ALFINE™ METAL DETECTOR

Operation Manual

(AFM-3000)

 Version : 2019, October

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Chapter 5. System Setting

Chapter 1. Overview

1.1. Introduction

Thank you for purchasing AFM-3000.

AFM-3000 Metal Detector is a machine that can be installed on the backend of manufacturing lines such as production equipment and automatic packing machine to prevent shipment of defects (metallic foreign substances: iron, stainless) through lot inspection on products, to enhance the brand image of your company by protecting your consumers, and to prevent degradation of performance of functional products due to metal.

This machine is used to inspect foreign substances (metals) included in aluminum-packed products and applies to a wide range of uses including detergents, confectioneries, foodstuffs, paper, plastic injections, plastic bags, bottles and boxes.

Since this Operation Manual explains functions and methods of using AFM-3000, read and understand the contents to be applied to your manufacturing processes.

☞ Specifications of this product and contents of this Manual are subject to change without notice to make performance and functional improvement.

☞ Contents of this Manual cannot be duplicated, reproduced or translated in part or whole without the consent of the manufacturer.

☞ Our company is not held liable for any problems caused by the use of non-standard consumables or arbitrary attachments.

1.2. Features

1) 10-inch, 16.7M color TFT LCD (resolutions: 1,024 x 600)
2) Convenient touchscreen
3) Diverse screen compositions and graphic display methods
4) Auto calibration function
5) Multi-level transmission using an inverter
6) Built-in temperature change and noise compensating circuit
7) Function to save and call settings for each item (999 items)
8) Printing function <OPTION>
   : Can print by attaching a printer
9) Connection with external devices
   : Can be connected with various external devices via communication and contact
10) Ease of data analysis and totaling
   : Can check production status of each item on the total screen
   Can utilize totaled data using the Excel program
11) Function to save and update USB drive
   : Can copy production data onto a USB drive

1.3. Precautions 

1.3.1 Precautions for Touchscreen

1) Since this product uses touchscreen, be careful not to stain the LCD screen with foreign substances. (Contamination can cause malfunctioning of the screen.)
2) Do not press the screen too hard.
3) Touch the screen using fingertips.
(Do not use sharp awls or nails to touch the screen as they can damage the product.)
4) Do not paint the screen or attach stickers.
5) Lightly wipe the LCD screen using a soft cloth.
(Do not use chemicals or detergents.)

1.3.2. Precautions for Devices

1) Do not put metallic tools and magnetic bodies nearby this equipment.
2) Do not approach products that can damage magnetic property such as watches, credit cards and electronic devices.
3) Always keep the machine clean.
4) Use stable power since severe voltage fluctuation can lead to measurement errors.
5) Do not apply impact or load higher than the specifications.
6) Do not remodel the structure at your discretion because sensitivity of metal detection can be decreased.
7) To ensure safety, only allow the designated administrator to start or stop the conveyor and open or close the cover behind the control box.
8) Use a test piece to check abnormality of the equipment prior to production.

1.4. Installation and Inspection of Functions

1) Install in a place that is not affected by oscillation and heat.

2) Remove moveable metallic substances nearby the metal detector head in advance.

3) Use power of 110V/220V, 50Hz/60Hzand separate from the power line.

4) Make sure to perform earthing to prevent electric shocks such as electromagnetic wave and statistic electricity in advance.

5) Install in a place that maintains constant temperature and humidity.

- Optimal temperature: 5℃~35℃ [41℉~95℉], ±2℃/hr

- Optimal humidity: 35%~ 85% RH

7) Inspection of functions

① Frequently inspect abnormality of the lamp, motor, air solenoid valve and buzzer.

② Keep the conveyor clean by removing foreign substances.

Chapter 2. Screen Composition

2.1 Basic Screen Composition

Basic screen composition of AFM-3000 is explained here.

① Start/stop conveyor

: This button starts or stops the conveyor.

② Item no.

: This button is used to check another preset item no. or change to another item no.

③ Item name

: An item can be selected from the preset list of items.

④ SD, USB

: This area indicates status of SD card and USB drive recognition.

⑤ Icons

: These icons show current status.

⑥ Status display

: This area displays whether the conveyor is running, stopped or in normal metal state.

⑦ Work time

: This area displays work start time, end time and conveyor operation time.

⑧ Judged quantity

: This area displays normal quantity, metal judged quantity and total quantity.

⑨ Function selection

: These buttons can be used to execute different functions.

⑩ Quantity per minute

: This area displays production quantity per minute.

⑪ Speed: This area displays speed of the conveyor.

2.2 Start/Stop Conveyor

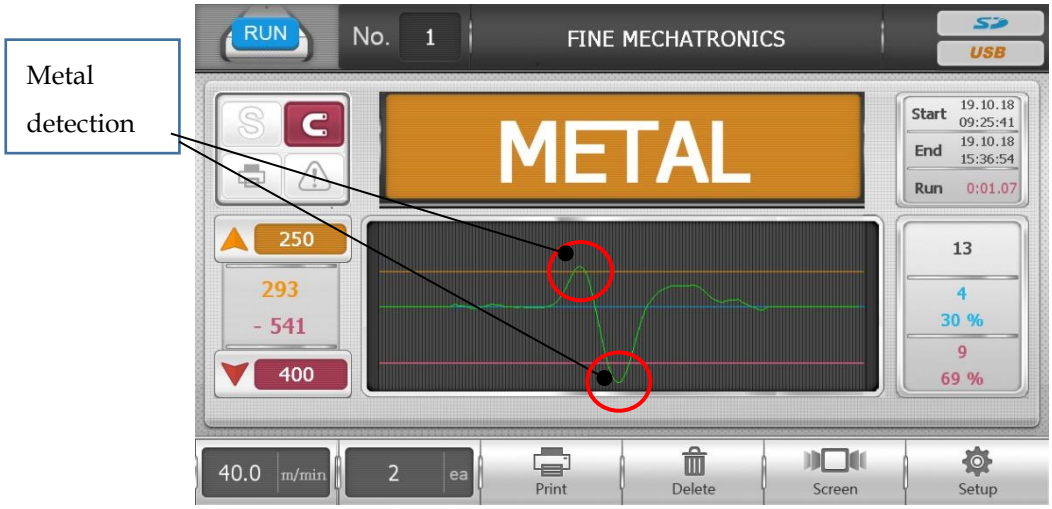
The conveyor can be started or stopped by touching this button.

If stopped: The button appears to be Start.

If started: The blue arrow moves with periodic display of "RUN."

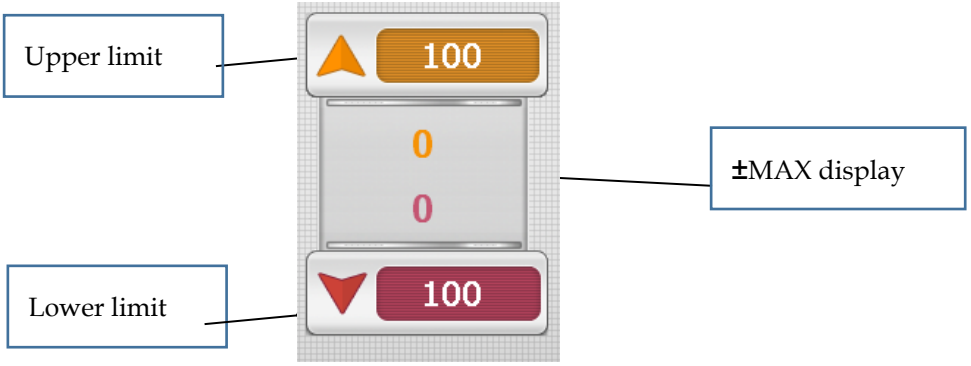
2.3 Upper and Lower Limits

Sensitivity of manufacturing products can be checked and changed.



The item is judged as a metal if the ±MAX value is greater than the upper and lower limit values.

Setting must be done so that the ±MAX value does not exceed the upper and lower limit values when a normal product is injected.

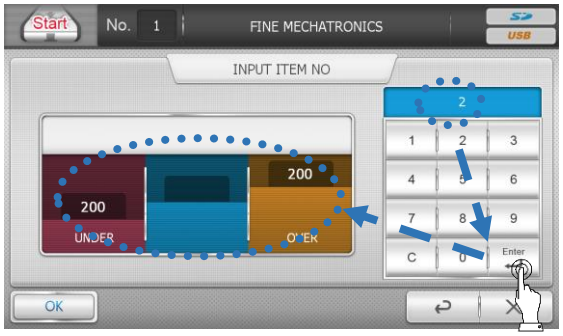


2.4 Item No.

Upper and lower limits of another preset item no. (1~999) can be checked or selected.

Step 1

Touch No. button.

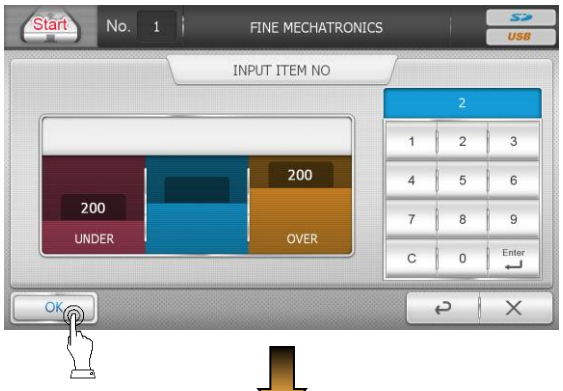


Step 2

Enter item no. to be checked and touch Enter.

Sensitivity setting of selected item no. is displayed on the left side.

* Cancel number entered by touching C.



Step 3

Touch OK to change item no. to be measured.

Touch ↩ or ✕ without touching OK to return to the previous screen without changing item no.

Step 4

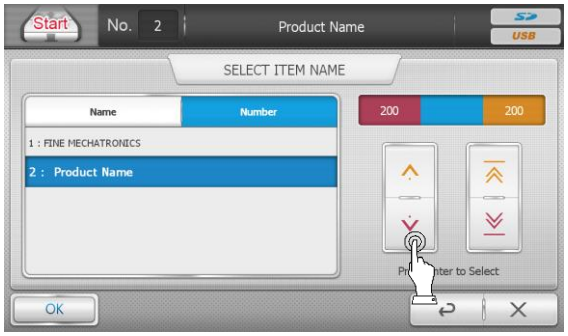
Item no. and item name are changed, as well as sensitivity setting.

2.5 Item Name

Item name can be checked and selected from the preset list of items.

Step 1

Touch the area that displays item name.



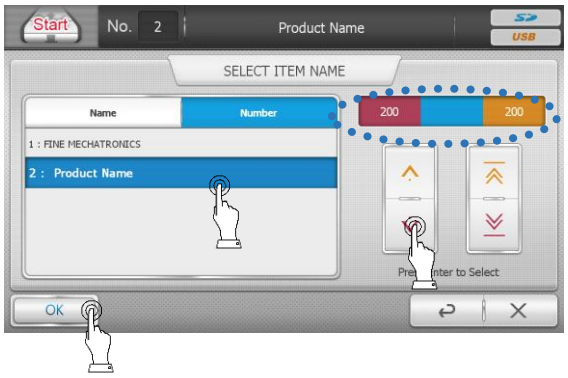
Step 2

Sorting method: By name or no.

Selection method: 1) Select from the list.

2) Touch  to move one item at a time.

3) Touch  to move one screen at a time.



Step 3

Touch  after selecting item name to be changed.

Touch  or  without touching  to return to the previous screen or initial screen without changing item no.

Step 4

Item no. and item name are changed.

2.6 Icon Display Area

Status are displayed using icons. Color of all icons is changed during operation.

Indicates detection by the entry sensor

Indicates detection of a metal

Indicates that the printer is operating

Confirms abnormality of the metal detector (CE: Continuous Error)

* CE: The continuous error icon disappears after touching.

2.7 Judgment Value Display Area

Current status is displayed. **Background color** changes according to the judgment result.

Stopped (initial screen): Green

Stopped: Green

Running: Blue

Running (normal): Blue

Running (metal): Yellow

2.8 Function Selection Buttons

The metal judgment result is printed.

When a printer is attached (OPTION), the result is printed as shown on the right.

INDIVIDUAL PRINT

****

PART	SER.	G.	DATE	TIME
1	411	M	2019.10.15	10:20:30
1	412	M	2019.10.15	10:20:31
1	413	M	2019.10.15	10:20:32
1	414	M	2019.10.15	10:20:33
1	415	M	2019.10.15	10:20:34
1	416	M	2019.10.15	10:20:35
1	417	M	2019.10.15	10:20:36
1	418	M	2019.10.15	10:20:37
1	419	M	2019.10.15	10:20:38
1	420	M	2019.10.15	10:20:39
1	421	M	2019.10.15	10:20:40
1	422	M	2019.10.15	10:20:41
1	423	M	2019.10.15	10:20:42
1	424	M	2019.10.15	10:20:43
1	425	M	2019.10.15	10:20:44

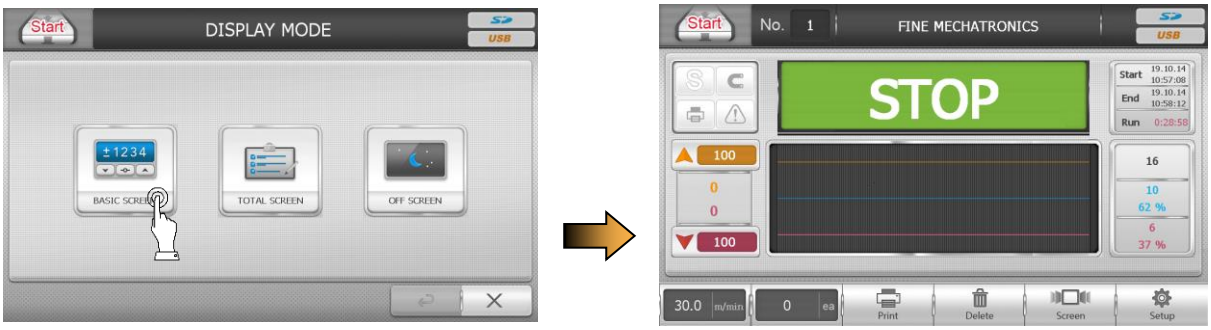
Quantity and work time for current item no. are deleted.

The user can switch to the screen according to convenience.

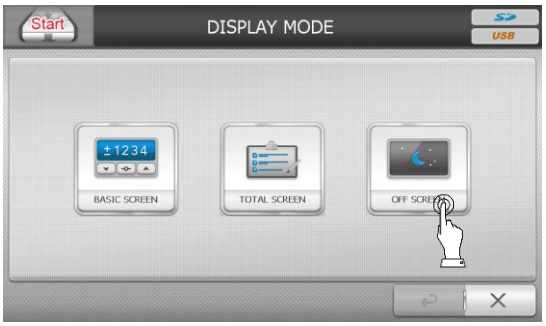
This button switches to the system setting mode.

Chapter 3. Screen Selection

3.1 Basic Screen



3.2 OFF Screen

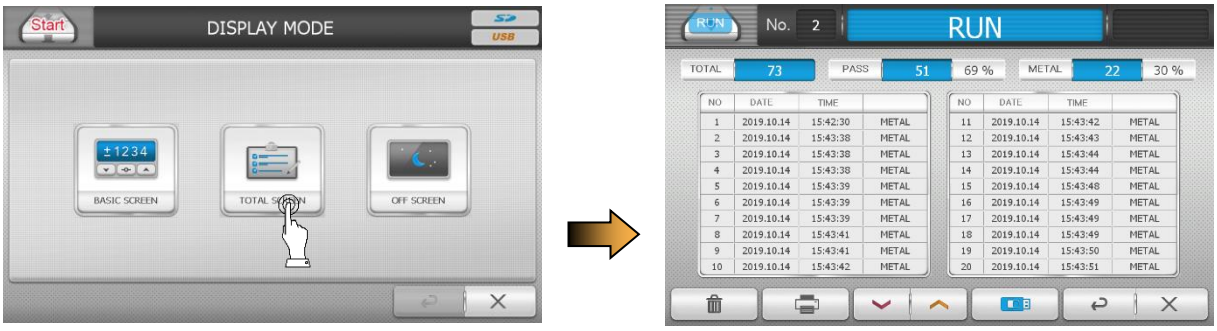


Only the screen will be turned OFF.

Touch any part of the screen to return to the initial screen.

* The screen is only turned OFF when **the conveyor is stopped**.

3.3 Total Screen



This screen displays history of metal detection for each item no.

(Detailed explanation is provided on the next page.)

This button deletes data of current item no. on the screen. Data in the internal memory will remain.

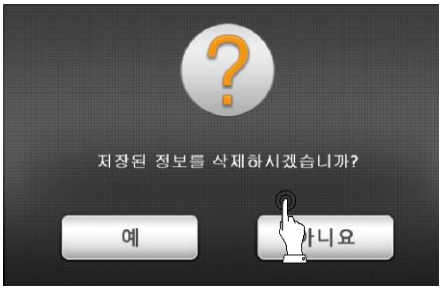
Total data are printed by the printer as shown below.

```
        TOTAL PRINT
**************************
PART        =1
S-DATE      =2017-03-10
Start       =  08:40:19
E-DATE      =2017-03-16
End         =  18:30:29
R-TIME      =  1:30:20

PASS
COUNT         22
RATIO       =52.38 %

METAL
COUNT       20
RAITIO        47.62 %

TOTAL
COUNT       42

**************************
```

*Item no.
*Start date
*Start time
*End date
*End time
*Conveyor operation time
*Normal quantity
*Normal ratio
*Metal quantity
*Metal ratio
*Total quantity

* Touch **Print Screen** to save the total screen as a BMP file in the "Capture" folder of the SD memory card.

This button saves all of total information collected after previous backup time in "backup" folder of the USB memory. Be careful as data backed up are deleted from the internal memory.



Touch "Yes" to save as file name based on date and time as below.

Backup\201012995242_as_db.csv (judgment list)

(January 29, 2010. 09:52:42)

Note) File structure of the SD memory

Backup\201012995242_as_db.csv (judgment list)
Capture\2010217102352.bmp
AssortList.csv (item list)

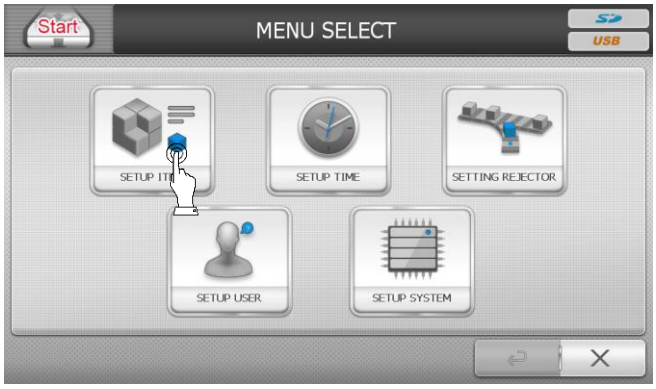
Here, you can check 'csv' file data using the Excel program on a PC. Also, the item list can be edited on a PC.

Chapter 4. Setting Screen

4.1 Item Setting

Step 1

Touch Setup button.



Step 2

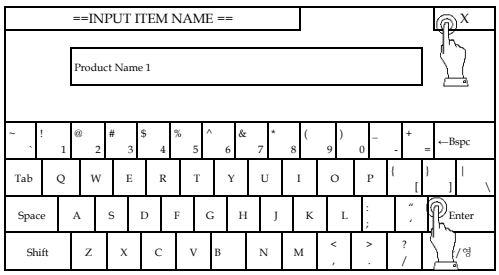
Touch SETUP ITEM.

Step 3

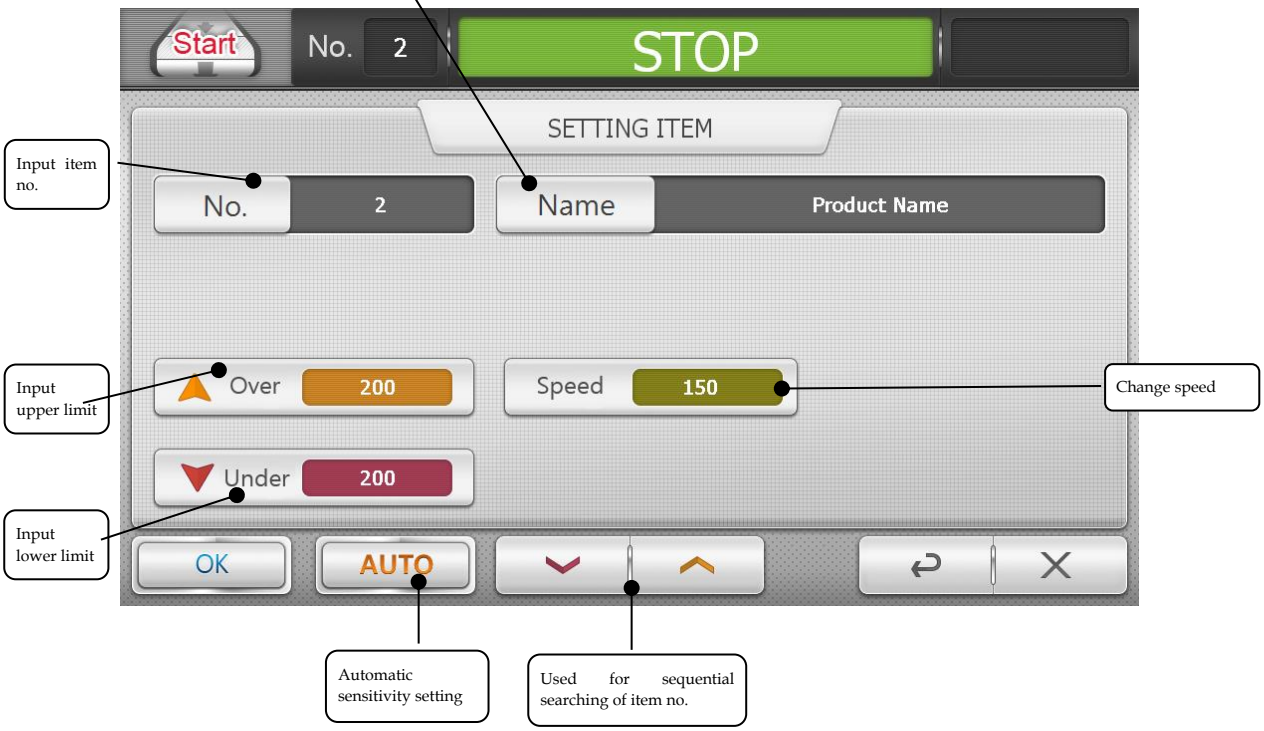
Touch OK button after entering item no., item name and other settings.

Refer to the following page for description of each item.

Input item name

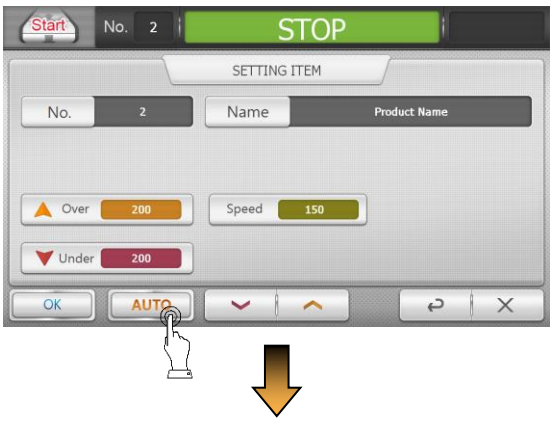


*Caution!:
Item name must be entered to include the item on the item list.
Touch Enter after entering item name.
Touch X to cancel input.



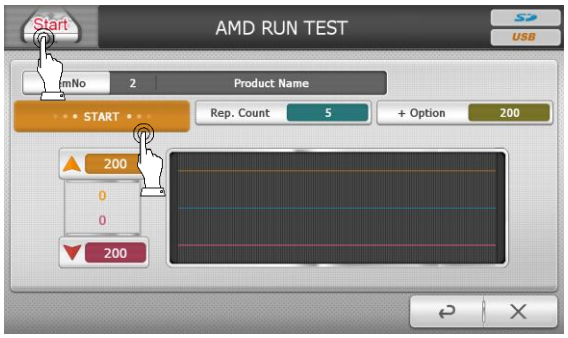
4.1.1 Automatic Setting

Upper and lower limits are set automatically through repeated measurement of product characteristics.



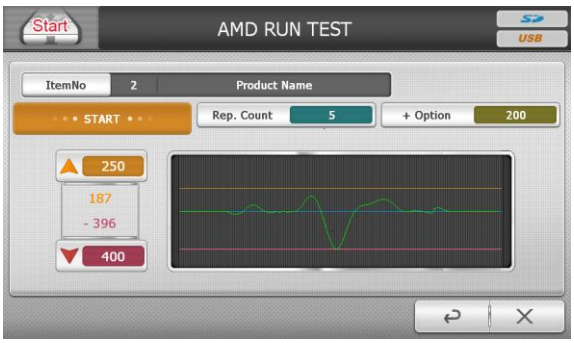
Step 1

Touch AUTO button.



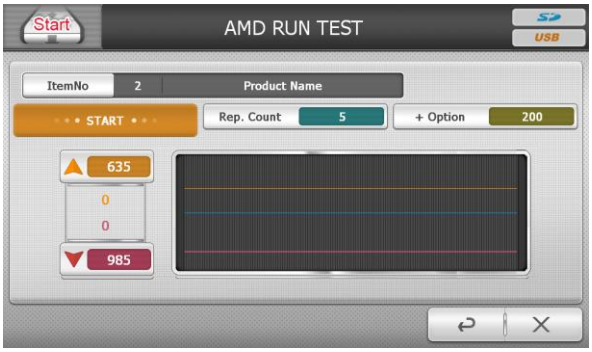
Step 2

- Touch conveyor start button.
- Touch START button.



Step 3

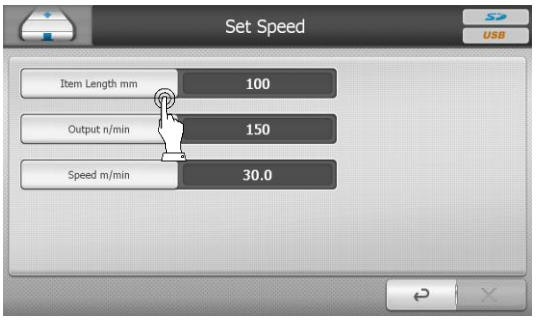
- Inject same number of products as repeat count and measure sensitivity.



Step 4

After injecting products, the maximum measurement value and OPTION are totaled to set upper and lower limits automatically.

4.1.2 Speed Setting



Step 1

Enter item length for accurate speed setting.

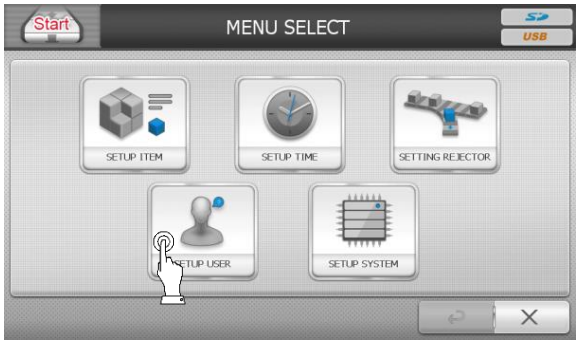
Step 2

Set speed using output n/min or speed m/min button.

4.2 User Setting

Step 1

Touch Setup button.



Step 2

Touch SETUP USER button.

Step 3

Enter 4-digit password and touch [Enter].

Initial password:1234

Step 4

Change settings.

* Judgment hold time

: Pass, metal status display is maintained for hold time after judgment.

Display is switched to RUN after hold time.

* Continuous reject

: Sends out a warning signal when continuous reject occurs for quantity entered

* Run power ON

: Decides initial running status of the conveyor when power is supplied

* Password setting

: Enter 4-digit password into the number pad and touch [Enter].

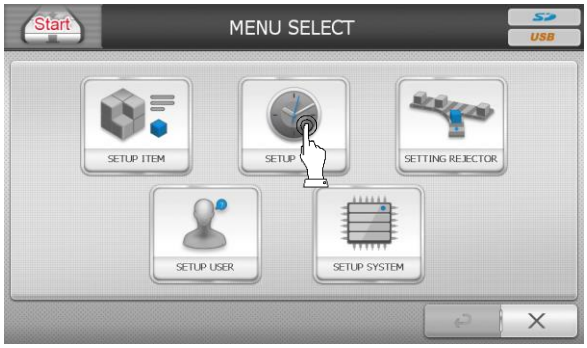
* Data backup

: Whether judgment data are to be saved on a USB drive

4.3 Time Setting

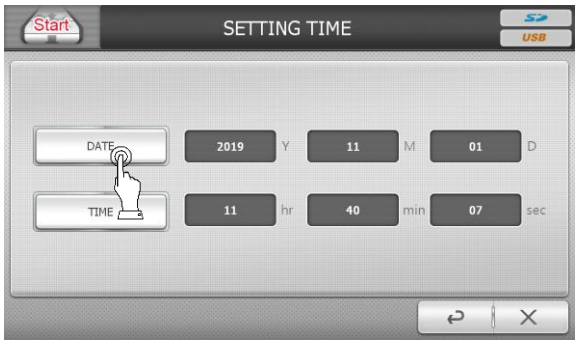
Step 1

Touch Setup button.



Step 2

Touch SETUP TIME button.



Step 3

Touch date and time buttons and enter a 6-digit value.

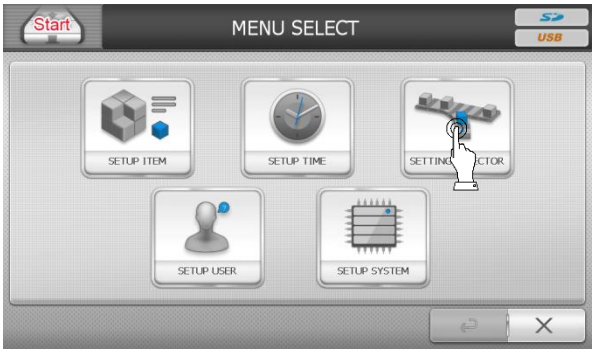
Ex) To enter October 15, 2019, “191015” [Enter]

Ex) To enter 04:09:33, “040933” [Enter]

4.4 Rejector Setting

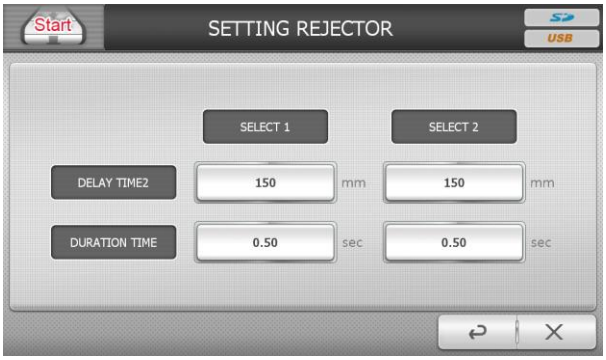
Step 1

Touch Setup button.



Step 2

Touch SETTING REJECTOR button.



Step 3

Change settings.

* Select position: Distance from the entry sensor to the rejector

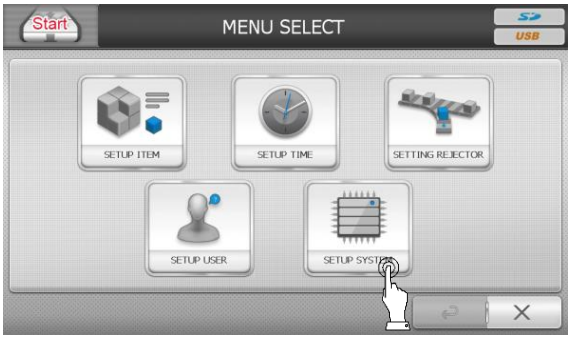
* Duration time: Time taken for the rejector to be operated to remove defects

4.5 System Setting

* Consult with an employee of our company as improper setting can lead to malfunctioning.

Step 1

Touch Setup button.



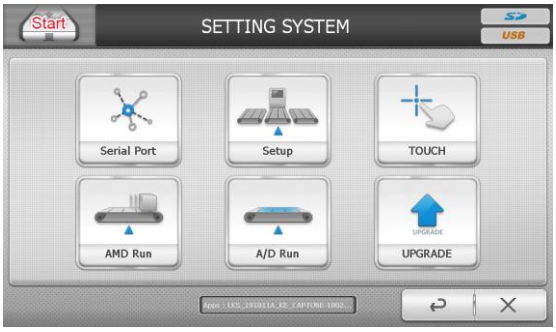
Step 2

Touch SETUP SYSTEM button.

Step 3

Enter 4-digit password and touch [Enter].

Password: 5900



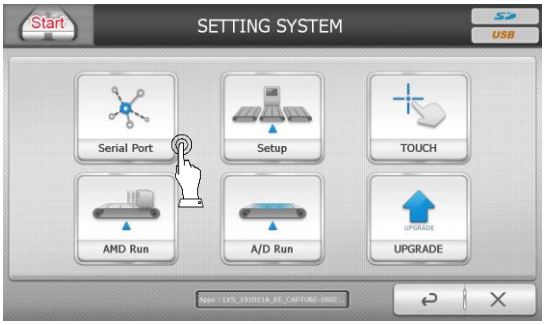
Step 4

Select wanted item.

(Refer to Chapter 5. System Setting)

Chapter 5. System Setting

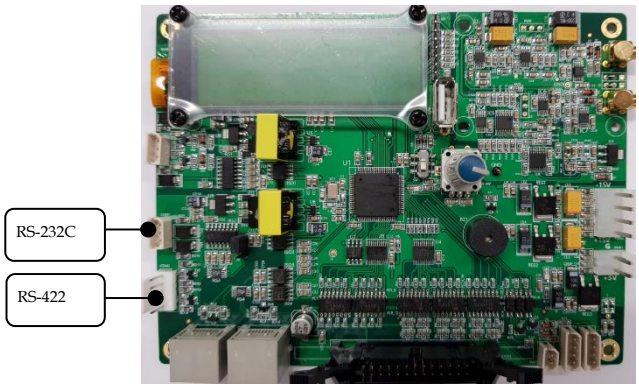
5.1 Communication



This setting is used for transfer of data between metal detector and P.L.C. or PC.

- Ch 1: RS232C or RS422 can be used.
- Ch 2: This port is used for the printer.
- Ch 3: This port is used for the PC. (RS232C)

Example of "Ch 1" setting)



Step 1

Connect to the corresponding communication connector on the left side of the motherboard.

(Caution: This is a transmission-only port.)

CON2 RS232

CON4 RS422

Step 2

Set "Ch 1."

Transfer rate: Choose 2,400~115,200 bps

DATA BIT: 8 bit

PARITY BIT: NONE

START BIT: 1 bit

STOP BIT: 1 bit

CODE: ASCII

Transmission format (metal) (SP) = SPACE

BYTE	1	3	6	1
DATA	STX	No.	(SP)METAL	ETX

Transmission format (pass)

BYTE	1	3	6	1
DATA	STX	No.	(SP) (SP)PASS	ETX

Example of "Ch 3" setting)

Channel 3 (touchscreen COM1 FEMALE port) – Transmission and reception

1. When setting computer data

COMPUTER -> AFM-3000 (data setting)

BYTE	1	3	1	4	4	1
DATA	STX	No.	"S"	Lower limit	Upper limit	ETX

AFM-3000 -> COMPUTER (after reception)

BYTE	1	1	1
DATA	STX	ACK	ETX

2. When changing item no.

COMPUTER -> AFM-3000

BYTE	1	3	1
DATA	STX	No.	ETX

3. When the automatic metal detector [A/C] makes metal judgment

AFM-3000 -> COMPUTER

BYTE	1	3	1	5	1
DATA	STX	No.	M	METAL	ETX

Same as "1. When setting computer data" upon completion of reception and in case of error

4. COMPUTER -> AFM-3000 (when deleting counter)

BYTE	1	3	1	1
DATA	STX	No.	C	ETX

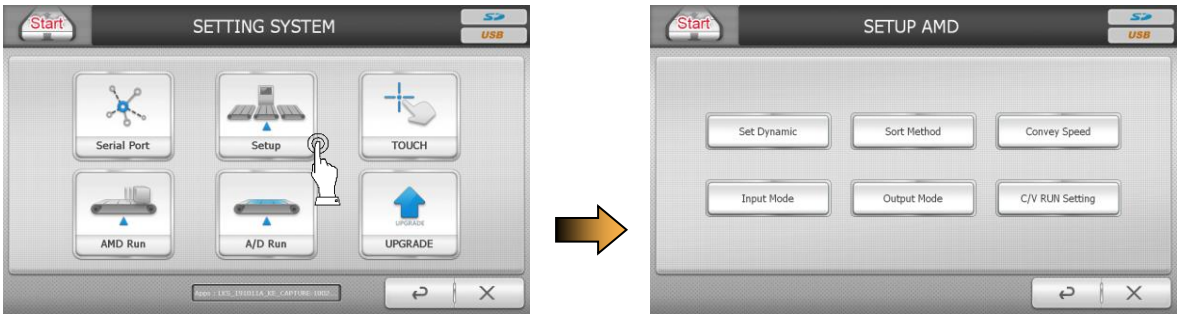
5. COMPUTER -> AFM-3000 (when requesting computer data)

BYTE	1	3	1	1
DATA	STX	No.	"R"	ETX

6. AFM-3000 -> COMPUTER (when requesting computer data)

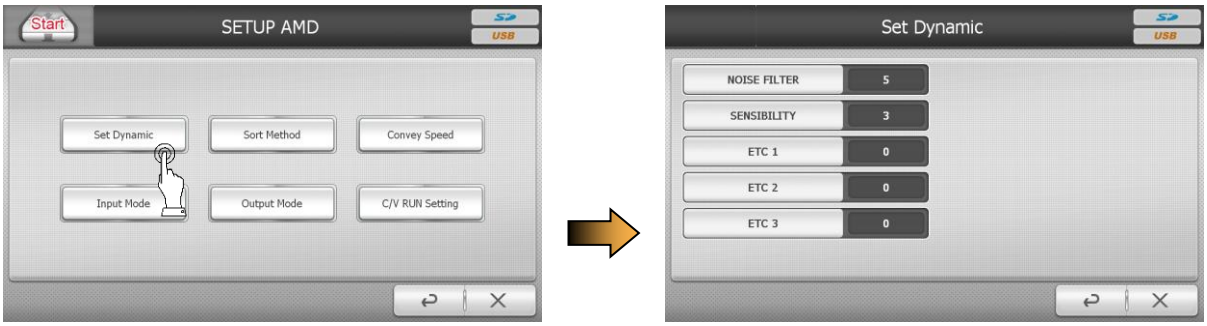
BYTE	1	3	1	4	4	6	4	1
DATA	STX	No.	"A"	Lower limit	Upper limit	Pass count	Metal count	ETX

5.2 AMD Setting



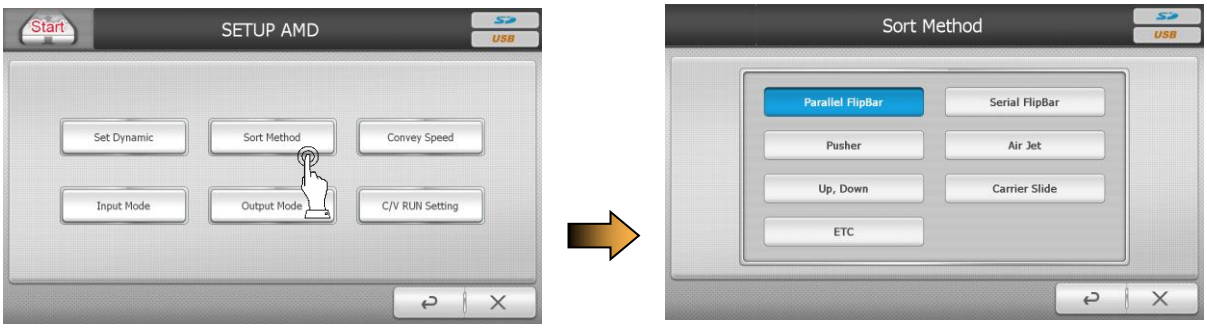
Touch the right number button of each setting to open the number pad window. Enter desired value and touch [Enter].

** This setting is done upon release of the product from the factory, and changing the setting can affect system performance.*

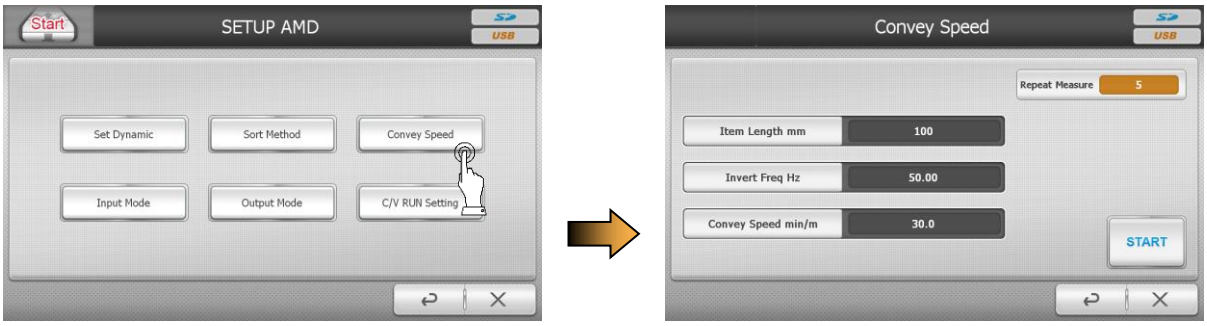


Touch each setting button to open the number pad window. Enter desired value and touch [Enter].

** This setting is done upon release of the product from the factory, and changing the setting can affect system performance.*

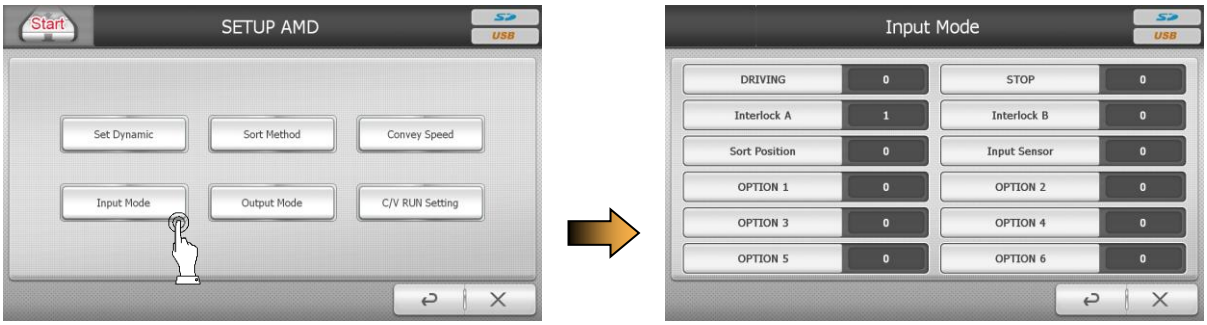


The user may change the sort method.

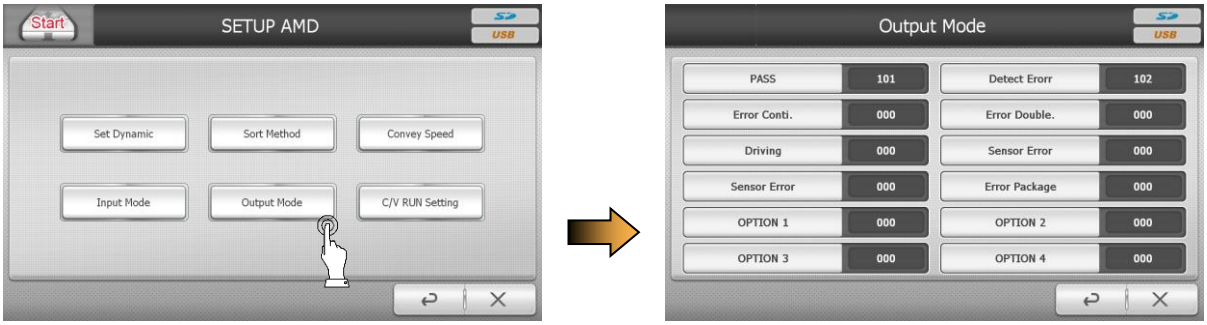


Touch the right number button of each setting to open the number pad window. Enter desired value and touch [Enter].

** This setting is done upon release of the product from the factory, and changing the setting can affect system performance.*



Touch the right number button of each setting to open the number pad window. Enter desired value and touch [Enter].

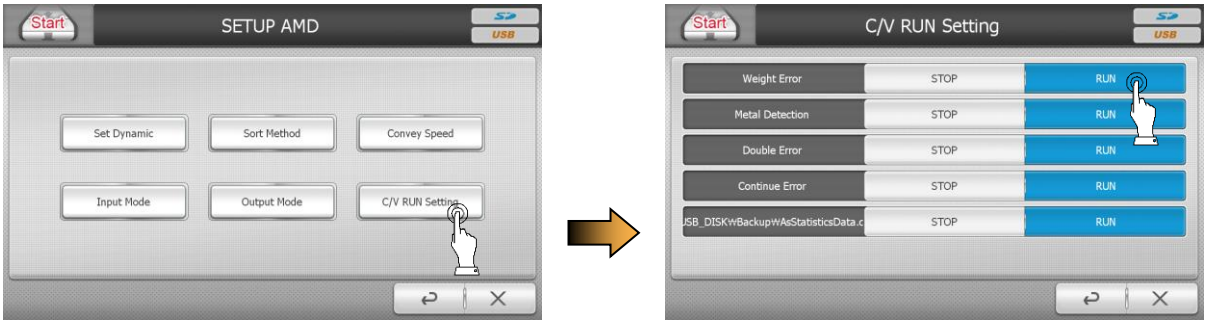


Touch the right number button of each setting to open the number pad window. Enter desired value and touch [Enter].

Ex) Pass 101 -> Sort 1 ① output setting,

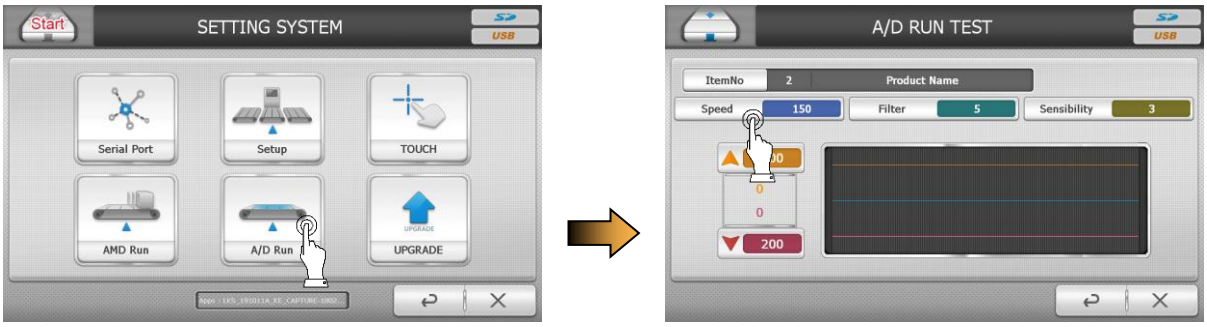
Metal 223 -> Sort 2 ②③ output setting

(Two output modes can be selected as the same time.)



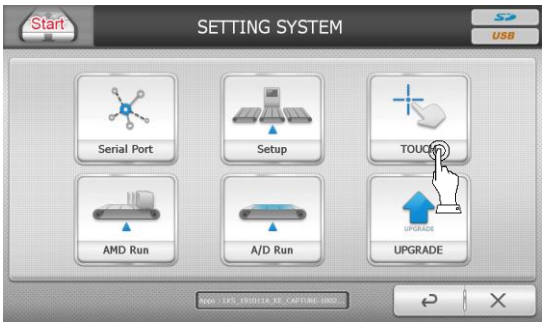
If there is no rejector, running and stopping of the conveyor can be configured for metal detection, double error and continuous error situations.

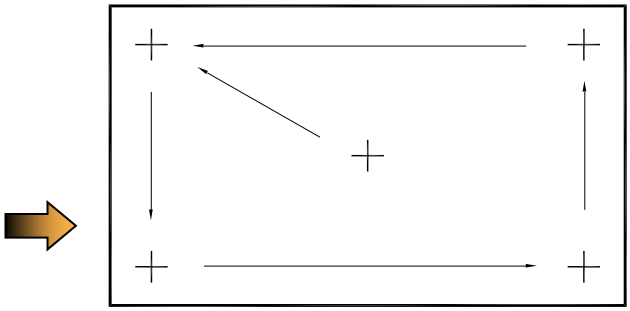
5.3 A/D Run Test



The A/D run test screen is used to check status of the equipment and effects of external noise.

5.4 Touch

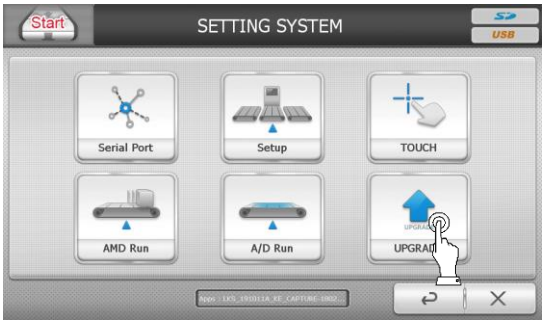




AFM-3000 Metal Detector uses a touch panel. If you touched a button but it does not function properly, run this setting as shown on the right side.

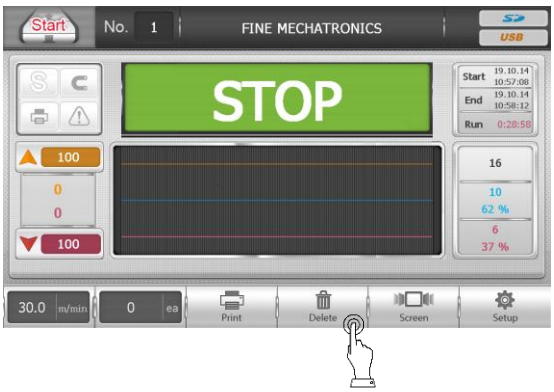
A cross icon appears at the center of the screen. Touch this icon using a touch pen to move it in the direction of the arrow. After touching all moveable cross icons, the cross icon will disappear. Touch the screen once again to finish the touch setting and return to the system setting screen.

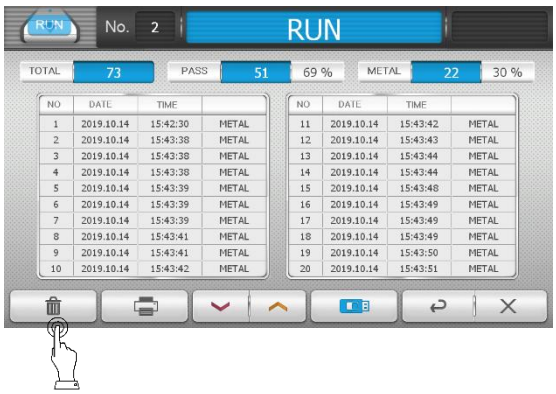
5.5 Upgrade



The system can be upgraded using a USB drive. This menu is used upon additional request of the user or when our company applies a patch to the program.

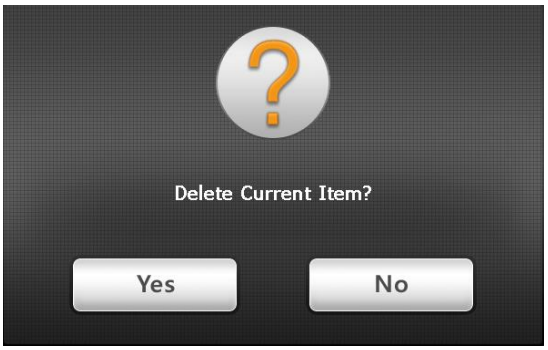
5.6 Data Deletion





Touch “Delete” button on the basic screen or total screen to open the following screen.

Touch “Yes” to delete count and total data (total screen) for current item from the screen.
This does not delete data saved on the internal memory.



5.7 Data Backup DB File

All of information totaled after previous backup time are saved on a USB drive.

To use data backup, make sure to set production history to **"Save"** under user setting.

When saving on the USB drive, the backup file is automatically generated in the backup folder based on date and time of backup.

(ex 20191015_091801_as_db.csv, as_db_all.csv)

Only metal detection history is saved on date_time_as_db.csv file.

History of pass and metal detection is saved on as_db_all.csv.

Information saved is as follows.

• Description of F1~F2 functions

F1: Power ON time of AFM-3000

F1	yymmdd	_hhmmss	Item No.	Item Name	POWER ON

F2: Judgment

F2	yymmdd	_hhmmss	Item No.	Item Name	Grade	Metal Count	Pass Count

• Sample

Ex) as_db_all.csv

F1	2019.10.15	19:24:15	1	NAME	POWER ON		
F2	2019.10.15	19:25:39	2	NAME	P	0	1
F2	2019.10.15	19:26:42	2	NAME	M	1	1
F2	2019.10.15	19:26:44	2	NAME	M	2	1
F2	2019.10.15	19:26:46	2	NAME	P	2	2
F2	2019.10.15	19:26:47	2	NAME	P	2	3
F2	2019.10.15	19:26:49	2	NAME	M	3	3
F2	2019.10.15	19:26:50	2	NAME	P	3	4
F2	2019.10.15	19:26:57	2	NAME	P	3	5

Ex) 20191015_091801_as_db

F1	2019.10.15	19:24:15	1	NAME	POWER ON		
F2	2019.10.15	19:26:42	2	NAME	M	1	
F2	2019.10.15	19:26:44	2	NAME	M	2	
F2	2019.10.15	19:26:49	2	NAME	M	3	
F2	2019.10.15	19:26:58	2	NAME	M	4	
F2	2019.10.15	19:27:00	2	NAME	M	5	
F2	2019.10.15	19:27:01	2	NAME	M	6	
F2	2019.10.15	19:27:03	2	NAME	M	7	

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