Manual for switching the **ZKL 3000 RC** through the Dual Inventive application

USA edition

Dual Inventive
Ubiquitous Rail

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CONTENTS

1. INTRODUCTION

This manual describes the process of remotely operating the ZKL 3000 Remote Control (RC) Line Blockage System via the Dual Inventive Smartphone APP.

The Dual Inventive (DI) application (APP) provides remote access to the ZKL 3000 RC system, which safeguards a section of track by producing and monitoring a short circuit which in turn, simulates a train in the track section. This causes the track circuit to be 'OCCUPIED', holding the protecting signals at danger. The section will be immediately closed for rail traffic, aiding rail workers in performing their work on the track both safely and efficiently.

This manual is part of a set that details the entire ZKL 3000 RC system: The web interface (MTinfo 3000), the Line Blockage System (ZKL 3000 RC) and the manual for switching the ZKL 3000 RC through the Dual Inventive application.
Within this manual the terms 'project' and 'period' are used regularly. The explanation of these two terms can be found below:

Term	Meaning
Project	In MTinfo 3000, a project is used in a similar manner to a folder on a computer, to group together a set of related items, in this case periods (please see definition). A project could be created to cover a specific area, or for a specific piece of work.
Period	A period, in MTinfo 3000, is a 'configuration' of ZKL 3000 RC(s) to be switched within a project. For example, this could be a single ZKL 3000 RC to switch the Up or Down line, or multiple ZKL 3000 RC's to switch the Up and Down lines simultaneously.

2. APPLICATION

The DI APP allows the user to remotely operate one, or a group of, ZKL 3000 RC's in a safe, effective, and efficient manner. The APP uses Dual Inventive's secured network to connect to the ZKL 3000 RC. You can remotely switch one or a group ZKL 3000 RC's.

a. Scope

Using the DI APP you are able to:

- view the projects for which you are authorised;
- switch ZKL 3000 RC(s) on or off;
- view the real time status of equipment;

2. APPLICATION CONTINUED

b. Technical specifications

- The DI APP runs on iOS, Android and Windows smartphones/tablets.
- The DI APP needs a minimum storage capacity of 8 MB.
- An internet connection is required to use the DI APP.

3. CONDITIONS & SAFETY INSTRUCTIONS

WARNING!
Please read all safety instructions carefully before using the ZKL 3000 RC. Please ensure you fully understand the system and its functions. When the correct safety measures are not followed, there is a risk of electric shock, fire or even death.

Conditions for use

Users must only use the DI APP when the following criteria are satisfied:

- The user has been trained to use the ZKL 3000 RC
- The user has been assigned the appropriate user rights in MTinfo 3000
- The user has been authorised to use the RS 3000 functions on the DI APP

As a trained user you are responsible for:

- Any relevant paperwork, user names and passwords (and any authorisation codes via text message or PIN that you have been assigned)
- Managing your password and (if applicable) your PIN. You must never share this information with others

a. Instructions

— DI APP

- You will need a user name, company code and password for the DI APP. Additionally, you should ensure your mobile phone number is correctly entered in MTinfo 3000, using the correct country code (e.g. +44 for UK), as this is used for authorisation during first-time logon
- Ensure user has access to the DI APP, and RS 3000 module before use
- Only start using the DI APP when your smartphone or tablet has been fully charged

— ZKL 3000 RC

- Check whether the ZKL 3000 RC has the correct certificates. Please consult our website for the list of required certificates: www.dualinventive.eu
- Always take care of your own safety within the railway environment using the most up-to-date, applicable legislation
- Issues may be encountered which mean ZKL 3000 RC's cannot be switched. For more information about these alerts, please see chapter 6 "Alerts"

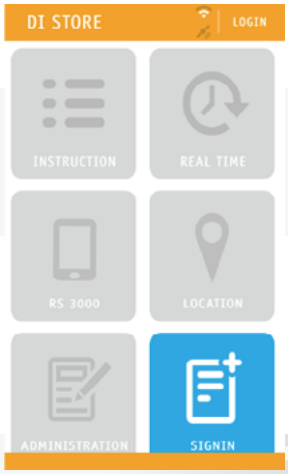
4. USING THE DI APP

a. Download and installation

To download the DI APP, do the following:

- Go to the APP store on your smartphone or tablet and search for “Dual Inventive”
- Download the free DI APP (the APP requires a minimum storage capacity of 8 MB)

Once you have installed and started the DI APP, the following screen will appear:



b. DI APP symbols

The DI APP uses several symbols. The explanation of these symbols can be found below:

 Go back to main screen

 Go back to projects

 Go back to previous screen

 Refresh the screen

If you see fewer options, it means that the project has not been set up for these functions.

c. Login

- Open the APP and select the login button in the top right corner
- Enter your login information (user name, company code and password), accept the general terms & conditions and press the ‘Login’ button

Attention: logging in is only possible when you possess the correct APP user rights.
Please contact your internal contact person for this.

— Authorisation

- You will receive an authorisation code via SMS on the phone number that is linked to your MTinfo 3000 account. Enter the authorisation code and click “log in” again.

The authorisation code will expire after one month. If you do not log onto the APP within a month, you will receive a new authorisation code when you next login.

4. USING THE DI APP CONTINUED

If you do not receive an authorisation code, please consult your internal contact person for more information. It may be that your phone number has been entered into MTinfo 3000 incorrectly.

- Once logged in, the APP will show you a list of all of the modules you have access to. The RS 3000 module is the one which will be covered in this document. Please open it, by selecting the 'RS 3000' icon

A grey tile indicates that you do not have the correct rights to access this tile. If you are not able to access certain tiles, please consult your internal contact person.

d. Logout

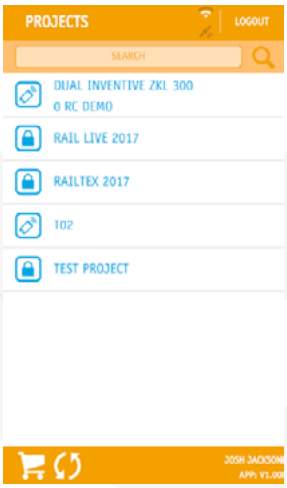
- Click the Logout button in the top right corner
- You will be taken back to the home screen
- When finished using the APP, it can be closed using your phone's application manager

5. OPERATING THE DI APP

To operate a ZKL 3000 RC using the DI APP, you first need to press the RS 3000 tile.

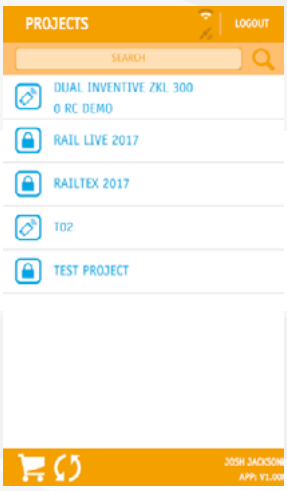
a. Select project

- The RS 3000 module will display the projects the logged in user is assigned to
- Select the required project from the list
- Non-released projects are indicated by a padlock symbol. Selecting one of these projects will display the name and phone number of the project leader. You will not be able to switch any devices on a project until it has been released



b. Select Period

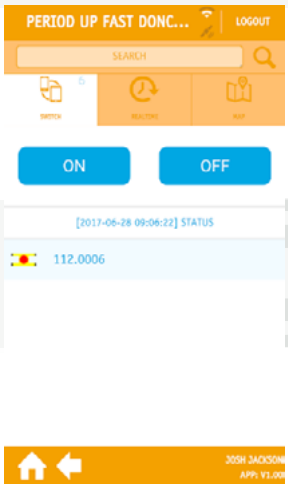
- After selecting a project, the screen will then display the periods contained within it
- Select the required period



5. OPERATING THE DI APP CONTINUED

c. Equipment status

Once a period has been selected, the following screen will be displayed. From this screen, the ZKL 3000 RC's in the period can be switched and their status seen in real time. The positions can also be seen on a map under the 'MAP' tab.



- Press the 'REALTIME' button to check the status of the selected ZKL 3000 RC(s) during the selected period
- The status of the selected ZKL 3000 RC [ID] is indicated on the screen by a colour. Red indicates that the ZKL 3000 RC is switched off and/or not detecting a short circuit. Green means that the ZKL 3000 RC is switched on and successfully creating a short circuit

Any problems are indicated with an icon, as shown in the below table.

Warning	Description
No Equipment Available	No equipment dedicated to period
Key Switch Position ⚠	This ZKL 3000 RC is overruled. Its status can be read but it cannot be controlled remotely
Short Present ⚠	A short circuit is already present in the section when the ZKL 3000 RC is switched on. The track circuit is already occupied
Battery Level Low ⊗	The level of one of the batteries is low
Inaccessible	Device is offline

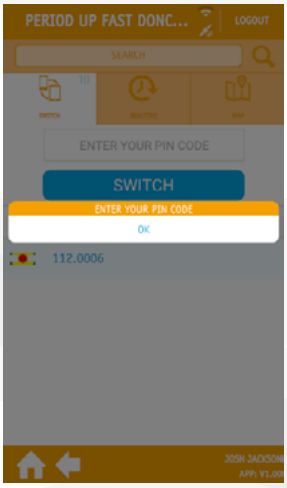
Please note, for more information, please see chapter 6, "Alerts".

- When the '+' icon next to a ZKL 3000 RC is pressed, the status box will expand to give more details on the ZKL 3000 RC (as shown to the right)

- A countdown is displayed on the 'REALTIME' button, and it will continue to refresh the status of the ZKL 3000 RC's every 10 seconds. To update this sooner, please select the 'REALTIME' button again

5. OPERATING THE DI APP CONTINUED

d. Switching using the DI APP



- To switch the ZKL 3000 RC(s) in the period, select one of the 'ON' or 'OFF' buttons on the 'SWITCH' tab. A verification screen will then appear
- Confirm your choice by typing either "ON" or "OFF" using the on screen keyboard
  Attention: the letters are not always in the same place
- Once an action has been entered, you will be asked to enter your PIN code for security reasons

- If the correct PIN is entered when switching 'ON', the green LED on the ZKL 3000 RC will start to blink and then the unit will report that it has been switched on
- If the correct PIN is entered when switching 'OFF', the green LED on the ZKL 3000 RC will switch off and then the unit will report that is has been switched off

Note: If any problems are encountered during the switching process, an icon will appear alongside a red notification. Selecting the icon will present you with further information on the failure.

Please note, for more information, please see chapter 6, "Alerts". Alternatively, periods can also be switched using the web interface MTinfo 3000 (where product approval allows). Please read the manual MTinfo 3000 for this, chapter "Switching". You may encounter situations that prevent you from switching the ZKL 3000 system. For more information about these notifications, please see the ZKL 3000 RC Installation manual, chapter 8 "Troubleshooting".

6. ALERTS

a. Status Screen Alerts

When you click the 'plus' symbol next to a ZKL 3000 RC on the realtime screen, you will see an expanded status view for the ZKL 3000 RC.

Status	Explanation
IDcode	Shows the ID code of the device
Device type	Shows the type of device
Last update	The last time the device signaled to the DI APP and MTinfo 3000
Measurement ON/OFF: ON	The ZKL 3000 RC is now switched "ON"
Measurement ON/OFF: OFF	The ZKL 3000 RC is now switched "OFF"
Detection status: OK	A short circuit has been detected
Detection status: NOK	A short circuit has not been detected
Quality of the short circuit: 95.23%	Shows the quality of the short circuit (if one has been detected)
Switch status: ON	The ZKL 3000 RC is in the "ON" position
Switch status: OFF	The ZKL 3000 RC is in the "OFF" position
Key switch: OPERATIONAL	The override key is in the operational position
Key switch: OVERRULED	The override key is in an overruled position
Battery 1 status : 6.644V: OK	The backup battery is connected to the ZKL 3000 RC and has sufficient power; 6.644V
Battery 1 status: 6.2V: ALMOST EMPTY	The backup battery is connected to the ZKL 3000 RC, but is almost empty
Battery 1 status: 6.0V: EMPTY	The backup battery is empty
Battery 1 status: 0.000V: REMOVED	The backup battery has been removed from the ZKL 3000 RC or is completely empty and therefore has a voltage of 0V
Battery 2 status: 6.644V: OK	The external battery is connected to the ZKL 3000 RC and has sufficient power
Battery 2 status: 6.2V: ALMOST EMPTY	The external battery is connected to the ZKL 3000 RC and is almost empty
Battery 2 status: 6.0V: EMPTY	The external battery is empty
Battery 2 status: 0.000V: REMOVED	The external battery has been removed from the ZKL 3000 RC or is completely empty and therefore has a voltage of 0V
GPS position	Shows the GPS location of the device

6. ALERTS CONTINUED

b. SMS Alerts

Users with switching rights on a released project will automatically receive alerts via SMS. Those not on a project can also receive these, however this will need to be arranged with the company contact person as they will need to register the mobile phone number as an additional alarm number using MTinfo 3000. Monitoring starts as soon as the ZKL 3000 RC has been powered on. It is the responsibility of the recipient to act upon these alerts (more information is available in the ZKL 3000 RC Installation Manual).

The text message alerts that require action are:

SMS alert	Explanation
Project: 'Manual ZKL 3000 RC', Period 'A' released	Project "Manual ZKL 3000 RC" containing Period "A" has been released
Project: 'Manual ZKL 3000 RC', Period: 'A' has been returned	Project "Manual ZKL 3000 RC" containing Period "A" has been returned
ZKL 3000 X * DET. ALARM	The ZKL 3000 RC X is no longer detecting a short
ZKL 3000 X * BATT1. ALARM * BATT2. OK	The backup battery of ZKL 3000 RC X is (almost) empty. The external battery is OK
ZKL 3000 X * BATT1. OK * BATT2. ALARM	The external battery of ZKL 3000 RC X is (almost) empty. The backup battery is OK

c. Errors and Alerts

General

Error	Explanation and Solutions	Further Reading
ZKL 3000 RC offline in real-time status	Try again, check the batteries and if needed use the override key switch	Check batteries: ZKL 3000 RC Installation manual, chapter "Preparation" Use key switch: ZKL 3000 RC Installation manual, chapter "Key switch"
Override key is not in setting OPERATIONAL	ZKL 3000 RC has been overruled with the override key. It is not possible to remotely operate this ZKL 3000 RC. Rotate override key to 'OPERATIONAL' to allow remote switching	Use key switch: ZKL 3000 RC Installation manual, chapter "Key switch"
Short circuit already present	When switching, a short circuit was already detected in the vicinity (section is not empty). The ZKL 3000 RC cannot guarantee it is creating the short circuit. Check the section and try again before proceeding. Always be certain of a proper short circuit (in an empty space)	Execute functional test: ZKL 3000 RC Installation manual, chapter "Functional test in the track"

6. ALERTS CONTINUED

Error	Explanation and solution	Further reading
Short circuit still present after ZKL 3000 RC has been switched off	ZKL 3000 RC has been switched off, but a short circuit is still being measured in this section. Try removing the ZKL 3000 RC from the track	Execute functional test: ZKL 3000 RC Installation manual, chapter "Functional test in the track"
ZKL 3000 RC has been switched on, but there is no (proper) short (DET NOK)	Connection with the ZKL 3000 RC has been lost (partly or decreased quality). Try switching again. If this doesn't work, attempt to use the override key. If still encountering problems, please contact Dual Inventive	Placing ZKL 3000 RC: ZKL 3000 RC Installation manual, chapter "Placing the ZKL 3000 RC"
After switching ZKL 3000 RC on, there is no immediate (proper) short circuit (DET NOK)	ZKL 3000 RC short has not been detected (DET NOK). Please attempt to reseat the ZKL 3000 RC in the track and check again	Placing ZKL 3000 RC: ZKL 3000 RC Installation manual, chapter "Placing the ZKL 3000 RC"
After switching ZKL 3000 RC ON, SWITCH remains OFF	ZKL 3000 RC has not been successfully switched OFF. Try again or use the override key switch	Use key switch: Installation manual ZKL 3000 RC, chapter "Key switch"
After switching ZKL 3000 RC ON, SWITCH remains OFF	ZKL 3000 RC has not been successfully switched ON. Try again or use the override key switch	Check batteries: Installation manual ZKL 3000 RC chapter "Preparation" Use key switch: Installation manual ZKL 3000 RC, chapter "Key switch"
ZKL 3000 RC SWITCH status unknown whilst being switched ON	The ZKL 3000 RC is experiencing issues communicating with the switch. Please repeat command, and if the problem persists, take it out of service	Execute functional test: Installation manual ZKL 3000 RC, chapter "Functional test in the track"
ZKL 3000 RC SWITCH status unknown whilst being switched OFF	There is no guarantee about the status of the ZKL 3000 RC. Be certain of a switched off short circuit (in an empty section) by contacting the signaller	Execute functional test: Installation manual ZKL 3000 RC, chapter "Functional test in the track"
ZKL 3000 RC battery 2 is almost empty	External battery of ZKL 3000 RC is almost empty. Replace battery as soon as possible	Check batteries: Installation manual ZKL 3000 RC, chapter "Preparation"
ZKL 3000 RC battery 2 is empty	External battery of ZKL 3000 RC is empty. Replace battery	Check batteries: Installation manual ZKL 3000 RC, chapter "Preparation"
No ZKL 3000 RC in period	Consult the project lead	Consult the project lead

6. ALERTS CONTINUED

DI APP

Error	Explanation and Solutions	Further Reading
No projects available in DI APP after login	No 'released' projects are available. Consult the project lead	Consult the project lead
No Internet Connection	The APP is not able to connect to the internet.	Create a network connection via Wi-Fi or the 3G/4G network, restart the APP and try again.
Poor connection, try again	The APP has a poor network connection.	Move to a new location, restart the APP and try again.
Enable GPS and restart the APP	The APP cannot determine your GPS location. This may be because this function is not enabled on your smartphone, or because you did not provide the APP with permission to use your GPS location.	Enable the GPS function or grant permission to the DI APP, restart the APP and try again.

7. MAINTENANCE & SERVICE

Please contact your local Dual Inventive contact person for service, repairs and maintenance.

8. IN CONCLUSION

If you encounter any problems whilst using our products, or are unsure of anything in this manual, please report this to us via info@dualinventive.com or by phone. Ultimately, customer satisfaction and your safety are our top priorities and therefore we take all feedback very seriously. We use this to improve the safety and design of our products. On behalf of the Dual Inventive team, we wish you all the best.

Strukton Rail North America Inc.
3 Bethesda Metro Center, Suite 700
Bethesda, MD 20814, United States
Phone Cell +1 901 254 7758
Phone Office +1 301 961 1552
E-mail Ellen.linnenkamp@strukton.com
Internet www.struktonrail.com

Dual Inventive Nederland BV
Belgiëstraat 5
5061 KG Oisterwijk
Phone +31 (0) 13 533 9969
Fax +31 (0) 13 533 9970
E-mail info@dualinventive.com
Internet www.dualinventive.eu