

⚠ WARNING

Before operating, inspecting, or maintaining this machine, read these instructions thoroughly. Failure to follow these instructions and safety precautions could result in serious injury, death or property damage.

**INSTRUCTION
MANUAL**

MODEL

**Auto Brake
Assist System
Guardman**

From R2H-4 → 1R7-70853
GW754 → 1GW4-40145
SW354 → 1SW73-30742
TW354 → 1TW73-32739
SW504 → 1SW74-30419
TW504 → 1TW74-33777

SAKAI

INTRODUCTION

This instruction manual is a guide for the safe use of the SAKAI Guardman Auto Brake Assist System.

Before your first use of this machine. Read the instruction manual for the machine on which the Auto Brake Assist System (“ABAS”) is installed for information about the handling of the machine.

Before using a machine with the ABAS, read this instruction manual carefully and be sure to fully understand its contents in order to use this equipment correctly. Also, after reading this instruction manual, be sure to store it properly in a place near this equipment so it is readily available.

Replace this instruction manual immediately if it is lost or damaged and cannot be read.

If the machine on which the ABAS is installed will be lent to or used by another person, adequately explain how to handle it properly and instruct them to read this manual in advance. When transferring the machine on which this equipment is installed, be sure to include this instruction manual.

The details in this instruction manual may differ from the product when purchased due to improvements of the ABAS.

Contact your dealer if you have any questions or concerns about the ABAS, or if it malfunctions.

TABLE OF CONTENTS

INTRODUCTION

MACHINE MODEL AND CHASSIS NUMBER LOCATIONS	1
--	---

1 SAFETY NOTICES.....	2
1.1 About the safety notices	2
1.2 About this product	3
1.3 Safety Precautions	4
1.4 Safety Labels.....	9

Applicable machines (R2H-4 / GW754)

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM	A-1
2.1 Conditions for operating the ABAS and the alarm functions	A-2
2.2 Detection area	A-4
2.3 Names and functions of each part of the ABAS	A-6
2.4 Handling the 3D sensor	A-7
2.5 Names and functions of the parts of the display	A-10
3 OPERATING PROCEDURE	A-12
3.1 Turning on the Auto Brake Assist System.....	A-12
3.2 Turning off the ABAS.....	A-13
3.3 Contents of the Display screen	A-13
3.4 Procedure for releasing the ABAS after activation	A-17
3.5 Turning the ABAS and alarm functions on and off.	A-18
3.6 Setting the display brightness	A-19
3.7 Displaying the instruction manual.....	A-22
3.8 Error information.....	A-24
3.9 Alarm list (when an object is detected) and response actions	A-25
3.10 Alarm list (errors) and response actions.....	A-28
4 INSPECTION AND MAINTENANCE.....	A-32
4.1 Inspection before starting work	A-32
4.2 Maintenance	A-32
4.3 Inspecting the parking brake	A-33
4.4 Fuses.....	A-35
4.5 Storage	A-36
4.6 Regular inspections.....	A-36
4.7 Warranty, disclaimer.....	A-36
5 OVERVIEW AND SPECIFICATIONS.....	A-37

Applicable machines (SW354 / TW354 / SW504 / TW504)

2	OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM	B-1
2.1	Conditions for operating the ABAS and the alarm functions	B-1
2.2	Detection area	B-2
2.3	Names and functions of each part of the ABAS	B-5
2.4	Handling the Millimeter-wave radar	B-6
2.5	Names and functions of the parts of the display	B-8
3	OPERATING PROCEDURE	B-10
3.1	Turning on the Auto Brake Assist System	B-10
3.2	Turning off the ABAS	B-11
3.3	Contents of the display screen	B-12
3.4	Procedure for releasing the ABAS after activation	B-16
3.5	Switching the button assignment display	B-16
3.6	Left side wall compaction mode	B-17
3.7	Right side wall compaction mode	B-18
3.8	Turning the ABAS and alarm functions on and off.	B-19
3.9	Setting the display brightness	B-20
3.10	Speaker low mode	B-24
3.11	Alarm mode	B-25
3.12	Error information	B-26
3.13	Alarm list (when an object is detected) and response actions	B-27
4	INSPECTION AND MAINTENANCE	B-30
4.1	Inspection before starting work	B-30
4.2	Maintenance	B-30
4.3	Inspecting the parking brake	B-31
4.4	Fuses	B-33
4.5	Storage	B-34
4.6	Regular inspections	B-34
4.7	Warranty, disclaimer	B-34
5	OVERVIEW AND SPECIFICATIONS	B-35

MACHINE MODEL AND CHASSIS NUMBER LOCATIONS

When contacting your dealer with inquiries about the ABAS, be prepared to provide the machine model and chassis number.

(1) Machine model

Refer to the "Machine model" in the instruction manual for the machine being used.

(2) Machine serial number

Refer to the "Machine serial number" in the instruction manual for the machine being used.

1 SAFETY NOTICES

For the safe use of Auto Brake Assist System (“ABAS”), correct handling and periodical maintenance are of utmost importance. Carefully read and fully understand the safety precautions contained in this instruction manual before using the ABAS.

Refer to the instruction manual for the machine being used for operating information and safety precautions related to the use of the machine.

1.1 About the safety notices

■ When this machine is used in a manner other than authorized in this manual, it could be dangerous and you assume responsibility for your own personal safety.

■ Precautions for the safe operation and maintenance of the ABAS are indicated on the safety label attached to the ABAS.

 **DANGER** DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
The safety labels on the machine are red.

 **WARNING** WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
The safety labels on the machine are orange.

 **CAUTION** CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
The safety labels on the machine are yellow.

NOTICE NOTICE is used to address practices not related to physical injury.
The safety labels on the machine are blue.

★ About the safety label

A safety label is attached to the ABAS. Never remove or modify the information on the safety label. (See “1.4 Safety Labels” for information on the contents and attachment position of the safety label).

■ The contents of this instruction manual and the safety label attached to the ABAS cannot predict or describe all possible dangerous conditions. For this reason, in addition to the information presented in this instruction manual and on the safety label of the ABAS, pay close attention to other details while working and be careful not to cause an accident.

1.2 About this product

■ Drive safely

- The purpose of the ABAS is to assist in avoiding collisions when the machine is reversing, but the system does not avoid collisions or reduce collision damage in all situations. But drivers should always take responsibility for being aware of their surroundings and drive safely without relying on the ABAS.
- The ABAS is designed for use in construction work on flat ground with the machine operating at low speed. Note that the ABAS may not be able to perform properly when the machine is working on a downhill slope or when operating at high speed.
- If the alarm is activated, the driver should check the road and surroundings, and take immediate appropriate action such as braking the machine.

■ Understand the capabilities of the ABAS

Be sure to fully understand the capabilities of the ABAS before using it. Over-reliance on the capabilities of the ABAS may lead to an accident.

■ About the recording of machine data

The ABAS records and accumulates control data for the controller of the ABAS. The controller does not record voices, such as conversations, or video.

■ About the handling of data

SAKAI may acquire and use the data recorded in the controller for the purposes of diagnosing machine failure, performing research and development, and improving quality.

SAKAI will not disclose or provide any of the acquired data to third parties except in the following cases.

- When the owner of the machine has consented to such disclosure
- When such disclosure is based on a legally enforceable request, such as from the police, courts, or government agencies.

1.3 Safety Precautions

DANGER

- Do not test the stopping operation of ABAS with people, walls or other objects. The ABAS may not operate properly depending on the situation, and this could lead to an accident.
- Never use the ABAS to stop the machine on a routine basis. The ABAS may not operate properly depending on the situation, and this could lead to an accident.

WARNING

- Do not use an ABAS that has not been maintained
 - Before using the ABAS, thoroughly inspect and maintain it to make sure that there are no malfunctions. (See “4.1 Inspection before starting work.”)
 - If you feel that there is an abnormality in the operation or performance, or if there is any damage, stop using the ABAS immediately and contact your dealer.
 - In the event that the sensors need to be removed or repaired, such as due to an accident, or if a sensor error appears on the display, be sure to contact your dealer.
 - In order to ensure safety, ask your dealer to inspect and perform maintenance on the system once a year.
- Have workers in the surrounding area wear reflective safety vests
 - Since the detection sensor can easily detect a reflective vest, be sure to have workers in the surrounding area wear safety vests. The detection sensor can easily detect light-colored (white, orange, etc.) work clothing, but not dark-colored (black, dark blue, etc.) work clothing. So have workers in the surrounding area wear light-colored work clothing for the upper and lower body. Do not allow workers to work wearing only dark-colored work clothing.
- Sit in the driver’s seat before starting operation
 - When driving the machine, sit fully back in the driver’s seat with your back against the backrest, and be sure to wear the seatbelt while driving a machine that is equipped with a seatbelt.
- Do not let go of the F-N-R lever and the steering wheel while driving.

⚠ WARNING

- In the following situations listed below, the ABAS may not be able to properly detect a person or an obstacle (hereafter referred to as an object) in the path of the machine. In some cases, the ABAS will not operate, or the collision cannot be avoided even if an object is detected and the ABAS is activated.

Situations where ABAS may not work :

- When the object is hidden in thick steam or dust generated on the asphalt road surface.
- When the object suddenly enters the detection area.
- When the object is outside the detection area of the 3D sensor or the millimeter-wave radar. (See “2.2 Detection area.”)
- When the size of the object is less than 0.4 m (1.3 ft) in width or less than 0.6 m (2 ft) in height for detection by the 3D sensor, and less than 0.8 m (2.6 ft) in height for detection by the Millimeter-wave radar.
- When the object has a rounded shape.
- When the surface of the object is glossy, such as a mirror or metal.
- When the object is moving toward the rear of the machine.
- When used in bad weather (rain, snow, fog, etc.).
- When the mounting position of the 3D sensor or the Millimeter-wave radar is misaligned.
- When the glass surface of the 3D sensor or the surface of the Millimeter-wave radar is dirty or scratched.
- When the hydraulic oil temperature is low.
- When the hydraulic oil being used is different from the specified oil.
(Be sure to use the hydraulic oil specified in the instruction manual for the machine being used.)
- When driving on slippery roads (ice, sand, etc.).
- When the surrounding workers are wearing dark-colored (dark blue, black, etc.) work clothing.
- When condensation has formed on the glass surface of the 3D sensor.
- When sunlight strikes the 3D sensor directly, or when sunlight is reflected such as by a puddle on the road surface, other vehicles, or glass or mirrors of buildings.
- When the object does not conduct electricity easily, such as an object made of cardboard or wood.
- When the unloader valve is not fully open.

⚠ WARNING

- If the operating conditions are not met, the ABAS and the alarm functions are automatically turned off. (See “2.1 Conditions for operating the ABAS and the alarm functions”). Be sure to fully check the safety of the surrounding environment before driving.
- Do not drive until the ABAS has started up.
Do not operate the machine until the 3D sensor startup check has completed.
- Do not operate the unit or watch the display while driving.
Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.
- Slow down when going downhill
 - When going downhill in reverse, the braking distance is longer when the brakes are applied. Even if the ABAS is activated, the risk of a collision is greater. Be sure to slow down and drive carefully.
 - The activation timing of the ABAS is set as if the construction work is being performed on flat ground.
- When the hydraulic oil temperature is low, braking distances may be longer than normal. Warm-up machine before operating.
- Do not rely on alarms while driving
Depending on the detection timing, the Alarm display may be delayed or may not be displayed, or the alarm sound may be delayed or may not be played.
- When using the machine with the ABAS and alarm functions turned off during loading and unloading work, be sure to pay close attention to the safety of the surrounding environment.
- If the ABAS and alarm functions were turned off, such as during loading and unloading work, be sure to turn them back on before moving the machine. (See “3.5 Turning the ABAS and alarm functions on and off.”)

⚠ WARNING**■ Detection sensors**

- Keep the window glass of the 3D sensor laser emission surface and the surface of the Millimeter-wave radar clean. (See “2.4 Handling the 3D sensor” and “2.4 Handling the Millimeter-wave radar.”) If the glass surface of the 3D sensor or the surface of the Millimeter-wave radar is left as is with water droplets or dirt, the sensor will not be able to perform properly.
- When storing the machine, wipe the area around the detection sensor with a clean, soft cloth, dry it thoroughly, and then cover it with the detection sensor cover that comes with the product.
- Do not attach any films or stickers (including transparent types) to the window glass of the 3D sensor laser emission surface and the Millimeter-wave radar surface.

Doing so may cause failures or malfunctions.

- Do not allow the detection sensor and the surrounding area where the detection sensor is installed to be struck strongly. If the part where the detection sensor is mounted is damaged due to an accident, contact your dealer.
- When using a high pressure washer, do not spray water directly on the detection sensor as this will cause the sensor to fail.

■ Never modify, disassemble, or repair the ABAS (including the detection sensor). Doing so may result in failures, detection errors, or malfunctions.**■ The ABAS may activate in the following situations, even if there is no risk of a collision.**

- When approaching a steep uphill slope or at the end of a downhill slope.
- When used in bad weather (rain, snow, fog, etc.).
- When there is thick steam or dust.
- When flying objects (trash, insects, birds, etc.) are detected.
- When the machine is passing near a vehicle or wall.
- When the mounting position of the detection sensor is misaligned.
- When the glass surface of the 3D sensor and the surface of the Millimeter-wave radar are dirty or scratched.
- When condensation has formed on the glass surface of the 3D sensor.
- When sunlight strikes the 3D sensor directly, or when sunlight is reflected such as by a puddle on the road surface, other vehicles, or glass or mirrors of buildings.
- When there is a metal object on the ground such as a manhole or grating (ditch cover).

■ Do not look into the window glass of the laser emission surface for a long time while the 3D sensor is operating. Doing so could cause your eyes to be injured.

1 SAFETY NOTICES

CAUTION

- Do not cover the light-receiving part of the brightness adjustment sensor (see “2.5 Names and functions of the parts of the display”) with a cloth. Since the display brightness is adjusted based on data from the brightness adjustment sensor, the visibility of the display may decrease and could lead to an accident.
- When Guardman ABAS is activated and the machine comes to a sudden stop, the drums and/or tires may shove the asphalt mat or soil and cause cracking.

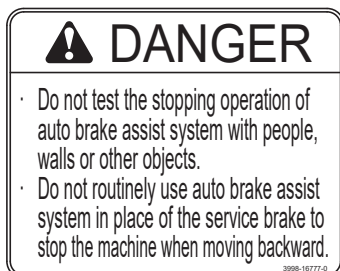
1.4 Safety Labels

R2H-4

Keep all labels clean. If you cannot read a safety label or the label is missing, replace it with a new one. There are other safety labels than those shown below and treat them in the same manner as the one shown here.

Never remove or modify the information on the safety label.

①3998-16777-0



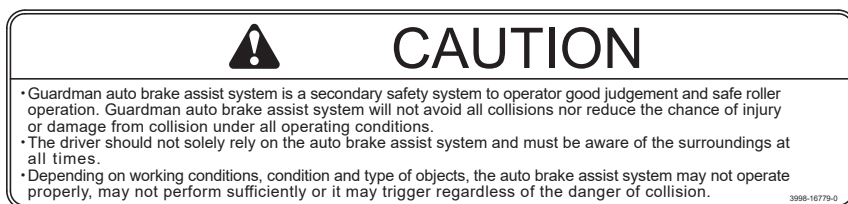
②3998-16778-0



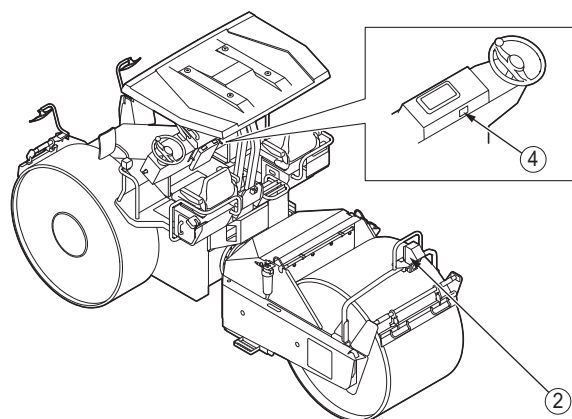
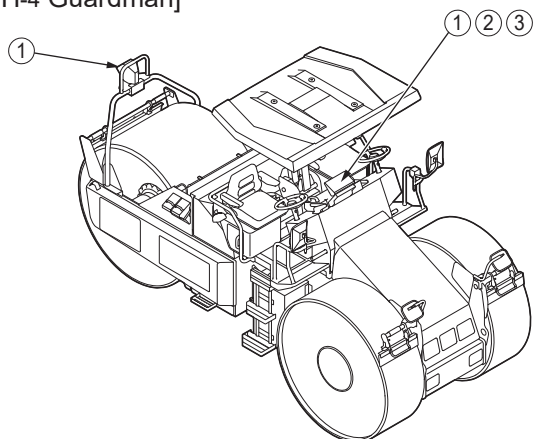
④3998-16780-0



③3998-16779-0



[R2H-4 Guardman]



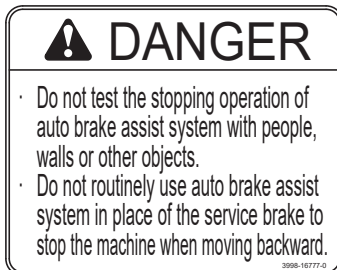
1 SAFETY NOTICES

GW754

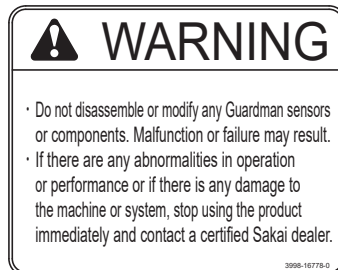
Keep all labels clean. If you cannot read a safety label or the label is missing, replace it with a new one. There are other safety labels than those shown below and treat them in the same manner as the one shown here.

Never remove or modify the information on the safety label.

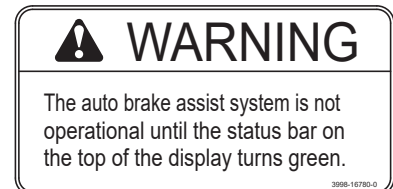
① 3998-16777-0



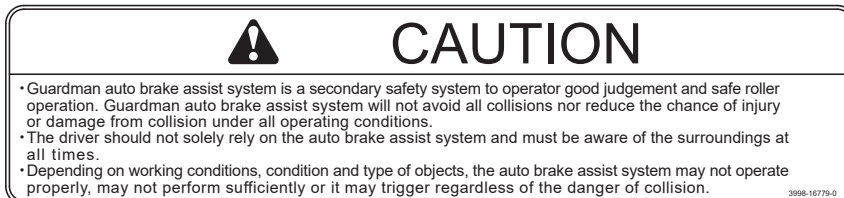
② 3998-16778-0



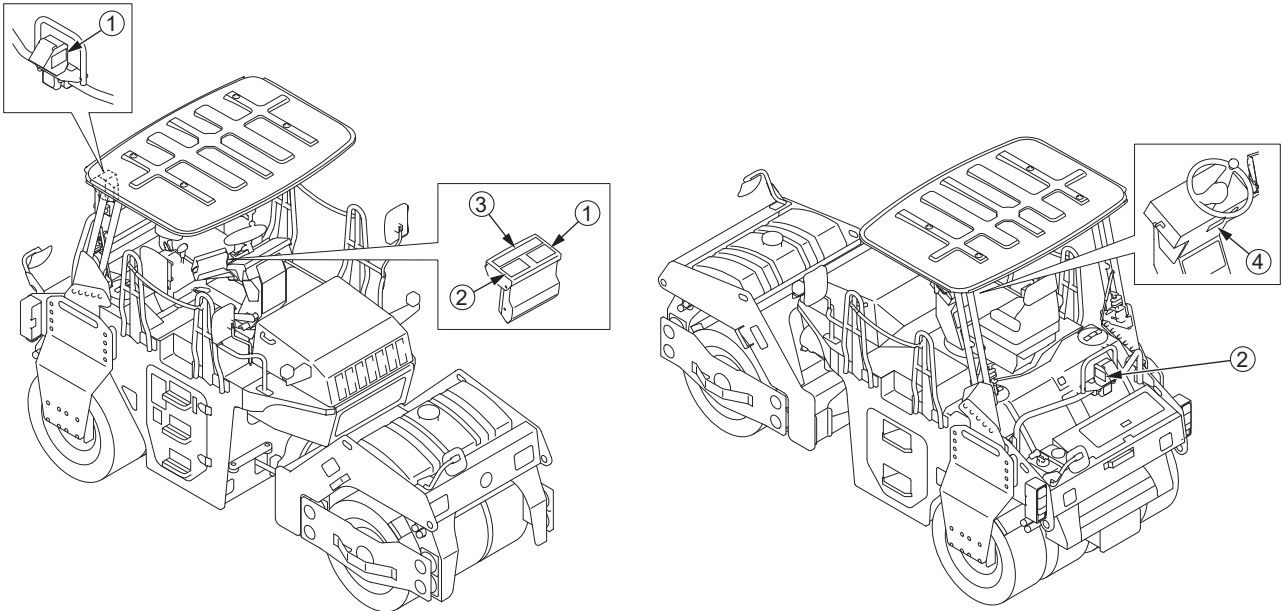
④ 3998-16780-0



③ 3998-16779-0



[GW754 Guardman]

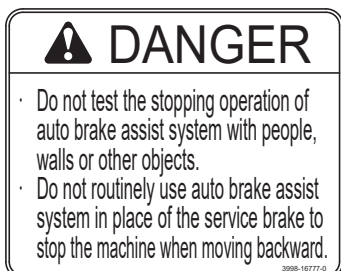


SW354, TW354, SW504, TW504

Keep all labels clean. If you cannot read a safety label or the label is missing, replace it with a new one. There are other safety labels than those shown below and treat them in the same manner as the one shown here.

Never remove or modify the information on the safety label.

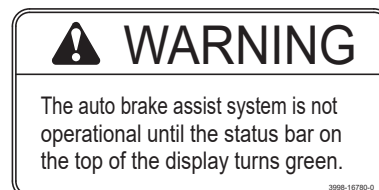
① 3998-16777-0



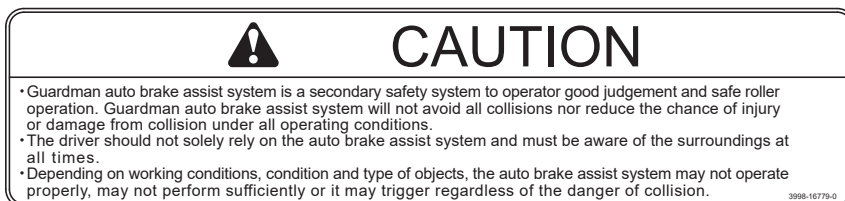
② 3998-16778-0



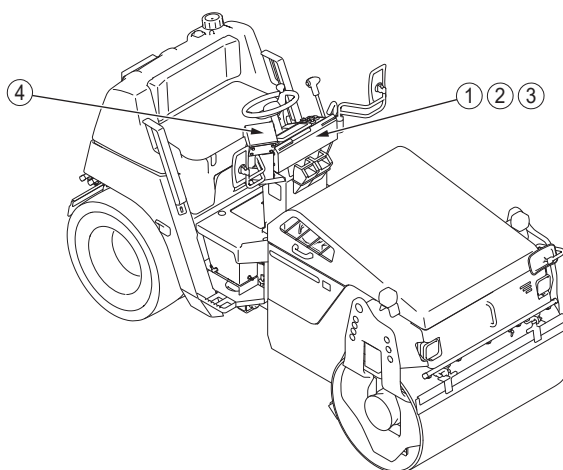
④ 3998-16780-0



③ 3998-16779-0



[SW354 Guardman]
 [TW354 Guardman]
 [SW504 Guardman]
 [TW504 Guardman]



MEMO

APPLICABLE MACHINES

- R2H-4 Guardman
- GW754 Guardman

2	OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM	A-1
3	OPERATING PROCEDURE	A-12
4	INSPECTION AND MAINTENANCE.....	A-32
5	OVERVIEW AND SPECIFICATIONS.....	A-37

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

The Auto Brake Assist System consists of the following three functions.

1) Auto Brake Assist System

The Auto Brake Assist System (“ABAS”) function uses a 3D sensor mounted at the rear of the machine to detect objects in the path of the machine when the machine is moving in reverse. When the system determines that the risk of a collision is even greater than when the alarm operates as described in 2), the system activates the ABAS to assist in avoiding the collision or reducing collision damage.

2) Alarms (Include alarm sounds for drivers, alarm sounds for surrounding workers, and display alarms)

The alarm functions use a 3D sensor mounted at the rear of the machine to detect objects on the road when the machine is moving in reverse. If the system determines that there is a high risk of a collision, it will display an alarm and play an alarm sound to the driver and an alarm sound to alert the surrounding workers in order to assist the driver and surrounding workers in avoiding the collision.

3) Back monitor

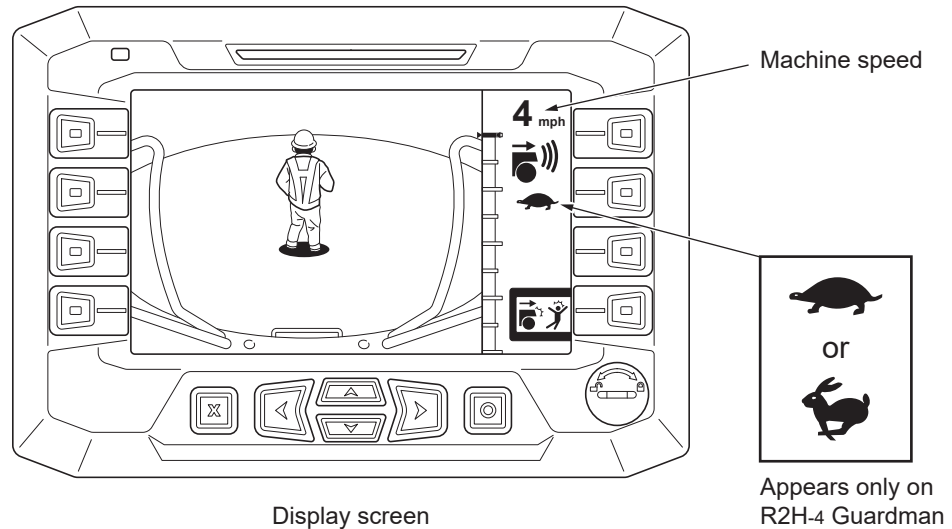
The Back monitor function constantly displays the image captured by the Rear camera on the display to assist the driver in monitoring the area in the rear of the machine.

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM



2.1 Conditions for operating the ABAS and the alarm functions

- The Auto Brake Assist System (“ABAS”) and alarm functions are activated when the machine is in reverse (when the Forward/reverse lever is in the Reverse (R) position).

*The speed shown on the display is just a standard and may differ from the actual.



Guardman operating conditions

	R2H-4 Guardman	GW754 Guardman
Low speed (1st) 	0 – 8 km/h (0 – 5.0 mile/h)	0 - 6 km/h (0 – 3.7 mile/h)
High speed (2nd) 	0 – 0.5 km/h *1 (0 – 0.3 mile/h)	0 - 12 km/h (0 – 7.5 mile/h)

*1 : At “High speed”, the machine cannot stop due to the performance of the sensor and the inertia of the machine.

Therefore, when set to “High speed”, the Guardman is activated only when the machine starts moving, and the Guardman function is turned off while the machine is in motion.

*Refer to the instruction manual of the machine being used for the position and details of the Speed shift switch.

*The activation of ABAS reduces the risk of a collision, but the higher the vehicle speed, the longer it takes to stop even if ABAS is activated, and the greater the risk of collision.

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

2.2 Detection area

	R2H-4 Guardman	GW754 Guardman
Behind the machine	0.6 to 4 m (2 to 13.1 ft)	0.6 to 4 m (2 to 13.1 ft)
Height from the ground*	0.6 m (2 ft) or more	0.6 m (2 ft) or more
Detection width	Compaction width (approx. 2.1 m (83 in))	Compaction width (approx. 2.2 m (87 in))

*Objects that are less than 0.6 m (2 ft) in height may be detected depending on the color, shape, or other characteristics of the object.

The above values are approximate values and may vary depending on various conditions.

WARNING

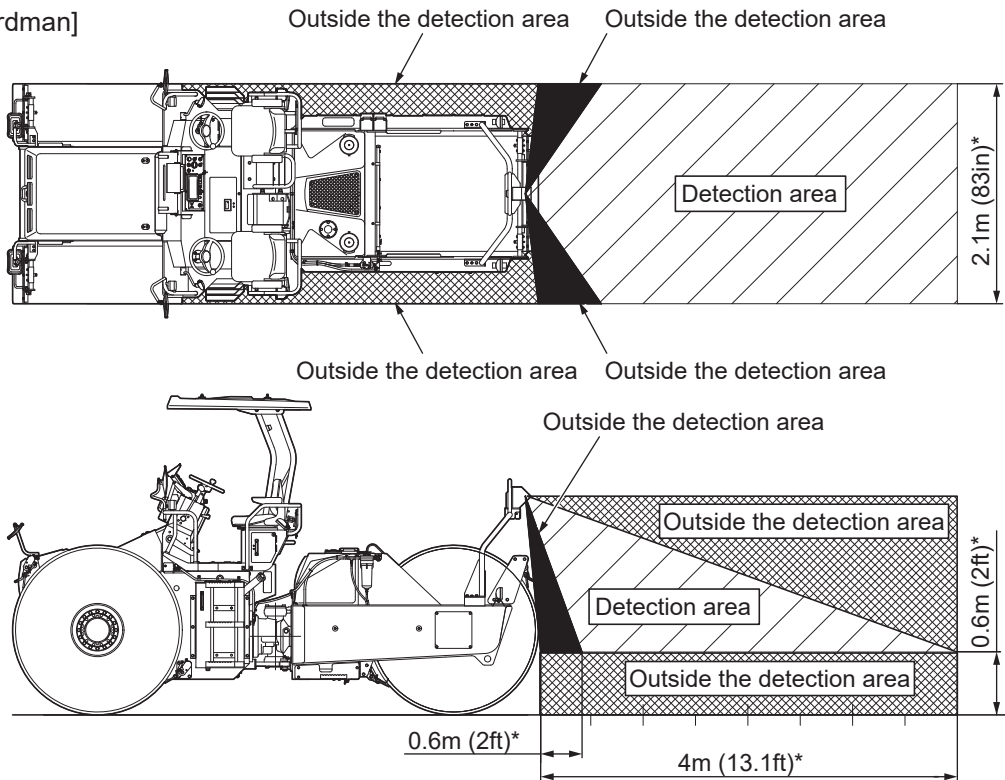
- **There is an area immediately behind the machine that is outside the detection area. If an object is outside the detection area, the object will not be detected. Do not rely solely on the ABAS when driving.**
- **When using the R2H-4 Guardman Auto Brake Assist System, there is an area on the side of the machine behind the front wheels that is outside the detection area. If an object is outside the detection area, the object will not be detected. Do not rely solely on the ABAS when driving.**
- **Even if an object is within the detection area, it may not be detected depending on the color, shape, or size of the object, the surrounding environment, or other conditions.**
- **Since the 3D sensor can easily detect a reflective fabric, be sure to have workers in the surrounding area wear reflective safety vests. The 3D sensor can easily detect light-colored (white, orange, etc.) work clothing, but not dark-colored (black, dark blue, etc.) work clothing. So have workers in the surrounding area wear light-colored work clothing for the upper and lower body. Do not allow workers to work wearing only dark-colored work clothing.**

CAUTION

Depending on the road surface conditions, the surrounding environment, and the color and shape of the object, the object may be detected even if it is outside the detection area.

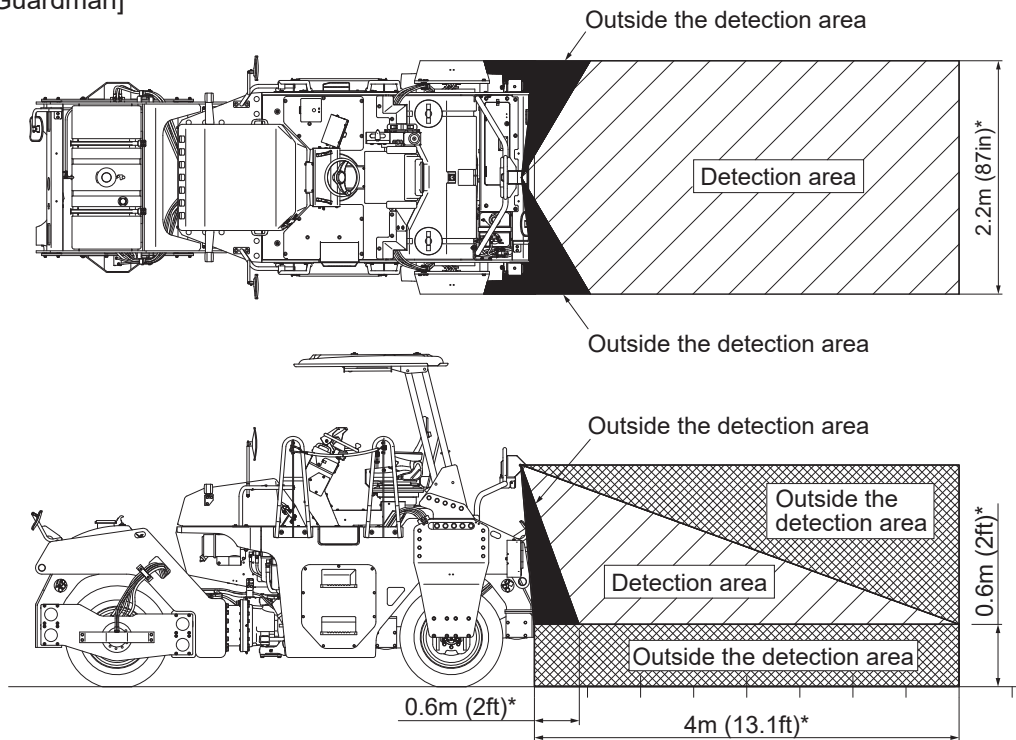
2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

[R2H-4 Guardman]



Note: Values are estimates and may differ depending on various conditions.

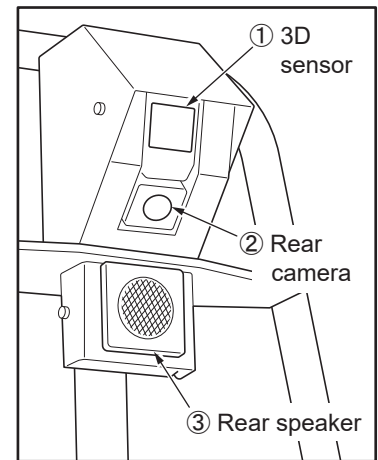
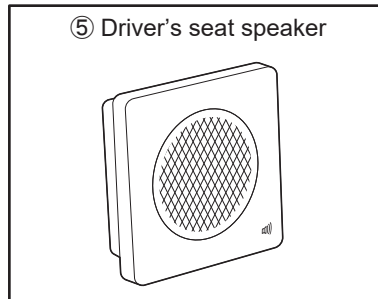
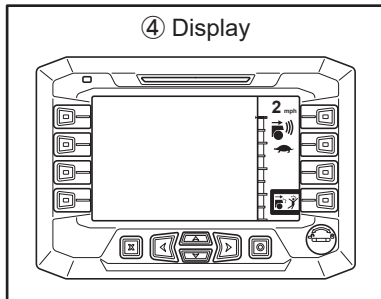
[GW754 Guardman]



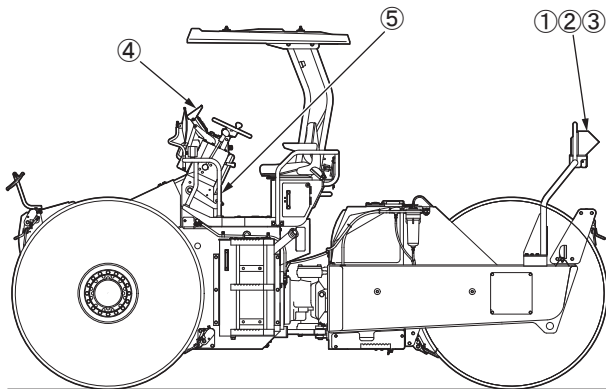
Note: Values are estimates and may differ depending on various conditions.

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

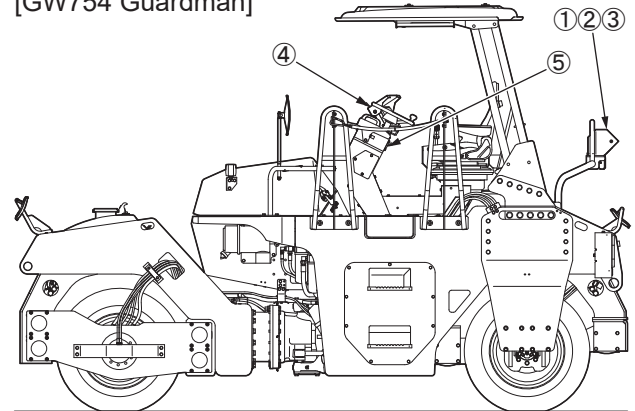
2.3 Names and functions of each part of the ABAS



[R2H-4 Guardman]



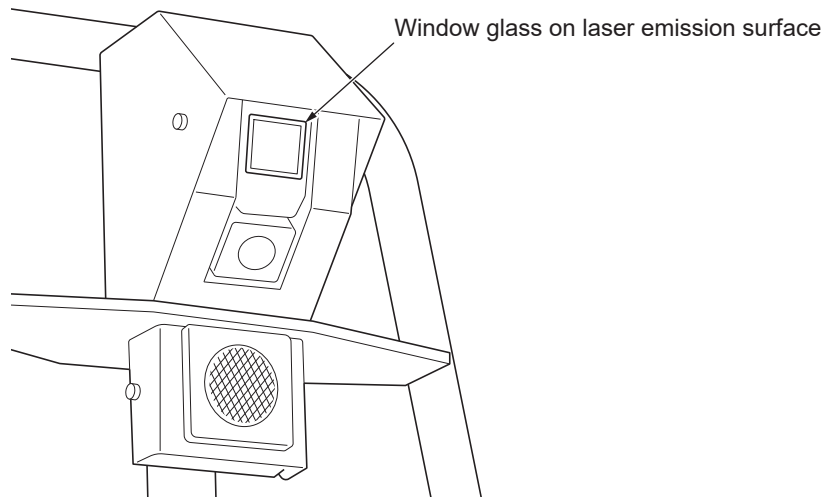
[GW754 Guardman]



- ① 3D sensor
Detects the presence or absence of objects behind the machine.
- ② Rear camera
Captures an image of the area behind the machine.
- ③ Rear speaker
An alarm sound is played to workers behind the machine.
- ④ Display
- Contains various operation buttons such as the on/off button for the Auto Brake Assist System functions.
 - Displays various alarms.
 - Displays a distance bar that indicates the approximate distance from the rear of the machine to the object.
 - Displays the image captured by the Rear camera (②).
- ⑤ Driver's seat speaker
Plays an alarm sound to the driver.

2.4 Handling the 3D sensor

The 3D sensor is installed at the rear of the machine.
Observe the following points to use the 3D sensor safely.



⚠ WARNING

- **Keep the window glass of the 3D sensor laser emission surface clean and free of dirt and water droplets.**
Cleaning method: Gently wipe off any dirt and water droplets on the window glass of the laser emission surface using a cotton swab or a clean, soft cloth such as gauze that is moistened with a small amount of ethanol (ethyl alcohol).
- **When using a high pressure washer, do not spray water directly on the 3D sensor as this will cause the sensor to fail.**
- **Do not allow the 3D sensor and the surrounding area where the 3D sensor is installed to be struck strongly.**
If the part where the 3D sensor is mounted is damaged due to an accident, contact your dealer.
- **Do not remove or disassemble the 3D sensor. Also, do not change the mounting method.**
- **Do not attach any films or stickers (including transparent types) to the window glass of the 3D sensor laser emission surface.**
- **Do not attempt any repairs by yourself as this is dangerous. In the unlikely event that you see smoke coming from the 3D sensor, immediately stop using it and request repairs from your dealer.**

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

⚠ CAUTION

Do not look into the window glass of the 3D sensor laser emission surface for a long time. The laser of the 3D sensor complies with the laser safety class 1 standard. Looking into the window glass of the laser emission surface for a long time while the 3D sensor is operating could cause your eyes to be injured.

■ Environmental conditions

Avoid long-term storage in locations with high temperatures, high humidity, condensation, or corrosive gases.

■ About the laser safety

The device is a CLASS 1 LASER PRODUCT. The product fulfills the requirements of IEC 60825-1:2014 (Safety of Laser Products).

Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

CLASS 1 LASER PRODUCT

NIPPON SIGNAL CO., LTD. 5-1, Marunouchi-1chome, Chiyoda-ku, Tokyo, Japan. March, 2023

Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC

60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

NIPPON SIGNAL CO., LTD. Utsunomiya Plant Utsunomiya-city, Tochigi, Japan. March, 2023

Certified label

⚠ WARNING

- **Do not look through the glass window on the laser emission surface for a long period of time while the sensor is operating. Doing so may injure your eyes.**
- **Do not use the product at a supply voltage other than the voltage prescribed. Doing so may cause fire or an electric shock.**
- **In the unlikely event something unusual occurs, such as smoke or a foul smell coming from the product, shut off the power supply immediately.**
- **In the unlikely event smoke has been coming from the product, check that the smoke has stopped, and request that the product be serviced. Due to the danger, you should never attempt to repair the product yourself.**

⚠ CAUTION

• **Vibrations and impacts**

Do not subject the product to strong vibration or shock, such as by dropping it. If this product has been dropped onto the floor, the product cannot be guaranteed. Precise optical elements have been used in this product. Any mechanical vibration, impact or so forth may damage the product and result in performance degradation. Take care when handling the glass window as it is particularly fragile.

• **Environmental conditions**

Take care not to leave the product in an area where there are condensation or corrosive gases. Certain environmental conditions may cause performance degradation.

• **Wiring**

If this product has not been used correctly, such as incorrect wiring, incorrect insertion of a connector or used in excess of the rated range of use, the product may not perform properly or it may be rendered ineffective.

• **Disassembly**

If this product is taken apart, users may be injured as a result of performance degradation, broken internal components or other such reasons. Also, the product cannot be guaranteed once it has been taken apart.

• **Instructions for washing/cleaning**

If normal properties cannot be attained due to the glass window on the laser emission surface becoming dirty, dip a cotton swab, gauze or some other clean, soft cloth into a tiny amount of reagent ethanol (ethyl alcohol) and lightly wipe away the dirt. Do not wash any other parts besides the glass window.

• **This User Manual and the documents, electronic data, programs and other attachments included with the product are prohibited from being reproduced, transcribed, distributed, altered, etc., either in part or in full, without authorization from our company.**

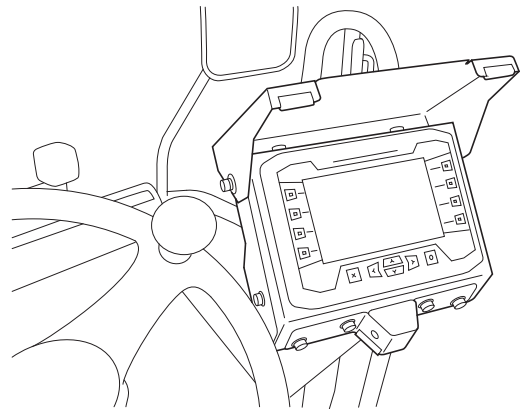
• **Imitating this product or otherwise producing similar products is prohibited.**

• **Please note that the contents of this User Manual are subject to change without notice.**

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

2.5 Names and functions of the parts of the display

The display is located in front of the driver's seat.



Display with front cover open

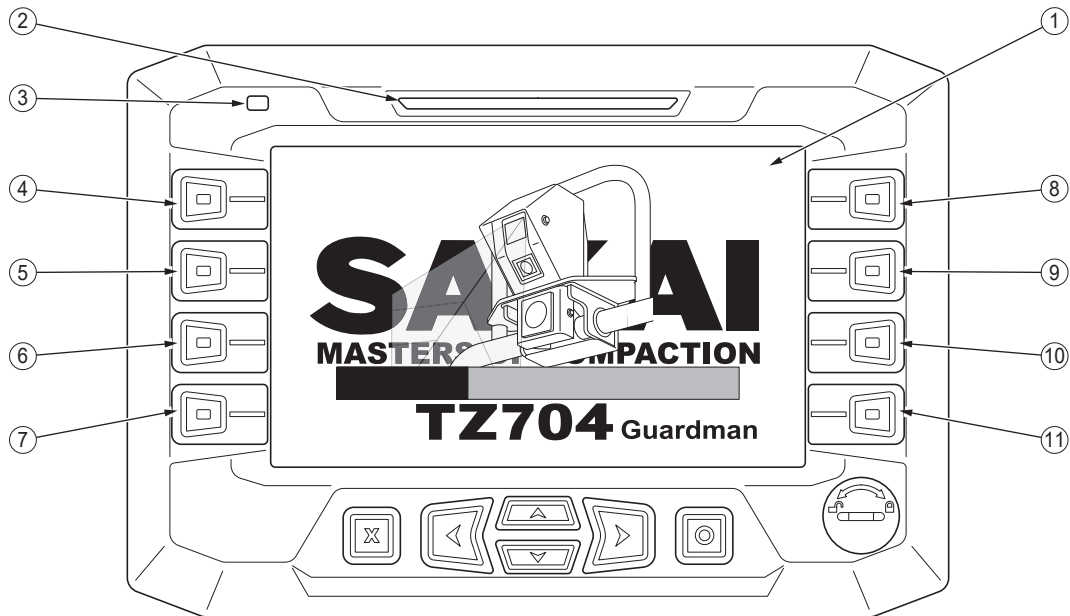
NOTICE

Open the front cover of the display before using it.

The cover will stay open at the position you set it.

Adjust the angle of the cover so that the Display screen is easy to see.

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM



① Display screen

② LED indicator lamp

Displays the operating status of the ABAS and alarm functions.

- Green LED : Indicates that the ABAS and alarm functions are on.
- Off LED : Indicates that the ABAS and alarm functions are off.

③ Light-receiving part of brightness adjustment sensor

Detects ambient brightness.

④ to ⑪ Buttons

Each button has different functions. For details, see “3. OPERATING PROCEDURE”.

*Buttons without numbers in the illustration are not active and pressing these buttons do not have any effect on operation of ABAS.

⚠ CAUTION

- ① **Keep the Display screen (glass surface) clean.**
- ③ **Do not cover the Light-receiving part of the brightness adjustment sensor with a cloth. Also, keep the light-receiving part clean.**
When the screen brightness is set automatically by the brightness adjustment sensor, the screen may become difficult to see if the brightness adjustment sensor does not correctly recognize the surrounding environment.

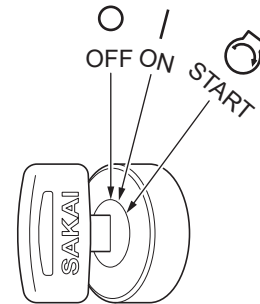
3 OPERATING PROCEDURE

3 OPERATING PROCEDURE

3.1 Turning on the Auto Brake Assist System

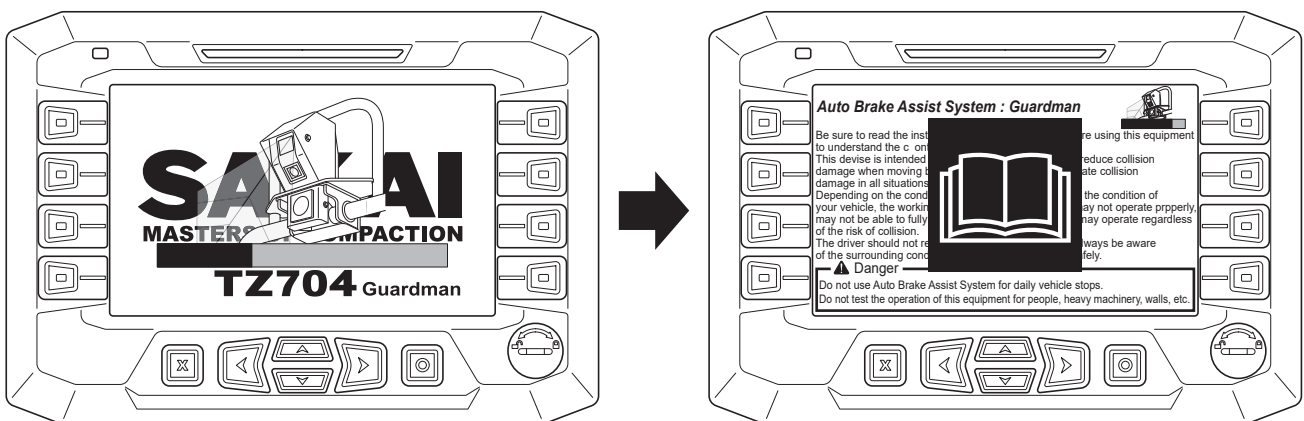
When the Starter switch of the machine is turned to the on position, the Auto Brake Assist System ("ABAS") automatically starts to turn on.

*Refer to the instruction manual of the machine being used for the position and details of the Starter switch.



A sensor startup progress bar is displayed until the ABAS is operational.

When the engine is started, the ABAS system is activated, and when the LED turns green, ABAS is ready for operation.



⚠ WARNING

When the engine is started, the ABAS system is automatically activated. When the LED turn green, ABAS is ready for operation.
Do not operate the machine until the 3D sensor startup check has finished.

NOTICE

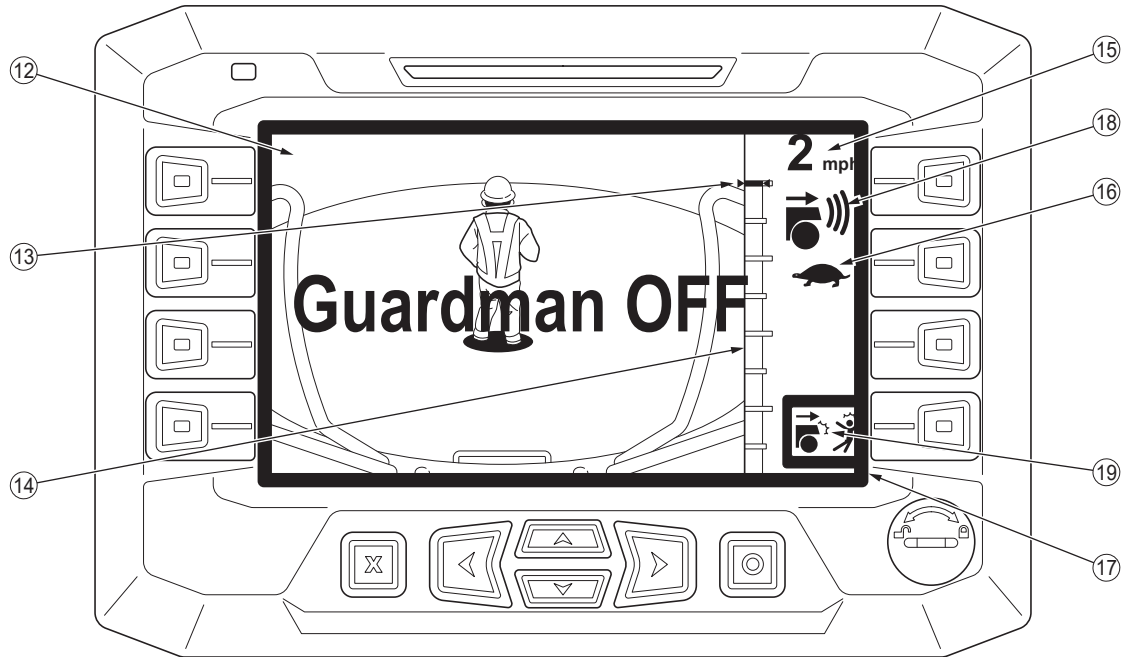
- After stopping the engine, wait about 30 seconds before immediately restarting the engine again.
- The ABAS may restart when the Starter switch of the machine is turned to the on position and then to the start position.

3.2 Turning off the ABAS

When the Starter switch of the machine is turned to the off position, the engine stops and the Auto Brake Assist System also turns off.

3.3 Contents of the Display screen

Main screen



⑫ Rear camera display

The image captured by the camera installed on the rear of the machine is displayed. The image of the area behind the machine is always displayed regardless of the movement of the machine (forward or reverse).

3 OPERATING PROCEDURE

⑬ Brake line bar

- The red horizontal bar indicates when the ABAS is activated.
(The target position changes depending on the machine speed.)
- The ABAS is activated when the top of the Distance bar displayed in ⑭ overlaps with the Brake line bar.

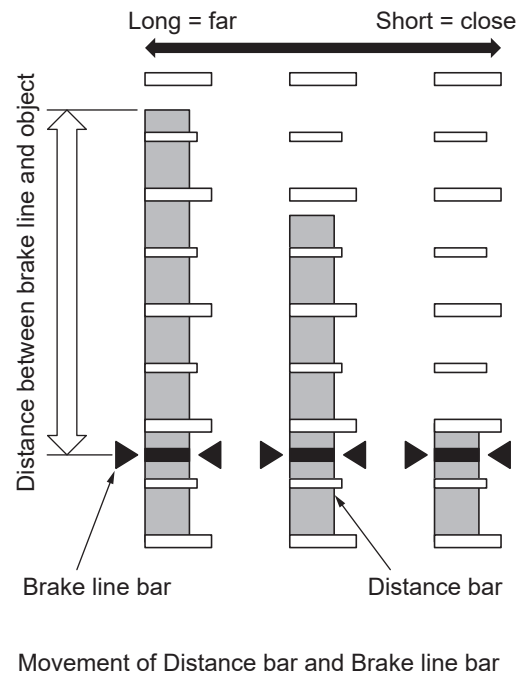
⑭ Distance bar

The length of the vertical bar displays how far apart the object detected by the 3D sensor is from the machine.

Short bar: The distance between the object and the machine is close.

Long bar: The distance between the object and the machine is far.

- The Distance bar is the longest when no object is detected.
- 1 hatch mark on the bar represents approximately 0.5 m (1.6 ft)
- Display of distance bar colors
 - Green : When no object is detected or when the detected object is at a safe position.
 - Yellow: When the 3D sensor detects an object and there is a risk of collision.
 - Red : When the 3D sensor detects an object and the risk of collision becomes greater, when the Auto Brake Assist System is activated, or until the ABAS is released after being activated (see page A-17).



NOTICE

The Distance bar operates when the Forward/reverse lever of the machine is pushed to the Neutral (N) or Reverse (R) position.

When the lever is pushed to the Forward (F) position, the Distance bar is fixed at the 4 m (13.1 ft) position.

⑮ Display of machine speed



- White : Displays the machine speed.
- Off : When the machine speed cannot be detected due to a malfunction of the speed sensor or other reason.

NOTICE

The displayed machine speed is the speed used to control the ABAS and may differ from the actual machine speed.

⑩ Speed stage display (R2H-4 Guardman)

Displays the speed stage selected with the shift switch.

- Low speed stage :  is displayed.
- High speed stage:  is displayed.

⑪ Guardman OFF display

When the ABAS and alarm functions are turned off, Guardman OFF is displayed with a flashing red square frame.



⑫ ABAS display

Orange: When the ABAS and alarm functions are on.

Gray : When the ABAS and alarm functions are off.

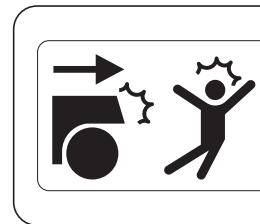


⑬ Auto Brake Assist System on/off mark

Orange: When the ABAS and alarm functions are on.

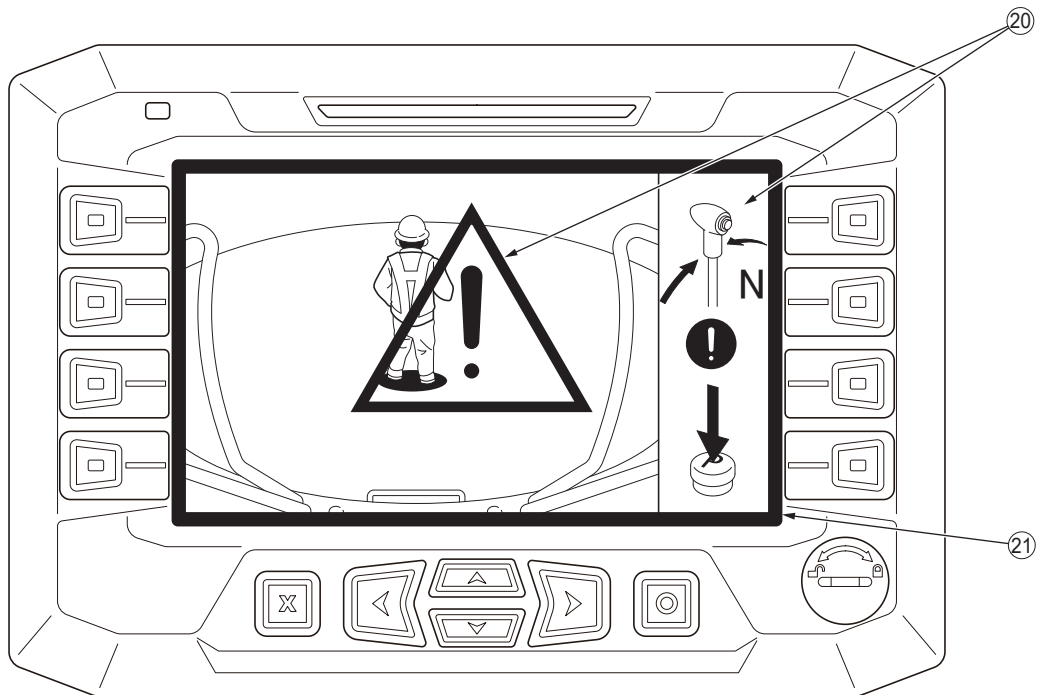
Gray : When the ABAS and alarm functions are manually turned off.

Orange frame, gray illustration :
When the ABAS and alarm functions are automatically turned off.



Auto Brake Assist System on/off mark

Alarm screen example



⑳ Alarm display

Various symbols and illustrations are displayed depending on the situation, and the display lights up or flashes.

㉑ Outer frame

The Outer frame is displayed in various colors depending on the situation, and the frame lights up or flashes.

For details on the contents of the Alarm display, see “3.9 Alarm list (when an object is detected) and response actions” and “3.10 Alarm list (errors) and response actions.”

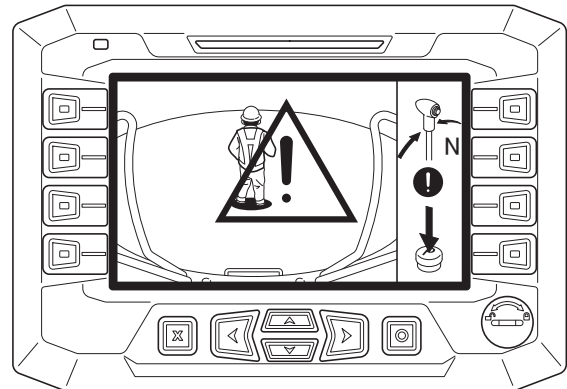
3.4 Procedure for releasing the ABAS after activation

When the ABAS has activated, the screen will show you how to release the ABAS.

The ABAS can be released using the following procedure.

- 1) Return the Forward/reverse lever to Neutral (N).
- 2) Press the Parking brake switch.

After performing the above steps, the ABAS function will be ON and ready to operate.



NOTICE

On the screen, the Neutral (N) position is indicated by “N” and the Parking brake switch is indicated by “P”.

* Refer to the instruction manual for the machine being used for the locations of the Forward/reverse lever and Parking brake switch.

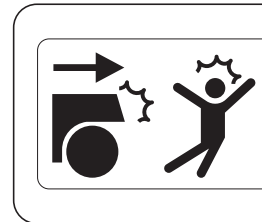
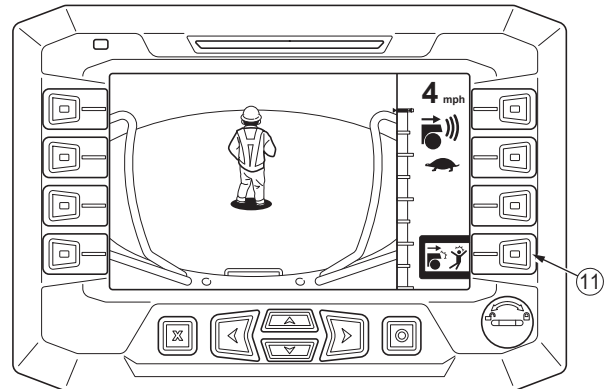
3 OPERATING PROCEDURE

3.5 Turning the ABAS and alarm functions on and off.

When the Auto Brake Assist System on/off mark is displayed, press the ⑪ “Auto Brake Assist System on/off” button on the display to switch between the on and off states of the ABAS and alarm functions.

Orange: When the ABAS and alarm functions are on.

Gray : When the ABAS and alarm functions are off.



Auto Brake Assist System on/off mark

⚠ WARNING

Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

NOTICE

Turn off the ABAS and alarm functions in the following situations.

- **When compacting close to a structure located behind the machine.**
- **When loading and unloading to and from trucks, trains, ships, etc.**
- **When the machine is unstable due to an accident or breakdown.**
- **When there are many detection errors due to the adverse conditions in the surrounding environment.**
- **When driving on steep slope.**

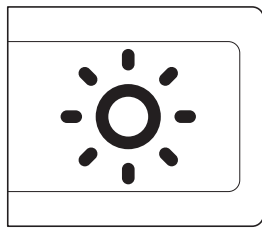
3.6 Setting the display brightness

There are two modes available for setting the display brightness: Automatic and Manual. When delivered, the product is set by default to Automatic mode.

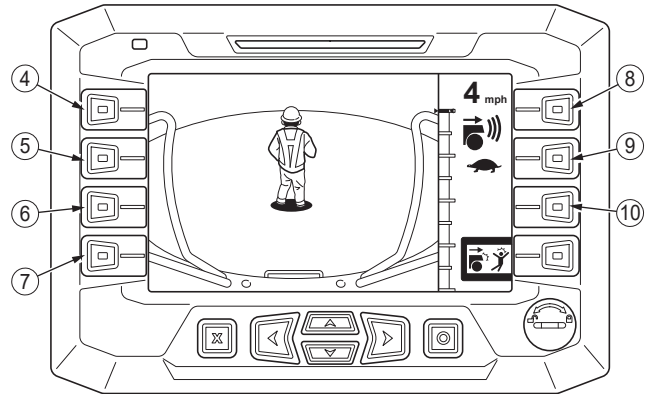
Setting the Automatic mode

The procedure for setting the Automatic mode is as follows.

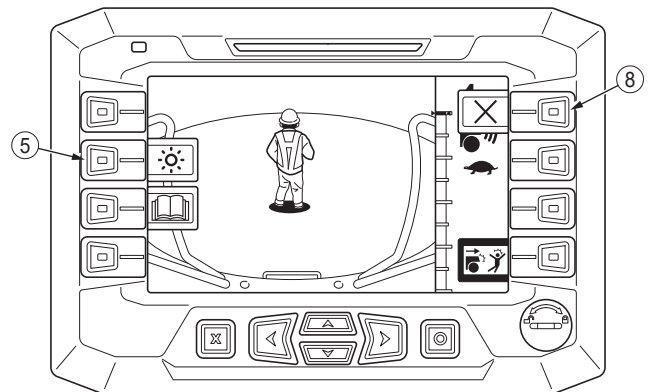
- 1) On the main screen, press any button from ④ to ⑩ to display the Brightness adjustment mark.



Brightness adjustment mark

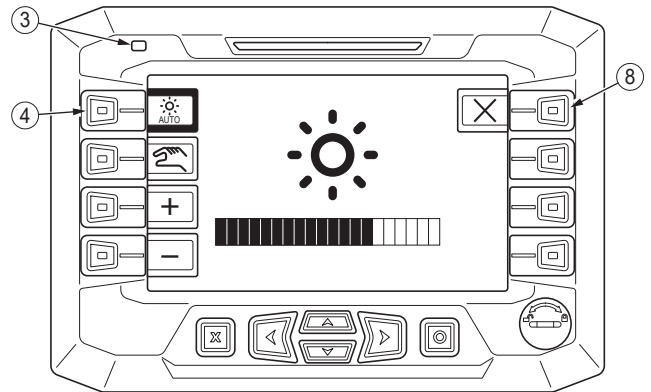


- 2) When the Brightness adjustment mark is displayed, press the ⑤ “☀️” button. If you do not press any buttons for about three seconds after the Brightness adjustment mark appears, or if you press the ⑧ “Close” button, the Brightness adjustment mark will disappear.



3 OPERATING PROCEDURE

- 3) When Automatic is displayed, press the ④ “Automatic” button. If the frame around Automatic is orange, the display brightness adjustment is set to the Automatic mode.
- 4) Press the ⑧ “Close” button to return to the main screen.



Brightness adjustment screen

*If the machine is moved forward or in reverse while the Brightness adjustment screen is displayed, the display will automatically switch to the main screen after a certain period of time.

⚠ WARNING

Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

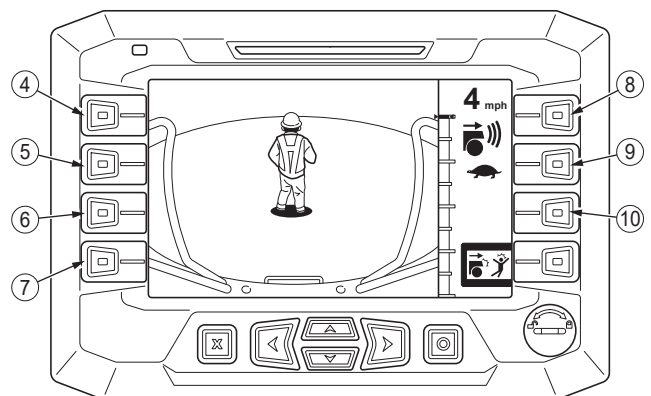
⚠ CAUTION

③ **Do not cover the Light-receiving part of the brightness adjustment sensor with a cloth. Since the display brightness is adjusted based on data from the brightness adjustment sensor, the visibility of the display may decrease.**

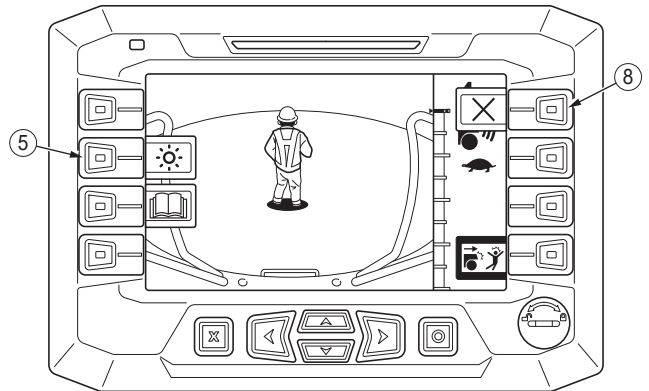
Setting the Manual mode

The procedure for setting the Manual mode is as follows.

- 1) On the main screen, press any button from ④ to ⑩ to display the Brightness adjustment mark.

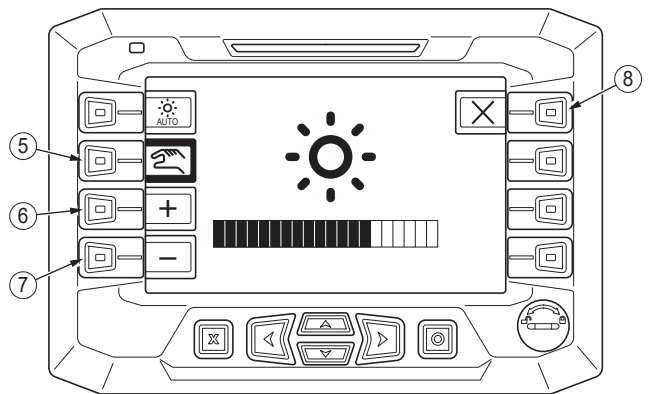


2) When the Brightness adjustment mark is displayed, press the ⑤ “☀️” button. If you do not press any buttons for about three seconds after the Brightness adjustment mark appears, or if you press the ⑧ “Close” button, the Brightness adjustment mark will disappear.



3) When Manual is displayed, press the ⑤ “Manual” button. If the frame around Manual is orange, the display brightness adjustment is set to the Manual mode.

4) Press the ⑥ “+” button or ⑦ “-” button to adjust the display brightness.
 +: Brighten
 -: Darken



Brightness adjustment screen

5) After adjusting the brightness, press the ⑧ “Close” button to return to the main screen.

*If the machine is moved forward or in reverse while the Brightness adjustment screen is displayed, the display will automatically switch to the main screen after a certain period of time.

⚠️ WARNING

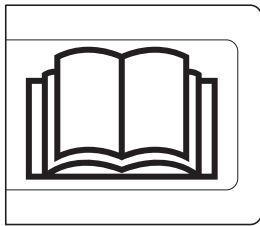
Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

3 OPERATING PROCEDURE

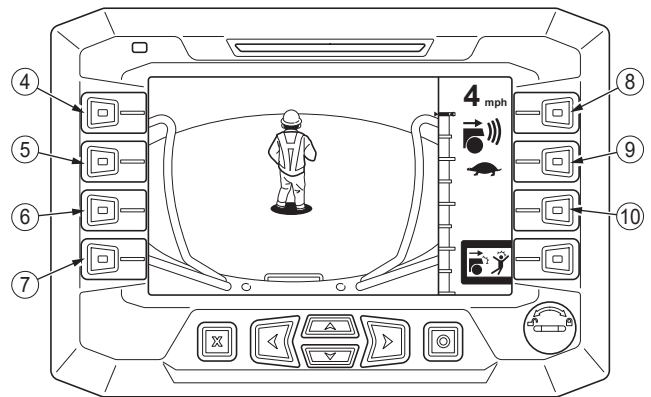
3.7 Displaying the instruction manual


The display contains the operating instructions for the ABAS. Follow the steps below to view the information that you require. Since the screen is small, it may be difficult to see the displayed contents, so be sure to check the information in this instruction manual.

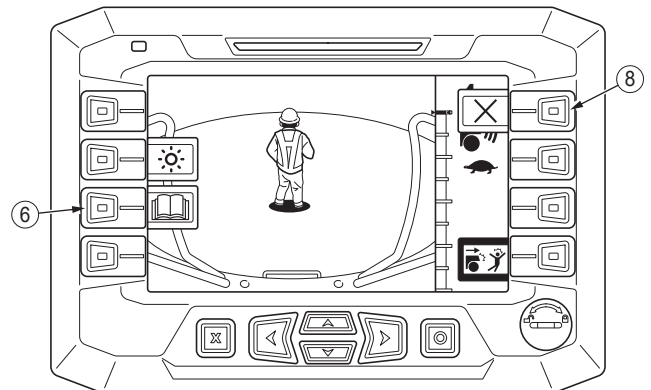
- 1) On the main screen, press any button from ④ to ⑩ to display the Instruction manual mark.



Instruction manual mark

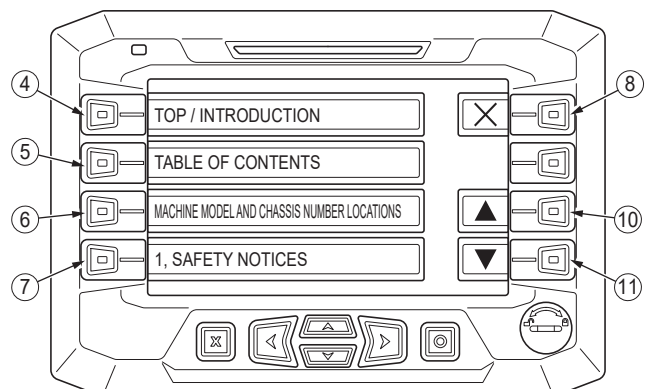


- 2) When the Instruction manual mark is displayed, press the ⑥ “” button. If you do not press any buttons for about three seconds after the Instruction manual mark appears, or if you press the ⑧ “Close” button, the Instruction manual mark will disappear.



- 3) Use the ⑩ and ⑪ buttons to move the item selection up and down, and use the ④ to ⑦ buttons to display the item you want to view.
⑩ button: Moves the item selection up.
⑪ button: Moves the item selection down.

*Press the ⑧ “Close” button to close this screen and return to the main screen.



Selection screen (example)

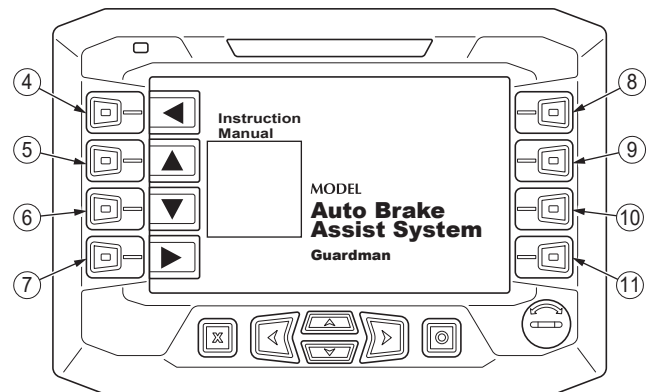
4) When the instruction manual is displayed, use the buttons ④ to ⑦ to move to the part you want to view.

④ “◀” button: Moves to the previous page.

⑤ “▲” button: Moves the displayed contents upward.

⑥ “▼” button: Moves the displayed contents downward.

⑦ “▶” button: Moves to the next page.

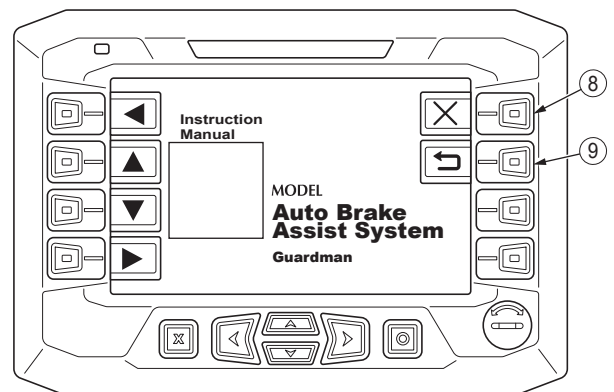


5) Press any of the ⑧ to ⑪ buttons to display “Close” and “Back”.

6) Press the ⑧ “Close” button to close the instruction manual and return to the main screen.

Press the ⑨ “Back” button to return to the item selection screen.

* If the machine is moved forward or in reverse while the item selection screen or the instruction manual screen is displayed, the display will automatically switch to the main screen after a certain period of time.



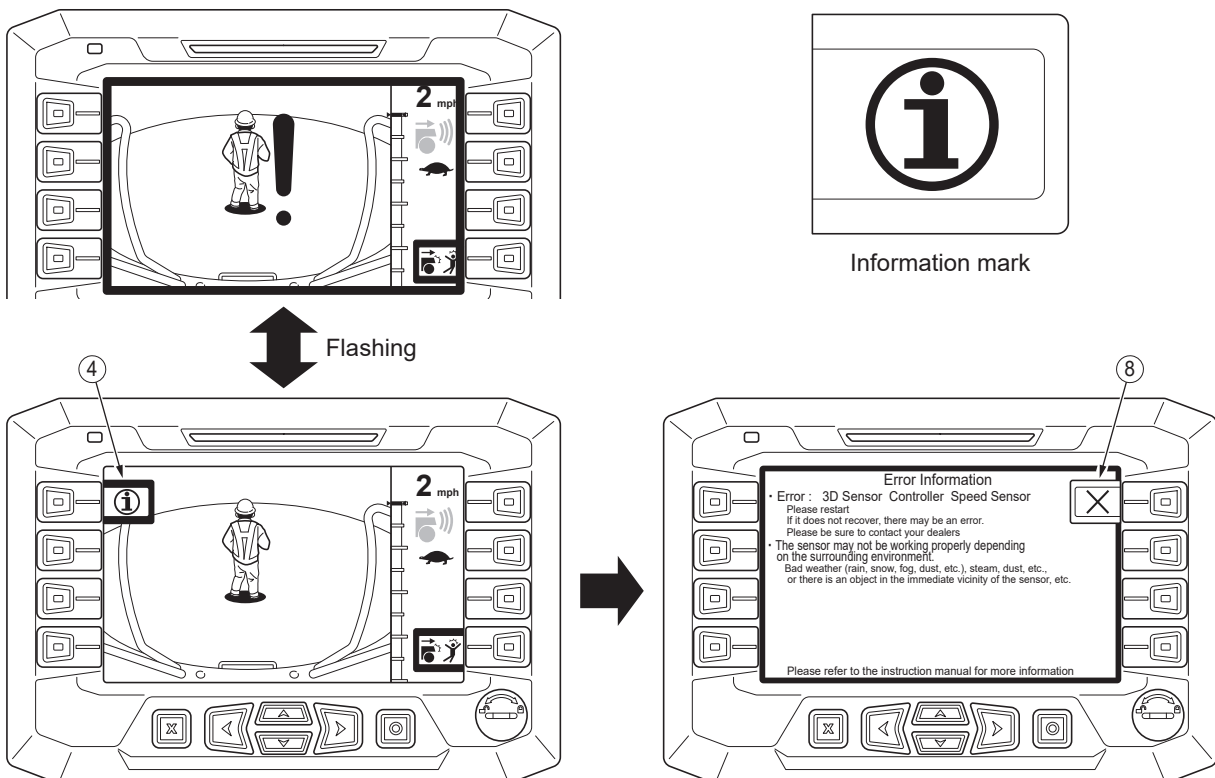
⚠ WARNING

Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

3 OPERATING PROCEDURE

3.8 Error information

- An Information mark is displayed when an error occurs.
Errors: Causes of errors include when the 3D sensor, controller (for controlling the ABAS), speed sensor, etc. have malfunctioned or disconnected, in bad weather (rain, snow, fog, etc.), and in high concentrations of steam or dust.
See “3.10 Alarm list (errors) and response actions”.
- Press the ④ “Information” button to display detailed information about the error.
 - 1) When an error occurs, the screen alternates between the error display and Information mark.
 - 2) Press the ④ “Information” button to display detailed information about the error.
 - 3) Check the information on the display and press the ⑧ “Close” button to return to the original screen.
- * If the machine is moved forward or in reverse while the error information screen is being displayed, the display will automatically switch to the main screen after a certain period of time.
- * If the ABAS and alarm functions are turned off while an error is occurring, the error will not be displayed.

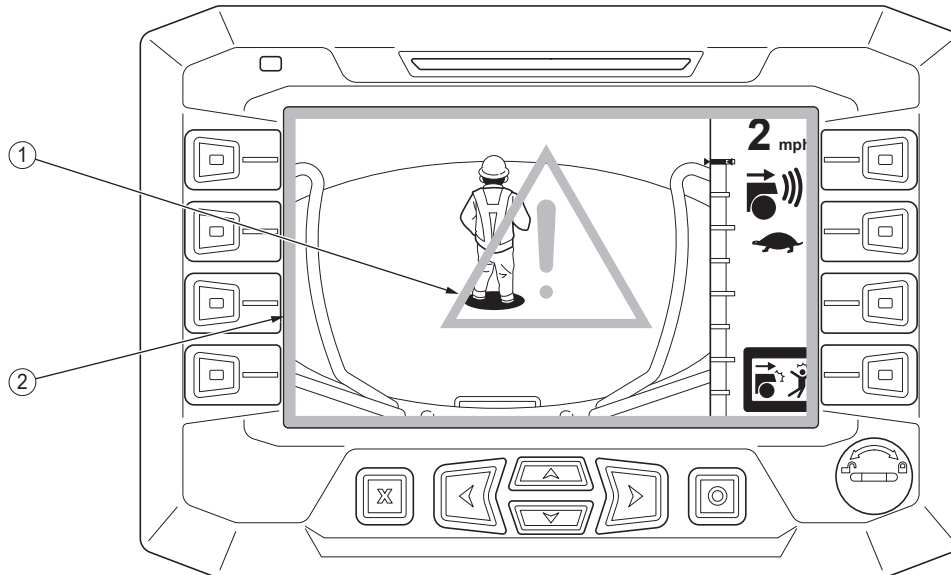



☆ Displayed error information (See “3.10 Alarm list (errors) and response actions”)

⚠ WARNING

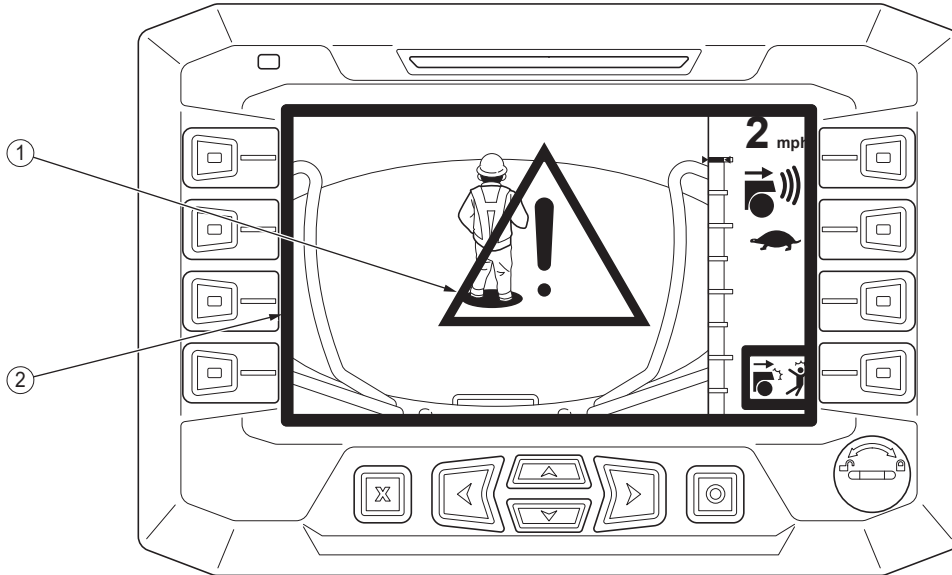
Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.


3.9 Alarm list (when an object is detected) and response actions

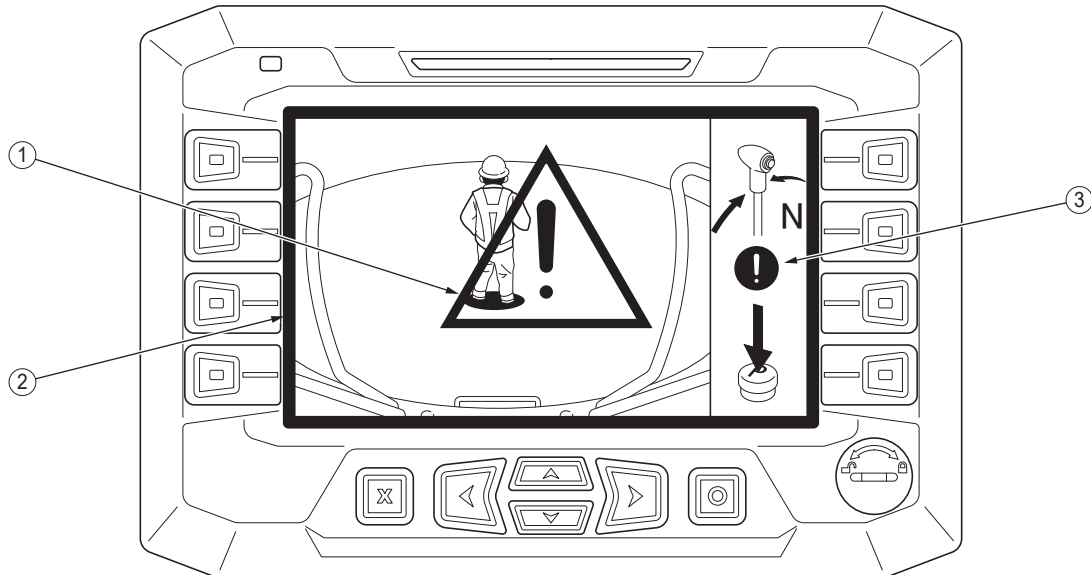



<p>Alarm description</p>	<ul style="list-style-type: none"> • Display: ① “ <p>State</p> 	<ul style="list-style-type: none"> • An object is detected in the detection area and there is a risk of collision. • The ABAS is not activated.
<p>Response action</p>	<ul style="list-style-type: none"> • Check and avoid the danger. Avoidance procedure : ○ Step on the Brake pedal ○ Move the Forward/reverse lever to Neutral (N), or move the lever to Forward (F) after checking the safety of the area ahead of the machine. ○ Stop the machine in a safe place and move the object out of the detection area. • If the alarm symbol is constantly displayed or the alarm sound replayed with no influences from the surrounding environment and no object present, contact your dealer. 	
<p>Notice</p>	<ul style="list-style-type: none"> • The alarm sound is played from the Driver's seat speaker and the Rear speaker of the machine. • When the ABAS and alarm functions are turned off, the Alarm display will not appear and the alarm sound will not be played. 	

3 OPERATING PROCEDURE



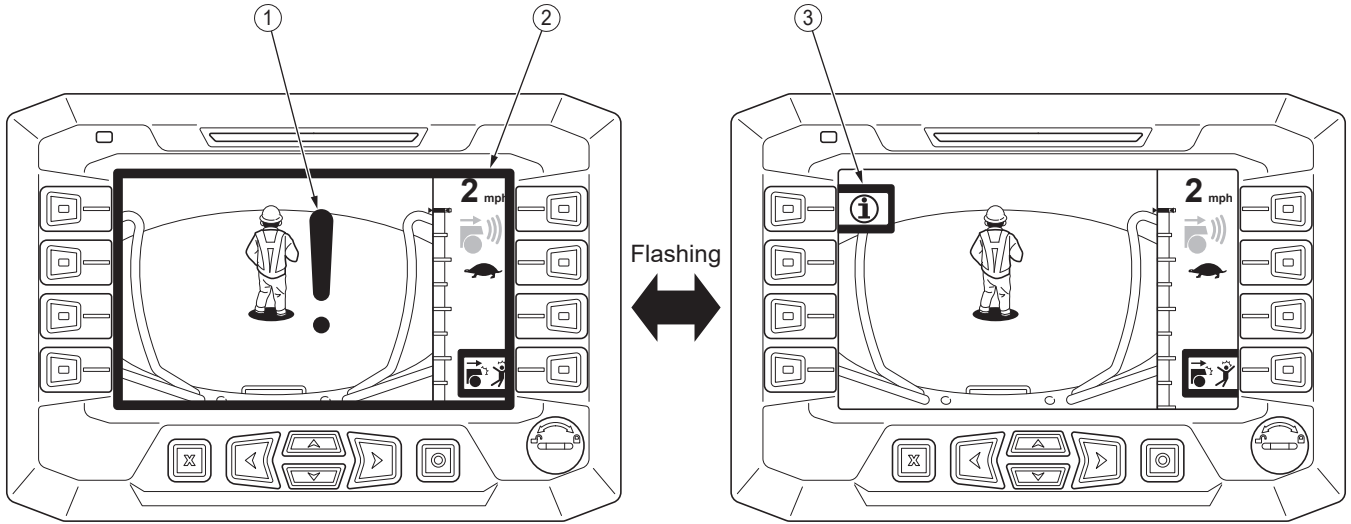
<p>Alarm description</p>	<ul style="list-style-type: none"> • Display: ① “” and ② “Outer frame” are flashing in red. • Alarm sound: “Beep beep beep beep...” sound is played. Sounds at shorter intervals than in the flashing yellow state (see page A-25). (Regarding the alarm sound timing, the alarm sound plays when an object is detected, and the sound is repeated while there is a high risk of collision.)
<p>State</p>	<ul style="list-style-type: none"> • The risk of a collision is determined to be higher than that of the flashing yellow condition (see page A-25). • The ABAS is not activated.
<p>Response action</p>	<ul style="list-style-type: none"> • Check and avoid the danger. Avoidance procedure: Step on the Brake pedal • If the alarm symbol is constantly displayed or the alarm sound replayed with no influences from the surrounding environment and no object present, contact your dealer.
<p>Notice</p>	<ul style="list-style-type: none"> • The alarm sound is played from the Driver's seat speaker and the Rear speaker of the machine. • When the ABAS and alarm functions are turned off, the Alarm display will not appear and the alarm sound will not be played.



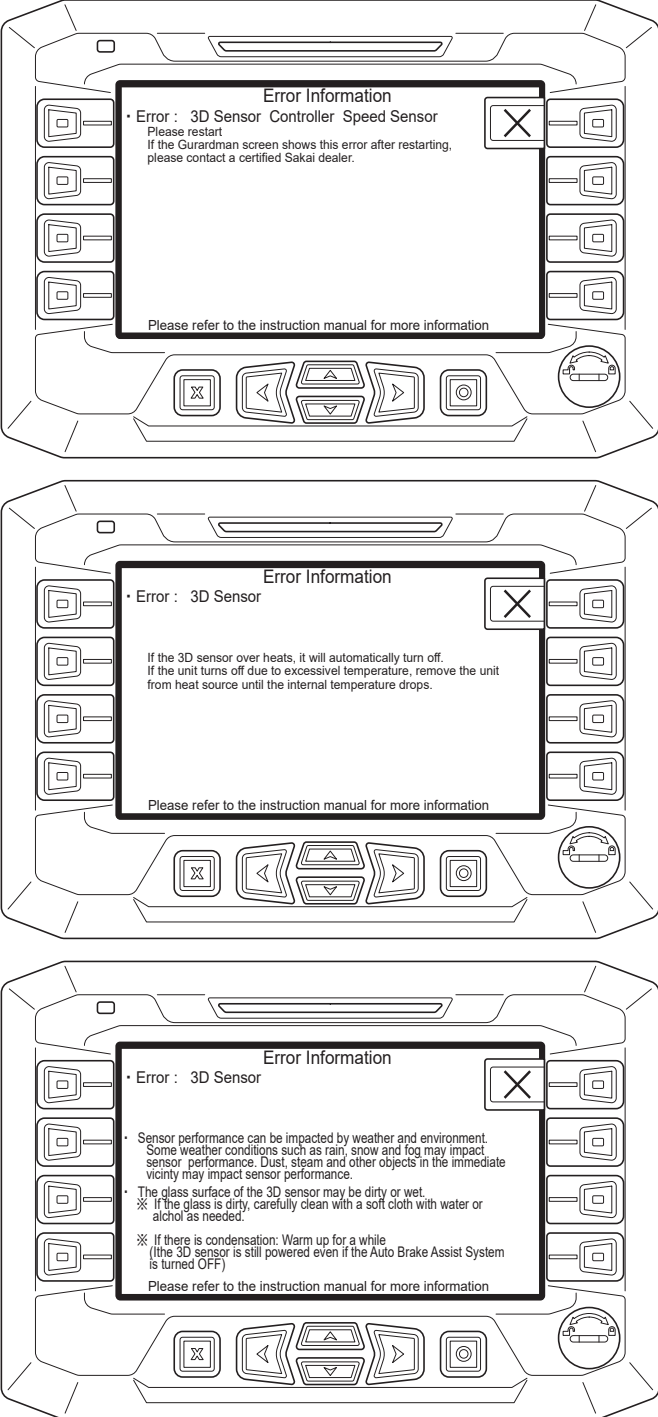
<p>Alarm description</p>	<ul style="list-style-type: none"> • Display: <ul style="list-style-type: none"> ① “” and ② “Outer frame” are lit in red. ③ “Return the Forward/reverse lever to N and press P” animation is displayed. * On the screen, the Neutral (N) position is indicated by “N” and the Parking brake switch is indicated by “P”. • Alarm sound: <ul style="list-style-type: none"> A long “Beep” sound is played. (Regarding the alarm sound timing, the alarm sounds continuously from activation until deactivation of ABAS.)
<p>State</p>	<ul style="list-style-type: none"> • The ABAS has activated and the machine is decelerating or stopping.
<p>Response action</p>	<ul style="list-style-type: none"> • Check and avoid the danger. <ul style="list-style-type: none"> Avoidance procedure: Step on the Brake pedal. • After the machine stops, check the safety of the surrounding environment. • Release the ABAS. <ul style="list-style-type: none"> Release procedure: Return the Forward/reverse lever to Neutral (N) and press the Parking brake switch. • If the ABAS continues to be activated, the alarm symbol is constantly displayed or the alarm sound replayed with no influences from the surrounding environment and no object present, contact your dealer.
<p>Important</p>	<ul style="list-style-type: none"> • By stepping on the Brake pedal after the ABAS is activated, the braking distance is shortened and the possibility of a collision is decreased. • When Guardman ABAS is activated and the machine comes to a sudden stop, the drums and/or tires may shove the asphalt mat or soil and cause cracking.
<p>Notice</p>	<ul style="list-style-type: none"> • After the ABAS is activated, it will not be released even if you turn off the ABAS and alarm functions (see page A-17). It is necessary to follow the procedure for releasing the ABAS after activation. • After the ABAS is activated, the Rear speaker will play a “Beep Beep Beep Beep...” alarm sound until the machine comes to a stop.

3 OPERATING PROCEDURE

3.10 Alarm list (errors) and response actions

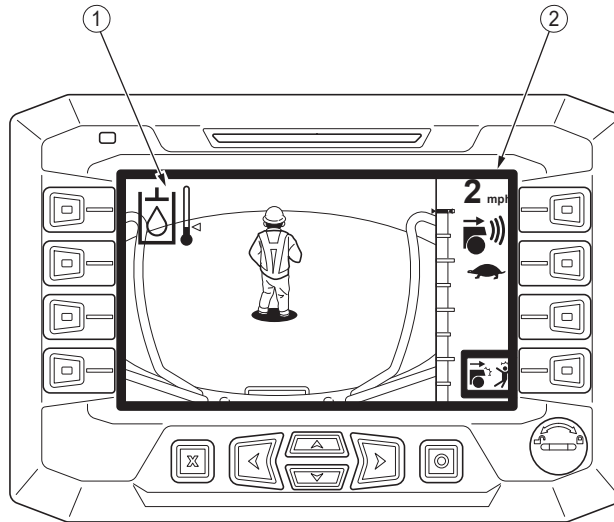


<p>Alarm description</p>	<ul style="list-style-type: none"> • Display: <ul style="list-style-type: none"> ① “ ! ” and ② “Outer frame” are flashing in red. ③ “Information mark” is flashing. • Alarm sound: <ul style="list-style-type: none"> A “chirping” alarm sound is played. (Regarding the alarm sound timing, the alarm sound repeats at regular intervals when an error occurs.)
<p>State</p>	<ul style="list-style-type: none"> • An error has occurred in the ABAS and alarm functions. • The ABAS and alarm functions are automatically turned off (the LED indicator lamp goes out). • The following are possible causes of the error. <ul style="list-style-type: none"> ○ Communication error ○ Failure of 3D sensor ○ Failure of controller ○ Failure of speed sensor ○ Disconnection of wiring ○ The 3D sensor overheated, the protection circuit was activated, and the sensor was stopped. ○ Bad weather (rain, snow, fog, etc.) or high concentrations of steam, dust, etc. ○ There is an object near the 3D sensor. ○ The glass surface of the 3D sensor is dirty. ○ There is condensation on the glass surface of the 3D sensor. ○ The glass surface of the 3D sensor is scratched.

<p>Response action</p>	<ul style="list-style-type: none"> • Stop the machine in a safe place, press the information button, and check the detailed information about the error. • Follow the instructions in the displayed information and remove the cause of the error. • If the error persists, contact your dealer. 
	<p>Notice</p>

3 OPERATING PROCEDURE

Function available only on R2H-4 Guardman



Alarm description	<ul style="list-style-type: none"> • Display: <ul style="list-style-type: none"> ① "Perform the warm-up operation" graphic symbol and ② "Outer frame" are flashing in blue. • Alarm sound: <ul style="list-style-type: none"> A "chirping" alarm sound is played. (Regarding the alarm sound timing, the alarm sound repeats at regular intervals when the hydraulic oil temperature is low.)
State	<ul style="list-style-type: none"> • The hydraulic oil temperature is low. • When the hydraulic oil temperature is low, braking distances may be longer than normal.
Response action	<ul style="list-style-type: none"> • Be sure to fully check the safety of the surrounding environment before driving. • The hydraulic oil will warm up as the machine repeats its forward and reverse movement.
Notice	<ul style="list-style-type: none"> • This alarm sound is played only from the Driver's seat speaker. • The Alarm display will appear and the alarm sound will be played when the hydraulic oil temperature is low regardless of whether the ABAS and alarm functions are turned on or off.

⚠ WARNING

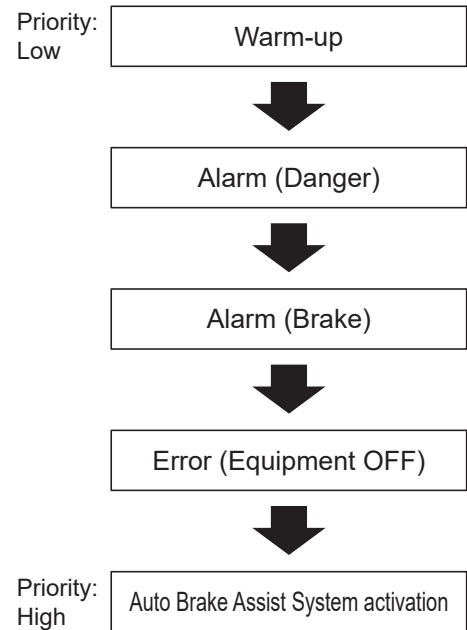
When the hydraulic oil temperature is low, braking distances may be longer than normal. In some cases, the ABAS may not work properly, and even if it does work, it might not be possible to avoid a collision.

⚠ WARNING

When multiple alarms occur, the Alarm display and alarm sound of the highest priority alarm will be shown and played according to the priority below. The Alarm display and alarm sound of lower-priority alarms are not shown or played.

*The ABAS will not be released even if an error occurs after the ABAS has been activated.

*A warm-up alarm is not available on the GW754 Guardman.



4 INSPECTION AND MAINTENANCE

4.1 Inspection before starting work

To be sure the Auto Brake Assist System (“ABAS”) will work properly, it is important to perform a daily inspection before starting work. Perform the following safety checks.

- Is the glass surface of the 3D sensor, camera, or display scratched or dirty?
- Are there any loose bolts and nuts?
- Is the mounting of the equipment damaged or deformed?
- Is there any evidence that something has collided with the equipment?

After checking the above points, start the ABAS and check the display for any error information. Press each operation button and be sure that it works normally.

If nothing is displayed on the display even after starting the engine of the machine, it is possible that the ABAS has failed to start, the system itself has failed, or the display function of the system has failed.

Stop the engine once and start the engine again. If the condition does not improve, contact your dealer.

WARNING

If the ABAS is not maintained or used in an abnormal state, the ABAS may not operate properly and could lead to an accident.

4.2 Maintenance

- Regularly check the glass surfaces of the 3D sensor, camera, and display for dirt and scratches.
- If the 3D sensor glass surface is Gently wipe off the glass surface using a cotton swab, it will affect the performance of the object detection. Be sure to wipe the surface clean.
- Gently wipe the water or oil off the glass surface using a cotton swab or a clean, soft cloth such as gauze that is moistened with a small amount of ethanol (ethyl alcohol).

WARNING

- **If the window glass of the laser emission surface of the 3D sensor has water droplets or dirt on it, the 3D sensor and ABAS will not be able to perform properly, which could lead to an accident.**
- **Do not disassemble the ABAS. The system may not perform properly if the mounting position is different, and this could also lead to failures, detection errors, or malfunctions.**

4.3 Inspecting the parking brake

Every 500 hours or 3 months, or each time after brake pedal is used.

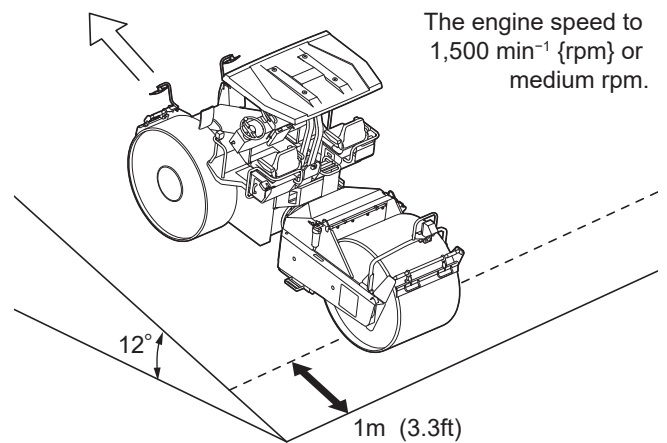
This inspection should also be performed when the ABAS is activated. If the inspection is not performed, the Parking brake may not function properly and a serious accident could occur.

⚠ WARNING

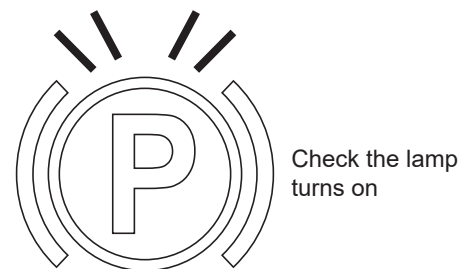
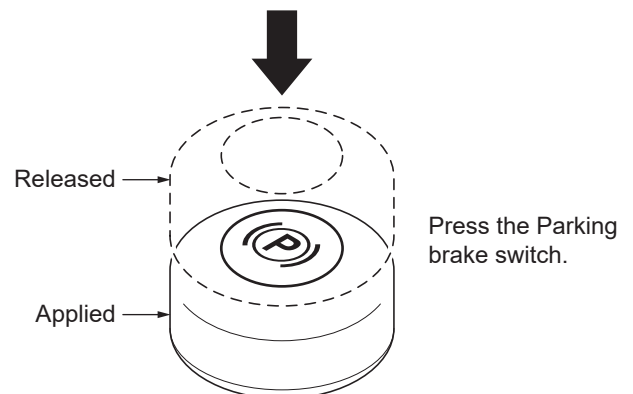
- **Make sure there are no people or obstacles near the machine to ensure safety.**
- **Keep your hands on the F-N-R lever and the Steering wheel during this inspection. The machine may move unexpectedly during the inspection, which may lead to accidents.**

1) Adjust the engine speed to $1,500\text{min}^{-1}$ {rpm} or medium rpm.

2) With the engine running, move the machine upward by 12° (20%) (slope with upward inclination of 12°) on a hard surface such as asphalt pavement.



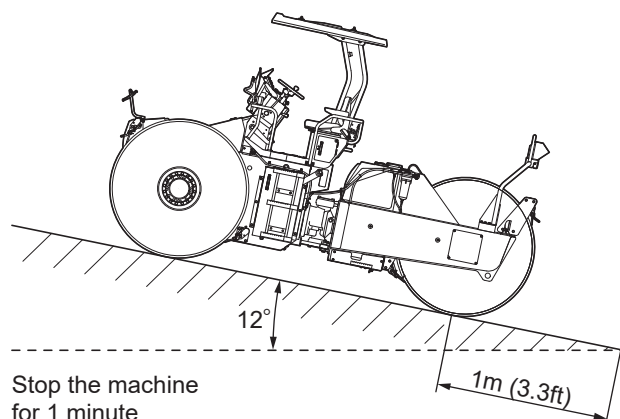
3) Press the Parking brake switch (P) to engage the parking brake. Check that the Parking brake indicator lamp (P) turns on. If the lamp (P) does not turn on, contact your dealer.



Parking brake indicator lamp

4 INSPECTION AND MAINTENANCE

- 4) Remain seated to make sure the machine remains completely still for 1 minute. If it moves, move it immediately to a flat ground, stop using it, contact your dealer, and have it repaired.



⚠ WARNING

- **This inspection should be performed each time the Brake pedal is used. If not inspected, the Parking brake may malfunction the next time when you try to use it, resulting in a serious accident.**
- **Modify the machine.**
Please do not modify the machine without the permission for safety reasons. We are not responsible for injuries, death or breakdowns caused by the modifications.

4.4 Fuses

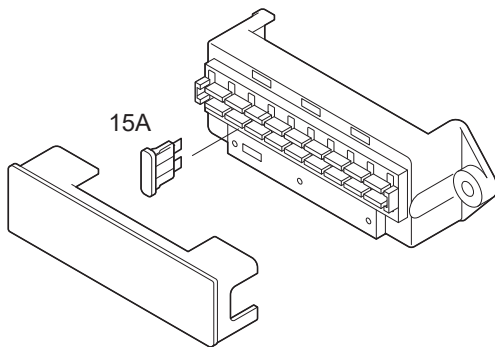
⚠ WARNING

When changing a fuse, turn off the power supply by turning the Starter switch to the OFF position.

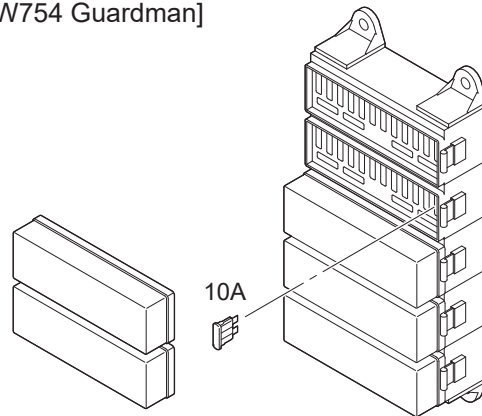
Changing fuses without turning off the power supply may cause a fire, a electric shock or malfunction.

Refer to the instruction manual for the machine being used for the installation location of the fuse box.

[R2H-4 Guardman]



[GW754 Guardman]



- The ABAS uses fuses that are located where it is labeled Guardman.
- Change any fuse which has become powder-coated due to deterioration or where the fuse is loose in the fuse holder.
- Remove cover and replace the fuse.
- Be sure to use fuses of correct capacity.
- Always use genuine fuses.

⚠ WARNING

- If a fuse blows, the ABAS will not operate.
- When replacing the fuses, be sure to replace them with fuses of the same capacity. Using a fuse that exceeds the specified capacity may cause a fire or malfunction.

NOTICE

When a fuse blows, investigate the cause before replacing it.

4.5 Storage

WARNING

When storing the machine, wipe the area around the 3D sensor with a clean, soft cloth, dry it thoroughly, and then cover it with the 3D sensor cover that comes with ABAS.

4.6 Regular inspections

WARNING

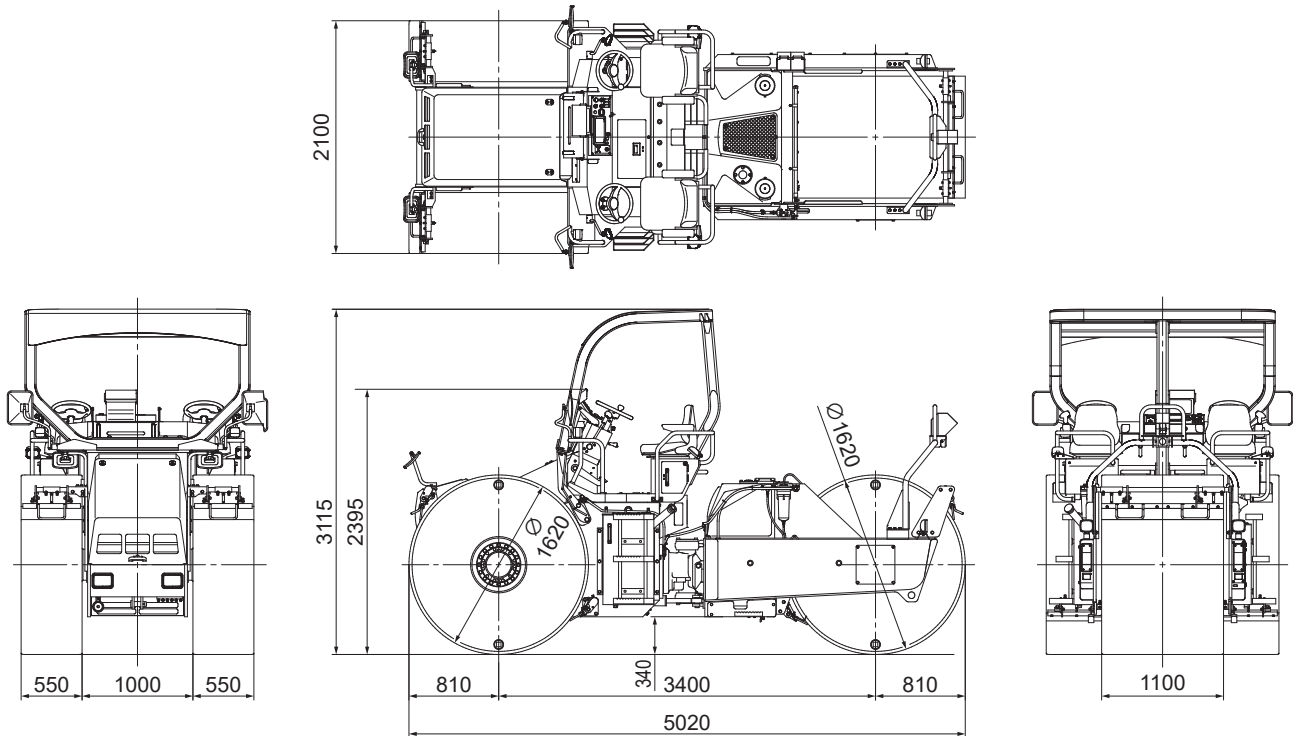
In order to ensure safety, ask your dealer to inspect and perform maintenance on the system once a year.

4.7 Warranty, disclaimer

- The product warranty varies depending on the country, please check with the local SAKAI dealer.
Contact your dealer if a failure occurs under normal operating conditions within this warranty period.
However, if “4.6 Regular inspections” is not performed, the warranty is not applicable.
- If you disassemble the ABAS, the warranty will be voided and the system will not be covered.
- Our company is not responsible for any personal injury, damage to property, or malfunctions caused by a disassembled or modified ABAS or use of the system under abnormal conditions.
- Our company is not responsible for any damage to the road surface caused by the activation of the ABAS.
- The purpose of the ABAS is to assist in avoiding collisions when the machine is reversing or to reduce collision damage, but the system does not avoid collisions or reduce collision damage in all situations. Our company is not responsible for accidents resulting in injury or property damage that occur when the ABAS does not activate or when a collision cannot be avoided even when the ABAS does activate.

5 OVERVIEW AND SPECIFICATIONS

[R2H-4 Guardman (with ROPS)]



Weight		Performance	
Operating weight	14,080 kg (31,045 lbs)	Gradeability	17 degrees
On front axle	7,010 kg (15,455 lbs)	Rolling width	2,100 mm (83")
On rear axle	7,070 kg (15,585 lbs)	Minimum turning radius	6,300 mm (249")
Dimension		Engine	
Overall length	5,020 mm (198")	Model	KUBOTA "V3307-CR-T-EF05" Diesel Engine
Overall width	2,100 mm (83")	Total displacement	3.331 L (203 cu.in)
Overall height	3,115 mm (123")	Rated output	54.6 kW / 2,200 min ⁻¹ (73 HP / 2,200 rpm)
Wheelbase	3,400 mm (134")	Max. torque	261 N•m / 1,500 min ⁻¹ (193 ft•lbs / 1,500 rpm)
Drum size (dia. x Width)		Tank capacity	
Front	1,620 mm x 550 mm (64" x 22")	Fuel tank	100 liters (26 gal)
Rear	1,620 mm x 1,100 mm (64" x 43")	Hydraulic oil tank	85 liters (22.5 gal)
Performance		Sprinkler tank	680 liters (180 gal)
Travel speed	Low	0 - 8.0 km/h (0 - 5.0 mile/h)	
(forward/reverse)	High	0 - 16.0 km/h (0 - 9.9 mile/h)	

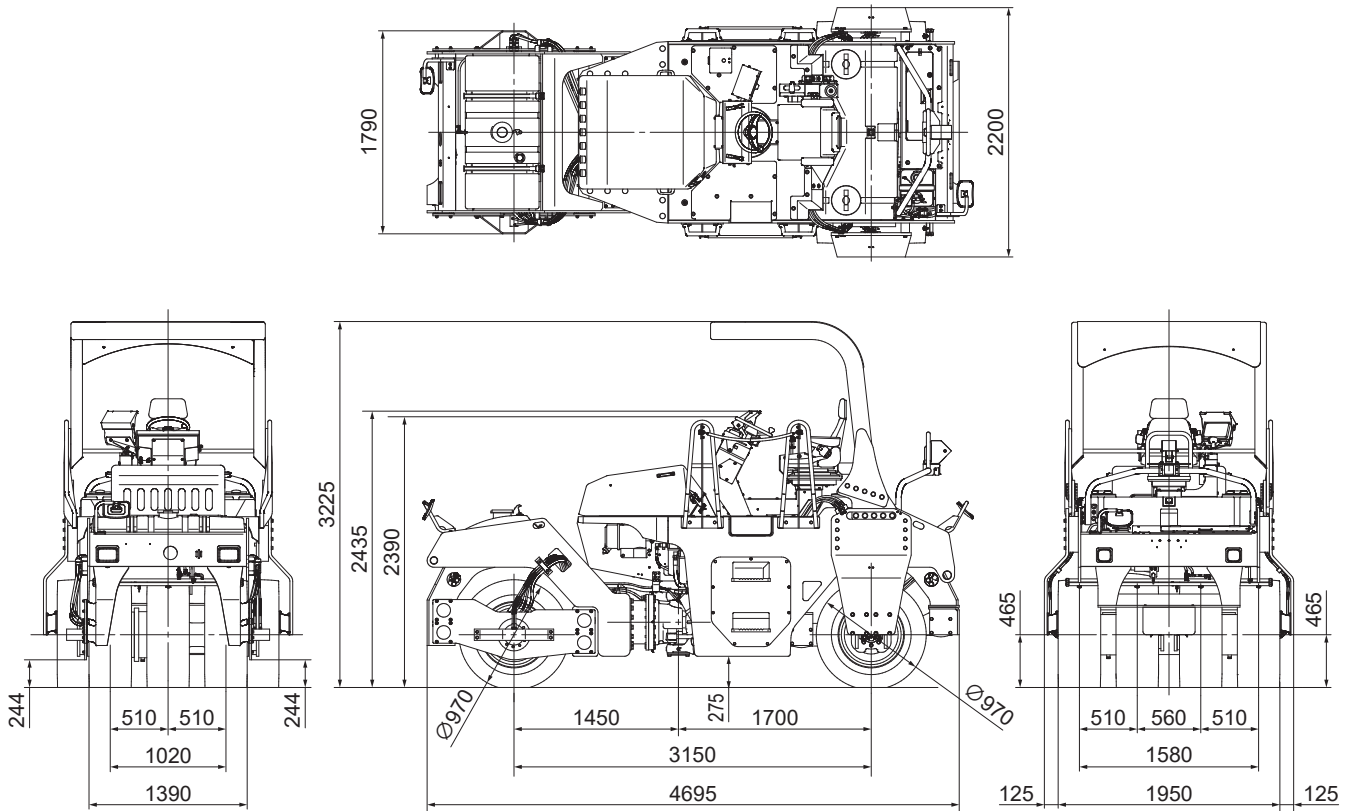
NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

5 OVERVIEW AND SPECIFICATIONS

[GW754 Guardman (with ROPS)]



Weight			
Operating weight	8,890 kg (19,600 lbs)		
On front axle	3,680 kg (8,115 lbs)		
On rear axle	5,210 kg (11,485 lbs)		
Dimension			
Overall length	4,695 mm (185")		
Overall width	2,200 mm (87")		
Overall height	3,225 mm (127")		
Wheelbase	3,150 mm (125")		
Wheel			
Front	Tire × 3		
	14 / 70 - 20 - 12PR		
Rear	Tire × 4		
	14 / 70 - 20 - 12PR		
Performance		1st	2nd
Travel speed		0 - 6 km/h	0 - 12 km/h
(forward/reverse)		(0 - 3.7 mile/h)	(0 - 7.5 mile/h)
Vibrating power			
Centrifugal force	1st 8 kN (1,800 lbs)	3rd 42 kN (9,440 lbs)	
	2nd 25 kN (5,620 lbs)	4th 58 kN (13,040 lbs)	
Gradeability	20 degrees		
Rolling width	1,950 mm (77")		
Minimum turning radius	5.9 m (233")		
Engine			
Model	KUBOTA "V3800-CR-TI-EV03"		
	Diesel Engine with turbo charger		
Total displacement	3.769 liters (230 cu.in)		
Rated output	81.8 kW {110 HP} / 2400min ⁻¹		
Max. torque	379.3 N·m / 1,500 min ⁻¹		
Tank capacity			
Fuel tank	130 liters (34.3 gal)		
Hydraulic oil tank	90 liters (23.8 gal)		
Sprinkler tank	Front 280 liters (74 gal)		
	Rear 450 liters (118.9 gal)		

NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

APPLICABLE MACHINES

- **SW354 Guardman**
- **TW354 Guardman**
- **SW504 Guardman**
- **TW504 Guardman**

2	OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM	B-1
3	OPERATING PROCEDURE	B-10
4	INSPECTION AND MAINTENANCE.....	B-30
5	OVERVIEW AND SPECIFICATIONS.....	B-35

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

The Auto Brake Assist System consists of the following two functions.

1) Auto Brake Assist System

The Auto Brake Assist System (“ABAS”) function uses a Millimeter-wave radar mounted at the rear of the machine to detect objects in the path of the machine when the machine is moving in reverse. When the system determines that the risk of a collision is even greater than when the alarm operates as described in 2), the system activates the ABAS to assist in avoiding the collision or reducing collision damage.

2) Alarms (Include alarm sounds and display alarms)



The alarm functions use a Millimeter-wave radar mounted at the rear of the machine to detect objects on the road when the machine is moving in reverse. If the system determines that there is a high risk of a collision, it will display an alarm and play an alarm sounds to the driver and an alarm sounds to alert the surrounding workers in order to assist the driver and surrounding workers in avoiding the collision.

2.1 Conditions for operating the ABAS and the alarm functions

- The ABAS and alarm functions are activated when the machine is in reverse (when the Forward/reverse lever is in the reverse (R) position).
- *The machine speed that is shown on the display is a reference speed for the Auto Brake Assist System.

The displayed speed may differ from the actual speed of the machine.

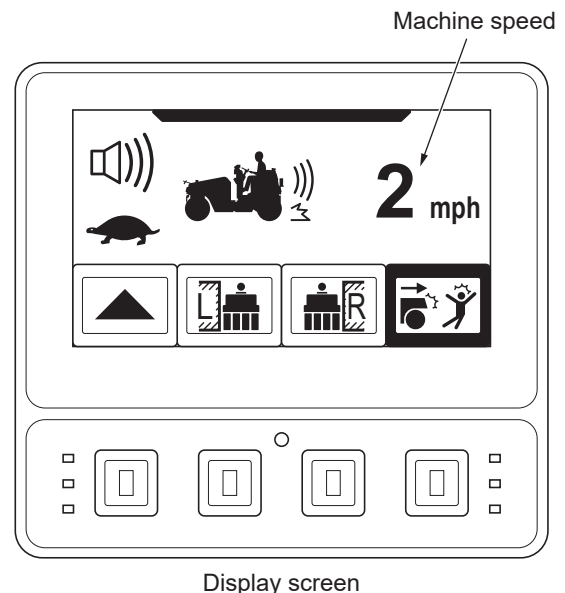
Guardman operating conditions

	SW/TW354, TW504 Guardman	SW504 Guardman
Low speed (1st) 	0 – 7 km/h (0 – 4.3 mile/h)	0 – 7.5 km/h (0 – 4.7 mile/h)
High speed (2nd) 	0 – 10 km/h (0 – 6.2 mile/h)	0 - 10 km/h (0 – 6.2 mile/h)

*The ABAS and alarm functions are activated when within the specification speed.
See “5 OVERVIEW AND SPECIFICATIONS” for details on specification speeds.

*Refer to the instruction manual of the machine being used for the position and details of the Speed shift switch.

*The activation of ABAS reduces the risk of a collision, but the higher the vehicle speed, the longer it takes to stop even if ABAS is activated, and the greater the risk of collision.



2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

2.2 Detection area

		SW/TW354 Guardman	SW/TW504 Guardman
Behind the machine		0.8 to 7 m (2.6 to 23 ft)	0.8 to 7 m (2.6 to 23 ft)
Height from the ground *1		0.8 m (2.6 ft) or more	0.8 m (2.6 ft) or more
Detection width	Normal usage	1.4 m (55 in)	1.4 m (55 in)
	*2	1.2 m (47 in)	1.2 m (47 in)
	*3	1.0 m (39 in)	1.0 m (39 in)

*1 : Objects that are less than 0.8 m (2.6 ft) in height may be detected depending on the color, shape, or other characteristics of the object.

The above values are approximate values and may vary depending on various conditions.

*2 : While operating in left (or right) side wall compaction mode (one side only)

*3 : While operating in left (or right) side wall compaction mode (both sides)

WARNING

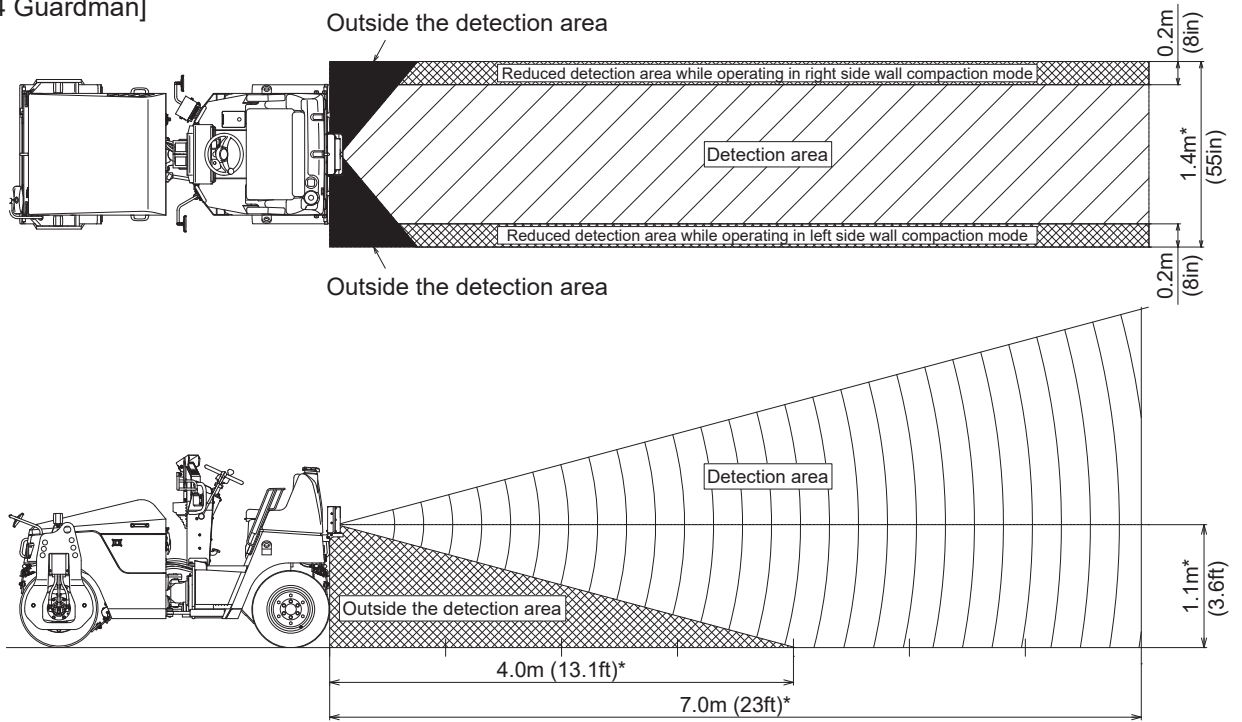
- **There is an area immediately behind the machine that is outside the detection area. If an object is outside the detection area, the object will not be detected. Do not rely solely on the ABAS when driving.**
- **Even if an object is within the detection area, it may not be detected depending on the color, shape, or size of the object, the surrounding environment, or other conditions.**

CAUTION

Depending on the road surface conditions, the surrounding environment, and the color and shape of the object, the object may be detected even if it is outside the detection area.

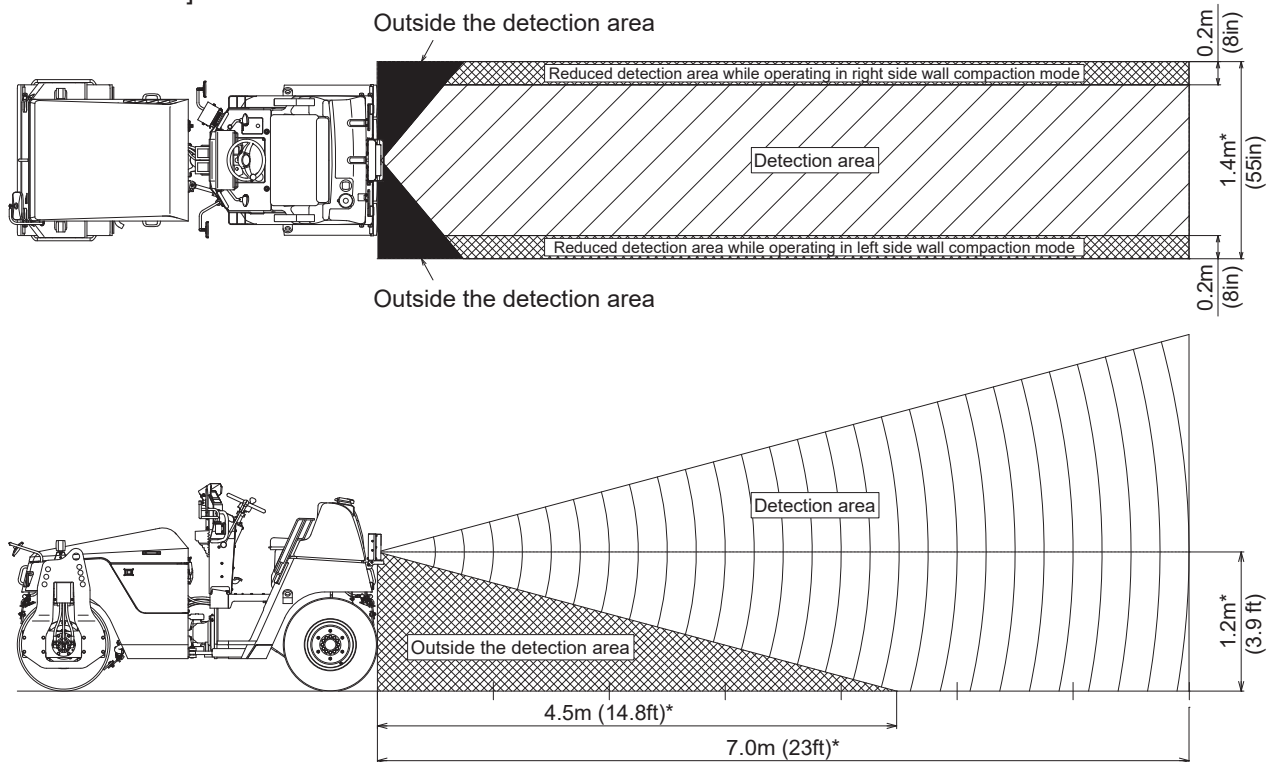
2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

[SW354 Guardman]
[TW354 Guardman]



Note: Values are estimates and may differ depending on various conditions.

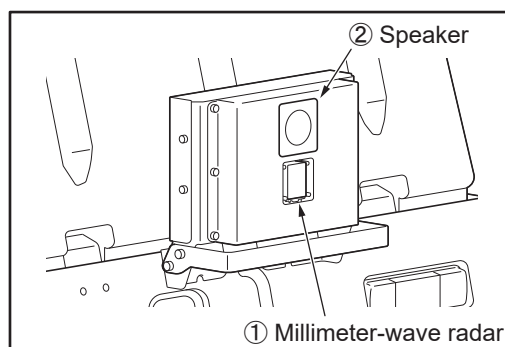
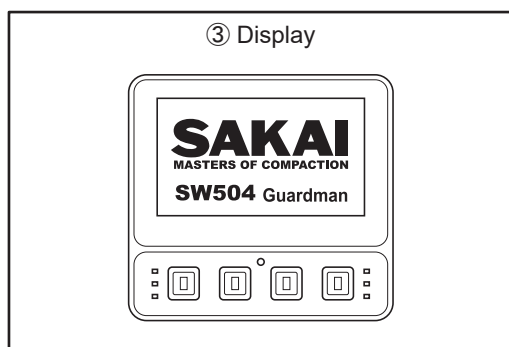
[SW504 Guardman]
[TW504 Guardman]



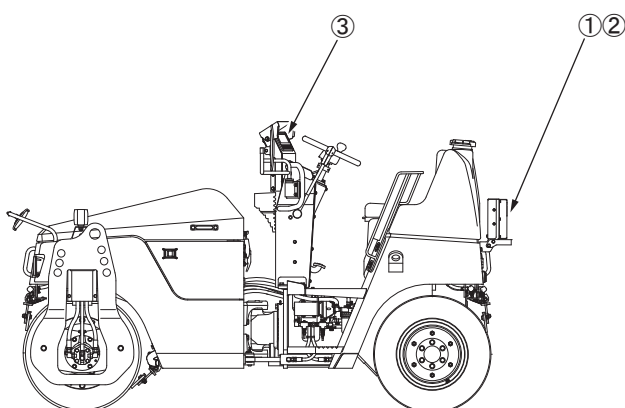
Note: Values are estimates and may differ depending on various conditions.

MEMO

2.3 Names and functions of each part of the ABAS



[SW354 Guardman]
[TW354 Guardman]
[SW504 Guardman]
[TW504 Guardman]



① Millimeter-wave radar

Detects the presence or absence of objects behind the machine.

② Speakers

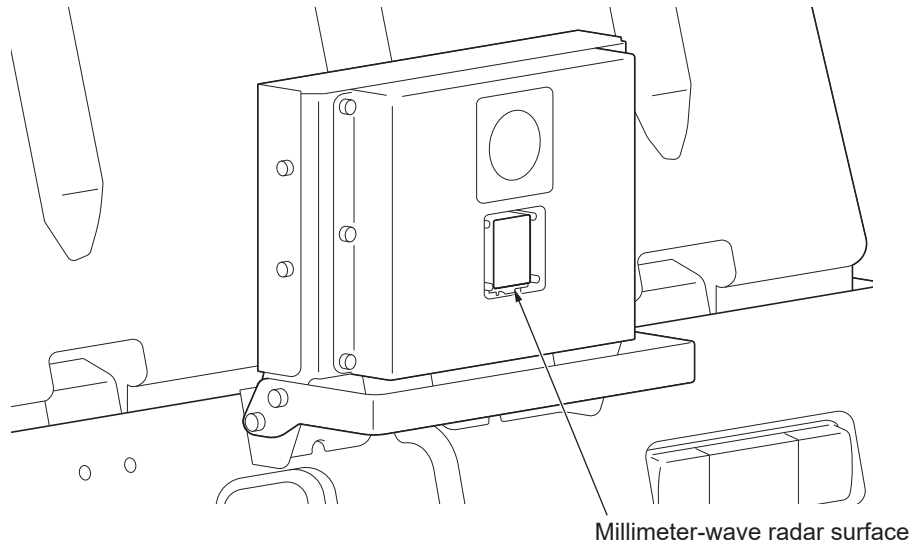
Play an alarm sound to the driver and workers behind the machine.

③ Display

- Contains various operation buttons such as the on/off button for the Auto Brake Assist System functions.
- Displays various alarms.
- Displays the machine speed.

2.4 Handling the Millimeter-wave radar

The Millimeter-wave radar is installed at the rear of the machine. Observe the following points to use the Millimeter-wave radar safely.



⚠ WARNING

- Keep the surface of the Millimeter-wave radar clean and free of dirt and water droplets.
Cleaning method: Gently wipe off any dirt and water droplets on the surface using a cotton swab or a clean, soft cloth such as gauze.
- When using a high pressure washer, do not spray water directly on the Millimeter-wave radar as this will cause it to fail.
- Do not allow the Millimeter-wave radar or the surrounding area where the Millimeter-wave radar is mounted to be struck strongly.
If the part where the Millimeter-wave radar is mounted is damaged due to an accident, contact your dealer.
- Do not remove or disassemble the Millimeter-wave radar. Also, do not change the mounting method.

⚠ WARNING

- Do not attach any films or stickers (including transparent types) to the surface of the Millimeter-wave radar.
- Do not attempt any repairs by yourself as this is dangerous. In the unlikely event that you see smoke coming from the Millimeter-wave radar, immediately stop using it and request repairs from your dealer.

■ **Environmental conditions**

Avoid long-term storage in locations with high temperatures, high humidity, condensation, or corrosive gases.

■ **Radio Regulatory Compliance**

For Japan

Millimeter Wave Radar complies with the Japanese Radio Law.

Do not erase the millimeter wave radar printout as it is proof of compliance.

Do not modify millimeter wave radar.

Modification will invalidate the certification number.



For USA

Contains Part 95 Vehicular Radar Systems
FCC ID: 2A3MR-OSA-79G-AL



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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

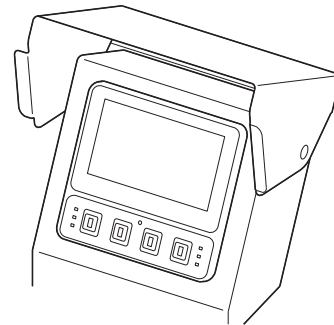
NOTICE

Millimeter wave radar should never be taken outside of Japan and the U.S., where it complies with radio laws.

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM

2.5 Names and functions of the parts of the display

The display is located in front of the driver's seat.



Display with front cover open

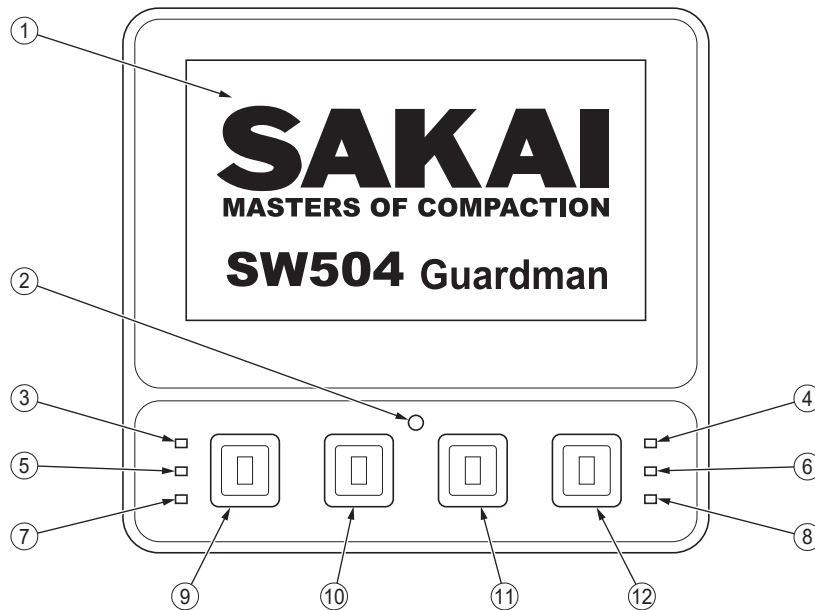
NOTICE

Open the front cover of the display before using it.

The cover will stay open at the position you set it.

Adjust the angle of the cover so that the display screen is easy to see.

2 OVERVIEW OF THE AUTO BRAKE ASSIST SYSTEM



① Display screen

② Light-receiving part of brightness adjustment sensor
Detects ambient brightness.

③ ④ LED indicator lamps (green)
Green LED: Indicates that the ABAS and alarm functions are on.

⑤ ⑥ LED indicator lamps (orange)
Flashing orange LED: Indicates that the alarm mode is on.

⑦ ⑧ LED indicator lamps (red)
Red LED: Indicates that an error has occurred in the ABAS and alarm functions.

⑨ to ⑫ buttons
Each button has different functions. For details, see “3. OPERATING PROCEDURE”.

⚠ CAUTION

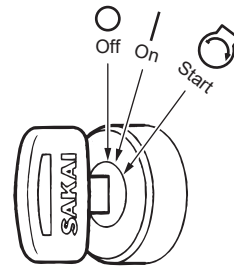
- ① **Keep the display screen (glass surface) clean.**
- ② **Do not cover the light-receiving part of the brightness adjustment sensor with a cloth. Also, keep the light-receiving part clean.**
When the screen brightness is set automatically by the brightness adjustment sensor, the screen may become difficult to see if the brightness adjustment sensor does not correctly recognize the surrounding environment.

3 OPERATING PROCEDURE

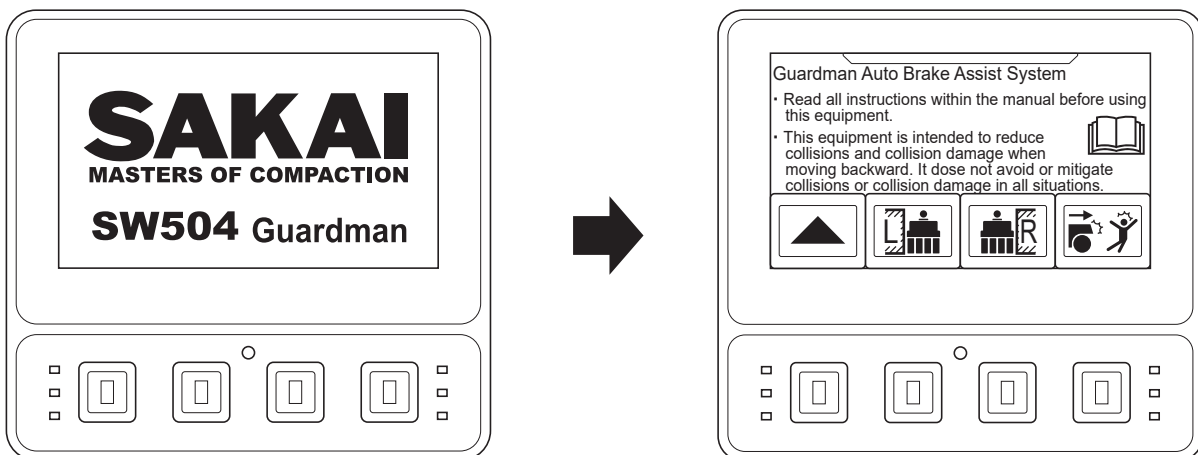
3.1 Turning on the Auto Brake Assist System

When the Starter switch of the machine is turned to the on position, the Auto Brake Assist System (“ABAS”) automatically starts to turn on.

*Refer to the instruction manual of the machine being used for the position and details of the Starter switch.



When the engine is started, the ABAS system is activated, and when the LED turns green, ABAS is ready for operation.



⚠ WARNING

When the engine is started, the ABAS system is automatically activated. When the LED turn green, ABAS is ready for operation. Do not operate the machine until the Millimeter-wave radar startup check has finished.

NOTICE

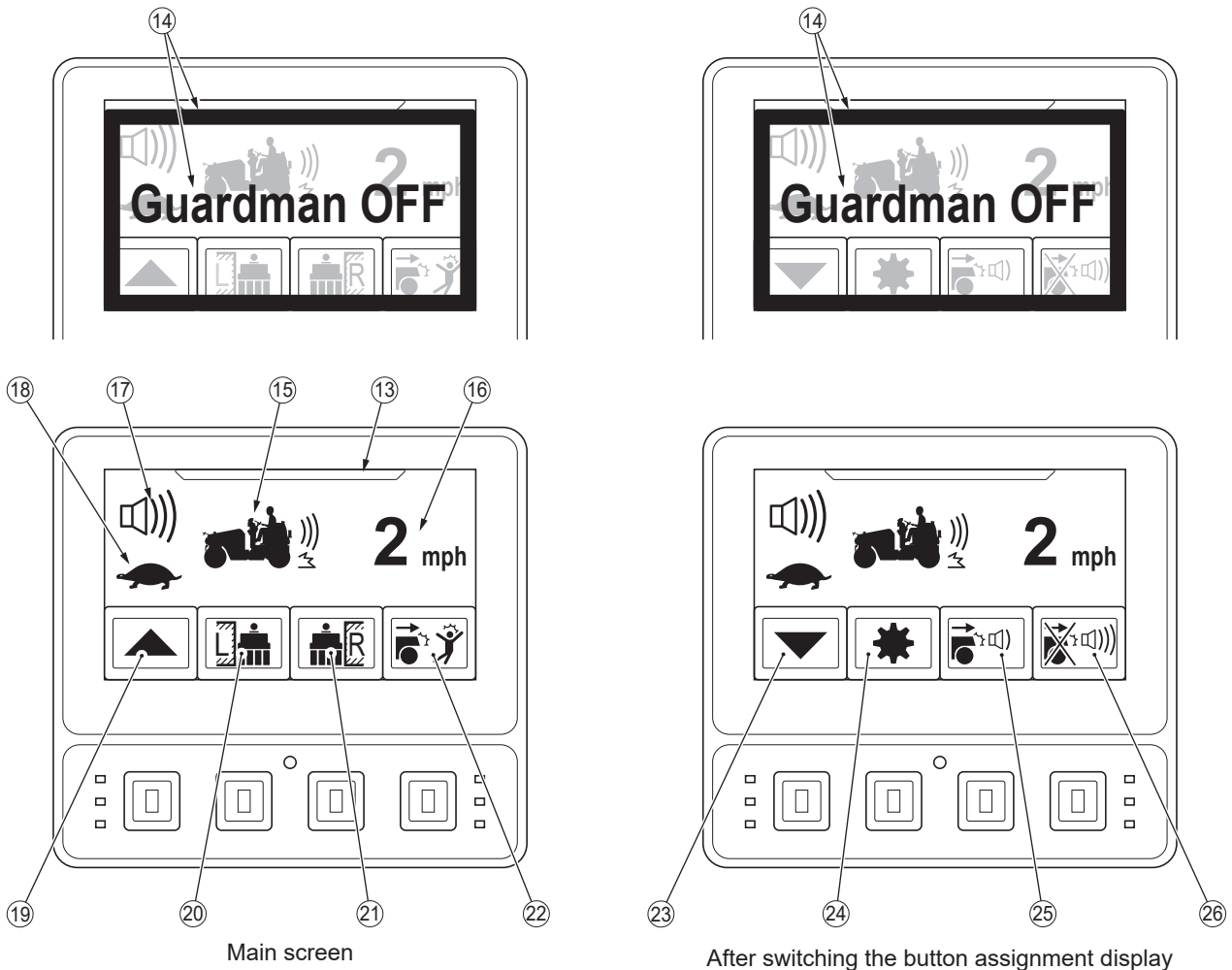
- After stopping the engine, wait about 30 seconds before immediately restarting the engine again.
- The ABAS may restart when the Starter switch of the machine is turned to the on position and then to the start position.

3.2 Turning off the ABAS

When the Starter switch of the machine is turned to the off position, the engine stops and the ABAS also turns off.

3 OPERATING PROCEDURE

3.3 Contents of the display screen



⑬ Operating status display line

Displays the operating status of the ABAS and alarm functions.

- Green : Indicates that the ABAS and alarm functions are turned on.
- Off : Indicates that the ABAS and alarm functions are turned off.

⑭ Guardman OFF display

When the ABAS and alarm functions are turned off, Guardman OFF is displayed in a red frame.



⑮ Auto Brake Assist System ON/OFF display

Displays the operating status of the ABAS.

- Orange : Indicates that the ABAS is turned on.
- Gray : Indicates that the ABAS is turned off.



⑯ Display of machine speed

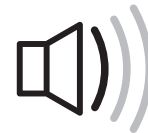
- White : Displays the machine speed.
- Off : When the machine speed cannot be detected due to a malfunction of the speed sensor or other reason.

NOTICE

The displayed machine speed is the speed used to control the ABAS and may differ from the actual machine speed.



⑰ Speaker low display

The two lines are gray when the speaker low mode is turned on.



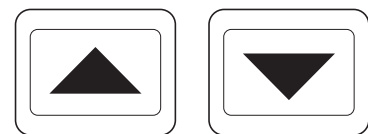
⑱ Speed stage display

Displays the speed stage selected with the shift switch.

- Low speed stage :  is displayed.
- High speed stage :  is displayed.

⑲ ⑳ Button assignment display switch mark

Gray : When the button assignment display can be switched.



Button assignment display switch mark

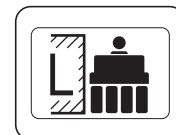
㉑ Left side wall compaction mode mark

Orange: When the left side wall compaction mode is turned on.

Gray : When the left side wall compaction mode is turned off.

Orange frame, gray illustration:

When the left side wall compaction mode is automatically turned off.



Left side wall compaction mode mark

3 OPERATING PROCEDURE

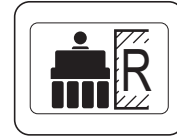
⑳ Right side wall compaction mode mark

Orange: When the Right side wall compaction mode is turned on.

Gray : When the Right side wall compaction mode is turned off.

Orange frame, gray illustration:

When the Right side wall compaction mode is automatically turned off.



Right side wall compaction mode mark

㉑ Auto Brake Assist System on/off mark

Orange: When the ABAS and alarm functions are on.

Gray : When the ABAS and alarm functions are manually turned off.

Orange frame, gray illustration:

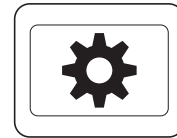
When the ABAS and alarm functions are automatically turned off.



Auto Brake Assist System on/off mark

㉒ Brightness setting mark

Gray : When the brightness setting can be changed.



Brightness setting mark

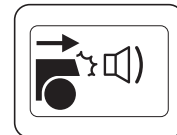
㉓ Speaker low mode mark

Orange: When the speaker low mode is turned on.

Gray : When the speaker low mode is turned off.

Orange frame, gray illustration:

When the speaker low mode is automatically turned off.



Speaker low mode mark

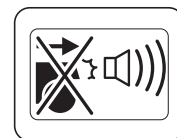
㉔ Alarm mode mark

Orange: When the alarm mode is turned on.

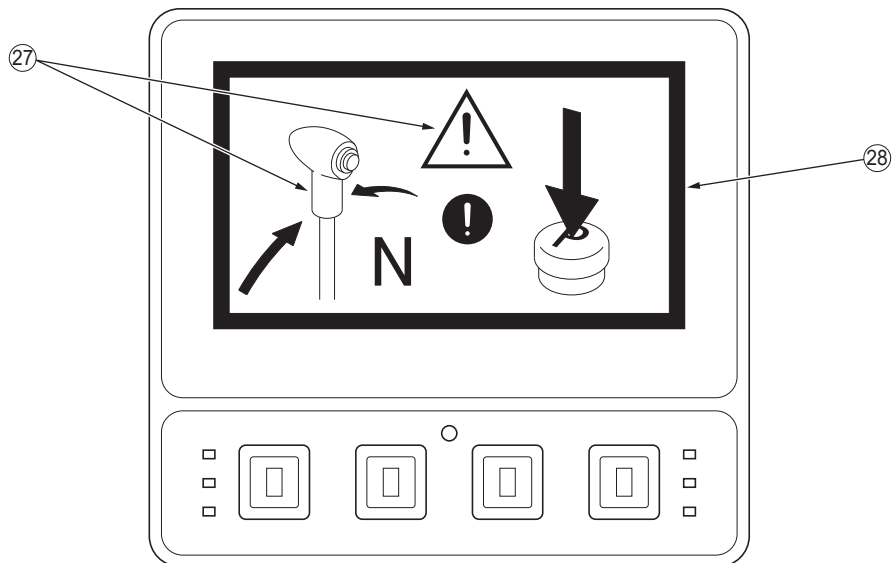
Gray : When the alarm mode is turned off.

Orange frame, gray text:

When the alarm mode is automatically turned off.



Alarm mode mark

Alarm screen example**②⑦ Alarm display**

Various symbols and illustrations are displayed depending on the situation, and the display lights up or flashes.

②⑧ Outer frame

The Outer frame is displayed in various colors depending on the situation, and the frame lights up or flashes.

For details on the contents of the Alarm display, see “3.13 Alarm list (when an object is detected) and response actions.”

3 OPERATING PROCEDURE

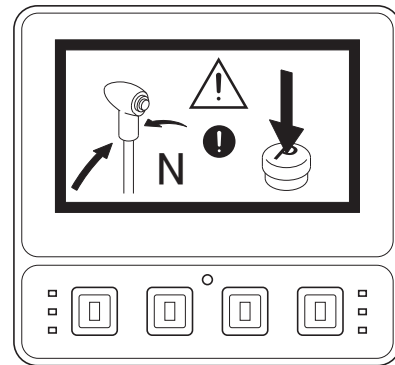
3.4 Procedure for releasing the ABAS after activation

When the ABAS has activated, the screen will show you how to release the ABAS.

The ABAS can be released using the following procedure.

- 1) Return the Forward/reverse lever to Neutral (N).
- 2) Press the Parking brake switch.

After performing the above steps, the ABAS function will be ON and ready to operate.



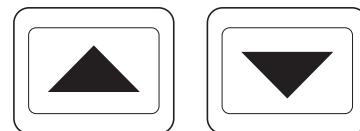
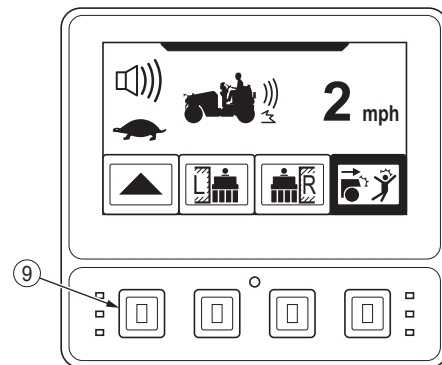
NOTICE

On the screen, the Neutral (N) position is indicated by “N” and the Parking brake switch is indicated by “P”.

* Refer to the instruction manual for the machine being used for the locations of the Forward/reverse lever and parking brake switch.

3.5 Switching the button assignment display

When the Button assignment display switch mark is displayed, the button assignment display can be switched by pressing the ⑨ “Button assignment display switch” button on the display.



Button assignment display switch mark

3.6 Left side wall compaction mode

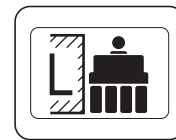
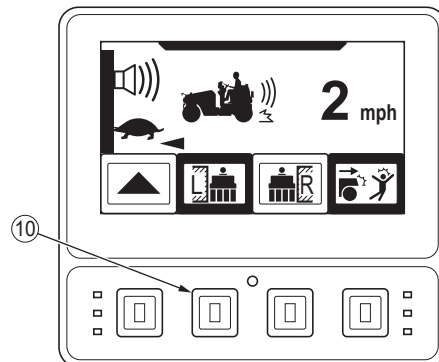
The left side wall compaction mode can be used when the ABAS and alarm functions are turned on, or when the alarm mode is turned on.

When the Left side wall compaction mode mark is displayed, press the ⑩ “Left side wall compaction mode” button on the display to switch the left side wall compaction mode on and off.

Orange: When the left side wall compaction mode is turned on.

Gray : When the left side wall compaction mode is turned off.

Orange frame, gray illustration:
When the left side wall compaction mode is automatically turned off.



Left side wall compaction mode mark

⚠ WARNING

When using the left (or right) side wall compaction mode, the detection width will be narrowed, so be careful of the surrounding environment.

3 OPERATING PROCEDURE

3.7 Right side wall compaction mode

The Right side wall compaction mode can be used when the ABAS and alarm functions are turned on, or when the alarm mode is turned on.

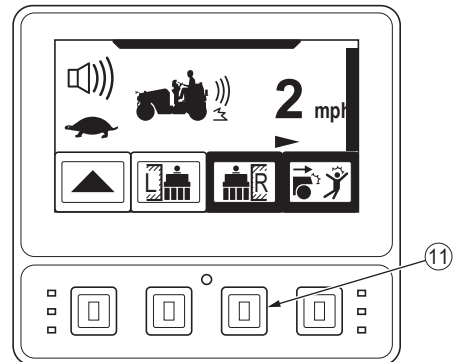
When the Right side wall compaction mode mark is displayed, press the ⑪ “Right side wall compaction mode” button on the display to switch the Right side wall compaction mode on and off.

Orange: When the Right side wall compaction mode is turned on.

Gray : When the Right side wall compaction mode is turned off.

Orange frame, gray illustration:

When the Right side wall compaction mode is automatically turned off.



Right side wall compaction mode mark

⚠ WARNING

When using the left (or right) side wall compaction mode, the detection width will be narrowed, so be careful of the surrounding environment.

NOTICE

Use the side wall compaction mode in the following situations.

- **When the ABAS is activated frequently while compacting close to a structure on the side of the machine.**
- **When there are many detection errors due to the adverse conditions in the surrounding environment.**

3.8 Turning the ABAS and alarm functions on and off.

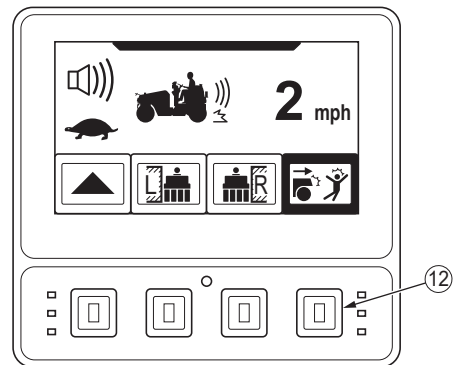
When the Auto Brake Assist System on/off mark is displayed, press the ⑫ “Auto Brake Assist System on/off” button on the display to switch between the on and off states of the Auto Brake Assist System and alarm functions.

Orange: When the ABAS and alarm functions are on.

Gray : When the ABAS and alarm functions are off.

Orange frame, gray illustration:

When the ABAS and alarm functions are automatically turned off.



Auto Brake Assist System on/off mark

⚠ WARNING

Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

NOTICE

Turn off the ABAS and alarm functions, or turn on the alarm mode in the following situations.

- **When compacting close to a structure located behind the machine.**
- **When loading and unloading to and from trucks, trains, ships, etc.**
- **When the machine is unstable due to an accident or breakdown.**
- **When there are many detection errors due to the adverse conditions in the surrounding environment.**
- **When driving on steep slope.**

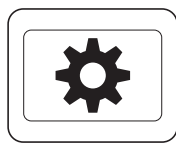
3.9 Setting the display brightness

There are two modes available for setting the display brightness: Automatic and Manual. When delivered, the product is set by default to Automatic mode.

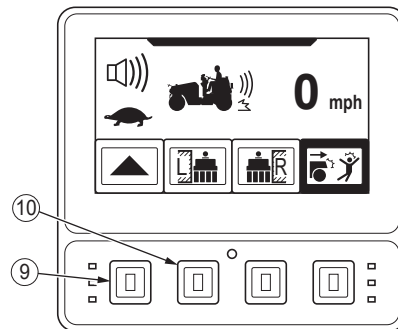
Setting the Automatic mode

The procedure for setting the Automatic mode is as follows.

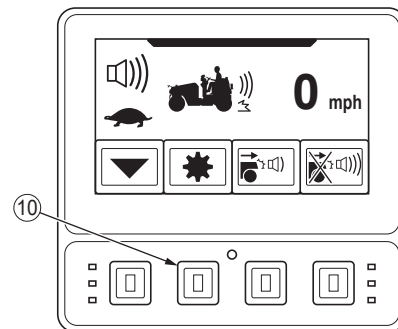
- 1) On the main screen, press the ⑨ “Switch button assignment display” button to display the Brightness setting mark.



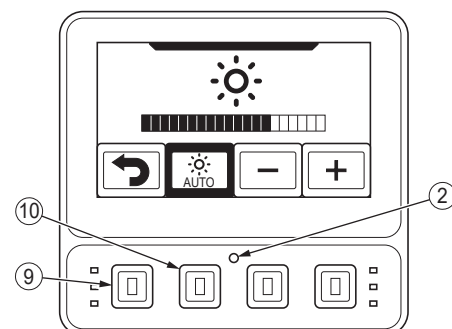
Brightness setting mark



- 2) When the Brightness setting mark is displayed, press the ⑩ “Brightness setting” button.



- 3) When Manual is displayed, press the ⑩ “Switch auto/manual” button. If the frame around Automatic is orange, the display brightness adjustment is set to the Automatic mode.



Brightness adjustment screen

- 4) Press the ⑨ “Close” button to return to the main screen.

* If the machine is moved forward or in reverse while the brightness setting screen is displayed, the display will automatically switch to the main screen after a certain period of time.

⚠ WARNING

Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

⚠ CAUTION

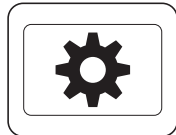
Do not cover the ② light-receiving part of the brightness adjustment sensor with a cloth.
Since the display brightness is adjusted based on data from the brightness adjustment sensor, the visibility of the display may decrease.

3 OPERATING PROCEDURE

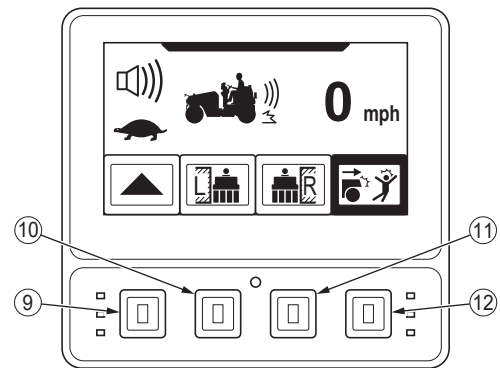
Setting the Manual mode

The procedure for setting the Manual mode is as follows.

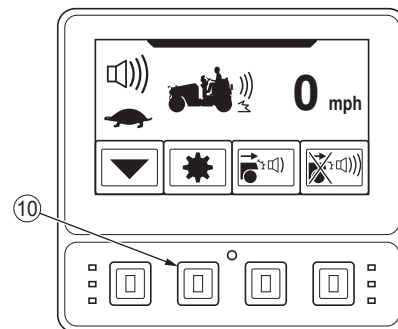
- 1) On the main screen, press the ⑨ “Switch button assignment display” button to display the Brightness setting mark.



Brightness setting mark



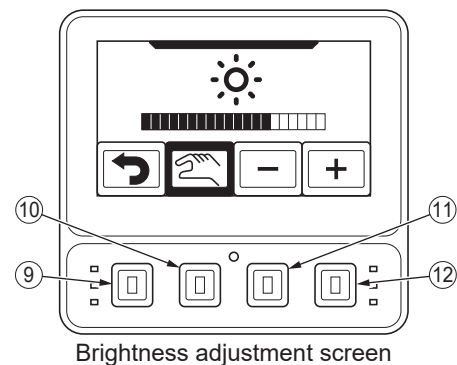
- 2) When the Brightness setting mark is displayed, press the ⑩ “Brightness setting” button.



- 3) When Automatic is displayed, press the ⑩ “Switch auto/manual” button. If the frame around Manual is orange, the display brightness adjustment is set to the Manual mode.

- 4) Press the ⑫ “+” button or ⑪ “-” button to adjust the display brightness.

+: Brighten
-: Darken



- 5) After adjusting the brightness, press the ⑨ “Back” button to return to the main screen.

* If the machine is moved forward or in reverse while the Brightness adjustment screen is displayed, the display will automatically switch to the main screen after a certain period of time.

 WARNING

Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

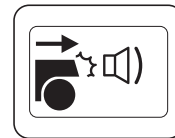
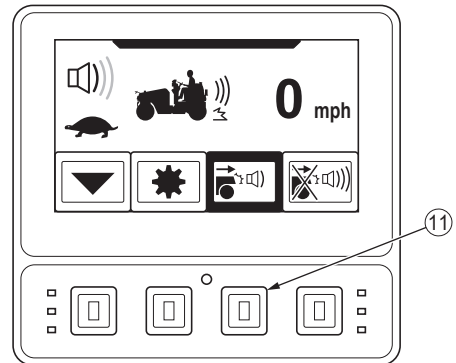
3 OPERATING PROCEDURE

3.10 Speaker low mode

When the Speaker low mode mark is displayed, the speaker volume can be changed by pressing the ⑪ “Speaker low mode” button on the display.

Orange: When the speaker low mode is turned on.

Gray : When the speaker low mode is turned off.



Speaker low mode mark

⚠ WARNING

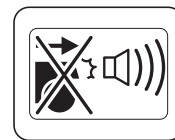
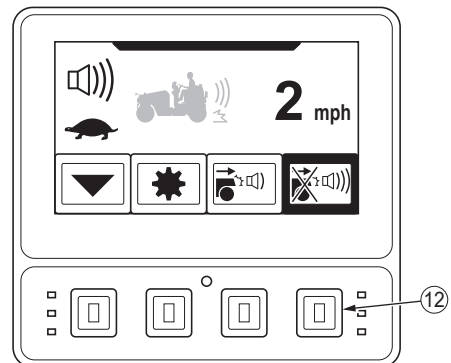
If you must unavoidably use the speaker low mode, pay attention to the safety of the surrounding environment.

3.11 Alarm mode

When the Alarm mode mark is displayed, pressing the ⑫ “Alarm mode” button on the display will switch the alarm mode on and off.

Orange: When the alarm mode is turned on.

Gray : When the alarm mode is turned off.



Alarm mode mark

NOTICE

When the alarm mode is turned on, only the alarm function operates without the ABAS.

⚠ WARNING

- If you must unavoidably use the alarm mode, pay close attention to the safety of the surrounding environment.
- Do not operate or stare at the display while driving as doing so could cause a collision. Be sure to stop the machine in a safe place and press the Parking brake switch to the on position before operating the machine.

NOTICE

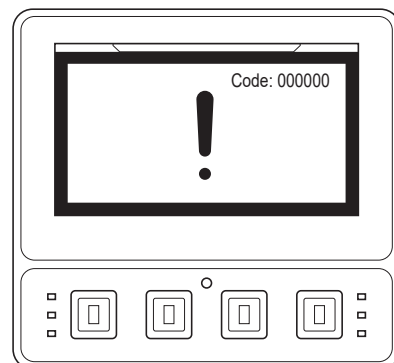
Turn on the alarm mode or turn off the ABAS and alarm functions in the following situations.

- When compacting close to a structure located behind the machine.
- When loading and unloading to and from trucks, trains, ships, etc.
- When the machine is unstable due to an accident or breakdown.
- When there are many detection errors due to the adverse conditions in the surrounding environment.

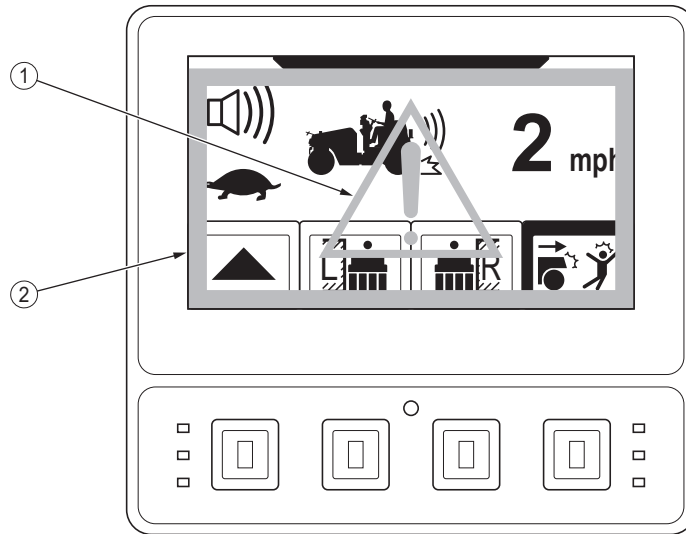
3.12 Error information


An error is displayed on the screen if any abnormality occurs in the ABAS.

Contact your dealers when an error is displayed.

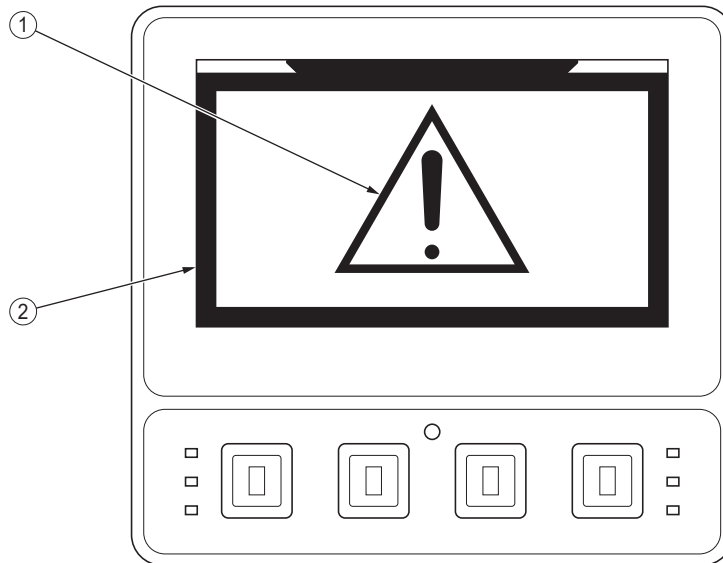



3.13 Alarm list (when an object is detected) and response actions

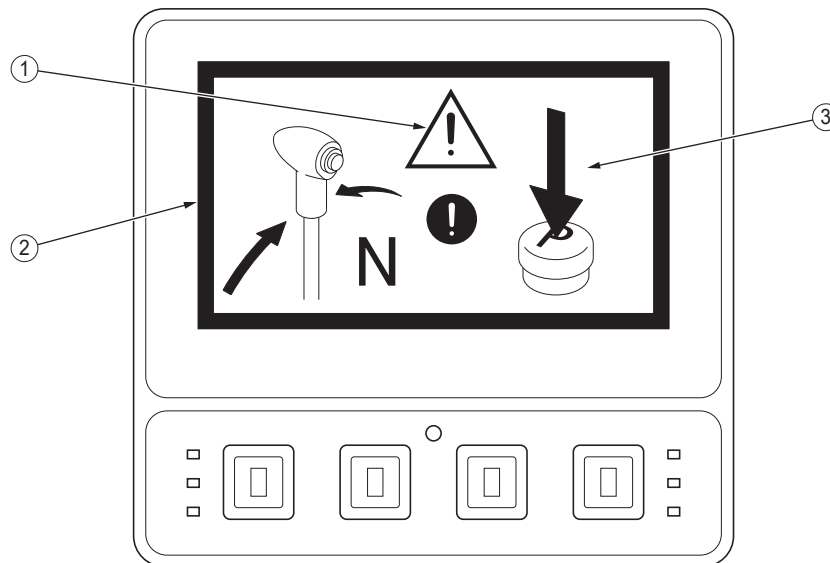



Alarm description	<ul style="list-style-type: none"> • Display: ① “” and ② “Outer frame” are flashing in yellow. • Alarm sound: “Beep beep beep...” sound (Auto Brake Assist System, alarm mode) is played. (Regarding the alarm sound timing, the alarm sound plays when an object is detected, and the sound is repeated while there is a risk of collision.)
State	<ul style="list-style-type: none"> • An object is detected in the detection area and there is a risk of collision. • The ABAS is not activated.
Response action	<ul style="list-style-type: none"> • Check and avoid the danger. Avoidance procedure : ○ Step on the Brake pedal ○ Move the Forward/reverse lever to Neutral (N), or move the lever to Forward (F) after checking the safety of the area ahead of the machine. ○ Stop the machine in a safe place and move the object out of the detection area. • If the alarm symbol is constantly displayed or the alarm sound replayed with no influences from the surrounding environment and no object present, contact your dealer.
Notice	<ul style="list-style-type: none"> • The alarm sound is played from the speaker. • When the ABAS and alarm functions are turned off, the Alarm display will not appear and the alarm sound will not be played.

3 OPERATING PROCEDURE



Alarm description	<ul style="list-style-type: none"> • Display: ① “State	<ul style="list-style-type: none"> • The risk of a collision is determined to be higher than that of the flashing yellow condition (see page B-27). • The ABAS is not activated.
Response action	<ul style="list-style-type: none"> • Check and avoid the danger. Avoidance procedure: Step on the Brake pedal • If the alarm symbol is constantly displayed or the alarm sound replayed with no influences from the surrounding environment and no object present, contact your dealer. 	
Notice	<ul style="list-style-type: none"> • The alarm sound is played from the speaker. • When the ABAS and alarm functions are turned off, the Alarm display will not appear and the alarm sound will not be played. 	



<p>Alarm description</p>	<ul style="list-style-type: none"> • Display: <ul style="list-style-type: none"> ① “” and ② “Outer frame” are lit in red. ③ “Return the Forward/reverse lever to N and press P” animation is displayed. * On the screen, the Neutral (N) position is indicated by “N” and the Parking brake switch is indicated by “P”. • Alarm sound: <ul style="list-style-type: none"> A long “Beep” sound is played. (Regarding the alarm sound timing, the alarm sounds continuously from activation until deactivation of ABAS.)
<p>State</p>	<ul style="list-style-type: none"> • The Auto Brake Assist System has activated and the machine is decelerating or stopping.
<p>Response action</p>	<ul style="list-style-type: none"> • Check and avoid the danger. <ul style="list-style-type: none"> Avoidance procedure: Step on the Brake pedal. • After the machine stops, check the safety of the surrounding environment. • Release the ABAS. <ul style="list-style-type: none"> Release procedure: Return the Forward/reverse lever to Neutral (N) and press the Parking brake switch. • If the ABAS continues to be activated, the alarm symbol is constantly displayed or the alarm sound replayed with no influences from the surrounding environment and no object present, contact your dealer.
<p>Important</p>	<ul style="list-style-type: none"> • By stepping on the Brake pedal after the ABAS is activated, the braking distance is shortened and the possibility of a collision is decreased. • When Guardman ABAS is activated and the machine comes to a sudden stop, the drums and/or tires may shove the asphalt mat or soil and cause cracking.
<p>Notice</p>	<ul style="list-style-type: none"> • After the ABAS is activated, it will not be released even if you turn off the ABAS and alarm functions (see page B-16). It is necessary to follow the procedure for releasing the ABAS after activation. • After the ABAS is activated, the speaker will play a “Beep Beep Beep Beep...” alarm sound until the machine comes to a stop.

4 INSPECTION AND MAINTENANCE

4.1 Inspection before starting work

To be sure the Auto Brake Assist System (“ABAS”) will work properly, it is important to perform a daily inspection before starting work. Perform the following safety checks.

- Is the surface of the Millimeter-wave radar display scratched or dirty?
- Are there any loose bolts and nuts?
- Is the mounting of the equipment damaged or deformed?
- Is there any evidence that something has collided with the equipment?

After checking the above points, start the ABAS and check the display for any error information. Press each operation button and be sure that it works normally.

If nothing is displayed on the display even after starting the engine of the machine, it is possible that the ABAS has failed to start, the system itself has failed, or the display function of the system has failed.

Stop the engine once and start the engine again. If the condition does not improve, contact your dealer.

WARNING

If the ABAS is not maintained or used in an abnormal state, the ABAS may not operate properly and could lead to an accident.

4.2 Maintenance

- Regularly check the surface of the Millimeter-wave radar display for dirt and scratches.
- If the Millimeter-wave radar surface is stained by water or oil, it will affect the performance of the object detection. Be sure to wipe the surface clean.
- Gently wipe the water or oil off the surface using a cotton swab or a clean, soft cloth such as gauze.

WARNING

Do not disassemble the ABAS. The system may not perform properly if the mounting position is different, and this could also lead to failures, detection errors, or malfunctions.

4.3 Inspecting the parking brake

Every 500 hours or 3 months, or each time after brake pedal is used.

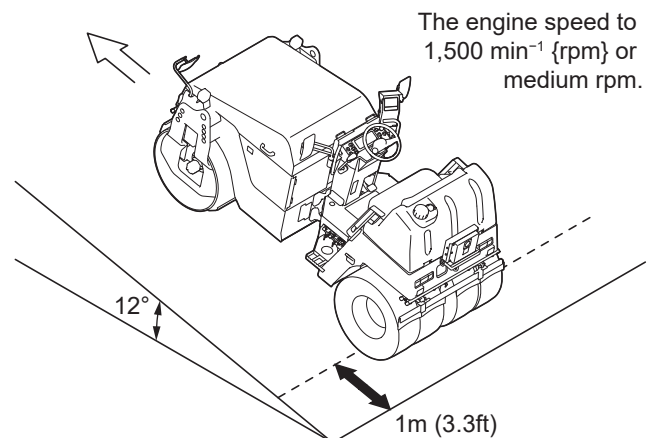
This inspection should also be performed when the ABAS is activated. If the inspection is not performed, the Parking brake may not function properly and a serious accident could occur.

⚠ WARNING

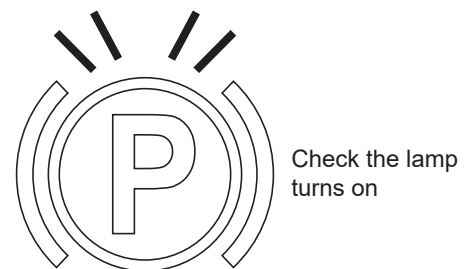
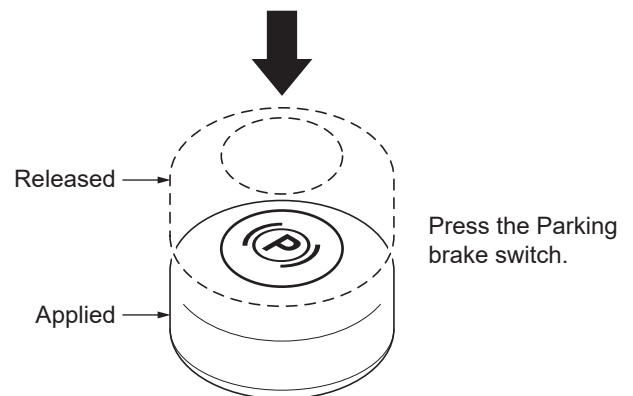
- Make sure there are no people or obstacles near the machine to ensure safety.
- Keep your hands on the F-N-R lever and the Steering wheel during this inspection. The machine may move unexpectedly during the inspection, which may lead to accidents.

1) Adjust the engine speed to $1,500 \text{ min}^{-1}$ {rpm} or medium rpm.

2) With the engine running, move the machine upward by 12° (20%) (slope with upward inclination of 12°) on a hard surface such as asphalt pavement.



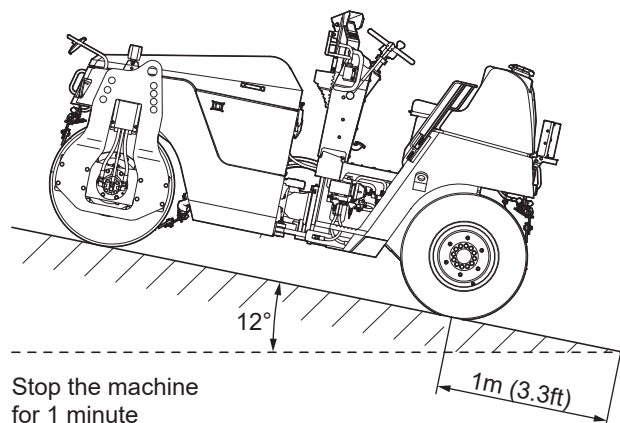
3) Press the Parking brake switch (P) to engage the parking brake. Check that the Parking brake indicator lamp (P) turns on. If the lamp (P) does not turn on, contact your dealer.



Parking brake indicator lamp

4 INSPECTION AND MAINTENANCE

- 4) Remain seated to make sure the machine remains completely still for 1 minute. If it moves, move it immediately to a flat ground, stop using it, contact your dealer, and have it repaired.



⚠ WARNING

- This inspection should be performed each time the Brake pedal is used. If not inspected, the Parking brake may malfunction the next time when you try to use it, resulting in a serious accident.
- Modify the machine.
Please do not modify the machine without the permission for safety reasons. We are not responsible for injuries, death or breakdowns caused by the modifications.

4.4 Fuses

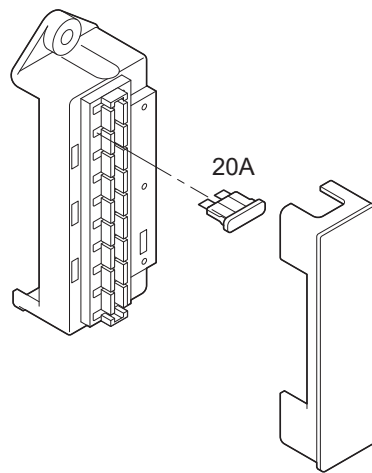
⚠ WARNING

When changing a fuse, turn off the power supply by turning the Starter switch to the OFF position.

Changing fuses without turning off the power supply may cause a fire, a electric shock or malfunction.

Refer to the instruction manual for the machine being used for the installation location of the fuse box.

[SW354 Guardman]
[TW354 Guardman]
[SW504 Guardman]
[TW504 Guardman]



- The ABAS uses fuses that are located where it is labeled Guardman.
- Change any fuse which has become powder-coated due to deterioration or where the fuse is loose in the fuse holder.
- Remove cover and replace the fuse.
- Be sure to use fuses of correct capacity.
- Always use genuine fuses.

⚠ WARNING

- **If a fuse blows, the ABAS will not operate.**
- **When replacing the fuses, be sure to replace them with fuses of the same capacity. Using a fuse that exceeds the specified capacity may cause a fire or malfunction.**

NOTICE

When a fuse blows, investigate the cause before replacing it.

4.5 Storage

WARNING

When storing the machine, wipe the area around the Millimeter-wave radar with a clean, soft cloth, dry it thoroughly, and then cover it with the Millimeter-wave radar cover that comes with ABAS.

4.6 Regular inspections

WARNING

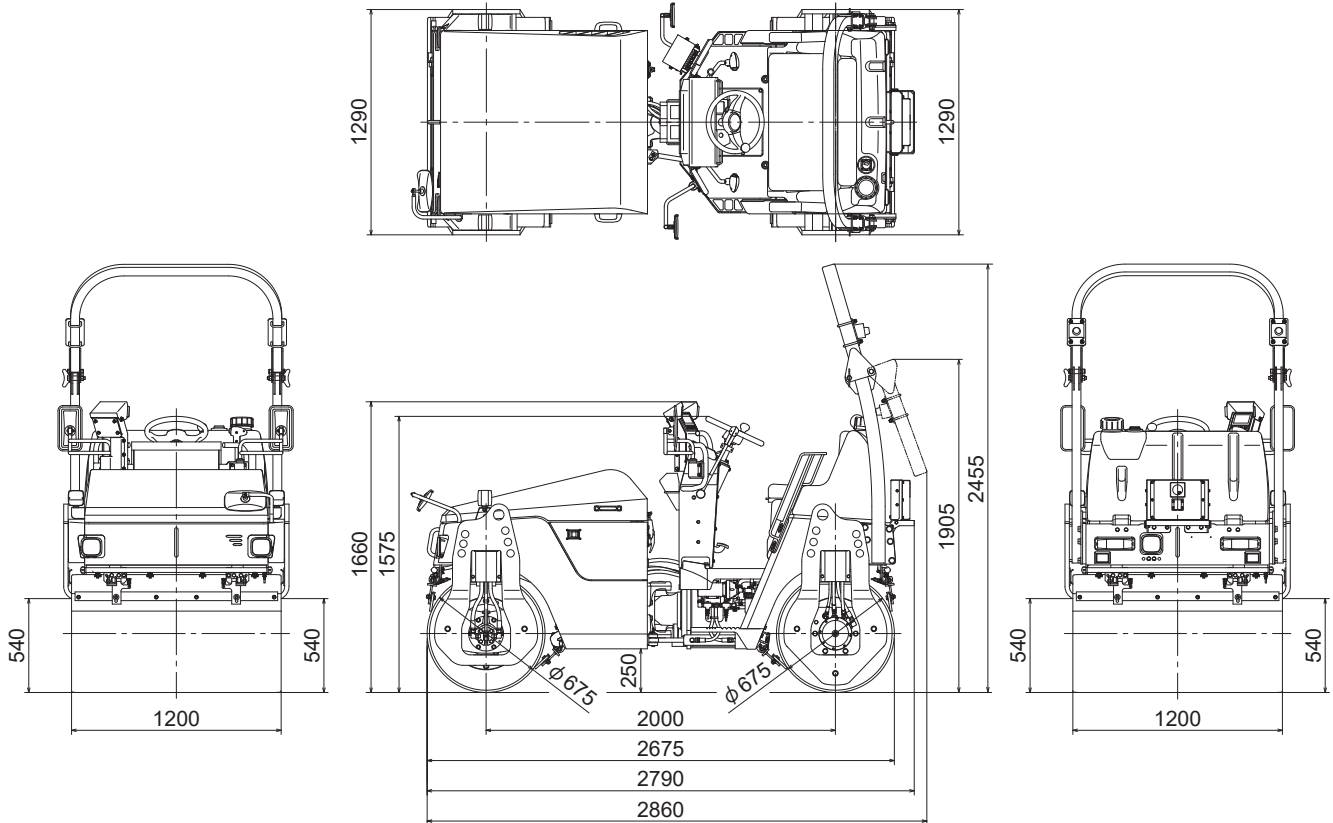
In order to ensure safety, ask your dealer to inspect and perform maintenance on the system once a year.

4.7 Warranty, disclaimer

- The product warranty varies depending on the country, please check with the local SAKAI dealer.
Contact your dealer if a failure occurs under normal operating conditions within this warranty period.
However, if “4.6 Regular inspections” is not performed, the warranty is not applicable.
- If you disassemble the ABAS, the warranty will be voided and the system will not be covered.
- Our company is not responsible for any personal injury, damage to property, or malfunctions caused by a disassembled or modified ABAS or use of the system under abnormal conditions.
- Our company is not responsible for any damage to the road surface caused by the activation of the ABAS.
- The purpose of the ABAS is to assist in avoiding collisions when the machine is reversing or to reduce collision damage, but the system does not avoid collisions or reduce collision damage in all situations. Our company is not responsible for accidents resulting in injury or property damage that occur when the ABAS does not activate or when a collision cannot be avoided even when the ABAS does activate.

5 OVERVIEW AND SPECIFICATIONS

[SW354 Guardman (with ROPS)]



Weight		Performance	
Operating weight	2,990 kg (6,595 lbs)	Vibration system	
On front axle	1,480 kg (3,265 lbs)	Frequency	66.7 Hz (4,000 vpm)
On rear axle	1,510 kg (3,330 lbs)	Centrifugal force	29.0 kN (6,520 lbs)
Dimension		Gradeability	21 degrees
Overall length	2,790 mm (110")	Compaction width	1,200 mm (47")
Overall width	1,290 mm (51")	Minimum turning radius	3.8 m (150")
Overall height	2,455 mm (97")	Engine	
Wheelbase	2,000 mm (79")	Model	KUBOTA "D1703-M-DI-EF03"
Wheel			Diesel Engine
Front	Roll (dia. x width)	Total displacement	1.647 liters (100.5 cu.in)
	675 mm x 1,200 mm (27" x 47")	Rated output	18.2 kW / 2,200 min ⁻¹
Rear	Roll (dia. x width)		(24 HP / 2,200 rpm)
	675 mm x 1,200 mm (27" x 47")	Max. torque	96 N•m / 1,500 min ⁻¹
Performance			(71 ft•lbs / 1,500 rpm)
Travel speed		Tank capacity	
(forward/reverse)		Fuel tank	40 liters (10.6 gal)
Low	0 - 7 km/h (0 - 4.3 mile/h)	Hydraulic oil tank	43 liters (11.4 gal)
High	0 - 10 km/h (0 - 6.2 mile/h)	Sprinkler tank	200 liters (52.8 gal)

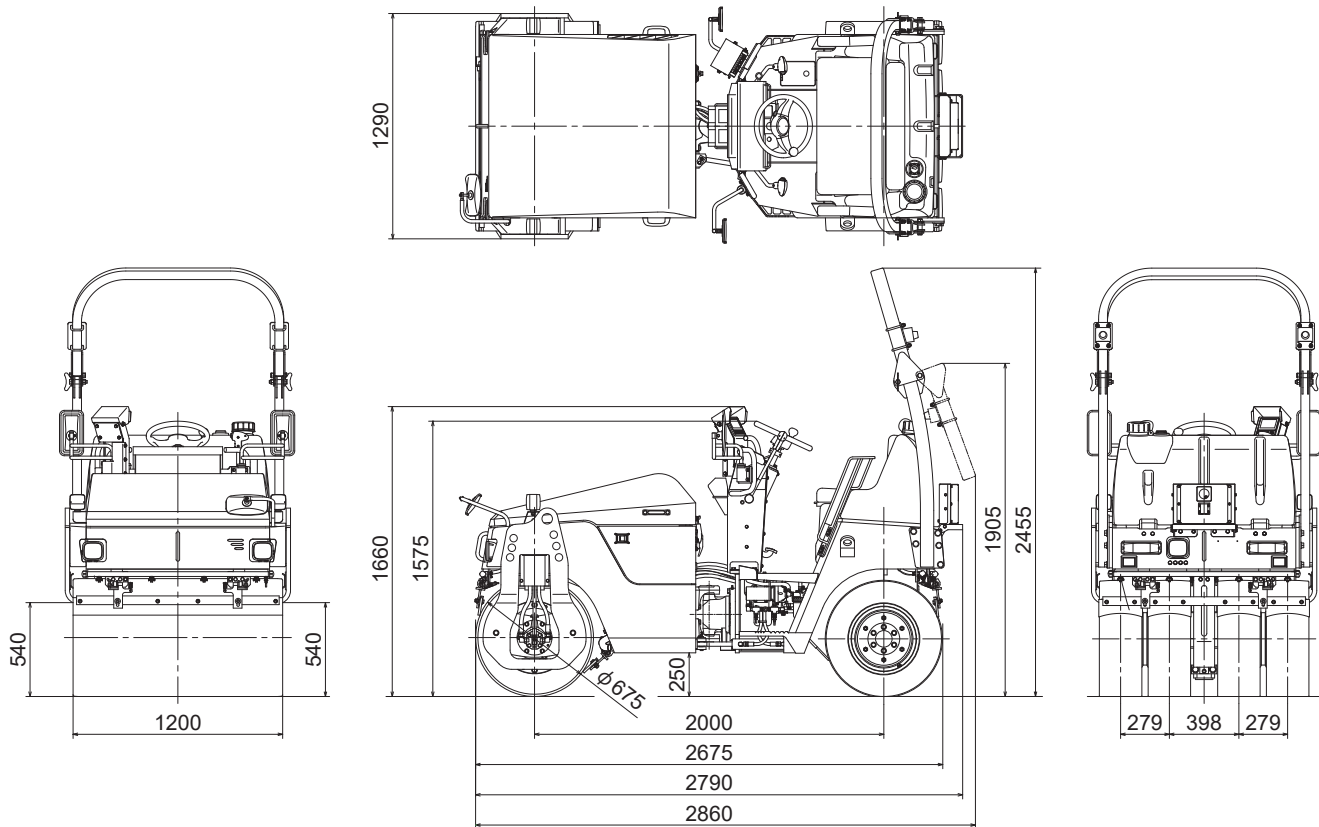
NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

5 OVERVIEW AND SPECIFICATIONS

[TW354 Guardman (with ROPS)]



Weight		Performance	
Operating weight	2,690 kg (5,935 lbs)	Vibration system	
On front axle	1,480 kg (3,265 lbs)	Frequency	52 Hz (3,120 vpm)
On rear axle	1,210 kg (2,670 lbs)	Centrifugal force	20.6 kN (4,630 lbs)
Dimension		Gradeability	21 degrees
Overall length	2,790 mm (110")	Compaction width	1,200 mm (47")
Overall width	1,290 mm (51")	Minimum turning radius	3.8 m (150")
Overall height	2,455 mm (97")	Engine	
Wheelbase	2,000 mm (79")	Model	KUBOTA "D1703-M-DI-EF03"
Wheel		Diesel Engine	
Front	Roll (dia. x width)	Total displacement	1.647 liters (100.5 cu.in)
	675 mm x 1,200 mm (27" x 47")	Rated output	18.2 kW / 2,200 min ⁻¹
Rear	Tire		(24 HP / 2,200 rpm)
	9.5 / 65 - 15 - 6PR	Max. torque	96 N•m / 1,500 min ⁻¹
			(71 ft•lbs / 1,500 rpm)
Performance		Tank capacity	
Travel speed		Fuel tank	40 liters (10.6 gal)
(forward/reverse)		Hydraulic oil tank	43 liters (11.4 gal)
Low	0 - 7 km/h (0 - 4.3 mile/h)	Sprinkler tank	200 liters (52.8 gal)
High	0 - 10 km/h (0 - 6.2 mile/h)	Liquid tank	10 liters (2.6 gal)

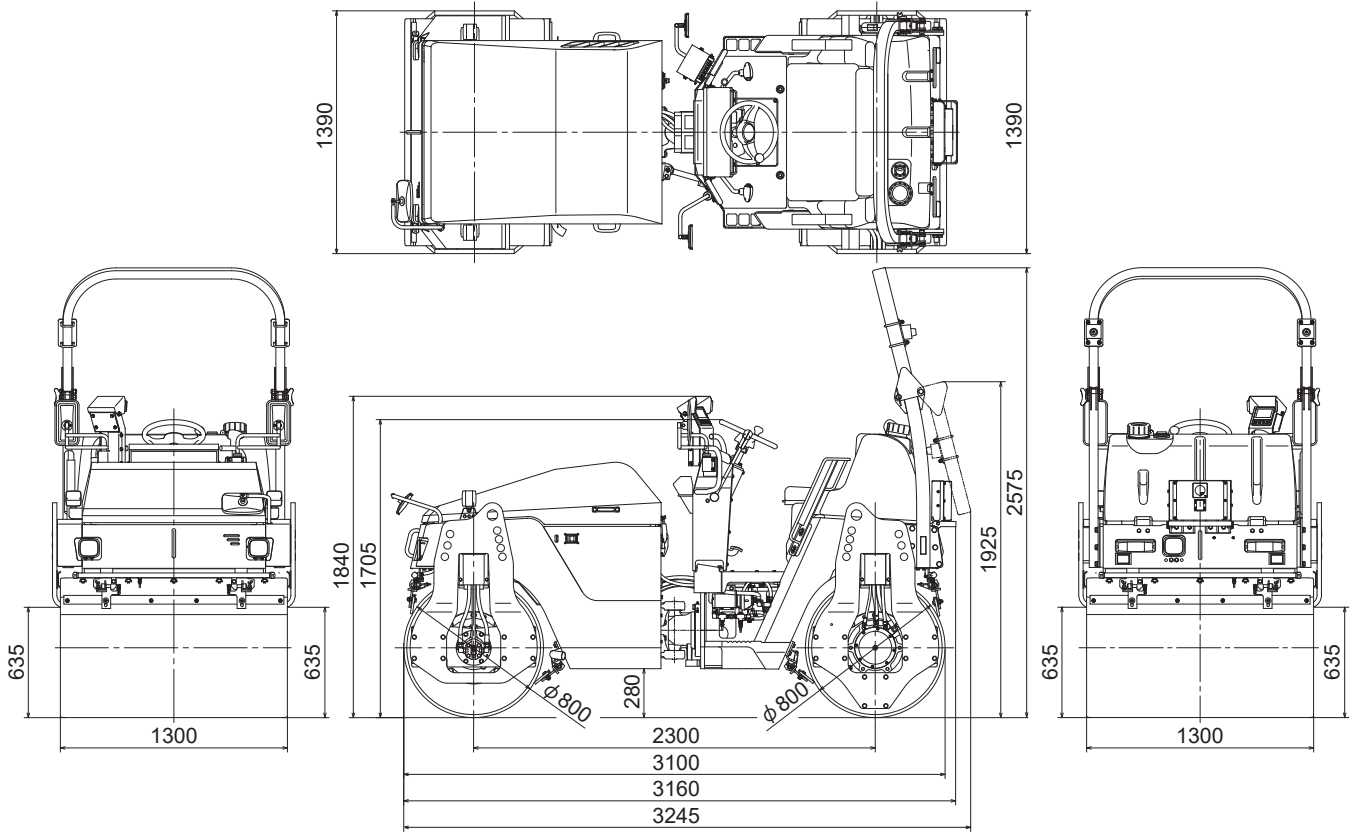
NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

5 OVERVIEW AND SPECIFICATIONS

[SW504 Guardman (with ROPS)]

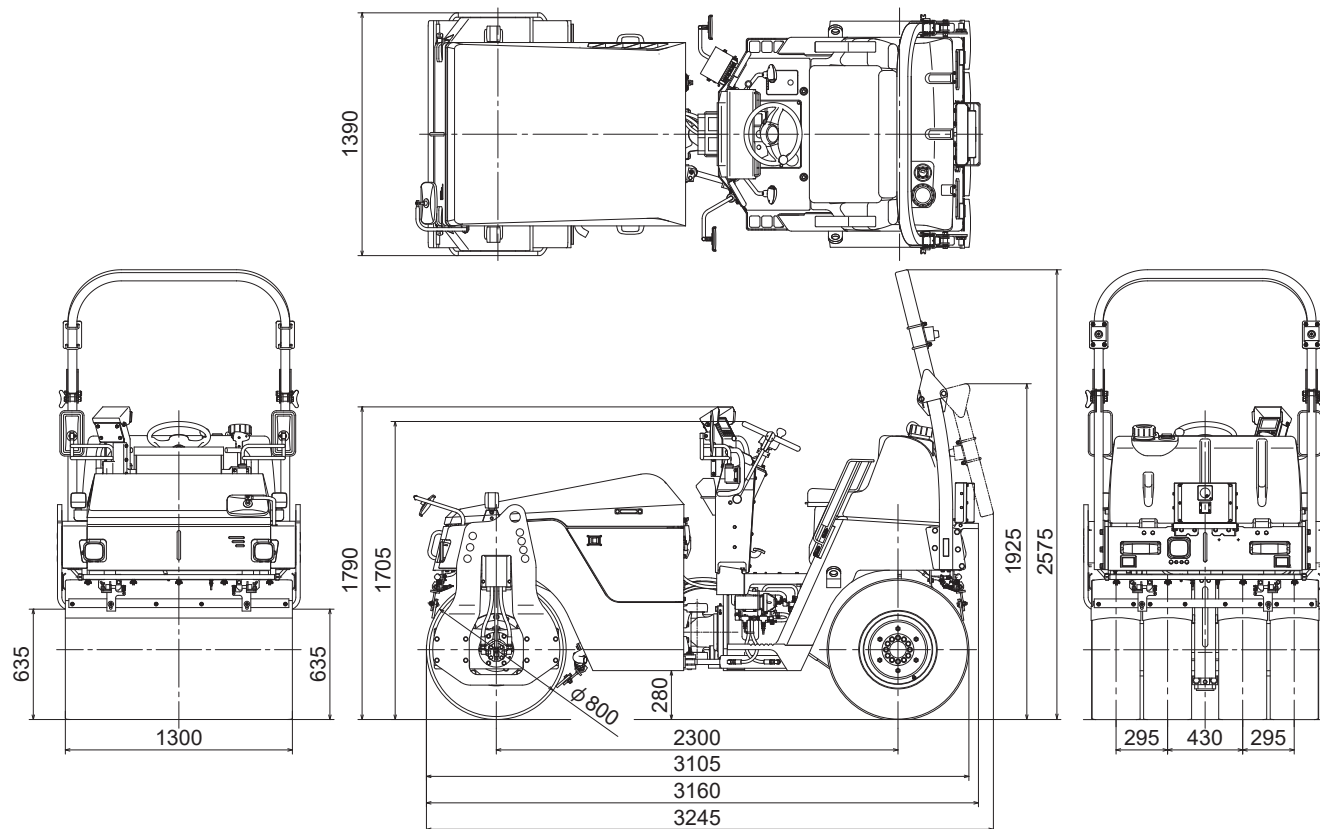


Weight		Performance	
Operating weight	4,090 kg (9,020 lbs)	Vibration system	Low High
On front axle	2,000 kg (4,410 lbs)	Frequency	55 Hz (3,300 vpm) 55 Hz (3,300 vpm)
On rear axle	2,090 kg (4,610 lbs)	Centrifugal force	26.5 kN (5,955 lbs) 34.3 kN (7,710 lbs)
Dimension		Gradeability	21 degrees
Overall length	3,160 mm (124")	Rolling width	1,300 mm (51")
Overall width	1,390 mm (55")	Minimum turning radius	4.3 m (170")
Overall height	2,575 mm (101")	Engine	
Wheelbase	2,300 mm (91")	Model	KUBOTA "D1803-CR-T-EF02"
Wheel		Diesel Engine	
Front	Roll (dia. x width)	Total displacement	1.826 liters (111.4 cu.in)
	800 mm x 1,300 mm (31.5" x 51")	Rated output	32.3 kW / 2,400 min ⁻¹
Rear	Roll (dia. x width)		(43 HP / 2,400 rpm)
	800 mm x 1,300 mm (31.5" x 51")	Max. torque	148 N·m / 1,500 min ⁻¹
Performance			(109 ft·lbs / 1,500 rpm)
Travel speed		Tank capacity	
(forward/reverse)		Fuel tank	50 liters (13.2 gal)
Low	0 - 7.5 km/h (0 - 4.7 mile/h)	Hydraulic oil tank	43 liters (11.4 gal)
High	0 - 10.0 km/h (0 - 6.2 mile/h)	Sprinkler tank	310 liters (81.9 gal)

NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.
 2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.
 Operating weight : Fuel=50%, Water=50%, Operator=75kg.

5 OVERVIEW AND SPECIFICATIONS

[TW504 Guardman (with ROPS)]



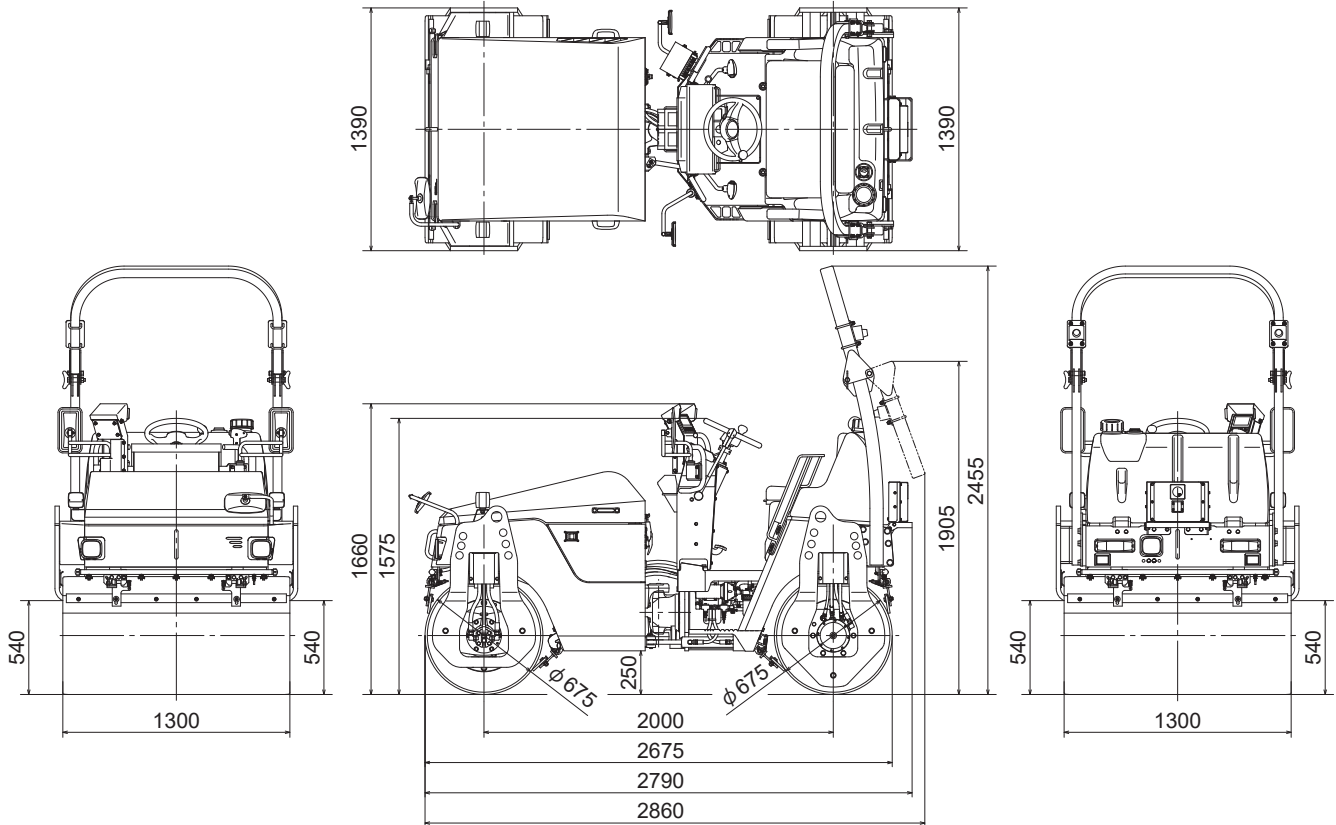
Weight		Performance	
Operating weight	3,540 kg (7,800 lbs)	Vibration system	Low High
On front axle	1,990 kg (4,385 lbs)	Frequency	52 Hz (3,100 vpm) 52 Hz (3,100 vpm)
On rear axle	1,550 kg (3,415 lbs)	Centrifugal force	26.5 kN (5,955 lbs) 34.3 kN (7,710 lbs)
Dimension		Gradeability	21 degrees
Overall length	3,160 mm (124")	Rolling width	1,300 mm (51")
Overall width	1,390 mm (55")	Minimum turning radius	4.3 m (170")
Overall height	2,575 mm (101")	Engine	
Wheelbase	2,300 mm (91")	Model	KUBOTA "D1703-M-DI-EF03"
Wheel		Diesel Engine	
Front	Roll (dia. x width)	Total displacement	1.647 liters (100.5 cu.in)
	800 mm x 1,300 mm (31" x 51")	Rated output	18.2 kW / 2,200 min ⁻¹
Rear	Tire		(24 HP / 2,200 rpm)
	10.5 / 80 - 16 - 6PR	Max. torque	96 N•m / 1,500 min ⁻¹
			(71 ft•lbs / 1,500 rpm)
Performance		Tank capacity	
Travel speed		Fuel tank	50 liters (13.2 gal)
(forward/reverse)		Hydraulic oil tank	43 liters (11.4 gal)
Low	0 - 7 km/h (0 - 4.3 mile/h)	Sprinkler tank	310 liters (81.9 gal)
High	0 - 10 km/h (0 - 6.2 mile/h)	Liquid tank	10 liters (2.6 gal)

NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

[SW354 WIDE DRUM Guardman (with ROPS)]



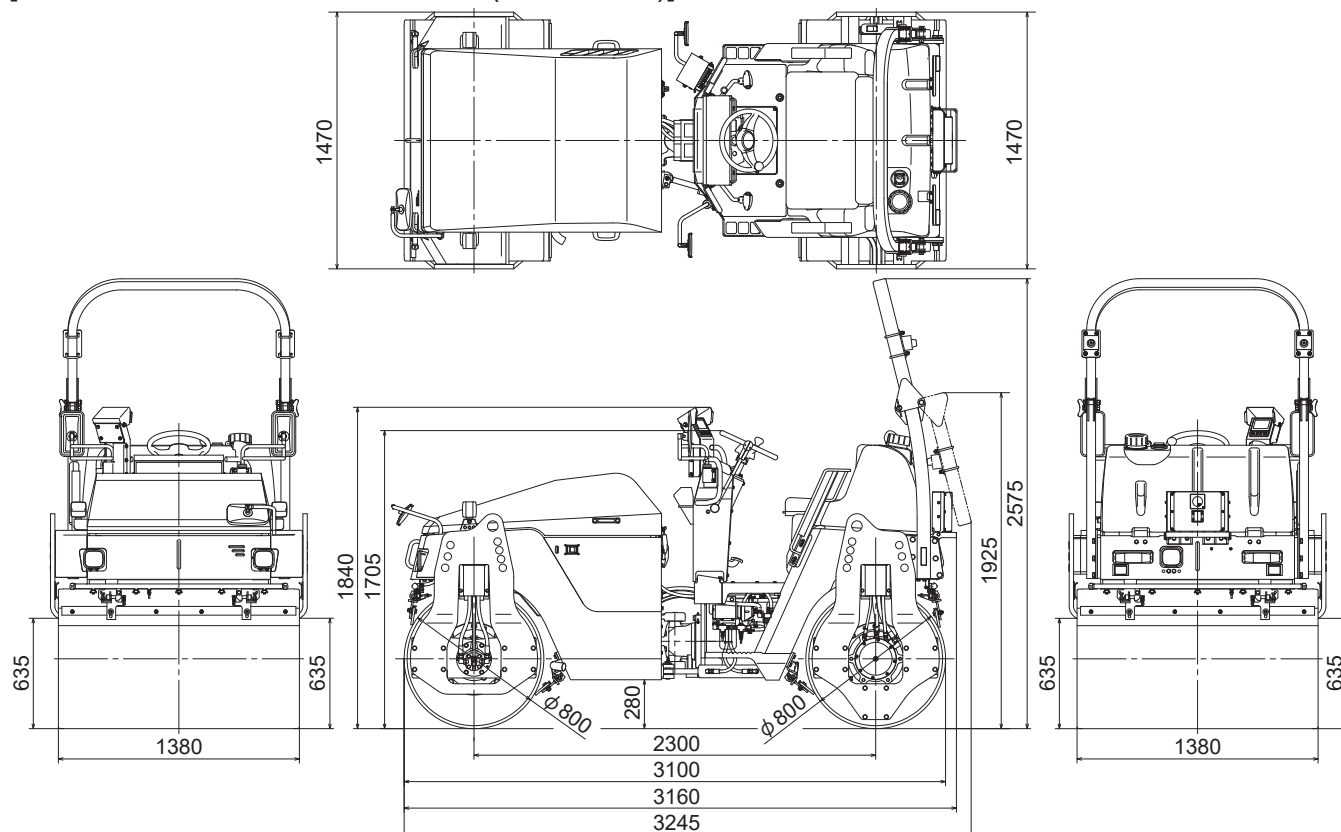
Weight	
Operating weight	3,090 kg (6,815 lbs)
On front axle	1,530 kg (3,375 lbs)
On rear axle	1,560 kg (3,440 lbs)
Dimension	
Overall length	2,790 mm (110")
Overall width	1,390 mm (55")
Overall height	2,455 mm (97")
Wheelbase	2,000 mm (79")
Wheel	
Front	Roll (dia. x width) 675 mm × 1,300 mm (27" x 51")
Rear	Roll (dia. x width) 675 mm × 1,300 mm (27" x 51")
Performance	
Travel speed (forward/reverse)	
Low	0 - 7 km/h (0 - 4.3 mile/h)
High	0 - 10 km/h (0 - 6.2 mile/h)

Performance	
Vibration system	
Frequency	66.7 Hz (4,000 vpm)
Centrifugal force	29.0 kN (6,520 lbs)
Gradeability	21 degrees
Compaction width	1,300 mm (51")
Minimum turning radius	3.9 m (154")
Engine	
Model	KUBOTA "D1703-M-DI-EF03" Diesel Engine
Total displacement	1.647 liters (100.5 cu.in)
Rated output	18.2 kW / 2,200 min ⁻¹ (24 HP / 2,200 rpm)
Max. torque	96 N•m / 1,500 min ⁻¹ (71 ft•lbs / 1,500 rpm)
Tank capacity	
Fuel tank	40 liters (10.6 gal)
Hydraulic oil tank	43 liters (11.4 gal)
Sprinkler tank	200 liters (52.8 gal)

NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.
 2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.
 Operating weight : Fuel=50%, Water=50%, Operator=75kg.

5 OVERVIEW AND SPECIFICATIONS

[SW504 WIDE DRUM Guardman (with ROPS)]



Weight		Performance	
Operating weight	4,230 kg (9,330 lbs)	Vibration system	Low High
On front axle	2,070 kg (4,565 lbs)	Frequency	55 Hz (3,300 vpm) 55 Hz (3,300 vpm)
On rear axle	2,160 kg (4,765 lbs)	Centrifugal force	26.5 kN (5,955 lbs) 34.3 kN (7,710 lbs)
Dimension		Gradeability	21 degrees
Overall length	3,160 mm (124")	Rolling width	1,380 mm (54")
Overall width	1,470 mm (58")	Minimum turning radius	4.4 m (174")
Overall height	2,575 mm (101")	Engine	
Wheelbase	2,300 mm (91")	Model	KUBOTA "D1803-CR-T-EF02"
Wheel		Diesel Engine	
Front	Roll (dia. x width)	Total displacement	1.826 liters (111.4 cu.in)
	800 mm x 1,380 mm (31.5" x 54")	Rated output	32.3 kW / 2,400 min ⁻¹
Rear	Roll (dia. x width)		(43 HP / 2,400 rpm)
	800 mm x 1,380 mm (31.5" x 54")	Max. torque	148 N·m / 1,500 min ⁻¹
Performance			(109 ft·lbs / 1,500 rpm)
Travel speed		Tank capacity	
(forward/reverse)		Fuel tank	50 liters (13.2 gal)
Low	0 - 7.5 km/h (0 - 4.7 mile/h)	Hydraulic oil tank	43 liters (11.4 gal)
High	0 - 10.0 km/h (0 - 6.2 mile/h)	Sprinkler tank	310 liters (81.9 gal)

NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

SAKAI HEAVY INDUSTRIES, LTD.

Head Office: 1-9-9, Shibadaimon, Minato-ku,
Tokyo, Japan

Telephone: 81-3-3431-9971

Facsimile: 81-3-3436-6212

SAKAI HEAVY INDUSTRIES, LTD.
