SCANRECO

Radio Remote Control

Instruction Manual

Remote Control system RC400

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1 General

1.1 Terminology

Abbreviation	Description
PCU	Portable Control Unit
CU	Central Unit
LED	Light Emitting Diode
DV	Dump Valve

2 Preface

2.1 General information

This manual is intended as a complement to the crane / machine instruction book and covers the Scanreco RC 400 Remote Control System.

The Scanreco RC 400 offers the driver an extremely advanced remote control system with speed, precision, control and maximum safety.

In order to ensure your safety and the safety of your crane / machine you should study and learn these instructions. This will enable you to quickly familiarise yourself with your new remote control system and how to utilise it.

- Remotely controlled cranes may only be operated by qualified personnel. The driver must be aware of the contents of chapter 4 "Safety regulations and Operating instructions" before operation is started. Serious accidents may occur if these instructions are not followed.
- To protect the portable control unit from damage and for safety reasons, the control unit must be kept in a locked cab.
- Follow the instructions given in the crane handbook regarding moving the crane from its parking position, the best arm positioning while loads are being handled and parking of the crane.
- Due to the unlimited variety of cranes, machines, objects, vehicles and equipment on which the remote control system are used, and the numerous standards which are frequently the subject of varying interpretation, it is impossible for the personnel at Scanreco to provide expert advice regarding the suitability of a given remote control for a specific application. It is the responsibility of the purchaser to determine the suitability of any Scanreco remote control product for an intended application and to insure that it is installed and guarded in accordance with all country, federal, state, local, and private safety and health regulation, codes, standards and Scanreco recommendation (this manual). If the Scanreco RC 400 G4 will be used in a safety critical application, the customer / driver must undertake appropriate testing and evaluation to prevent injury to the ultimate user. Scanreco does not take responsibility for any damage or injure
- Unauthorized tampering with Scanreco automatically invalidates guarantee.

To the operator:

Pause for a while and give yourself extra time to read chapters 3 (General system description) and 4 (Safety regulations and Operating instructions).

To the installer:

Pause for a while and give yourself extra time to read chapters 5 (Installation instructions) and "Inspection / Installation documents”.

2.2 Notice and Warnings

This equipment complies with part 15 of the FCC Rules and RSS-210 of IC 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. Changes or modifications not expressly approved by Scanreco Industrielektronik AB will void the user's authority to operate the equipment.

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 or more 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.

3 General system description

3.1 Schematic overview of Scanreco RC-400 G4

The Remote Control System is comprised of the following components (see figure 3.1):

Figure 3.1 Schematic overview of the Scanreco RC-400 G4.

General scope of delivery (see your specification and Figure 3.1).

No	Description	Qty
1	Portable Control unit (PCU) Chapter 3.2	1
1	Portable Control Unit Handy (PCU-H) Chapter 3.3	1
2	Central unit (CU) Chapter 3.4	1
3	Emergency stop box (Optional)	1
4	Cable kit supply cables + digital outputs	1
5	Cable kit valves cables (analogue outputs)	1

3.2 Portable Control Unit

The Portable Control Unit is impact, weather resistant, light weight and compact.

Figure 3.2 The Portable Control Unit.

The manoeuvre levers are fully proportional and have spring return to the zero position, i.e. a "dead-man's-handle". The control unit has a stop function which will immediately stop all movements.

All manoeuvre levers are protected with a protective frame against unintentional activation and against mechanical damage. A LED and sound signal are used to indicate such things as operating and battery status and for a simple and diagnostic fault finding (see Figure 3.2).

3.2.1 Stop function panel

There is a red stop function switch (**STOP**) with a manual twist reset, a push button and a red LED on the control unit's stop function panel, see figure 3.3.

The control unit is started with the spring reset push button (⏀)

All movement of the crane is stopped if the stop function is activated on the control unit. The red LED indicates operating and battery status.

Figure 3.3 View of a stop function panel.

3.2.2 Function switch (Fn)

The RC400 G4 offers two modes of operation controlled by the Function switch (Fn).

The function switch (Fn) switches the lever between controlling analogue outputs and digital outputs, this makes additional 8 on/off features eligible thru lever control.

The green LED Fn indicates current mode of operation, if the LED Fn is lit the levers operate the analogue outputs whilst if not lit the levers operate the digital outputs.

3.3.4 Technical data (PCU)

Item	Technical data
Battery pack	7.2 VDC
Portable Control Unit effective operating time	Approximately 8 hours per charge
Weight	1,45/1,70 kg. (without/with battery pack)
Dimension (W.H.D)	290x160x190 mm
IP class	IP65
Ambient temperature (Celsius / Farenheit)	-25°C to +70°C /approx. -15°F to to +160°F

3.2.4 Battery charger and battery charging

The battery charger is using two different modes of charging. Initially the unit will charge with a high current until the battery is charged, then it reduces to a trickle charge mode until battery is removed. The normal charging time for an empty battery is approximately 3 hours. The battery charger is designed not to damage the battery even with long continuous charging (see figure 3.12).

Figure 3.5 The battery charger.

3.2.5 Battery Charger installation

- The battery charger must be mounted in a vibration free area inside the cab or indoors and be protected against damp, direct sunlight and temperature variations.
- Operating ambient temperature is 0° C to +70° C, but could be narrower depending on the battery specification.
- The supply voltage to the battery charger should be +10 VDC to +35 VDC, externally fused with 3.0 Amp fuse.
- The batter charger is constructed so that no damage will occur from long continuous charging.
- Polarity for connection cable: Inc Marked Cable = +
- Maximum power consumption for battery charger with battery: ≈ 400 mA
- Power consumption for battery charger without battery: ≈ 10-20 mA
- After connection the cable connector, put the cable inside the cable track as illustrated in figure 3.13 below

Figure 3.6 After connecting the cable connector, put the cable inside the cable track.

3.2.6 Operation

The battery charger will start a charge cycle when a new battery is inserted (green LED starts blinking). After approx. 3 hours the battery is charged and ready for use (green LED is continuous ON). If the power supply is lost, the battery charger will remember the charging status and continue with a fast charge mode or trickle charge mode when the power is on again. As a safety precaution the charger will stop charging after 3 hours whether the battery is fully energized or not. The green LED will be continuously ON.

There are two LED indicators on the battery charger:

- Red LED (power) - Indicates supply power.
- Green LED (charging status) is blinking - Battery is charging (the charger is in fast charge mode).
- Green LED (charging status) is continuously ON - Battery is charged (the charger is in trickle charge mode).

3.3 Portable Control Unit Handy

The portable control unit Handy can be supplied with one step, two step or with innovative stepless infinitely variable (proportional) speed.

The innovative push buttons which operate with stepless infinitely variable (proportional) speed - remains in direct proportion to the push buttons displacement for maximum precision and performance of the crane/machine. Up to four proportional functions can be controlled simultaneously (Handy-10). This stepless infinitely variable speed is facilitated by an innovative unique push button technology design principle. The Handy series has large distinct push buttons and can be used wearing working gloves, and the units are in are robust, light-weight, innovative, user-friendly and functional design.

Figure 3.7 The Portable Control Units Handy.

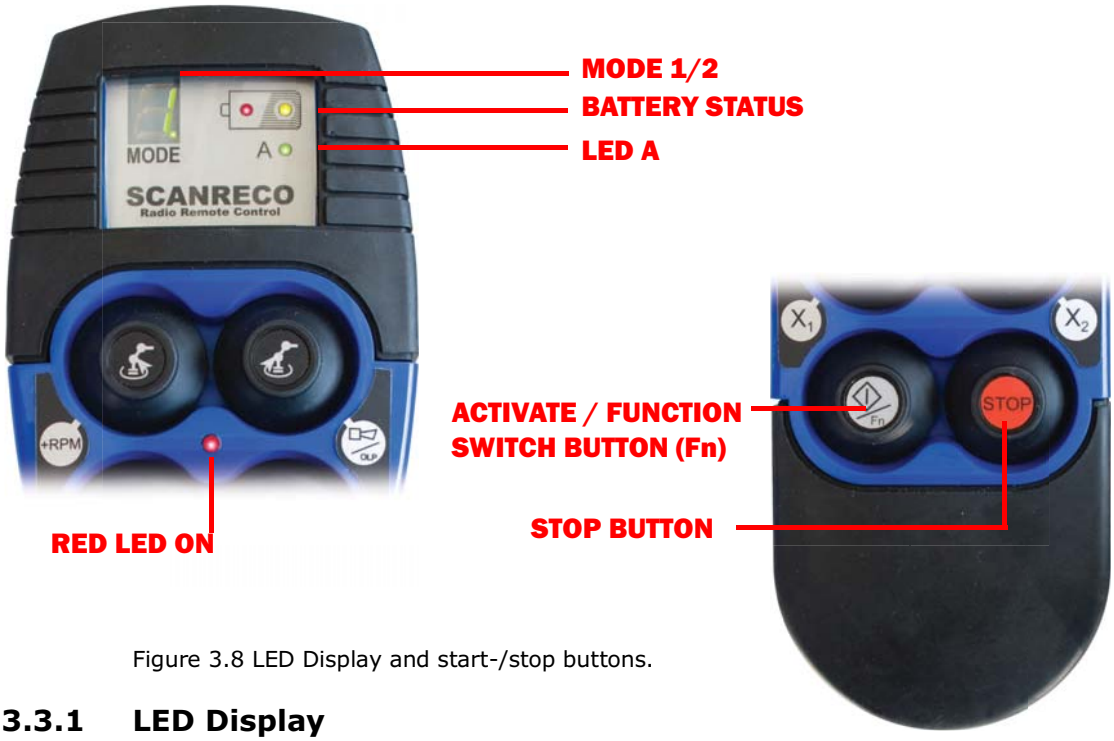

Figure 3.8 LED Display and start-/stop buttons.

3.3.1 LED Display

A LED indicate functional and battery strength status as well as providing a simple, diagnostic, trouble-shooting option.

The 7-segment display (MODE) indicates current mode of operation selected via the function switch (Fn)

1 = Analogue output mode

2 = Digital output mode

The battery indicator (High/Low) indicates current battery and charging status.

The LED ON indicates if the unit is activated or deactivated.

3.3.2 Stop button

Deactivates the unit and immediately disables all outputs on the Central Unit.

3.3.3 Activate / Function switch button (Fn)

To activate the unit; press and hold the Stop button, press once on the Activate / Function switch button and then release the Stop button.

The RC400 G4 offers two modes of operation controlled by the Function shift (Fn).

While active, the Activate / function switch button (Fn) switches the push buttons from controlling analogue outputs to digital outputs, this makes additional on/off features available (additional 4 functions for the PCU-H6 and additional 8 functions for the PCH-H6).

The 7-segment display (MODE) indicates current mode of operation (See chapter 3.4.1.).

3.3.4 Battery operation

20 hours operational life is guaranteed following charging. Recommended charging time is approximately two hours. The battery (powered by two NiMH AA-batteries) is housed inside the hand-held unit and can be easily changed by the operator.

When battery capacity is depleting the Portable Control Unit Handy will indicate this by the LED on flashing continuously and buzzer sounding simultaneously, the unit will be in an alarm state and no further operation is allowed until batteries are recharged.

If operation is required; recharge batteries, replace batteries or connect the battery charger in order to allow further operation. The batteries are rechargeable via standard +12/24 VDC cigarette lighter charger or optional 110/220 VAC- charger.

Figure 3.9 Battery housing, battery charger and batteries.

3.3.5 Battery charger and battery charging

Charger functionality

The PCU-H6 and PCU-H10 onboard charger is capable of charging NiMH batteries

To achieve maximum performance a number of different charging modes are used. The active charge mode is indicated to the operator by using different flashing rates of the charge LED.

Charge pending mode

This mode is indicated by a flash rate of 1 second (LED is lit for 1 second and dark for 1 second). This mode is entered if any of the following conditions is filled:

- Battery is fully drained and a trickle charge is active to revive the battery.
- A pre-charge qualification test is active to determine the battery health.
- The ambient temperature is above 40 degrees Celsius and charging is not allowed.
- The ambient temperature is below 0 degrees Celsius and charging is not allowed.

Fast charge mode

This mode is indicated by a flash rate of ¼ second (LED is lit for 250ms and dark for 250ms). This mode is entered if fast charge of the batteries is active. During fast charge the batteries are charged with a current of 1A.

Top off mode

This mode is indicated by a constantly lit charge LED. When fast charge mode is naturally terminated a top off mode is entered to ensure maximum capacity is reached. Top off mode is performed for 170 minutes with a current of 62.5mA.

Trickle charge mode

This mode is indicated by a constantly lit charge LED. Trickle charge is performed as long as the battery voltage does not exceed faulty levels and the ambient temperature is within limits.

No battery mode

This mode is indicated by a constantly lit charge LED. Once batteries are connected the proper mode will be entered.

Charge termination

The fast charge mode is terminated if any of the following occurs:

- Fast charge is active for more that 170 minutes.
- Negative peak voltage is detected; this detection is disabled for the initial 5.3 minutes of the fast charge period.
- Ambient temperature is above 40 degrees Celsius.
- Ambient temperature is below 0 degrees Celsius.

Important notice:

- Use only batteries / battery chargers supplied by Scanreco, Sweden, for the specific product.
- Do not charge batteries in a hazardous environment.
- Do not attempt to use a battery pack that is damaged, leaking, swollen or corroded.
- Avoid usage of battery / battery charger outside of the specified ambient temperature.

3.4 Central unit (CU)

The central unit is manufactured in plastic and is provided with contacts for connection for supply voltage, the electro-hydraulic converter valves, dump valve and ON/OFF functions.

Since the central unit can be exposed to very tough environments, the box is encapsulated to give protection from damp, heat, cold, dust, vibration and corrosive environments.

The central unit has short circuit proof inputs and outputs and has protection against polarity reversal, over-voltage, large incoming voltage transients and EMC / RF. Connection of the central unit can therefore be made without risk of damage. The central unit is delivered for supply voltages of +12 / +24 VDC (+/- 20 %) with negative ground. There is one standard car type fuse located inside the central unit.

Plus fuse: + 10 Amp.

A transformer for standard mains voltages can also be used to provide the central unit with supply voltage. Primary voltage: 110, 115, 220-240, 380, 440 VAC and secondary voltage + 12 / +24 VDC (+/- 10%).

The central unit is equipped with:

1. Standard antenna
2. Operational mode switch (Remote/Manual: See Chapter 4.2 Operational instructions)
3. Programming port
4. Status LED´s
5. 7-segment LED Display

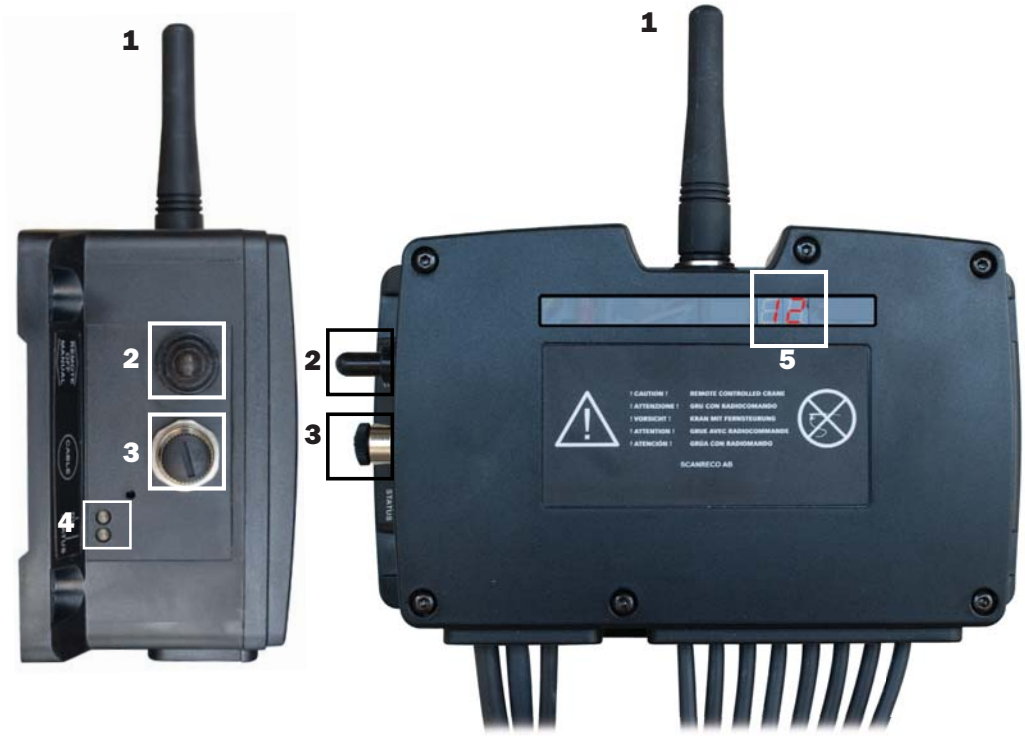

Figure 3.10 The central unit.

4 Safety regulations and operating instructions

4.1 Safety regulations

These instructions cover those special regulations which apply for remotely controlled cranes. The driver must be aware of the contents of these safety regulations.

Remote controlled cranes may only be operated by trained personnel. The portable control unit must never be passed over to any person who has not received training for remote controlled cranes. If these instructions are not followed, serious accidents can occur.

THE OPERATOR MUST:

- Check that the control unit matches the crane / machine which he is to operate.
- Acquaint himself with the symbols and positions for operating functions and directions.
- Every time before starting work, check the stop function on the portable controller unit by doing the following:
  1. Operate a crane / machine function and press the stop button on the portable controller unit. The crane must immediately come to a standstill. No further crane movements are possible.
  2. If the cranes movement is not interrupted, crane operation must be stopped immediately and a service workshop visited.
- During operation, walk or stand at a suitable distance from the crane to be able to get a good view of the operation. No unauthorised persons may be within the crane's working area.
- Be aware that it is forbidden to convey loads over himself or fellow workers.
- Release all manoeuvre levers (dead-man's-handles) if crane movement control is lost and then immediately press the stop function on the control unit and the emergency stop on the crane.
- The stop function on the control unit should always be in the depressed position whenever the unit is not in use. This applies even for short stoppages, for example, if the driver wishes to move.
- After a completed run, press the stop function on the control unit and on the crane. The control unit must be kept out of reach of unauthorised persons.
- Always report equipment faults or shortcomings to the person responsible for the crane.
- Check that none of the safety devices have been altered or removed.
- Refer to the current regulations / instructions regarding "Personnel lifting with cranes", "Overloading/overload protection ", "Visible signals during the operation of cranes" and "The location of cranes close to airports and high-tension power lines".
- Be aware of any other pertinent regulations and of any local regulations which may apply. These are to be found in the relevant safety regulations regarding crane transport.

- Be aware of the contents in "OPERATING INSTRUCTIONS" and the handling and method of working of the remote control system. See next section " Operating instructions "

4.2 Operating instructions

Before operation, the driver must make himself aware of the contents in the "SAFETY REGULATIONS" for remotely controlled cranes. The driver must be aware of the function of all manoeuvre levers and switches.

1. For remote control: Place the central unit operational mode switch into REMOTE.
2. For manual/emergency operation: Place the central unit operational mode switch into MANUAL. Power is now only supplied to the dump valve and the crane's functions can be manoeuvred directly from the valve's hand levers.
3. Twist up the emergency stop switches on the crane and on the PCU (Not required for the PCU-H (Equipped with spring return push button).
4. Radio operation: Place a newly charged battery in the PCU's battery holder.

5A. Activate the PCU in accordance to below:

   1. Press the on button ⏻ to activate, the red LED will light continuously.

5B. Activate the PCU-H in accordance to below three step procedure:

   1. Press and hold the Stop button.
   2. Press once the Activate / Function switch button (Fn).
   3. Release the Stop button, the red LED will light continuously.

6. The system is now ready for operation. The driver must be aware of all manoeuvre lever/joystick and switch functions before operation is started.
7. To switch off or to activate the stop function the stop function switches on the control unit and the emergency stop on the crane should be pressed down. The stop function on the control unit should always be in the depressed position whenever the unit is not in use. This applies even for short stoppages, for example, if the driver wishes to move.
8. To ensure a long life for the control unit and for reasons of safety, the control unit must be kept locked in the cab. The control unit should be regularly wiped off with a damp cloth for example.

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