

RST FIELD 2 USER GUIDE

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HISTORY

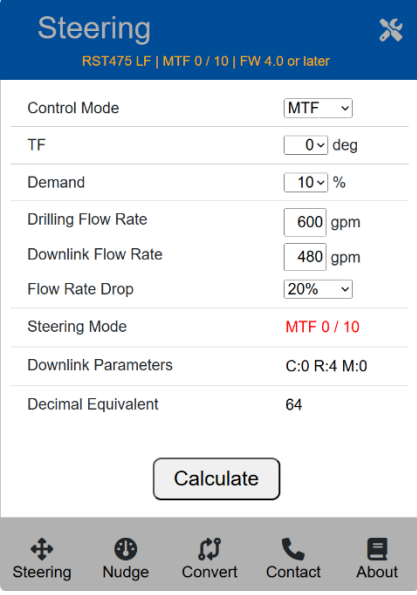
Version	Change	Date
2.0.0	First release	2025-11-20
2.1.0	Modified to work with new maps in firmware v5.1, with addition of v5.x option to Map in Settings window. Includes calculation of new messages for IH, IHL, IHR & IH2 Inclination modes to 5°, 10° & 15°.	2026-05-29

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1. INTRODUCTION



The screenshot shows the 'Steering' application interface. At the top, it says 'Steering' with a close icon and 'RST475 LF | MTF 0 / 10 | FW 4.0 or later'. Below this is a table of settings:

Control Mode	MTF
TF	0 deg
Demand	10 %
Drilling Flow Rate	600 gpm
Downlink Flow Rate	480 gpm
Flow Rate Drop	20%
Steering Mode	MTF 0 / 10
Downlink Parameters	C:0 R:4 M:0
Decimal Equivalent	64

Below the table is a 'Calculate' button. At the bottom is a navigation bar with icons for Steering, Nudge, Convert, Contact, and About.

The D-Tech RST Field 2 application is software tool used to assist a rig operator to communicate steering commands to the tool in real time. This communication is achieved by altering the flow rate of the drilling mud at specific time intervals producing a pulse train that encodes the command being sent. The basic function of this application is to calculate this timed sequence of pump flow rates and instruct the operator when to alternate between the two flow rates to produce this pulse train.

This document is divided into two sections. The first provides a technical discussion of this application and the second is the user guide.

This application uses a technology known as Progressive Web Application (PWA) and can run offline without an internet connection. However, an internet connection is required to download and install the application as well as to receive updates. Instructions on how to install a PWA on various devices are covered in Appendix 1 – Installing a PWA.

Note that we recommend installing the application when running on a mobile device as it will ensure that the screen is drawn correctly (with certain older models and versions can cause the Calculate button to be misplaced).

2. CONTROLS

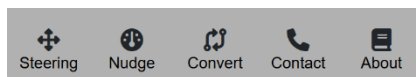
2.1. TITLE SECTION



The top section of the application (the title section) displays the page name, a back button (where appropriate), the firmware version and the steering mode or nudge name dependent on whether the steering page or nudge page is selected.

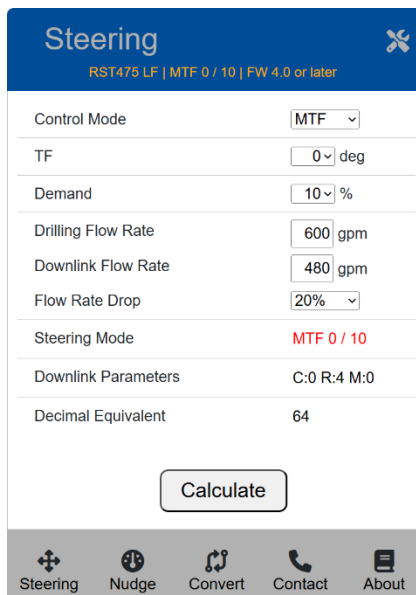
The settings icon in the top right-hand corner is used to select the firmware version, tool in use and whether to use the Auto-Downlink Skid option. Note that the parameters that are available for a steering mode are dependent on the version of the firmware in the tool. Selecting the appropriate version of the firmware is covered below in Settings (section 2.8 below).

2.2. MAIN MENU



At the bottom of the page are five buttons which determine the information and controls displayed in the middle of the screen, and which are described below.

2.3. STEERING

A screenshot of the 'Steering' control page. It has a blue header with 'Steering' and a settings icon, and the text 'RST475 LF | MTF 0 / 10 | FW 4.0 or later'. Below the header is a list of controls: 'Control Mode' (MTF dropdown), 'TF' (0 dropdown with 'deg' unit), 'Demand' (10 dropdown with '%' unit), 'Drilling Flow Rate' (600 input with 'gpm' unit), 'Downlink Flow Rate' (480 input with 'gpm' unit), 'Flow Rate Drop' (20% dropdown), 'Steering Mode' (MTF 0 / 10 in red), 'Downlink Parameters' (C:0 R:4 M:0), and 'Decimal Equivalent' (64). A 'Calculate' button is at the bottom of the list. At the very bottom is a main menu bar with icons for Steering, Nudge, Convert, Contact, and About.

When the application is started the Steering page is shown by default. This is where the parameters are defined and displayed for directing the Rotary Steerable Tool. This includes the control mode and any associated parameters as well as the drilling and downlink flow rates. In addition, the steering mode, the downlink parameters and the decimal equivalent are calculated and displayed.

Note that the Downlink Parameters may be displayed as CRM or XYZ depending on the configuration of the Settings (see section 2.8 below). Also, see Appendix 2 – CRM & XYZ (section 4.2 below) for an explanation of the CRM and XYZ modes.

2.3.1. CONTROL MODE AND PARAMETERS

The first option defines the control mode, and dependent on the mode selected, will be followed either by options to set the Tool Face (TF) angle and Demand percentage, or an option to set the Inclination Target (Inc Tgt) degree, or by no options at all. The available control modes along with their associated parameters and available ranges are shown in the table below.

The combination of the control mode and any associated parameters form the Steering Mode (e.g. MTF 0 / 10) which is displayed in real time further down the page and in the title bar.

Control Mode	TF	Demand	Inc Tgt
MTF	0..345°	10..100%	n/a
GTF	-180..165°	10..100%	n/a
IH	n/a	n/a	5, 10, 15, 20..119°
IHR	n/a	n/a	5, 10, 15, 20..119°
IHL	n/a	n/a	5, 10, 15, 20..119°
IHRR	n/a	n/a	5, 10, 15, 20..119°
IHLL	n/a	n/a	5, 10, 15, 20..119°
Vertical	n/a	n/a	n/a
Neutral	n/a	n/a	n/a
IH2	n/a	n/a	5, 10, 15, 20..119°

2.3.2. DRILLING AND DOWNLINK FLOW RATES

These are the flow rate parameters that are used for a normal drilling operation and for downlinking. Each of these values can be set manually or using a fixed percentage difference between them. Note that the acceptable ranges for these two flow rates are dependent on the tool selected.

2.3.3. STEERING MODE

This is the RST Mode as determined by combining the selected Control Mode and its associated parameters.

2.3.4. DOWNLINK PARAMETERS

This section displays the command values that relate to the chosen Control Mode and Parameters. It will either be displayed as CRM or as XYZ dependent on which firmware version is being used and whether the Auto-Downlink Skid option has been selected, as described in Settings (see section 2.8 below).

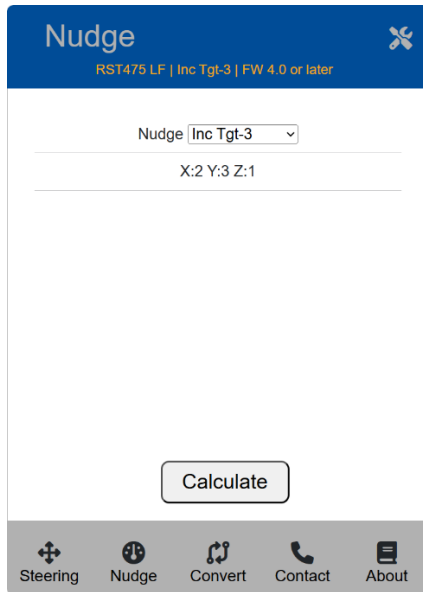
2.3.5. DECIMAL EQUIVALENT

This value is the decimal encoding of the Downlink Parameters when calculated as CRM and is required for compatibility with certain third-party equipment.

2.3.6. CALCULATE

This button will change the display to show downlink sequence mode that informs a user on when to change the flow rates to perform the desired command. See section Sending a Command (3.1 below) for information on how it works.

2.4. NUDGE



This section allows for a nudge to be selected to send to the tool.

2.4.1. NUDGE

This option allows for a nudge to be selected from the drop-down list. Once a value has been selected the CRM or XYZ value beneath will update to display the command values that need to be sent to perform the nudge.

Note that this application does not track the Control Mode that the tool is currently set to, and not all nudges can be successfully applied to each mode. It is the responsibility of the operator to ensure that the nudge selected is appropriate for the current Control Mode of the tool.

Nudge	Control Mode							
	MTF	GTF	IH	IHR	IHL	IHRR	IHLL	IH2
Inc Tgt -3			✓	✓	✓	✓	✓	✓
Inc Tgt -1			✓	✓	✓	✓	✓	✓
Inc Tgt +1			✓	✓	✓	✓	✓	✓
Inc Tgt +3			✓	✓	✓	✓	✓	✓
Dem Ang -15	✓	✓						
Dem Ang +15	✓	✓						
Dem % down	✓	✓						
Dem % up	✓	✓						
Azi Tgt -3								✓
Azi Tgt -1								✓
Azi Tgt +1								✓

Nudge	Control Mode							
	MTF	GTF	IH	IHR	IHL	IHRR	IHLL	IH2
Azi Tgt +3								✓

2.4.2. CALCULATE

This button will change the display to show downlink sequence mode that informs a user on when to change the flow rates to perform the desired nudge. See section Sending a Nudge (3.2 below) for information on how it works.

Note that this button will only be enabled when a valid nudge has been selected from the list.

2.5. CONVERT

Convert

RST475 LF | Inc Tgt-3 | FW 4.0 or later

IHR 20

Decimal: 515

C:

R:

M:

Go To Decimal

Convert

RST475 LF | Inc Tgt-3 | FW 4.0 or later

MTF 30 / 100

C:2 R:0 M:0

Decimal Value From Real-Time Message

Go To CRM

The convert page is used to convert the RST command in CRM format to the Decimal Equivalent value and vice versa. These conversions take place as the values are entered, without the need to press a button.

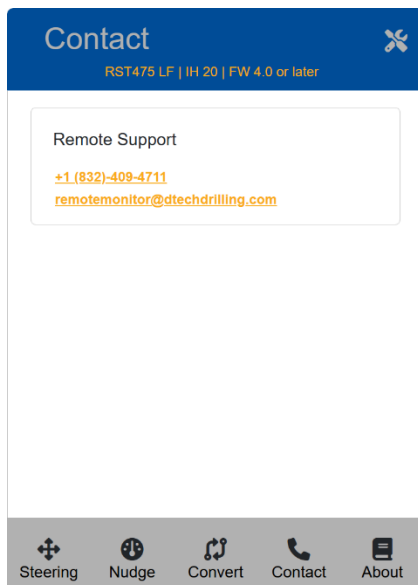
2.5.1. CRM/DECIMAL VALUE

When in CRM conversion mode three boxes will be displayed to enter each part of the CRM command with the calculated decimal value shown above, and when in Decimal mode one box will be shown to enter the encoded value with the decoded CRM values shown above. In both cases the control mode will also be displayed.

2.5.2. GO TO DECIMAL/GO TO CRM

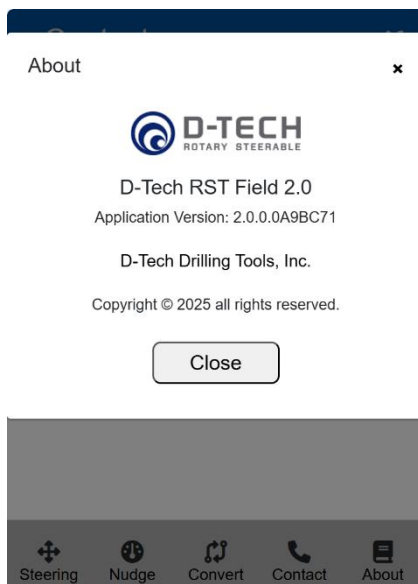
This button is used to switch modes.

2.6. CONTACT



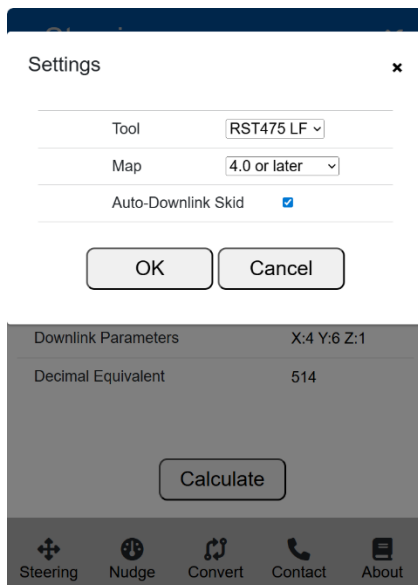
The Contact page contains contact details for remote support. If the application is running on a mobile device, it is possible to call the telephone number by simply clicking on it. Selecting the email link will automatically create a new email to send to the D-Tech support team and will work on any device that has a default email client defined.

2.7. ABOUT



The About dialog box provides information about this application.

2.8. SETTINGS



The image shows two overlapping windows from the application. The top window is titled 'Settings' and contains three input fields: 'Tool' with a dropdown menu showing 'RST475 LF', 'Map' with a dropdown menu showing '4.0 or later', and 'Auto-Downlink Skid' with a checked checkbox. Below these fields are 'OK' and 'Cancel' buttons. The bottom window is titled 'Downlink Parameters' and shows 'X:4 Y:6 Z:1' and 'Decimal Equivalent' with the value '514'. It has a 'Calculate' button and a bottom navigation bar with icons for 'Steering', 'Nudge', 'Convert', 'Contact', and 'About'.

The Settings dialog box is displayed when the tools icon in the top right-hand corner of the title section is clicked.

2.8.1. TOOL

This drop-down list is used to define which D-Tech RST the commands are being calculated for.

Note that it is extremely important that the correct variant is selected to calculate the correct commands.

2.8.2. MAP

This drop-down list allows for the firmware of the tool to be defined.

Note that it is extremely important that the correct version is selected to calculate the correct commands.

2.8.3. AUTO-DOWNLINK SKID

This checkbox defines whether CRM or XYZ will be displayed, with XYZ values shown when it is checked.

Please refer to Appendix 2 – CRM & XYZ (section 4.2 below) for further details about the difference between the modes.

2.8.4. OK

This button will close the dialog box and apply any changes made.

Note that dependent on changes made, the application may reload to initialise them after selecting this button.

2.8.5. CANCEL

This button will close the dialog box without applying any changes.

3. OPERATION

The primary purpose of this application is to send commands to the tool in real time. The procedures for achieving these are discussed below.

However, before making use of either the Steering or Nudge controls it is vitally important that the correct variant of the tool to be controlled and the firmware it has been programmed with are defined. These are displayed in the title section of the application and can be changed if required in the Settings dialog box (see section 2.8 above).

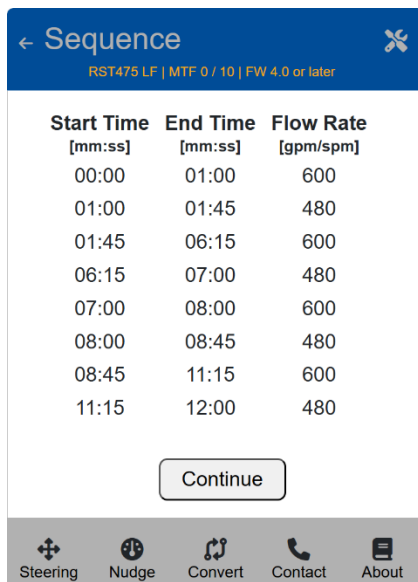
3.1. SENDING A COMMAND

Sending a specific command is achieved via the Steering page, where the Control Mode, any associated parameters and the flow rates must be defined.

As the steering parameters are being set, the Steering Mode, Downlink Parameters and Decimal Equivalent will update accordingly. If possible, the operator should verify that these values match those expected. If not, it is important that the parameters selected are corrected or the discrepancy is resolved before proceeding.

When everything is set correctly the Calculate button may be pressed. This will change the display to put it into the command sending wizard. If you wish to exit from this mode at any time, either the back arrow in the title section can be used or simply select any of the control buttons at the bottom of the screen.

3.1.1. SEQUENCE



Start Time [mm:ss]	End Time [mm:ss]	Flow Rate [gpm/spm]
00:00	01:00	600
01:00	01:45	480
01:45	06:15	600
06:15	07:00	480
07:00	08:00	600
08:00	08:45	480
08:45	11:15	600
11:15	12:00	480

Continue

Steering Nudge Convert Contact About

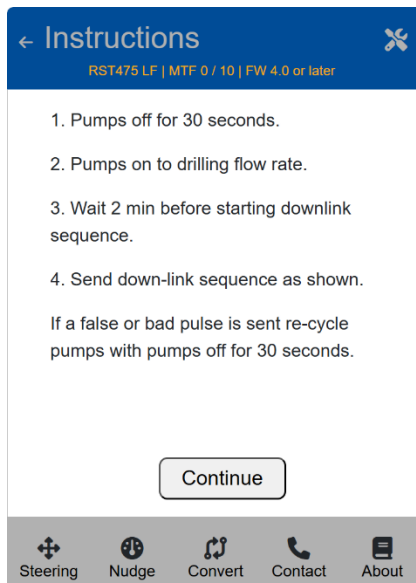
The Sequence page is the first screen displayed when selecting the Calculate button. This page displays the timings in minutes and seconds for when the flow rate must be changed to send the command to the tool, and the rate it should be set to.

3.1.1.1. CONTINUE

If the information is as expected, the Continue button should be pressed to proceed to the next screen.

To exit use the back arrow in the title section or simply select one of the control buttons at the bottom of the screen.

3.1.2. INSTRUCTIONS



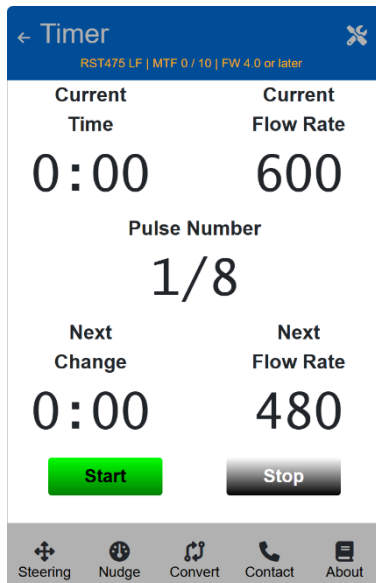
This page details the steps that must be taken to ensure a clean command is sent to the tool and how to reset the sequence in the event of a missed timing.

3.1.2.1. CONTINUE

Once the steps described have been completed, the Continue button should be pressed to proceed to the next screen.

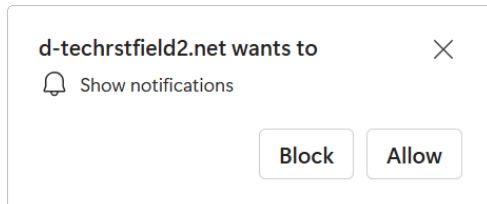
To exit use the back arrow in the title section or simply select one of the control buttons at the bottom of the screen.

3.1.3. TIMER

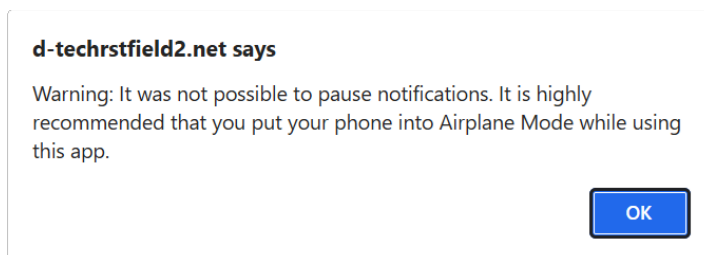


Once the Start button is pressed, the application will give clear instructions on when to change the pump flow rates.

In order that the timing sequence is not interrupted by other applications running on the device, the application will request permission to block notifications. The operator should click the Block button.

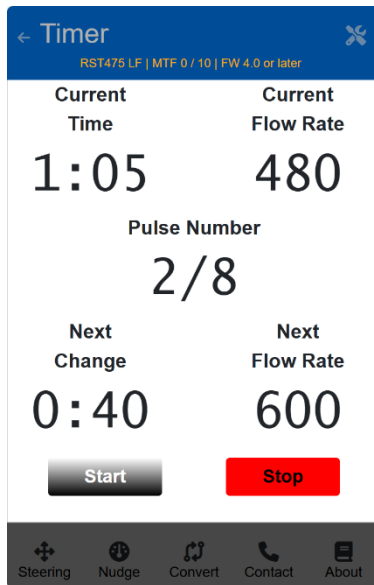


If it is not possible to block notifications the warning below will be shown.

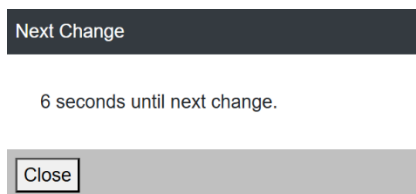


It is important this message is given due consideration. If notifications are not blocked the timer may be interrupted by other processes resulting in an invalid downlink command being sent. Note that it is not possible to prevent this when running on a PC, and for this reason that it is recommended that the application is run on a mobile device while timing a downlink command.

Once these messages have been addressed the timer will start running and the screen will appear as below during the process.



The Current Time will increment and Next Change will begin to countdown. When there are only fifteen seconds remaining before the pump flow rate must be changed, the following prompt is displayed.



It can be closed manually by clicking on the Close button or will automatically disappear when the next time change has occurred.

When the Next Change counter reaches zero the operator should change the pump flow rate to the value given as the Next Flow Rate, and the display will automatically change to restart the Next Change countdown and show what the Next Flow Rate will be. This process is repeated until all pulses have been sent.

On completion, it is possible to press the Start button to send the same command for a second time should the need arise. Note that a message will appear asking the user to confirm that the pumps have been recycled before starting again.

3.1.3.1. CURRENT TIME

This item displays the total time elapsed during the command sequence in minutes and seconds and will update each second.

When the process is complete it will display "Ended".

3.1.3.2. CURRENT FLOW RATE

This displays the flow rate that the tool should be currently receiving.

3.1.3.3. PULSE NUMBER

This item displays which pulse is currently being performed and the total number of pulses to action for the command.

3.1.3.4. NEXT CHANGE

This item displays a countdown timer to the next flow rate change in minutes and seconds.

When the process is complete it will display "Ended".

3.1.3.5. NEXT FLOW RATE

This item displays the flow rate that the system should be changed to when the Next Change counter reaches zero.

3.1.3.6. START

This button will commence the downlink timing process.

Note that when the Start button is selected, all other controls in the application will be disabled, apart from the Stop button to stop a user from accidentally exiting the Timer screen.

3.1.3.7. STOP

This button can be used to halt the timing process. The dialog shown below will be displayed requesting confirmation before stopping the process.

Confirm Stop

Are You Sure?

Yes No

3.2. SENDING A NUDGE

Nudges have been available to use with D-Tech's RST since v3.3 of the Main Firmware was released. The purpose of nudging is to make a small adjustment to the current steering mode without incurring the time taken to send a full Steering command. However, not all nudge commands are shorter than all Steering commands so care should be taken when selecting a Nudge over a Steering command. The table below shows the time taken to send each of the Nudge commands and can be used when choosing between a Steering and a Nudge command.

Nudge	Duration v3.3 (mm:ss)	Duration v4.x (mm:ss)	Duration v5.x (mm:ss)
Inc Tgt -3	14:00	10:00	09:30
Inc Tgt -1	14:30	10:00	09:30
Inc Tgt +1	15:00	10:00	09:30
Inc Tgt +3	15:30	10:00	09:30
Dem Ang -15	15:00	10:00	09:30
Dem Ang +15	15:30	10:00	09:30
Dem % down	15:30	10:00	10:00
Dem % up	16:00	10:00	10:00

Nudge	Duration v3.3 (mm:ss)	Duration v4.x (mm:ss)	Duration v5.x (mm:ss)
Azi Tgt -3	15:30	10:00	10:00
Azi Tgt -1	16:00	10:00	10:00
Azi Tgt +1	16:30	10:00	10:00
Azi Tgt +3	17:00	10:00	10:00

The user should be confident about the mode the tool is currently in before sending a nudge. There is no danger to the tool, as if it receives a nudge command when not in the correct mode it will ignore it, however precious time may be wasted. Please refer to section Nudge (2.4.1 above) for information on which nudges can be used with which modes.

Once a nudge has been selected and the Calculate button clicked to start the process the application will operate in exactly the same manner as for a normal command (see section 3.1 above).

4. APPENDICES

4.1. APPENDIX 1 – INSTALLING A PWA

To install a Progressive Web App (PWA), follow the steps below based on your device.

Once installed, the PWA will function like a native app on your device, allowing you to launch it directly from your home screen or app menu.

4.1.1. ON ANDROID

Open the PWA in Chrome, tap the menu (three dots), and select "Add to Home screen".

4.1.2. ON IOS

Open the PWA in Safari, tap the share icon, and select "Add to Home Screen".

4.1.3. ON WINDOWS

Use Microsoft Edge, navigate to the PWA, click the menu (three dots), and select "Install".

4.1.4. ON MAC

Open the PWA in Chrome or Safari and follow the same steps as on Windows.

4.2. APPENDIX 2 – CRM & XYZ

CRM is the steering mode as understood by the tool and refers to the numbers encoded into the downlink that the firmware uses to set the steering mode. CRM is used for firmware versions v3.3 and earlier.

Firmware version v4 uses reordered downlinks that puts the most popular messages early in the list (which means that they will be processed faster), and hence the numbers are encoded differently in the downlink, with the tool converting these to the original CRM when it receives them.

CRM is the default display as any real-time feedback sent from the tool about steering mode will be in the CRM form. This allows the user to cross check the CRM sent by downlink, with the CRM received by received via real-time.

However, for the special case of using a downlink skid with firmware version 4.0 or later, it is important that the XYZ format is displayed, as it must be XYZ that is entered into the downlink skid to send the correct message.