile machinery or on a vehicle, then you should attach four rubber bumpers that can be ordered directly from your Hetronic dealer, unless already supplied as standard fittings on the radio control type in use. These rubber bumpers will dampen the strong vibrations coming from the machine from reaching the receiver.

6. Determine the position where the enclosure is to be mounted and drill the holes as per diagram below.



*Drill pattern for standard ES-CAN HL Receiver*

## **Troubleshooting**

If your ES-CAN HL receiver does not operate as required, follow the recommended troubleshooting sequence to help isolate the cause and determine corrective action. If you need more information, contact your nearest Hetronic dealer.

<b>PROBLEM</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTION</b>
Receiver does not power up	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
	Incorrect input voltage supplied	Check input voltage. Check requirements on drawings
	Blown fuse in receiver	Check all fuses and replace if needed
	Incorrect wiring	Check input voltage connections
Transmitter is transmitting (Power LED flashing), but machine will not respond	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
	Transmitter/receiver frequency channels do not match	Follow instructions under "Setting Frequency and channels" or contact your supervisor
	Transmitter out of range	Take the transmitter back into the range of the receiver, press START
	Receiver power off	Turn on power to receiver
	Blown fuse in receiver	Check all fuses and replace if needed
	STOP failure in receiver. Red STOP LED on PC board is illuminated	Contact your supervisor
All machine motions operate intermittently	Receiver antenna connection is loose or missing	Tighten or replace antenna
	External antenna (if used) has loose connection, poor grounding or interference	Tighten antenna and ground connection. Contact Hetronic or your Dealer for more information
	Connector inside receiver is loose	Check all connectors, reseal if needed
	Another frequency may be interfering with the system	Contact your supervisor
Some machine motions operate intermittently	Receiver antenna connections may be loose to those specific machine motions	Check connections from the receiver to the machine motions
	Connectors inside receiver are loose	Check all connectors, reseal if needed
	Receiver antenna connection is loose or missing	Tighten or replace antenna
Outputs do not correspond to transmitter functions	Incorrect output connections	Check system wiring. Refer to output connection diagram

*Troubleshooting tips*

### **FCC Part 15 Notice**

“This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.”

### **ISED RSS-Gen Notice**

“This device complies with Industry Canada’s licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.”

“Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes :

- 1) l’appareil ne doit pas produire de brouillage;
- 2) l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.”

### **For Canadian User**

CAN ICES-3 (B)/NMB-3(B)”

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

“Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment”

The FCC/IC ID label must be visible through a window, or it must be visible on an access panel, door or cover that is easily removed. If neither of the above is possible, a second label must be placed on the outside of the device that contains the following text: “**FCC ID: LW9MFSCANHS1A.**”

“**IC: 2119B-MFSCANHS1A**”

### **RF Exposure**

The Hetronic RX-MFS-ESCAN-HS1A equipment has been approved for mobile applications where the equipment should be used at distances greater than 20cm from the human body. Operation at distances of less than 20cm is prohibited and requires additional SAR evaluation.

### **Exposition RF**

L'équipement Hetronic RX-MFS-ESCAN-HS1A a été approuvé pour les applications mobiles où l'équipement doit être utilisé à des distances supérieures à 20 cm du corps humain. L'utilisation à des distances inférieures à 20 cm est interdite et nécessite une évaluation SAR supplémentaire.