16 – 37 TM
INTEGRATED RADIO CONTROL
INSTRUCTION MANUAL

An Oshkosh Truck Corporation Company

1. Introduction 2
2. The Components of the IRC-System 3
3. Description of the System 4
3.1 The IRC-System, general Description 4
3.2 IRC-Remote Control Box 5
3.2.1 General Description of the Remote Control Box 5
3.2.2 Control Levers 6
3.2.2.1 Operating Symbols 6
3.2.2.2 Lever Sequence, 6 Crane Functions 7
3.2.2.3 Lever Sequence, 5 Crane Functions 7
3.2.2.4 Lever Sequence, 4 Crane Functions 8
3.2.2.5 Lever Sequence, 6 + 2 Crane Functions 8
3.2.3 Press Buttons and Tumbler Switches 9
3.2.3.1 Remote Control of RCL Functions 9
3.2.3.2 Engine Throttle Control (Option) 10
3.2.3.3 Engine Start-Stop (Option) 11
3.2.3.4 Electric Reverser Function, 7 or 8 Crane Functions 12
3.2.3.5 Choice of Engine Revolutions (Option) 14
3.2.4 The Remote Control Box in Stand-By Mode 15
3.4 IRC-Battery and Battery Charger 16
3.4.1 Replacement of the Battery 16
3.4.2 Charging of the Battery 17
3.4.3 Good Advice about the Battery 17
3.6 Transmitter System, Frequencies 18
4. Safety Regulations 19
5. Starting Up of the Crane 20
5.1 Starting Up from the Indicator Panel of the RCL 20
5.2 Starting Up of the IRC-System 21
5.3 Starting Up from the IRC-Remote Control Box 21
6. Signalling during Crane Operation 22
7. Emergency Stop during Crane Operation 22
8. Stopping the IRC-System 22
9. Emergency Operation of the Crane 23
10. The HDL-System (Option) 23
10.1 Proportional HDL 24
10.2 Micro Operation 24
Troubleshooting 25
Maintenance 26
Technical Data 27
Electronic box 27

1. Introduction

This instruction manual on IRC radio remote control is meant for the user of the crane and must be considered as a supplement to:

- the Instruction Manual for the individual Crane Series and
- the RCL Instruction Manual

It is important to read these instruction manuals before starting up and using the radio remote control. This should give the best starting point for an unproblematic use of the system.

The designation IRC is short for Integrated Radio Control, which means that the transmission of data from the radio remote control is an integrated part of the crane's RCL safety system.

During crane operation, the IRC-system sends signals to the RCL 5100/5200 controller which monitors which crane functions that are activated.

The RCL safety system is thus monitoring the following parameters:

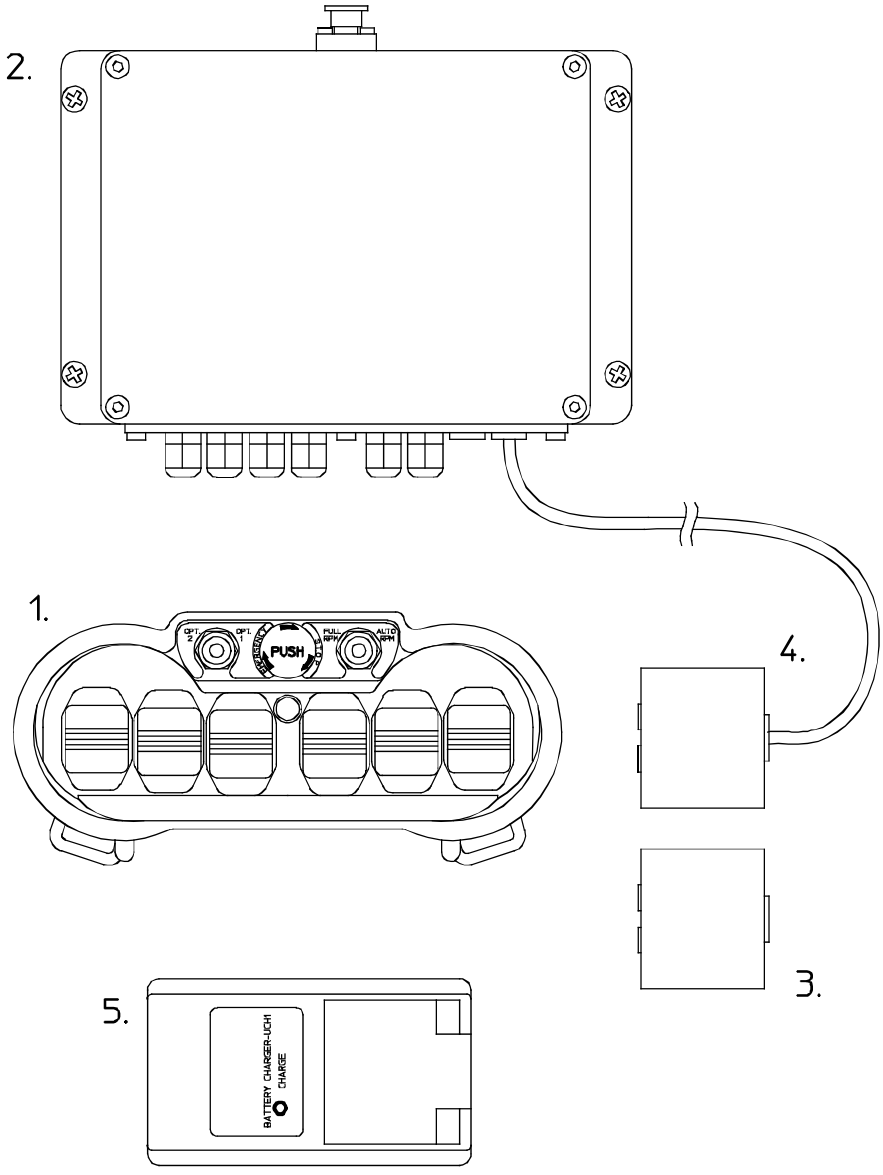
- The load moment of the crane
- The operation of the crane
- The functional conditions

and stops the crane if critical situations occur.

2. The Components of the IRC-System

The IRC system consists of the following components:

Remote control box with radio transmitter
Electronic box with radio receiver
Battery for the remote control box (2 pcs.)
Remote control cable (option)
Battery Charger



3. Description of the System

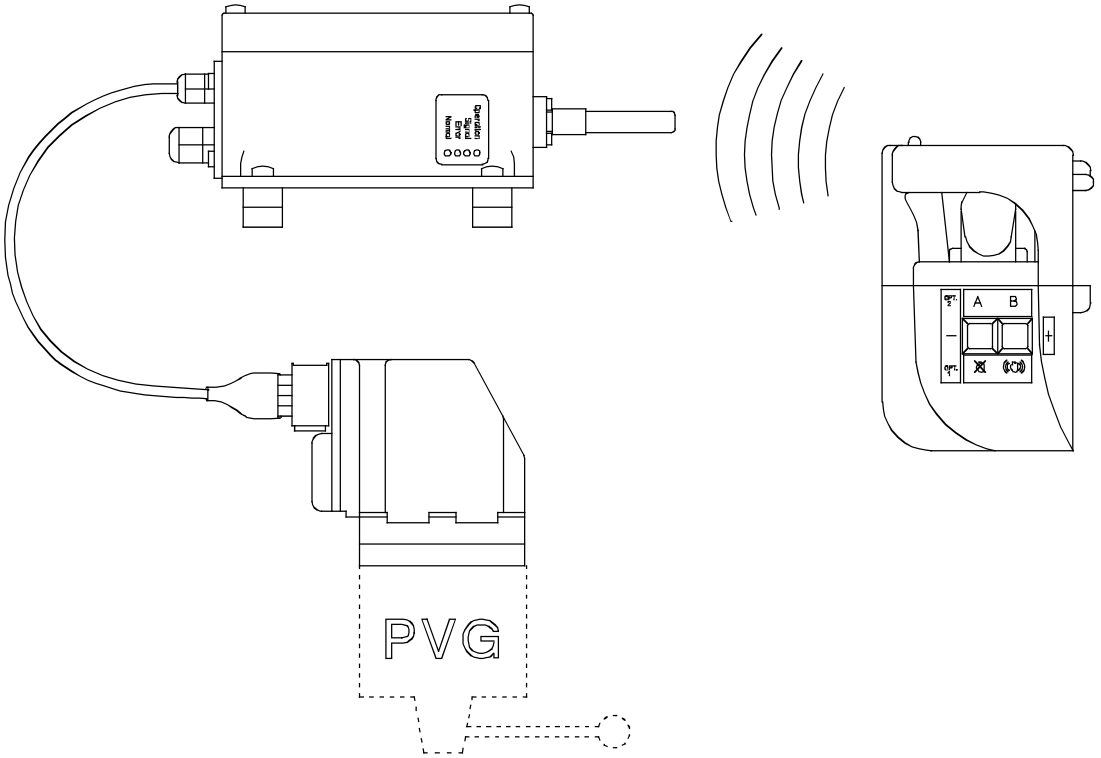
3.1 The IRC-System, general Description

The electronic box is connected to the electric activations on the valve block by means of electric cables.

During crane operation, the control levers on the remote control box are operated. Digitally coded control information is thus sent via radio signals to the electronic box. The radio signals are converted to electric voltage, which is sent to the electric activations of the valve block.

In the electric activations the electric voltage controls small hydraulic solenoid valves. These solenoid valves control a hydraulic oil pressure, which activates the control levers of the valve block.

The control levers on the valve block move at the same speed and in the same direction as the control levers on the remote control box.



3.2 IRC-Remote Control Box

3.2.1 General Description of the Remote Control Box

The remote control box can be equipped with up to 6 **control levers** (pos. 1) depending on how many crane functions are to be operated.

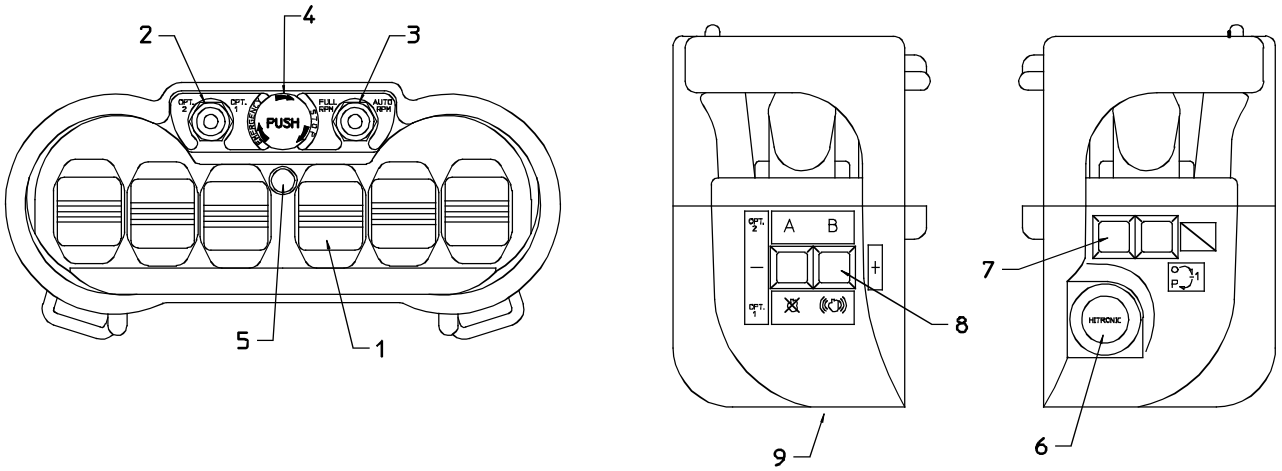
The **left tumbler switch** (pos. 2) and the **right tumbler switch** (pos. 3) for operating extra functions are placed in front of the control levers. Please note: extra functions related to the engine control of the vehicle, are only active when the vehicle body builder has carried out the necessary electric connections.

In front of the control levers there is also a **stop button** (pos. 4) as well as an **indicator lamp** (pos. 5). The indicator lamp as well as the built-in **buzzer** currently keep the operator informed of the functional condition of the system.

On the right side of the remote control box is built in a **key switch** (pos. 6). The **press buttons** (pos. 7) remote control functions in the RCL controller.

On the left side of the remote control box are built in some **press buttons** (pos. 8) for extra functions.

The remote control box is powered by a **battery** (pos. 9) placed at the bottom of the box.



3.2.2 Control Levers

The control levers have stepless activation to both sides. They are spring-loaded and therefore they automatically go back into neutral position when they are released.

The control levers on the valve block move at the same speed and in the same direction as the control levers on the remote control box.

The signal from a control lever is proportional, i.e. the more it is operated towards the extreme position, the more speed is increased on the crane function in question.

Please note that all control levers must be in neutral position before starting up the system.

The number of control levers depends on the number of crane functions, which are to be remote controlled. From IMT the positioning of the individual control lever as well as the direction of travel of the crane in relation to the direction of travel of the control levers are determined as standard configurations.

A standard configuration can be changed by an IMT service point, if required.

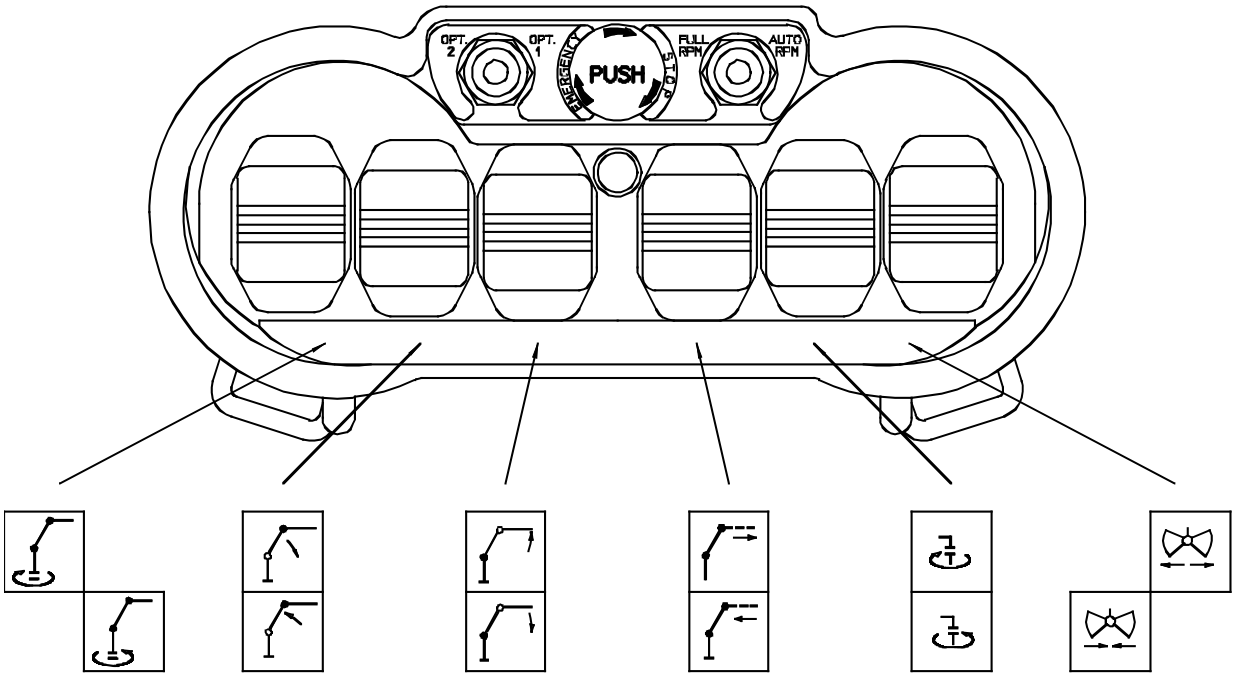
3.2.2.1 Operating Symbols

Cranes equipped with IRC-system are delivered from IMT with operating symbols labelled on the remote control box.

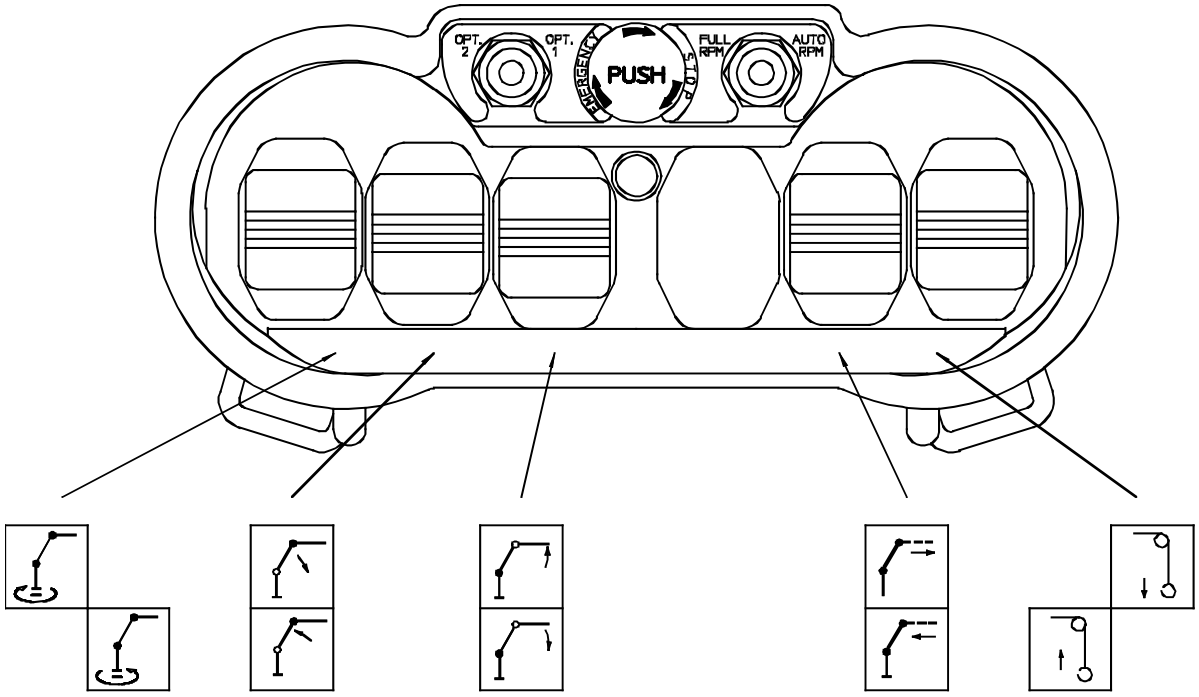
When changing a standard configuration, the operating symbols must be labelled on the remote control corresponding to the lever sequence in question.
At the same time, you must state the change in this Instruction Manual by changing one of the below sketches.

In the following pages are indicated the different standard configurations of the remote control boxes with their corresponding operating symbols.

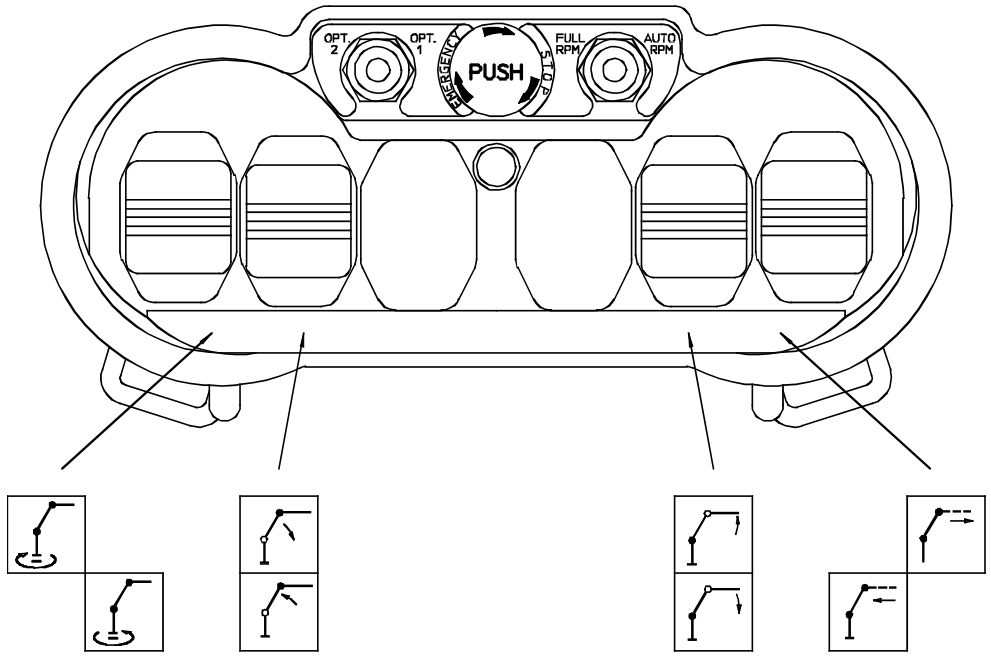
3.2.2.2 Lever Sequence, 6 Crane Functions



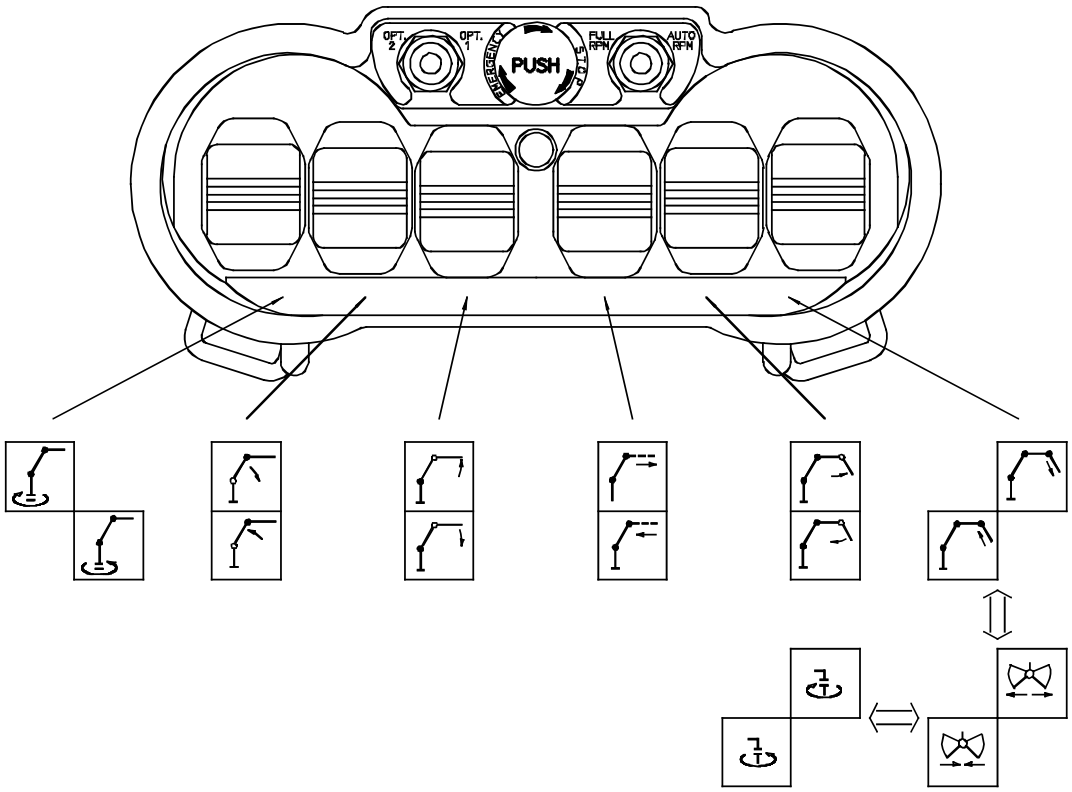
3.2.2.3 Lever Sequence, 5 Crane Functions



3.2.2.4 Lever Sequence, 4 Crane Functions



3.2.2.5 Lever Sequence, 6 + 2 Crane Functions



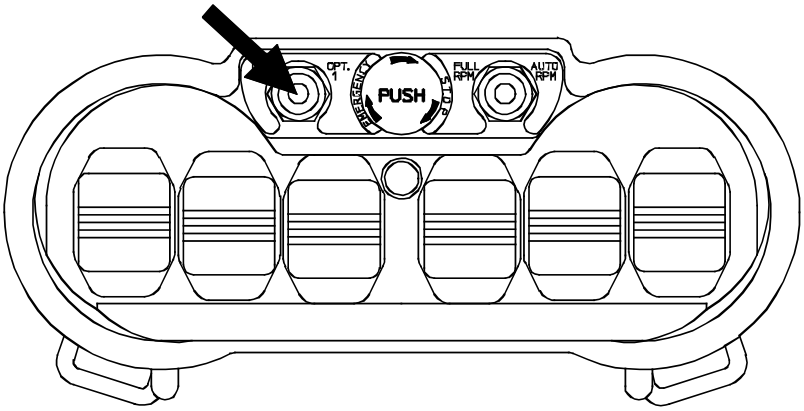
3.2.3 Press Buttons and Tumbler Switches

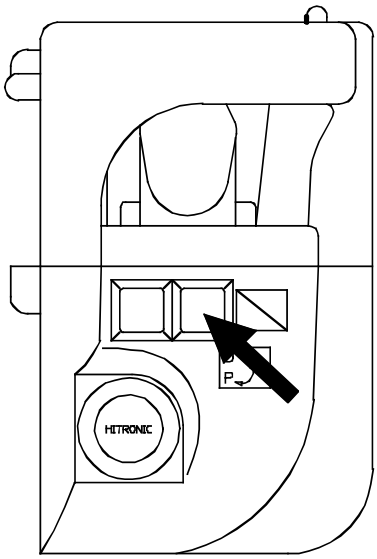
All press buttons and tumbler switches on the remote control box only control “ON/OFF”-functions in the IRC-system.

3.2.3.1 Remote Control of RCL Functions

On the RCL controller, different functions can be operated by means of the three press buttons; red, yellow and green. These functions can also be remote controlled by means of the press buttons on the right side of the remote control box. However, there are only two press buttons.

The functions of the **green** and **red** press buttons are operated directly, while the function of the **yellow** press button is operated by pushing the *left tumbler switch* to the right (opt. 1) and at the same time pushing the *red press button.*





The following functions are operated by means of the press buttons:

Green press button: Activation of the RCL-system / Deactivation of buzzer
Red press button: Override / Manual activation of HDL / Indication of errors
Yellow press button: Alternative function mode.

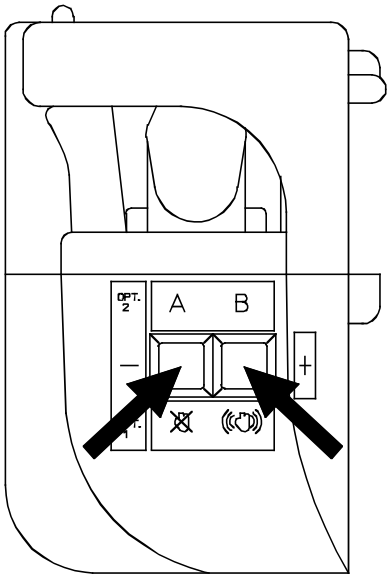
These RCL functions are thoroughly described in the RCL Instruction Manual.

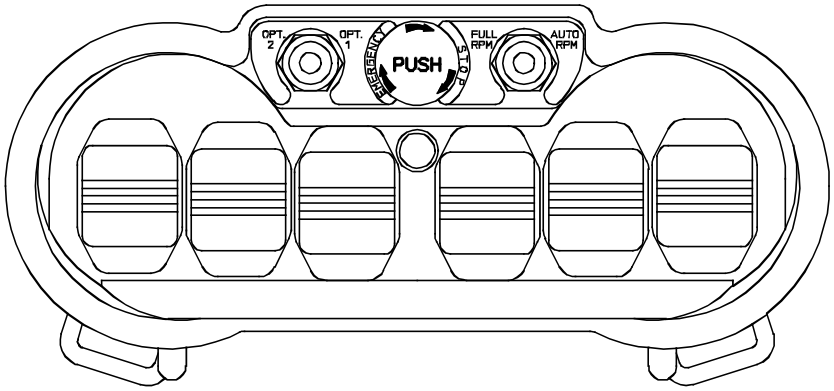
3.2.3.2 Engine Throttle Control (Option)

Throttle control of the engine of the vehicle can be carried out from the remote control box. The regulation area is between idling and a max. number of revolutions fixed by the IMT service point and programmed in the EDC-engine control by the supplier of the vehicle.

Operate the throttle control in the following way:

- The *left tumbler switch* must be in central position
- By pushing the *right press button* several times, the number of revolutions is increased (+ RPM) stepwise
- By pushing the *left press button* several times, the number of revolutions is decreased (- RPM) stepwise

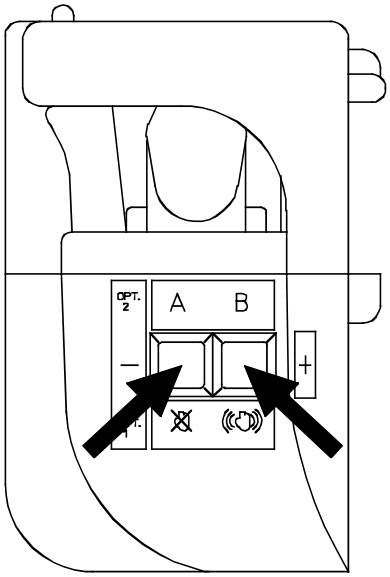


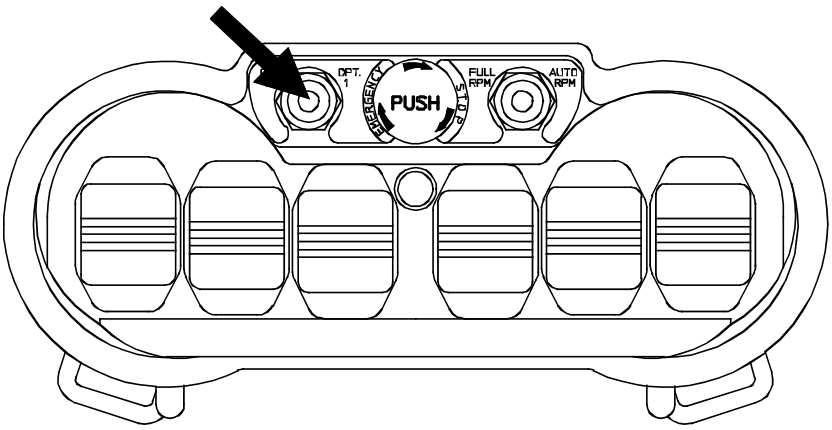


3.2.3.3 Engine Start-Stop (Option)

The engine of the vehicle can be started and stopped from the remote control box as follows:

- Push the *left tumbler switch* to the right (opt 1). The tumbler switch must be kept in this position because it is spring-loaded and automatically goes back into neutral position
- The engine is started by pushing the *right press button*
- The engine is stopped by pushing the *left press button*





3.2.3.4 Electric Reverser Function, 7 or 8 Crane Functions

The remote control box has 6 proportionally acting control levers for operating 6 crane functions.

By means of an electric reverser function it is possible to operate up to two more crane functions. I.e. one of the control levers can control three different crane functions (or crane equipment).
By means of the *left tumbler switch* and the *press buttons* on the left side of the remote control box, it is possible to change between up to three crane functions on the control lever.

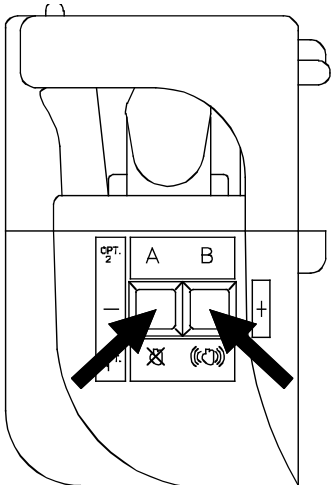
Example:

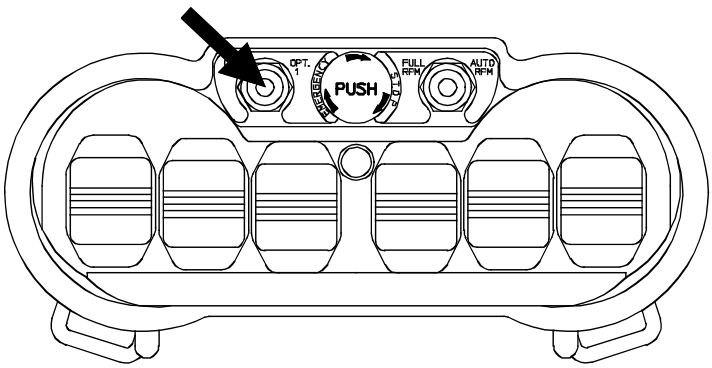
The crane is fitted with Fly-Jib. The 5th control lever operates the jib function of the Fly-Jib and the 6th control lever operates the extension function (the two levers to the extreme right) .

The Fly-Jib is fitted with extra valves for grab and rotator (7th and 8th function).

Operate the grab and rotator in the following way:

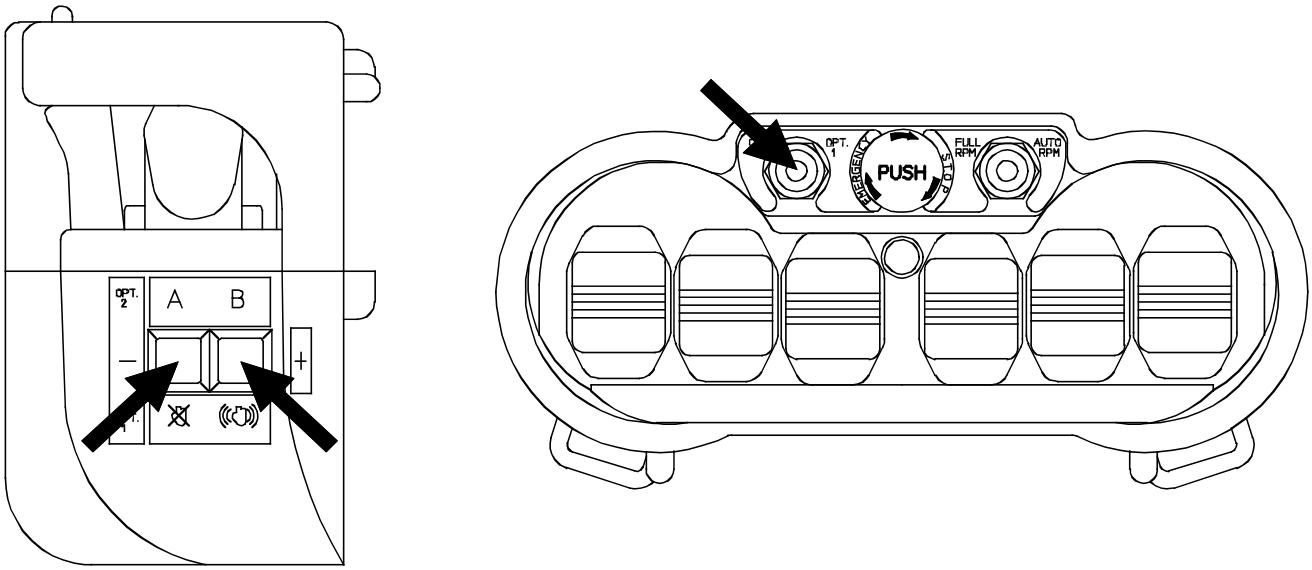
- Push the *left tumbler switch* to the left (opt. 2).
- While holding down the *left press button* (A), the 6th control lever changes from Fly-Jib “extension”-function to “rotator”-function.
- While holding down the *right press button* (B), the 6th control lever changes from Fly-Jib “extension”-function to “grab”-function.





If you require the 7th or 8th crane function to be activated permanently, carry out as follows:

- Push the *left tumbler switch* to the left (opt. 2).
- Hold down the *left press button* (A) or the *right press button* (B) while pushing the *left tumbler switch* into central position again.



Now the “grab”- or “rotator”-function is a direct function in the 6th control lever.

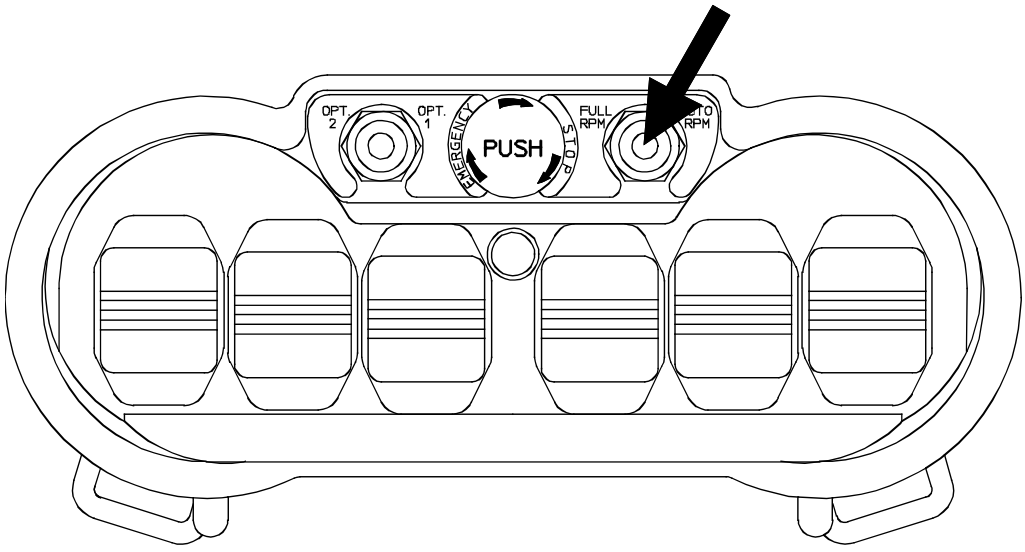
By repeating the procedure, the functions of the control levers are changed back to their original functions.

3.2.3.5 Choice of Engine Revolutions (Option)

During crane operation, the number of engine revolutions must be increased to a fixed level (e.g. 900-1000 RPM) to optimise the capacity of the engine as well as the working speed of the crane.

The change from the engine running idle to its number of revolutions being increased into working level, can be remote controlled.
By means of the *right tumbler switch* on the remote control box, you can choose between two types of engine revolutions.

- If the *right tumbler switch* is in central position, the engine revolutions are not activated and the engine is running idle.
- If the *right tumbler switch* is pushed to the left (FULL RPM), the engine is continuously running at high working speed.
- If the *right tumbler switch* is pushed to the right (AUTO RPM), the high engine revolutions are automatically engaged and disengaged.
  I.e. when one of the control levers is being operated, the high engine revolutions are engaged. When the control levers are back in neutral position, the high engine revolutions are disengaged and the engine is running idle.



3.2.4 The Remote Control Box in Stand-By Mode

To optimise the running time of the battery as well as for safety reasons, the remote control box is pre-programmed to go into stand-by mode after approx. 10 minutes. At the same time the indicator lamp turns off.
I.e. if there has been no operation from the remote control box for the last 10 minutes, it goes into stand-by mode, where the power consumption is very limited.

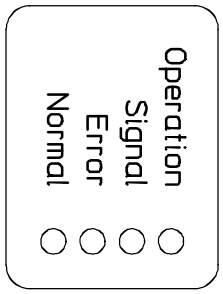
Please note! To reactivate the remote control box, push the green press button.

3.3 IRC-Electronic Box

A radio receiver is built into the electronic box, which by means of the external antenna receives radio signals from the remote control box.

The electronic box is connected to either 12 or 24 volts power supply from the accumulator of the vehicle. There are outputs for cable connection to the electric activations of the valve block as well as to the RCL-system.

On the right side of the electronic box there is a small square with four diodes signalling whether or not the system functions correctly.



Diode	Function
OPERATION (yellow diode)	The diode is flashing when the hydraulic pump of the vehicle has been activated and the electric system is powered.
SIGNAL (green diode)	The diode is flashing when the remote control box is activated and the decoder in the electronic box receives a correct radio signal.
NORMAL (yellow diode)	The diode indicates that the system is ready for operation. The diode is lit while the SIGNAL diode is flashing.
ERROR (red diode)	When the system functions normally, the diode must be turned off. In connection with system errors, the diode is flashing at the same interval as the OPERATION diode. Please see chapter on troubleshooting.

3.4 IRC-Battery and Battery Charger

Together with the IRC-system there are two rechargeable batteries. The battery is placed at the bottom of the remote control box and can be replaced by one single movement. Please note: A completely charged battery works for approx. 8 hours of remote control operation.

The battery charger must be mounted in the driver's cab where it is protected against dirt and humidity. The charger must via a fuse be connected to 12 or 24 volts power supply directly to the battery of the vehicle. This is how charging is made possible, also when the ignition is turned off.
Please note: It takes approx. 3.5 hours to recharge a battery that has been completely discharged.

3.4.1 Replacement of the Battery

The transmitter electronics in the remote control box currently monitor the battery voltage. When the voltage comes below a certain value after approx. 8 hours of operation, the following is indicated:

- The buzzer in the remote control box gives a periodic signal during 30 seconds.
- Then the remote control box is disconnected

Now the battery has to be replaced by a recharged battery from the battery charger.

Follow the procedure below:

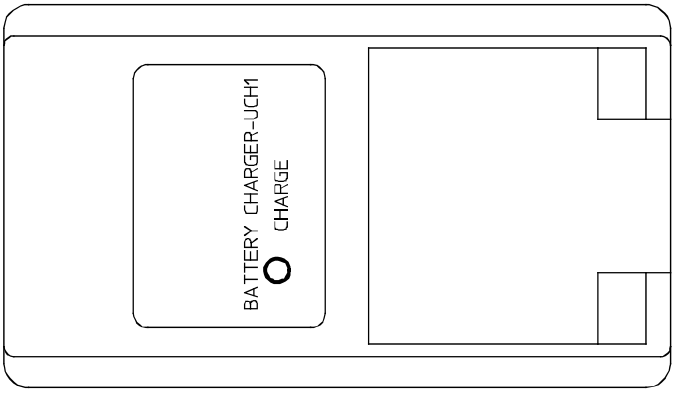
- Move the crane into a safe position within the 30 seconds of the periodic signal from the buzzer
- Turn the key switch on the right side of the remote control box into position "0"
- Take out the discharged battery from the remote control box
- Clean the battery compartment and make sure that the pole connectors are normally spring-loaded and not corroded
- Put a recharged battery from the battery charger up into the battery compartment and press it into position so that it is fixed and has a good electric connection
- Start up the remote control box according to the chapter: "Starting Up of the IRC-System"

The radio remote control is now ready for operation.

3.4.2 Charging of the Battery

Right after a discharged battery has been taken out of the remote control box, it has to be recharged in the battery charger according to the following procedure:

- Put the battery into the battery compartment of the battery charger and press it into position so that it is fixed and has a good electric connection.
- The green diode on the charger is lit, indicating that the battery is being charged.
- The battery charger registers when the battery is completely charged
- After approx. 3.5 hours the charging is completed, and the green diode starts flashing
- The battery charger now change to “maintenance charging”, ensuring that the battery does not discharge after some time
- A completely charged battery is thus always available in the battery charger



3.4.3 Good Advice about the Battery

To ensure the longest possible working time of the batteries, the following must be respected:

- The battery must be completely discharged before recharging it
- Do not replace the battery before the buzzer indicates that the battery has to be recharged
- In case of low temperatures the capacity and working time of the battery are reduced
- When at rechargeable battery is discarded, dispose of it as special waste

3.5 **Remote control cable** (option)

The remote control box can be connected to the electronic box by means of a remote control cable.
Please note! The cable is not delivered together with the IRC-system as standard.

The remote control cable can be used if the remote control box cannot communicate with the electronic box in case of battery failure, interruption in the radio communication, errors in radio transmitter/receiver, or the like,

The cable has an adapter in one end, which is inserted in the battery compartment on the remote control box.

3.6 Transmitter System, Frequencies

Every time the IRC-system is started up, one out of 16 frequencies in the ISM-band is chosen.

In the self-test phase during start up of the remote control box, the system is testing whether the chosen frequency can be used or whether it collides with other radio transmitters. If it cannot be used, repeat the starting up procedure and the next frequency will be chosen.

A coded data telegram is now transmitted from the remote control box with an address that must be in accordance with a corresponding data telegram with its address in the electronic box at the frequency in question.

When the radio receiver has accepted the coded data telegram of the radio transmitter, the IRC-system is ready for operation.

4. Safety Regulations

The IRC-system makes it possible to control the crane via radio signals, and therefore there are certain safety regulations that have to be respected:

- Only personnel, who have been instructed in operating the equipment, must work with a remote controlled crane.
- The crane operator must read the instruction manuals delivered together with the crane before starting up crane operation, and follow the instructions during crane operation.
- When the remote control box is not being used, disconnect it, and pull out the key from the key switch.
- For safety reasons, keep the remote control box inside the driver's cab when not in use.
- Before carrying out mounting, maintenance or repair work, turn off the power supply to the system
- Do not change or remove anything from the safety devices.
- When cleaning the crane, avoid spraying on water and never use high-pressure rinsing for cleaning the electronic components.

Before crane operation, the crane operator must check as follows:

- that the remote control box belongs to the crane that is to be operated
- whether there are any cracks on or damage to the IRC-system
- that the operating symbols on the remote control box are intact
- that the crane is stopped when pushing the stop button
- that the remote control system functions correctly
- that no other person stays on or near the crane
- that the parking brake of the vehicle has been applied before starting the engine by means of the remote control box.

During crane operation the operator must:

- stand in a suitable distance from the hook and the load, have a good visibility, and see to it that no unauthorized persons enter into the working area.
- be aware that it is not permitted to move the load over himself or anybody else
- be ready to let go of the control levers and push the stop button, if he looses control over the crane movements.

After crane operation the operator must:

- *push* the stop button on the remote control box and on the crane.
- put the remote control box in a place inaccessible to others
- report any errors, damage or defects on the equipment to the person responsible for the crane

5. Starting Up of the Crane

Before starting up, the essential safety regulations have to be respected, just as the general procedure in connection with starting up of the crane has to be followed.
Please see the *Instruction Manual* of the *crane* as well as the *RCL Instruction Manual*.

Before crane operation, extend the stabilizer beams and lower the stabilizer legs to the surface.

5.1 Starting Up from the Indicator Panel of the RCL

When the crane is equipped with an IRC-system, the diodes on the RCL indicator panel have different indications than a manually operated crane during start up.

- Connect the pump (PTO); the controller is thus powered
- All stop buttons must be pulled out (there is a stop button at each control position).
- Push the green press button on the RCL indicator panel.
- The RUN and FUNC diodes are flashing
- Push the yellow press button *twice* to choose the stabilizer function
- When the stabilizer legs have been lowered, *start up the IRC-system*

Crane operation can start.

Please note: During stabilizer operation, a change of the load moment of the crane exceeding 10% will entail that the system automatically changes into crane operation mode.

5.2 Starting Up of the IRC-System

Starting up of the IRC-System from the remote control box:

- The key switch must be in position “0”
- The stop button on the remote control box must be pulled out (turn it to the right).
- All control levers must be in neutral position
- Turn the key switch into position “I”
- The buzzer indicates: signal for approx. 3 sec. - pause for approx. 3 sec. – a short signal
- The indicator lamp starts to flash
- Push the green press button (starting up the RCL).

The following is indicated:

Remote control box	The indicator lamp is flashing
Electronic box	The OPERATION diode is flashing The SIGNAL diode is flashing The NORMAL diode is constantly lit
RCL indicator panel	The RUN diode is constantly lit

The RCL/IRC-system is ready and crane operation can start.

5.3 Starting Up from the IRC-Remote Control Box

Alternatively the RCL/IRC-system can be started up from the remote control box:

- Connect the pump (PTO); the controller is thus powered
- All stop buttons must be pulled out (there is a stop button at each control position).
- Start up the IRC system (see that item)
- Push the yellow press button *twice*
- Extend the stabilizer beams and lower the stabilizer legs

Crane operation can start.

6. Signalling during Crane Operation

When the crane is remote controlled, the operator must keep an eye on the indications of the RCL indicator panel. Please see the *RCL Instruction Manual* of the crane.

To avoid unexpected stops of the crane movements, it is important to pay attention to the indications from the buzzer of the remote control box. A periodic signal from the buzzer during 30 seconds indicates that the battery has to be changed (recharged).
Move the crane into a safe position within the 30 seconds of the periodic signal from the buzzer.

If the indicator lamp on the remote control box turns off and the crane cannot be remote controlled, it may be due to radio interference or system errors. Please see chapter on troubleshooting.

7. Emergency Stop during Crane Operation

If a dangerous situation occurs, where you are about to loose control of the crane, push the stop button on the remote control box and stop the crane.

When the stop button is pushed on the remote control box, the RCL controller registers this as an error. The RUN and FUNC diodes start flashing.

Start up the IRC-system again according to the procedure and continue crane operation.

Please note! Every time the IRC-system is started up, always test the functioning of the stop button. When pushing the stop button, it must not be possible to remote control the crane.

8. Stopping the IRC-System

After crane operation, interrupt the IRC-system according to the following procedure:

- Push the stop button.
- Turn the key switch into position “0”, pull out the key and keep it with you.
- Stop the hydraulic pump, the power to the system is thus interrupted

9. Emergency Operation of the Crane

In case of IRC-system errors the following is indicated:

- The ERROR diode on the electronic box flashes
- The RUN and FUNC diodes on the RCL indicator panel are flashing

In this fault condition it is not possible to remote control the crane.

However, it is possible to change into emergency operation of the crane in the following way:

- On the RCL indicator panel, hold down the yellow press button while pushing the red press button
- The RUN and FUNC diodes on the RCL indicator panel are still flashing

Now emergency operation of the crane is possible by using the control levers on the valve block of the crane.

As a control of whether the system is set for emergency operation, it is possible to push the red press button and the 100% diode will flash. If not, then change into emergency operation again according to the above-mentioned procedure.

Please note: In case of manual emergency operation of the crane, the crane's lifting capacity is reduced (the crane is derated) to 90% of its normal capacity.

To change back into remote control mode, repeat the procedure stated above: push/hold down the yellow press button and push the red press button.

10. The HDL-System (Option)

If the crane is equipped with an HDL system (Heavy Duty Lifting), it offers the possibility of an increase of the crane's nominal load by approx. 10 % while the working speed is reduced.

10.1 Proportional HDL

In connection with the IRC-system, activation of the HDL-system is proportional, i.e. step-less.

Example:
A heavy load is extended at max. speed at a longer out-reach by means of the "extension out"-function.
When the crane has reached 80% of its capacity limit, the HDL is automatically activated independent of the operator's doings.

Now the speed of the "extension out" movement is reduced proportionally down to 20% of the nominal working speed.

Correspondingly the working speed is increased proportionally to 100%, if the load is retracted to a shorter reach by means of the "extension in"- function.

The example describes how the HDL-system works in connection with the extension-function. The proportional HDL-activation functions in the same way in connection with all other crane functions, which increase or reduce the load moment of the crane.

When the HDL-system is activated, this is indicated on the RCL indicator panel by the FUNC diode flashing.

10.2 Micro Operation

If the crane is to make positioning tasks, it will be possible to reduce the working speed of the crane by means of the HDL-system.

Irrespective of the crane's load moment, the working speed of the crane can be reduced to approx. 20% by pushing *the red press button* on the remote control box, thus activating the HDL.

By pushing *the red press button* once again, the HDL-system is deactivated again. However, this implies that all control levers have been into neutral position at the same time as the load moment is below the crane's normal lifting capacity limit.

Troubleshooting

In case of an error in the radio communication or the transmission of data between the electronic box and the RCL controller, the system comes up with the following error messages:

- The ERROR diode on the electronic box flashes
- The RUN and FUNC diodes on the RCL indicator panel are flashing

It will now be possible to troubleshoot by *pushing and holding down the red press button* on the RCL indicator panel.

Now a diode indicates where to find the error in the system.

Flashing diode	Type of error	Remedy
85% diode	The IRC-system has not been started up	Re-start the IRC-System
90% diode	Start up error in the Can-bus communication	Re-start the IRC-System
100% diode	The RCL controller has been set for emergency operation	Change back into remote control mode. Please see chapter on Emergency Operation.
80%, 85% diodes	The stop button on the remote control box is activated (pushed in)	Pull out the stop button (turn it to the right)
80%, 90% diodes	Error at the cable connection for the dump valve input in the RCL	Please contact an authorized IMT service point.

If problems continue, contact immediately an authorized IMT service point.

Maintenance

It is important to check and maintain the IRC-system both currently and when the crane has its regular service overhaul at an authorized IMT service point.

The following items must be respected:

- When cleaning the crane, avoid spraying on water and never use high-pressure rinsing for cleaning the electronic components.
- Before carrying out mounting, maintenance or repair work, turn off the power supply to the system.
- Check whether there are any cracks on or damage to the IRC-system. If yes, the equipment must be repaired immediately.

Technical Data

General System Data

Frequency:	the 70 cm band
Range:	approx. 100 meters
Address:	16 bit. 65536 possibilities
Operating temperature:	-20° through + 70°C
Transmission rate:	4800 Baud
Hammingdistance:	4

Electronic box

Degree of protection:	IP 65
System:	Synthesizer technics
Operating voltage:	12 to 24 VDC (-50% - +20%)
Decoding:	Multi bit activation and comparison
Fuse:	7,5A / 80V Kfz.
Output:	Intrinsically safe emergency stop with two MOS-FET-transistors 12 digital outputs, potential free 250V/8A, 6 analog outputs, 2 speed ranges
Static current:	260mA, Stand by
Antenna connection:	TNC-socket
Dimensions: approx. (LxWxH)	265mm x 161mm x 111mm
Weight	2.5kg

Remote Control Box

Degree of protection:	IP 65
Battery:	Design Nova 6L: 3.6V / 300mAh (NiCd)
Transmitting power	<10mW
Current rating, self test:	approx. 75mA
Current rating, transmission:	approx. 83mA
Dimensions: approx. (LxWxH)	230mm x 106mm x 170mm
Weight (incl. battery and strap):	1.8kg

Battery Charger

Operating voltage:	12 / 24VDC
Charging current:	Design Nova 6L, 100mA
Open circuit voltage:	15 - 22V