Basket/Observer Dual Radio Remote Control System

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Introduction

The Redmond Gary Basket/Observer Dual Radio Remote Control system provides safe and reliable wireless control of the machine from the operator's radio remote in the basket.

Emergency control from the Observer's radio remote is activated by switching to Take Control. All functions are then controlled by the Observer's radio remote.

Warnings on Use

1. The radio remote control system must only be operated by persons competent in its use, and in the use of the machine being controlled (or be acting under the instruction of a competent person for training purposes).

2. Whilst the nominal operating radius of the control system is 150m, it is possible to control the machine from far greater distances under some circumstances.

3. The radio remote must never be operated out of sight of the machine

4. The radio remote must never be operated when motion of the machine is not desired (e.g. when training or testing) without suitable isolation policies in place.

5. Never leave an unattended radio remote turned on – turn the keyswitch to the OFF position and remove the key if necessary.

6. If any hazard arises that requires the machine to be stopped, press the STOP button in and turn the key to the OFF position.

7. Keep the radio remotes and receiver free of dirt and other deposits and immediately replace any seals that are damaged.

8. Never use solvents, corrosive or flammable chemicals to clean the system.

9. Never use steam or pressure cleaners to clean the system.

Components

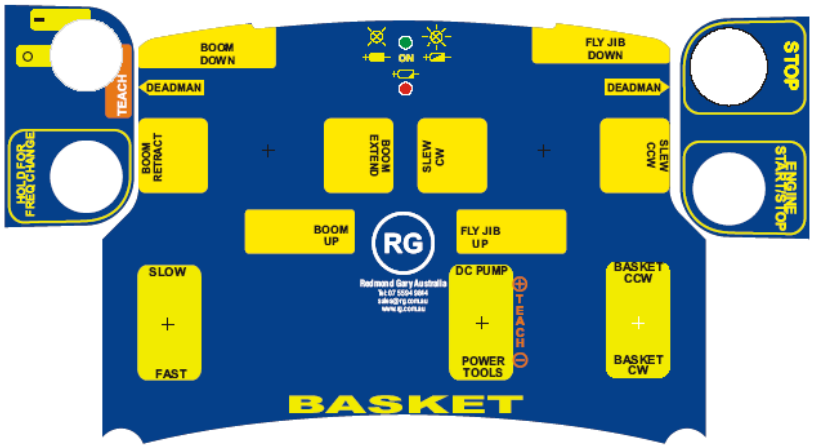
The complete radio remote control system comprises:

- Basket Radio remote
- Observer Radio remote
- Basket Receiver
- Observer Receiver
- Interface Module

Each radio remote sends encoded signals over a radio link. These are then decoded by a matching receiver which enables it to operate the corresponding outputs. The interface module is wired to both receivers and controls the hand-over of control from one to the other. The interface module monitors the actual direction of the valve spool movements simultaneously and compares these with the commanded direction. If a valve moves in the opposite direction to that commanded, power is removed from the outputs immediately.

For service and advice, please call
Redmond Gary's Service Department – Ph: 07 5594 9844

Operator Controls



The radio remotes have the following controls and indicators:

Keyswitch (OFF-ON-TEACH).
Used to turn the radio remote on and off – the key can be removed in the OFF position to isolate the system.

The TEACH position is used only for maintenance purposes. The system will not start if the key is in this position.

STOP Button
Pressing the STOP button will cause all outputs from the radio remotes to drop, and machine motion to cease.

The system will restart when the STOP button is released by twisting clockwise, so long as all other controls are in the neutral positions.

Deadman Buttons.
To activate any of the motion commands (Boom Up/Down, Boom Extend/Retract, Fly Jib Up/Down, Slew CW/CCW, Basket CW/CCW), the operator must also hold down at least one of the two Deadman buttons. (**Deadman button must be pressed first)**

Proportional Joysticks.
The proportional control functions (Boom Up/Down, Boom Extend/Retract, Fly Jib Up/Down, Slew CW/CCW) are controlled from the proportional joysticks. The speed of the motion increases the further the joystick is moved from the rest position.

The joysticks are gated so that they can only move one function at a time. This reduces the risk of inadvertent movement in a second direction.

Note that for the joysticks to cause motion, at least one Deadman button must be held down at the same time.

Slow/Fast Switch
This toggle switch changes the maximum speed possible with all of the proportional joysticks. In the slow position, the joysticks will operate the machine with reduced speed across the full travel of the joystick.

DC Pump / Power Tools.
This toggle switch is OFF in the centre, and must be in this position to start the system.

When the toggle is moved to the Power Tools position, hydraulic pressure is available to the outlet in the basket, but all other motion functions are disabled.

When the switch is moved to the DC Pump position, the battery-powered hydraulic pump will run when the Deadman button and joystick function are selected.

Basket Rotate CW/CCW Toggle
This switch provides ON/OFF (not proportional) control of the basket-rotate motion.

This toggle switch is spring return to OFF position therefore has to be held in required position. The Deadman must be held at the same time.

Engine Start/Stop
Pressing this button alternately starts and stops the truck engine. The ignition must be turned ON in the truck.

Frequency-change button
If the radio control system is suffering interference (which normally manifests as random STOPs of the control system), then the operating frequency of the radio remote can be changed. Holding this button down for 8 seconds will cause the red and green LEDs to flash and the radio remote to emit a beep. The system will restart on a new frequency.

Observe/Take-Control Toggle (Observer only – not present on Basket Remote)

Normally, the machine is controlled from the radio remote in the Basket, and this toggle remains in the Observe position. In that mode, the Observer's controls do not operate, with the exception of the STOP button. For the vehicle to operate, the Observer's radio remote must be running, and the STOP button released. If the STOP button is pressed on the observer's radio remote, then the system will stop, regardless of the actions undertaken at the Basket radio remote. It is also possible for the Observer to take full control of the machine, by moving this toggle to the Take-Control position. In this mode, the observer's radio remote is fully-functional and overrides all Basket controls, including the Basket STOP.

Green and Red LED

In normal operation, the green LED flashes slowly to indicate that the system is operational. If the battery level falls to a point where there is only about 15 minutes of capacity remaining, then the green LED will start to flash rapidly. The operator should make plans to replace the battery with a charged one as soon as possible. If the battery level falls still further, then the red LED will light, indicating that there is only a few minutes of operation remaining. The machine should immediately be moved to a safe location, and the battery changed.

Operation

Basket radio remote

- Place a charged battery into the basket radio remote
- Radio remote should be operated only when placed in the basket-mounted receptacle and the anchor straps are locked into place
- Ensure that the STOP button is out, and that the DC-PUMP / POWER-TOOLS switch is in the centre (OFF) position
- Turn the keyswitch to the '1' position

  The radio remote should start. The green LED commences flashing at about 1Hz.

  If the radio remote does not start, check that the STOP button and all actuators are in the normal positions, and that the battery is charged. Refer to the Fault-finding section as necessary.

Observer Radio remote

Repeat the above procedure for the Observer radio remote also, noting that the TAKE-CONTROL toggle switch should be in the Observe position for normal operation.

Pre-usage Test

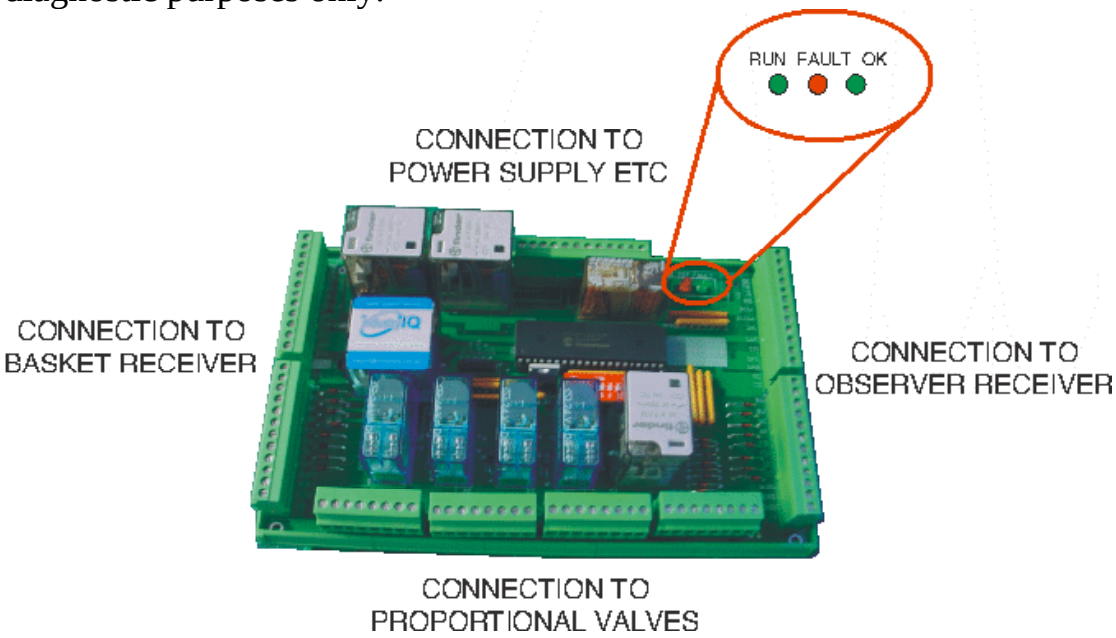
Before each usage session, test that the STOP command on the transmitter removes hydraulic power, and that all motion functions are operating correctly. It is recommended that these tests be undertaken first from the Basket radio remote, and then from the Observer radio remote (in Take Control mode).

Audible Alarm

The radio remote will emit an audible alarm when signal is not being transmitted correctly or there is interference from another source.

Interface Module:

In normal operation, no interaction is required with the Interface Module. Information on the operation of the module is provided here for diagnostic purposes only.



The purpose of the interface module is to arbitrate the handover of control between the observer and basket receivers and to monitor operation of the valves. When the system is operating normally from the basket radio remote and the observer radio remote (in Observe mode), the commands from the Basket receiver are passed through to the machine. If the Observer enters Take-Control mode, then the Basket STOP is bypassed, and the outputs of the observer receiver are passed through to the machine. Regardless of the mode, the commands given to each of the four proportional valves are monitored by the interface card, which also monitors the actual direction of movement (via feedback signals from the valve).

If a valve ERR alarm activates, or it moves in the opposite direction from that commanded for a period exceeding the programmed threshold, then the interface card will enter a fault condition, and remove power from the actuators. To reset this fault, the radio remote must be turned off, then on again.

The interface card also includes the facility for an Override input that will disable both receivers by removing power from them.

In normal operation, the LEDs behave as follows:

- RUN LED – flashes at about 1Hz
- FAULT LED – off
- OK LED – on

If a direction error is detected, then the LEDs behave as follows:

- RUN LED – flashes at about 1Hz
- FAULT LED – on
- OK LED – off

The DIP switches located on the interface card determine the expected direction of movement for each valve, and set the timeout period before a fault condition is entered. These are preset to the correct settings, and should not be altered unless under the advice of Redmond Gary.

Receivers

In normal operation, no user interaction is required with the receivers – this information is provided for diagnostic purposes only.

There are two LEDs visible from the outside of the receiver – POWER and ENABLE. The POWER LED is normally illuminated, but note that the Basket receiver will not be powered if the Observer radio remote is in Take Control mode. Neither receiver will be powered if the Override input to the interface card is on.

The ENABLE LED on each receiver should be lit if the receiver is powered, and the corresponding radio remote is operational.

Maintenance

No special maintenance procedures are necessary on the radio control systems, but the systems should be tested before each use. If any anomalies are detected, the systems should be removed from service immediately, and the problem reported to Redmond Gary.

When not in use, the radio remotes and batteries should be stored in a cool dry location out of the sun. The radio remotes and batteries should be kept clean and all seals regularly inspected for damage. No solvents, corrosive or flammable chemicals, pressure cleaners, or steam cleaners may be used. The battery terminals and contacts should be kept free of dirt and contaminants.

Battery Care

The supplied batteries are NiMH types with a nominal voltage of 7.2Vdc. They will power the radio remote for a period of approximately 8-10 hours before requiring a charge. The charger is permanently powered, and commences charging when a battery is inserted, at which time the "ON CHARGE" red LED will light. When charging is complete, the green "END OF CHARGE" LED will illuminate. Every time that a battery is inserted, the charger will initiate a complete charge cycle. For that reason it is important that

- The flat battery is inserted into the charger
- A battery can be removed before the charge is complete
- Redmond Gary Australia now uses Smart Chargers which will only charge as required.

Batteries should be used, charged and stored within the temperature range of 5-35^{O}C.

Teach-in of Speeds

It is possible to change the minimum and maximum speeds associated with each direction of the proportional valves for both Slow and Fast speeds.

These settings may be altered from the radio remote using a Teach-in procedure once a programming key has been inserted in the receiver. If re-programming of the operating speeds is required, **contact Redmond Gary Australia.**

Fault-Finding

Should operation not be as expected, then the following guide will aid in isolating the cause. If the problem cannot be identified using these guides, contact Redmond Gary for further assistance. The possible causes listed should be investigated in the order given.

Fault: Radio remote will not start (i.e no flashing green LED)
Possible Causes:

- Key not in '1' position
- Flat battery
- STOP button is in
- DC-PUMP/POWER-TOOLS toggle is not in the OFF position
- Joystick or pushbutton not in the neutral position
- Loose internal connection
- Faulty Radio remote

Fault: Radio remote green LED flashing, but no machine operation
If: Receiver POWER light is not illuminated. Possible Causes:

- Basket system is bypassed by the Observer
- Radio control system has been isolated by the manual controls
- Failure of power supply to interface card
- Fuse failure in receiver
- Faulty interface card
- Faulty receiver

Fault: Radio remote green LED flashing, but no machine operation
If: Receiver POWER light is illuminated but ENABLED light is not.
Possible Causes:

- Interference – change radio frequency from the radio remote by holding the 'CHANGE FREQUENCY' button down for 8 seconds.
- Faulty radio remote
- Receiver diagnostic error. Cycle power – if fault persists, replace.

Fault: Radio remote green LED flashing, but no machine operation
If: Receiver POWER and ENABLED lights both lit
Check: Interface module LEDs
If: Interface module RUN is flashing, FAULT is lit. Possible Causes:

- A direction error has been detected, or a valve ERR signal has been detected. Check valves, and the 3 feedback signals coming from them to the interface card.

If: Interface module RUN is not flashing. Possible Causes:

- Loss of power to interface card
- Faulty interface card

If: Interface module RUN is flashing, OK is lit, FAULT is not lit
Possible Causes:

- STOP active elsewhere on vehicle
- Faulty receiver or cabling
- Faulty interface card

If the problem cannot be isolated, **contact Redmond Gary Australia**.

Specifications

Radio remote

Frequency range	433.100 – 434.6875 MHz
Radio Channels	64
Channel Spacing	25kHz
Modulation	GFSK
Transmitting Power	<10mW
Protection	IP65
Battery	7.2V 1300mAh NiMH
Operating Time	8-10 hours
Battery warning time	Approx 15min (pre-warning), 3 mins
Weight (with battery)	< 2kg
Dimensions	236x160x173 mm

Receiver

Hamming Distance	>=8
Probability of non-recognition of error	$< 10^{-11}$ typical
Working range	150m typical
Temperature	-20 to +70 ^{o}C
Passive Emergency time (signal loss)	500ms
Response Time	70ms typical
Sensitivity	0.5uV (20dB SINAD)
Dimensions	180x230x95 mm
Protection	IP65
Weight	2.8kg