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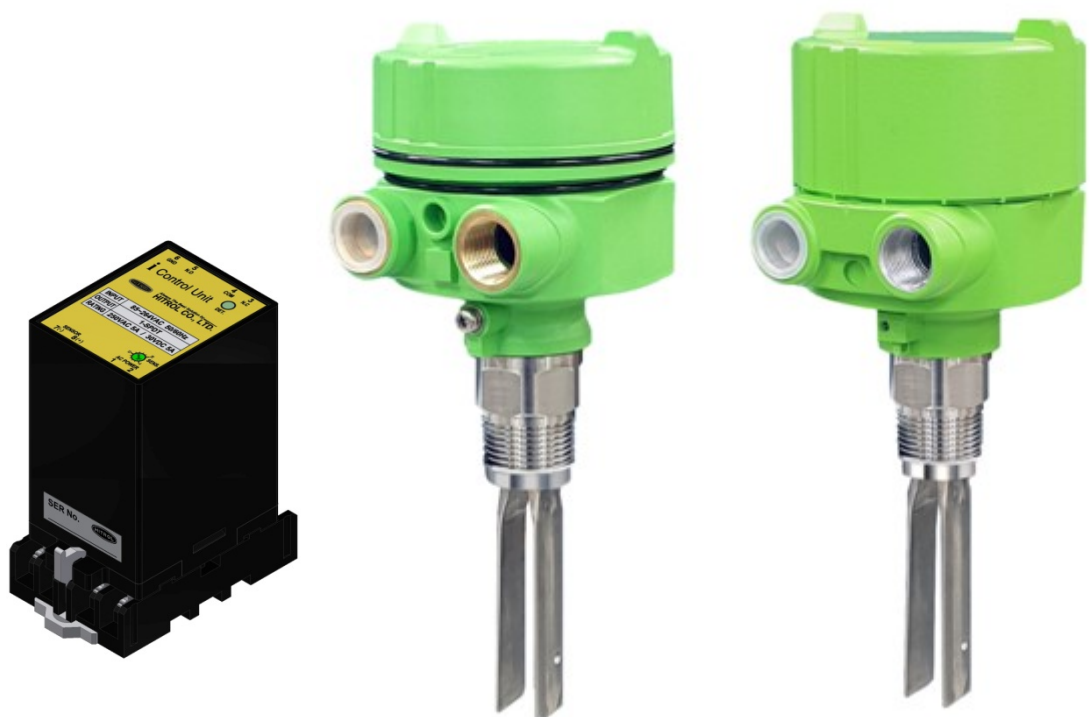
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INSTRUCTION MANUAL

VIBRATION TYPE LEVEL SWITCH

HTM-30T Series



Doc. no. : HTM30T_IM_Eng_Rev.0.0

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You should be well-informed of the contents where **WARNING** is marked before carrying out the work.



You should be careful where **CAUTION** is marked to carry out the work.



You should be aware of where **NOTICE** is marked to carry out the work.

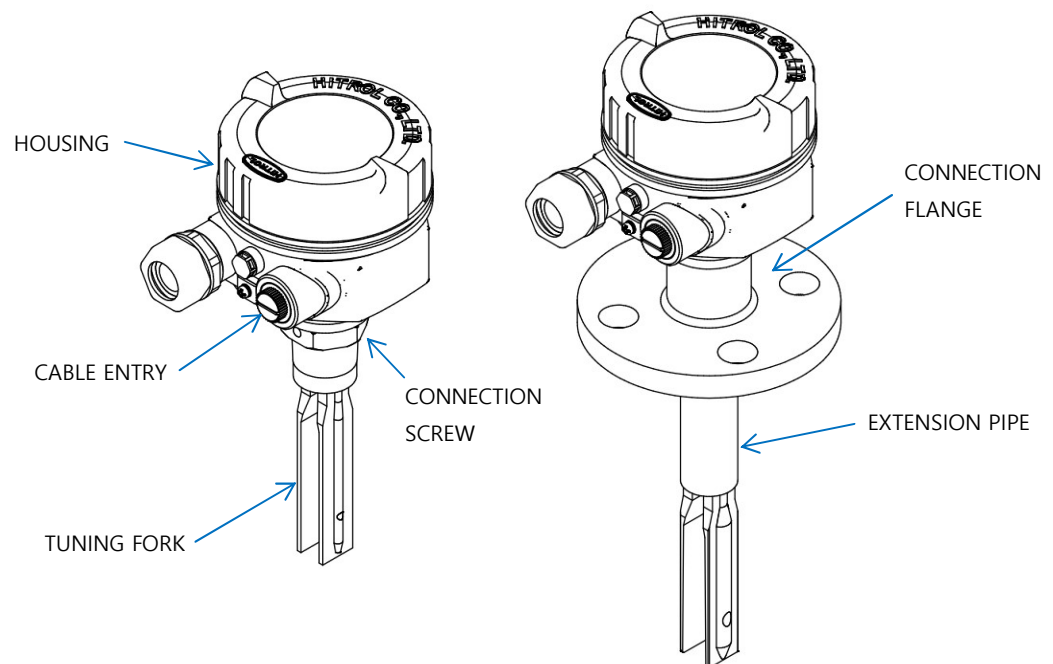
Overview

HTM-30T Series is a Tuning Fork Type level switch device consisting of two stainless steel Tuning Forks based on a vibration center membrane, a separate vibration type level switch device that measures and detects the density of the measurement and outputs DC 2-Wire Loop current at the level in the tank.

Operation
Principle and
Composition

Using the Piezo piezoelectric effect, applying a constant frequency electrical force vertically creates vibrations in the mechanical Tuning Fork.

When the level of the measurement rises and comes into contact with the Tuning Fork, the vibration weakens, and the frequency received varies according to the reverse piezoelectric effect, and measures the changing frequency to output the presence and absence of the measurement as DC 2-Wire Loop current.

**Characteristics**

- Applicable for various solid or Liquid.
- It is semi-permanent with a solid structure and no mechanical drive.
- Available for Measurement Range Setting.
- Easy to Control the Relay Contact(N.O, N.C).
- Applicable Connection Port for setting and monitoring by Computer.
- It can be used with various operating devices such as I Control Unit and PLC.

Specifications Product Spec.

Model	H T M - 3 0 T	HTM-30T-Ex-* *
Mounting	Screw or Flange	
Housing ; Cable Entry	PBT / ALC ; 2- PF 1/2"(F)	ALC ; 2- PF 1/2"(F)
Enclosure	Weather-Proof (PBT ; IP65 / ALC ; IP66)	Ex tD A21 IP66 T85°C/T160°C(*) Ex d IIC T3/T4/T5/T6(*), IP66
Max. Temperature	PBT Housing: 80°C ALC Housing: 150°C	(*) Ex tD/ Ex d Fluid Temp. & Grade Ex tD : Max. 50°C for T85°C Max. 150°C for T160°C Ex d : Max. 150°C for T3 /Max. 100°C for T4 Max. 60°C for T5 / Max. 50°C for T6
Ambient Temperature	-20°C ~ +60°C	
Max. Process Pressure	20kgf/cm ² (Screw Type)	
Power Source	DC +24V(Std.)	
Output Signal	SPDT	
Contact Rating	AC 250V, 5A / DC 30V, 5A	
Wetted Part Material	SUS 316L + SCS 14 / HASTELLOY-C (Opt.)	
Process Connection	PT 1"(M)	
Installation	Side or Top	
Combination Unit	I-Control unit	

(*) Ex tD/ Ex d Fluid Temp. & Grade

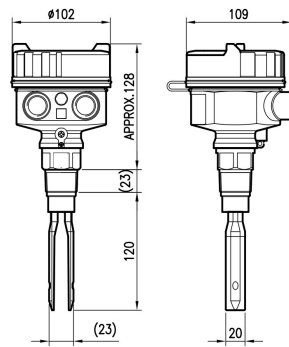
(**) Product identity

Amplifier Spec.

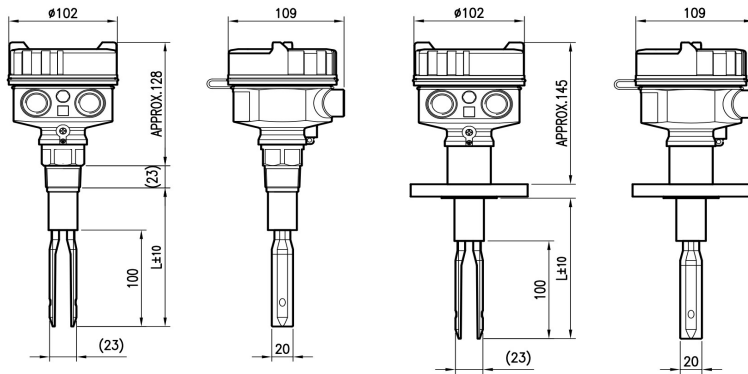
Module	M-30T	
Microprocessor	16Bit Microprocessor	
Oscillation Frequency	380KHz @ ± 50KHz	
Sensitivity Resolution	1Hz	
Current Out	Current Control – N.C	Non Detection : 9mA Detection : 16 mA
	Current Control – N.O	Non Detection : 16mA Detection : 9mA
Current Control	Normal Close @ Default 9mA	
Status Indicator	Bi-Color LED [Green / Red / Orange]	
Detection Indicator	RED LED	
Relay Control Indicator	GREEN LED	
Dielectric Constant	0.6g/cm ³ @ Min. (Liquid)	
Dimension	80mm x 65mm x 54mm	
Ambient Temperature	-20°C ~ +80°C	

Dimensions

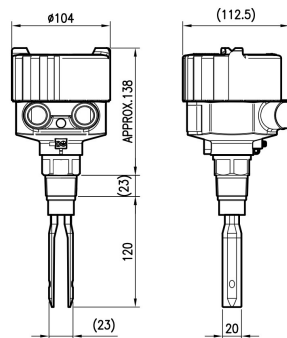
■ HTM-30T (Weather-proof)



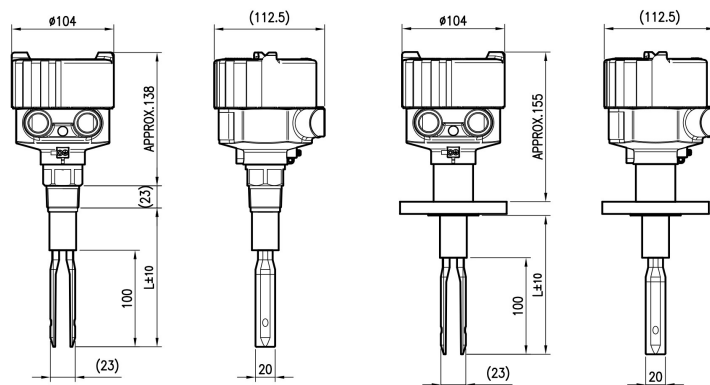
Standard type (PBT)



Extension type (PBT)



Standard type (AL.C)

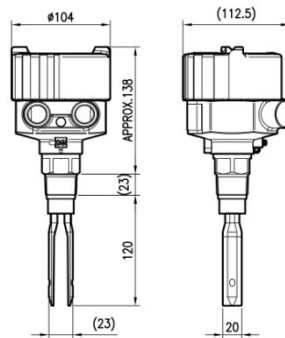


Extension type (AL.C)

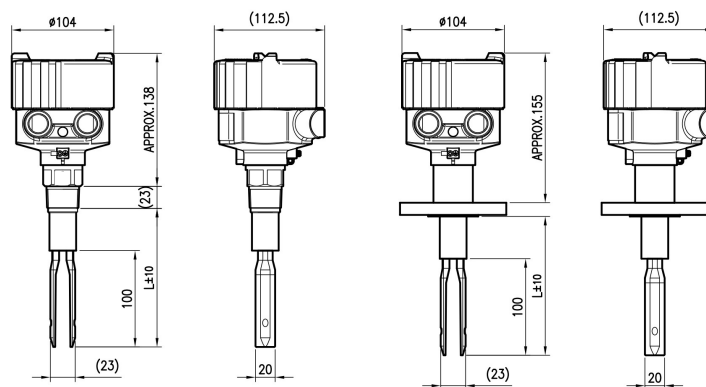


NOTICE Actual product may have a tolerance slightly.

■ HTM-30T-Ex (Explosion-proof)



Standard type (AL.C)



Extension type (AL.C)



Actual product may have a tolerance slightly.

Installation

- When installing the Sensor, avoid bumps or obstructions.
- Fluid flow is severe near the outlet, and mechanical damage or chattering can occur, so installation should be avoided in this area.
- The temperature and pressure generated inside the tank must be checked to the specification.
- Condensation may occur if the temperature of the housing differs significantly from the ambient temperature. Dehumidifier filling or Gortex must be applied.
- When tightening flanges or screws, they must be of the same size.
- Make sure to insert gaskets between flanges. (Select the gaskets in consideration of the temperature of the content and the pressure inside the container.)



In the case of explosion-proof products, you shall apply the appropriate rating for your installation.



The Control Unit is not an explosion proof product and must be installed in a safe area.

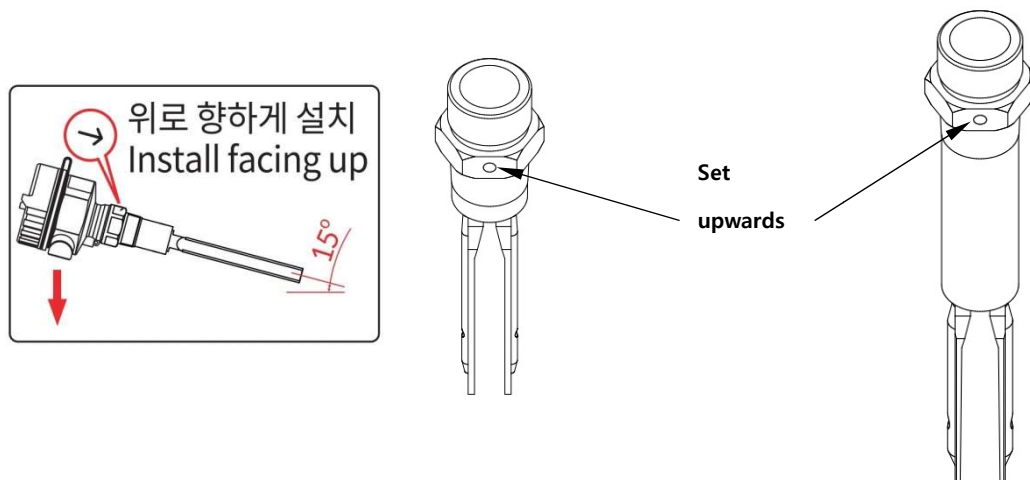
Precautions HTM-30T Series is installed on the top or the side of a container and silo to detect the upper or the lower limit, respectively. The level switch can be installed on any material, so it is applicable to ferrous or nonferrous tanks and silos. When installing this product, consider the following:

For Installation

■ When installation, the process connection should be screw or flange type, and a length of the screw should not be over 24mm. Otherwise, dust or foreign matter may enter, resulting in a malfunction. For horizontal installation, mark indicated in below drawing facing upward and installing the wide surface of the fork vertical.

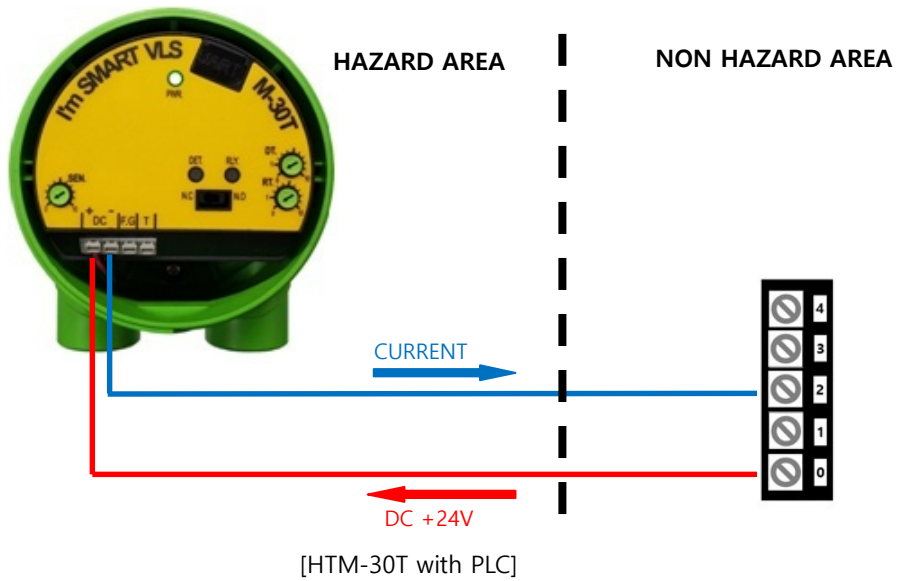
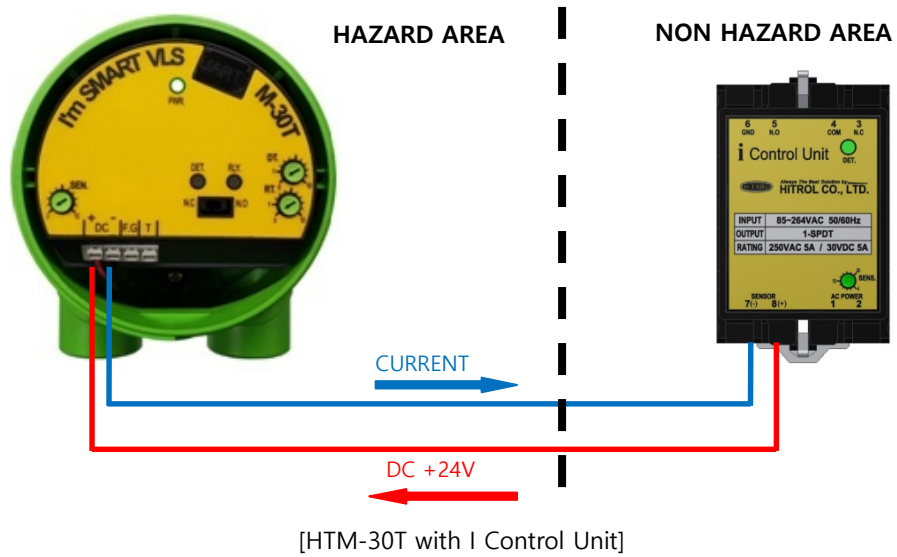


The direction of the tuning fork can be checked from the outside.



- To prevent buildup, the product should be installed at an inclination of 15° or more. In addition, the wing of the sensor must be installed vertically.
- Sensor shall be installed at the place far from inlet of the tank and protector shall be installed in order to protect the sensor from damage by falling medium if it is installed at the inlet. The protector shall have sufficient area to protect the sensor from incoming medium and be installed at a distance that does not affect sensor operation.
- Cable lead-in inlet must face the direction shown in the figure.
- If the housing temperature rises because of direct sunlight, install a sun cover to prevent such occurrence.

- AMP & Wiring**
- Make sure to connect the power with the correct polarity (+,-).
 - Do not connect the wire with the power connected.
 - Use AWG 16-26 cables.



For explosion-proof products, apply power after tightening the cover.

Precautions for Use

The level switch that prevents the vibration of the tuning fork is good for most of the bulk materials, but the following need to be taken in consideration.

- Do not install in a hazardous area unless it is an explosion-proof product (HTM-30T-Ex).
- The explosion-proof product (HTM-30N-Ex) can be installed in zone 1 and zone 2.
- Do not use when the temperature is out of the ambient temperature range (-20°C ~ +60°C).
- Do not use if the degree of protection is higher than IP 66

Precautions for Removal

- Check the level and presence of liquid in the tank before removing it.
- Overheated product may cause burn, so wear gloves to remove it.
- Remove it with the power disconnected.
- Make sure that any O-ring or gasket is not damaged while opening or closing the cover.



If there is explosive gas in the atmosphere, do not open the cover.



Make sure that it is not subject to any high impact when moving.

Safety & Environment

- Cautions for Use
 - Make sure to connect the product and the container using the required tools.
 - Do not cause high impact to the product.
- Cautions for Wiring
 - Make sure to connect contacts with the correct terminals. (Refer to Wiring.)
 - Wire and supply the power to the device after checking the specifications.
 - Incorrect power voltage may cause damage to the device.
 - Pay attention to prevent electric shock.
- Disposal

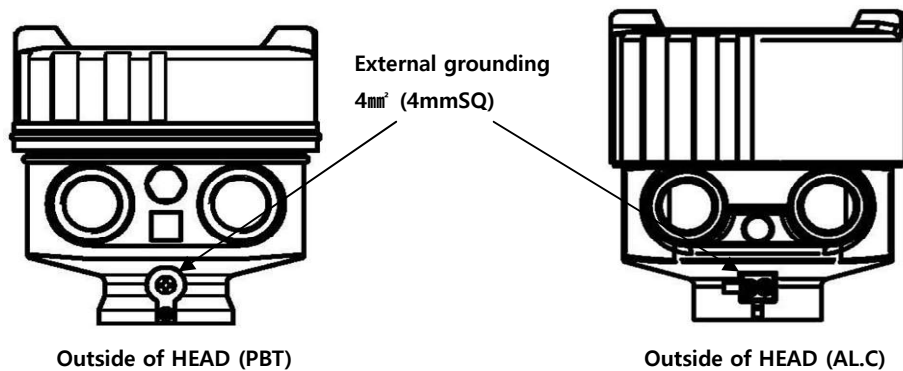
Make sure to separate the AMP and main unit from the housing before disposing the product. No part has an influence on the environment, so special attention is not required (e.g., mercury switch).

**Precautions
for Lead-In
Method of
External Wire**

- External wiring precautions (Explosion-proof type)
Certified cable gland (Ex d IIC, Ex tD A21, IP66, PF 1/2") must be used for cable entry.
Unused inlets must be sealed with certified plugs (Ex d IIC, Ex tD A21, IP66, PF 1/2").
- Grounding Precautions
 - The location of external grounding is experimental, and when connecting external grounding, the size of the grounding wire must be over 4 mm² and monitored. (Internal grounding is connected with the same specification as the connecting cable.)
 - The internal grounding line should be the same length as the power line, and the size of the internal grounding terminal lug should be 3.1mm² so if the power line is larger than 3.1mm², connect the grounding line with the terminal lug facing each other.



When inserting external(power and signal lines), wire thickness of AWG 24~14(0.2mm²~2.1mm²) is applied. Make sure to insert a washer if the terminal lug is removed from the ground terminal and subsequently reconnected. (Loosening prevention)



**Failure Check
& Maintenance**

- **Maintenance**
The main inspection parts of the vibrating level switch are divided into the sensor and transmission parts. The life span of the major components depends on user's environment and can be used in optimal condition through periodic checks. Therefore, the user shall check and maintain at least once a year. Inspection of the appearance of the product shall be visually checked to see if there is any damage, and the attachment of the medium or foreign substances to the sensor will make it worse, so they shall be removed regularly.
- **Failure Check**
 - 1) Is the power connection correct?
 - 2) Is the power voltage supplied correctly?
 - 3) Is cable wiring correct?
 - 4) Is the FAIL-SAFE MODE setting correct?
 - 5) Does the green LED turn on?




**Turn off the power of the product for maintenance.
In a hazardous area, do not disassemble when power is applied.**

Marking

■ Product Identification

The product identification mark is attached onto the shows the model name, serial number, working temperature, working pressure, and matters regarding output. The serial number is a unique manufacturing number for the identification of products.



PRODUCT _____	POWER _____
TAG NO. _____	OUTPUT CURRENT _____
SER. NO. _____	AMBIENT TEMP. _____
MAX. TEMP. _____	ENCLOSURE _____
MAX. PRESS. _____	

<http://www.hitrol.com> Manufactured by
 Made in Korea 

< Weather Proof >

PRODUCT _____	POWER _____
TAG NO. _____	OUTPUT CURRENT _____
SER. NO. _____	AMBIENT TEMP. _____
MAX. TEMP. _____	CABLE ENTRY _____
MAX. PRESS. _____	

EXPLOSION PROOF
Ex d IIC ** IP66
 xx-xxxxx-xxxx


<http://www.hitrol.com> Manufactured by
 Made in Korea 

< Explosion Proof >

The device is certified by KOSHA.



Ex d : 20-AV2BO-0579X / Ex d IIC T3/T4/T5/T6, IP66

Ex tD : 20-AV2BO-0681X / Ex tD A21 IP66 T85°C/T160°C

Product Identity

HTM-30T-Ex-* *

WETTED PART MATERIAL – S: 316L SS
 H: HASTELLOY-C
 PROCESS CONNECTION – F: FLANGE
 S: SCREW

User Training

Under the aforementioned, do not exceed 150°C, respectively, for the liquid in containers when using the product. In addition, make sure that the ambient temperature of housing is kept at -20 to +60°C.

Explosion-proof products are designed according to Article 34 of the Industrial Safety and Health Act and Article 58-4 of the Enforcement Regulations of the same Act.



Do not apply general products to hazardous areas and explosion-proof products can only be used in zone 1 and zone 2.

Install in accordance with explosion-proof temperature rating and fluid temperature.

**Warranty
& Contact**

■ Warranty & Service

This product is subject to a two-year shipment warranty. Unpaid service will be provided for any damage found under normal operating conditions. If it does not refer to product failure, payment will be required for the service charge.

You can request for A/S through our website or by contacting our headquarters.

■ Headquarters · Factory · Laboratory Contact Number

Address : HITROL CO.,LTD 141, Palhakgol-gil, Jori-eup, Paju-si, Gyeonggi-do, Korea

TEL : 031-950-9700 (Headquarters and A/S)

FAX : 031-943-5600 (Headquarters and A/S)

APPENDIX W



HTM-30T

Setting Guide

2Wire Separation Tuning Fork Type Vibration Level Switch



Doc. no. : Rev0.0

1. M-30T Configuration and Function

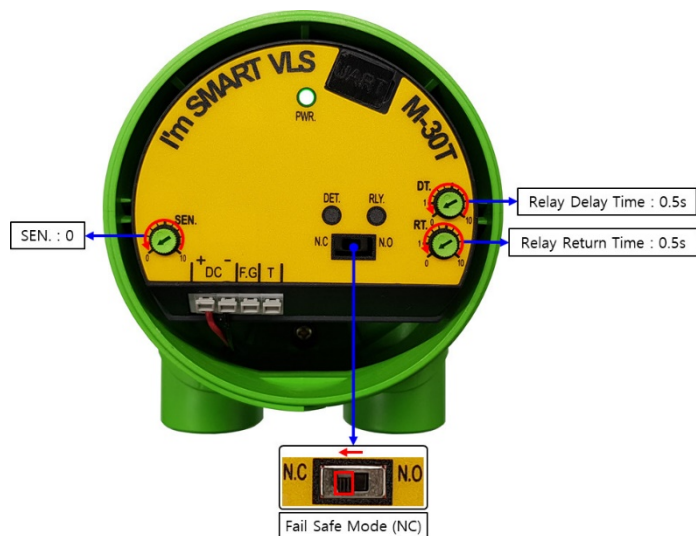


No	CONFIGURATION	FUNCTION
1	SEN.	<ul style="list-style-type: none"> ■ Sensitivity Adjustment
2	DT.	<ul style="list-style-type: none"> ■ Current Delay Time Adjustment ○ Time Range : 0.5s, 1s ~ 10s @ Adjustment 0.1s
3	RT.	<ul style="list-style-type: none"> ■ Relay Return Time Adjustment ○ Time Range : 0.5s, 1s ~ 10s @ Adjustment 0.1s
4	Fail Safe Mode	<ul style="list-style-type: none"> ■ Current Out Adjustment ○ N.C (9mA) ↔ N.O (16mA)
5	DET.	<ul style="list-style-type: none"> ■ Measurement Status LED ○ OFF → Red
6	RLY.	<ul style="list-style-type: none"> ■ Current Status LED ○ N.C : OFF → Green ○ N.O : Green → OFF
7	PWR	<ul style="list-style-type: none"> ■ Power & Status Display
8	UART	<ul style="list-style-type: none"> ■ M-30T Status Display Communication Port
9	Power	<ul style="list-style-type: none"> ■ DC+24V 2Wire Loop

2. M-30T Setting & Adjustment

■ Initialization Setting Method

- After installing it on the tank, set it to the initial state for quick response.




■ Tuning Setting 1

- The reference setting method according to the "Initialization Setting Method".

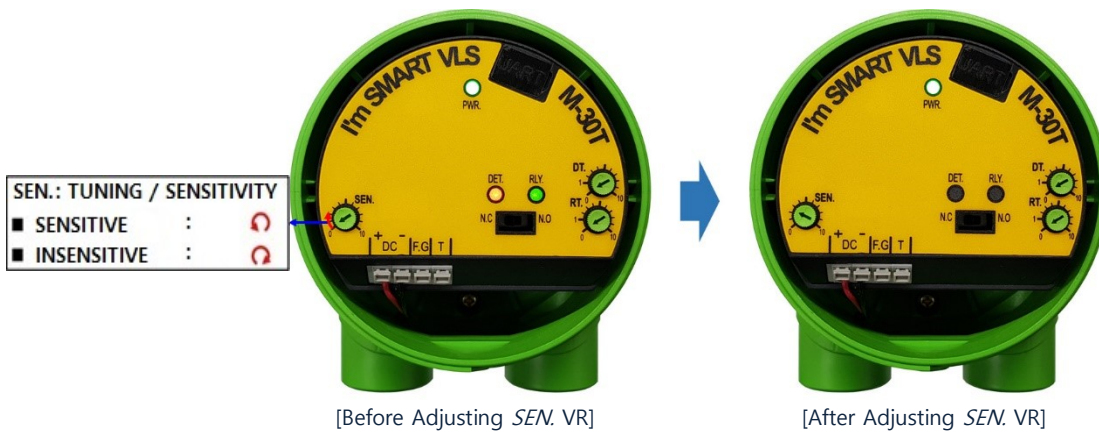


[Initialization Setting Status]

No	FUNCTION	METHOD
1	Vibration Frequency Tuning	<ul style="list-style-type: none"> ■ <i>SEN.</i> VR status is the most sensitive state in the initialization setting method. ■ Keep this status for sensitive use 

■ Tuning Setting 2

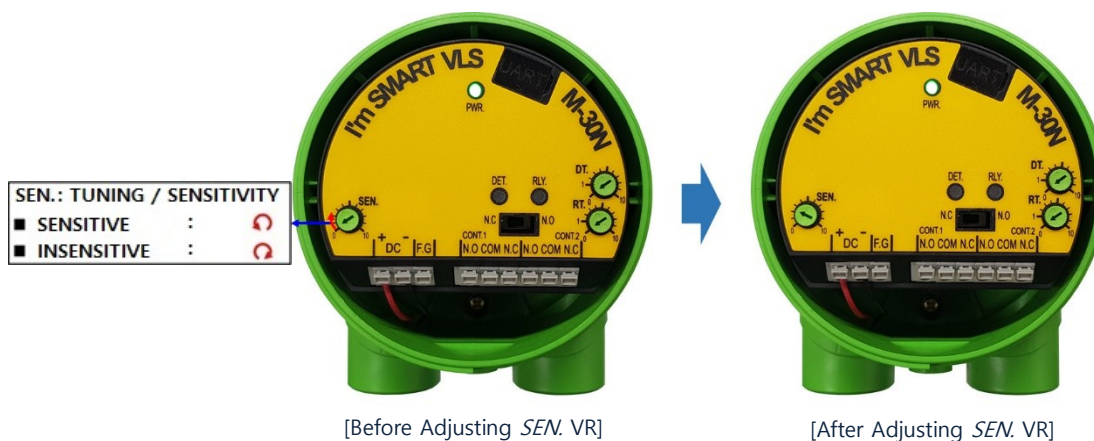
□ How to set up when the *DET.* LED is on.



No	FUNCTION	METHOD
1	Vibration Frequency Tuning	<ul style="list-style-type: none"> ■ If the <i>DET.</i> LED is on, fine-tune the <i>SEN.</i> VR to the right until the <i>DET.</i> LED turns off to set the reference value. <p>[Before Adjusting <i>SEN.</i> VR] [After Adjusting <i>SEN.</i> VR]</p>

■ Sensitivity Adjustment Method

□ You can adjust measurement sensitivity for each environment.




No	FUNCTION	METHOD
1	Tuning Setting Status	<ul style="list-style-type: none"> ■ <i>SEN.</i> VR status is the most sensitive state in the tuning setting method. ■ Keep this status for sensitive use
2	Sensitivity Adjustment	<ul style="list-style-type: none"> ■ You can adjust the sensitivity by adjusting the <i>SEN.</i> VR. ■ Sensitivity Adjustment Method <p>[SENSITIVE] [INSENSITIVE]</p>

■ Current Delay Time Adjustment Method

□ You can adjust the current delay time after detecting the measurement.




[Operating Status According to Current Delay Time]

No	FUNCTION	METHOD
1	DT.	<ul style="list-style-type: none"> ■ Current Delay Time ■ Time Adjustment Range : 0.5s, 1s ~ 10s @ Adjustment 0.1s 

□ You can adjust the current out time after undetecting the measurement



[Operating Status According to Current Return Time]

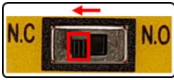

No	FUNCTION	METHOD
1	RT.	<ul style="list-style-type: none"> ■ Current Return Time ■ Time Adjustment Range : 0.5s, 1s ~ 10s @ Adjustment 0.1s 

■ Fail Safe Mode Adjustment Method

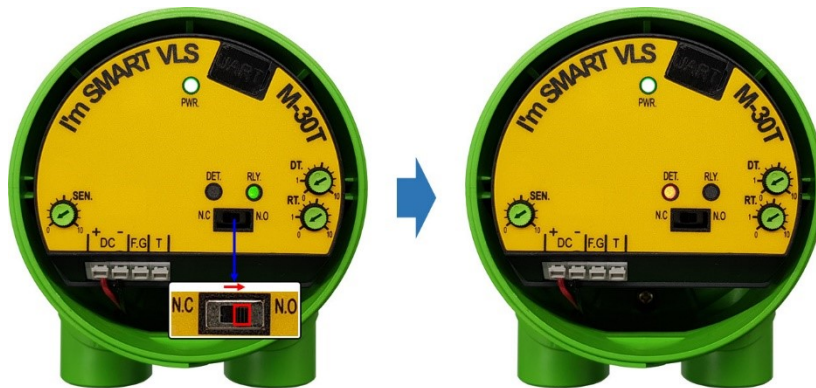
□ You can adjust the contact status to Current Out N.C.



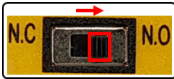

[Operating Status According to Current out [N.C]]

No	FUNCTION	METHOD
1	N.C	<ul style="list-style-type: none"> ■ Current Out (9mA) Default Status .  <ul style="list-style-type: none"> ■ After detecting the measurement, Current Out changes from 9mA to 16mA. ■ LED Status . 

□ You can adjust the contact status to Current Out N.O.



[Operating Status According to Current Out [N.O]]

No	FUNCTION	METHOD
1	N.O	<ul style="list-style-type: none"> ■ Current Out (16mA) Opposite Status.  <ul style="list-style-type: none"> ■ detecting the measurement, Current Out changes from 16mA to 9mA. ■ LED Status 

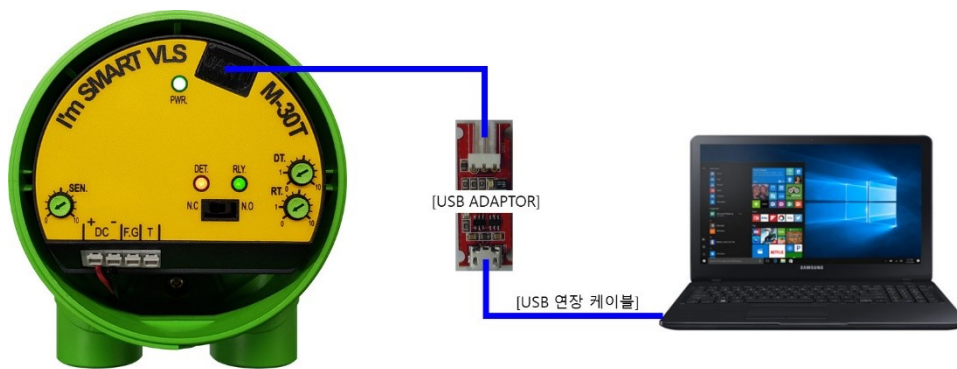
3. M-30T UART Monitoring

■ Monitoring Method

- You can only check the state of the adjusted setting values using your PC or Smartphone.
- The execution method is the same using your PC or Smartphone. (Password: 1975)
- Run Screen Component: You can check the sensor measurement status, sensitivity setting value, relay setting, etc.

■ Monitoring Method Using PC

- Component: PC, USB Cable (typical USB to Micro USB B), UART ADAPTOR.



[M-30T PC UART Component]

```

*****
01. Sensitivity lower limit      : 180 Hz
02. Sensitivity upper limit     : 370 Hz
03. Measurement frequency       : 204 Hz
04. Reference frequency         : 237 Hz
05. Current delay time          : 0.5 Sec
06. Current return time         : 0.5 Sec
07. Current control             : Normal close
08. Measuring temperature       : 27.0 °C
( Refresh : R, Repeat : RR, Exit : exit
  Return to menu or stop repeat : ESC )
*****
Select Menu(1~2) : █
    
```

01. Sensitivity lower limit	: 180 Hz	<input type="checkbox"/> Minimum Frequency Setting Value for Medium Detection
02. Sensitivity upper limit	: 370 Hz	<input type="checkbox"/> Maximum Frequency Setting Value for Medium Non-detection
03. Measurement frequency	: 200 Hz	<input type="checkbox"/> Current Measurement Vibration Frequency
04. Reference frequency	: 300 Hz	<input type="checkbox"/> Sensitivity Setting State Frequency Threshold
05. Relay delay time	: 0.5 Sec	<input type="checkbox"/> Relay Delay Time Adjustments
06. Relay return time	: 0.5 Sec	<input type="checkbox"/> Relay Return Time Adjustments
07. Relay contact	: Normal close	<input type="checkbox"/> Relay Contact Status
08. Measuring temperature	: 28.0 °C	<input type="checkbox"/> Board Measuring Temperature

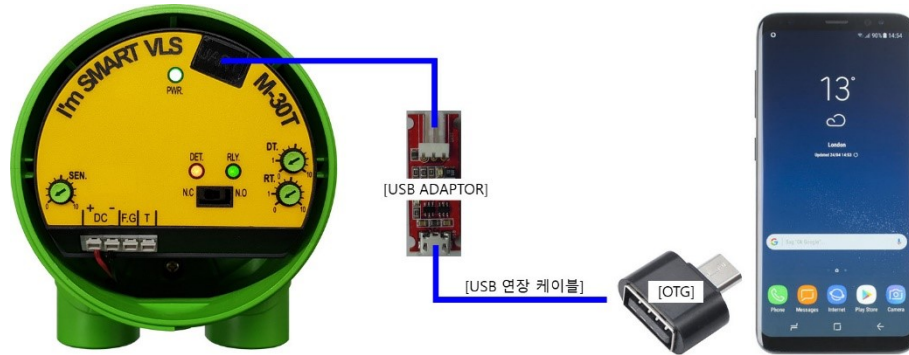
```

( Refresh : R, Repeat : RR, Exit : exit
  Return to menu or stop repeat : ESC )
*****
Select Menu(1~2) : █
    
```

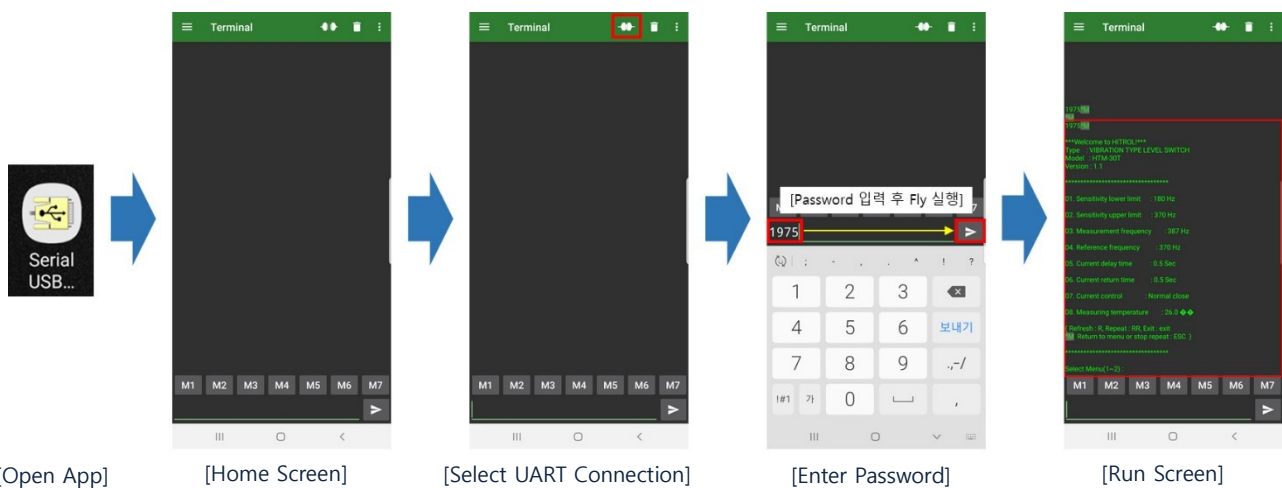
[M-30T PC UART RUN SCREEN]

■ Monitoring Method Using Smartphone

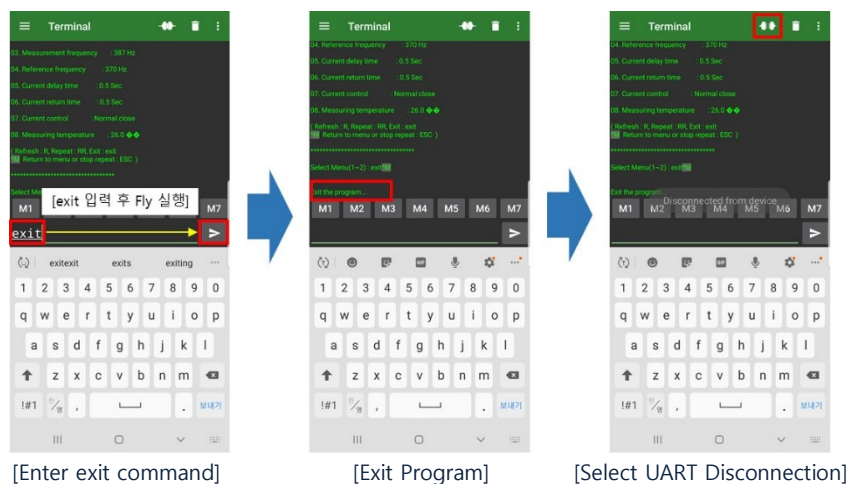
- Component: Smartphone(Android OS), OTG, USB Cable(typical USB to Micro USB B), UART ADAPTOR.
- App App: Refer to "Serial USB Terminal Install & Setting Guide"



[M-30T Smartphone UART Component]



[M-30T Smartphone UART Execution]



[M-30T Smartphone UART Exit]

APPENDIX H



Serial USB Terminal

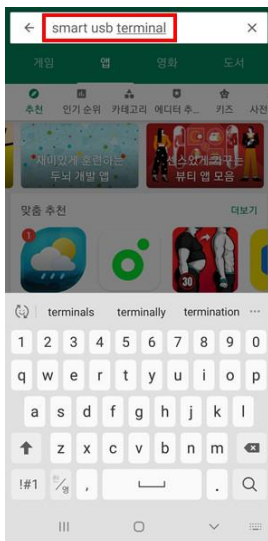
Serial USB Terminal Install & Setting Guide

Application : Level Switch / Level Transmitter

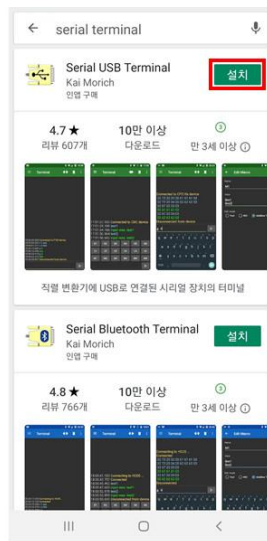


■ Installing Serial USB Terminal App

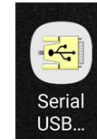
- Search and Install a App that "Serial USB terminal" in the App Store.



[Search]



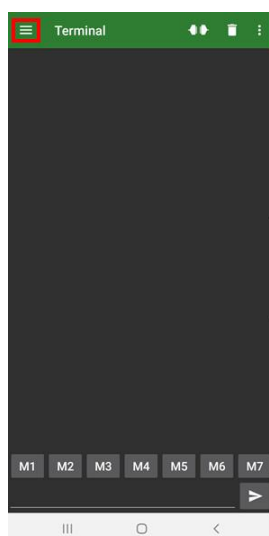
[Install]



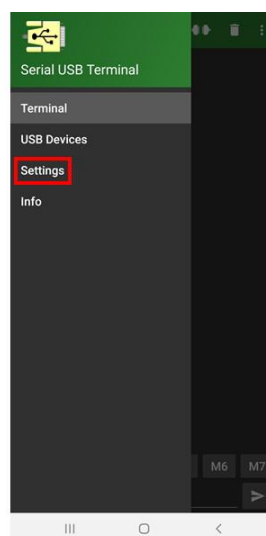
[Icon]

■ Serial USB Terminal Setting

- Run The Serial USB Terminal Icon
- Four types of environments must be set up for normal operation of Serial USB Terminal.
 - ▶ Serial
 - ▶ Terminal
 - ▶ Receive
 - ▶ Send



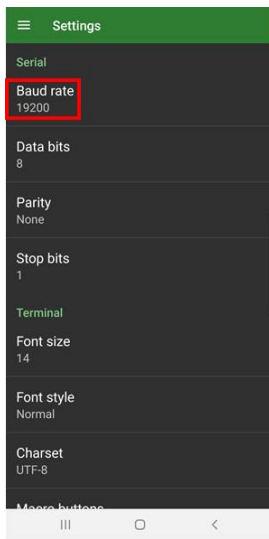
[Configuration]



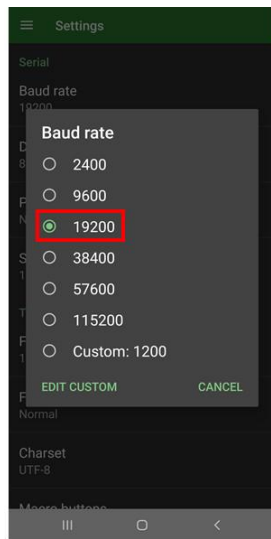
[Setting]

Serial – Baud rate Setting

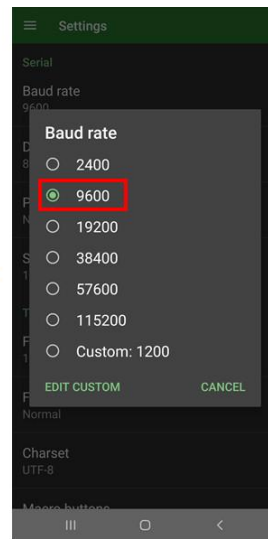
Baud rate : 19200 -> 9600



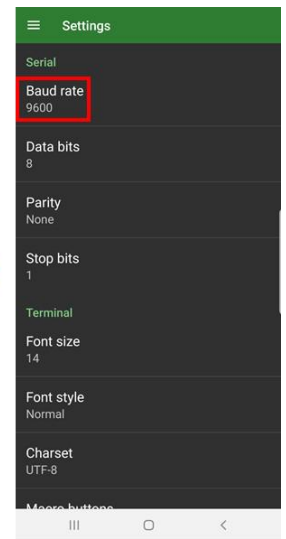
[Select Baud rate]



[Default]



[Setting]



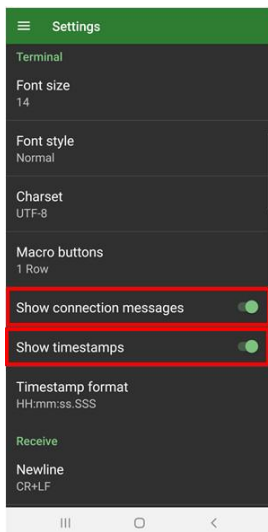
[Complete]

Terminal - Show connection message / Show timestamps Setting

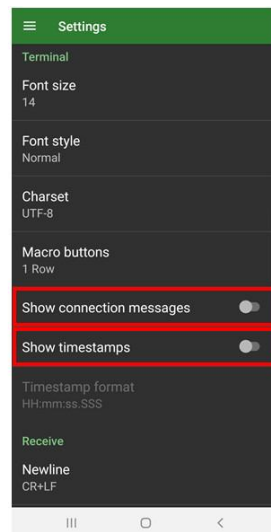
Show connection message : ON -> OFF

Show timestamps : ON -> OFF

The size of the Terminal Font is the size set in the Smartphone.

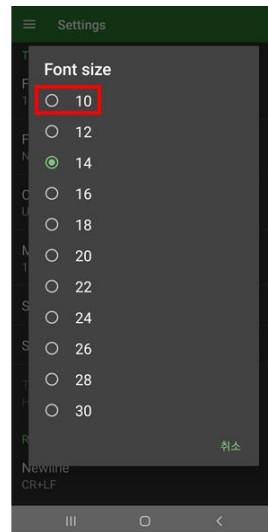


[Default]

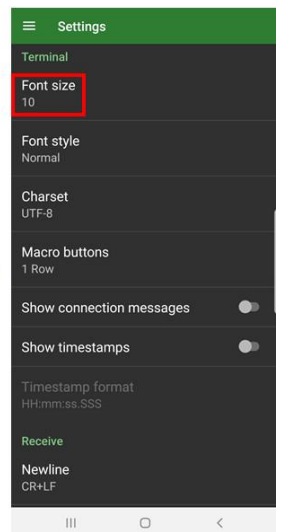


[Complete]

[Terminal Setting]



[Default]

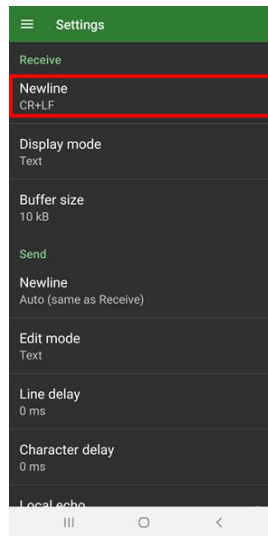


[Complete]

[Terminal Font Setting]

Receive – Newline Setting

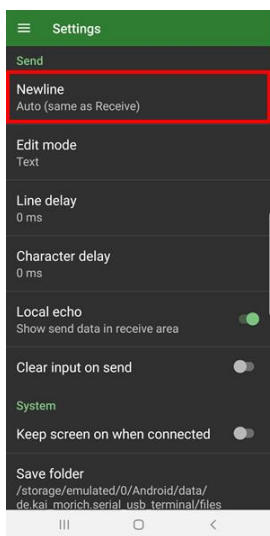
Newline : CR+LF (Carriage Return + Line Feed) Check



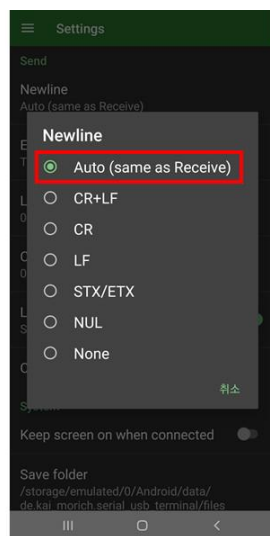
[Default]

Send - Newline Setting

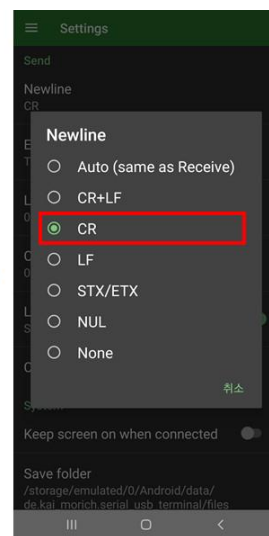
Newline : Auto(same as Receive) -> CR



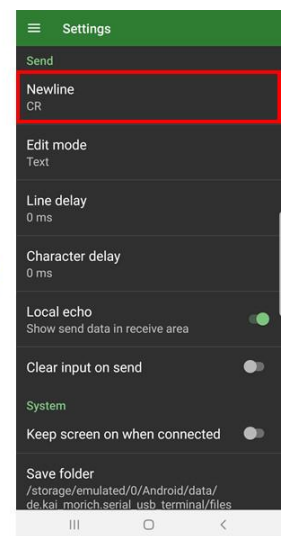
[Select Newline]



[Default]



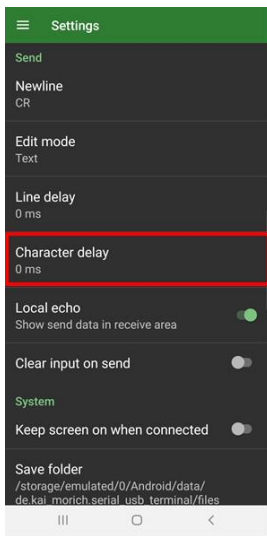
[Setting]



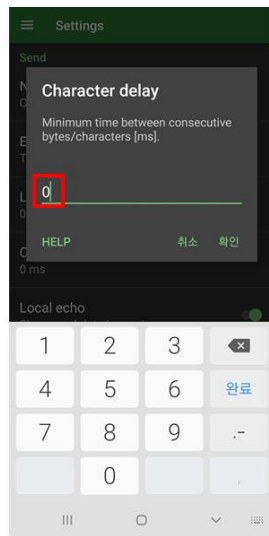
[Complete]

■ Send - Character delay Setting

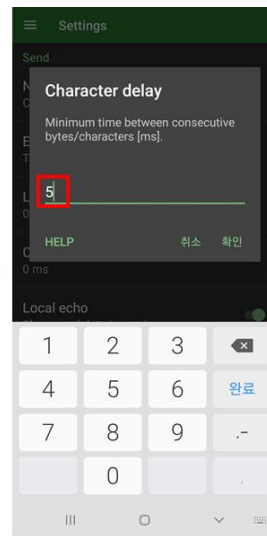
□ Character delay : 0ms -> 5ms



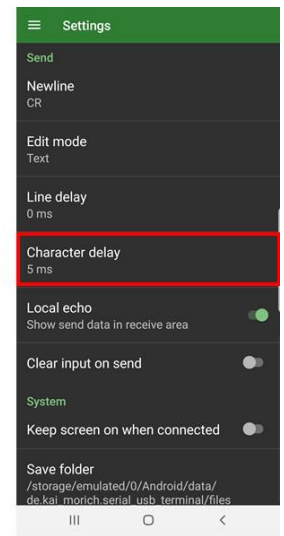
[Select Character delay]



[Default]



[Setting]

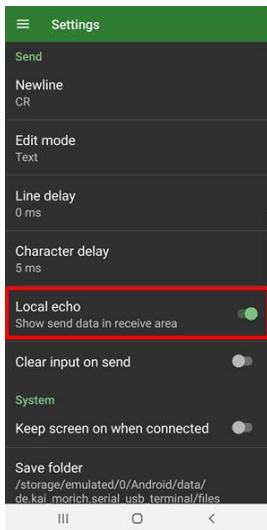


[Complete]

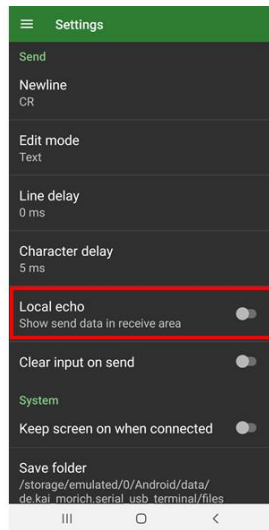
■ Send – Local echo / Clear input on send Setting

□ Local echo : ON -> OFF

□ Clear input on send : OFF -> ON

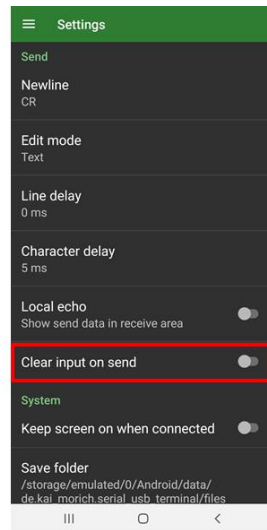


[Select Local echo]

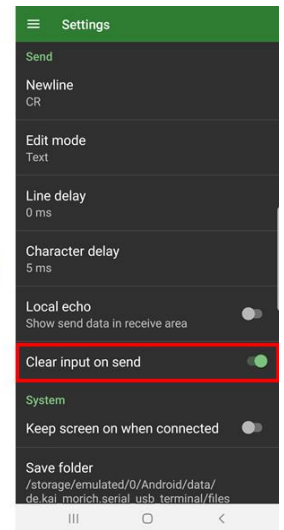


[Complete]

[Local echo Setting]



[Select Clear input on send]



[Complete]

[Clear input on send Setting]

※ For detailed instructions, refer to the manual of each product.