CATTRON™

CattronControl™ LRC-S1

Operator Control Unit (OCU)

Remote Control System
User Manual

9M02-9124-A001-EN

CONNECT. CONTROL. PROTECT.

Revision History

VERSION	DATE	NOTES
1.0	08/2013	Initial release
1.1	06/2014	Updated battery pack images and information
1.2	01/2015	Updated support Added cleaning warning Added membrane labels image
1.3	04/2016	Updated support facilities Updated confidentiality notice
1.4	04/2016	Updated support facilities Updated confidentiality notice
2.0	05/2020	Document rebranded and contact information updated

Contents

1 Important Notes

Information to the User regarding Radio and Functional Safety Compliance:

- Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment
- Changes or modifications may invalidate Radio Certification and Functional Safety
- In the case of equipment that is supplied as compliant with FCC Part 15 and Industry Canada ICES-003 standards, the following notice applies:

Note: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
- This device may not cause harmful interference
- This device must accept any interference received, including interference that may cause undesired operation

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- This manual is Confidential and Proprietary to Cattron – the entire document including any or all of the information contained therein is not to be reproduced, disclosed, or used in whole or in part for any purpose without prior written authorization of Cattron

2 Safety Instructions

2.1 Warnings and Cautions

WARNING statements are strategically placed throughout this document prior to all operating and maintenance procedures, practices or conditions considered essential to the protection of personnel or equipment and property. A WARNING applies each time the related step is repeated. Before starting any task, review and understand the WARNINGS included in the text. All WARNINGS appearing in this manual are included below.

	**WARNING**
	MORE THAN ONE REMOTE CONTROL SYSTEM MAY BE USED AT, AROUND OR NEARBY YOUR OPERATING FACILITY. THEREFORE, BEFORE INSERTING A TRANSKEY INTO AN OCU, BE SURE THE CORRECT CODED TRANSKEY IS SELECTED FOR THE DESIRED EQUIPMENT TO OPERATE. IF THE WRONG TRANSKEY IS INSERTED INTO AN OCU, OTHER REMOTE CONTROLLED EQUIPMENT LOCATED AT, AROUND OR NEARBY YOUR FACILITY MAY BECOME OPERATIONAL. FAILURE TO COMPLY WITH THE ABOVE WARNINGS MAY RESULT IN UNINTENDED OPERATION OF REMOTE CONTROLLED EQUIPMENT, WHICH COULD RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

	**WARNING**
	BEFORE ATTEMPTING TO USE THE REMOTE CONTROL SYSTEM, VERIFY THE TARGET CRANE OR MACHINE YOU WISH TO OPERATE IS UNDER THE DIRECT COMMAND OF YOUR OCU. THIS IS ACCOMPLISHED BY OPERATING A NON-MOTION OCU FUNCTION SUCH AS A HORN OR LAMP AND OBSERVING THAT THE RESPECTIVE FUNCTION ON THE TARGETED CRANE OR MACHINE RESPONDS. FAILURE TO COMPLY WITH THE ABOVE WARNING MAY RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

	**WARNING**
	DO NOT OPEN THE BATTERY CHARGING UNIT. TO PREVENT A FIRE HAZARD OR AN ELECTRIC SHOCK, PROTECT THE UNIT AGAINST MOISTURE AND RAIN. OPERATE THE BATTERY CHARGING UNIT IN DRY, INDOOR SPACES ONLY. DO NOT USE THE BATTERY CHARGING UNIT IF THE HOUSING OR MAIN POWER PLUG IS DAMAGED. FAILURE TO COMPLY WITH THE ABOVE WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

	**WARNING**
	LRC-S BATTERY CHARGING UNITS ARE DESIGNED ONLY FOR USE WITH CATTRON NICKEL METAL HYDRIDE (NI-MH) BATTERY PACKS. OTHER BATTERY PACKS MAY EXPLODE WHEN CHARGED WITH THIS DEVICE. FAILURE TO COMPLY WITH THE ABOVE WARNING MAY RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

	**WARNING**
	USING UNAPPROVED COMPONENTS OR ACCESSORIES IN THE SYSTEMS SOLD BY CATTRON IS STRICTLY PROHIBITED. UNAPPROVED COMPONENTS ARE DEFINED AS ANY COMPONENT NOT INSPECTED AND SOLD BY CATTRON. THIS ALSO INCLUDES ANY COMPONENT MODIFIED FROM ITS INTENDED USE AND/OR ANY COMPONENT EXHIBITING OBSERVABLE DAMAGE OR DEFECT. USE OF NON-CONFORMING PARTS, ASSEMBLIES AND ACCESSORIES MAY LEAD TO INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

	**WARNING**
	THE REMOTE CONTROL SYSTEM YOU HAVE PURCHASED IS DESIGNED TO STOP IN A SAFE MODE UNDER A VARIETY OF CONDITIONS. SOME EXAMPLES OF THESE CONDITIONS ARE EXCESSIVE RADIO SIGNAL INTERFERENCE, LOSS OF BATTERY AND/OR ELECTRIC POWER, FAILURE OF CERTAIN COMPONENTS, OPERATION BEYOND SIGNAL RANGE AND OTHERS. ALTHOUGH CATTRON DOES NOT SPECIFY THE POSITION OF THE OPERATOR WHEN CONTROLLING THE EQUIPMENT, WE ARE AWARE THAT SOME USERS ARE INSTRUCTED AND TRAINED BY THEIR EMPLOYER TO RIDE THE EQUIPMENT IN A SAFE MANNER. IT IS IMPERATIVE THAT YOU ARE PREPARED FOR AN UNPLANNED STOP OF THE EQUIPMENT AT ANY TIME. DO NOT PLACE YOURSELF OR OTHERS IN A POSITION WHERE THIS SITUATION MAY CAUSE A FALL FROM THE EQUIPMENT. FAILURE TO USE CAUTION MAY LEAD TO INJURY OR DEATH.

	**WARNING**
	ONLY CLEAN THE OCU EXTERIOR RESIN USING METHYL OR ISOPROPYL ALCOHOL, MILD SOAP SOLUTIONS, HEPTANE OR HEXANE. DO NOT CLEAN WITH PARTIALLY HYDROGENATED HYDROCARBONS, KETONES (SUCH AS MEK), STRONG ACIDS OR WITH ALKALINES (SUCH AS SODIUM HYDROXIDE).

	**WARNING**
	DO NOT IMMERSE THE OCU IN WATER.

3 System Description

The LRC-S Operator Control Unit (OCU) is part of a remote control system that can be made to serve a wide range of applications, from standard electric overhead traveling (EOT) cranes through highly customized cranes and machines.

The LRC-S OCU and its chosen, matching Machine Control Unit (MCU) can be factory manufactured to match the exact requirements of an individual customer.

LRC-S remote control systems offer the safety and dependability required for industrial control applications with reversing motor control such as overhead cranes, conveyors, etc. The remote control system described in this manual incorporates high-performance, safety-critical design for maximum safety. Each system includes one or more **OCU**s and one or more **MCU**s.

3.1 The Hand-Held Operator Control Unit (OCU)

The LRC-S OCU is a lightweight, ergonomic, hand-held OCU designed to withstand tough industrial environments which may include humidity, oil, vibrations, shock and wide temperature fluctuations.

Each OCU is configured and manufactured to satisfy a specific control application. Referring to Figure 1, an LRC-S1 OCU incorporates the following controls and indicators:

- Two joysticks
- One ‘STOP’ switch
- Five definable pushbutton switches
- One multicolor ‘STATUS’ LED
- Six function LEDs
- One predefined ‘HORN’ pushbutton switch
- One predefined Power ‘ON/OFF’ pushbutton switch
- One internal acoustic buzzer
- One optional LCD screen

Each OCU comes with a sheet of adhesive labels (Part Number 3LBL-9121-B102), shown in Figure 2, that can be used to identify the product’s switches and features. Remove each applicable label and adhere it to the appropriate area of the OCU membrane as illustrated in Figure 3.

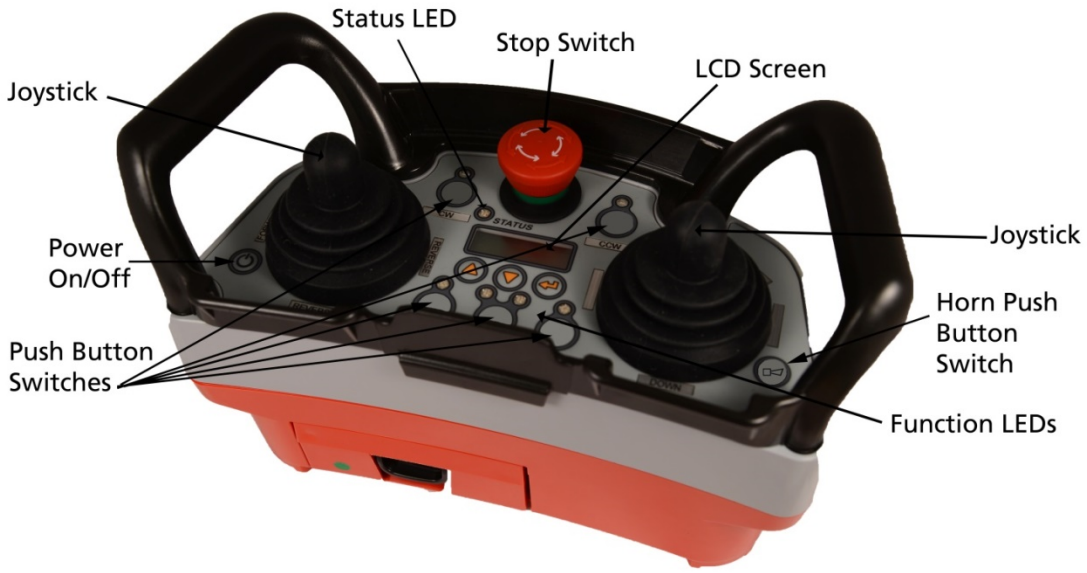

Figure 1: LRC-S Joystick OCU

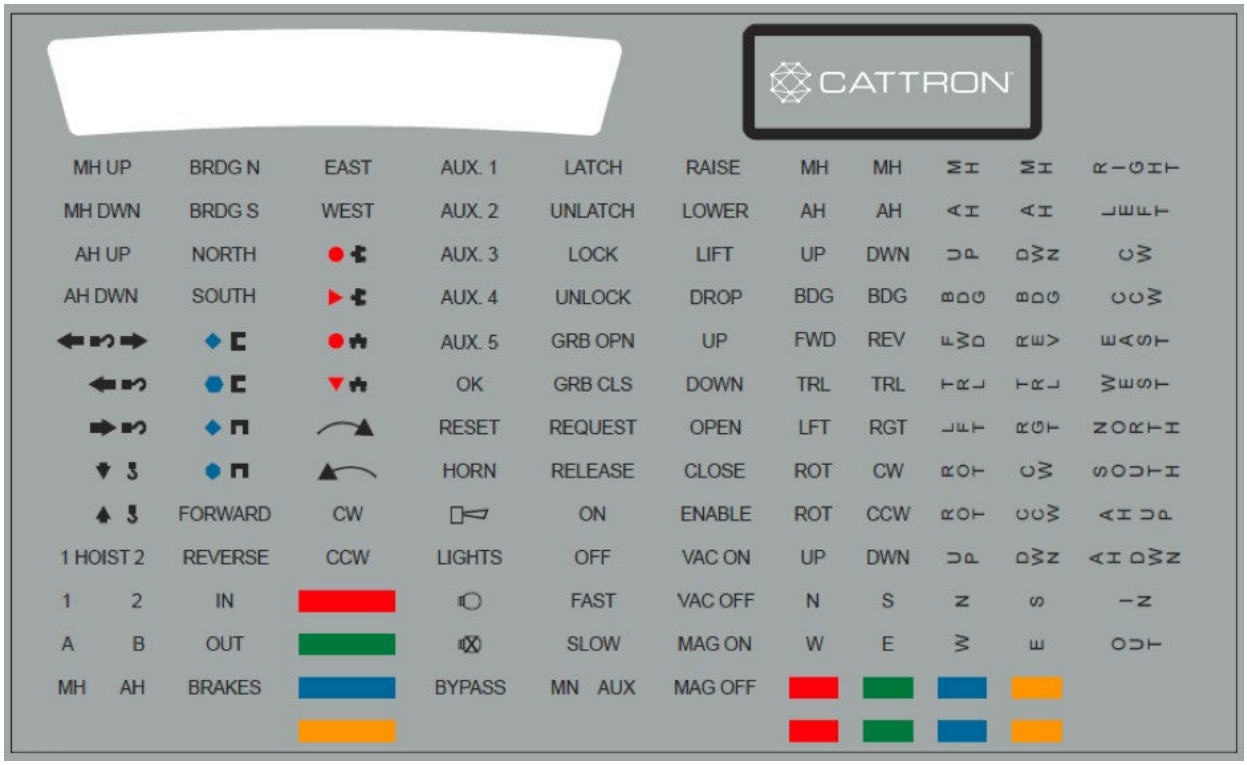

Figure 2: LRC S1 OCU Label Sheet

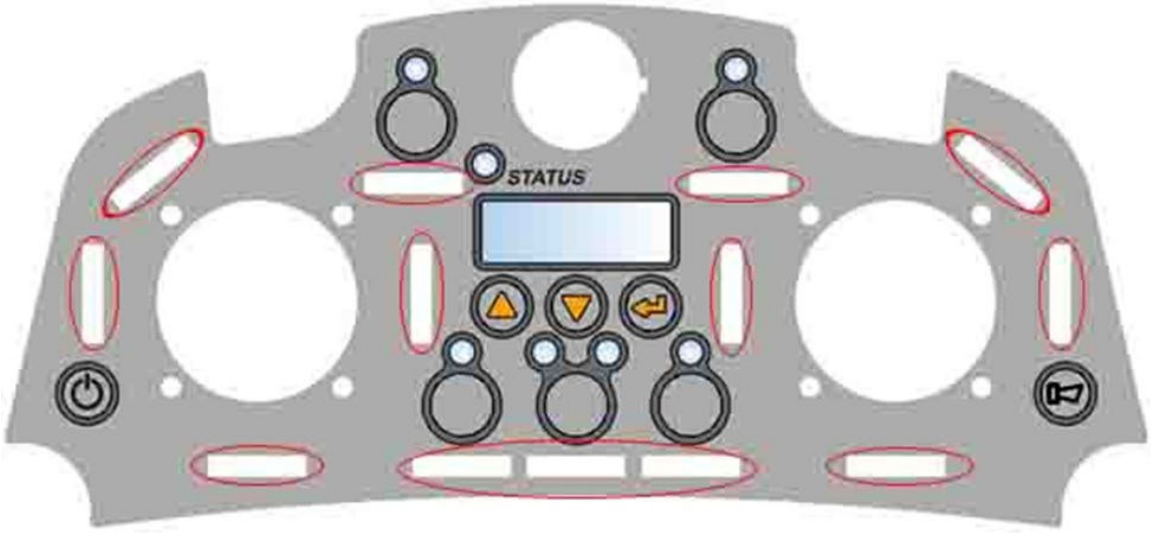

Figure 3: LRC-S OCU Sample Membrane (Label Locations Circled in Red)

Operational security advances to its maximum through the use of a removable TransKey which, when installed to the OCU, defines and enables the specific operating parameters, as illustrated in Figure 4.

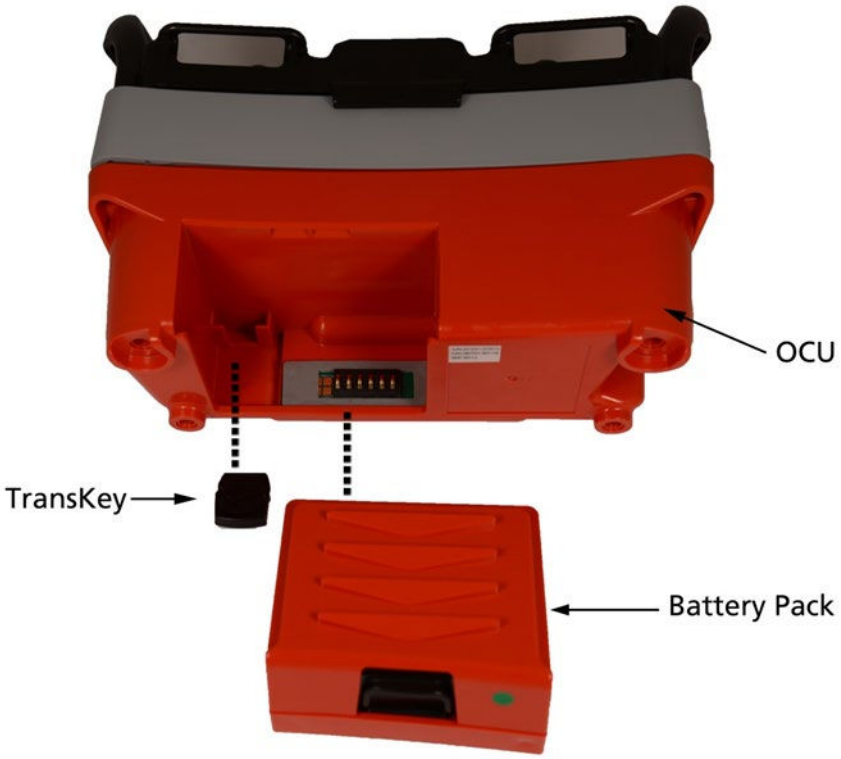

Figure 4: Removable TransKey and Battery Pack

Note: Do not swap the OCU and MCU TransKeys. The OCU (transmitter) TransKey is black. The MCU (receiver) TransKey is yellow. Swapping TransKeys results in OCU/MCU fault indications and the system will not operate.

LRC-S OCUs are equipped with an internal antenna with a typical operating range in excess of 120 m (400 ft) uninterrupted line-of-sight. Understand that the operating range varies with environmental conditions and the selected radio module. Should the OCU go out of operating range, all motions on the crane or controlled machine will stop.

All LRC-S OCUs are powered by rechargeable 4.8 V, 1600 mAh, Nickel Metal Hydride (Ni-MH) battery packs.

A worldwide, all-purpose, plug-in battery pack charger, complete with battery adapter, is provided with the unit. This allows Ni-MH battery packs to charge from a power source between 100 to 240 VAC at 50-60 Hz.

LRC-S OCUs are normally hand carried by the operator. Referring to Figure 5, an optional body carrying strap (Part Number MT 006-00295) is available on request.

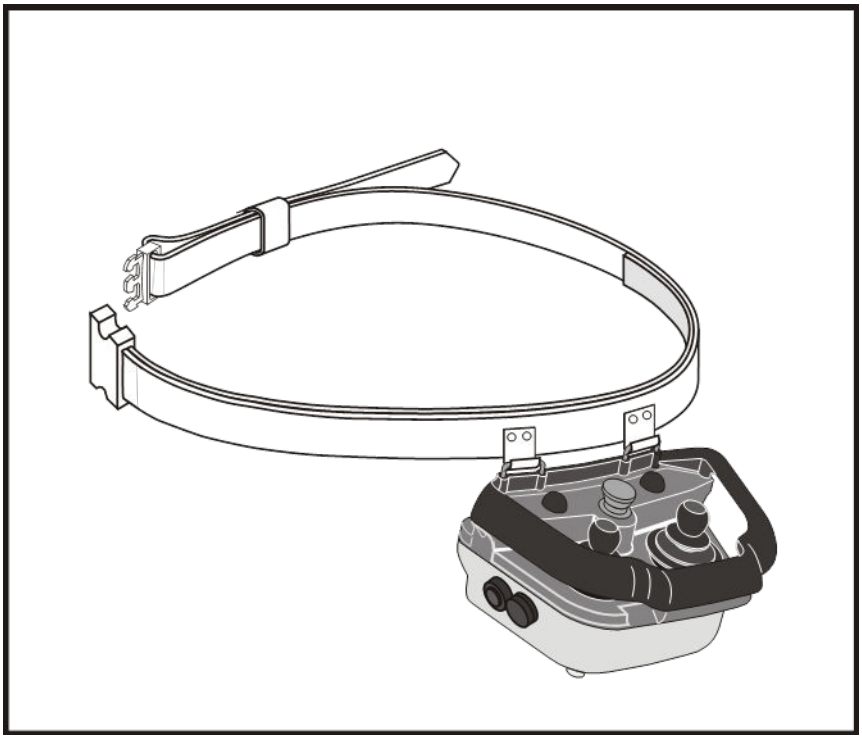

Figure 5: Optional Body Carrying Strap

4 Operation

4.1 Prepare the Battery

Fully charge the OCU rechargeable battery pack before using the remote control system for the first time.

Note: Charging the battery pack can take up to three hours.

Refer to Section 4.4 and Section 4.5 for battery changing and charging instructions, respectively.

4.2 Selecting the TransKeys

Due to the flexible TransKey concept, it is common for one OCU to control multiple cranes or machines. Each crane or machine is provided with a unique pair of TransKeys with the same address. Insert this pair of TransKeys into their respective OCU and MCU locations before carrying out remote control operations.

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4.3 Turning on the OCU

The OCU start sequence is configurable and is supplied preset to either ‘Default’ or ‘Alternate’; both sequences can include a STOP Switch Test Routine.

4.3.1 Prestart Check

Be sure to insert the correct TransKey – refer to Figure 4 for the OCU TransKey location.

Note: Do not swap the OCU and MCU TransKeys. The OCU (transmitter) TransKey is black. The MCU (receiver) TransKey is yellow. Swapping TransKeys results in OCU/MCU fault indications and the system will not operate.

Make sure the STOP switch is in the “out” position. If the switch has been pushed down to the ‘STOP’ position, you first must unlatch the switch knob by rotating in a clockwise direction.

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4.3.2 Default Start Sequence

1. Press the ON/OFF button for a minimum of 500 ms, until the STATUS LED turns a steady red. Then release the ON/OFF button.
2. Within 5 seconds following the release of the ON/OFF button, simultaneously press the ON/OFF and Horn buttons, and then release both buttons. “Active” displays on the optional LCD screen and the STATUS LED indicator start flashing green, indicating an RF signal transmission.

Note: The above operations must be performed within a ten second timeframe.

If the first step is unsuccessful, the unit returns to and maintains power-down mode.

4.3.3 Alternate Start Sequence

1. Press the ON/OFF button for a minimum of 500 ms, and then release it. The STATUS LED flashes green. The LRC-S is now powered on.

Note: If this step is unsuccessful, the unit returns to and maintains power-down mode.

4.3.4 Optional STOP Switch Test Sequence

Testing the STOP Switch may have been predefined and, if required, is performed immediately after the chosen start sequence above.

You may also perform a system STOP at any time during operation by pushing down on the red STOP switch.

If the STOP Switch Test is required,

1. Carry out the required start sequence above; the STATUS LED turns a steady red after initialization and while it waits for the STOP Switch to be depressed.
2. Press the STOP Switch; the STATUS LED turns to steady amber.
3. Release the STOP switch; the STATUS LED becomes a flashing green and the OCU is ready to use.

Note: The above operations must be performed within a ten second timeframe.

If this step is unsuccessful, the unit returns to and maintains power-down mode.

4.3.5 Normal Operation

Note: Operate the remote control transmitter as required. Motion control switches are designed to revert to neutral when released. Any or all functions may be operated simultaneously if the controlled machine permits such operation.

In normal operation, the STATUS LED (centrally located above the optional LCD screen) flashes green. When the battery voltage becomes low, the STATUS LED flashes red and a beep sounds every ten seconds to alert the operator that the battery pack needs to be replaced or recharged.

Only Cattron battery packs should be used; if the battery type is not recognized, the STATUS LED flashes yellow. The STATUS LED also illuminates in a series of red blinking sequences to indicate a specific OCU fault, as described in Section 5.1.

The OCU switches off automatically when the following events occur:

- Battery low voltage detected (after a preset time delay)
- Internal fault detected
- STOP switch depressed
- ON/OFF switch pressed

4.4 Changing the Battery

Referring to Figure 6, remove the battery pack as follows:

1. Lay the OCU on its side.
2. Remove the rechargeable battery pack from the bottom of the OCU by pressing the battery latch button and sliding out the battery.

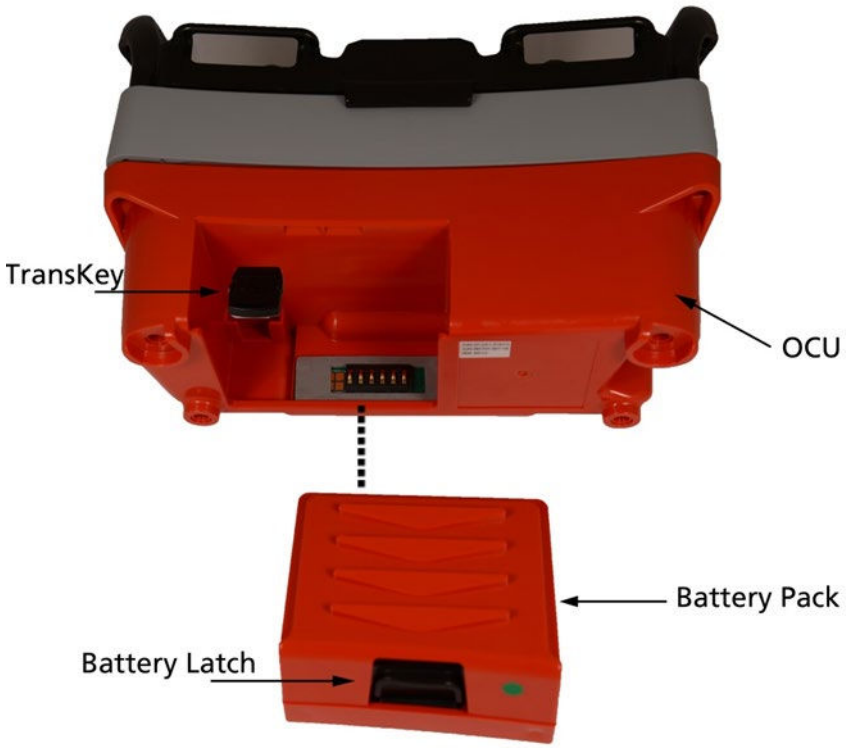


Figure 6: Removing the Battery Pack

4.5 Charging the Battery

⚠	**WARNING**
	LRC-S BATTERY CHARGING UNITS ARE DESIGNED ONLY FOR USE WITH CATTRON NICKEL METAL HYDRIDE (NI-MH) BATTERY PACKS. OTHER BATTERY PACKS MAY EXPLODE WHEN CHARGED WITH THIS DEVICE. FAILURE TO COMPLY WITH THE ABOVE WARNING MAY RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

4.5.1 Preparing the Battery Charging Unit

⚠	**WARNING**
	DO NOT OPEN THE BATTERY CHARGING UNIT. TO PREVENT A FIRE HAZARD OR AN ELECTRIC SHOCK, PROTECT THE UNIT AGAINST MOISTURE AND RAIN. OPERATE THE BATTERY CHARGING UNIT IN DRY, INDOOR SPACES ONLY. DO NOT USE THE BATTERY CHARGING UNIT IF THE HOUSING OR MAIN POWER PLUG IS DAMAGED. FAILURE TO COMPLY WITH THE ABOVE WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

Referring to Figure 7, connect the Battery Charging Unit as follows:

1. Select the correct plug for your country of operation.
2. If necessary, shift the locking tab on the back of the charger in the indicated direction and remove the existing plug.
3. Insert the correct plug into the charger until it locks in place with an audible ‘click’.
4. Plug the Battery Charging Unit into the main power supply socket.
5. As soon as the charger is connected to the main power supply, the red ‘Power’ LED (1) illuminates to indicate the ready condition.

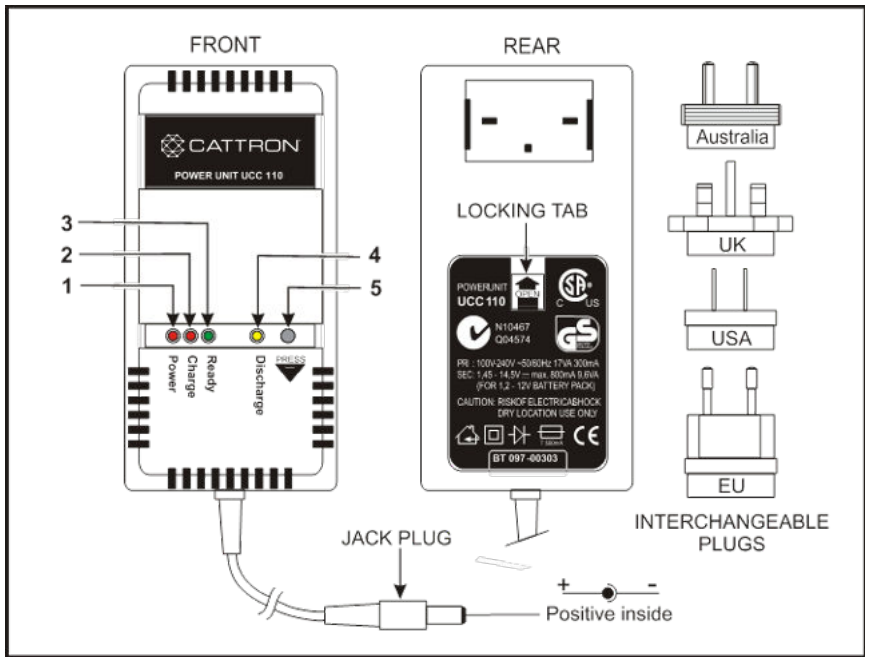


Figure 7: Battery Charging Unit with Interchangeable Plugs

4.5.2 Charging the Battery Pack

Referring to Figure 7, charge the battery pack as follows:

1. Connect the jack plug from the Battery Charging Unit into the battery as shown in Figure 8.

Figure 8: LRC-S Rechargeable Battery and Charging Port

⚠	**WARNING** LRC-S BATTERY CHARGING UNITS ARE DESIGNED ONLY FOR USE WITH CATTRON NICKEL METAL HYDRIDE (NI-MH) BATTERY PACKS. OTHER BATTERY PACKS MAY EXPLODE WHEN CHARGED WITH THIS DEVICE. FAILURE TO COMPLY WITH THE ABOVE WARNING MAY RESULT IN SERIOUS INJURY OR DEATH TO PERSONNEL AND DAMAGE TO EQUIPMENT.

2. Plug in the battery pack and observe that the red ‘Charge’ LED (2, Figure 7) illuminates to indicate the charging mode. After approximately 5 seconds, a one minute battery test mode starts and is indicated by the blinking green ‘Ready’ LED (3, Figure 7). If the green ‘Ready’ LED illuminates immediately after connecting the battery and the red ‘Charge’ LED blinks from time to time after 20 seconds, the battery pack is defective and can no longer be charged. If necessary, replace the battery pack with a new one.

   Note: Charging the battery pack can take up to three hours.

3. When the battery pack is fully charged, the red ‘Charge’ LED extinguishes and the green ‘Ready’ LED illuminates.
4. The device switches to pulse trickle charge automatically and after about two minutes the green ‘Ready’ LED starts blinking. The battery may be used immediately or left until required.

4.5.3 Charging Status Indication via LEDs

Indication	Description
Red ‘Power’ LED (item 1, Figure 7)	Steady illumination indicates the charger is ready for operation. LED illuminates immediately after the charger is connected to the power supply.
Red ‘Charge’ LED (item 2, Figure 7)	Steady illumination indicates the battery pack is being charged.
Green ‘Ready’ LED (item 3, Figure 7)	Steady illumination indicates that the battery is charged. The green LED switches to blinking mode after approximately two minutes to indicate pulse trickle charging. During testing mode, the LED blinks in conjunction with the ‘Charge’ LED.
Yellow ‘Discharge’ LED (item 4, Figure 7)	After pressing the discharge button for approximately 2 seconds, steady illumination indicates the battery pack is being discharged. Simultaneously, the ‘Ready’ LED blinks for approximately one minute to indicate the testing phase.
Discharge button (item 5, Figure 7)	Pressing the discharge button for approximately 2 seconds starts the process to discharge the battery pack.

4.5.4 Battery Maintenance

We recommend discharging the battery packs completely from time to time to preserve their capacity.

Pressing the discharge button (5, Figure 7) discharges the battery. After completely discharging the battery, which in some cases can take several hours, the charger automatically switches to the charge mode. Once the battery is fully charged, the battery charger switches over to pulse trickle charging.

The battery pack is tested for defects before the charging process begins. During the charging cycle, the battery pack status is continuously monitored to prevent overcharging.

5 System Fault/Status Messages

Note: Only qualified personnel should make repairs or replacements.

5.1 OCU Fault/Status Messages

The OCU has a STATUS LED indicator that displays the current system status to the operator. When an OCU fault is detected, the STATUS LED illuminates red and signals the fault with a series of blinks. Refer to the following table for the blink sequence and the corresponding fault messages.

OCU STATUS LED Indication	Fault	Action Required
2 flashes	TransKey missing	Plug in the TransKey
3 flashes	TransKey cannot be read	Check the TransKey configuration*
4 flashes	Fault in the low-voltage test during switch-on	Switch the OCU 'OFF' then 'ON' again Replace/charge the battery pack If the fault persists, investigate the fault* Change the transmitter board* Return the OCU for repair
5 flashes	Switch-on sequence not performed correctly	Ensure the STOP pushbutton is released Switch the OCU 'OFF' then 'ON' again
6 flashes	Fault during reading of command initiator	Investigate the fault* Change the transmitter board/keyboard* Return the OCU for repair
7 flashes	Incorrect RF module or RF module incorrectly configured	Replace the RF module or correct the configuration* Return the OCU for repair
8 flashes	General system fault	Investigate the fault* Change the transmitter board* Return the OCU for repair
9 flashes	Low Power Supply voltage	Replace/charge the battery pack Change the transmitter board* Return the OCU for repair
10 flashes	Hardware Fault	Change the transmitter board* Return the OCU for repair

*Qualified personnel only

If necessary, contact Cattron at www.cattron.com/contact for the replacement part number applicable to your system configuration.

6 Maintenance Instructions

Unless customer technicians receive formal maintenance training from Cattron, our maintenance philosophy is that inoperative OCUs be returned as complete units to our workshops for repair. This is to ensure functional safety is maintained.

Note: When returning an OCU for repair, remove the original TransKey supplied with the unit and retain it for use with your spare unit.

6.1 Preventive Maintenance

Preventive maintenance is limited to the following:

Daily Visual Inspection:

Before use, visually inspect the OCU for cleanliness, physical damage and security of external parts (screws, battery pack, switches, etc.). Cattron emphasizes that regular visual inspections not only mean quickly locating a source of potential problems, but also may prevent serious problems from developing later.

Cleaning the Transmitter:

Clean the OCU with a moist cloth, and then wipe dry with a clean paper towel.

	**WARNING**
	ONLY CLEAN THE OCU EXTERIOR RESIN USING METHYL OR ISOPROPYL ALCOHOL, MILD SOAP SOLUTIONS, HEPTANE OR HEXANE. DO NOT CLEAN WITH PARTIALLY HYDROGENATED HYDROCARBONS, KETONES (SUCH AS MEK), STRONG ACIDS OR WITH ALKALINES (SUCH AS SODIUM HYDROXIDE).

	**WARNING**
	DO NOT IMMERSE THE OCU IN WATER.

Functional Check:

Perform a functional check by operating the OCU in accordance with the Operating Procedures for the crane or other controlled machine. Ensure all system control functions are fully operational.

7 Technical Data

7.1 Transmitter (OCU)

Frequency bands	Dependant on region: 433-434 MHz (Europe) 902-927 MHz (North America and other applicable countries)
Transfer rate	4.8 - 20 kbps
Transmission power	1-10 mW (within the allowable limits)
Antenna	Internal
System addresses	24 Bit
Power-saving mode	Automatic switch-off (configurable 0 – 30 minutes)
Power supply	Ni-MH, 4.8 V, 1600 mAh, quick-swap rechargeable battery pack
Operating time	>12 h @ 100% duty cycle
Operating elements	2 joysticks STOP, START, HORN 5 configurable pushbutton switches, each with an associated LED
Indication	1 STATUS/multi-function LED 6 switch status LEDs LCD display (optional) Acoustic signal for status/tilt/low battery and error indication
Weight	2.2 lb (1.0 kg) with the battery installed
Dimensions (L x W x H)	9 x 4.6 x 6 in (229 x 117 x 152 mm)
Housing	Lexan EXL Polycarbonate Resin, standard colors: grey/red with black railing
Operating temperature	-4º to 140º F (-20º to +60º C)
Protection class	IP 65
Safety	EN 13849-1 Performance Level d for all safety related functions EN 60204-1 EN 60204-32 CE Compliant

7.2 Battery Charger

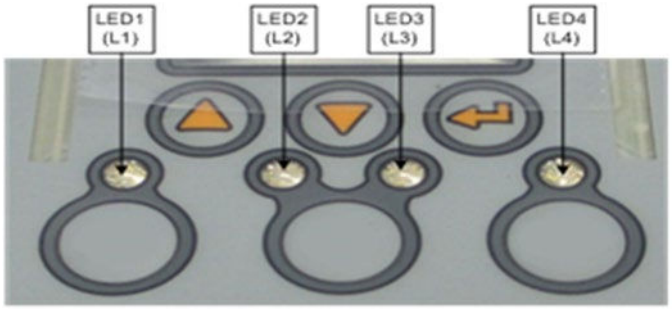
Model	Processor-controlled charger for Ni-MH battery packs
Dimensions (W x D x H)	2.4 x 3.5 x 4.7 in (60 x 90 x 120 mm)
Power supply	Primary: 100 – 240 VAC, 50/60 Hz, 17 VA, 300 mA Secondary: 1.45 – 14.5 VDC, max. 800 mA, 9.6 VA

8 Technical Support

For remote and communication control systems support, parts and repair, or technical support, visit us online at: www.cattron.com/contact.

Appendix – RF Channels

The four LEDs indicating the RF Channel in use can be located on the membrane according to the image below:



433-434 MHz Frequency Band (Europe)

Channel #	Center Frequency (MHz)	OCU LED			
		1	2	3	4
1	433.0775				
2	433.1025				
3	433.1275				
4	433.1525				
5	433.1775				
6	433.2025				
7	433.2275				
8	433.2525				
9	433.2775				
10	433.3025				
11	433.3275				
12	433.3525				
13	433.3775				
14	433.4025				
15	433.4275				
16	433.4525				
17	433.4775				
18	433.5025				
19	433.5275				
20	433.5525				
21	433.5775				
22	433.6025				
23	433.6275				
24	433.6525				
25	433.6775				

Channel #	Center Frequency (MHz)	OCU LED			
		1	2	3	4
26	433.7025				
27	433.7275				
28	433.7525				
29	433.7775				
30	433.8025				
31	433.8275				
32	433.8525				
33	433.8775				
34	433.9025				
35	433.9275				
36	433.9525				
37	433.9775				
38	434.0025				
39	434.0275				
40	434.0525				
41	434.0775				
42	434.1025				
43	434.1275				
44	434.1525				
45	434.1775				
46	434.2025				
47	434.2275				
48	434.2525				
49	434.2775				
50	434.3025				
51	434.3275				
52	434.3525				
53	434.3775				
54	434.4025				
55	434.4275				
56	434.4525				
57	434.4775				
58	434.5025				
59	434.5275				
60	434.5525				
61	434.5775				
62	434.6025				
63	434.6275				

Channel #	Center Frequency (MHz)	OCU LED			
		1	2	3	4
64	434.6525				
65	434.6775				
66	434.7025				
67	434.7275				
68	434.7525				
69	434.7775				

902-927 MHz Frequency Band (North America and other applicable countries)

Operation mode: OM005, OM011, OM012

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
0	1	903.00				
0	2	904.20				
0	3	905.40				
0	4	906.60				
0	5	907.80				
0	6	909.00				
0	7	918.60				
0	8	919.80				
0	9	921.00				
0	10	922.20				
0	11	923.40				
1	12	903.20				
1	13	904.40				
1	14	905.60				
1	15	906.80				
1	16	908.00				
1	17	909.20				
1	18	918.80				
1	19	920.00				
1	20	921.20				
1	21	922.40				
1	22	923.60				
2	23	903.40				
2	24	904.60				
2	25	905.80				

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
2	26	907.00				
2	27	908.20				
2	28	909.40				
2	29	919.00				
2	30	920.20				
2	31	921.40				
2	32	922.60				
2	33	923.80				
3	34	903.60				
3	35	904.80				
3	36	906.00				
3	37	907.20				
3	38	908.40				
3	39	909.60				
3	40	919.20				
3	41	920.40				
3	42	921.60				
3	43	922.80				
3	44	924.00				
4	45	903.80				
4	46	905.00				
4	47	906.20				
4	48	907.40				
4	49	908.60				
4	50	919.40				
4	51	920.60				
4	52	921.80				
4	53	923.00				
4	54	924.20				
5	55	904.00				
5	56	905.20				
5	57	906.40				
5	58	907.60				
5	59	908.80				
5	60	918.40				
5	61	919.60				
5	62	920.80				

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
5	63	922.00				
5	64	923.20				
5	65	924.40				

Operation mode: OM005, OM011

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
6	66	902.60				
6	67	910.60				
6	68	911.80				
6	69	913.00				
6	70	914.20				
6	71	915.40				
6	72	916.60				
6	73	917.80				
6	74	925.20				
6	75	926.40				
7	76	902.80				
7	77	910.80				
7	78	912.00				
7	79	913.20				
7	80	914.40				
7	81	915.60				
7	82	916.80				
7	83	918.00				
7	84	925.40				
7	85	926.60				
8	86	909.80				
8	87	911.00				
8	88	912.20				
8	89	913.40				
8	90	914.60				
8	91	915.80				
8	92	917.00				
8	93	918.20				
8	94	925.60				
8	95	926.80				

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
9	96	910.00				
9	97	911.20				
9	98	912.40				
9	99	913.60				
9	100	914.80				
9	101	916.00				
9	102	917.20				
9	103	924.60				
9	104	925.80				
9	105	927.00				
10	106	910.20				
10	107	911.40				
10	108	912.60				
10	109	913.80				
10	110	915.00				
10	111	916.20				
10	112	917.40				
10	113	924.80				
10	114	926.00				
10	115	927.20				
11	116	910.40				
11	117	911.60				
11	118	912.80				
11	119	914.00				
11	120	915.20				
11	121	916.40				
11	122	917.60				
11	123	925.00				
11	124	926.20				
11	125	927.40				

Operation Mode: OM012

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
12	126	903.10				
12	127	904.30				
12	128	905.50				

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
12	129	906.70				
12	130	907.90				
12	131	909.10				
12	132	918.70				
12	133	919.90				
12	134	921.10				
12	135	922.30				
12	136	923.50				
13	137	903.30				
13	138	904.50				
13	139	905.70				
13	140	906.90				
13	141	908.10				
13	142	909.30				
13	143	918.90				
13	144	920.10				
13	145	921.30				
13	146	922.50				
13	147	923.70				
14	148	903.50				
14	149	904.70				
14	150	905.90				
14	151	907.10				
14	152	908.30				
14	153	909.50				
14	154	919.10				
14	155	920.30				
14	156	921.50				
14	157	922.70				
14	158	923.90				
15	159	903.70				
15	160	904.90				
15	161	906.10				
15	162	907.30				
15	163	908.50				
15	164	909.70				
15	165	919.30				

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
15	166	920.50				
15	167	921.70				
15	168	922.90				
15	169	924.10				
16	170	903.90				
16	171	905.10				
16	172	906.30				
16	173	907.50				
16	174	908.70				
16	175	919.50				
16	176	920.70				
16	177	921.90				
16	178	923.10				
16	179	924.30				
17	180	904.10				
17	181	905.30				
17	182	906.50				
17	183	907.70				
17	184	908.90				
17	185	918.50				
17	186	919.70				
17	187	920.90				
17	188	922.10				
17	189	923.30				
17	190	924.50				
18	191	902.70				
18	192	910.70				
18	193	911.90				
18	194	913.10				
18	195	914.30				
18	196	915.50				
18	197	916.70				
18	198	917.90				
18	199	925.30				
18	200	926.50				
19	201	902.90				
19	202	910.90				

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
19	203	912.10				
19	204	913.30				
19	205	914.50				
19	206	915.70				
19	207	916.90				
19	208	918.10				
19	209	925.50				
19	210	926.70				
20	211	909.90				
20	212	911.10				
20	213	912.30				
20	214	913.50				
20	215	914.70				
20	216	915.90				
20	217	917.10				
20	218	918.30				
20	219	925.70				
20	220	926.90				
21	221	910.10				
21	222	911.30				
21	223	912.50				
21	224	913.70				
21	225	914.90				
21	226	916.10				
21	227	917.30				
21	228	924.70				
21	229	925.90				
21	230	927.10				
22	231	910.30				
22	232	911.50				
22	233	912.70				
22	234	913.90				
22	235	915.10				
22	236	916.30				
22	237	917.50				
22	238	924.90				
22	239	926.10				

Cluster	Channel #	Freq. (MHz)	OCU LED			
			1	2	3	4
22	240	927.30				
23	241	910.50				
23	242	911.70				
23	243	912.90				
23	244	914.10				
23	245	915.30				
23	246	916.50				
23	247	917.70				
23	248	925.10				
23	249	926.30				
23	250	927.50				

Due to continuous product improvement, the information provided in this document is subject to change without notice.

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