PORTABLE READER
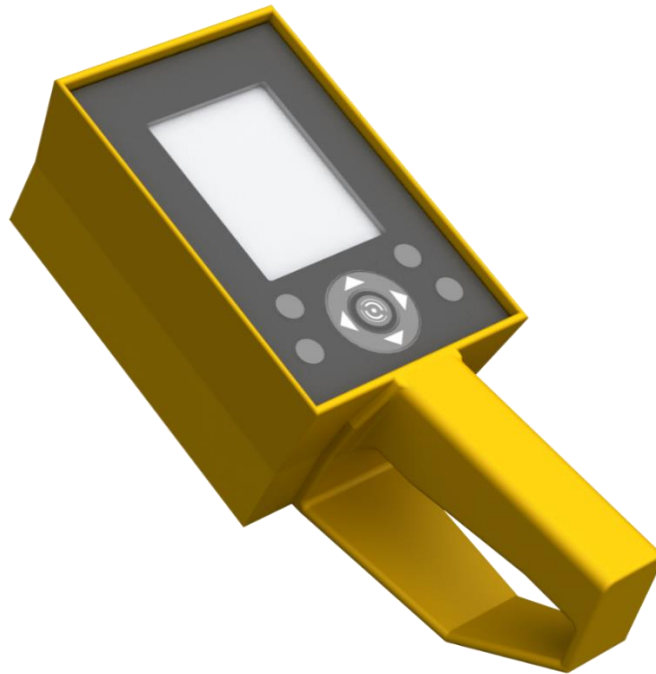
User Manual

Rev 6.0 Jan 2023

Warning: Any changes or modifications not expressively approved by CR Mining could void the user's authority to operate this equipment

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1.   Introduction

The GET Trakka system provides real-time actionable information to optimise mine-critical assets.

GET Trakka monitors the real-time operation of digger buckets and GET, detects component loss when they occur and locates GET before they enter the downstream process. GET components include teeth, adapters, lip shrouds and side bars that make up a full protective wear package on a digger bucket.

The key hardware components of a GET Trakka system are;

a) GET Sensors – battery powered radio frequency sensors embedded into the GET components and mounted to digger buckets.
b) Portable Reader – portable reader to communicate with all Sensors and locate missing GET.
c) Receiver Gateway – digger mounted receiver to monitor the GET on a bucket.
d) Crusher Gateway – fixed receiver installed near the crusher to detect broken GET that have entered the downstream process.

The wireless (Radio Frequency) signal emitted from any Sensor can be read by any Portable Reader.

This User Manual is written for operators to ensure correct procedures during installation and removal of GET components using the GET Sensors and Portable Reader as part of the GET Trakka system.

2.   Sensor Types

There are a range of GET Sensor types supplied from the factory, each having their own specific role. It is important that the Sensor types be understood to ensure that the operator is aware of the differences.

2.1   GET Sensors

The flagship product of GET Trakka, designed to fulfil a wide range of applications, these Sensors are installed within drilled or cast recesses of bucket teeth, adaptors, lip shrouds and side bars. The number of Sensors will vary depending on the wear package design e.g., some buckets may contain six (6) teeth while others might contain ten (10). An active Sensor will operate over six (6) months and is used to obtain real-time information about the digger it is used with. The GET Sensor type can be monitored by the Portable Reader at any time, with new information being provided approximately every second.

2.2   Reference Sensors

One (1) Reference Sensor is activated and installed permanently on each digger. It uses low power and large update times to last for multiple years before requiring replacement. Its function is to act as a point of signal reference for the GET Trakka system to ensure functionality. Reference Sensors are visible using the Portable Reader and act as a convenient check point for operators to ensure the radio receiver is working correctly and the digger identification is correct.

2.3   Bucket Sensors

Two (2) Bucket Sensors are activated and installed permanently on each digger bucket. Its function is to continually monitor the activity of the bucket.

Although it contains similar functionality to a GET Sensor, it is supplied in a tough protective casing designed to be permanently installed on the external rear section of the bucket.

Bucket Sensors can be monitored by the Portable Reader at any time and will display the same set of information as the GET Sensors.

The average battery life of a Bucket Sensor is typically greater than 2 years.

3. GET Sensor Overview

The wireless detection of a GET component is completed by inserting a GET Sensor into a drilled or cast recess.

GET Sensors are designed for harsh mining environments, with extreme shock and temperatures. The Sensor transmits an RF signal in the 860 - 930 MHz band and is delivered to suit local license free radio regulations. The Sensor housing is a cylinder that push fits into a GET drilled or cast recess.

Each GET Sensor is a single use consumable item with a unique 5-digit identification code printed on the top face.

The Portable Reader is used to activate and deactivate GET Sensors.

This manual uses the following standard terms in bold to describe the process.

a) **Activate** GET Sensors to an asset (Inactive to **Active** state).
b) **Deactivate** GET Sensors from an asset (Active to **Inactive** state).

3.1 Active Sensors

When installing GET components, each Sensor is activated and assigned to a specific digger, component and index position as per normal identification of GET e.g., Shovel 35, tooth position 1. This enables the wireless identification of each component type, index position and the digger it belongs to. Signal transmission intervals vary according to the component type but are typically set between one (1) and three (3) seconds. An active Sensor can be detected by the Portable Reader up to 50 metres away and can be active for up to 6 months or more depending on the settings.

3.2 Inactive Sensors

If required, a Sensor can be deactivated, and all the data automatically cleared from the Sensor memory. This may be required if the Sensor has been incorrectly activated. Inactive Sensors run at very low power to conserve the battery and can only be read by a Portable Reader from up to 10 metres away. All GET Sensors are delivered inactive from the factory and must be used within 3 months to avoid flat batteries.

A Sensor can be switched between inactive and active states as many times as required.

4.   GET Sensor Installation

GET Sensors have been engineered with a push-fit design.

A bead of silicone adhesive may be applied at the base of the Sensor / recess to provide additional holding strength if required. Do not apply adhesive to any other area of the Sensor.

The following pictures contain a step-by-step approach to installing the GET Sensors into their desired components

Picture 1. GET Sensor

| **Picture 2.** GET Sensor ready to be inserted into the recess of a digger tooth.	**Picture 3.** GET Sensor fitted in recess.

5.   Portable Reader Overview

The unit is a rugged, purpose built portable wireless device designed for use in the field. It will only detect GET Sensors that are within wireless radio communication range.

The Portable Reader software is designed to perform the following standard functions;

a) Add GET Sensors to a selected digger and activate them one at a time. Used when fitting new GET components to a digger.
b) View the status of all active Sensors. Used during routine checking of digger bucket.
c) Locate GET components. Used when a component has been detached.
d) Remove GET Sensors from a selected digger and deactivate them if required.

To prevent accidental changes to Sensor and digger settings, there are no system changes available on the Portable Reader. The LCD **Backlight Mode** and **Touch Sensor** under the **Settings** menu are the only items that can be adjusted.

Picture 4. Portable Reader
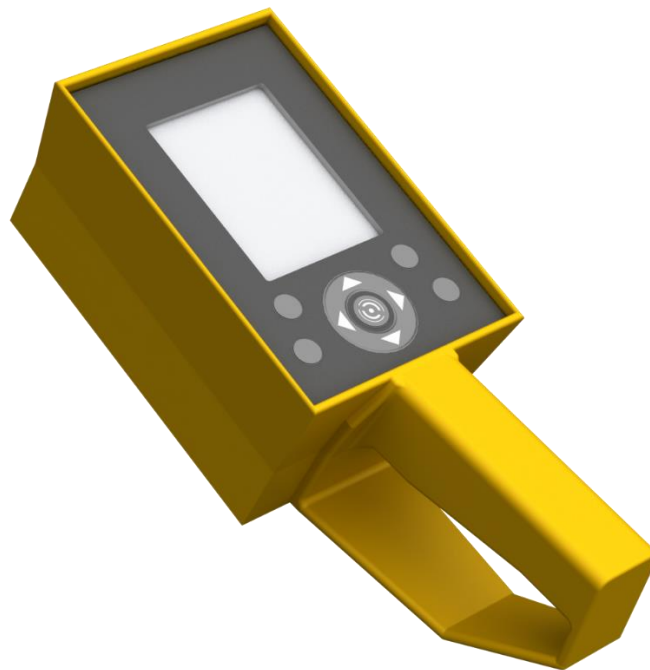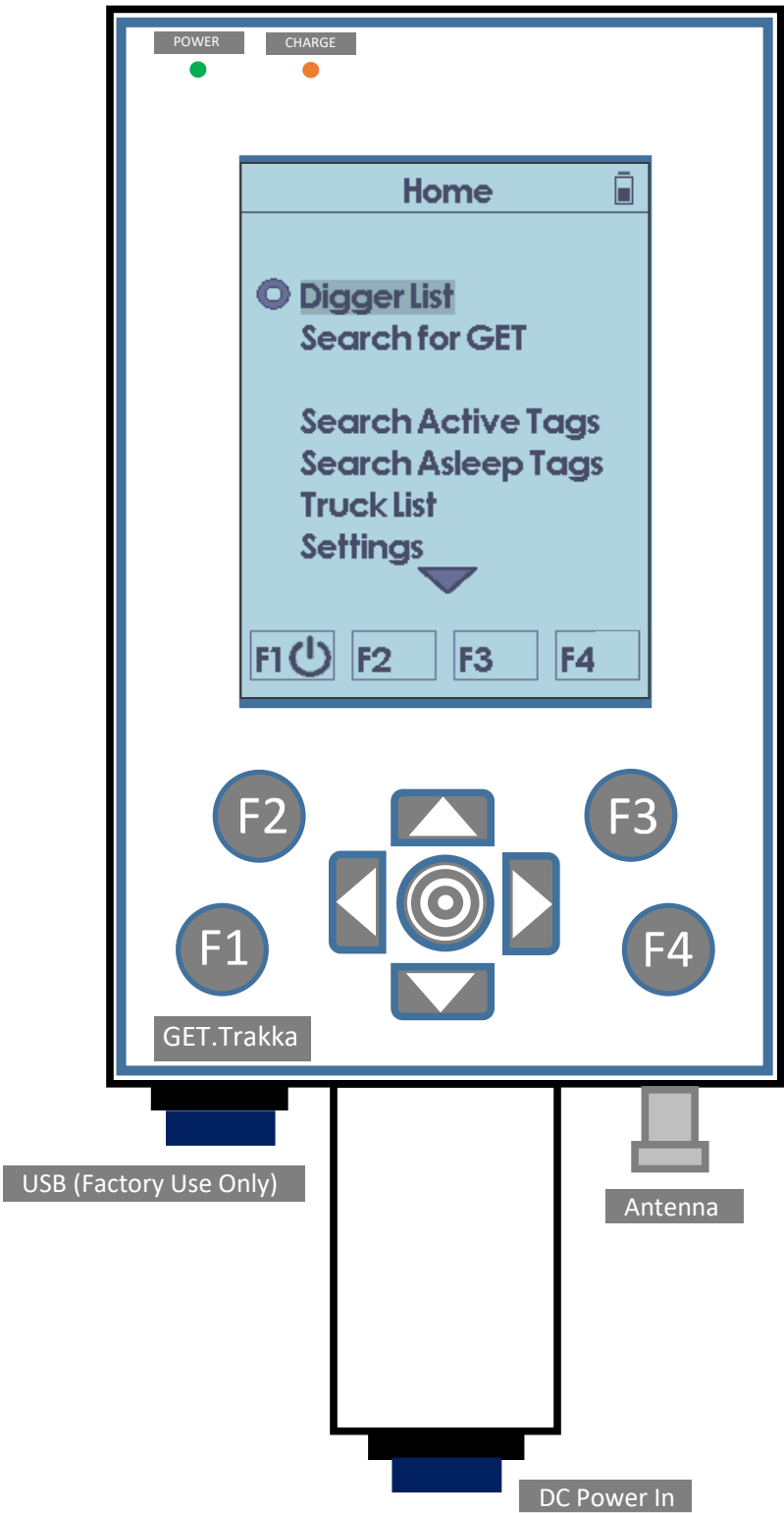
POWER

Green LED light to indicate external DC power is connected.

CHARGE

Orange LED light to indicate battery is charging from external power.

DC Power In

External charging jack for DC power plug.

USB

Factory use only.

Antenna

Connection for external antenna used in Search Mode.

6.   Power and Charging

6.1   Power

The Portable Reader is a portable, re-chargeable, battery powered device that provides up to 10 hours of use.

To power on the Portable Reader, press the **[ENTER]** button. The GET Trakka start up screen will appear containing the reader firmware and hardware information. After five (5) seconds, the home screen will appear. A battery indicator icon in the top right-hand corner of the display indicates the battery charge level.

To turn off the Portable Reader, hold down the **[ENTER]** button. A Power Down screen will begin to countdown. Keep holding the button for the displayed three (3) seconds to turn the reader off.

Alternatively, return to the **HOME** screen seen in *Picture 6* by pressing **F3** (Return) as many times as needed. Once on the home screen, press **F1 [⏻]** to turn off the reader.

6.2   Charging

To recharge the battery, plug in the supplied 12-volt DC charger to a wall socket and plug the round DC plug into the **DC Power In** socket located at the base of the handle. A fully drained battery will recharge in 2.5 hours.

The green **POWER** LED will illuminate to indicate that power is applied.

The orange **CHARGE** LED will illuminate to indicate the battery is charging. When the battery is fully charged this light will turn off.

7.   Keypad and LCD Touch Screen Functions

The reader has a dual function keypad and LCD touch screen to provide the operator with a choice of input methods. The touch screen can be triggered using a fingertip or touch screen pointer.

Warning *** DO NOT USE A PEN OR SHARP OBJECTS TO TOUCH THE SCREEN ***

All 9 keys on the keypad are duplicated as icons on the LCD touch screen and perform the same function.

A selected menu item has a round **[ENTER]** symbol to the left and highlighted text. See *Picture 6.*

Pressing the **[DOWN]** key will select the next item down the list until you reach the bottom. The **[DOWN]** key on the screen will disappear when the curser is at the bottom of a list. Pressing the **[UP]** arrow key will move to the next item up the list until you reach the top. The **[UP]** arrow key on the screen will disappear when the curser is at the top of a list. **Keypad & Touch Screen Keys:**

◎ [ENTER] **key to enter a deeper menu level on selected item and confirm command. Turns portable reader ON and OFF (When held).**

△ [UP] **key to move curser up a list.**

▽ [DOWN] **key to move curser down a list.**

◁ [LEFT] **key to move curser left on index positions.**

▷ [RIGHT] **key to move curser right on index positions.**

F1 [✚] **Add Sensor to digger and activate or [⏻] Turn Digger off when on home screen.**

F2 [🔍] **Search Sensors.**

F3 [🏠] **Return to Home menu or [↺] Escape out of current function.**

F4 [━] **Remove a Sensor from digger and deactivate.**

Picture 6. Home screen menu with ENTER symbol and highlighted text on selected Digger List.	**Picture 7.** Press [DOWN] key to move curser down the list.
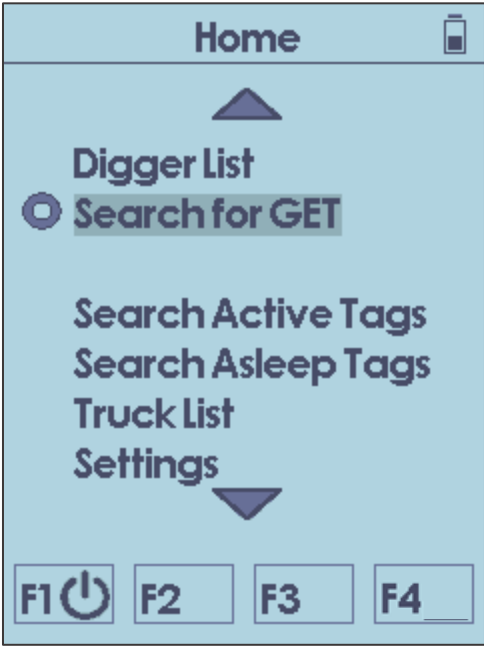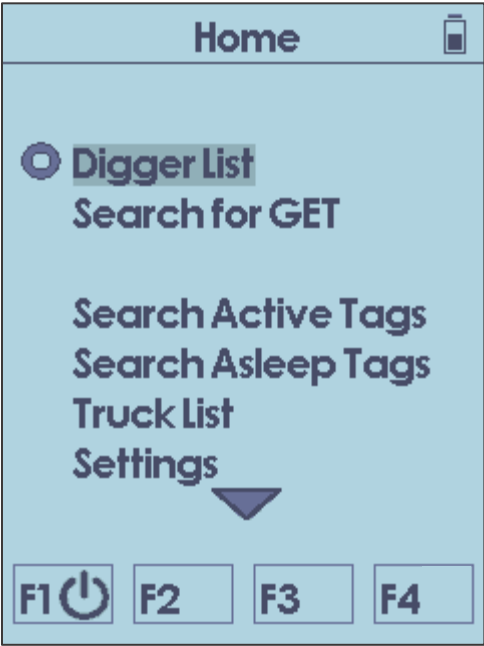
8. Digger List

From the **Home** menu select **Digger List** and press **[ENTER]** to view a list of the diggers. Note the **Digger List** is the default selection on the **Home** menu.
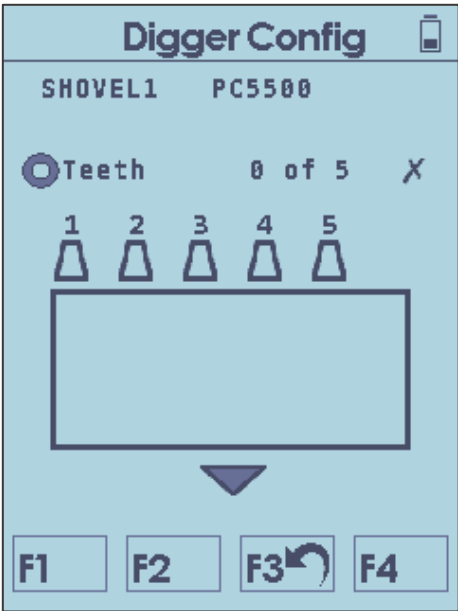
Press **[UP]** or **[DOWN]** to select a digger.

Press **[ENTER]** to view and configure the GET Sensors on the selected digger.

Use **[UP]** or **[DOWN]** to view the status of different GET components on a digger such as teeth, lip shrouds, adapters and side bars as well as the bucket and reference Sensors. Each digger may have a different configuration of GET component types and quantity according to the mine site requirements.

Demo Site Example

a) Press **[UP]** or **[DOWN]** to select digger **SHOVEL1 – PC5500**. Press **[ENTER].**
b) From the **Digger Config** screen press **[UP]** or **[DOWN]** to select the GET component type **Teeth**. The display **0 of 5 ✗** indicates that zero (0) of the five (5) teeth are activated.

Picture 8. Digger List	**Picture 9.** Digger Config

9.   Add GET Sensors to a Digger

When new GET components are added to a digger, each fitted Sensor is activated and assigned to a specific component type and index position on a digger bucket. This enables wireless identification of each component and the digger it belongs to.

The Portable Reader only scans for inactive Sensors when adding them to a digger.

The ✗ and ✓ symbols provide a quick visual guide to determine the status of a component group.

**Steps – Add GET Sensors to a Digger**

1. Select **Digger List** and press **[ENTER]**
2. Select a digger from the list and press **[ENTER]**
3. Select the GET component type e.g., teeth or side bars. **0 of _ ✗** indicates that zero (0) Sensors of the component group are activated.
4. Press **[ENTER]** to configure and index position one (1) will be highlighted.
5. Aim the reader directly towards the GET Sensor in component 1.
6. Press **[F1]** to add and the reader will scan nearby deactivated Sensors for six (6) seconds.
7. The closest deactivated sensor will typically be at the top of the list, and this will usually be the Sensor the reader is pointing towards. The word "**Activate?**" is displayed below the Sensor list. To select another Sensor, use the **[UP]** or **[DOWN]** arrows. If the Sensor is not in the list press **[F1] to scan again.**
8. Press **[ENTER]** to activate the selected Sensor.
9. The component graphic will change to a solid dark fill. The display **1 of _ ✗** indicates that one of the components are now activated but not all of them. If the component graphic does not change to a solid dark fill, then the process did not succeed, and Steps 6 to 8 must be repeated.
10. Press **[RIGHT]** arrow to select index position two (2) and aim the reader directly towards the GET Sensor in that component.
11. Repeat steps 6 to 8. The display **"2 of _ X"** indicates that two (2) of the components are now activated.
12. Repeat steps 6 to 8 to add and activate remaining components.
13. The display **_ of _ ✓** indicates that all components are now activated.
14. Press **[F3]** to escape configuration mode and view GET Sensor status. All teeth icons will change to become a solid dark fill indicating the presence of active Sensors.

Add GET Sensors - Demo Site Example Screens

Picture 10. Select the required GET component type and press [ENTER] in order to enter configuration mode	**Picture 11.** Press [F1] or [✚] to add Sensors
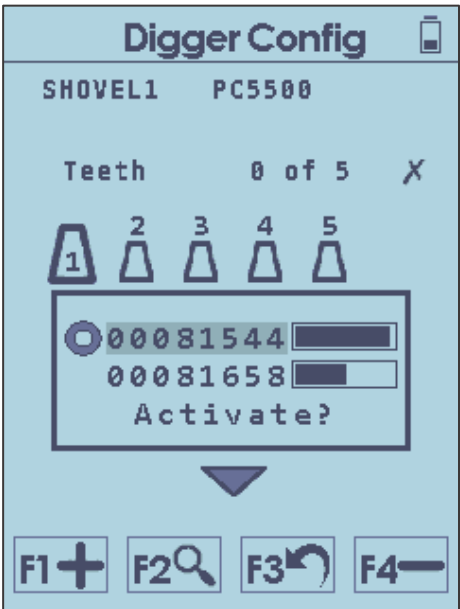
Picture 12. Press [ENTER] to activate Sensor	**Picture 13.** Press [F3] to escape configuration mode after all components have been activated

10. Duplicate GET Sensors

The Portable Reader enables operators to have duplicate Sensors for the same index position. This feature is to minimize delays during the GET change out procedure and allows the flexibility to activate new Sensors near a digger bucket with worn GET still fitted.

The reader allows for a maximum of two (2) Sensors per index position to be active at the same time. Components with duplicate Sensors are clearly marked with a small **X** above the component graphic icon.

Steps – Duplicate GET Sensors

1. Select a GET component type with a full set of GET components with active sensors, e.g., teeth or side protectors. Note: The display _ of _ ✓ indicates that all components in that group are activated.
2. Press **[ENTER]** to configure and index position one (1) will be highlighted. The existing active Sensor ID is displayed.
3. Aim the Portable Reader directly towards the GET Sensor in <u>NEW</u> component 1.
4. Press **[F1]** to add and the reader will scan nearby deactivated Sensors for six (6) seconds.
5. The closest deactivated Sensor will typically be at the top of the list, and this will usually be the Sensor the reader is pointing towards. The word "**Activate?**" is displayed below the Sensor list. To select another Sensor, use the **[UP]** or **[DOWN]** arrows. If the Sensor is not in the list press **[F1] to scan again.**
6. Press **[ENTER]** to activate the selected Sensor.
7. With all component graphics remaining a solid dark fill, the display _ **of** _ **X** now indicates the presence of a duplicate Sensor. Both active Sensor ID's will be displayed.
8. Press **[F3]** to escape configuration mode and view GET Sensor status
9. The tooth 1 component graphic will display an **X** above it to indicate that this is a duplicated Sensor.

Duplicate GET Sensors - Demo Site Example Screens

Picture 14. Select a GET component type and press [ENTER] to enter configuration mode	**Picture 15.** After selecting a specific index, press [F1] to add a Sensor

Picture 16. Press [ENTER] to activate Sensor	**Picture 17.** Press [F3] to escape configuration mode. In the diagram, Tooth 1 can be seen to contain duplicate Sensors
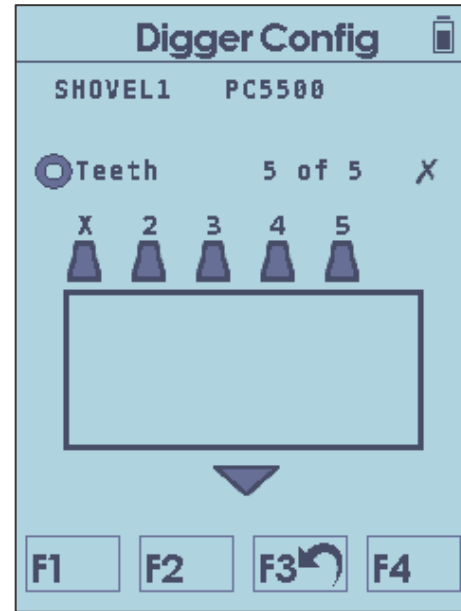
11. Remove GET Sensors

When removing worn components, each fitted Sensor is removed from the digger and automatically deactivated. The data is cleared from the Sensor memory, so it is ready for re-use as required.

The Sensors can be removed in any order; however, it is recommended to follow a logical order.

Demo Site Example

The following example removes five (5) teeth from **Demo 1 Small Digger**.

a) Select a full set of teeth with activated sensors.
Note: The display **5 of 5** ✓ indicates that five (5) out of five (5) teeth are activated.

b) Press **[ENTER]** to configure and tooth index position one (1) will be highlighted by displaying a large, filled graphic of the tooth and the existing active Sensor ID.

c) Aim the reader directly towards the GET Sensor in tooth one (1).

d) Press **[F4]** to remove the GET Sensor and the word "**Remove?**" will be displayed below the Sensor ID.

e) Press **[ENTER]** to confirm removal and the Portable Reader will scan for the selected Sensor for up to six (6) seconds while counting down and displaying a flashing antenna. If the Sensor reappears on the display, press **[F4]** and **[ENTER]** again.

f) The tooth one (1) icon will change to no fill. The display **4 of 5** ✗ indicates that four (4) of the five (5) teeth are still active.

g) Press **[RIGHT]** to select tooth index position **2** and aim the reader directly towards the GET Sensor in tooth two (2).

h) Repeat steps d) and e). The display **"3 of 5 ✗"** indicates that three (3) of the five (5) teeth are still active.

i) Repeat steps d) and e) to remove teeth 3, 4 and 5.

j) The display **0 of 5** ✗ indicates that zero (0) out of five (5) teeth are active.

k) Press **[F3]** to escape configuration mode and view GET Sensor status. All teeth icons will have no fill indicating the absence of any active teeth Sensors.

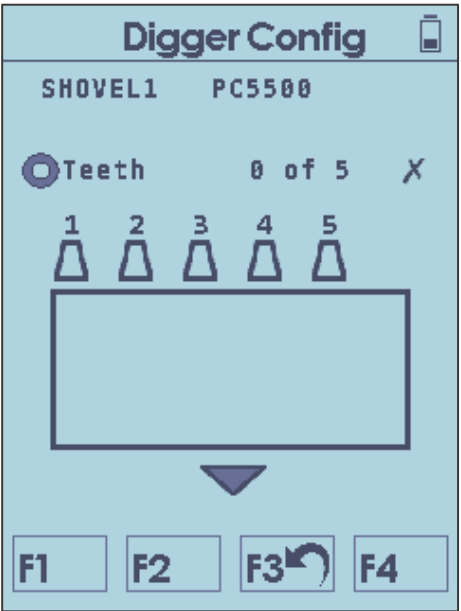**Remove GET Sensors - Demo Site Example Screens**

Picture 18. Select the component you would like to remove and press [F4] and [ENTER] to remove	Picture 19. Sensor 1 has been removed

Picture 20. Press the [RIGHT] arrow key to select tooth 2 and continue removing all components	Picture 21. Diagram of Digger Config after all components have been removed

12. Search Sensors

The Portable Reader can search for all active Sensors or inactive Sensors within wireless range. Active Sensors can be read up to 50 metres away and inactive Sensors can be read up to 10 metres away.
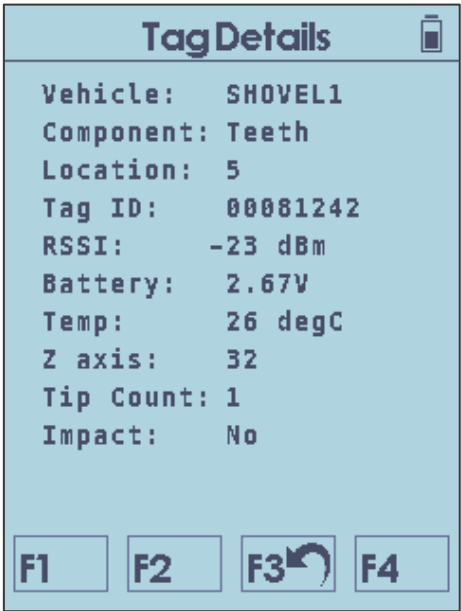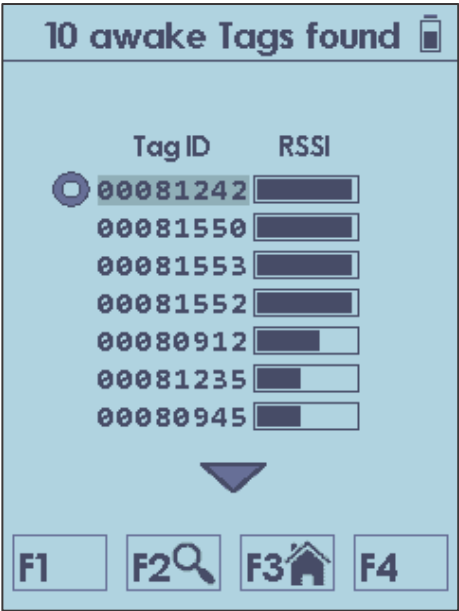
12.1 Search Active Sensors

From the **Home** menu, press **[UP]** or **[DOWN]** to select **Search Active Tags** and press **[ENTER].**

The Portable Reader will search active Sensors for six (6) seconds and display a list of found Sensors. To search again press **[F2].**

The Sensor list displays the Sensor ID and signal strength bar. To view the full Sensor details, press **[UP]** or **[DOWN]** to select a Sensor and press **[ENTER]**. A detailed list of the Sensor information is displayed. The heartbeat symbol indicates that the Sensor is still within reader range and the information is current.

Any inactive Sensors will not be read.

Picture 22. Search Screen	**Picture 23.** Detailed Sensor Information

12.2 Search Inactive (Asleep) Sensors

From the **Home** menu, press **[UP]** or **[DOWN]** to select **Search Asleep Tags** and press **[ENTER].**

The Portable Reader will search inactive Sensors for six (6) seconds and display a list of found Sensors. To search again press **[F2].**

The Sensor list displays the Sensor ID and signal strength bar. No other details are available from a sleeping Sensor.

Any active Sensors will not be read.

12.3 Search for Lost Sensors

The reader has the ability to assist personnel in locating missing components. Typically used when a component has been dislodged during digging operation and is not visible.

Only Sensors that have been added to the digger list can be searched for using this function. Inactive Sensors cannot be searched for.

NOTE: An external antenna must be connected to the Portable Reader for the search function to operate correctly. An external antenna significantly increases the reading distance.

Steps – Search for Lost Sensor

1. Connect the external antenna to the Portable Reader.
2. Navigate to the **Home** menu and press **[UP]** or **[DOWN]** to select **Search for GET** and then press **[ENTER]**.
3. Press **[UP]** or **[DOWN]** to select the digger that the missing component belonged to.
4. Press **[ENTER]** and a list containing the component types for the chosen digger will appear**.**
5. Press **[UP]** or **[DOWN]** to select the lost component type and press **[ENTER].** E.g., If a tooth was lost, choose **Teeth**.
6. A screen will be displayed with the digger ID, component type and **Sensor Location** which is the index position of the component. A **Sensor Location** of 1 will be seen e.g., Tooth 1
7. Use **[LEFT]** or **[RIGHT]** to select the index of the component that has been lost.
8. Press **[F2]** to begin searching for the chosen part.
9. A locating screen will be displayed, showing the received signal strength of the tooth and emitting an audible beeping sound if the Sensor is within range. This information can be used to pinpoint the location of a nearby missing component as the received signal strength will increase when the external antenna is pointed in the correct direction and moved closer to the object. The audible beeping sound will also increase in frequency when the Portable Reader gets closer to the lost object.
10. Move towards the area of highest signal strength and narrow down the lost component's position.

11. Once the missing component has been located, press **[F3]** to exit out of the search function as it will consume the Portable Reader battery faster than usual.

12.4 Search Process

A broken component will either be in the pit face or in a truck tray and either partially or fully buried in the ore. If an immediate search of the pit face does not locate the component, then the procedure on the following page should be followed to enable rapid location.

The GET Trakka system provides an alarm on GET loss so the search zone can immediately be narrowed down to the last digging area and truck.

Note: *The most effective method to locate a GET component buried in the pit face or truck tray is to stimulate movement of the ore while searching. This is achieved by monitoring the truck while it is slowly tipping its load and monitoring the digger bucket while it is scooping and dumping ore. Using this method, reliable detection of missing GET components can be achieved up to 50 metres away using the search function with an external antenna.*

Picture 24. Search Process Flow.
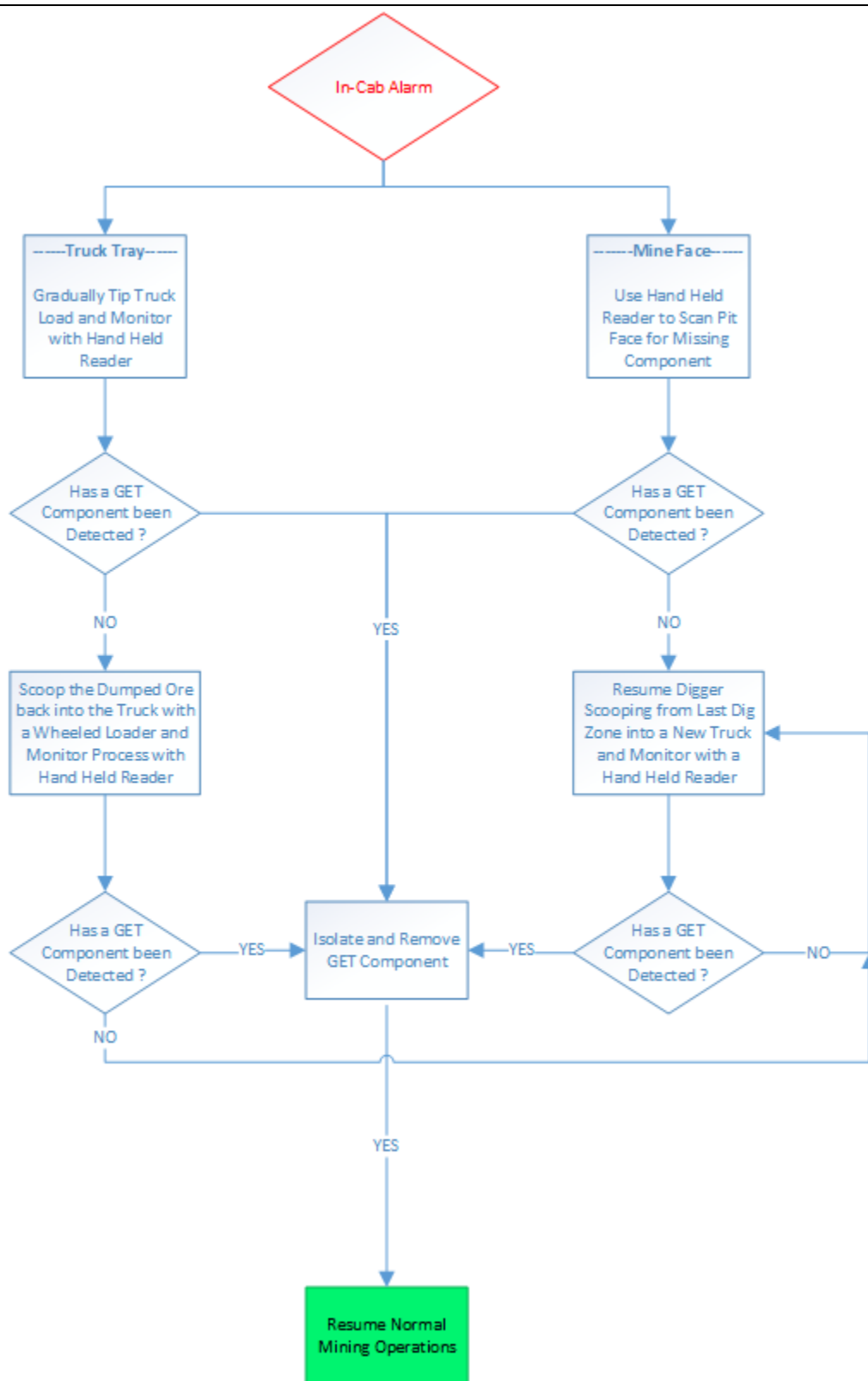
13. Settings

The Portable Reader has some user settings to change the LCD backlight function and touch screen.

The LCD **Backlight Mode** and **Touch Sensor** under the **Settings** menu are the only items that can be adjusted on the reader.

From the **Home** menu press **[UP]** or **[DOWN]** to select desired **Settings** and press **[ENTER].**

13.1 Backlight Mode

Options are **Off**, **On** or **Auto**. It is recommended to keep the **Backlight Mode** set to **Auto** for best viewing under all light conditions including direct sunlight and darkness.

13.2 Calibrate Touch Sensor

Touch sensors sometimes require calibration such as when gloves are used.

Touch the moving target at each of the four (4) reference points and press **Exit** to save the new calibration settings.

 To redo the calibration, allow the ten (10) second timer to timeout and then repeat calibration, otherwise press **Exit** and then **Reset Touch Sensor** to undo all changes and revert to factory settings.

13.3 Reset Touch Sensor

To reset the touch sensor back to factory default setting, Press enter **[ENTER]** on the **Reset Touch Sensor** settings option**.**

A countdown screen will appear, and the reader will turn off. When turned on again, the touch sensor will be reset.

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