

Remtron™ 411, 611 and 325 OCU

User Manual

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CONNECT. CONTROL. PROTECT.



Revision History

VERSION	DATE	NOTES
1.0	May 5 th 2020	Initial Release per ECO-20-0193
2.0	July 8 th 2020	Updated LED behavior and CattronLink™

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1. Introduction

This manual includes general information concerning the operation of the Remtron 411, 611 and 325 radio remote Operator Control Units (OCUs). The information is of a general nature and does not include system-specific data. System-specific data is provided in the technical documentation accompanying the delivery of the system.

For information pertaining to the matching Machine Control Unit (MCU), please refer to the separate MCU user manual.

1.1 Terminology

The following represents important acronyms and long form names used in this document:

- OCU Operator Control Unit, historically referred to as a transmitter
- MCU Machine Control Unit, historically referred to as a receiver

2. Warnings and Cautions

2.1 Warnings

WARNING statements have been strategically placed throughout all text prior to operating or 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, the WARNINGS included in the text for the task should be reviewed and understood.

WARNINGS appearing in this manual follow the general format below.



WARNING

Description of warning Possible consequence of non-compliance

2.2 General Safety Information

- Persons under the influence of drugs, alcohol and/or other medicine that impairs reaction may not assemble, disassemble, install, put into operation, repair or operate the product.
- All conversions and modifications of an installation or system must conform to the relevant safety requirements.
- Only qualified, trained, authorized personnel may perform work on the equipment, in accordance with the relevant safety requirements.
- In the event of malfunction and/or visible defects or irregularities, the product must be stopped, switched off, and the relevant master switches also switched off.





WARNING

Observe the statutory regulations and directives applicable for the intended purpose, e.g.:

- Accident prevention regulations
- Safety rules and directives
- Standards
- Generally applicable statutory and other binding regulations for accident prevention and environmental protection, and general safety and health requirements.
- Ensure that users have access to the user manual.
- The personnel assigned to work on/with the product must have read and understood this operating manual and the safety instructions.
- The safety instructions must, if necessary, be supplemented by the user with instructions concerning the work organization, work sequences, qualified personnel, etc.
- All repairs made during the warranty period must be carried out by the manufacturer or appointed authorized service center; failure to comply will invalidate the warranty.
- All repairs made should be carried out in a suitably clean static-safe environment, free from contaminants such as metal filings, water, oil, etc.
- It is the user's responsibility to ensure that the product always operates in good condition and that all applicable safety requirements and regulations are observed.
- Product modifications may not be carried out without the consent of the manufacturer.
- Original spare parts from the manufacturer must be used.
- Carry out periodic inspections and/or maintenance either required by law or prescribed in the user manual within the required intervals.

2.3 Improper Use

Ensure compliance with equipment ratings and operate only as intended, in particular:

- · Ensure all supplies to the equipment are isolated before installation/maintenance
- Check that power supply voltage / frequency data is correct
- · Do not misuse or exceed operating specifications
- Ensure periodic maintenance routines are observed

CAUTION



Damage to the device: The unit is rated at IP67. For environments harsher than this, use an appropriate secondary enclosure.

Neglecting the above can result in danger for life and limb and/or cause physical damage to the product or the environment.

2.4 Safety Instructions for Assembly / Disassembly

Note: Ensure suitable transient protection devices are fitted to controlled electrical relays or valves. Ensure correct wiring of the crane's main contactor and the manual radio transfer switch.



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- Isolate the system from the electrical power in accordance with the applicable regulations.
- Observe user-specific regulations.
- Only use suitable tools.

CAUTION

• Secure the installation area.

2.5 Operation of OCUs and MCUs with Identical System Address

To ensure safe operation, OCUs and MCUs are paired by way of a system address.

This system address is unique and only assigned once by Cattron.



Conflict of Addresses:

Addresses are never repeated and are System Unique.

The user must ensure that the system address and addressing mode is used as designed. The system address is marked on the OCU and MCU and must match. In the event of a breach of this undertaking, the user is liable for any resulting damage/loss and shall indemnify the manufacturer against all third-party liability claims.

3. Why use Remote Control

Cattron Portable Remote Control (PRC) systems deliver the safety and dependability that are required for efficient industrial control applications such as overhead cranes, conveyors, machines, etc.

A remote-control system enables an operator to be in the safest, most comfortable and most efficient position for each operation, thereby minimizing risks of illness, injury or material damage and simultaneously boosting efficiency and productivity.

4. Remote Control Safety

With an OCU and a matching MCU, a machine such as a crane or vehicle can be remotely radio controlled, avoiding the need for a wired connection between the human interface and the controlled device. Several different control elements are integrated into the OCU housing so commands to the device securely encode into a radio transmission. The MCU is then able to receive this transmission, securely decode these commands, and provide suitable interfaces to drive the machine.

4.1 Radio Transmission and Security

The transmission between the OCU and MCU is performed by means of a secure RF telegram. Regarding the actual radio frequency that is used it typically depends on the national regulations and the choice of a licensed or license exempt frequency band.

A specific RF frequency band and channel may have been selected prior to delivery of the system, depending on the frequency band, a specific number of RF channels will be available within that band. In all cases a clear unused (unless timesharing with another Cattron system) channel will be required for reliable operation.

The OCU and MCU must operate on the same RF channel in order to be able to communicate.





4.1.1 Continuous Transmission

Normally transmission is continuous and the MCU uses this as part of the information required to maintain the Main Contactor control relays in an active state. If the MCU does not receive a valid telegram in this mode for a defined period of time, it automatically turns off, i.e. main contactor control relays and command relays open. Depending on the application, this time varies from 0.5 s to 2.0 s.

Some MCU function relays may be maintained in the absence of communication from an OCU, an example may be the latched lights function, there are wide range of non-crane type applications that may also continue to run function relays in the absence of an online OCU.

Note: In order to ensure optimum communication between the OCU and the MCU, the OCU should always ideally be operated with line-of-sight transmission to the MCU antenna. Try to avoid total shielding of the signal path by metallic and other solid obstructions.

4.1.2 Radio Interference

Signals from other RF-emitting sources might interfere with the radio communication between the OCU and MCU. If the radio link is affected by these sources, it may cause intermittent operation and a changing the RF channel might be necessary.

4.2 Telegram Security

The transmitted telegram contains several security features, as follows:

4.2.1 System Address

This system uses a 24-bit addressing scheme, normally comprising a 16 bit master-address and an 8 bit subaddress extension, where each OCU/MCU pair shares a common, unique overall address. This address is contained in every telegram sent by the OCU and is checked by the MCU every time an RF signal is received. The MCU processes a command only when the address in the telegram matches its own defined address. This is a safety measure to ensure that the MCU will act only upon its assigned OCU.

4.2.1.1 Addressing Modes

There are multiple addressing modes that may be implemented depending on the specific application needs, these are;

TSAC mode = 16 bit Master Address (MA) and 8 bit Sub Address (SA), creating one single 24 bit address. e.g. OCU address = 0000 0000 0000 0001 0000 0001

MCU address = 0000 0000 0000 0001 0000 0001 (MCU Online matching MA plus SA byte) equivalent to a 24 bit address.

This mode enables an OCU to select one of up to 255 MCUs (and request a Talkback™ message from that MCU).

BSAC mode = 16 bit MA and an 8 bit SA where each bit of the SA represents one of 8 possible MCUs.

e.g. OCU Address = 0000 0000 0000 0001 0100 0101 MCU 1 Address = 0000 0000 0000 0001 0000 0001 (MCU Online matching MA plus SA bit) MCU 2 Address = 0000 0000 0000 0001 0000 0100 (MCU Online matching MA plus SA bit) MCU 3 Address = 0000 0000 0000 0001 0100 0000 (MCU Online matching MA plus SA bit)







This mode enables an OCU to simultaneously select between 1 and 8 MCUs (and request a Talkback[™] message from any of those MCUs).

ESAC mode = 8 bit Master Address and a 16 bit Sub Address where each bit of the sub address represents one of 16 possible MCUs, this mode is only used in limited and controlled circumstances due to the reduction in total effective telegram addresses.

e.g. OCU Address = 0000 0001 1000 0000 0100 0101 MCU 1 Address = 0000 0001 0000 0000 0000 0001 (MCU Online matching MA plus SA bit) MCU 2 Address = 0000 0001 0000 0000 0100 (MCU Online matching MA plus SA bit) MCU 5 Address = 0000 0001 0000 0000 0001 0000 (MCU Offline because there is no matching SA) MCU 16 Address = 0000 0001 1000 0000 0000 0000 (MCU Online matching MA plus SA bit)

equivalent to a 9 bit address.

This is an extension of the BSAC mode that enables an OCU to simultaneously select between 1 and 16 MCUs (and request a Talkback[™] message from any of those MCUs).

4.2.2 CRC

The telegram is checked for integrity using a 16-bit CRC, corrupted frames will be rejected because the recalculated CRC will not match the transmitted CRC.

4.2.3 Session and Frame Security

Each message is protected by an enhanced proprietary security protocol in such a way that every telegram sent is both encrypted and unique, thereby eliminating any possibility of a 'hacking' or 'store and replay' attack from ever being successful.





4.3 Firmware Features

Firmware enables the safe core functionality of the OCU and MCU, additionally it is the resident firmware 'Apps' within the firmware in conjunction with the related Configuration Parameters that enable the OCU and MCU to implement specific functionality such as Hoist Select, Crane Select, Pitch and Catch, Motion interlocking, Talkback, RFID Security and RFID re-configuration, etc.

Firmware is upgradeable over the Bluetooth[™] link, this is a closed box operation.

4.4 Configuration Parameters

The configuration parameters, including the System Address, Sub-Address and Addressing mode, the selected RF channel(s), and those parameters needed to enable programmed function to operate much more are initially programmed over the Bluetooth[™] link, that is a closed box operation.

Configuration parameters may also be selected when programmed to do so by interaction with such items as an RFID tag.

5. System Overview

Each system typically includes one or two OCUs and one MCU plus accessories, but other combinations of OCUs and MCUs are possible.

Additionally, systems may operate independently or in combinations that allow for example tandem control.

MCUs are available in with differing interface formats such as Relay, Safety relay, CAN, Ethernet etc. and can be paired with these OCUs.

An MCU can be considered as a specialized Safety PLC.

Currently the 411, 611 and 325 OCUs can be used with the 10R or 17R MCU, this portfolio and the possible combinations will be continuously expanded.

These OCUs are not backward compatible with older Remtron[™], Cattron[™] or CattronControl[™] MCUs because they have a high security, Enhanced Black Channel RF telegram format, that has become necessary to prevent a remote control system being subjected to a 'Store and Replay Attack', the possibility of which has been made more likely by the proliferation of lower cost RF scanning equipment.

The OCU and MCU are linked by this secure communication system and the MCU drives the machine interface (relays, etc.). Therefore, the machine is under the direct control of the OCU and hence operator.

The system is available as a range of standard packages that fit most applications but can also be tailored to any custom application, this provides a great deal of flexibility to make the solution exactly fit your needs.

Standard Systems configurations, and other media are available on the www.Cattron.com website under the specific product resources tab.

These systems feature an ability to wirelessly connect to the OCU or MCU and upgrade firmware to take advantage of new features as they are released as well as the ability to wirelessly change configuration items such as frequency, address, function, interlocking, hoist crane select, SymmetryLock[™], or examine function totalizers, data and error logs etc.





6 OCU Overview

6.1 General

These OCUs are globally compliant when supplied with an appropriate radio module for the region being used, for non-standard applications additional regional or application specific certifications may be required. These units have been designed with the latest generation safety electronics and firmware and exceed the safety related systems requirements for ISO13849 Category 3 PLd for the stop function and when configured with specific options, also for defined control functions.

OCUs are equipped with two internal antennae, one for 2.4GHz and the other for the sub-GHz link, the typical operating range while dependent on the local environment is well in excess of 300 ft, with an open site performance in excess of 750ft can be expected.

Should the OCU exceed the operating range and the signal be lost, all motions on the controlled machine will cease.

OCUs have been approved to comply with the RF standards applicable to the region or country of use, there are license exempt bands and license required bands.

In North America, the 915MHz band is license exempt (FCC Part 15 and Industry Canada RSS-210 standards).

In Europe and other regions, the typical license exempt band is 433-434 MHz, 869MHz; again, other licensed and unlicensed frequency bands are available.

Globally the 2.4GHz band is generally available as license exempt with some technical variations.

The use of licensed bands including 450-470MHz will require an operating license but provide additional reliability because they are protected from interference.

The OCUs are designed to be powered by two off the shelf AA batteries for the quoted 95 hours of nominal operation (depending on configuration) and while the OCU would work with NiMH rechargeable batteries the battery life monitoring would not be accurate and may lead to unexpected shutdown.

Status and feedback are provided by 6 LEDs and a Haptic vibration motor, the 6 LEDs are Status, Stop, A, B, 1 and 2; Status is a Tri-color, Stop, A, B, 1 and 2 are Bi-color, there is an ambient light sensor to adjust the intensity based on background light levels.

The Stop LED shows the current availability of the Stop switch in line with the latest standards.

LEDs A, B, 1 and 2 located to the right and left of the 'STATUS' LED may be configured to indicate when an OCU function command such as hoist select, or to provide status indication of machine state, via Talkback.

A Force Sensor provides continuous monitoring of OCU and freefall will safely blank functions if the OCU is dropped. High G shock is logged to monitor for equipment abuse.





6.2 OCU Types Overview

The Remtron 411, 611 and 325 OCUs are lightweight, palm-sized, extremely rugged controllers that are available in standard and customized configurations.

Each OCU is designed to meet a specific control application. Two housing sizes are available that are fitted with the three switch layouts seen below

A label insert sheet is provided to identify button functionality to suit most applications, and while the front graphic is standard, it is possible to have both customized graphics and customized switch configurations.





The 'STATUS' LED (located center top) indicates the operational mode and any error messages.

The aperture directly under the 'STATUS' LED is an ambient light sensor that is used to adjust LED intensity and improve battery life.

The four remaining LEDs, A, B, to the left of the Status LED and 1 and 2 to the right of the Status LED, indicate either selection such as hoist or crane select, information or optional Talkback information.

There is a Haptic (vibration) feedback motor within the case to provide alerting and confirmation to an operator focused on the task at hand.

A high reliability switch system is provided and the rocker switches of the 411 and 611 are single step while the rockers of the 325 are dual step, the other auxiliary buttons are single step. The Stop switch is unique and features a Cat3 safety architecture and incorporates LED back lighting to provide information on the Stop switch availability as per latest standards.





Each function pushbutton or rocker switch may have one or more steps as described above, these can operate different functions. Typically, on a two-step rocker the first step controls a direction or function and the second step controls a speed increment, although it is possible with a step-less drive to use the second step as accelerate, the first step as hold speed, and the released state as decelerate.

Additionally for a high safety function it is possible to use both the direction and speed step as a CAT3 PLd input.

Any function is normally active only if the respective pushbutton is pressed. When the pushbutton is released, the function automatically stops, however latched MCU functions may be defined for functions such as Lights that need to be maintained in the absence of an online OCU.

The Start push button is for System Start / Mainline reset and / or HORN depending on machine wiring.

At startup the pushbuttons are checked for the correct off state.

These OCUs use off the shelf AA Alkaline batteries that will typically provide around 95 hours of continuous operation, the batteries are accessed via a sealed cover retained by two screws as shown below.

Figure 2 OCU, rear view



- 1. Sealed Battery Cover
- 2. Battery Access Screws
- 3. Loop for belt clip





6.3 RFID Reader

These OCUs have an additional feature option of a 125kHz RFID reader that can be used in two primary modes

- 1. User Authorization; where the user needs to hold the OCU to an ID badge at start up to be able to select an operational mode. This means that an OCU can associate an ID badge identity (person) to a specific machine and a specific set of available commands, or if no match is found not be able to start the OCU.
- 2. OCU Configuration to match a specific machine; where the user needs to hold the OCU to an ID TAG located on or near a machine at start up, to be able to select that specific machine. This means that an OCU can be owned by one user but used freely to control many different machines.

These two are similar and both required a database that cross references either Authorized User identities or Machine Identities to a specific System Address and set of configuration parameters. This database is then loaded into the OCU and used at startup.

6.4 Data Logging

These OCUs feature a fault and data logging capability that provides users with the ability to diagnose any intermittent operational issues and records the total switch activations for planned maintenance of the OCU.

The Associated MCUs feature enhanced logging capabilities with totalizers and run time per motion that enable planned maintenance and data-analytics.

The OCU logs specific data as shown in the table below, the MCU has extensive data logging that goes beyond this data set.

Data log events and switch totalizers can be downloaded over a Bluetooth link using the Configuration PC tool.

OCU Logs are shown in sequence, MCU logs are shown against a Real Time Clock

Table 1 OCU Event Logging

OCU Events Self-test Power on Power off Stop switch pressed Totalizers for every switch Battery replaced Run time on current batteries Low battery warning RF Talkback signal level below defined level Unit configuration changed Data-log downloaded Data-log cleared Switch Read Errors





These logs are explained in more detail in the following table;

Table 2 Log Event Detail

Log	Detail
Self test results	Event completed with no error or specific detail of fault shown
Power up	OCU power ON triggered
Power Down	OCU power OFF triggered
E-Stop pressed	E-Stop was pressed
Switch Totalizers for each switch	Current total activations for each switch
Battery Replaced	Batteries have been removed and replaced
Run time on batteries	Total run time since new bateries were fitted
Low Battery warning	Low Battery Warning has been triggered
	Received Signal Level is below -95dBm AND two of the last three
RF received signal level below defined level	messages were missed.
Configuration change and config ID	Configuration or Program has been updated
Datalog download	Datalog has been accessed
Datalog cleared	Datalog has been cleared
Cat 3 errors	Switch read Errors have been recorded



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7 Operating Instructions

7.1 OCU First Use

Insert a new set of AA size Alkaline batteries, these need to be installed as follows.

7.2 OCU Battery – Removal and Replacement

Referring to the figure below, battery access is under the cover on the rear of the OCU.

- To gain access to the batteries, remove the two screws securing the cover, remove cover and old batteries.
- To replace the batteries, insert new batteries taking note of the correct polarity as shown on the graphic under the batteries, then replace the cover and gently tighten the screws to snug the cover down.

Figure 3 OCU, rear views



Figure 4 Battery Pack Removal and Replacement





7.3 Activating the System

The following assumes that the MCU has been installed according to the associated user manual. Ensure that the OCU being used is the correct one for the machine to be controlled, an OCU may operate equipment that is many hundreds of feet away. Each system is assigned a unique address, the OCU and MCU both use this address and it is not normally duplicated, the OCU should have a label on it identifying the machine to which it is assigned.

WARNING

More than one remote control system may be used at, around, or nearby your operating facility. Therefore, before selecting an address for a system or spare you must ensure that it is the correct address for the desired equipment to be operated.

If the wrong address is programmed into an OCU or MCU, other remote-controlled equipment located at, around, or nearby your facility may unintentionally become operational. Failure to comply with the above warnings may result in serious injury or death to personnel and damage to equipment.

7.4 Operating the OCU

7.4.1 Momentary Transmission Mode

For systems configured in the Momentary Transmission (MT) mode, the OCU will (assuming no faults and good battery) transmit the STOP command from the OFF, Passive or Active States but will not transmit command functions until the Start sequence (STOP / START) has been completed. The OCU will continue to transmit for 5 seconds after any command button has been released or the stop switch has been pressed, then cease transmitting. The LED and Haptic indications for Stop being pressed in Sleep or Passive mode are no different to those shown in the following paragraphs.

WARNING

Momentary Transmission (MT) mode should not be used where it must be guaranteed that the OCU will be able stop the machine, for these applications a continuous mode of transmission must be used. Additionally, in MT Mode the MCU main contactor control safety relays can be configured to stay turned on for varying lengths of time including infinite, or until the OCU has commanded them to turn OFF.

MT should only be used where a risk assessment has indicated that this mode of operation presents no additional risk.

In MT mode there is no guarantee that when an OCU button is pressed it will manage to communicate with the MCU.

Failure to comply with the above warnings may result in serious injury or death to personnel and damage to equipment.

7.4.2 Transition to Passive Mode

From an OFF state the OCU can be powered up by pressing the START button, this will wake the OCU from a deep sleep state to a fully tested PASSIVE mode where it is waiting for user input to move into another operational mode.

The LEDs and Haptic will be tested at this point so you will see all LEDs flash briefly and the Haptic buzz to confirm they are all working.

The center Status and Right-hand LEDs 1 & 2 will then illuminate, the battery status will be shown on LEDs 1 & 2, after a few seconds LED1 & 2 will turn back OFF.





Table 3 Switch ON LED Sequence

Sequence				LEDs		Function		
	E-Stop	A	В	STATUS	1	2	HAPTIC	
Entering Passive State				GREEN				
	RED	RED	RED	RED	RED	RED		
At switch on after self test		GREEN	GREEN	GREEN	GREEN	GREEN		quick verify of LEDs & haptic
				BLUE			1 BUZZ	
INTERNAL Error				RED			3 BUZZ	
CAT 2 Error				N/A				
SWITCH Error				ALT. RED/GRN			3 BUZZ	Alternating Red/Green with Battery state masked
Pause								
	OFF			GREEN	GREEN	GREEN		Battery more than 80%
Passive State	OFF			GREEN	GREEN	AMBER		Battery 60-80%
	OFF			GREEN	AMBER	AMBER		Battery 40-60%
	OFF			GREEN	AMBER	RED		Battery 20-40%
	OFF			GREEN	RED	RED		Battery less than 20%

7.4.3 Transition to Active Mode

From Passive Mode the OCU can be moved into Active (Transmitting) mode, this stage involves some critical Safety tests and a positive transition into active machine controlling mode.

The STOP switch has two contact elements under it, and they are tested every time the OCU is moved into an Active mode, additionally all switch elements are tested at this phase to ensure that none of them are activated, the start sequence from Passive Mode is; Press the Stop switch and then press the Start switch within 3 seconds.

Table 4 Active Mode LED Sequence

Sequence	LEDs							Function
	E-Stop	A	В	STATUS	1	2	HAPTIC	
Active State Transmission Battery >40%	RED F			OFF				Active and E-Stop available
Active State Transmission Battery 20- 40%	RED F			AMBER F				Active and E-Stop available
Active State Transmission Battery <20%	RED F			RED F			3 BUZZ	Active and E-Stop available

At this point the OCU is operative and the target machine will be under direct control, verify the connection by activating a non-motion function such as the Horn button. Test all functions briefly at the start of the work session.



WARNING

Before attempting to use the 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 the horn and observing that the horn sounds on the targeted crane or machine. Failure to implement the above may result in serious injury or death to personnel and damage to equipment.





7.4.4 Transition to Passive Mode

The machine may be brought to a halt at any time by simply releasing the motion control button that will deactivate the motion control, or in an emergency pressing the STOP button that will typically deactivate the crane main contactor as well. When the STOP button is pressed the OCU sets the STATUS LED Red and the ESTOP LED Green and sends a positive stop command to the MCU and then terminates transmission, both of which will deactivate all commands and de-energize the crane main contactor.

From this stage the OCU can either be transitioned back to Active mode of switched off.

7.4.5 Transition to OFF Mode

From Passive mode the OCU can either be left until it powers down automatically, or manually put to sleep by pressing and holding the STOP button for 3 seconds.

7.5 Control Functions

The system will have been configured in one of many different standard configurations or possibly a custom configuration, there will be a configuration sheet that identifies all the functions in detail; some of the specific functions are mentioned below.

7.5.1 Magnet/Vacuum Lift and Drop

Lift is always a single button function whereas drop is always a two-button function for safety, depending on the number of available auxiliary buttons, the DROP may either be a separate button or combined with LIFT.

7.5.1.1 Separate DROP

To Drop press LIFT and DROP together for 3 seconds, release LIFT and then release DROP.

7.5.1.2 Combined DROP

To Drop press LIFT/DROP and ON/ALM together for 3 seconds, release LIFT/DROP then release ON/ALM.

7.5.2 Hoist or Crane Select

This function enables successive selection of two hoists or two cranes, typically by pressing one button on the OCU.

The sequence typically is set to default to 'no selection' at switch on and each press of the button increments around a loop of; no selection, A, B, BOTH, no selection etc.

Confirmation of the actual selection made is shown on the A, B, 1 and 2 LEDs on the top of the OCU. It is necessary to press the select button for longer than 500mS to ensure positive selection.

7.5.3 Lights

Lights or latched function selection is an MCU based variation where the relay being Latched toggles between the OFF and ON state and it is not affected by the state of the MCU Mainline Contactor relay outputs, i.e. when the MLC relays turn off, this assigned relay will stay in whatever state it was, OFF>OFF or ON>ON. The state can only be changed by turning the OCU back on and changing the state or resetting the MCUs power. This prevents an area light on a crane automatically turning OFF when the remote is turned off.

7.6 RFID Option

These OCUs have an additional feature option of a 125kHz RFID reader that can be used in two primary modes





1. User Authorization; where the user needs to hold the OCU to an ID badge at start up to be able to select an operational mode. This means that an OCU can associate an ID badge identity (person) to a specific machine and a specific set of available commands, or if no match is found not be able to start the OCU.

This mode has an associated database of users that have specific rights, the OCU will either allow or deny a user to transition the OCU into Active Mode, additionally a user may call up a specific preprogrammed configuration, so for instance a maintenance supervisor will be given additional control functionality not available to the normal user.

After a successful RFID Badge read if the OCU is powered OFF, the process will need to be repeated the next time it is powered ON.

2. OCU Configuration to match a specific machine; where the user needs to hold the OCU to an RFID TAG located on or near a machine at start up to be able to select that specific machines MCU. This means that an OCU can be owned by one user but used freely to control many different machines. This mode also has an associated database of machines MCU and associated characteristics, the OCU will call up a specific pre-programmed configuration such as frequency, address, button functionality and any additional required functions.

7.6.1 Transition to RFID Read Mode

From Passive mode the OCU can be transitioned to RFID read mode by pressing and holding the ON/ALM button for 5 seconds. If the OCU is held to a pre-assigned Personnel ID card or Machine Tag, the OCU will attempt to read the RFID device and set the appropriate parameters. After a successful read the OCU will revert to Passive Mode.

Sequence	LEDs							
	E-Stop	A	В	STATUS	1	2	HAPTIC	
RFID READ Stage 1 PASSIVE	OFF			GREEN	DEFAULT	DEFAULT		
After pressing ON/ALM for 5 Seconds	OFF	RED F		AMBER	OFF	OFF		
RFID READ Successfully	OFF	AMBER F		AMBER	OFF	OFF		
Configuration Updated	OFF	GREEN		GREEN	OFF	OFF		
Config Complete, back to Passive Mode	OFF	OFF		GREEN	DEFAULT	DEFAULT	1 BUZZ	
RFID READ FAILED	OFF	RED		AMBER	OFF	OFF	3 BUZZ	

Table 5 RFID Read Mode LED Sequence





8 OCU Maintenance

8.1 Built in Reliability

The 411, 611 and 325 series of OCUs and associated MCUs have been designed to be highly reliable by incorporating many features such as RF antenna diversity, high performance radios, built in fault tolerance that will safely isolate any faults if possible and self-clearing in the event of a transient fault, (these will still be logged) so users can expect superior reliability.

8.2 Maintenance Personnel

Unless customer technicians have received formal maintenance training from Cattron, the safe and approved maintenance philosophy is that faulty OCUs or MCUs should be returned to an authorized facility for repair. This ensures that safety and reliability are maintained at the required level.

Note: When returning an OCU for repair, make a note of the serial number so that the OCU configuration may be retrieved for any spare OCUs that need to be programmed.

8.3 Preventative Maintenance

Preventive on-site maintenance is extremely important to ensure system safety and longevity, the following items are recommended:

Daily Visual Inspection:

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

Cleaning the OCU:

 If necessary, the OCU should be cleaned with a moist cloth and a mild soap solution and then wiped dry with a clean paper towel. Do not immerse the OCU in water and do not use any alcohol-based or oil-based solvent cleaners—these could damage the housing.

Functional Check:

• After maintenance or repair, carry out a functional check to ensure the correct machine is under control and that all functions are working correctly.

Mission Time

 The OCU mission time (between major service or replacement) is expected in a normal heavy industrial environment to be about 5 years. Examination of the Totalizer logs should be made at least annually, if the number of switch activations has exceeded 1 Million operations, we recommend that the unit be returned for a switch assembly replacement before the projected switch life of 2 million operations is reached.





9 CattronLink[™]

WARNING
More than one remote control system may be used at, around, or nearby your operating facility. Therefore, before selecting an address for a system or spare you must ensure that it is the correct address for the desired equipment to be operated. If the wrong address is programmed into an OCU or MCU, other remote-controlled equipment located at, around, or nearby your facility may unintentionally become operational. Failure to comply with the above warnings may result in serious injury or death to personnel and damage to equipment.

These controllers feature the latest innovations in Safety, Programming and Configuration that enable continuous performance and feature upgrades to be a simple process.

There are two parts to this;

- 1. The Firmware that includes the core safety functions and the Features (or Apps) that have been integrated that give the OCU its operational capabilities such as RFID User Authorization or Tandem Crane control
- 2. The Configuration Parameters that define the enabled state of any features, the required configuration parameters such as Operating Frequencies, Address, Addressing Mode, Time-share Algorithms, Switches allowed to be ON at startup, RFID use, Switch Mapping and much more.

The Firmware may contain features that are not configured or used, however if a feature is wanted, its App must be in the firmware.

Configuration parameters that are not available in the firmware will not be implemented even if loaded in the Configuration file.

Therefore, as features are release the firmware needs to be upgraded in order to benefit from them (if wanted).

Due to this flexible and easily upgradeable configuration concept, it is not uncommon for one OCU to be kept as a spare for multiple cranes or machines, even if with widely varying functionality.

All OCU and MCU access is carried out wirelessly over a Bluetooth link from a laptop or PC running the Cattron software utility called CattronLink™.

9.1 What is CattronLink[™] Software.

CatttonLink[™] software is a suite of Apps that enable the latest generation of Cattron remote control products to be accessed over a Bluetooth[®] link for the purposes of;

- Firmware Upgrades
- Loading or changing of configuration parameters such as Frequency, Address, OCU Timeout, button / switch / relay allocation, etc.
- Examining device status including switch and relay totalizers
- Examining the datalogging stores.

CattronLink may be operated locally or remotely with the assistance of a member of the Cattron support team.





9.2 Transition OCU to Programming Mode

With the CattronLink[™] application running on a PC and ready to connect to the OCU turn on the OCU. The OCU will only allow a configuration connection to be made within the first 60 seconds of switching it on and while it is in Passive mode.

At this point the OCU can be found by scanning for OCUs, see the CattronLink[™] section below.

9.3 Compatibility

Cattron Link[™] requires a Windows 10 PC equipped with a Bluetooth link.

9.4 License Key Registration

Specific Feature availability is based on a license key system that the tool automatically accesses when it is started.

License registration requires that the PC to be used is registered on the Cattron licensing server, in order to do this the MAC address of the PC to be used needs to be sent to licensing1@cattron.com

The MAC address of the machine can be found by clicking on the HELP menu and then on Register



This will open up a window as shown below that shows your MAC address, clicking on the box (for the interface to be used) shown in the orange highlight box below will copy your MAC address to your clipboard, you can paste this into the email for your request to licensing1@cattron.com

Cooth Douison	n X
MAC Address	24:EE:9A:12:34:E9 (Intel(R) Wireless-AC 9260 💌 📔
Company Name	AnyCo.inc
Expiry Date	8/12/2021
	Re-Register Load License



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Once Cattron have entered your details into the licensing server you will be able to click on the lower left Register button (NB: this changes to Re-Register as shown above if already registered and changes are being requested) and the system will configure your required functionality with the CattronLink[™] tool.

Notes:

- 1. licenses have an expiry date, if your systems stops working, check that your license expiry date is still valid.
- 2. If you wish to use CattronLink when disconnected from the internet, you will need to request a license file (name.lic) that can be loaded with the 'load license' button shown above.

9.5 CattronLink[™] Functionality

Cattron Link functionality is implemented as a series of Plugins, not all Plugins are available for all users without specific training or authorization.

An extensive help screen is available that can be accessed from the Help Menu

The Graphic User Interface (GUI) for CattronLink™ is divided into 5 main zones:

- **Top menu** at the top right
- Recently connected devices on the right
- **Progress Log panel** at the bottom
- Workspace at the center that has tabs for each functionality
- Plugin group buttons on the left

Figure 5 Main elements of the UI







9.5.1 Top Menu

The top horizontal menu consists of 3 menu items:

9.5.1.1 File

This menu item has a submenu item 'Exit' to exit the Cattron application.

9.5.1.2 Device

This menu item has a submenu item 'New Device' used to connect to a new device.

9.5.1.3 Help

This menu has 4 sub menus

• About:

Clicking on this sub menu item will open a dialog box displaying the details about the application such as its product name, version, copyright etc.

• Register:

Clicking on this sub menu item will open a dialog box displaying the registration details discussed in the previous section.

User Guide:

Clicking on this sub menu item will open the user guide.

• Supported Device:

Clicking on this sub menu item will open new window to display list of supported devices by this application.

Figure 6 Top Menu







9.5.2 Recent Devices

List of recently connected devices are shown in the panel on the right. It consists of an icon for each of the recently connected device and its Name or Serial Number.

When the icon for an OCU or MCU is double clicked the application tries to connect to the device and after successfully connecting to it, will ask for a PIN to complete the connection, the default key is 219547 but this can be changed in the configuration file.

The OCU needs to have just been started (within 60 seconds) and in Passive mode.

If a connection could not be established, then the dialog box for connecting to the device is still shown. This is the same as that opened from the 'Device' menu, also pay attention to the logs window at the bottom of the page, if a connection is not established, retry a few times.

Each icon for a recently connected devices has item in the context menu, (right click), to remove the device from the recently connected list.

- 🗆 × CATTRON File Device Help **Device Information** ((*)) Dev **Device Information** Recent MCU_ec1bbd7678a2 Device Name OCUec1bbd767a92 OCU ec1bbd767a9c Bluetooth Address 259603886930578 BluetoothLE#BluetoothLE24:ee:9a:5f:ad:6f-ec:1b:bd:76:7a:92 Serial Number OCU_ec1bbd767a92 Erase logs Export 1:46:30 PM - INFO - Device connected successfully. BluetoothLE#BluetoothLE24:ee:9a:5f:ad:6f-ec:1b:bd:76:7a:92 1:46:18 PM - INFO - Paired successfully. 1:46:07 PM - INFO - Device ready to pair : OCU_ec1bbd767a92 1:46:04 PM - INFO - Scanning started. 1:45:57 PM - INFO - Load successful;Cattron.Plugins.OTATabFeature

Figure 7 Recent Devices





9.5.3 Progress Log

Every action performed by this application is logged and shown in the lower panel.

Figure 8 Progress Log

Erase logs Export		
11:08:42 AM - INFO - Load successful;Statistics		
11:08:38 AM - INFO - Load successful; Logs	Logs of this	
11:08:10 AM - INFO - Load successful;Configuration		-
11:08:00 AM - INFO - Load successful;Logs 11:08:00 AM - INFO - Load successful:OTA Config	here	
11:07:59 AM - INEO - Load successful Statistics		
Cattron Logs		

9.5.4 Central Workspace

This is the main area where all the installed plugins displayed, each plugin is shown as a separate tab on the workspace.

9.5.5 Plugin Groups

All the features in the application are implemented as plugins.

Plugins contain one or more functions with similar functionality.

Each plugin is represented by a button on the left panel of the application screen.

When the button is clicked all of the features of that plugin are loaded as tabs in the workspace.

Figure 9 Plugins and Workspace

	CATTRON	CattronLink(TM) Ne De	evice Help
DEVICE		Workspace area - Firmware Upgrade Screen	Recent Devices
UPGRADES	9	Permane Upgrade Settings - Device Type :	
DATA-LOGS		Existing Characteristics To be Upgraded Characteristics Pert No. : 3507-1234-A001	
SETTINGS		Version 1 1.0.2 CRC 1 0xx8556665 Sdem89y 1 0x01000000 Star (Bytes) 1 38345	
	Plug-in Groups	Brense Uppyde	
	Enset logs 12:13:07 - INHO - Load Stucess 12:13:07 - INHO - Device come 12:12:29 - INHO - Device come 12:12:29 - INHO - Park success 12:12:20 - INHO - Park success 12:12:20 - INHO - Park success 12:12:20 - INHO - Device ready 12:12:20 - INHO - Scaming stat 12:12:20 - INHO - Scaming stat	Sector Secto	Ĩ
	121204 - INFO - Device ready 121204 - INFO - Scarning star 123146 - INFO - Scarning star Cattron Logs	to pair con <i>exercence</i> Red La crista Ande	0







9.5.6 Device

This plugin group has two tabs.

9.5.6.1 Device Information Tab

On clicking this button, the application will attempt to connect to the last connected device and if the connection is established successfully, the device information will be displayed.

The connected device will be added into right panel of "Recent Devices".

Figure 10 Device Information Tab

CATTRON	(CattronLink(TM)	File	Device	Help	
((()))) Device Information	tion Device Information					Recent Devices
(FE)	Device Name	OCUec1bbd767a92				
	Bluetooth Address	259603886930578				
	Serial Number	BluetoothLE#BluetoothLE24:ee:9a:5f:ad:6f-ec:1b:bd:76:7a:92				
Erase logs Export						
1:46:30 PM - INFO - Device connected s	uccessfully. BluetoothLE#B	lluetoothLE24:ee:9a:5f:ad:6f-ec:1b:bd:76:7a:92				
1:46:10 PM - INFO - Paired successfully. 1:46:07 PM - INFO - Device ready to pai	r: OCU ec1bbd767a92					
1:46:04 PM - INFO - Scanning started.						
1:45:57 PM - INFO - Load successful;Cat	tron.Plugins.OTATabFeatur	e				





9.5.6.2 Connection Tab

If a connection could not be established or the application was not previously connected to a device, then the connection page will be displayed instead.

Pressing the 'Scan Devices' button will scan available BLE devices, the process will be completed after few minutes or a user can stop the scanning process by pressing the 'Stop Scan' button.

To connect or disconnect a device, select any device from the list and the relevant buttons will be displayed.

On successful device connection the device information page will be displayed, and device will be added to 'Recent Devices' panel.

Figure 11 Connection Page

CATTRON	CattronLink(TM)	File Device Help
Connection	Scan Devices Bluetooth Devices Device ID Device Name BluetoothLE#Bluetoothi ocu_####################################	File Device Help
Erase logs Export 12:08:47 - INFO - Scan completed. 12:08:17 - INFO - Scan completed. 12:08:17 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr 12:08:14 - INFO - Load successful/Cattr	: ocu_######## ron.Plugins.OTATabFeature ron.Plugins.LoggerTabFeature ron.Plugins.LogGconfigurationTabFeature ron.Plugins.ConfigurationTabFeature ron.Plugins.ConfigurationTabFeature	







9.5.7 Firmware Upgrade

This plugin is used to update the firmware of the OCU or MCU.

Remember that Firmware is the central operating system that comprised the core safety and enables the Features such as RFID, and that Configuration are the parameters used by the Firmware to customize the features with specific switch mapping, frequency, address etc.

In a Category 3 safety architecture there are two microcontrollers, the Master and the Slave, both need to be programmed. Additionally, the Radio module has a microcontroller that also needs to be programmed. Master and Slave always need to be upgraded together.

To upgrade the firmware, select any 'Device Type' (Master, Slave, Radio) option and browse for the correct firmware file (*.hex) on the PC.

Cattron offer a remote access service to your PC where they will be able to either do the upgrade for you with your assistance or guide you through the process. Email license1@cattron.com for assistance giving your device serial number and request.

Note that when selecting Master or Slave or Radio, the application will retrieve the boot table information from the OCU or MCU and display it on the 'Existing Characteristics' area.

The boot table information will also be displayed for any valid file in the 'To be Upgraded Characteristics' area.

Figure 12 Firmware Upgrades

		CattronLink	(TM)	Fi	le Device Help
((())) Firmware	Upgrade				Denicos
(Firmware Upgrade	Settings			
		Device Type :	Master O Slav	e 💌 Radio	
952]	Existing Characte	wistics	To be Upgrad	ed Characteristics	
0=0	Part No.	: 350F-4567-A001	Part No.	: 350F-4567-A001	
-	Version	1 103	Version	113	
Q	CRC	1 OVERECA488	CRC	0vF8C65468	
300			t de califaci		
	Identity	: 080000001	identity	: 020000001	
	Size (Bytes)	: 191188	Size (Bytes)	: 187840	
	(Internet of the second				
	DtiProject/BootLoad	der7esting/radiobinary/ocu-radio-app-1	1.3.hex	Browse Upgrade	
Frase logs	Export				
12:13:37 - INFO - ocu_#####	#### BluetoothLE#Blueto	othLE00:1a:7d:da:71:13-ec:1b:bd	76:7b:0e:Getting devic	e characteristics;No Error;Ok	
12:13:07 - INFO - ccu_#####	#### BluetoothLE#Blueto	othLE00:1a:7d:da:71:13-ec:1b:bd:	76:7b:0e;Getting devic	e characteristics;No Error;Ok	_
12:12:29 - INFO - Device cont	sected successfully. Blueto	oothLE#BluetoothLE00:1a:7d:da:7	1:13-ec:1b:bd:76:7b:0e		
12:12:18 - ERROR - Paired suco	ir Status : Failed				
12:12:07 - ERROR - Pair/Unpa	iir Status : Failed				
12:12:04 - INFO - Device read	y to pair : ocu_#########				-
12:12:04 . INSO . Scanning et	heted				<u></u>







9.5.8 Configuration Changes

This plugin is used to update the configuration (Operating characteristics; Frequency, Address, Switch functions etc.) for the OCU or MCU.

9.5.8.1 General Configuration

On clicking this plugin button, the application will open the screen below where it is possible to set different configuration values for 'Writing' into the OCU or MCU.

Configuration parameters are divided into categories like 'General', 'Address Mode', 'Switch', 'Interlock', 'Parent Child Interlock' and 'Telegram Mapping'. All categorized parameters have an individual tab.

Some configuration parameters are pre-defined to ensure compliance and stability and not available for customer use.

Cattron offer a remote access service to your PC where they will be able to either make the changes for you with your assistance or guide you through the process. Email license1@cattron.com for assistance giving your device serial number and request.

Figure 13 Configuration Screen

@c	ATTRON	CattronLink(TM)	Fi	le Device Hel	× p
(((;)))	Configuration Configuration	Configuration Set(s) Select Configuration Configuration 1 Select Configuratio		-	ant Daviene
	ration Fields	Default Configuration Set Configuration 3 Parent Configuration Set Set RF Control Address Mode Switch Neutrals Switch Directional Interlocks Sequential Interlocks Hoist Sequence Telegram Momentary Transmission SubGHz Time Sharing Pattern 3.3.3 F1 915000000 Hz			Dari
4		Talk-Back Mode OFF Diversity Disable ON OFF Bluetooth Bluetooth Pair Key 219547 Firmware			
		Authentication Password 12345678 OCU Automatic OFF Delay 300 sec			
Eras 2:58:16 PM - I 2:58:15 PM - I 2:57:24 PM - I 2:57:24 PM - I 2:57:23 PM - I	e logs Export NFO - OCU_ec1bbd767 NFO - Configuration pa NFO - OCU_ec1bbd767 NFO - Configuration pa NFO - Load successful/	Save Changes Write Prind 922 BluetoothLE#BluetoothLE24ees@a5fad.6f-ec:1bibd?67a92Load configuration from XML file;Ok Prind Prind 922 BluetootLE#BluetoothLE24ees@a5fad.6f-ec:1bibd?67a92Load configuration from XML file;Ok Prind Prind			

On the General Tab, configuration parameters are displayed in the work space and hovering over a field may show the available range of control.

When a configuration file has been edited according to your needs it can be sent to the OCU by pressing the WRITE button.



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Configurations files are in an xml format and must first be loaded with the Load button at the top of the screen. The final configuration file may be saved using the Save button at the top of the screen. Cattron can provide an updated configuration file that may be easily uploaded into your OCU or MCU to provide the required functionality or changes.

Figure 14 Applying Configuration Changes



NB: If a configuration has been loaded and changed and you intend to switch temporarily to a different App from the left column, it will be necessary to first click on the Save Changes button on the bottom of the screen, or the changes made to the configuration will be lost.





9.5.9 Data Logs



The Data Log Application allows the various OCU and MCU data logs to be examined and erased, the available data log access is controlled by a license key.

NB: Data log availability is controlled by a license key and some features may be restricted or subject to a user fee.

Data logs from the MCU are recorded against a real time clock, data logs from the OCU are recorded against time elapsed since OCU was turned on.

Figure 15 Data Log Page



9.5.9.1 Totalizers

This Log shows the current count of each switch or relay activation.

9.5.9.2 General Log

This Log shows a record of the general activity such as power up, power down, E-Stop pressed, internal test completed.

9.5.9.3 Error Log

This Log will contain the results of any internal errors such as switch errors, or self-test failures.





9.5.9.4 Erase Log

This button enable the various logs to be erased, access is restricted to Cattron service personnel.

9.5.9.5 Export Log

This button allows the log currently being displayed, to be saved as a CSV file to the chosen location.





10 Requirements to Achieve PLd within a 'System'

The 411, 611 and 325 OCUs meet a PLd rating for the Main Contactor control relays.

The Stop switch and all after is a CAT3 architecture with safety critical firmware, meeting ISO13849 performance level d.

Additionally, all OCU motion functions can meet the same performance level if two switch elements are used to operate a function, i.e. on a 325 both direction and speed switch inputs are combined into one control function, or on a 411 or 611 two switch inputs (one enable one control) are combined.

The R10 and R17 MCUs have the option of Safety Relays for motion functions and if two of these are used for a function, or one used as a motion enable and the other is placed in series, then a PLd performance level can also be achieved in the MCU and hence the entire motion function can be at a PLd level.





11 Technical Specifications

OCU Data	Description
OCU SERIES	411, 611, 325
FREQUENCY RANGE	2.4GHz, 902-928 MHz, 433-434 MHz, 868-869 MHz, 447-473 MHz and others
OPERATION RANGE	750 ft line-of-sight typical
TRANSMISSION SPEED	Sub-GHz 9.6 kb/s
POWER OUTPUT	Sub GHz 1-100mW, 2.4GHz 1-100mW (depends on regional RF rules)
ANTENNAE	Internal
SYSTEM ADDRESSES	24 Bit multi-mode
POWER SAVING MODE	15 minutes, configurable
VOLTAGE SUPPLY	Two AA Alkaline Batteries
BATTERY LIFE	95 hours nominal configuration (LED and RF power dependent)
CONTROL ELEMENTS	411, 4 motion one-speed 1 Aux
	611, 6 motion one-speed 1 Aux
	325, 3 motion two-speed, 5 Aux
USER FEEDBACK	5 Multi-Color LEDs for status and fault display and Haptic
WEIGHT	411 295g (0.65lBs)
	611 & 325 386g (0.85lbs)
DIMENSIONS	411 33.3 X 69.8 X 183 mm (1 5/16 X 2 3/4 X 7 3/16)
	611 & 325 33.3 X 69.8 X 220 mm (1 5/16 X 2 3/4 X 8 9/16)
HOUSING	Reinforced Nylon 66
OPERATING TEMPERATURE	-4 °F to +140 °F (-20 °C to +60 °C)
IP PROTECTION CLASS	IP65
SAFETY CATEGORY	ISO 13849 PLd Stop Command
	(PLd possible on motions with specific configurations)





12 Configuration Sheets

Refer to the resource tab for each OCU 411, 611 or 325 at the following web address. Cattrons website





13 CE Declaration of Conformity

Hereby Cattron declares that the radio equipment is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: cattrons website





14 RF Compliance

Information to the User regarding FCC Compliance:

- Changes or modifications not expressly approved by the manufacturer shall void the user's authority to
 operate the equipment.
- This Class A digital apparatus complies with Industry-Canada ICES-003 standards.
- 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

(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

OCUs have been approved to comply with both FCC Part 15 and Industry Canada RSS-210 applications standards.

No United States of America FCC or Industry Canada license is required for operation of FCC Part 15 or RSS-210 MKU OCUs.

14.1 Unlicensed Bands

Unlicensed bands include the following:

- 902-928 MHz in the U.S.A. and Canada
- 433-434 MHz in the EU, Brazil, China and others
- 868 MHz in the EU
- Other regions may differ based on National and regional rules.

14.2 Licensed Bands

Licensed bands include the following:

- 450-470 MHz in the U.S.A. and Canada
- Other regions may differ based on National and regional rules.





Distributed by Tri-State Equipment Company Inc. sales@tsoverheadcrane.com www.tsoverheadcrane.com Tel: (314) 869-7200

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

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

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