



RRC – Q&A

What is RRC (Radio Remote Control)?

RRC allows the remote operation of heavy machinery (LHDs, drills, wheel loaders, excavators, dozers, rock breakers) from up to 300 metres away.

What is its function?

The primary function of RRC is to remove the operator from the cab and enable the machine to enter and operate in a dangerous area, thus keeping the machine operator safe.

What types of heavy machinery is RRC compatible with?

RRC is brand compatible to work with any make, model or year of heavy machinery.

What is the range of the system?

On surface it is up to 300 metres. Underground it depends on the environment.

What variables of the environment affect operation?

This can include the angles and size of the tunnels and the materials being mined.

How does it communicate to the machine?

It connects through the radio cans, which are spread spectrum radios, and they are locked in between 900 and 928 MHz. And then we assign a link ID to the units to ensure they do not communicate with any other remotes in the area. (Please refer to document at end of Q&A on page four titled “MUCKMASTER Radio Remote Control System 900MHz Radio Specifications”)

What safety features does the system have?

One of the major features is the link ID, it stops any other radio in the world from being able to take control of our remotes. This also ensures that our own remotes cannot miscommunicate with one another. Upon establishing the link, we look for a remote select input, a park brake input and a neutral input which ensures that the machine is in a safe and stopped position before entering or exiting the cab of the machine. We also have timeouts on the transmitter units so that if an operator puts the transmitter down and tries to approach the machine – there is a timer built into it that would actually e-stop the machine and shut it down so nobody is entering an area where a piece of equipment is under remote control. There is also the fatigue factor. If an operator falls or anything like that, we have tilt switches built into our units so that if they do fall the remote will e-stop itself as well.

Is RRC equipped with a tilt switch?

Yes, RRC is equipped with a 45-degree mercury switch.

What does Line of Sight (LOS) mean?

This refers to the physical line of sight the operator has to the machine.

What frequencies can the LOS system run on?

900 MHz, 2.4 GHz and 5.8 GHz. Bluetooth 2.4 communication is also available.

**Is RRC customizable?**

Since HARD-LINE is the manufacturer of the system, RRC can be customized to accommodate specific control layouts or features required by the customer.

How long have we been producing LOS systems?

Over 26 years.

What hardware would typically need to be added to a machine?

This is machine dependent. HARD-LINE develops a Drive by Wire interface for all types of machines including mechanical, hydraulic, and electric machine types. This can include some electronic modules, cabling, a receiver, and a hydraulic interface if required.

What are the benefits of HARD-LINE remotes?

The first benefit is the increase in safety for the machine operator. The next benefit is that HARD-LINE enables the mine to adopt one remote solution for its entire mine site which has translated to increased operator familiarity that results in increased safety and efficiency. Additionally, because RRC was purpose-built for mining applications it is robust and simple to maintain.

Are RRC remotes compatible with the TeleOp system?

Yes, there is a cost savings when upgrading from RRC to TeleOp due to the Drive by Wire interface already being installed.

What is the difference between an RRC system and a TeleOp system?

The primary difference is the method of communication. TeleOp communicates through Wi-Fi or LTE which requires a fixed infrastructure whereas RRC radio does not. The other major difference is that TeleOp enables you to select an office-like location for the operator whereas with RRC the operator is still working close to the work zone.

What new technologies for RRC are you planning on rolling out in the near future?

As technology evolves, we've continued to update the product to be more powerful and require less power consumption and we have continued to support our original design. Since RRC is a proven product, we plan to maintain our solid track record with this product.



MUCKMASTER Radio Remote Control System 900MHz Radio Specifications

Spread Spectrum Radio - Operating in the 902-928MHz Frequency Range

Transmitting radio signals by rapidly switching a carrier among many frequency channels, using a pseudorandom sequence known to both transmitter and receiver.

HLS HARD-LINE Solutions Inc. Radio Link Identification

“Every single radio that is released from factory is pre-set with a unique link ID that is not field-changeable. Each radio is sold as a pair that communicates only with its mate. This means that it is impossible for two different radios to confuse controls.”

The HARD-LINE radio is designed to be completely Fail-Safe. 40 times each second, the Master and Slave units will have a closed-loop communication. Each packet will include a Link ID, control information, and all pertinent safety checks to ensure data integrity. If any data in the packet is corrupted or if the packet doesn't have the proper Link ID for that particular unit, the packet will be discarded, and no functions are updated. Upon receiving 5 consecutive corrupt packets or if 5 packets are missed, link will be dropped with every function brought to a safe state.

When two remotes are being operated in close proximity to each other, one remote will receive packets from other remotes that are in the area because they are on the same frequency channel. Since the Link ID will not match, the packet will be discarded and link may drop, shutting down safely. To make this happen less frequently, remotes that will work in close proximity can be put on different frequency channels so interference will be reduced. The default channel is centered at 908.5 MHz, but there are a total of 5 channels to select from.

Many customers operate multiple machines in close proximity when drawing from the same stope, drilling, and mucking at the same time, and when a machine is buried, they will operate 2 LHD's in remote to pull the machine out.

HARD-LINE cannot comment on how other radio remote control systems function.