MTG

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GET DETECTION SYSTEM

User Manual

Model v1.2

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1. Read me first

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2. SAFETY

The practices described in this manual can be taken as guidelines for operating safely in many conditions and in addition to the safety standards that are current and enforceable in your area or region.

Your safety and the safety of third parties is the result of putting into practice your knowledge of the correct operational procedures.

Attention, when performing the work described in these instructions, always work safely and use the personal protection elements required to minimize or avoid injury.

Always wear:

HARD HAT | SAFETY GLASSES | EAR PROTECTION | STEEL TOED BOOTS | PROTECTION GLOVES

To avoid eye injury, always wear safety goggles or a protective mask when using any equipment, hammer or similar tool. When equipment is under pressure or when objects are struck, chips or other debris can be thrown out. Make sure no one gets hurt by the debris that is fired before applying pressure or hitting an object. Wear eye protection that complies with ANSI Z87.1 and OSHA standards. Also wear hearing protection and gloves.

Lifting a heavy object can cause serious or fatal injury. DO NOT exceed the maximum rated capacity of lifting and positioning devices: Stay away from the area under a suspended load.

Make sure that the chain is not damaged and that the load is always balanced.

LIFTING LUG | HARD HAT

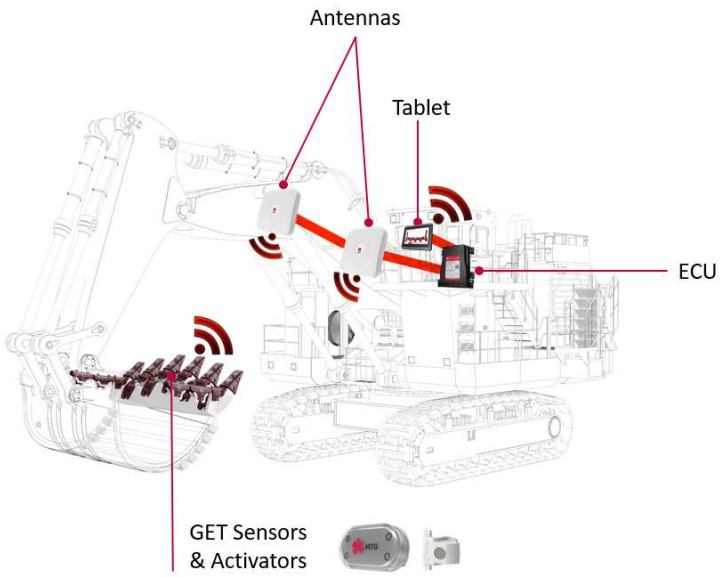
3. SYSTEM OVERVIEW

3.1 GET DETECTION DEFINITION

MTG's G.E.T detection system provides an immediate and reliable in-cab alarm when any digital-enabled G.E.T is separated from the bucket. The system can also collect data and information to enable MTG's Field Services Engineers to provide remote support to the mine site. It comprises wireless sensors, actuators, antennas, an Electronic Control Unit (ECU), and an operator tablet.

3.2 SYSTEM ARCHITECTURE

The system has wire-based and wireless connections to ensure ease of mounting and long-life reliability. The sensors are mounted into the GETs and they transmit wireless signals to the antennas. The antennas send the information through a wire to the ECU. The ECU processes the information and sends it to the tablet where it is displayed. This data is finally transmitted to the cloud-based MTG's platform for further analysis.



3. SYSTEM OVERVIEW

3.3 DEVICES DESCRIPTION

Sensors and Activators

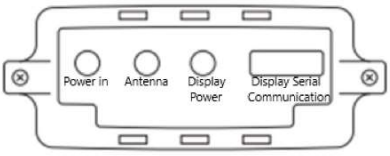
The magnetic field sensor (MFS) is the sensor that detects the detachment of a sensorized GET by means of detecting the activators (magnet). Each MFS has a label with an identifier (ID).

Antennas

The antennas are devices that detect the wireless signal sent by the MFS. There are two of them, one is located near the cabin and the other in the excavator's stick.

Electronic Control Unit (ECU)

The ECU is the core of the system. It collects all the data from the antennas and processes it. It is installed in the cabin and the resulting information is sent to the operator tablet to be displayed.

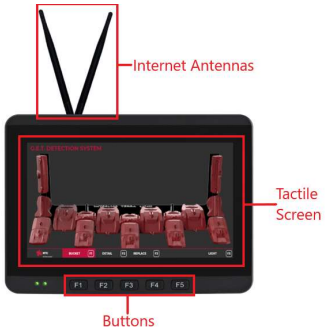


3. SYSTEM OVERVIEW

3.3 DEVICES DESCRIPTION

Operator Tablet

It is a tactile screen device installed in the cabin from which the operator can visualize the status of each of the sensorized GETs. In case of a detachment, the operator will receive a visual and an acoustic alert.



NOTE: The other connection ports not mentioned are not used

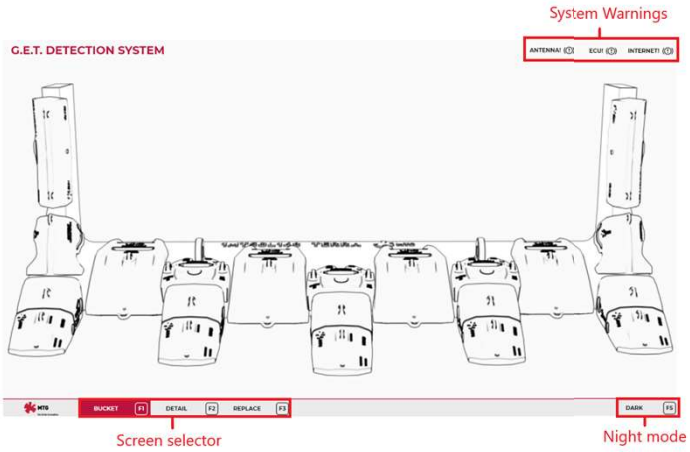
4. USER INTERFACE MANUAL

The User interface is the set of buttons and screens the tablet has. It comprises 4 screens and 5 buttons. Buttons may have a different functionality than explained here in REPLACE screen.

4.1 SCREENS

Bucket screen

The main screen, or bucket screen, visually summarizes the status of all the sensorized GETs. It is accessed by pressing F1.



Color	Status Name
	Armed
	Warning
	Alarm

NOTE: This example only contains teeth images, but it is applicable to any sensor enabled GET

Warning	Meaning
INTERNET! (!)	Internet Connection Lost
ECU! (!)	ECU Connection Lost
ANTENNA! (!)	Antenna Connection Lost

System Warnings

Pressing F5 turns on/off night mode. It changes the display to a dark background to reduce the light emitted.

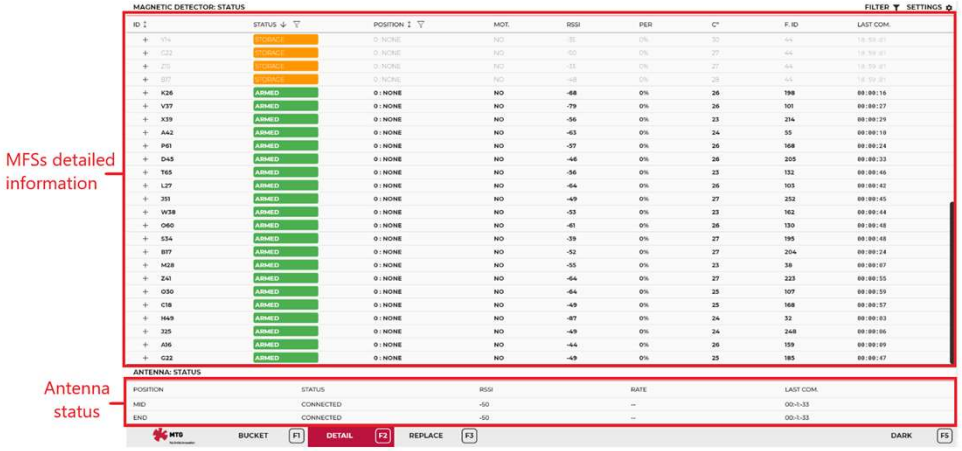
4. USER INTERFACE MANUAL

The User interface is the set of buttons and screens the tablet has. It comprises 4 screens and 5 buttons. Buttons may have a different functionality than explained here in REPLACE screen.

4.1 SCREENS

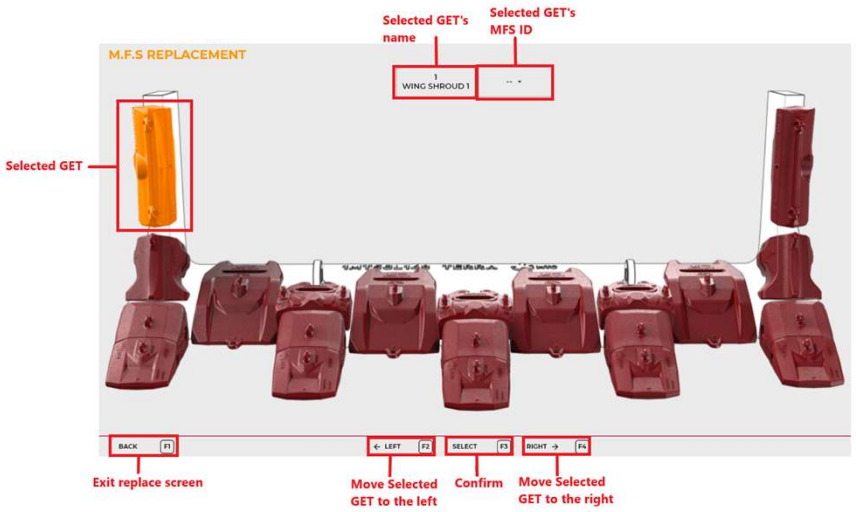
Detail Screen

The detail screen shows a list of all the MFSs. It gives a more detailed information of each one. At the bottom it is shown the status of both antennas. It is accessed by pressing F2.



Replace Screen

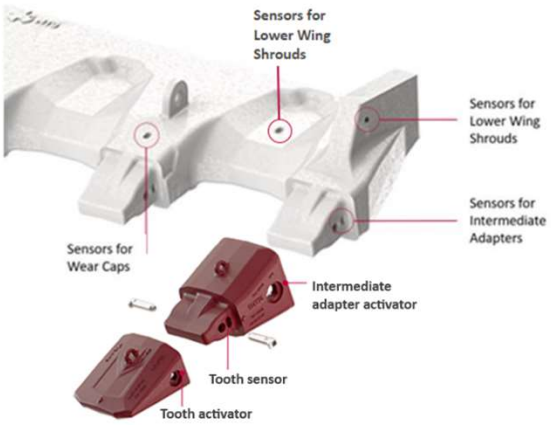
This is the screen used to assign each MFS to each GET. It displays a bucket and when a GET is selected it shows a list of MFSs to choose the MFS's identifier number (ID) which is in that GET.



5. FIRST STAR-UP AND MFS ASSIGNATION

If this is the first start-up of the system, the following procedure needs to be followed:

5.1 Place the MFSs in their slots.

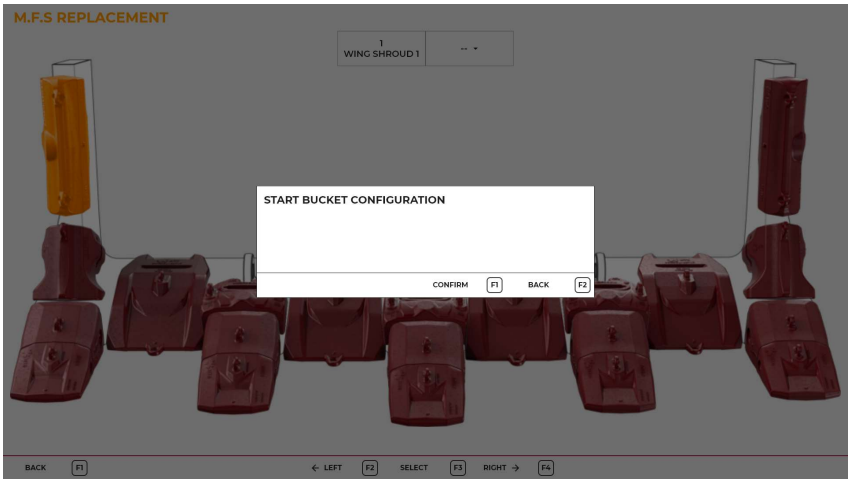


5.2 Write down the MFS' ID located in each GET.

Beware! The sensor that detects the tooth detachment is the one located at the adapter. The same way, the sensor that detects the intermediate adapter detachment is the one located at the cast-lip or plate-lip. Please, check the previous figure to correctly fill the list with the MFS IDs.

5.3 Install all the GETs on the bucket to activate the MFS, Following the MTG Installation procedures.

5.4 Turn on the system and wait for all the MFS to be detected (this might take a couple of minutes). Go to Replace screen and press F1 when the pop-up appears to confirm the start of the the bucket configuration process.



5. FIRST STAR-UP AND MFS ASSIGNATION

5.5 Press F2 or F4 to move the selected GET.

5.6 When the selector is in the desired position, press F3 to begin the selection of the sensor.

5.7 Now, using F2 and F4 select the MFS' ID and use F3 to confirm it.

5.8 Then press F1 to confirm when the pop-up appears.

5.9 Repeat from step 5 for every sensor enabled GET until all are assigned.

5.10 Press F1 to exit the replacement mode.

6. BEGINNING OPERATION: WHAT TO EXPECT IN THE FOLLOWING START-UPS

When starting the machine several things can be shown in screen:

Screen display	Meaning	What to do
All MFSs are in **armed state**	Everything is OK	Begin operation normally
MFSs are in **warning state**	Stablishing connection	Move bucket to activate sensors. If after 5 minutes the sensors are not in armed state, report to technical service
Alarm state	Some activators are not being detected	Report to technical service. Beware! In case of detachment, the GET will not be detected.

7. REPLACEMENTS

In case of a tooth, lip shroud, wear cap or wing replacement, replace the GET and continue operation normally.

In case of an intermediate adapter replacement, follow the instructions in “4. First start-up and MFS assignation” to replace the MFSs that will detect tooth detachments.

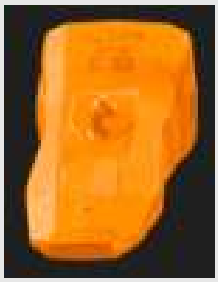
8. TROUBLESHOOTING

Some errors are shown in the tablet. In case one of them is shown follow these instructions:

Screen display	Cause	What to do
	No internet connection	Check if the tablet antennas are properly threaded into the WWAN connectors. **Continue operation.** If problem persists, call technical service.
	No ECU connection	Check if the wire going from the ECU to the tablet is properly connected. Call technical service because the **system is not working.**
	No antenna connection	Go to detail screen. At the bottom two antennas are shown. If **both are missing**, call technical service because the **system is not working**. If only **one is missing, continue operation**, but **warn technical services** to replace the missing one.
Screen off	No power supply in the tablet	Call technical services. If a detachment occurs, the alarm will not sound nor be displayed.

8. TROUBLESHOOTING

Some errors are shown in the tablet. In case one of them is shown follow these instructions:

Screen display	Cause	What to do
	Detachment	If any GET turns red and the alarm sounds, **STOP OPERATION,** a **detachment occurred.**
	Stablishing connection	If any GET turns orange, **continue operation**. If problem persists, call technical services.

9. TECHNICAL DATA

Item		Specification	
Technical data			
Product Name		GET Detection System	
Model		v1.2	
Hardware version		v1.2	
Software version		v1.2	
Wireless Communication			
Frequency band		387 - 470 MHz	
Device	**Power Input**	**Dimensions**	**Weight**
Antenna	9V - 24V	270 x 270 x 62 mm	1742 g
ECU	9V - 24V	180 x 120 x 60 mm	817 g
Tablet	9V - 24V	190 x 145 x 42 mm	1043 g
MFS	-	58 x 32 x 34 mm	120 g

Certifications

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. FCC ID: 2A7NH-DSMFS01 2A7NH-DSANT01

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:
1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.
IC ID: 29932-DSMFS01 29932-DSANT01

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