Ground Penetrating Radar System

TR-1

Operator Manual

TAKACHIHO SANGYO CO., LTD.

Safety

■ Before use, please read well in this instruction manual, use the product definitely and safely.

■ Here listing instructions in the security by the indication such as follows. Please read the text after understanding contents of the indication well.

■ After having read, please keep it by all means in the place to be seen anytime.

■ For product management and quality improvement, there is the case that puts a management No., a management cord on the product without a notice. Thank you for your understanding beforehand.

⚠ DANGER

- Do not put rechargeable battery in fire. In addition, do not disassemble and remodel it.
- Do not connect the plus and minus adversely, and do not let make short-circuit.
- Do not put water and an foreign material in the inside.
- Do not disassemble and remodel the main unit.
- Do not get on the main unit, and do not put on anything.
- When using the unit, secure the safety of the measurement point by safety corn and please be careful about traffic.

⚠ CAUTION

- The unit is not complete waterproofing specifications. Please do not put it in water.
  In addition, when water comes in inside, please use it after drying it well.
  If not completely dry, it causes the malfunction.
- Please do not fail to drop, give strong shock and vibration.
- Please take out rechargeable battery when not being used for a long term.
- Please do not keep the rechargeable battery which you took out of the unit near metal.
  It causes ignition, a burn, the trouble by the short-circuit of the terminal.
- If the battery status get quite low, please recharge it immediately.
  The false measurement is possible when just using it with no recharge.
- Please do not keep the unit in the extremely high/low temperature places like near fire and dust and humid place.
- When there was something wrong with the unit, please do not use it.
- When the unit becomes dirty, please do not wash it with water.
  In addition, please do not use the organic solvents because the unit may be damaged.
  Please wipe off dirt with well squeezed wet towels.

Table of Contents

1. Preparing for use

1) Inspection method

Please follow the guidelines to keep the unit a normal state.

1. Confirm that an antenna cover is attached to an antenna exactly.
2. Confirm that battery is completely charged and it is locked well.
3. Prior to use, a steering wheel is put up and is adjusted to appropriate height and confirm whether it is locked.
4. Confirm that a monitor is adjusted to an appropriate angle.

2) Antenna cover

When letting antenna part in contact with the ground and use it, burdens always hang over the antenna part.
To prevent abrasion of the lower antenna by the contact, an electrostatic cover is attached to an antenna.

⚠ CAUTION **Under no circumstances, do not operate it without antenna cover. May cause irreparable damage to the antenna housing.**

When replacing a new antenna cover with the worn antenna cover, off the screw.

⚠ CAUTION **When fitting a new cover, tighten screw by hand. Do not overtighten.**

Check antenna cover daily.

If any part of the cover is worn, it should be replaced immediately.

2. Battery & charging

Battery pack is supplied.
Please make sure it is charged fully before first use. Failure to do so may considerably shorten the life of the battery pack supplied.
Battery is contained in the battery compartment by pushing the locking pin down. To release the lock, push the locking pin again, then, withdraw the battery pack.

Replace battery when battery life lasts less than 90 minutes after being fully charged (atmospheric temperature 20℃)

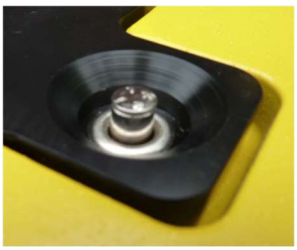
⚠ CAUTION

When charging the battery, use the supplied charging pod and adaptor.
Do not use any other adaptor or charging system.
It could damage battery and result fire or injury.

Fitting/Removing the battery

Step 1
Make sure power is OFF.

Step 2
Keep battery terminal downward, insert it into the battery compartment like in the left photo.

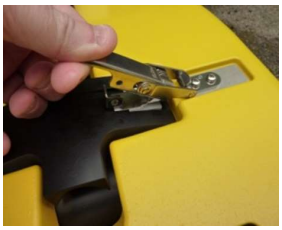


Step 3
Battery lock pin be down and fixed.
When taking battery out, down lock pin and release the fix.

⚠ CAUTION

When taking battery out, the power switch of the unit should be off. When taking battery out with power on, it causes the unit trouble.

3. Raising the handle to its working position



Operation is on level ground and in safe location.
Take off the safety fitting of the unit and open the handle stopper.

Lift up the handle bar.

Taking care not to let go until they are all the way back.

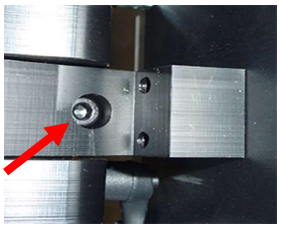
Close the handle stop and lock the safety fitting.

Open the height adjustment lever to extend the handle length to a comfortable working height.
After adjusting the height, fix it by closing the lever.

4. Adjusting the display angle

Please turn the coupling lever counterclockwise until the handlebar and the monitor move freely.
Adjust to the comfortable working angle and turn the coupling lever clockwise (in the opposite direction) until held firm.

Be careful, do not overtighten.



The monitor is tightened and fixed to a handlebar.
When adjusting the angle, please loosen the bolt having hexagon hole by the hexagon wrench.
After the adjustment of the angle, please tighten it again.

5. Method of starting

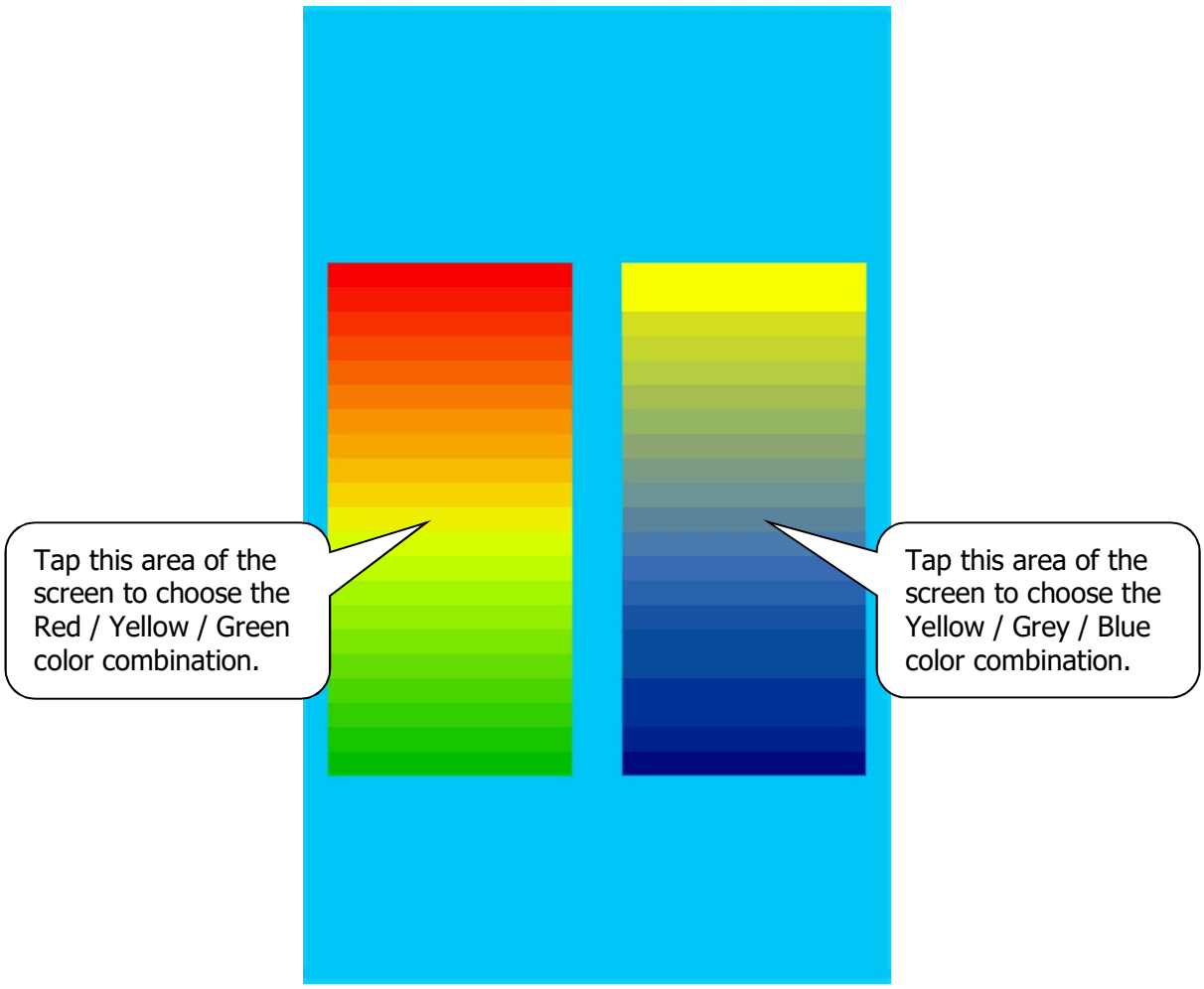
Move the power switch ON.

⚠ CAUTION	**Remove the battery when stored or no use for any length of time.**

Note. To prevent unintentional discharging of the battery, please remove the battery in case of transportation and temporary storage.

6. Choice of color combination

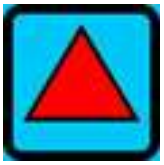
When power on, a choice between two color combination is displayed. （Red / Yellow / Green）or （Yellow / Grey / Blue）



Simply tap the screen to choose preferred color combination. It appears in the screen for 5 seconds.
If nothing chosen, color combination will be the initial setting, Red / Yellow / Green.
To change color combination, power off and then on. Operate as above mentioned.
In the manual, it is explained as using initial setting color combination, Red / Yellow / Green.

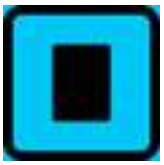
7. Icons' color combination

Depending on the color combination, the icon color to use for operation is as follows.

Action	Red/Yellow/Green color combination icons	Yellow/Grey/Blue color combination icons
Sensitivity up		
Sensitivity down		
Start forwards		
Start backwards		

8. Common icons

The following icons are commonly used no matter what color combination chosen.

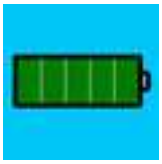
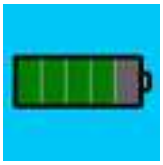
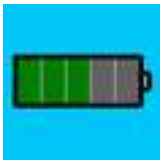
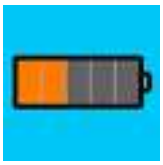
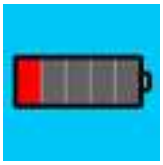
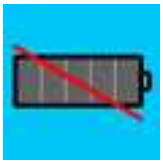
Action	Icon
Stop Stop collection of new data.	
Reset Reset measurement data. The next measurement is enabled.	
Overspeed（Warning） Appears if the data collection speed (walking pace) Becomes too fast for the system to deal with. If the speed is not adjusted soon, data corruption may occur. To avoid data corruption, please down the walking pace.	
Overspeed（Fault） Appears if skipping out the warning and exceed the data collection speed. Stop immediately and re-start the scan or may cause serous data loss.	
Overspeed（Error） Appears if skipping out above mentioned the "Overspeed (Fault)" message and do not stop, ON/OFF blinking starts. The system will automatically hold data collection any more.	
Estimated depth The value to be analyzed the provided data within the cursor is the estimated depth.	
Impossible to have depth estimation The data currently displayed within the cursor is not sufficient sensitivity to analyze the depth.	

9. Chronos masking icons

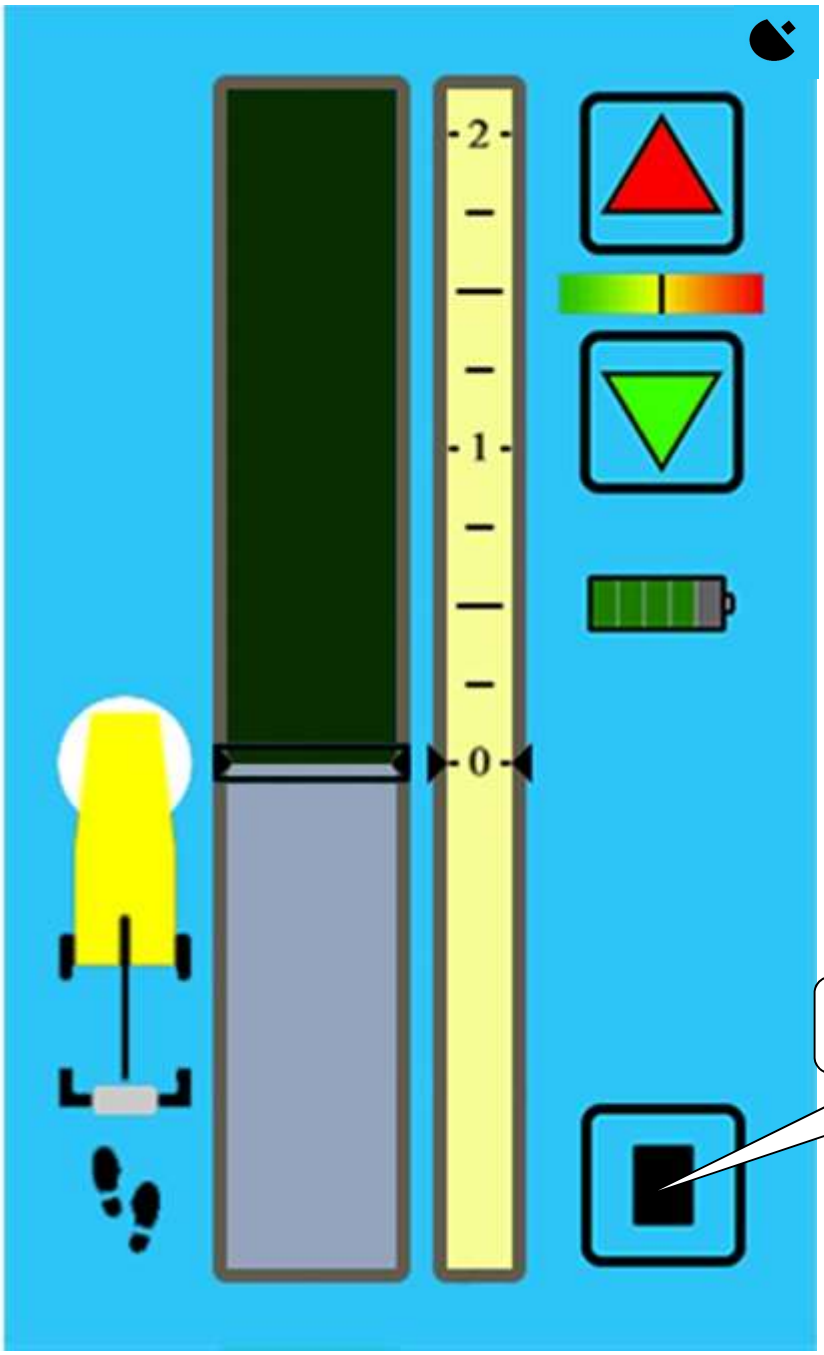
Action	Icon
Masking of data can be applied. Details see P13 to P15.	

10. Battery status icons

The following icons are used to represent the approximate value of current battery status.

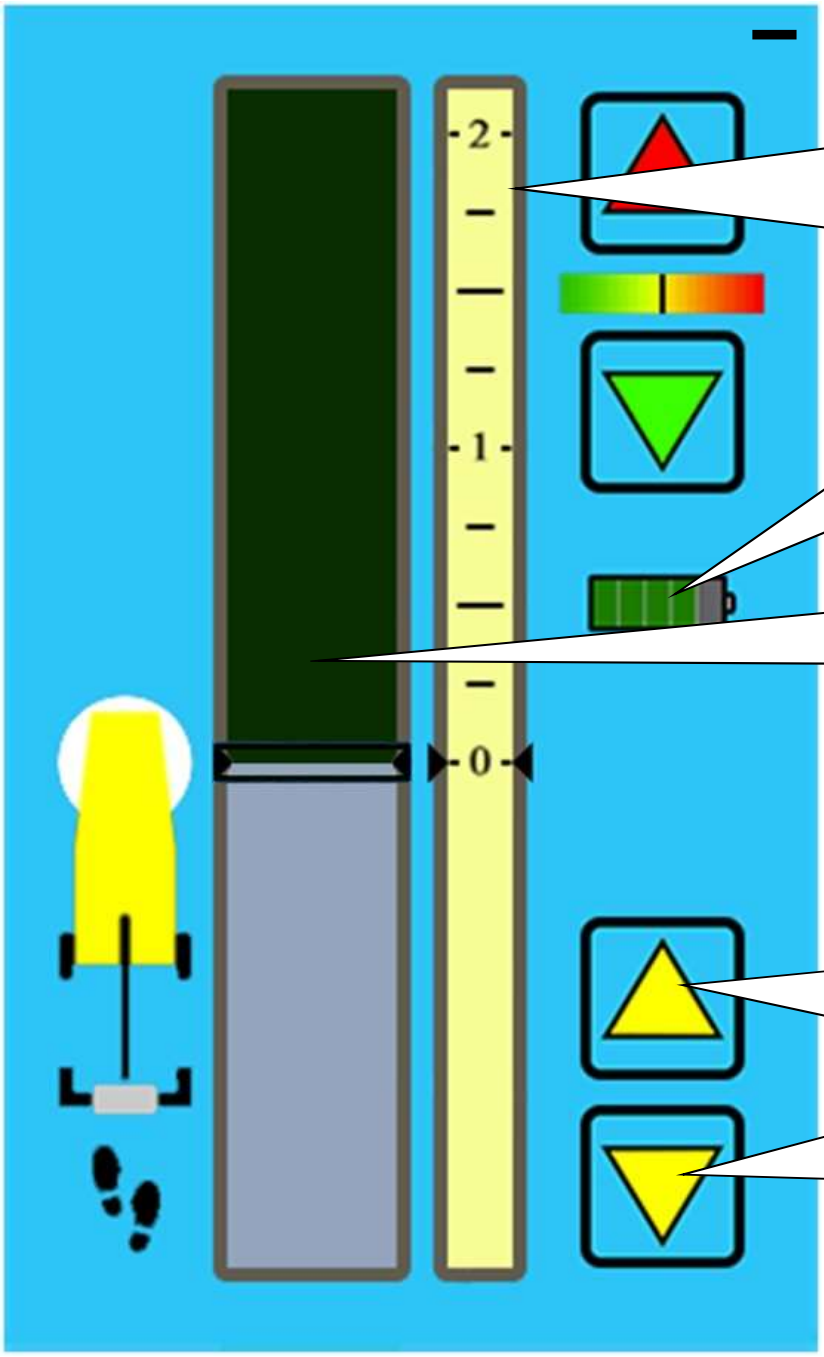
BATTERY <99%	
BATTERY <80%	
BATTERY <60%	
BATTERY <40%	
BATTERY <20%	
BATTERY <5%	

11. Start-up Screen



Pushing the reset button will enter the "start scan" screen

12. Start scan



Distance scale

Indicates, in meter, rough distance from start of scan.
Log collection up to 16 m is possible.

Battery status

Indicates battery status. (See P8)

Data panel

Displays progress and results here.

Forward scan

Press to start scan in the forward direction.

Backward scan

Press to start scan backward.

Push the unit over the subject field, the antenna (white section) must always remain in contact with the ground surface.

Note. Irrespective of direction of scan selected: Data is always displayed on-screen with a forward motion.

13. Scan in progress

Cursor

Current position is marked by the **Black** cursor.

Use central ►◄ for accurate positioning.

Unprocessed data

Not yet processed data is shown in **Purple.**

Operator feet

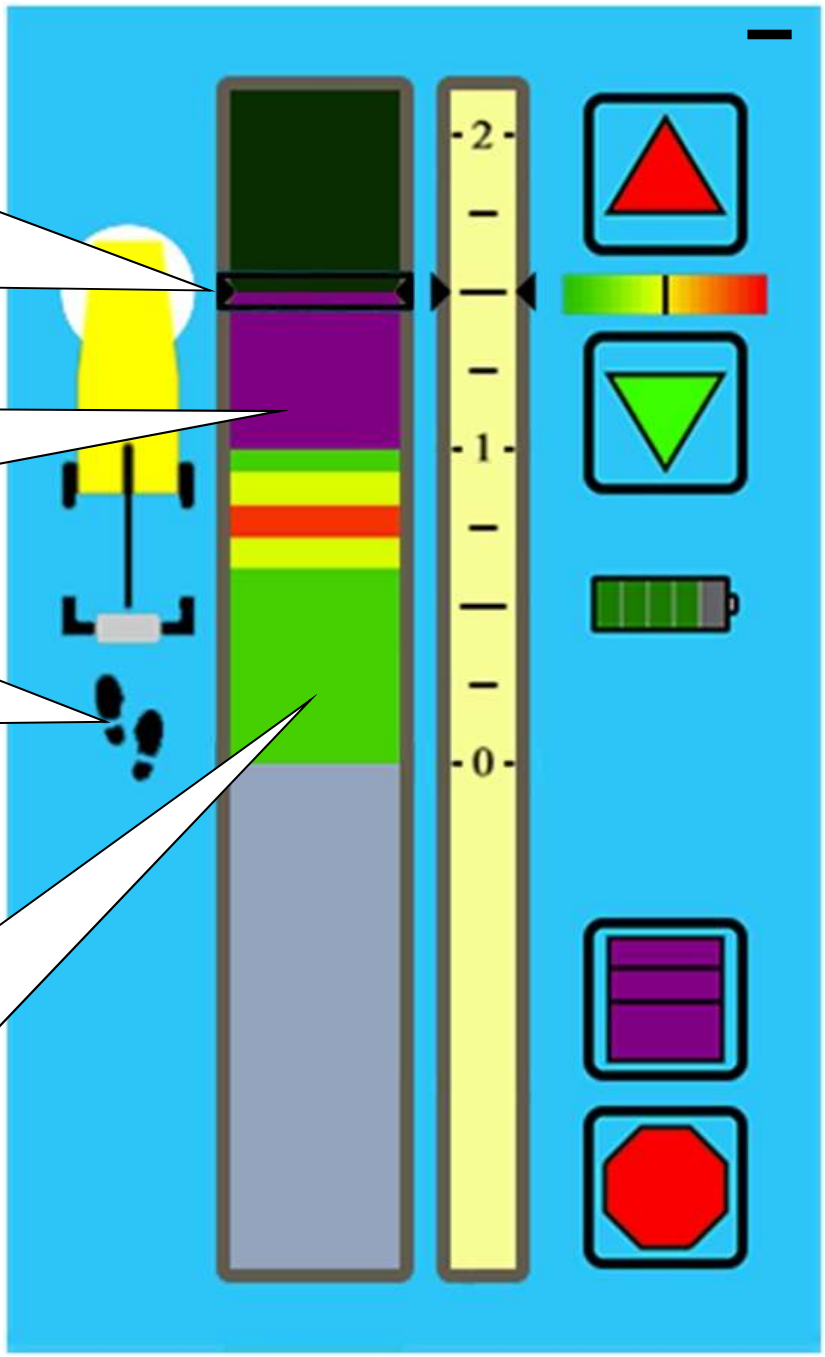
Allows approximate positioning relative to the operator.

Processed data

Red High likelihood of Service present.

Yellow Intermediate likelihood of Service present.

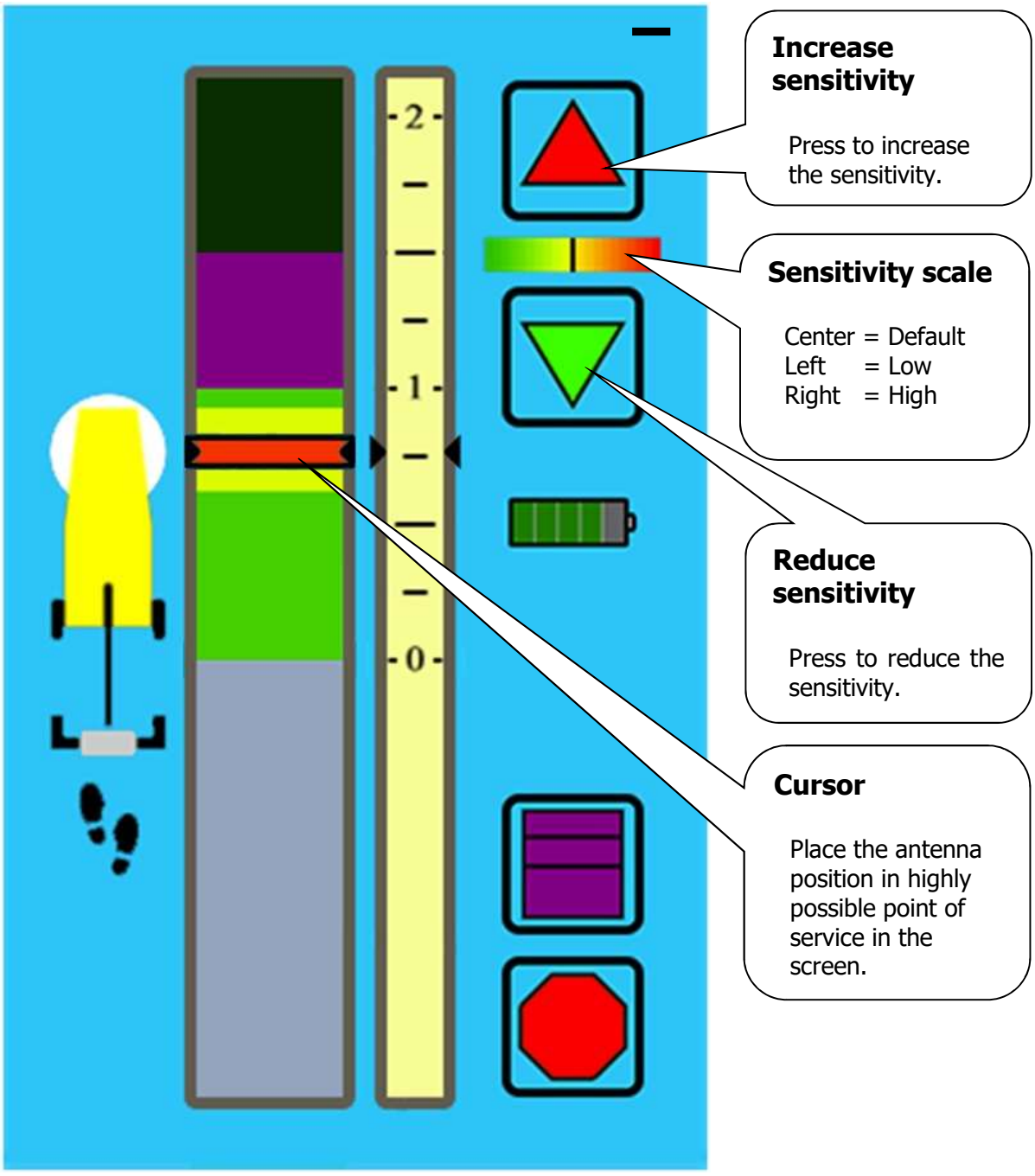
Green Low likelihood of Service present.



When pushing the unit over the subject field, data is collected. With a small delay the processed data result is automatically displayed.

Note. The maximum continuous scan distance is 16 meters.

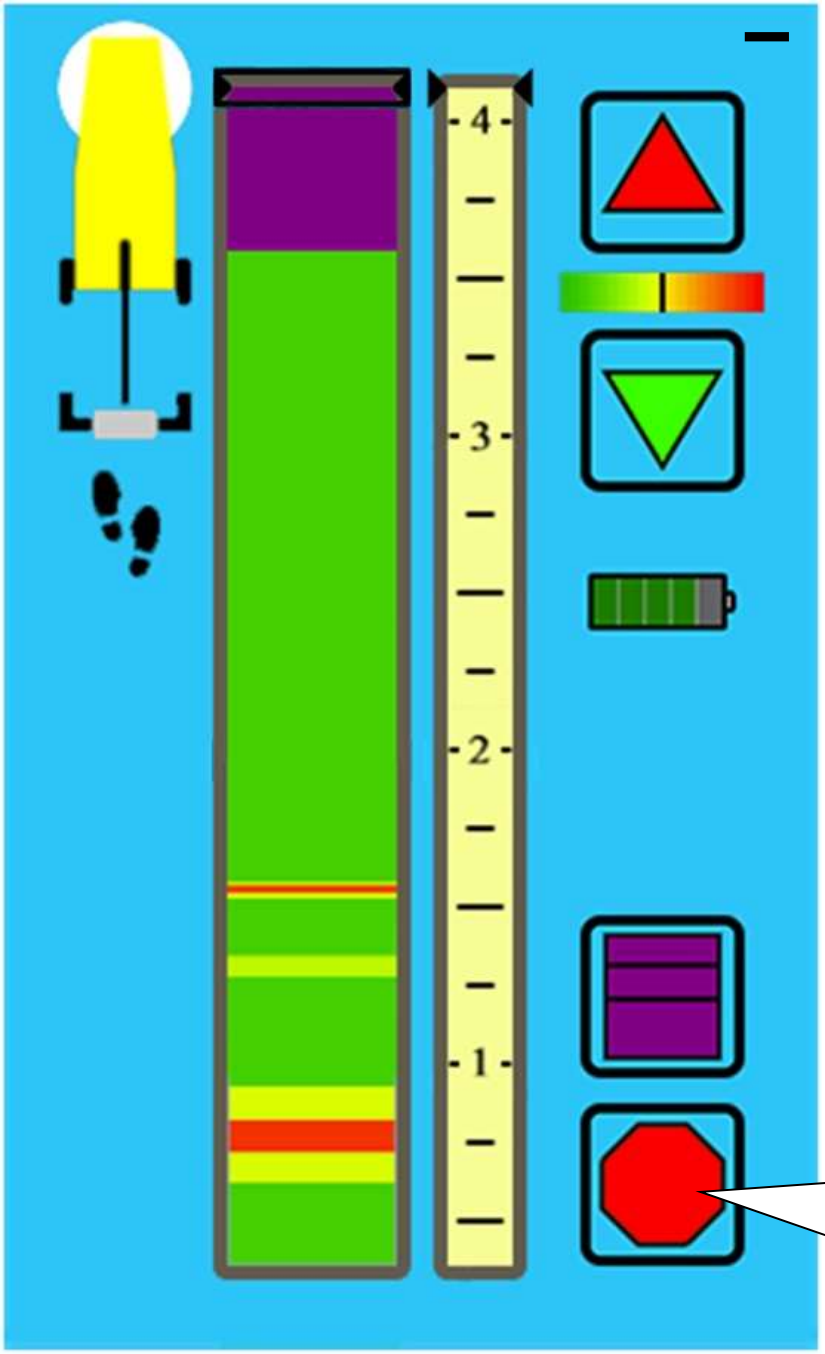
14. Data adjusting



Move the unit to reverse with the searching direction. Put cursor to the highly possible point of service. By the icon (►◄) of the cursor center, the accurate position searching of service is possible.
The estimated depth of service is displayed by tapping data panel. Maybe the object is missed with weak reaction or hiding by the reaction of the strong circumference but by adjusting the sensitivity, the object can be found. Be able to confirm the effect of the adjustment on a screen immediately, operate can be done intuitively and quickly.

Note. The system will automatically reset sensitivity back to the default (center point) position, each time the system is powered up, until then the last used setting will remain in effect.

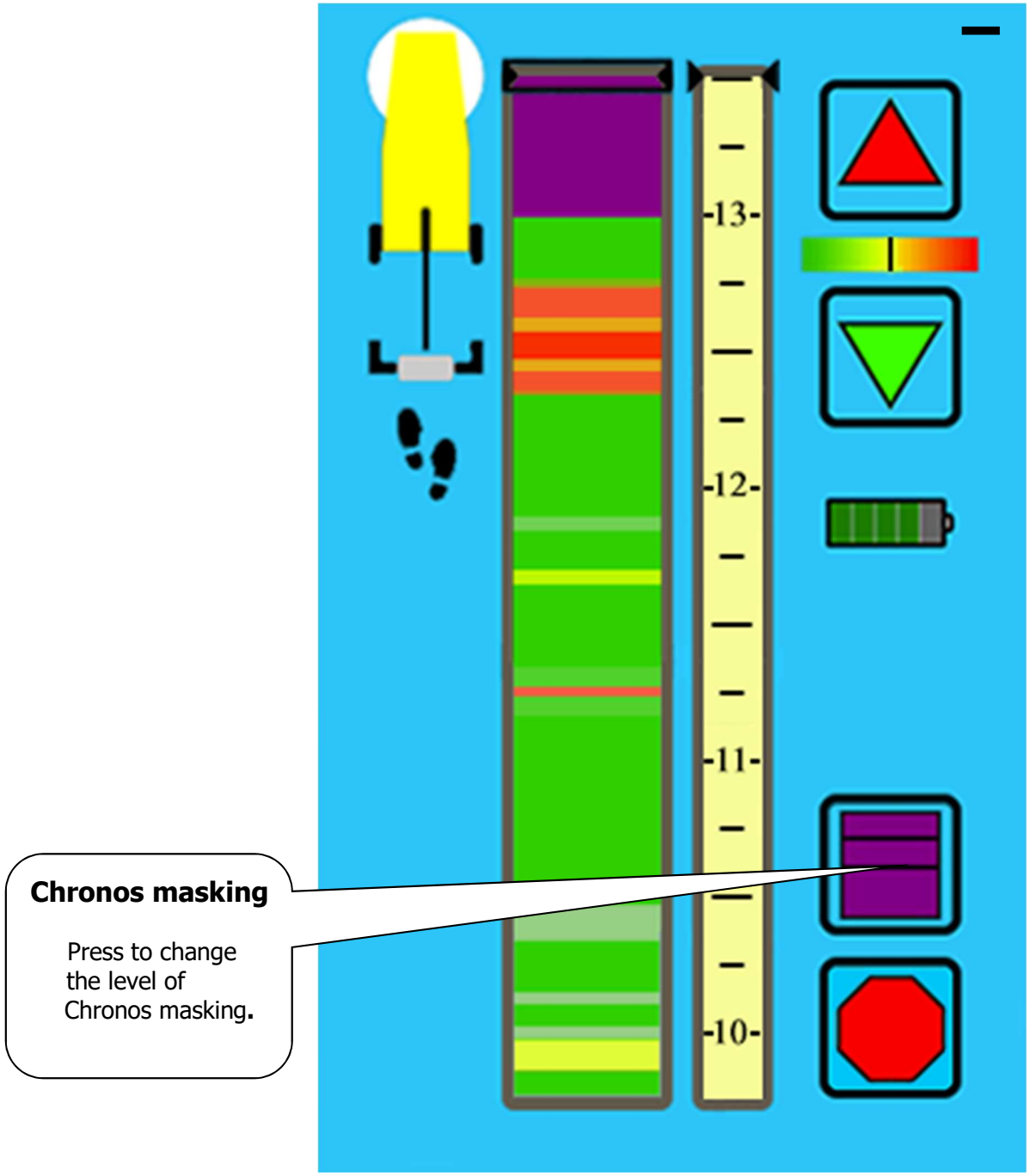
15. Continuing scan



After having moved the unit to reverse for data adjustment, able to continue the scan by moving the unit to the search direction again. Restart the scan automatically when it reaches at not-yet-processed data spot and new data is collected and the data panel begins scroll below.
When no need to continue the scan, please push the scan stop. See **Finishing a scan** (P20) for more details.

16. Chronos masking

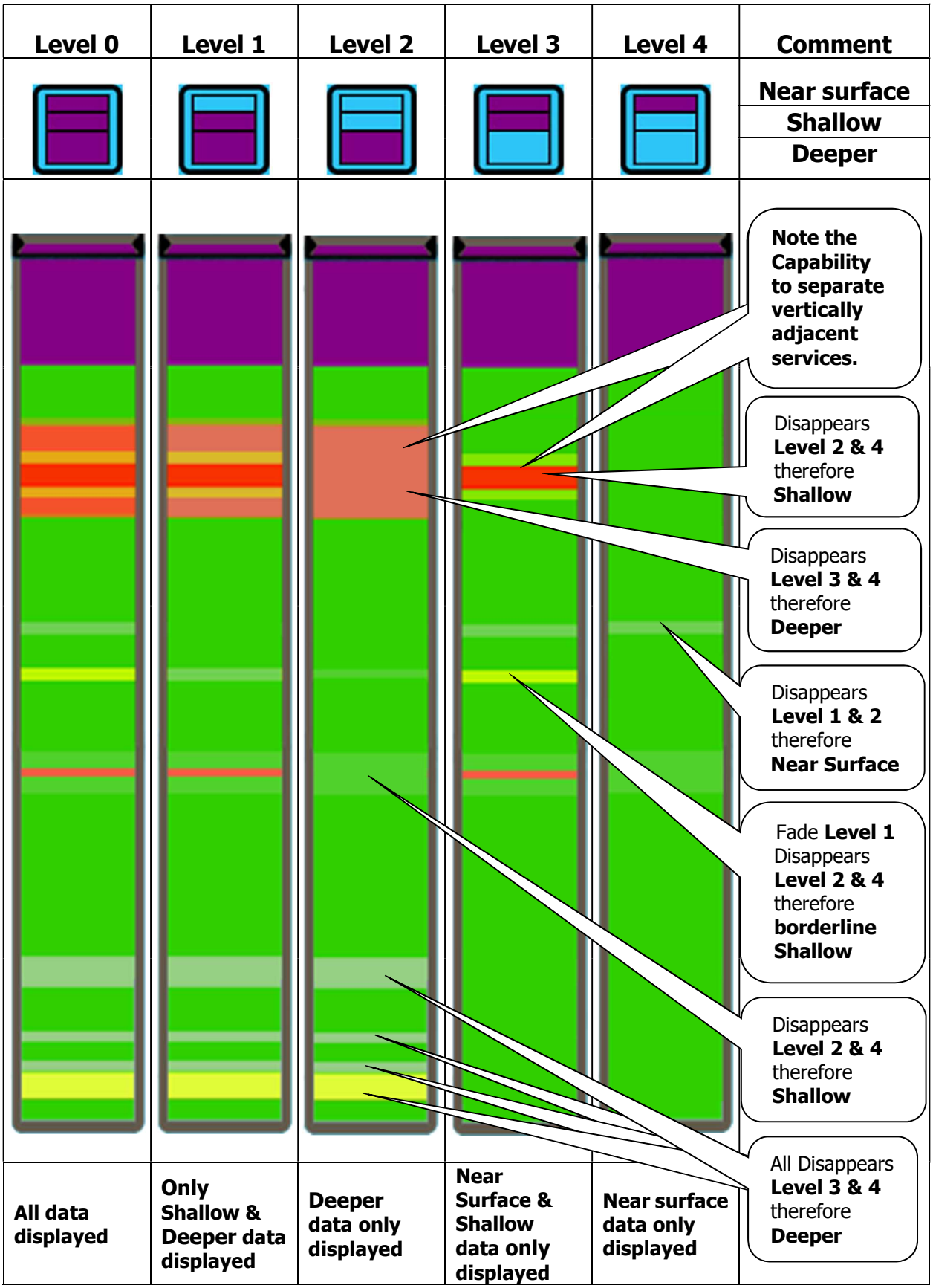
Provides masking of the measurement data. Masking setting is replaced whenever tapping Chronos masking. It is used when need to cutoff data depending on estimated depth or cutoff neighboring service to the vertical direction.
As long as Chronos masking works, data is never lost even if how many times repeating each setting. Able to perform repeatedly, even the beginner can find the rough estimated depth easily.



17. Chronos masking levels

Masking level	Icon
Level 0 **No masking. All data is displayed.**	
Level 1 **Top 16% data is masked.** **Only Shallow & deepest data displayed.**	
Level 2 **Top 32% data is masked.** **Only deepest data displayed.**	
Level 3 **Bottom 68% data is masked.** **Only Near surface & shallow data displayed.**	
Level 4 **Bottom 84% data is masked.** **Only near surface data displayed.**	

18. Chronos masking examples



19. Depth estimation

1) Basic

The estimated depth function is the function that the depth of the indicator value is displayed just to choose the data of the specific place with the cursor.

To start a depth estimated function, while choosing data with the cursor, please tap the data Panel. In the upper part of the Chronos masking icon, the analyzed depth will be displayed. This is the estimated depth only by the data which the cursor is put. (unit: Meter)

The precision of the estimated depth is ±0.1m (100mm). However, the precision is different from the situation of the underground such as water content ratio, the quality of soil and the state of the measurement data. When an estimated depth result becomes out of a range, the symbol which indicates impossible of the depth measurement is displayed. (See P7)

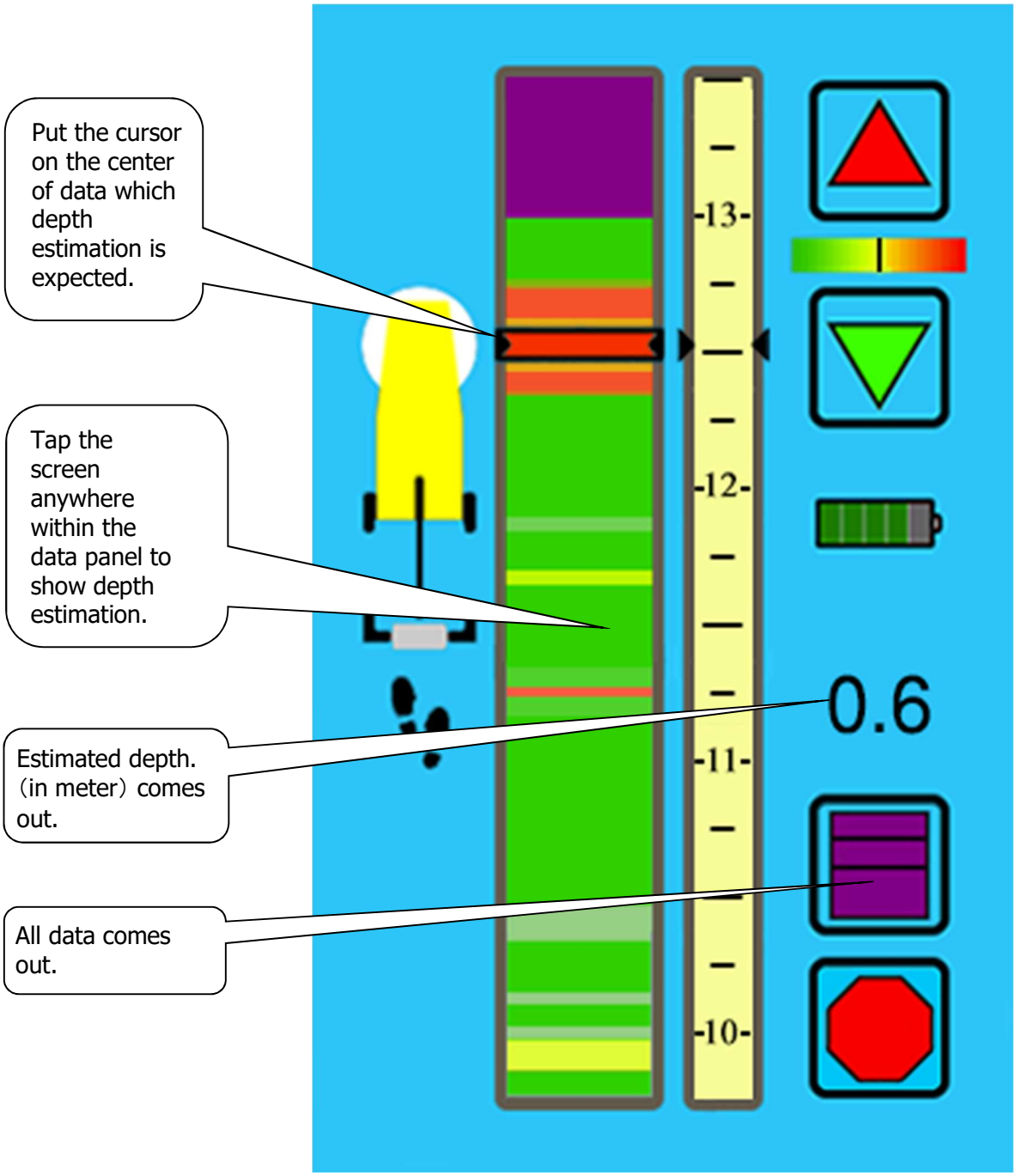
By performing sensitivity adjustment by manual operation, the estimated depth may be displayed. In this case, an error grows big in comparison with the initial setting and the measurement accuracy becomes ±0.3m ~ 0.5m (300mm ~ 500mm).

2) Advanced

The receiving signal may be mixed because it is reflected at a more chaotic place including a city area and the metropolis by the multi neighboring buried service.
To influence precision of the estimated depth most is when the buried service is neighboring and it is located up and down.
In such situations, please use Chronos masking to ensure estimated depth. The multi buried service is isolated by four masking levels. This work allows the compartmentation of the neighboring buried service that located at up and down.

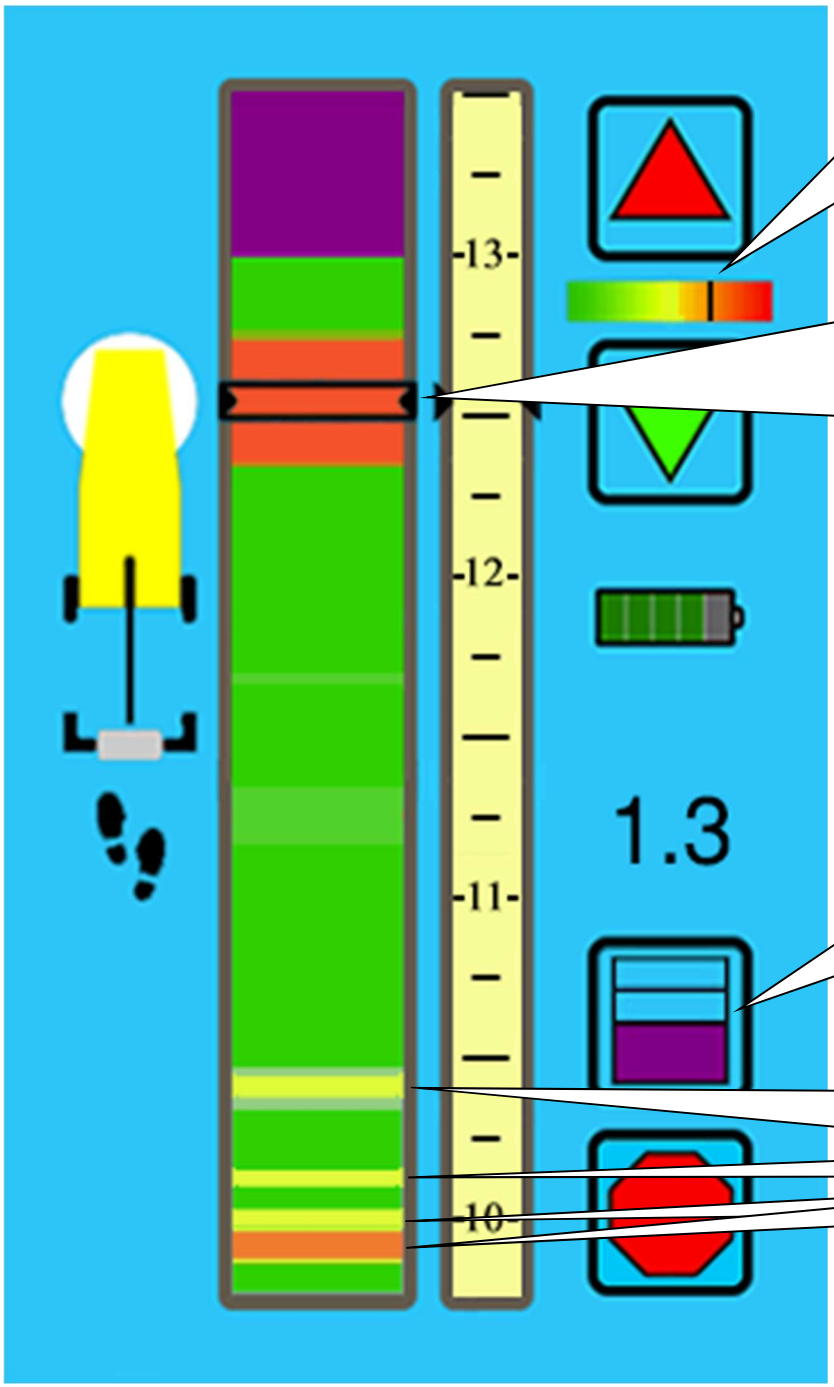
The analyzed depth result is an estimation. Without conclusive evidence by the further searching and visual contact, please do not assume it as the confirmed depth. As for the digging, please follow to the instruction rule of the industry.

20. Measurement example 1



It is the example of a basic result of a measurement screen without the Chronos masking.

21. Measurement example 2



Adjust sensitivity rather high and allow to analyze estimated depth even from weak signal.

Near surface & shallow data are masked and the cursor is put on data of the remaining high depth.

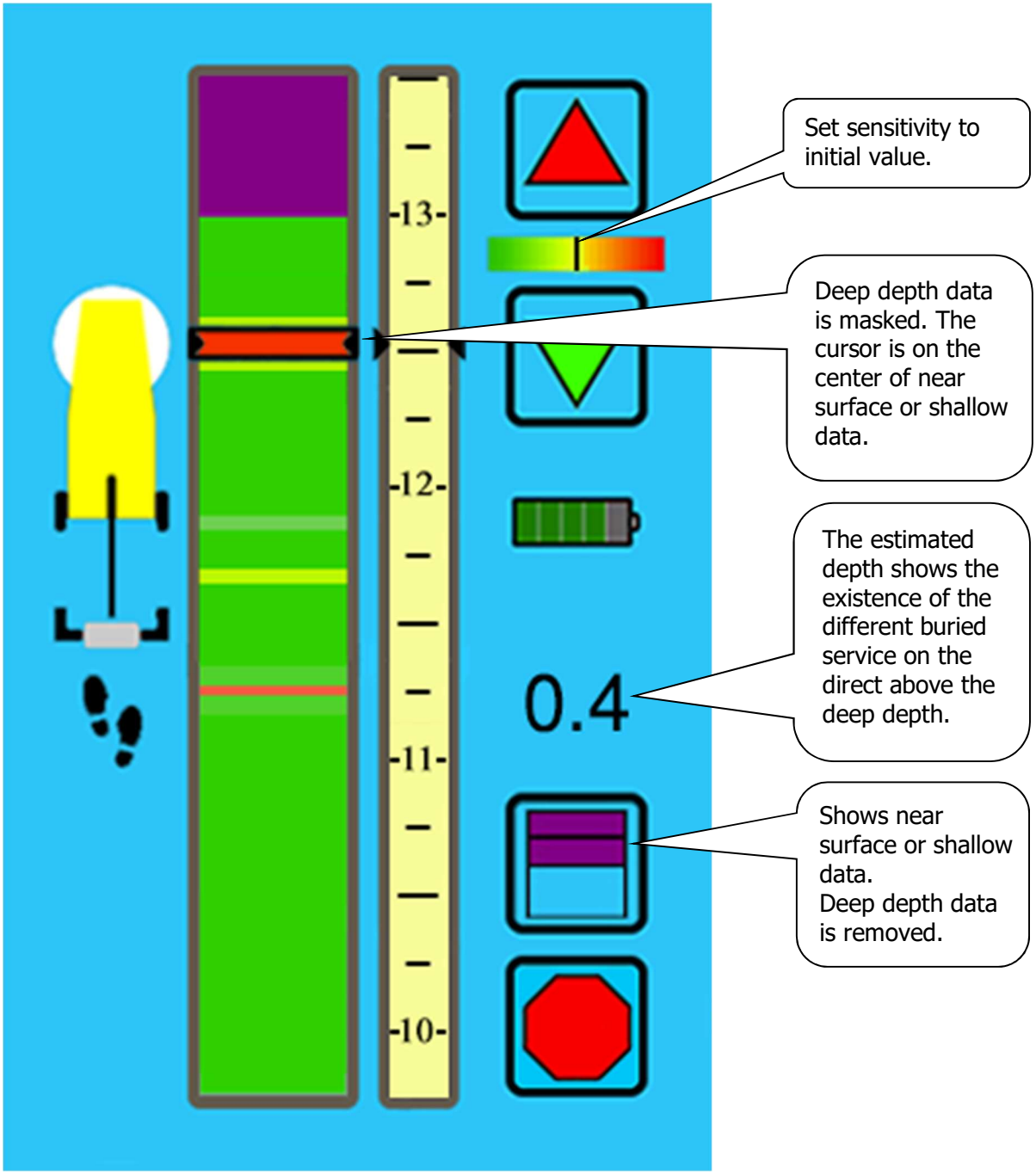
Notice: **Sensitivity is increased.**

Deep depth data is displayed. Near surface & shallow data are removed.

Sensitivity is increased on all other visible data.

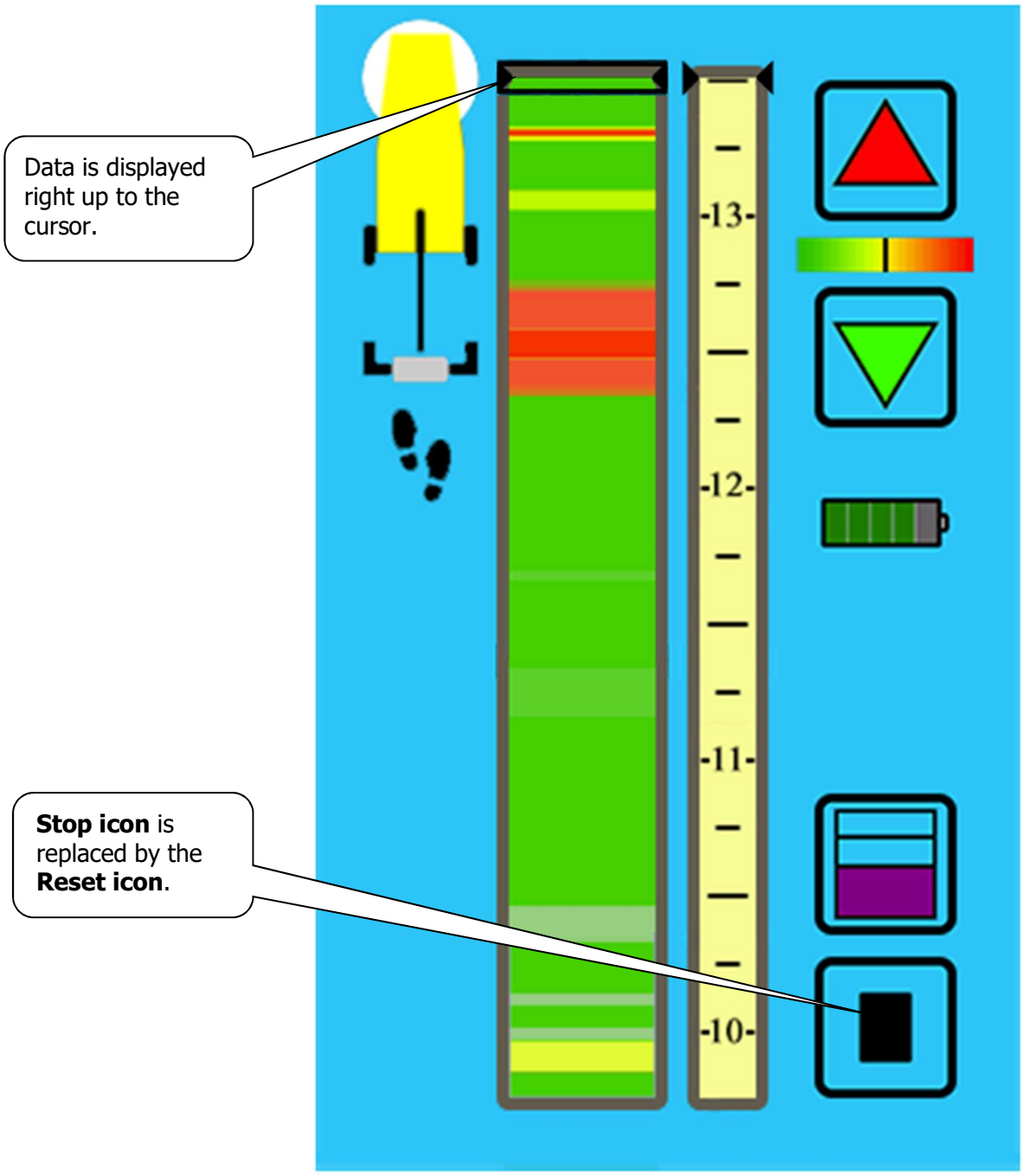
It is the example being used the estimated depth function and Chronos masking together. By masking near surface & shallow data, get the estimated depth by analyzing only data of the high depth. Compare to as a result of this result with previous result (See **Measurement example 1**), there is remarkable difference in the estimated depth. This shows that strong data exist in near surface or shallow level.

22. Measurement example 3



Chronos masking is set to level 3, the data of the deep depth is masked and near surface and shallow data are displayed.
Compare to the previous result, as a result of setting Chronos masking to level 2 (See **Measurement example 2**), able to well confirm the existence of two buried service from difference in the estimated depth.

23. Finishing a scan



When push the stop, the collection of data is stopped at a position of cursor. But processing is continued and the collected data are displayed to the cursor position.
Chronos masking can be applied depending on sensitivity adjustment or need until Reset icon is pushed. When push Reset icon, all data are removed in data panel and able to start the new measurement.

24. Replacing the Antenna Cover

1）Place the TR-1 body on a workbench upside down so that the antenna is facing up。

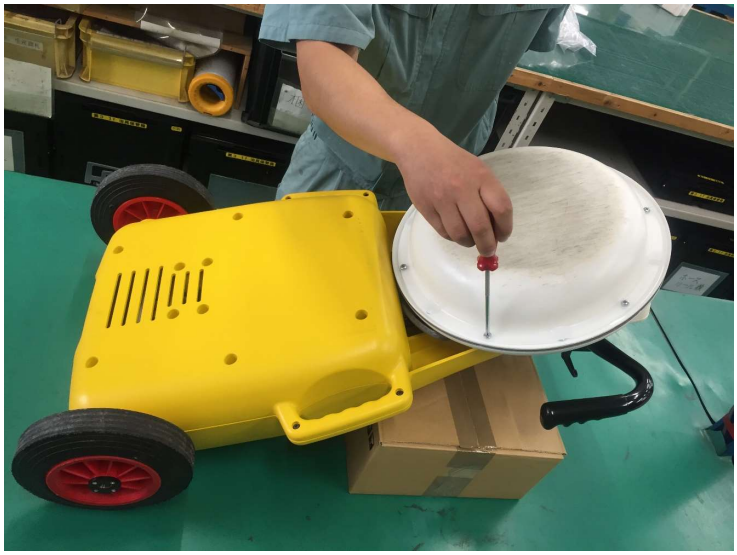
※ Take care to avoid putting undue weight on the monitor.

2）Using a Philips head (cross-head) screw driver, remove all 6 screws surrounding the antenna cover

3）Using your hands, lift and remove the cover from the antenna

4）Place a new cover on the antenna.

5）Return the 6 screws that were removed in step one and fasten the cover to the antenna



Caution **When replacing the cover, tighten the bolts by hand, taking care not to overtighten the bolts as it may damage the antenna**

25. Product specification

Working temperature range
: -10 °C ~ +50 °C

Material : Shock resistant plastic

Size, Weight
Antenna retracted : 340 mm (H) x 860 mm (L) x 510 mm (W)
Antenna extended : 820 mm ~ 1185 mm (H) x 1085 mm ~ 1290 mm (L)
Weight : 16.8kg

Power source
Battery : Bespoke 16.4V Rechargeable Lithium-ion battery
Standard voltage : 14.4 V
Battery life : 3~5 hours

Charging pod
External charger : AC100 V ~ 220 V
Charging hour :2~6 hours (Full charged)

Antenna parameter
Antenna standard : XPM2
Detecting resolution : 10mm ~ 300 mm
Width of measurement : 350 mm
Speed of data collection : Walking pace
Frequency : 135 MHz ~ 835 MHz

Detection parameter
Detection range : 50 mm ~ 1500 mm (depend on soil & environment)

Detecting object : Detect regardless of material
(Plastic pipe, Optical fiber cable, Earthenware drainage)

Accuracy of depth estimation
Standard setting : ±0.1 m (100 mm)
Manually adjust sensitivity : ±0.3 m ~ 0.5 m (300 mm ~ 500 mm)

Display
Screen : High contrast color LCD 177 mm portrait style,
direct sunlight readable

Angle adjustable tilt : 90 degrees of Operator adjustable tilt

Conditions making detection impossible (examples)
Detection may be impossible immediately after dirt has been replaced following an excavation.
Detection may be impossible when soil is mixed with ore deposits, or ceramic debris.
Detection may be impossible on road surfaces with water or mud puddles.

Call & Contact

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