

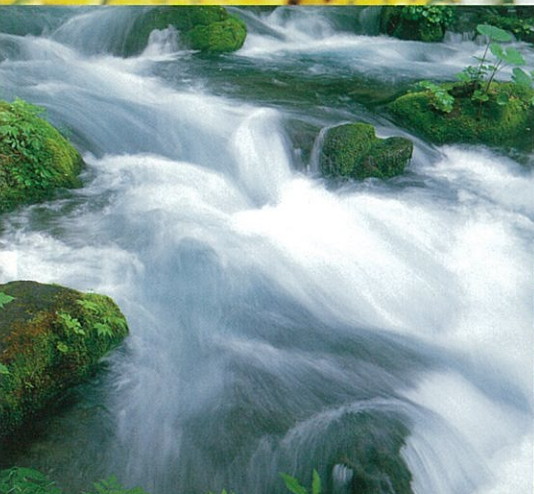
## Bio Lavatory

With Bio-R21 & Optional Systems

# Night Soil Becomes a Valuable Resource

Pioneer of Eco Technology

Daio Densetsu Industrial Co. Ltd





With Bio-R21 & Optional Systems

# Night Soil Becomes a Valuable Resource!

Currently in Japan, more than 70% of the population is served by sewers, a number that rises to 95% in urban areas. In addition to urban areas with concentrated populations, farming regions and mountain villages also have a high percentage of sanitation coverage, earning a well deserved reputation for excellent hygiene.

## At one time, night soil was a valuable resource

In those days, there were deep cultural roots in Japan to use night soil as a precious fertilizer instead of disposing of it. In the middle of the Edo period (1603-1868), complete night soil recycling systems drew farmers from the suburbs to row houses or samurai residences to buy night soil.

However, as Japan entered the Showa era (1962-1989), when the population engaging in engineering increased more than agriculture, as well as the population gradually began to shift from agricultural communities, becoming increasingly concentrated in urban areas, there was a glut of night soil, and purification or ocean disposal of night soil became inevitable in urban areas.

In the middle of the Showa era, chemical fertilizer began to be used in large quantities, further decreasing demand for night soil. This movement was further accelerated by a 1950 ban on direct dispersion of night soil in farmland enacted by the General Headquarters of the Allied Forces (GHQ). As a result, cities began to overflow with night soil, which was unlawfully dumped, causing epidemics of infectious diseases.

Thus, in urban areas, extremely large septic tanks were created to process night soil. Even in farming areas where night soil can be used as fertilizer, residents bear the heavy cost associated with the use of sewer and joint septic tanks and the use of large amounts of clean water to discharge night soil.

If the sanitation issue can be resolved, it is ideal if the impact on the environment and residences can be minimized.

## Ecological sanitation

Overseas, an idea dubbed ecological sanitation (see next page) has been spreading, in which solid waste and urine are separately collected and used as a soil conditioner or liquid fertilizer.

Bio-R21, a disposed organic matter fermentation decomposition processing machine can be combined with optional systems such as a **separate lavatory basin JSS (weight sensor system)** and **SBS (night soil separation system)** to create a composition toilet that can be used to separate and collect solid waste and urine while protecting the treatment tank. By adding aerobic bacteria at the beginning, this machine performs fermentation decomposition on night soil, as well as kitchen waste and waste cooking oil.

Also, it is possible to use a rainwater lavatory system together with this system to collect all urine (see page 9) or use a hybrid system that utilizes natural energy to store and use generated electricity.

## Urine resources separation system

The Japan Science and Technology Agency has obtained a patent on a **urine resources separation system** (patent no. 4025244) and has concluded a license agreement for patent rights, etc. (For details, see our website.)

Use of a urine separation system to capture valuable resources is the fruit of a strategy creation and research promotion project overseen by the Japan Science and Technology Agency and developed by Saburo Matsui, emeritus professor at Kyoto University, as well as other professors there, and a patent has been acquired.

This system is a urine separation toilet that uses a separate lavatory basin. By collecting urine separately, contamination problems caused by bacterial pathogen are avoided and nitrogen and phosphorus can be separated and collected continuously and efficiently from urine, which contains most of the valuable resources. It is now possible to separate and collect valuable resources (nutrients) and treat liquid as water, which has a lower impact on the environment.

Use of night soil as a resource is the most environmentally friendly system and follows the flow of natural circulation from ancient times.



## Ecological sanitation

### Urine

Plant nutrients in human excrement are discovered mostly in urine. **Approximately 400L urine is excreted a year per adult, which contains 4.0kg nitrogen, 0.4kg phosphorous, and 0.9kg potassium.**

What is interesting about this is that those nutrients exist in an ideal status, in that they are easily absorbed by plants (nitrogen in the form of urea, phosphorus in acid phosphate, and potassium in ions). The nutrient balance in urine is similar to the nutrient balance in chemical fertilizers.

**The 400L to 500L of urine excreted per year per person contains sufficient plant nutrients to grow 250kg of grain, which is sufficient to support one person for a year.** Compared to chemical fertilizers, there are only trace amounts of heavy metals, another advantage of urine-derived fertilizer.

Most of nitrogen (urea) in urine decomposes into ammonia during the collection and storage process. However, if stored in an enclosed container with controlled ventilation, the amount of ammonia produced can be kept to minimum.

Human urine can be used as fertilizer at home. Also, it can be used as fertilizer for commercial farming at the local level. Urine does not need to be diluted when directly sprayed on earth. However, when directly spraying urine on plants, it must be diluted with water by 2 to 5 times to prevent withering of plants. Until the value of urine as fertilizer was noticed, urine was disposed of by evaporation or other means.

### Solid waste

Human solid waste contains mainly organic matter such as undigested dietary fiber. **Human beings produce about 25 to 50kg solid waste per year, of which 0.55kg is nitrogen, 0.18kg is phosphorous, and 0.37kg is potassium.** The nutrient content is lower than in urine but this material is a very good soil conditioner. Harmless organic matter in which pathogens are killed through desiccation or decomposition can be used to improve the amount of organic matter in soil, soil water retention capacity, and nutrition.

Humus soil created in the course of decomposition helps to maintain a healthy number of edaphon, which protect plants from pathogens in soil.

Comparison of nutrients in urine and solid waste

|             | Urine        |    | Solid waste  |    | Total        |     |
|-------------|--------------|----|--------------|----|--------------|-----|
|             | g/person/day | %  | g/person/day | %  | g/person/day | %   |
| Wet weight  | 1200         | 90 | 140          | 10 | 1400         | 100 |
| Dry weight  | 60           | 63 | 35           | 37 | 95           | 100 |
| Nitrogen    | 11           | 88 | 1.5          | 12 | 12.5         | 100 |
| Phosphorous | 1            | 67 | 0.5          | 33 | 1.5          | 100 |
| Potassium   | 2.5          | 71 | 1.0          | 29 | 3.5          | 100 |

Cited from "Ecology Sanitation", published on January 19, 2001

|                   |   |
|-------------------|---|
| Author            | Steven A Esrey, Jean Gough Dave Rapaport,<br>Ron Sawyer Mayling Simpson-Hebert, Jorge Vargas Uno Winblad (ed)                               |
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Patent No. 3420573 acquired  
Patent No. 3578340 acquired  
Patent No. 4105563 acquired  
Patent No. 4515962 acquired  
Registration No. 1176781 acquired

## Equipment for decomposition fermentation of organic matter

# Bio-R21 EDUCATION

### Decomposition of night soil, kitchen waste, and used cooking oil

Neither flushing or collection type equipment, this environmentally friendly circulation/recycle type lavatory employs bio fermentation decomposition.



#### History of Bio-R21

Decomposition through using an agitation screw to mix urine with sawdust was developed around 1983 in Nagano Prefecture. (See the History of Bio-Lavatories on our website.)

A disadvantage of this method is that there is a limit on the number of times it can be performed in one day and the sawdust must be replaced several times a year. When the toilet is used many times in a short period of time, night soil accumulates, causing a bad odor and necessitating that the bacterial bed be replaced. Also, it was found that using a bacterial bed in this state as compost for fields is a problem in terms of sanitary control.

To solve this problem, a joint research agreement was concluded in June 2002 between the Agricultural Department of Shinshu University and the industrial sector and the Bio-Toilet Research Group was formed. This research led to the discovery of aerobic bacteria that can decompose oil components and a joint patent was filed in February 2003.

Aerobic bacteria tolerate temperature or humidity environmental changes well and can decompose a mixture of urine, kitchen waste and cooking oil. For the bacterial bed, buckwheat chaff or sawdust is used, depending on the bacteria. Buckwheat chaff does not easily absorb water, so a suitable location for aerobic bacteria can be secured even though there is a lot of water content.

The bacteria were patented in 2008.

To maintain an optimum environment in processing tank even when there is more usage than the available processing capacity, a **separate lavatory basin SBS (night soil separation system)** and **JSS (weight sensor system)** have been developed.

#### Features of Bio-R21 system

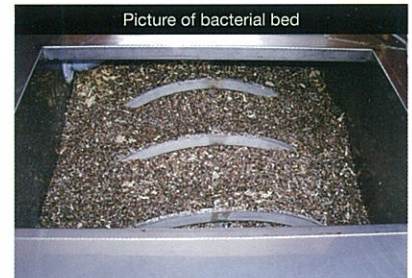
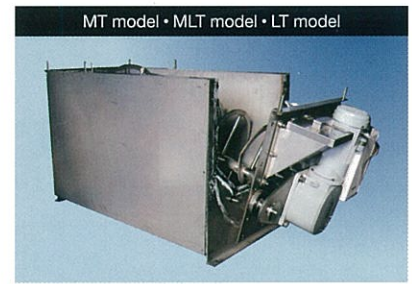
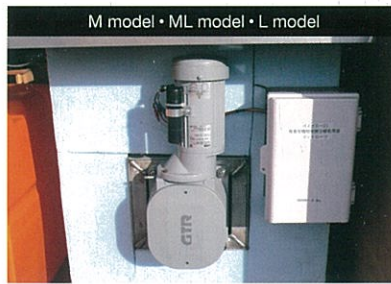
1. The bacterial bed is made from buckwheat chaff or sawdust.
2. Adding aerobic bacteria at beginning eliminates odors (the bacteria were jointly developed with the Agricultural Department of Shinshu University).
3. Night soil, kitchen waste, cooking oil, and toilet paper are fermented and decomposed into carbon dioxide and water. Urine is emitted outside through a heater and fermentation heat.
4. Fermentation heat from organic matter and heat from a heater kills harmful bacterium (colon bacterium, etc.), allowing night soil to be safely returned to the earth as compost (when used as fertilizer, up to 1/3 can be used after two years).
5. Use of a heater with a PTC planar heating element (far-infrared radiation system) which conserves power.
6. Heater has an ON/OFF circuit (for power conservation).
7. Separate lavatory basin separates solid waste and urine.
8. JSS (weight sensor system)  
Manages the weight of the fermentation tank.  
When a specified data value is reached, an indicator light is illuminated.
9. SBS (night soil separation system)  
When a set value is reached, the pipe route is switched for only urine (can handle large quantities).



## Bio-R21 specifications

The bacterial bed in the processing tank is comprised of buckwheat chaff or sawdust to which aerobic bacteria is added at the beginning.

Food that could not be decomposed by anaerobic bacteria, etc. in the digestive system is excreted as solid waste. The aerobic bacteria used are able to completely ferment and decompose solid waste. **The power of the earth is reproduced in the processing tank** by maintaining the **temperature, water content, and oxygen** inside the tank to the optimum conditions for fermentation decomposition.



### Basic usage (fluctuates by season)

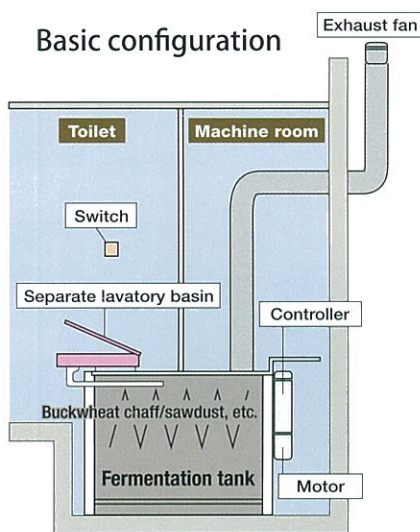
M model 30 times to 50 times/day  
ML model 60 times to 80 times/day  
L type 80 times to 100 times/day



### JSS (weight sensor system)

By use of SBS (night soil separation system),  
**capacity is increased dramatically!**  
**Can handle a sudden increase in usage**  
**With a 300L tank, can be used 1200 times**  
(assuming 250cc/use)

### Sample configuration



## Bio-R21 M model, ML model, L model specifications

| Item                                 |                                     | Bio-R21-M  | Bio-R21-ML               | Bio-R21-L                |
|--------------------------------------|-------------------------------------|--|--------------------------|--------------------------|
| Main unit dimensions                 | Width                               | 630mm  | 630mm                    | 750mm                    |
|                                      | Length                              | 1,400mm  | 1,700mm                  | 1,700mm                  |
|                                      | Total height                        | 730mm  | 730mm                    | 825mm                    |
| Main unit weight                     |                                     | 250kg  | 290kg                    | 310kg                    |
| Tank                                 | Capacity                            | 337L   | 482L                     | 619L                     |
|                                      | Cover                               | With inspection cover  |                          |                          |
|                                      | Heat insulating material            | Foamed rubber insulator  |                          |                          |
| Tank and cover material              |                                     | SUS304   |                          |                          |
| Screw                                | Outside diameter                    | 490mm  | 490mm                    | 600mm                    |
|                                      | Revolutions, 50HZ                   | Positive revolutions: 1.25/min.    Negative revolutions: 1.25/min. |                          |                          |
|                                      | Revolutions, 60HZ                   | Positive revolutions: 1.5/min.    Negative revolutions: 1.5/min.   |                          |                          |
| Motor                                | Type                                | 200W×1   |                          |                          |
|                                      | Auto turning setting                | 1 (1H) 2 (3H) 3 (5H) 4 (8H) 5 (12H) 6 (24H)                        |                          |                          |
| Power supply                         |                                     | AC100V   |                          |                          |
| Heater                               | PTC planar heating element          | 1,212mm × 303mm 3 sheets   | 1,212mm × 303mm 4 sheets | 1,363mm × 303mm 4 sheets |
|                                      | Temperature control ON temperature  | 0(OFF) 1(5°C) 2(10°C) 3(20°C) 4(30°C) 5(40°C) 6(60°C)              |                          |                          |
|                                      | Temperature control OFF temperature | 0 (—) 1 (30°C) 2 (40°C) 3 (50°C) 4 (60°C) 5 (70°C) 6 (80°C)        |                          |                          |
| Maximum power consumption at startup |                                     | 550W   | 735W                     | 880W                     |
| Constant power consumption           |                                     | 250W   | 340W                     | 370W                     |
| Control panel                        |                                     | Auto turning (attached externally)                                 |                          |                          |

Note 1: The heater temperature is usually set to 20°C with the ON circuit and 60°C with the OFF circuit.

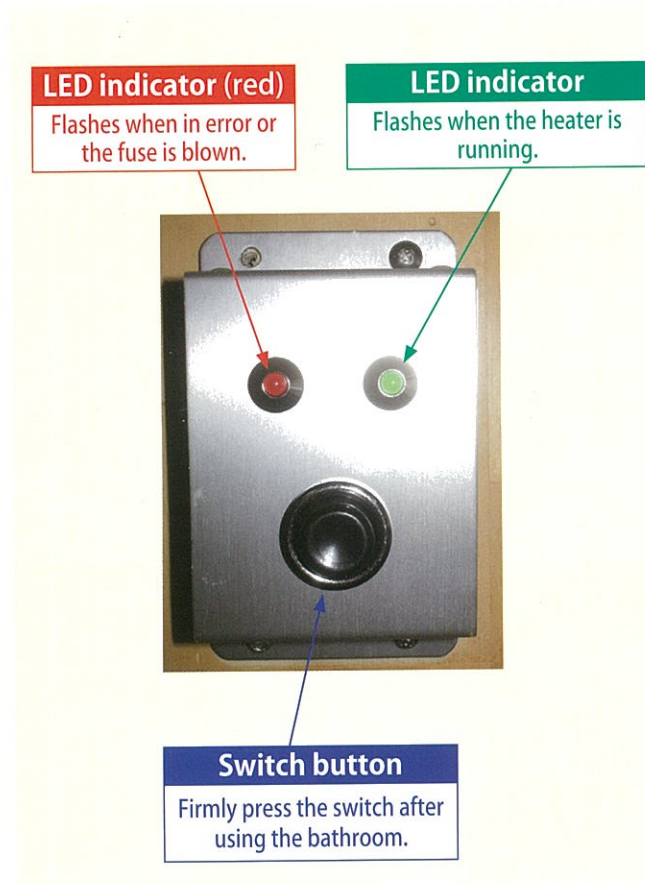
Note 2: For accelerated water evaporation, the heater is set to 60°C with the heater ON circuit and 80°C with the OFF circuit.

Note 3: Specifications are subject to change with prior notice for product improvement.



## Room switch

This switch is installed on the wall next to the lavatory basin.



Press the switch button once after using toilet paper or disposing of kitchen waste in the unit.

The screw inside the processing tank turns to collect organic matter while supplying oxygen. (Flashes green.)

Positive revolutions for 60 secs.

Pauses for 10 secs.

Negative revolutions for 60 secs.

### Emergency stop

In case an important item happens to fall into the lavatory basin.

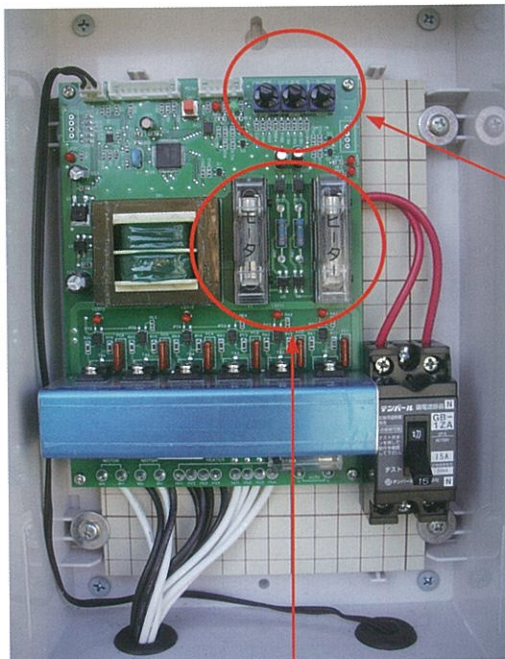
Pressing the button causes emergency stop of screw operation.

(Red light)

After completing necessary work, press the button again to restore operation. (Flashes green.)

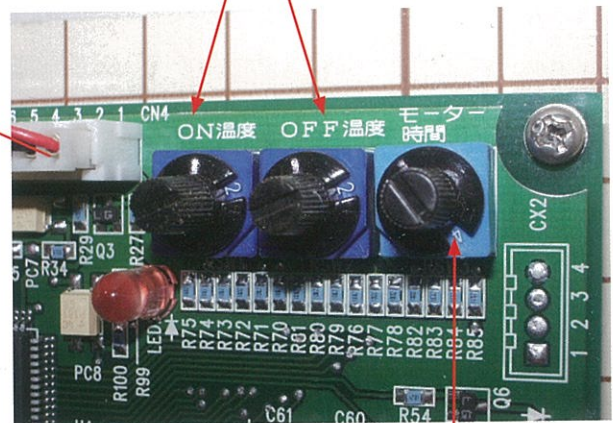
## Controller

The controller is attached to the side of the processing tank.



**Motor and heater fuse**

The heater temperature has two settings, ON and OFF. When the value drops under the specified value, the switch is turned ON and when the set value is exceeded, the switch is turned OFF.

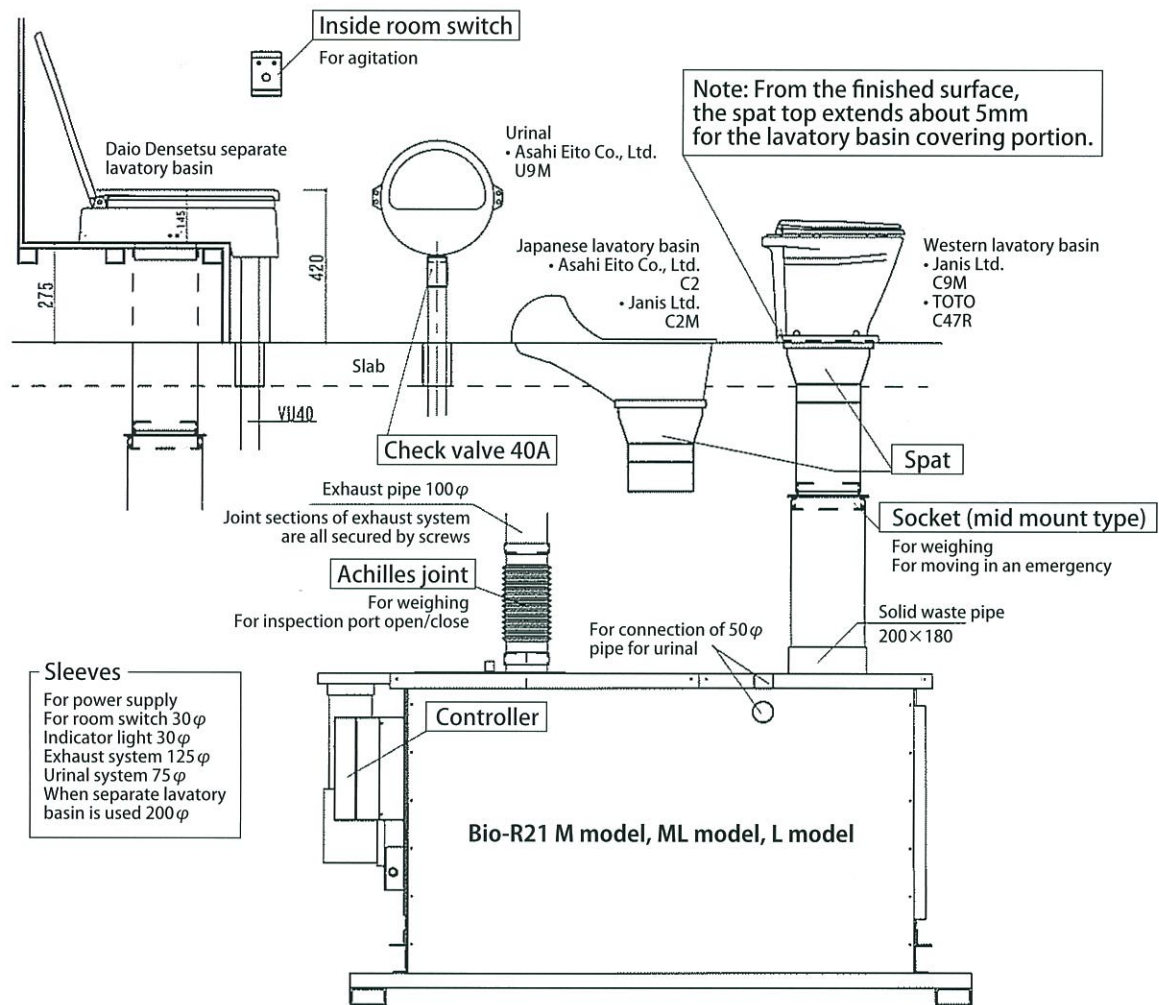


This dial is used to set the automatic turning time of the motor that operates the screw to agitate the material inside the processing tank.

The unit can be set to between 1 (1H) and 6 (24H); the setting depending on the contents of the material introduced into the unit and the usage conditions.



## Detailed installation diagram



Spat



Check valve 40A



Socket (mid-mount type)



Achilles joint



Japan, which has well-developed sewer and septic tank systems, has almost no lavatory basin that can separate solid waste and urine at an early stage.

In order to utilize night soil as an excellent resource, it is necessary to isolate urine, which does not have harmful

bacterium. Using this lavatory basin to safely separate out urine, the advantages of a **urine separation system** (see our website) for **ecological sanitation** and **the capturing of valuable resources** can be demonstrated to the maximum.



DN-2 Cream

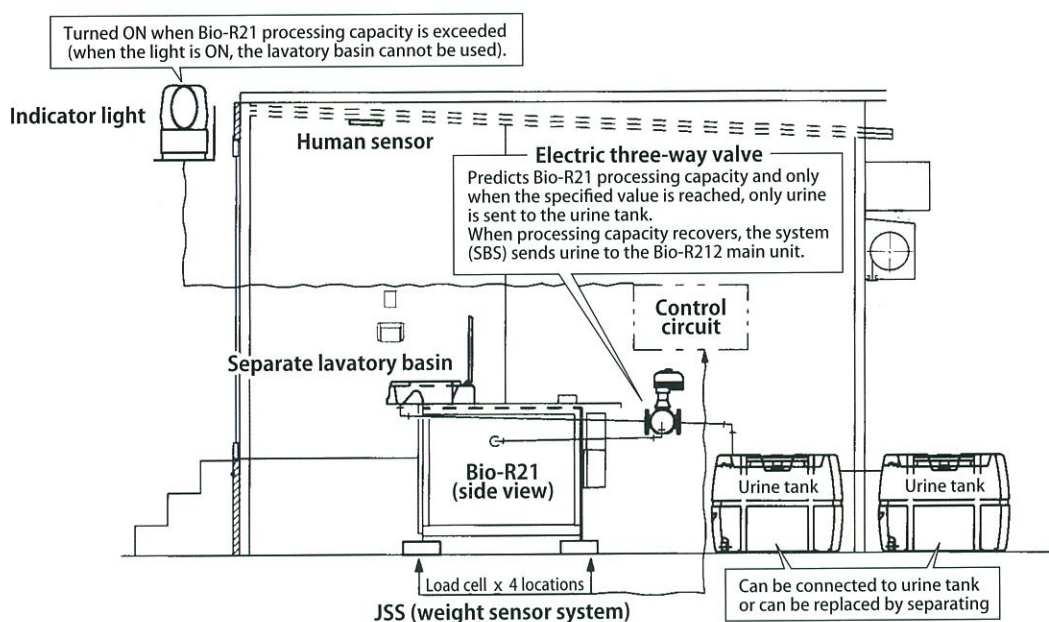


When used  
DN-3 Gray



DN-4 Wine

## JSS (weight sensor system) / SBS (night soil separation system)



Urine separated into the urine tank is evaporated by being returned to the processing tank while usage is small or, based on the ecological sanitation concept, is diluted to 2 to 5 times with water for use as an excellent liquid fertilizer. Also, using

the urine resources separation system, it is possible to retrieve only valuable resources (nutrients).  
(See the web pages Valuables in urine separation system)

## Control circuit



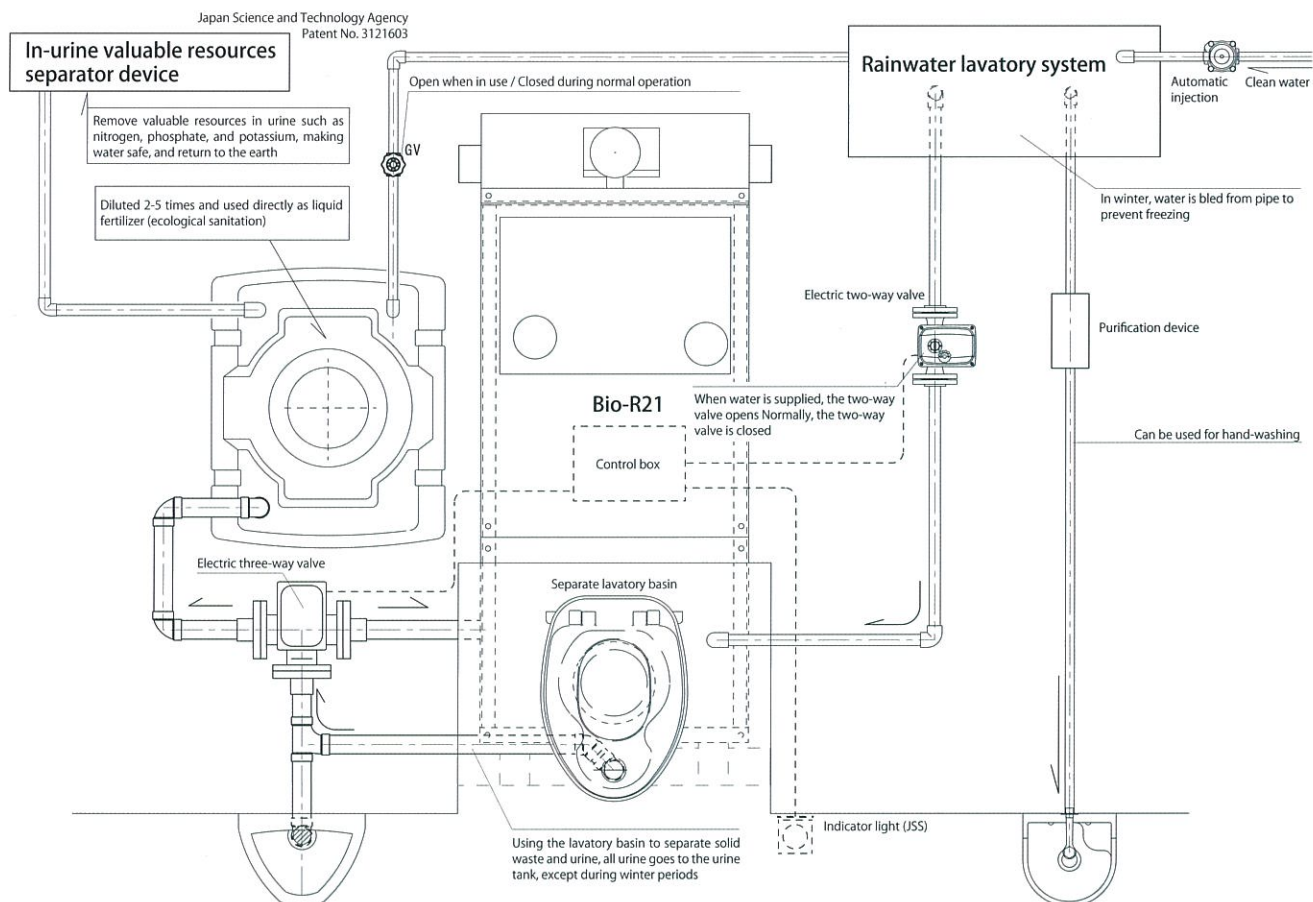
Indicator

The load is measured by a load cell under the processing tank and an indicator displays usage levels. Per the specified value, the electric three-way valve operates and an Indicator light is turned ON and OFF. Also, the water content can be adjusted according to usage conditions. The specifications differ when using only a JSS or using both a JSS and SBS.

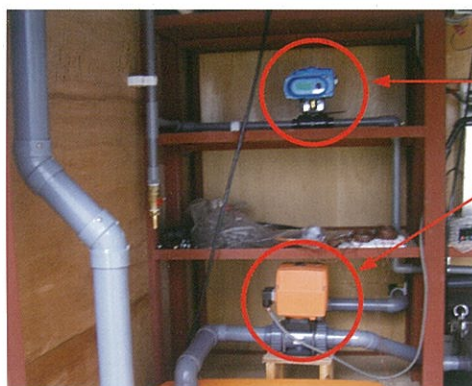


Electric three-way valve





The balance of moisture, oxygen, and temperature are important for fermentation decomposition of organic matter. By combining the JSS (weight sensor system) and SBS (night soil separation system), it is possible to automatically manage rainwater from the rainwater lavatory system. In winter, to clear rainwater, a three-way valve is used instead of a two-way valve and rainwater is used by the SBS. At that time, wiring of the three-way valve and installation of the power supply are required.



Electric two-way valve

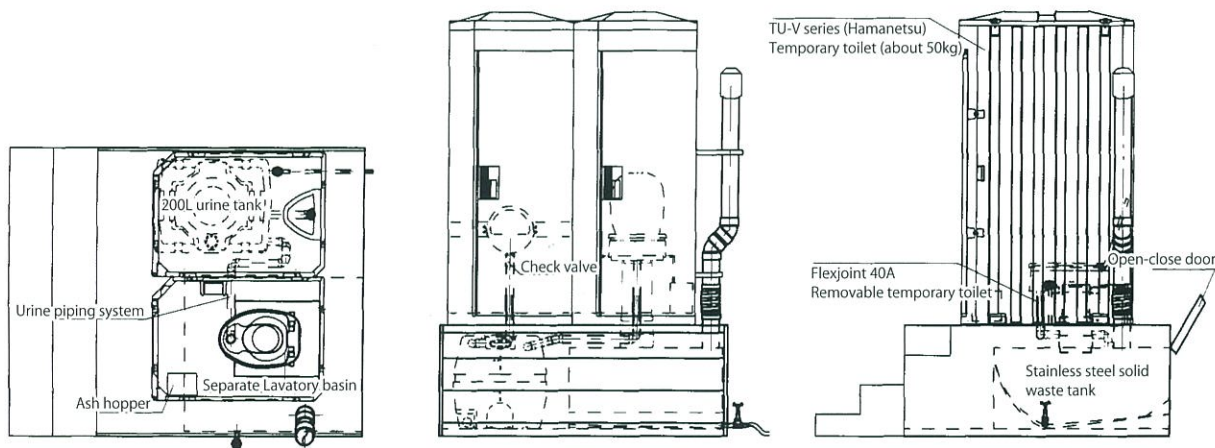
Electric three-way valve

Inside machine room



Rainwater tank

## Ecological sanitation for mountainous areas and developing countries (no power supply needed)





**TC**

W956mm × D2,415mm × H2,660mm (1 lavatory basin) Temporary construction model  
With no night soil separation

**Commercial power supply specification**

Available in three exterior wall colors



Toilet interior



Entrance side



Front side

**PKS**

M model W1,335mm × D2,500mm × H2,700mm (1 lavatory basin)  
L model W1,335mm × D2,910mm × H2,700mm

Vertical separation style  
100ℓ internal urine tank

**Commercial power supply specification**

Available in four exterior wall colors



Entrance side



Rear side (machine room)

Delivery and installation assembly work



Toilet interior

Can be installed in locations with height limitations such as inside tunnels and factories. It is installed by using a forklift to position the upper section and then connect it to the bottom section.

**PK1**

M model W1,335mm × D2,500mm × H2,700mm (1 lavatory basin)  
L model W1,335mm × D2,910mm × H2,700mm

100ℓ internal urine tank

**Commercial power supply specification**

Available in four exterior wall colors



Toilet interior



Rear side (machine room)



Entrance side



Front side



## PK1B

M model W2,500mm×D1,335mm×H2,700mm (1 lavatory basin, 1 urinal, 1 entrance)  
L model W2,910mm×D1,335mm×H2,700mm

Interior urine tank 100ℓ

The smallest model, this unit supports separation of night soil and enters from the lateral side of PK1.

## PK2

M model W1,770mm×D2,640mm×H2,700mm (1 lavatory basin, 1 urinal, 1 entrance)  
L model W1,770mm×D2,940mm×H2,700mm

Interior urine tank 200ℓ

### Commercial power supply specification

Available in four exterior wall colors



Entrance side



Rear side



Rear side (machine room)



Toilet interior

## PK2A

Unlike the PK2, it has a separate door for solid waste and urine.  
(1 lavatory basin, 1 urinal, 2 entrances)

Interior urine tank 200ℓ

## PK2B

M model W3,000mm×D1,800mm×H2,800mm (1 lavatory basin, 1 urinal, 2 entrance)  
L model W3,000mm×D1,900mm×H2,800mm

Interior urine tank 200ℓ

Unlike the PK2, users enter from the side.

## PK3

Staircase M model W3,300mm×D1,800mm×H2,800mm (1 lavatory basin, 1 urinal, 2 entrance)  
L model W3,600mm×D1,800mm×H2,800mm

Interior urine tank 300ℓ

### Commercial power supply specification

Snow and ice control type for regions that experience heavy snowfall



Front of men's toilet



Rear of women's toilet



men's toilet



Separate lavatory basin



Machine room interior



Urine separation in machine room



**MKY**

W1,800mm × D3,000mm × H2,800mm  
MKY1(1 lavatory basin) MKY2(1 lavatory basin, 1 urinal, 1 entrance)

Interior urine tank 300ℓ

Design registration no.1296749

**Commercial power supply specification**

(available in any combination)



Interior of MKY2



Rainwater hand-washing basin



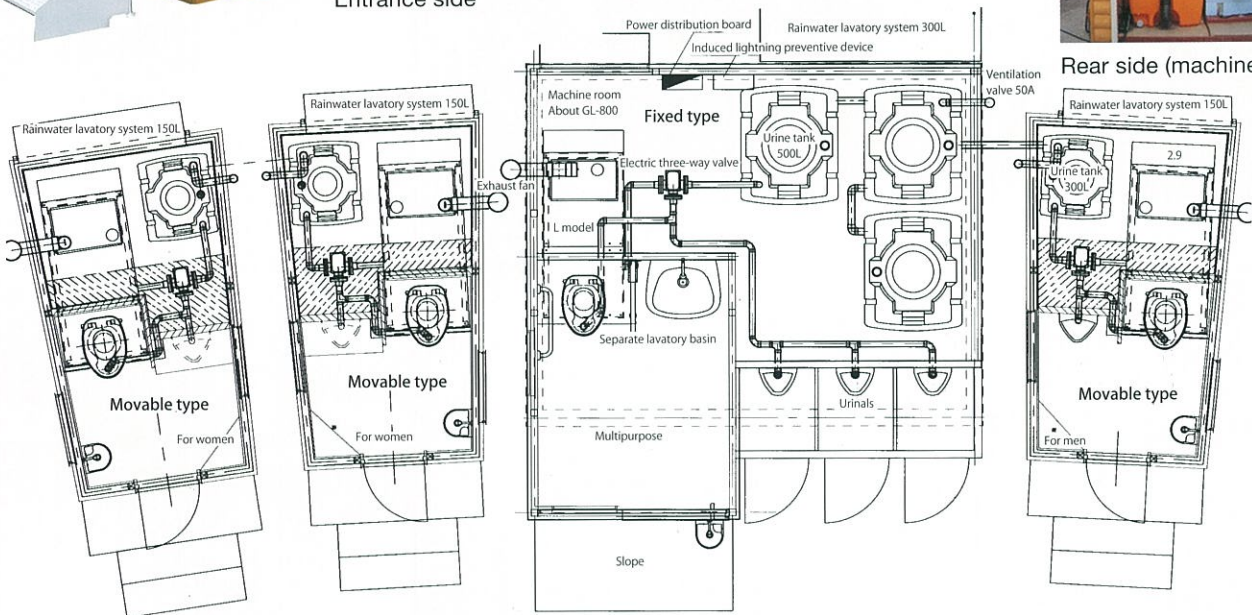
Entrance side



Roof rainwater lavatory system



Rear side (machine room)



**MKF**

W1,300mm × D2,200mm × H3,340mm(1 lavatory basin)  
With no night soil separation

Design registration no.1236232

**Commercial power supply specification**



When stairs are used



When stairs are stored



Interior of toilet



With western-style lavatory basin



**MKS**

MKS1 W1,090mm×D2,700mm×H2,800mm (1 lavatory basin) No night soil separation

MKS2 W1,260mm×D3,100mm×H2,800mm (1 lavatory basin, 1 urinal, 1 entrance)

Urine tank placed outside

**Commercial power supply specification**

Entrance side



Rear interior of machine room



MKS2 interior of toilet



Separate lavatory basin

**MK4H**

M model W2,800mm×D1,900mm×H2,800mm (1 lavatory basin, 1 urinal, 2 entrance)

L model W3,300mm×D1,900mm×H2,800mm

Interior urine tank 200ℓ

**Commercial power supply specification**

Half the size of the MK4. This is a symmetrical product and can be matched to the installation location.



Front side



Machine room side

**MK4H-E**

M model W2,800mm×D1,900mm×H2,800mm

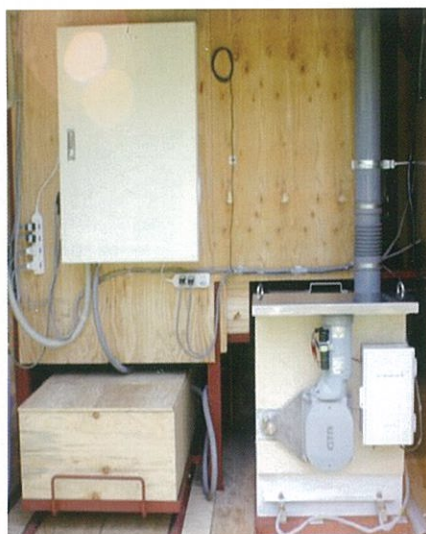
L model W3,300mm×D1,900mm×H2,800mm

panel option (1 lavatory basin, 1 urinal, 2 entrance)

Interior urine tank 200ℓ

**Hybrid specification**

Front side



Interior of machine room



Machine room side



## MK4

LW model W5,660mm×D1,900mm×H2,800mm (2 lavatory basin, 2 urinal, 4 entrance)  
MW model W5,060mm×D1,900mm×H2,800mm Interior urine tank 200ℓ

### Commercial power supply specification



Front side



Machine room side

## MK4-E

LW model W5,660mm×D1,900mm×H2,800mm panel option (2 lavatory basin, 2 urinal, 4 entrance)  
MW model W5,060mm×D1,900mm×H2,800mm Interior urine tank 200ℓ

### Solar powered system specification



Front side



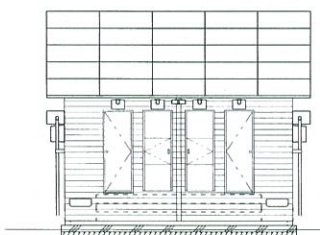
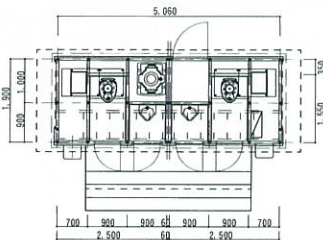
Rear side



Indicator light  
(over discharge sign)



Indicator light  
(restricted use sign)



Separate lavatory basin



Both sides Interior of machine room



Men's toilet



Rainwater hand wash basin



Rear Interior of machine room



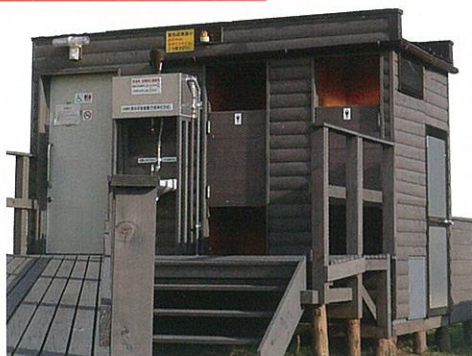
**MK 3**

Barrier-free type

W3,700mm×D1,800mm×H2,800mm (1 lavatory basin, 2 urinal, 3 entrance) Interior urine tank 300ℓ

**Commercial power supply specification**

Design registration no.1296750



Front (ramp/entrance side)



Rear (urine tank side)

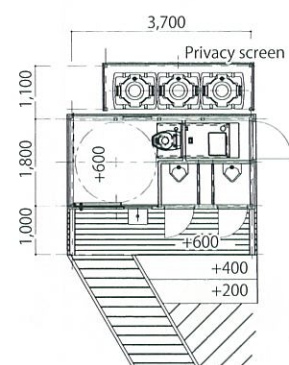
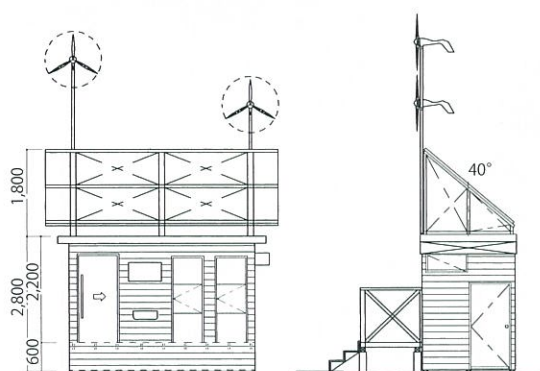


Urine tank connection

**MK 3-E**

Barrier-free type

W3,700mm×D1,800mm×H2,800mm (1 lavatory basin, 2 urinal, 3 entrance) Interior urine tank 300ℓ

**Hybrid specification**

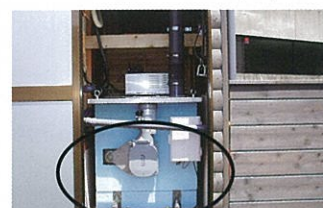
Interior of multipurpose toilet



Bamboo charcoal purified rainwater lavatory system



Men's toilet



Machine room



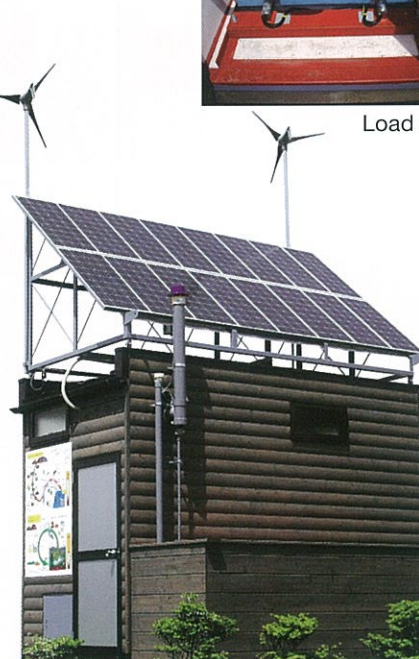
Load cell



Power distribution board



Front (ramp/entrance side)



Rear (solar panel side)

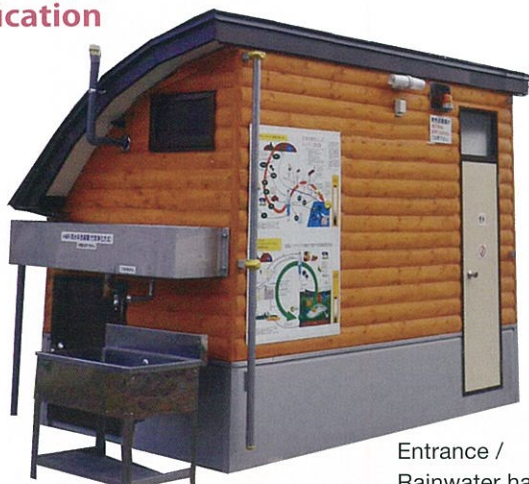


Utility model registration No.3128131

## MK1

**Commercial  
power supply  
specification**

W3,300mm×D1,800mm×H2,800mm  
(1 lavatory basin, 1 urinal, 1 entrance)  
Interior urine tank 200ℓ



Entrance /  
Rainwater hand-washing basin side



Interior of toilet



Rear / Machine room side  
(common with MK2)

## MK 1-E

(1 lavatory basin, 1 urinal, 1 entrance)  
**Hybrid specification**



Rear / Rainwater hand-washing  
basin side (common with MK2)

## MK2

**Commercial  
power supply  
specification**

W3,300mm×D1,800mm×H2,800mm  
(1 lavatory basin, 1 urinal, 2 entrance)  
Interior urine tank 200ℓ



Entrance /  
Rainwater hand-washing  
basin side



Men's toilet



Unisex toilet

## MK 2-E

(1 lavatory basin, 1 urinal, 2 entrance)  
**Hybrid specification**



Entrance /  
Rainwater hand-washing basin side



## MK1 · MK2 Structural characteristics

8 beam steel frames for solar frame installation



Before painting



After painted

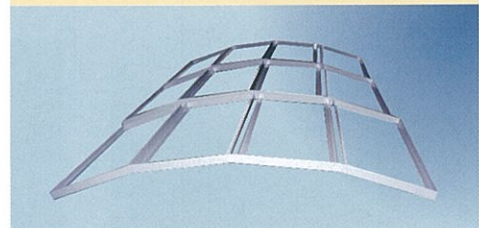
After roof and outer wall construction

Installation of solar frame

4 steel frame for crane lifting



Solar panels are mounted on this frame.  
Panels weigh about 240kg (12 panels).



With the MK 1 and MK 2, the steel framework is an integrated type unit common to both the commercial power and hybrid specifications. For that reason, it has strength and the ability to install additional options for disaster control at any time.

Steel structure

Steel weight : 821.6 kg

Strength of steel frame : 3.05 t when equipped for full disaster control

4 steel frame for crane lifting

Anticorrosive paint : JIS K5621 - 2 type



Battery shelf

The unit can be equipped with a battery to store electricity generated by solar and/or wind power. To suppress temperature changes and ensure efficient function, batteries are placed inside protective thermal insulation material. The unit can handle up to eight 70kg batteries.



When equipped with batteries



**S model**

W1,900mm × D2,700mm × H3,170mm

Standard model (1 lavatory basin, 1 urinal, 2 entrances)

Urine tank 300 ℓ × 2

W model (2 lavatory basins, 2 entrances) Urine tank placed outside

Patent no. 3941687

**S-E model**

**Commercial power supply specification**

**Hybrid specification**



Entrance



Front (entrance)



Rear side lower part machine room



Transportation methods



Men's toilet



Separate lavatory basin



Rear upper part Machine room

**B model**

W1,900mm × D2,700mm × H3,170mm

Standard model (1 lavatory basin, 1 urinal, 1 entrances)

Urine tank 500 ℓ

W model (2 lavatory basins, 2 entrances) Urine tank placed outside

Patent no. 3941637

**B-E model**

**Commercial power supply specification**

**Hybrid specification**



Entrance



Entrance



Rainwater hand-washing side



Separating type toilet bowl



Men's toilet



Machine / battery room

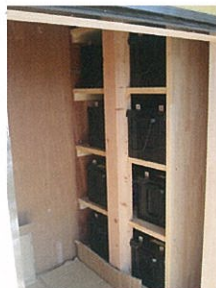


## JDBR-E

### Hybrid specification



W1,780mm × D3,550mm × H2,950mm  
JDBR-MW model-SP-FWP-HWR-JSS (2 lavatory basin)



Battery shelf



From road side



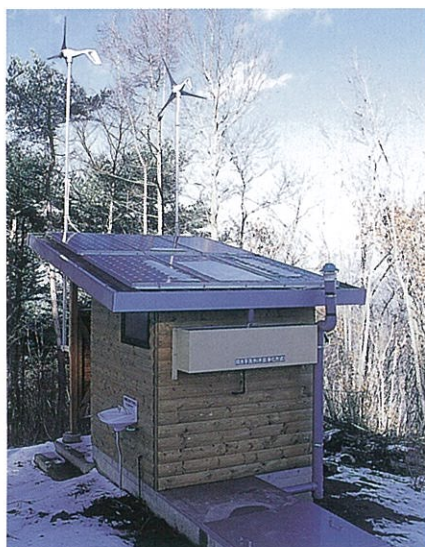
Rainwater lavatory system



Entrance / display



Interior of toilet



Storage side



Interior of pit



Battery



Lavatory basin for Men



Japanese-style lavatory basin

W1,780mm × D2,950mm × H2,950mm  
JDBR-M model-SP-FWP-HWR (1 lavatory basin, 1 urinal)

## JDBR

### Commercial power supply specification



W 3,600mm × D2,500mm × H2,900mm  
JDBR-L model-JSS-HWR (1 lavatory basin, 1 urinal)  
Barrier-free



Processing tank and piping in the pit



Lavatory basin for Men



Interior of toilet



Rainwater lavatory system



Indicator light



Maintenance and inspection work



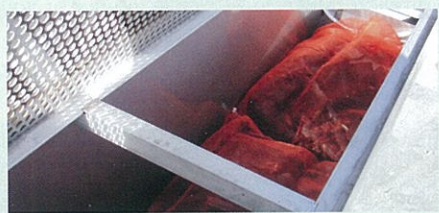
## MDBR-MK2-Disaster control specification

Options are available in any combination, per the installation location, conditions, etc.  
Installation construction costs will be estimated separately per the installation location, conditions, etc.



### HWR (rainwater lavatory system)

When in a location in which it is difficult to acquire water or when water is unavailable due to a disaster, rainwater can be used for hand washing and cleaning by purifying it with bamboo charcoal.



This water is not fit for human consumption.  
Bamboo charcoal is porous compared to wood charcoal.  
It is said to have 10 times greater adsorption since the surface area of the pores is twice that of bincho charcoal.  
As a result it has deodorization, adsorption and purification characteristics.



### SBS (night soil separation system)

When usage increases significantly than normal use due to a situation such as a disaster, event or tourist spot, before the capacity of the Bio-R21 is exceeded, the three-way valve turns and only urine that exceeds the specified value flows into the dedicated tank. This allows the optimum balance of temperature, moisture and oxygen necessary for fermentation decomposition to be maintained in the processing tank. Any number of tanks can be connected.

### Urine tank exhaust pipe

In addition to the exhaust pipe out of the processing tank, units also have a separately dedicated exhaust pipe to prevent backflow of odors from the urine tank.



### Indicator light (yellow, blue)

Yellow — Illuminates the limited use sign for JSS (weight sensor system)  
Blue — Illuminates the limited use sign when the battery has insufficient charge.



Patent no. 4515962

(MDBR is standard)

(Inside the main unit)

### Separate lavatory basin

Night soil separate type lavatory basin that separates solid waste and urine.



When toilet seat is raised

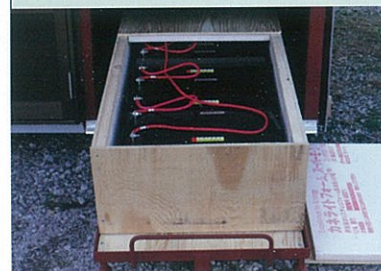


Interior of toilet

Note: Urine accumulated in the tank is used as fine liquid fertilizer in accordance with the ecological sanitation concept (for details, see our website).

### Battery room

Electricity is generated by solar energy(SP) and wind energy(FWP).





Note: Please consult with us about the shape of the roof. It can be changed to suit your need.



### Exhaust pipe

Water content is discharged from the processing tank. Drain water in pipes is discharged from the valve.

(Standard equipment)

### FWP (wind power generation)

According to the weather, SP alone may not be sufficient. This power source can be added as an auxiliary power supply.

### SP (solar power generator) Solar panel

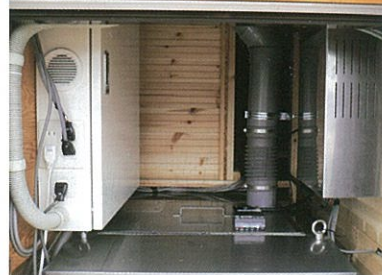
Panel installation designed to match the angle of the sun in all four seasons.



Frame-installation type

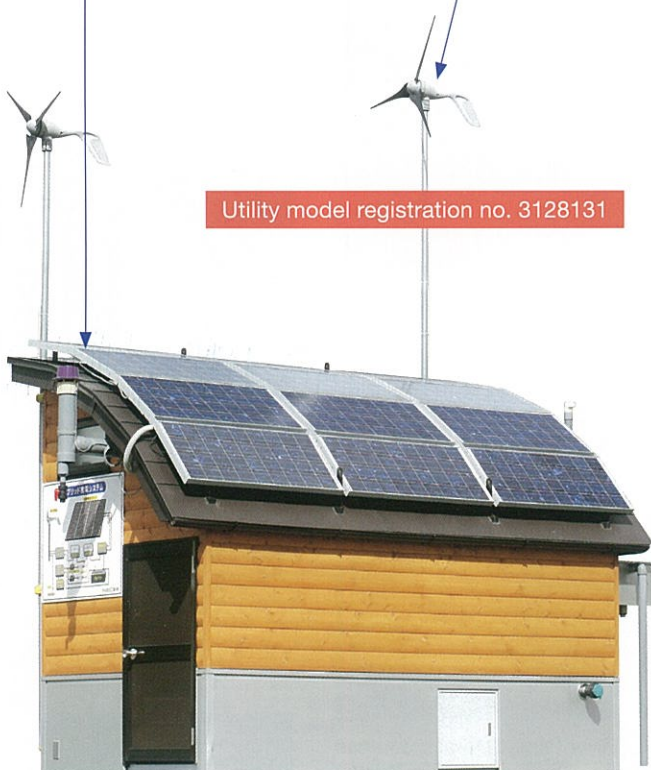
### Hybrid system

Solar and wind energy is converted to electricity and stored in batteries and devices are used after conversion with a power inverter. Available devices include anti-overcharge, anti-overdischarge, backflow prevention, equalizer charging and lightning protection.



Controller box

Utility model registration no. 3128131



### Lavatory basin with washlet



### Lavatory basin with infant fall protection equipment



Utility model registration no. 3121603

### JSS (weight sensor system)

Lavatory basin with infant fall protection equipment. The weight sensor installed in the lower part of Bio-R21 senses current usage and lights limited use indicator light before processing capacity is exceeded.

Load cell





# Installed examples of bio-toilets

## Bio R21



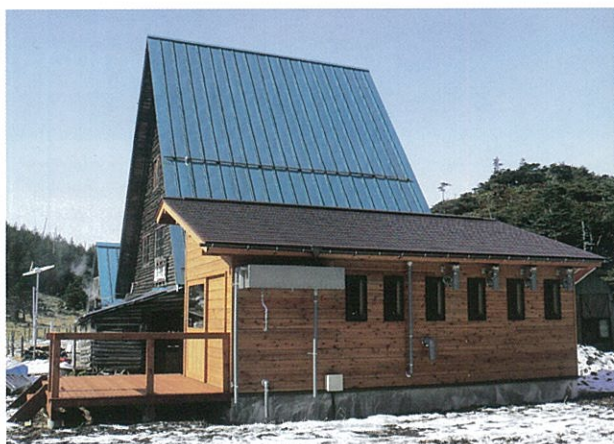
Konpirayama Park, Kitami-shi, Hokkaido  
M model×2, L model×2



Akita Civic Forest, Akita-shi, Akita-ken  
M model×2



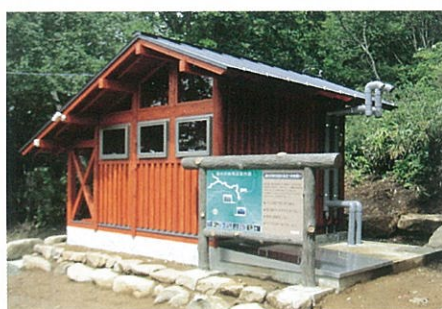
Ogata Water and Forest Park, Ogata-ku,  
Joetsu-shi, Niigata-ken  
L model×4



Shimagare Lodge, Yatsugatake-Chūshin Kōgen Quasi-National Park, Nagano-ken (2,200m)  
L model×4



Tsumetaike Lodge,  
Kashimayarigadake Northern Alps,  
Toyama-ken (2,400m) L model×1



Yunosawa Toge, Yamato-cho, Koshu-shi,  
Yamanashi-ken (1,652m)  
L model×2



Kera River Park, Gujo-shi, Gifu-ken  
L model×2



Ministry of Land, Infrastructure and Transport  
Osaka Airport Office, Itami-shi, Hyogo-ken  
1st 1ASR/SSR, TX Office Building  
M model×1



Okinawa Institute of Science and Technology,  
Onna-mura, Okinawa-ken  
M model×1



Fukuoka District Meteorological  
Observatory, Kagoshima-ken  
Kagoshima Airport Meteorological  
DR Office Building, Kagoshima-ken  
M model×1



## DB series (DBR)



Tateyama Okinojima park, Chiba-ken  
MDBR-MK4-MW model-SP-HWR-JSS-SBS-  
200L urine tank x 2



Glass Village, Suwa-shi, Nagano-ken  
MDBR-MK3-L model-SP-FWP-HWR-JSS-SBS-  
Generator - 300L urine tank x 3



Takino Suzuran Hillside National  
Government Park, Sapporo-shi, Hokkaido  
MDBR-B-MW model-SP-FWP-HWR 3 units



Nippon International Cooperation for Community  
Development, Shiga-ken  
MDBR-B-M model-SP-FWP-HWR-JSS-  
SBS(Manual) - 500L urine tank



Matsuhime Toge, Kosuge-mura,  
Yamanashi-ken  
JDBR-MW model-SP-FWP-HWR-JSS



Jumonji I/C on Yuzawa Yokote Road,  
Akita-ken  
MDBR-PK1-M model



At Tokuji Noya Forest Therapy base,  
Yamaguchi-shi, Yamaguchi-ken  
MDBR-MKS2-M model



Mt. Ryugaseki, Hamamatsu-shi, Shizuoka-ken  
MDBR-S-M model-SP-HWR



Entrance to Hiragadake Trail,  
Nagaoka-shi, Niigata-ken  
MDBR-PK3-ML model (w/ stairs) -  
JSS - SBS - 300L urine tank

**Please see our websites for details.**

**<http://www.daio.bio.co.jp>**

### Corporate Profile

Name : Daio Densetsu Industrial Co. Ltd.  
Location : Headquarters / 1872 Toyohira, Chino-shi, Nagano, 391-0213 Japan  
TEL 0266-82-2233 FAX 0266-82-3200  
Eco Vision Business Division, Headquarters / 1872 Toyohira, Chino-shi, Nagano, 391-0213 Japan  
TEL 0266-82-3773 FAX 0266-82-3774

Representative : Kiyoshi Machida  
Established : 1987  
Capital : ¥30 million  
Lines of business : Construction, general construction, electrical construction no. 21077, piping construction business no. 21077  
Business description : ● Bio-R21, DBR series (manufacturer and distributor) ● Floor heating (PTC planar heating element)  
● Electrical construction (Indoor, outdoor) ● House substation construction and maintenance





## Daio Densetsu Industrial Co. Ltd

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