ITOH DENKI

POWER MOLLER PLUS

Sorting

Right Angle Transfer Module

F-RAT-NX75

Flat-Right Angle Transfer

〈 Technical document 〉

Read this manual before use

Thank you for purchasing the Right Angle Transfer Module (hereinafter referred to as “this product”).

Make sure to read this manual carefully before using, and start using only after you have understood all the product’ s functions, safety information and precautions.
After reading the manual, make sure to keep it safe in a specified place for future use, whenever necessary.

ITOH DENKI

Module

Original notice - A1.32

INDEX

***MDR = motorized roller**

1. Introduction

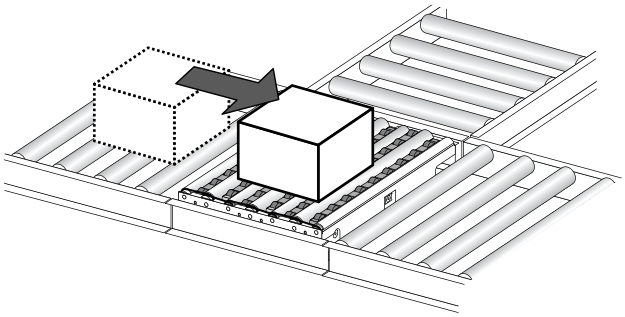
Features

Features of this product

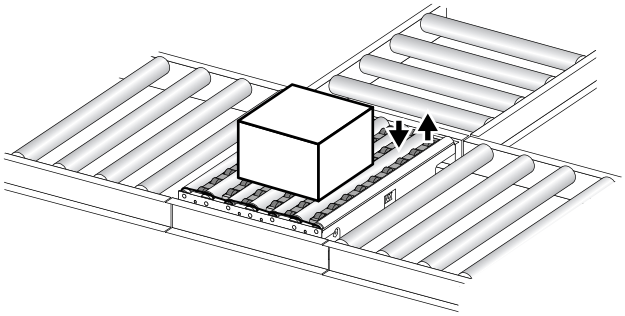
- This product is a module to divert at a right angle without changing its level, and there is no impact on the trays.
- All-electric control. No pneumatics, which do not require compressor.

Operation description (when diverting at a right angle)

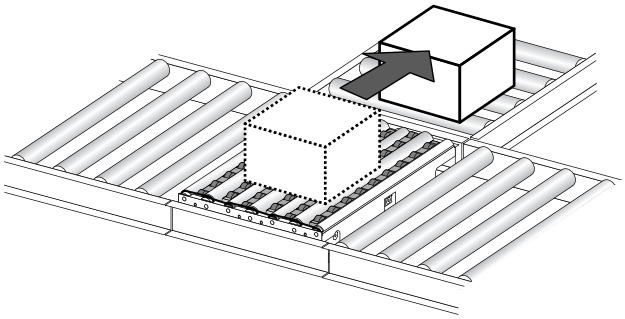
Load



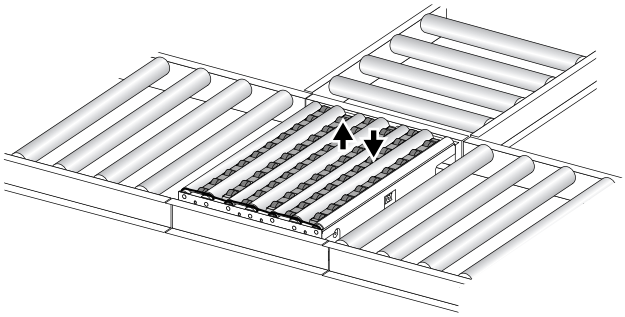
Switch to the diverting direction



Discharge

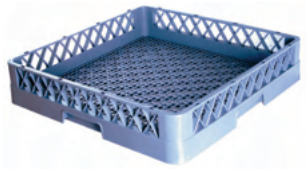


Switch to the straight direction



Bottom surface of load to be conveyed

This transfer table is made to transfer carton boxes or plastic trays with flat bottom, smooth and dry.
It is not designed to transfer trays with ribbed bottom, in plastic or metal. For tote with not flat bottom, please consult us.



1. Introduction

Disclaimer

This product is designed as a general industrial device. Do not use for other applications. We do not take any responsibility for any damage that may result from the disregarding of these warnings.
Also, in the event that an accident results from the use of this product, we do not compensate for any damage, including abnormalities of equipment, connection devices, and/or software, any damage resulting from malfunctions, and/or any other secondary damage.

Notes on industrial property rights

There are some examples of parts that need to be prepared by customers, as explained within this manual. However, this does not provide any guarantee against the existence of any rights, such as our industrial property rights, or those of other companies, in advance.

Notes on technical support

We respond to technical inquiries based on the contents described within this manual, and on this product within the range of general items for this product unit with standard specifications, and for the options prepared by us.
There are some descriptions in this manual, about parts, equipment, and wiring arranged by customers, as well as the controls and operation under such circumstances. However, these are not included in the guaranteed operating range and/or support.
When in use, please check and perform the aforementioned based on your responsibility according to operation.

About the risk category of this system

This product is intended to comply with the risk category 2*2 or lower as defined in NF EN13849-1*1. Its an incomplete machine and it have to be integrated on the complete machine to have CE certification. Nevertheless the module respect the point : 1.1.2 / 1.1.3/ 1.1.4/ 1.1.5/ 1.3.2/ 1.3.4/ 1.3.8.1/ 1.3.8.2/ 1.4.1/ 1.4.2.1/ 1.5.1/1.5.4/1.5.8/1.6.1/ 1.7.1/ 1.7.3/ 1.7.4/ 1.7.4.1/ 1.7.4.2 of the European machinery safety standard. It does not comply with purposes beyond risk category 3 or higher.

*1: European machinery safety standards
*2: This indicates that even though events that would result in serious injury occur infrequently under assumed risk environment, there is a high probability to avoid danger if you observe the safety contents described in this manual.

About installation environment

This product is not equipped with special dust proof/waterproof countermeasures, and is intended to be used in environments of “Pollution Degree 2”, as defined in IEC60664-1.
For this reasons, if users install this product in an environment that requires dust proof/waterproof treatments, they need to add necessary countermeasures, and check the performance based on their responsibility.

About description of the product

・In this manual, F-RAT-NX75 is described as F-RAT, and F-RAT-NX75 and F-RAT are described separately, when needed. For technical information about F-RAT-NX sizes 9070 & 9080 please consult the annex documentation F-RAT FS1 version.
・Depending on the signal type (NPN/PNP) specified by customers, different models of control driver cards are supplied as being the standard for this product.

Signal input/output type	NPN	PNP
Included driver card model	CBK-109FN（1） CB-016BN7（1） HBM-201BN（1）	CBK-109FP（1） CB-016BP7（1） HBM-201BP（1）

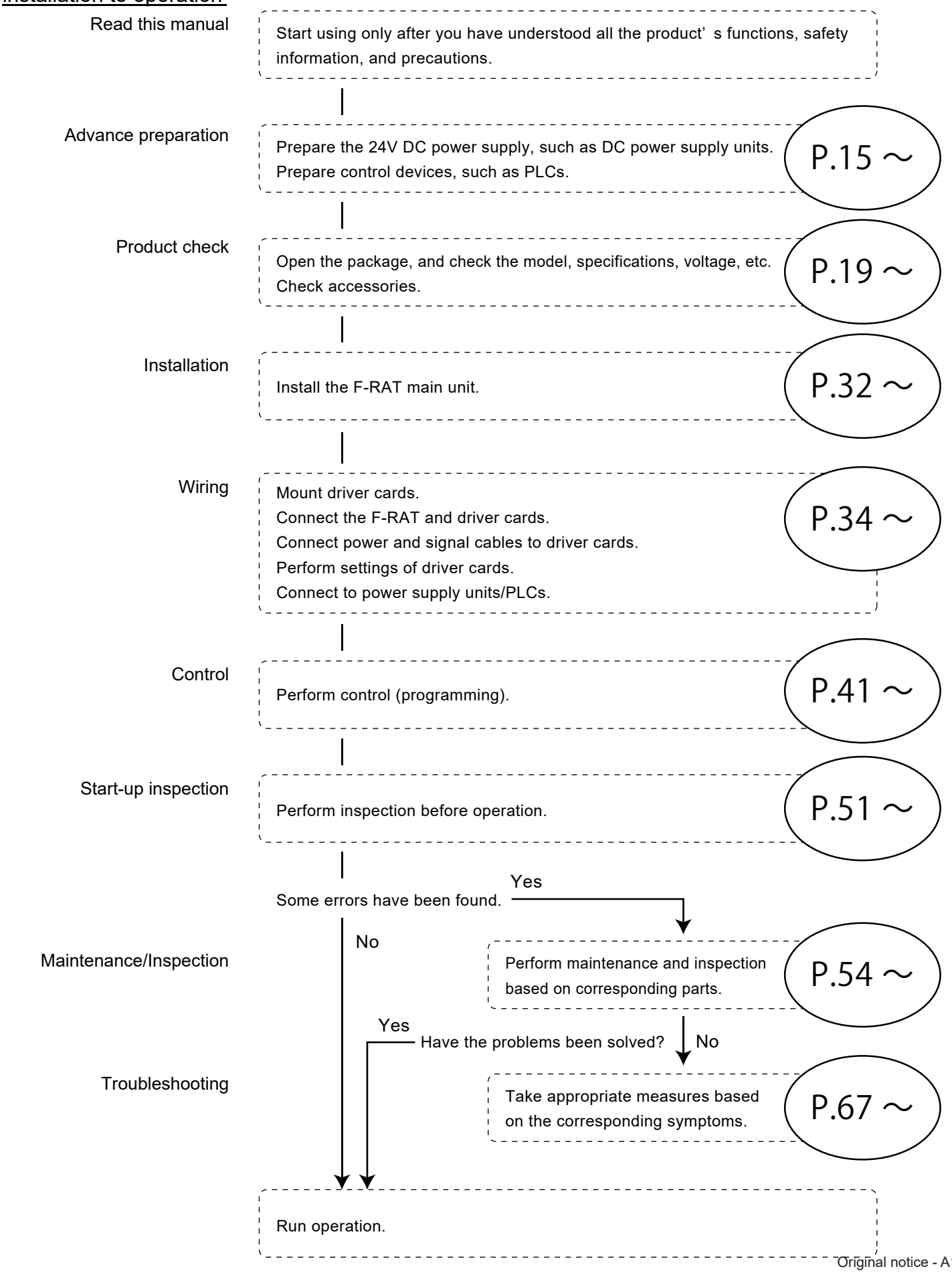
In this manual, CBK-109FN and CBK-109FP are described as CBK-109, CB-016BN7 and CB-016BP7 as CB-016, and HBM-201BN and HBK-201BP as HBM-201.
Also, CBK-109FN and CBK-109FP, CB-016BN7 and CB-016BP7, as well as HBM-201BN and HBM-201BP are described separately, when needed.

Signal input/output type	NPN	PNP
Included driver card model	IB-E04F-N-FT（1） HBM-201BN（1）	IB-P02F-P-FT (or IB-E04F-P-FT)（1） HBM-201BP（1）

In this manual, IB-E04F-N-FT and IB-E04F-P-FT are described as IB-E04F-FT, and HBM-201BN and HBM-201BP as HBM-201. Also, IB-E04F-N-FT and IB-P02F-P-FT (or IB-E04F-P-FT), as well as HBM-201BN and HBM-201BP are described separately, when needed.

2. Procedures from installation to operation

Procedures from installation to operation



3. Safety precautions

For parts names in sentences, refer to 6. Structures (P.21).

3. Safety precautions

Danger level

To prevent hazards to users and/or others, and/or damage to property in advance, the important precautions to be followed securely is described below.

■ The degree of hazard and/or damage that may result if a user disregards the description and operates the product improperly is caregorized as the following symbols and explained below.

⚠ WARNING	This indicates a high possibility that severe injury or even death may result.
⚠ CAUTION	This indicates a high possibility that injury, or only property damage may result.

Symbol explanation

■ The type of precautions is categorized as the following symbols and explained below.

	This symbol indicates a reminder which users should pay attention to.
	This symbol indicates operations that are prohibited.
	This symbol indicates forced operations that users should always perform.

3. Safety precautions

3-1. General precautions

⚠ WARNING

Do not use the product near places subject to explosive, flammable gas, and/or corrosive atmosphere, and/or combustible materials.
Failure to follow this could result in explosion, fire, electric shock and/or injury.

When using the product in places where serious accidents and/or damage may possibly occur, install backup and/or fail-safe functions systematically.
Failure to follow this could result in the inability to control this product due to driver card malfunction, which could lead to serious accidents.

⚠ CAUTION

Do not apply heavy loads to this product, such as stepping on it.
Failure to follow this could result in people falling and/or malfunction.

Do not come into contact with the moving parts, such as the carrier wheels, rollers, or lifting sections, and/or allow clothes to get close to them.
Failure to follow this could result in them getting caught and/or stuck.

Do not forcibly bend and/or pull cables.
Also, do not put heavy materials on cables, or do not get them stuck between cables.
Failure to follow this could result in fire and/or electric shock due to cable damage.

Never remodel the product and/or driver cards.
Failure to follow this could result in serious accidents.

Make sure to attach ground wires to this product and the DC power supply unit.
Failure to follow this could result in electric shock if any malfunction or leakage occurs.

Do not touch the product when it has just stopped operation.
Failure to follow this could result in burns.

Do not put water and/or oil on the product, and do not transfer wet and/or oily trays.
Failure to follow this could result in electric shock, and/or malfunction.

Do not apply strong impact and/or excessive force to the product, such as hitting it with objects, or dropping it. Also, do not use the equipment if strong impact has been applied, and/or if the appearance has become deformed.
Failure to follow this could result in malfunction due to applied impact.

The side and lower parts of the module are not protected against mechanical hazards. Protection complying with local safety standards must be provided.

3. Safety precautions

3-1. General precautions

⚠ CAUTION

Stop operation when abnormal sound is heard during operation.

Failure to follow this could result in unexpected accidents.

Do not use in a way exceeding the range of the product specifications.

Failure to follow this could result in malfunction, fire, and/or injury.

Turn off the power supply to the product before moving and/or installing the product, and performing maintenance and inspection (excluding those during operation).

Working while the power is on could result in accidents due to unexpected operation.

Observe the safety regulations required for installation locations, and/or products in use.

Securely wire each cable to connection parts.

Improper wiring could result in electric shock and/or malfunction.

Do not turn on/off relays and/or contactors near power cables, signal cables, and/or driver cards.

Failure to follow this could result in malfunction due to noise generation.

LED or Pull-up/Pull-down circuits implemented in the output circuit of control devices could result in unexpected operation.

Carefully check the output circuit.

Turn on the power of upstream power supplies before turning the product on.
Turn off the product before turning the power supplies off.

Turning on/off the power in the wrong order could result in malfunction.

Do not unplug power and/or signal cables during operation. Also, do not run/stop this product by the power supply. (Use the signal.)

Failure to follow this could result in malfunction.

Do not forcibly rotate the MDR at times other than maintenance and inspection.

Failure to follow this could result in damage to driver cards, and/or their lifetime to be significantly shortened.

Do not turn off the power during transfer (during MDR rotation).

Failure to follow this could result in malfunction.

3. Safety precautions

3-1. General precautions

⚠ CAUTION

Do not turn on the power when trays are unstable.
Failure to follow this could result in injury, accidents, and/or damage due to load collapse.

Make sure to perform the start-up inspection, and check that devices are free from any abnormalities, and that safety equipment functions correctly before using the product.

When disposing of the product, make consigning contracts with licensed industrial waste disposers, and consign the disposal to them.

3-2. Precautions on installation

⚠ WARNING

In principle, have two or more persons work when carrying and/or installing the product as it is a heavy load.
To carry the module with Block and tackle please see page 74 for more information.

When hoisting this product, never enter the area under the suspended load.
When hoisting, use appropriate hoisting equipment, and pay special attention to prevent the balance of the suspended load from being lost and/or falling. Also, have only qualified workers conduct the operation. Improper hoisting could result in serious accidents.

Do not hoist this product with goods loaded.
Failure to follow this could result in objects falling.

⚠ CAUTION

When handling, wear protective equipment, such as gloves.
Since this product consists in large part of metal, careless handling could result in hands getting injured.

Make sure to use the recommended tightening torque to tighten bolts for installing the F-RAT main unit and/or fastening screws of driver cards.
Failure to follow this could result in bolts and/or screws loosening, and/or malfunction.

Check the corresponding installing direction to the loading/discharging sides before installing.
Failure to follow this could result in objects/body parts getting caught and/or stuck.

3. Safety precautions

3-2. Precautions on installation

⚠ CAUTION

Take appropriate measures to prevent trays from popping out of the equipment.

For example, mount guide rails on the conveyor frames.
Failure to follow this could result in workers getting injured by trays popping out of the equipment.

If necessary warning/caution labels become hidden after installing fences, affix again on places where they can be seen.

3-3. Precautions on wiring

⚠ CAUTION

Perform wiring when the power is shut off.

Failure to follow this could result in electric shock and/or accidents due to unexpected operation.

When attaching or removing connectors, turn off the power first, securely hold connectors, and perform operation.
Also, do not apply excessive force to the driver card connection parts, such as obliquely attaching or removing connectors.

Failure to follow this could result in electric shock, malfunction, and/or accidents due to unexpected operation.

Securely attach connectors to the driver card connection parts.

Improper wiring could result in electric shock and/or malfunction.

Perform wiring to connectors so that cables make secure contact with connectors.

Make sure that connectors are tightly and correctly connected to avoid over-heating or short circuits.

3-4. Precautions related to control

⚠ CAUTION

Do not change switch settings for HBM-201.

Failure to follow this could result in malfunction, and/or accidents due to unexpected operation.

Do not change the VR1 and VR2 values on CBK-109 and CB-016. (Minimum (leftmost): Factory setting)

Do not turn the driver card switches with excessive force.

Failure to follow this could result in malfunction.

3. Safety precautions

3-5. Precautions related to operation

⚠ CAUTION

Do not forcibly move trays when they are placed on the carrier wheels.
Failure to follow this could result in damage and/or malfunction.

Make sure to perform the start-up inspection before starting operation.

At the start-up inspection, wear protective equipment, such as gloves.
Failure to follow this could result in hands getting injured by metal parts.

At the start-up inspection, shut off the power, and perform inspection.
(excluding inspection to be performed when operating this product.)
Failure to follow this could result in injury due to unexpected operation, such as getting caught and/or stuck.

When operating this product at the start-up inspection, take appropriate measures to prevent fingers from getting stuck and/or caught in carrier wheels and/or rollers.
Also, get ready to shut off the power in the event that something should happen.
Failure to follow this could result in accidents/injury by getting caught and/or stuck.

If any abnormalities are found at the start-up inspection, make sure to take countermeasures before the trial run.
Failure to follow this could result in damage and/or malfunction.

3-6. Precautions on maintenance and inspection

⚠ CAUTION

If any abnormalities are found, do not use this product until the causes have been eliminated completely .
Using this product with unattended abnormalities could result in not only damage to the devices, but also unexpected accidents.

Have specialists (or people who have sufficiently acquired skills) perform maintenance and inspection under instructions by management supervisors.

At the time of repair and replacement work, turn off the power to all connecting devices.
To prevent wraparound for the power circuits and/or signals, shut off the power, wait a sufficient amount of time, and discharge electricity inside the DC power supply equipment.

At the time of maintenance and inspection, post warning labels so as to prevent unauthorized persons from turning on the power.
Failure to follow this could result in malfunction and/or unexpected accidents.

3. Safety precautions

3-6. Precautions on maintenance and inspection

CAUTION

When repairing/replacing, wear protective equipment, such as gloves.

Failure to follow this could result in hands getting injured by metal parts.

Do not disassemble sections and/or parts other than those specified.

Failure to follow this could result in malfunction and/or unexpected accidents.

Depending on sections and/or parts to be repaired and/or replaced, they need to be rotated and/or lifted by hand.

Pay attention not to get caught and/or stuck. Failure to follow this could result in injury.

Before the trial operation after repair/replacement,

- Check that the roller drive belts have been mounted properly.
- Check that there is no friction between the moving parts, or between the moving and fixed parts.
- Check that screws/covers previously removed have been securely mounted again.
- Check that all parts are installed.

Failure to follow this could result in malfunction and/or unexpected accidents.

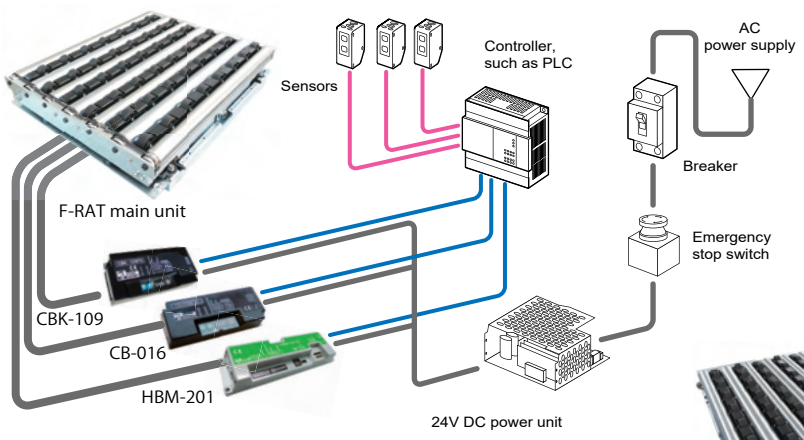
Make sure to prepare repair/replacement parts designated by ITOH DENKI.

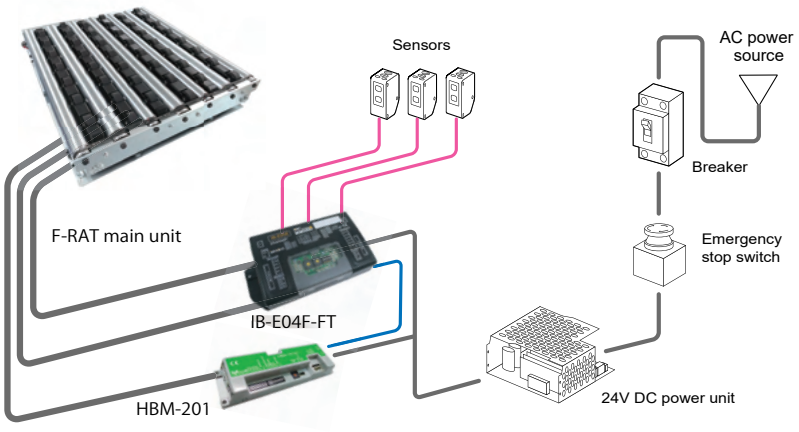
Using parts other than those designated by ITOH DENKI could result in malfunction.

4. Advance preparation

4. Advance preparation

Wiring image





【Important】 As for the sensor input, and input/output signals of driver cards, adopt the number of inputs/outputs based on operation.

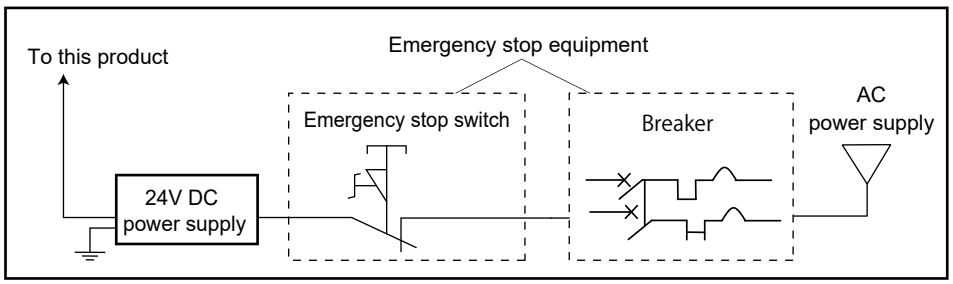
Items to be prepared by customers

Before introducing this product, prepare the following devices separately.

Emergency stop equipment

This product does not include the emergency stop equipment. Customers must make sure to install it.

Install the emergency stop equipment on the side of the DC power supply unit to which the power is supplied.



Checking the breaker

Regarding facilities where this product is incorporated, check that a breaker with appropriate capacity for the 24V DC power supply unit has been installed. If abnormal operation should occur, protection through the breaker could be effective.
Note that when using an earth leakage breaker, select one that is “inverter corresponding”. Some inverter non-corresponding earth leakage breakers could result in malfunction, since they may recognize high-frequency components of the switching power supply as leakage.

Operation check

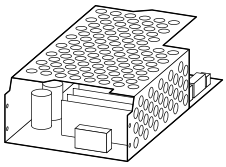
When the 24V DC power supply unit has been incorporated, check that the breaker and emergency stop switch can work properly. Perform operation following the trial operation after checking them.

① Input to the DC power supply (single phase 230V) is securely turned ON/OFF when turning ON/OFF the breaker.

② Input to this product (24V DC) is securely turned ON/OFF when turning ON/OFF the emergency stop switch.

4. Advance preparation

24V DC power supply Power supply equipment to supply 24V DC to this product



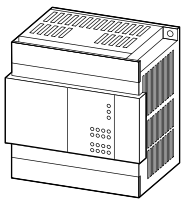
- Switching power supply (24V DC/10A, 240W or more)
- Rectified power (With a rectifying capacitor, ripple rate 10% or below)
- 24V DC Battery

Operation

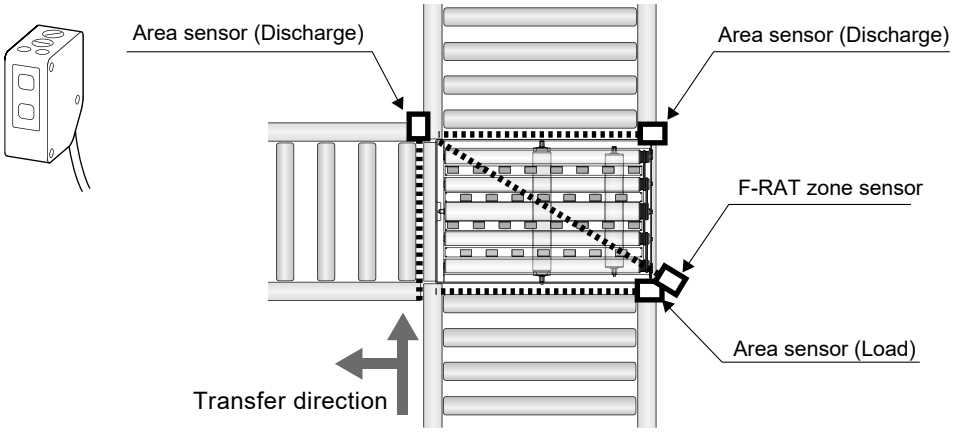
■ Since F-RAT uses MDR for each of carrier wheel transfer, roller transfer, and drive switching (3 MDRs in total), it is not recommeded to use multiple MDRs at the same time.

■ A switching power supply is recommended as the DC power supply (24V DC±10%) for drivers.
■ Use a stabilized power supply that has an adequate capacity of 24V DC and 10A or higher and does not fluctuate due to load variation.
■ The power supply shall have a capacity larger than the rated value of this product.
■ A transformer type power supply cannot be used.
■ Secure a voltage of 24V DC±10% at the power supply terminal of a driver card.
■ If the capacity of the power supply is less than the rated power of this product, it may cause the supply voltage leading malfunction or damage.
Be sure to use the power supply with a capacity larger than the rated power of this product.
■ In addition, the power supply should not activate protection with peak current 30A for 1ms or below.
■ For the power supply unit, use an isolation type switching power supply compliant with the safety standard (IEC60950-1 or UL60950-1). Do not use a non-isolation type power supply for safety reasons, since it may not conform to the radiation noise regulations.

Control devices Devices to control this product, such as PLCs



Sensors Zone sensors to check the tray, and area sensors to check loading and discharging, etc.



Term

Zone sensor
A sensor to detect the existence of trays within the zone

Area sensor
A sensor to detect load and discharge of trays

4. Advance preparation

Wiring materials

Necessary for wiring of power and signal cables, branch connectors, driver cards, controllers, such as sensors or PLCs, and power supply.

〈Available wire diameter for driver card connectors〉

Connector \ Driver card	CBK-109	CB-016 ／ HBM-201
Power connector	0.8～1.5mm² (AWG：18～14)	0.5～1.5mm² (AWG：20～14)
Control connector	0.08～0.5mm² (AWG：28～20)	

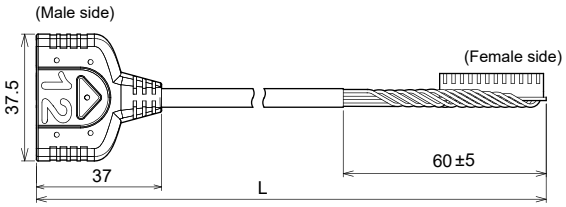
■ To select the current capacity of wiring materials, secure a high safety margin based on the current value in the equipment to be used.
■ Longer wiring between the power supply unit and driver cards/controllers could cause the voltage to decrease, resulting in malfunction and/or damage.

MDR extension cable (option)

Necessary when the installing location of the F-RAT main unit is far from that of the driver cards.

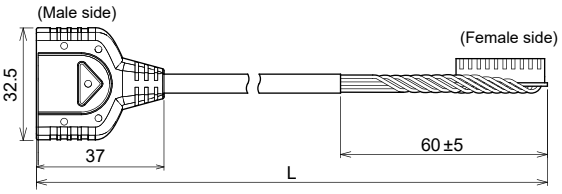
■ CBK-109：12P extension cable

Model	12P extension cable length
ACE-CBM-G0600	L= 600mm
ACE-CBM-G1200	L=1200mm



■ CB-016 ／ HBM-201：10P extension cable

Model	10P extension cable length
ACE-CBM-A0600	L= 600mm
ACE-CBM-A1200	L=1200mm

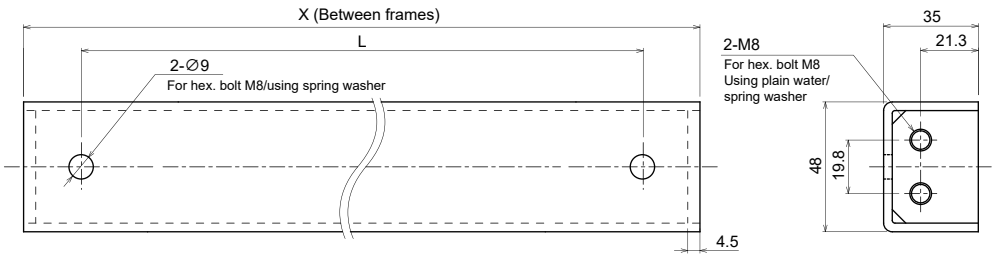


■ Use extension cables of 1200 mm or less.
■ Do not extend cables by connecting multiple extension cables.

Stay (option)

Size	L	X
6040 / 7540 / 9040	370	400
6050 / 7550 / 9050	470	500
6060 / 7560 / 9060	570	600
6070 / 7570	670	700
6080 / 7580	770	800

(mm)



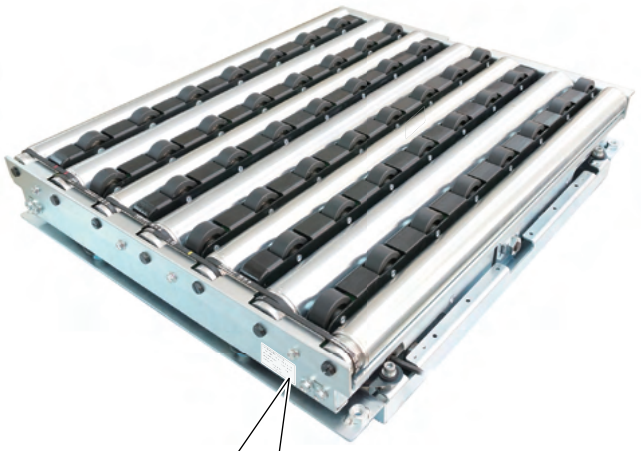
＊ For X dimensions (between frames) other than those mentioned above, contact us.

5. Product check

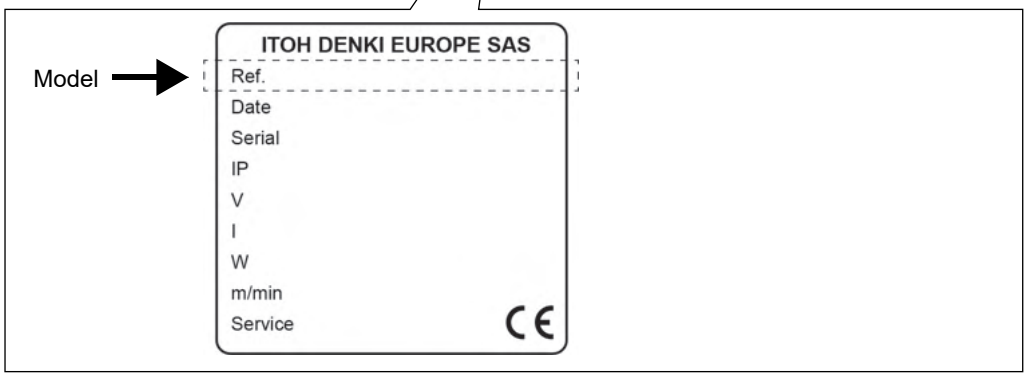
5. Product check

Checking the model

Unpack the product, and check that the product model is as ordered.



〈 Product label details 〉



Checking appearance

①Check that the main unit is free from any abnormalities, such as traces of scratches, dents, dirt, and/or corrosion (rust).

②Check that there is no omission and/or looseness of screws, etc.

＊If any abnormalities are found, contact the supplier immediately.

5. Product check

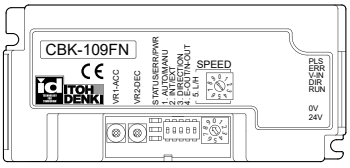
Checking accessories

Check that all the following items are included.

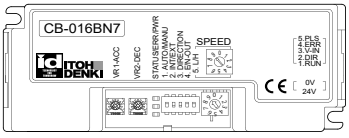
Driver cards

Depending on the F-RAT input and output signal type, driver cards with the NPN (N) or PNP (P) signal input are included. (Not included when no driver card type is specified.)

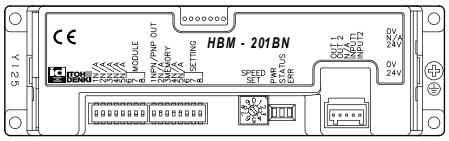
For F−RAT−NX75−□□□−□□□□−CN



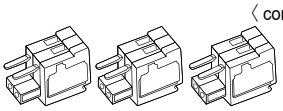
Driver card CBK-109FN
〈 For carrier wheel transfer 〉
1



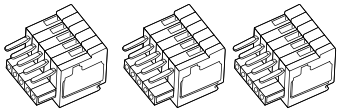
Driver card CB-016BN7
〈 For roller transfer 〉
1



Driver card HBM-201BN
〈 For drive switching 〉
1



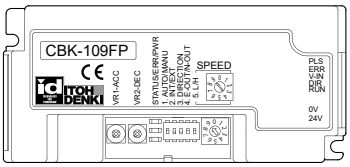
Power connector
〈 common to each driver card 〉
734-102
3



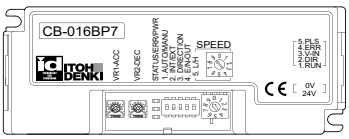
Control connector
〈 common to each driver card 〉
733-105
3

Cross-recessed head SW screw M4 x 15/Hex. nut M4
〈 For securing each driver card 〉 8 sets

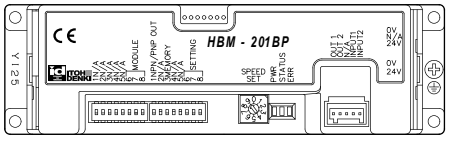
For F−RAT−NX75−□□□−□□□□−CP



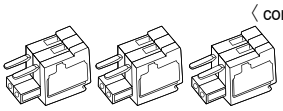
Driver card CBK-109FP
〈 For carrier wheel transfer 〉
1



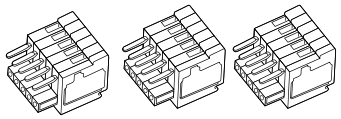
Driver card CB-016BP7
〈 For roller transfer 〉
1



Driver card HBM-201BP
〈 For drive switching 〉
1



Power connector
〈 common to each driver card 〉
734-102
3



Control connector
〈 common to each driver card 〉
733-105
3

Cross-recessed head SW screw M4 x 15/Hex. nut M4
〈 For securing each driver card 〉 8 sets

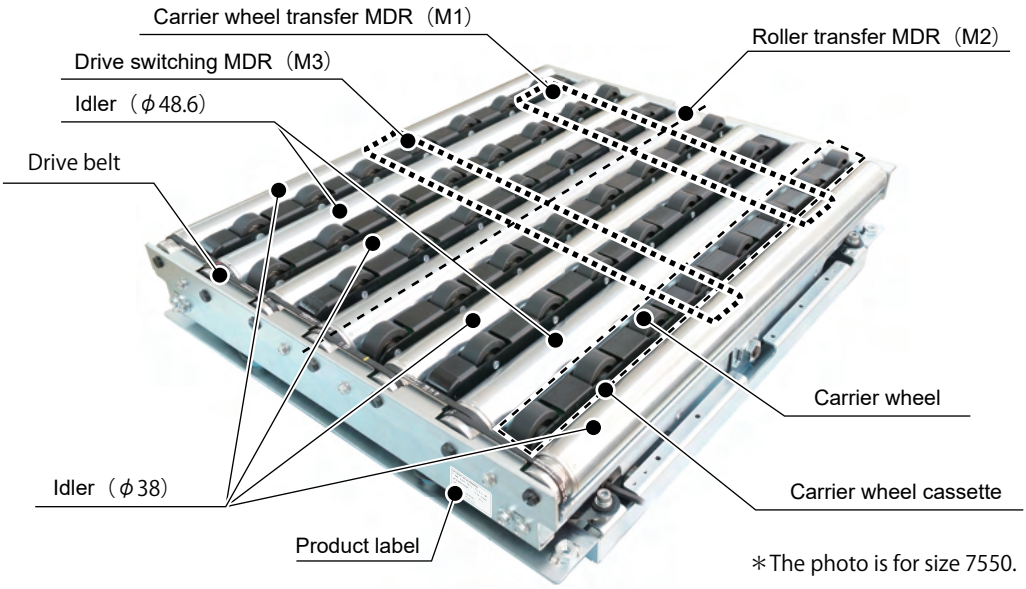
For installing the F-RAT main unit

Hex. bolt with spring lock and plain washers M8 x 20
4 sets

6. Structures

6. Structures

Structures



＊The photo is for size 7550.

Product designation

Product label

Model →

ITOH DENKI EUROPE SAS
Ref. F-RAT-N60X-6040F00
Date 11/18
Serial 123456789
IP 54
V 24VDC
I
W
m/min
Service CE

F-RAT-N60X-6040F00

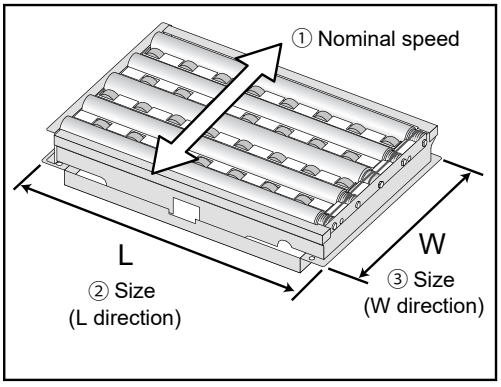
① Nominal speed
- 60 … Nominal speed 60m/min type

＊For details, refer to 8-3. Changing the transfer speed (P.47).

② Size (L direction)
- 60（L595mm）
- 75（L745mm）
- 90（L895mm）

③ Size (W direction)
- 40（W395mm）
- 50（W495mm）
- 60（W595mm）
- 70（W695mm）
- 80（W795mm）

④ Version number



Term

Nominal speed

The speed on the MDR roller surface (m/min), and the nominal speed with a nice round value for convenience. Values differ slightly from the actual speed.

7. Installation/Wiring

7. Installation/Wiring

7-1. Before installation

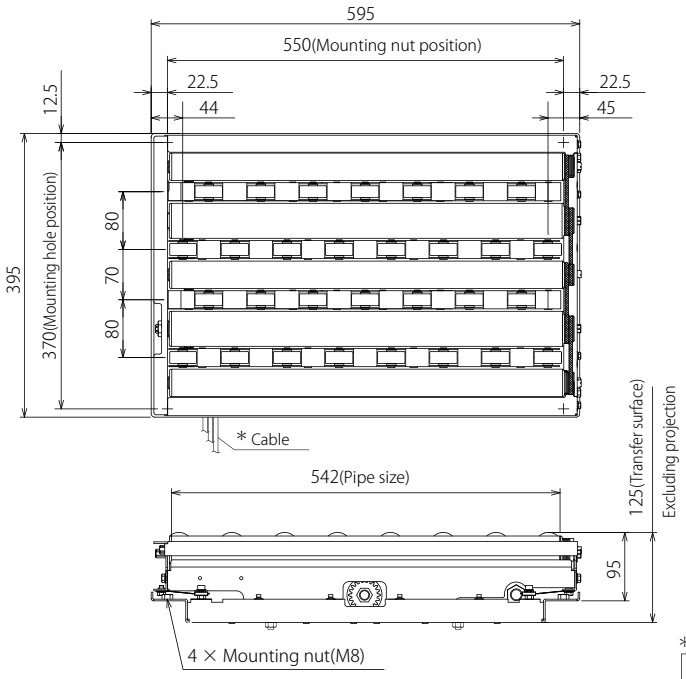
- Prepare stands, and perform frame processing in advance by reference to the mounting holes in dimensions.
- Determine the mounting location for zone sensors to check the existence of trays, and area sensors to check loading and discharging. Then, prepare for them to be mounted.

Min and max size load

- Minimum load size : 225 x 225mm
- Maximum load size : -100mm from the length and the width of F-RAT-NX75.

Mounting preparation for the F-RAT main unit

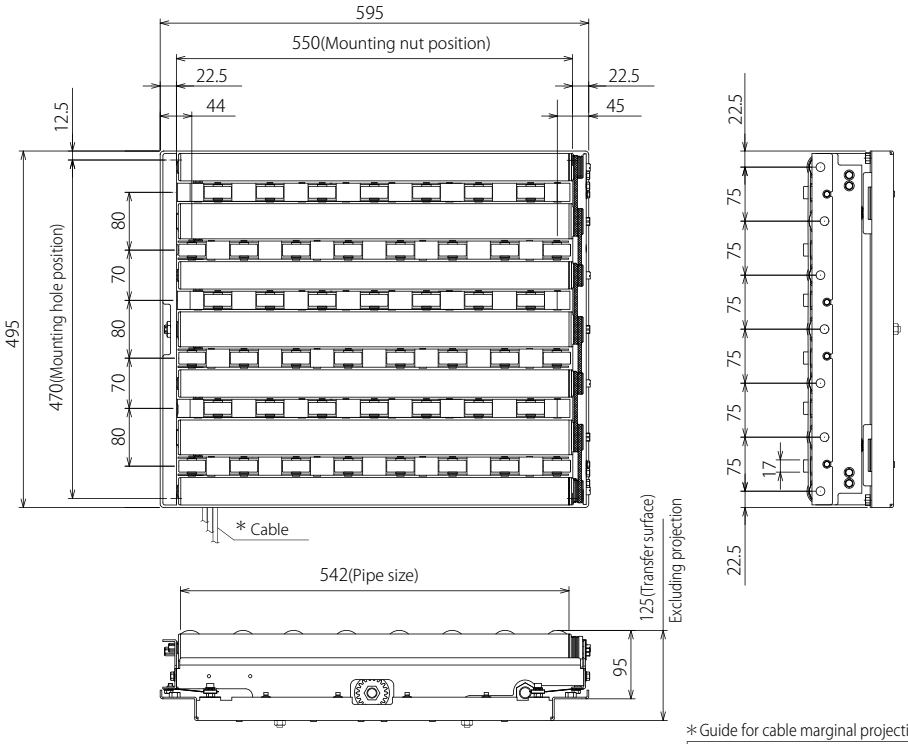
Size 6040
L595mm×W395mm



＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	1000
M2 : Roller transfer MDR	1100
M3 : Drive switching MDR	1300

Size 6050
L595mm×W495mm

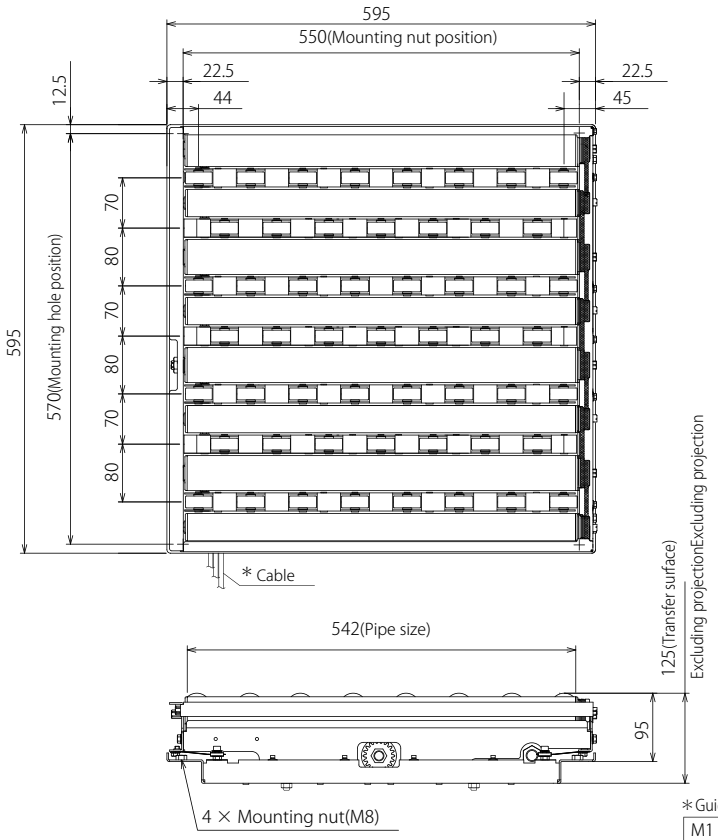


＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	1000
M2 : Roller transfer MDR	1000
M3 : Drive switching MDR	1300

7. Installation/Wiring

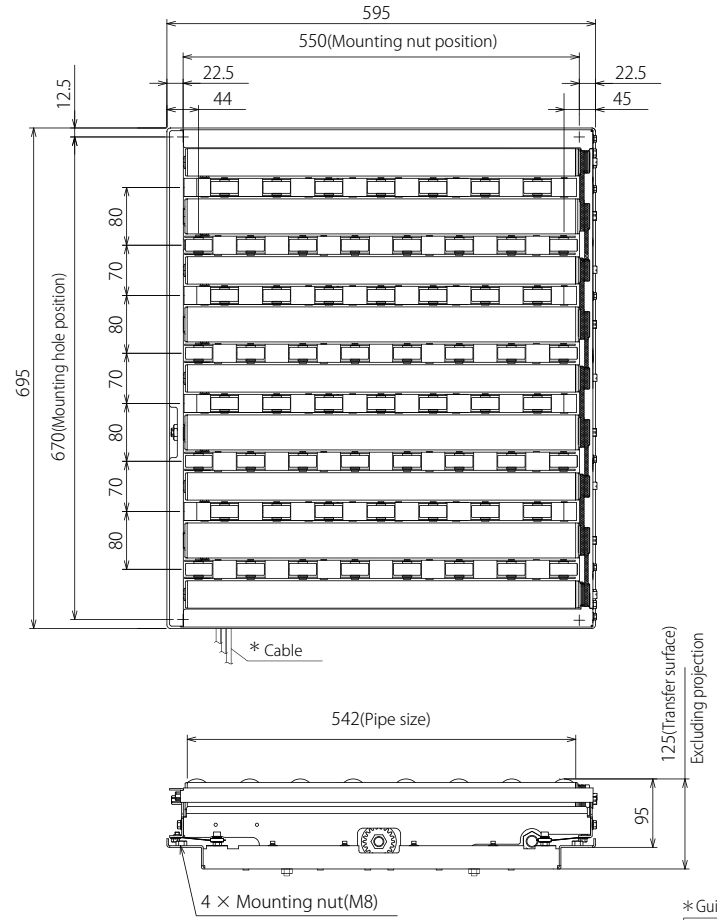
Size 6060
L595mm×W595mm



＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	1000
M2 : Roller transfer MDR	900
M3 : Drive switching MDR	1300

Size 6070
L595mm×W695mm

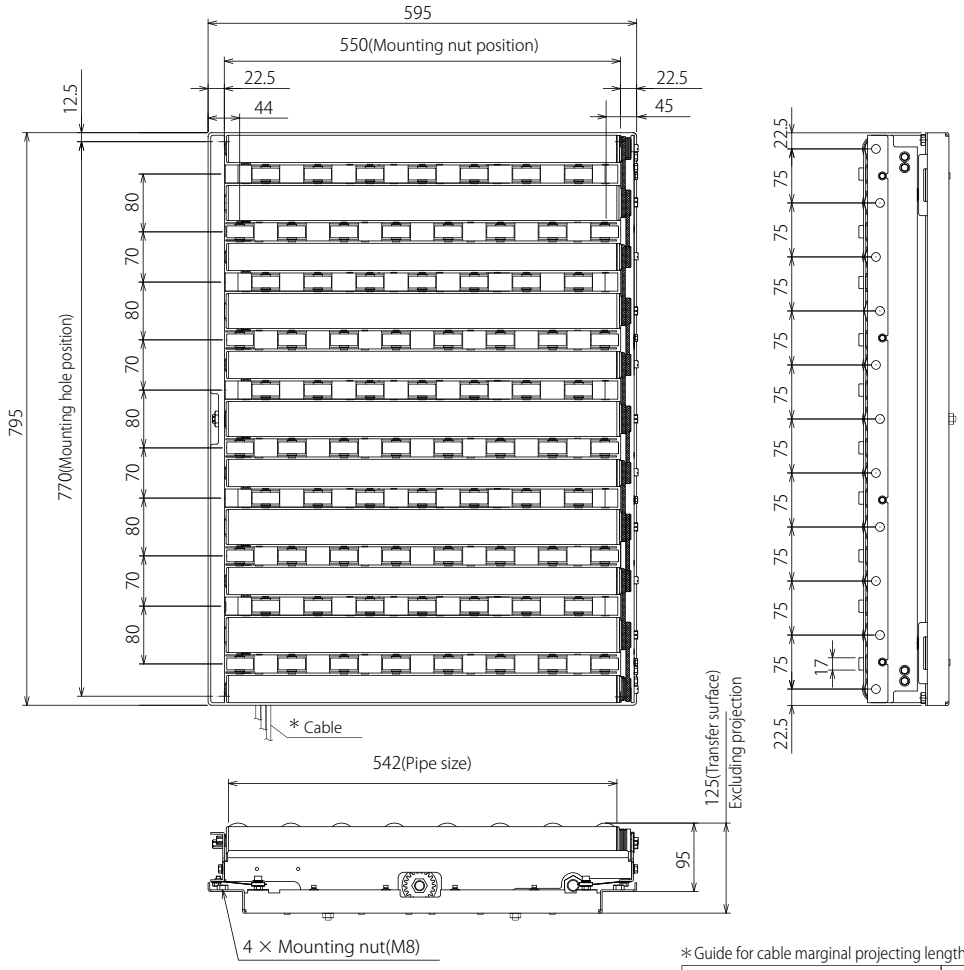


＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	1000
M2 : Roller transfer MDR	800
M3 : Drive switching MDR	1300

7. Installation/Wiring

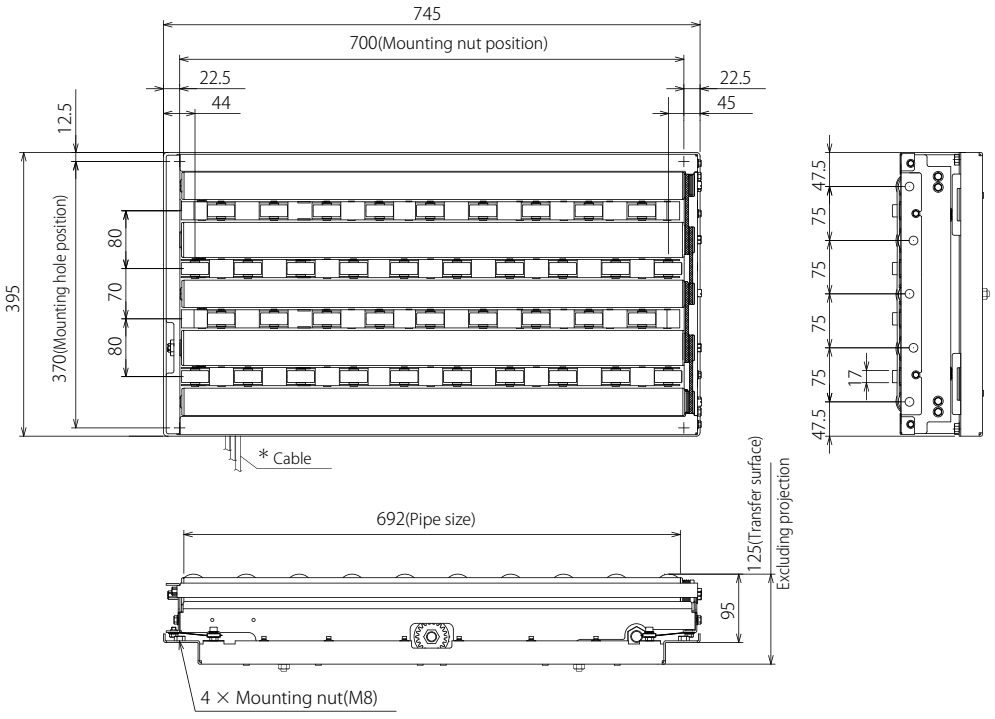
Size 6080
L595mm×W795mm



＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	1000
M2 : Roller transfer MDR	700
M3 : Drive switching MDR	1300

Size 7540
L745mm×W395mm

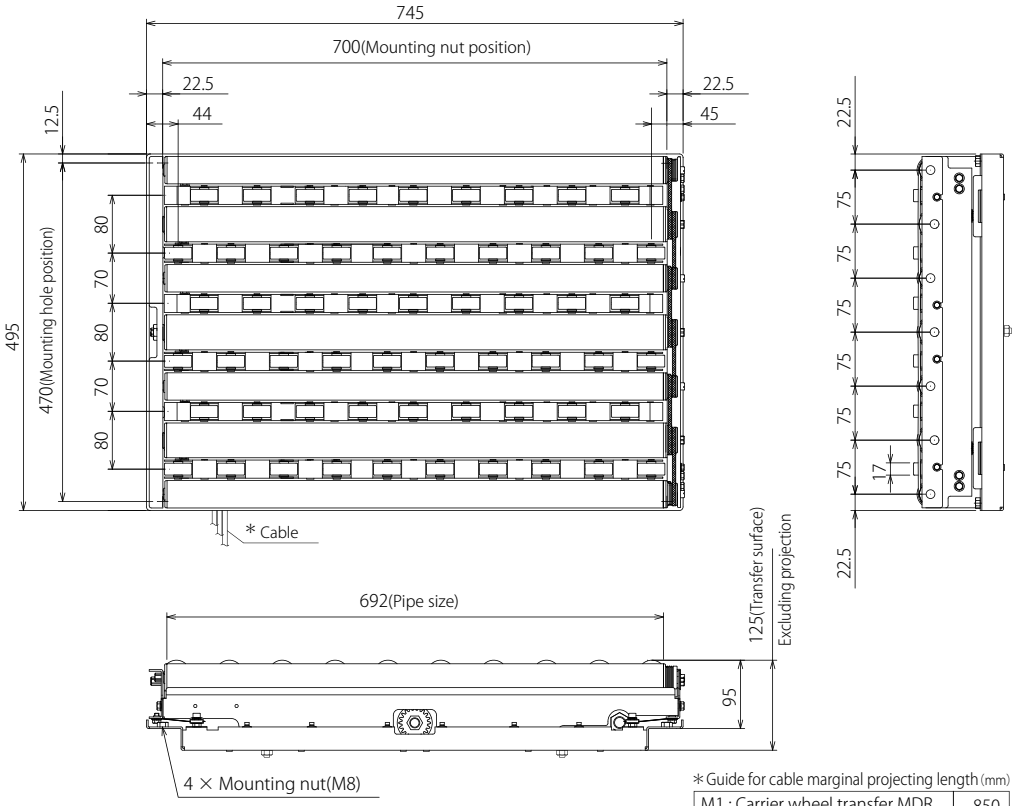


＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	1200
M2 : Roller transfer MDR	1100
M3 : Drive switching MDR	1200

7. Installation/Wiring

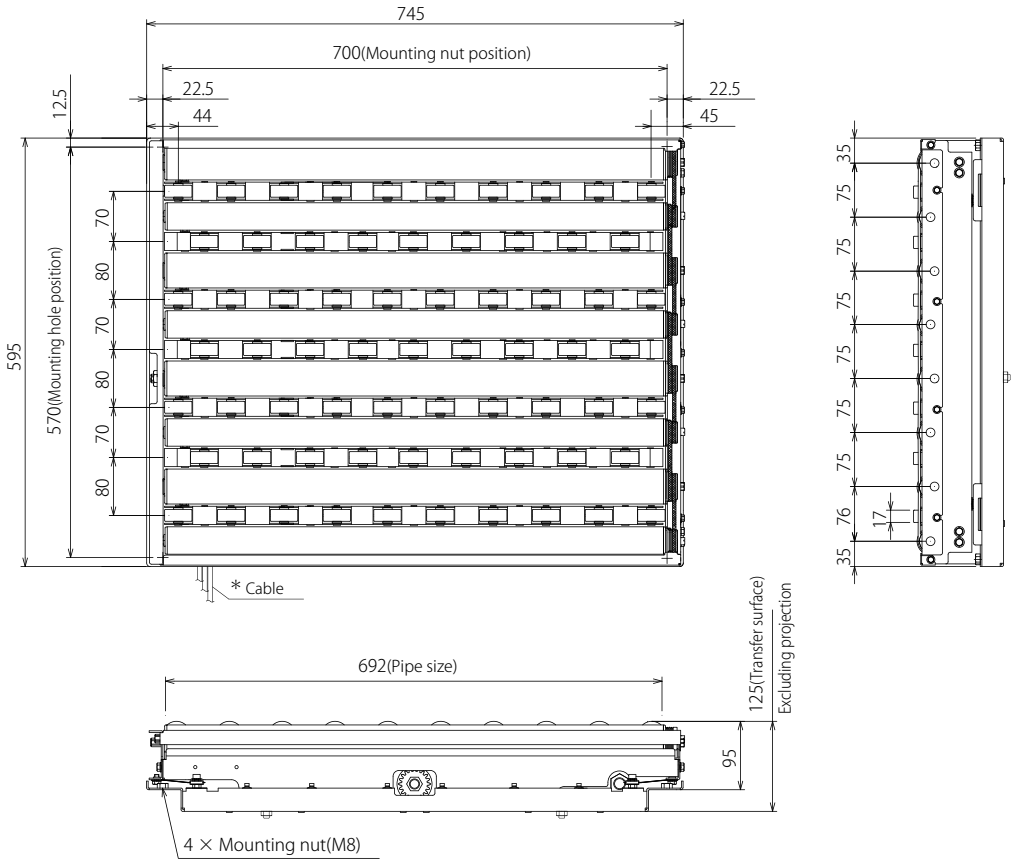
Size 7550
L745mm×W495mm



＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	850
M2 : Roller transfer MDR	1000
M3 : Drive switching MDR	1200

Size 7560
L745mm×W595mm

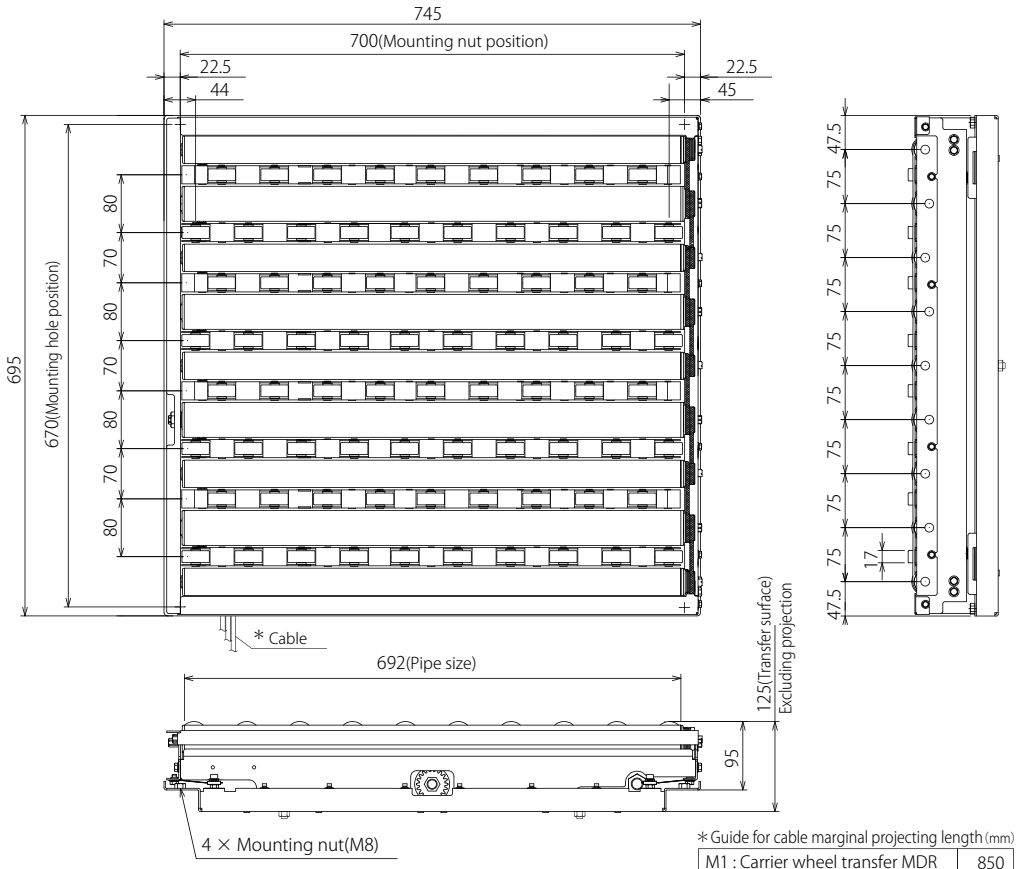


＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	850
M2 : Roller transfer MDR	900
M3 : Drive switching MDR	1200

7. Installation/Wiring

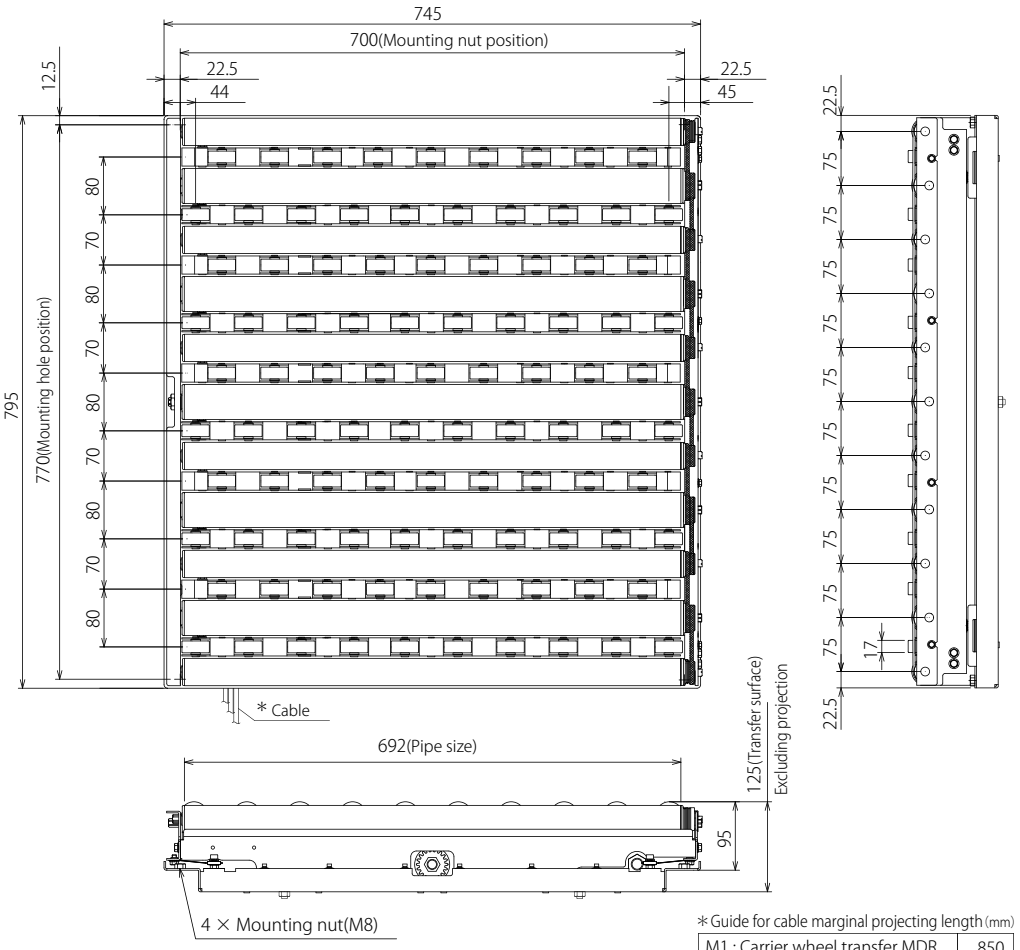
Size 7570
L745mm×W695mm



＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	850
M2 : Roller transfer MDR	800
M3 : Drive switching MDR	1200

Size 7580
L745mm×W795mm

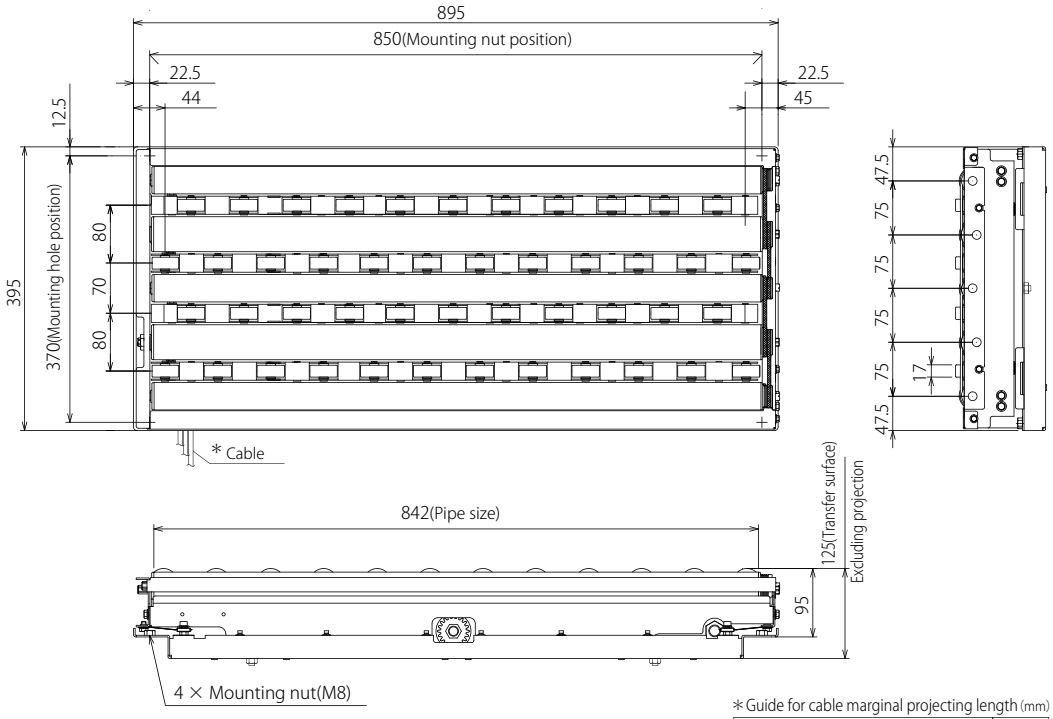


＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	850
M2 : Roller transfer MDR	700
M3 : Drive switching MDR	1200

7. Installation/Wiring

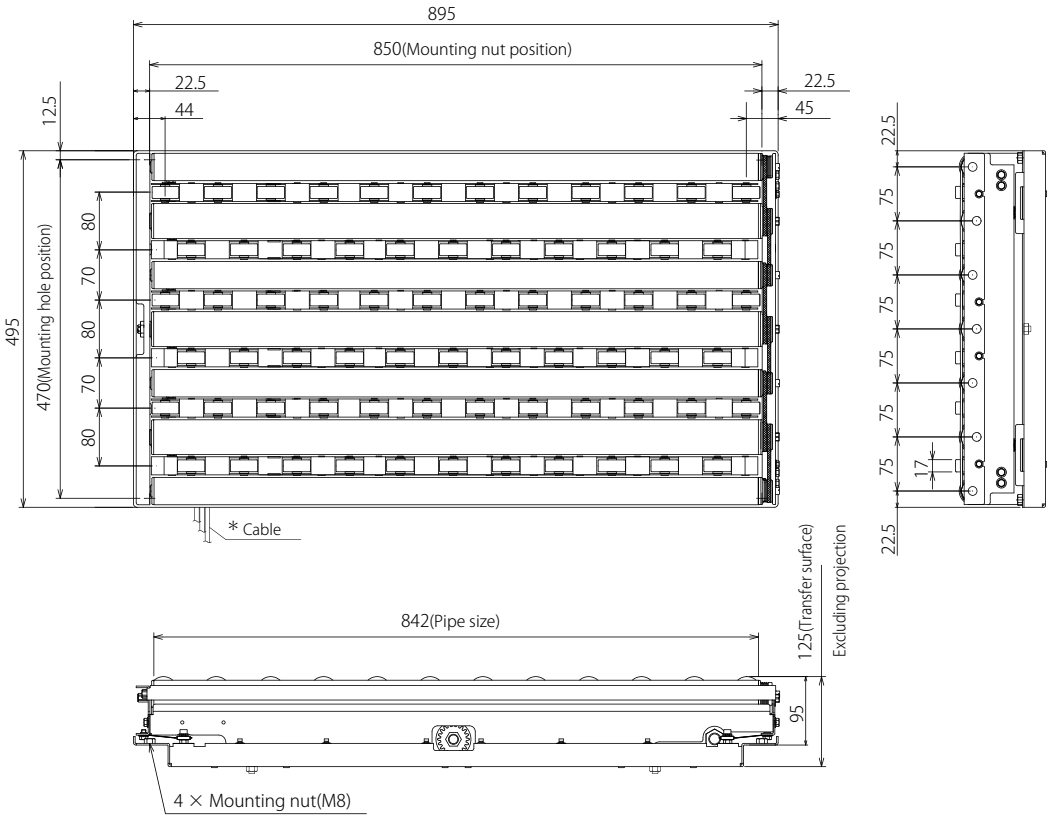
Size 9040
L895mm×W395mm



＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	700
M2 : Roller transfer MDR	1100
M3 : Drive switching MDR	1100

Size 9050
L895mm×W495mm

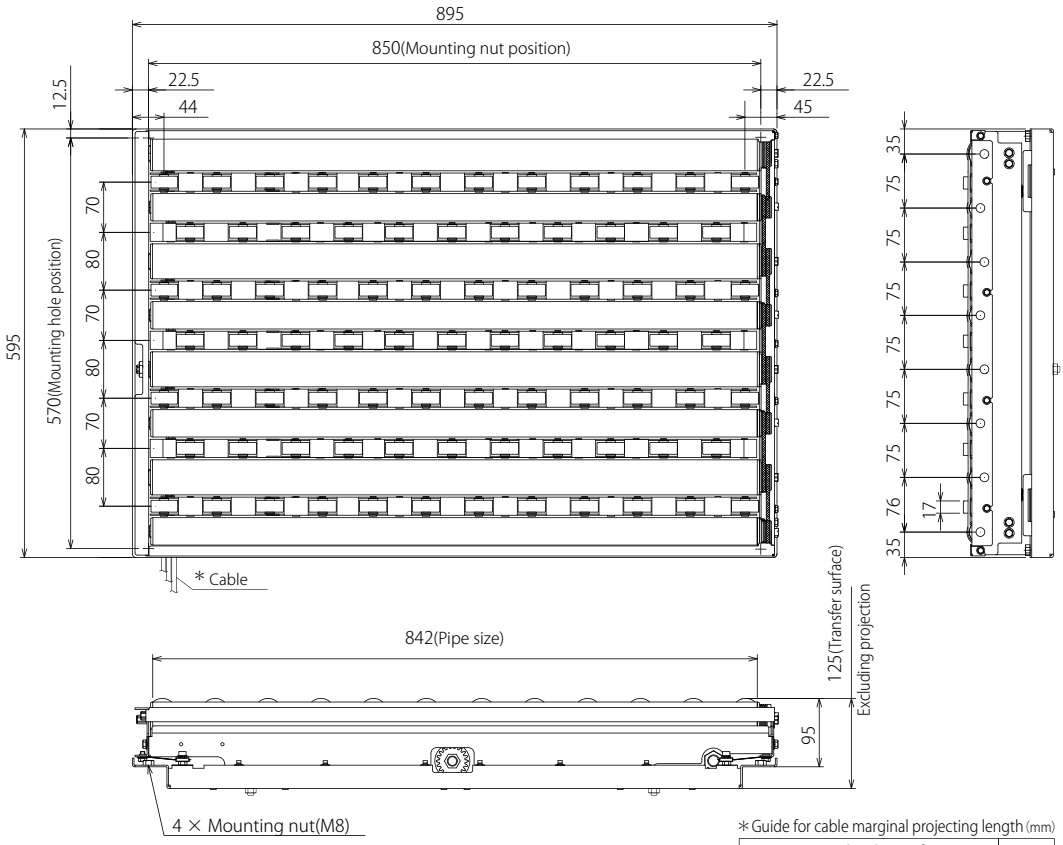


＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	700
M2 : Roller transfer MDR	1000
M3 : Drive switching MDR	1100

7. Installation/Wiring

Size 9060
L895mm×W595mm



＊Guide for cable marginal projecting length (mm)

M1 : Carrier wheel transfer MDR	700
M2 : Roller transfer MDR	900
M3 : Drive switching MDR	1100

7. Installation/Wiring

Mounting preparation for driver cards

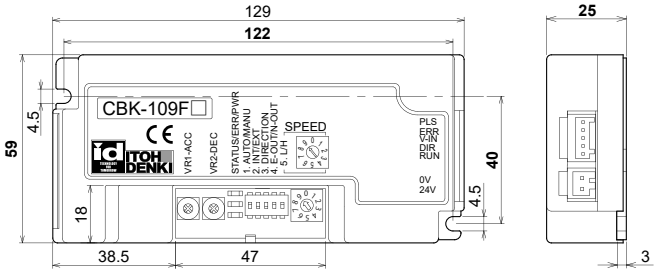
Hole processing on frames and control panel

1

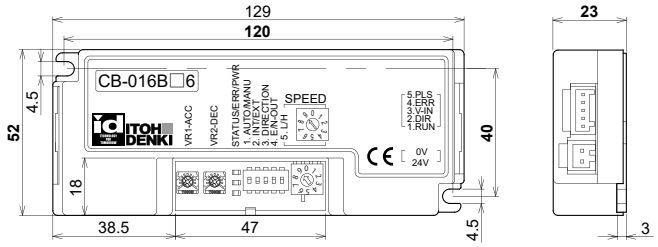
- Perform mounting processing on the frames and control panel by reference to the mounting holes for driver cards.
- For cable opening and projection from the F-RAT main unit, refer to Mounting preparation for the F-RAT main unit (P.24).

■ Mount driver cards on a flat surface where heat can be released easily.
■ Prevent chips generated during processing from entering driver cards.

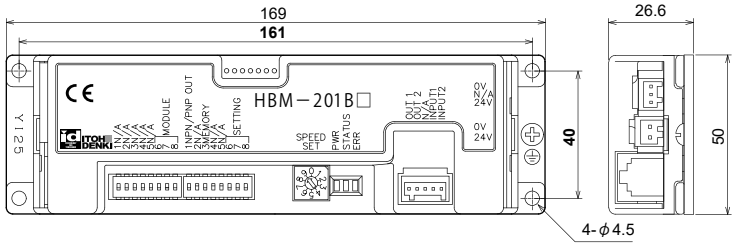
CBK-109



CB-016



HBM-201



Preparation of MDR extension cables

If the mounting location of the F-RAT main unit is far from that of driver cards, prepare the MDR extension cables separately.

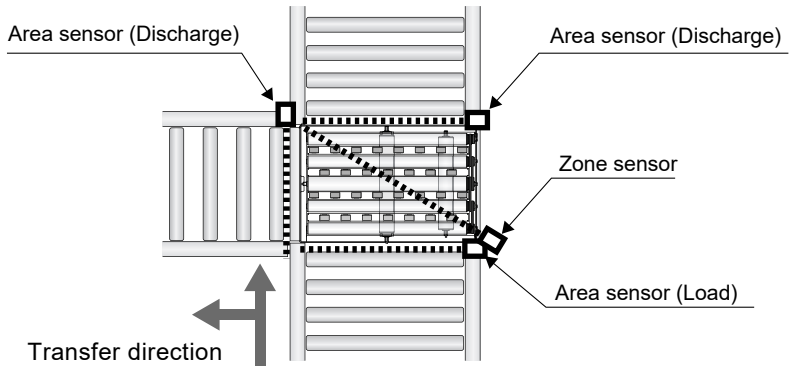
- For CBK-109（12P extension cable） ：ACE-CBM-G○○○○
- For CB-016 ／ HBM-201（10P extension cable）：ACE-CBM-A○○○○

■ Use extension cables of 1200 mm or less.
■ Do not extend cables by connecting multiple extension cables.

Mounting preparation for sensors

Determine the mounting location for zone sensors, and area sensors for loading and discharging, and prepare for them to be mounted.

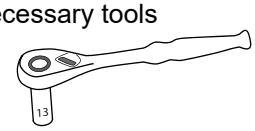
Example)
Mounting positions for each sensor



7. Installation/Wiring

7-2. Installation

Necessary tools

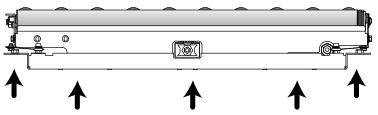


13mm ratchet wrench | Phillips head screwdriver (No.2) | Precision slotted screwdriver | Stripper

Installing the F-RAT main unit

1 Carry this product to the installing location.

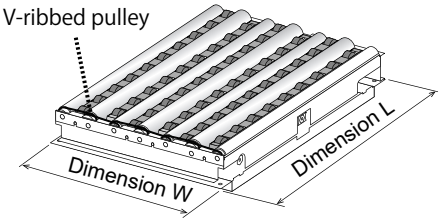
■ When lifting, hold the bottom of this product. Do not hold the moving parts, such as rollers, belt transfer parts, or lifting sections.



Hold the bottom of the main unit

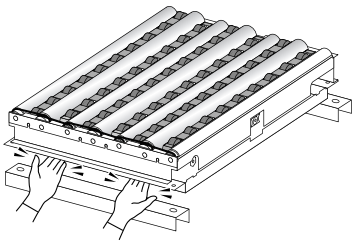
2 Check the installing direction for the loading/discharging sides.

■ Check the direction of V-ribbed pulley.

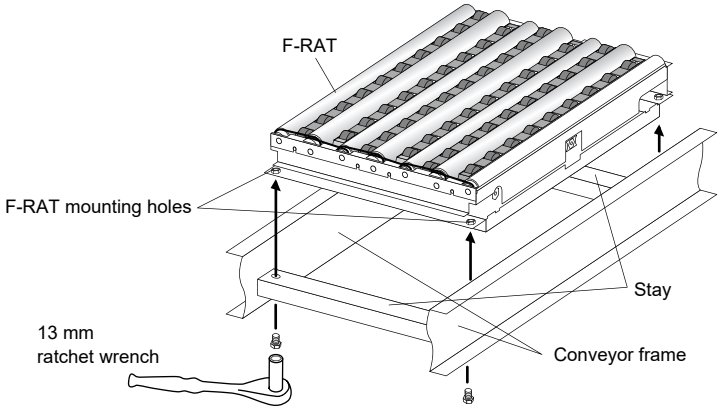


3 Use the included bolts to secure the unit on stands or stays with the mounting nuts for the F-RAT main unit.

■ When installing, be careful not to get fingers caught.
■ Install this product in places with a mounting surface tilt (inclination) of 0.5% or less.
■ Install in locations where the weight of this product and trays can be sufficiently supported. (For the main unit weight, refer to P.71)
■ The vibration level in the installation environment for this product should be 0.5 G or less.
■ Secure the working space for maintenance around this product.
■ Observe safety regulations required for installation locations or equipment in use.
■ **Recommended tightening torque: 12 to 15 N·m**



Mounting example using stays



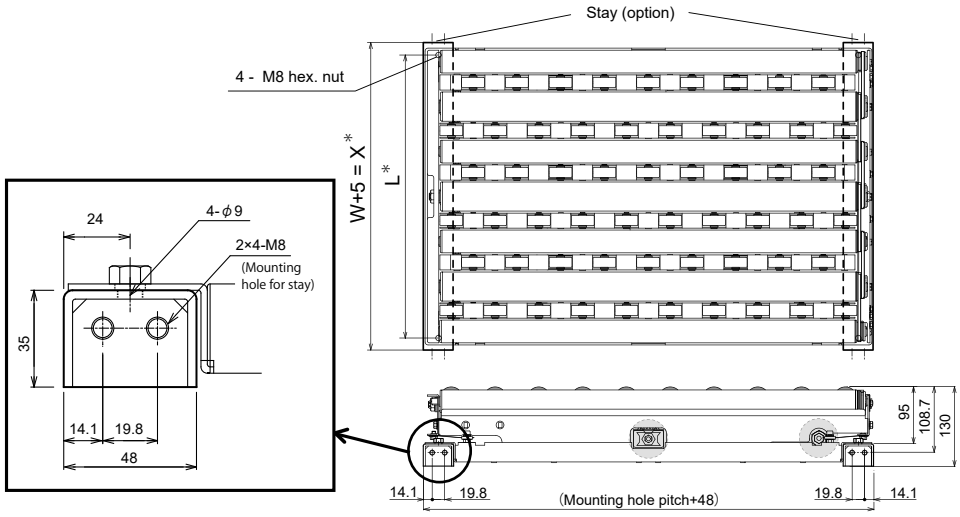
4 Adjust the conveyor frame legs on which the F-RAT main unit has been mounted, and align levels of the F-RAT main unit and the adjacent conveyor.

7. Installation/Wiring

About stays (option)

Dedicated stay (optional) is prepared for F-RAT installation.

■ If users do not use the stays, be sure to use the mounting holes on the F-RAT main unit to secure the F-RAT.
In addition, comply with the mounting dimensions for stays, as well as mount them by taking into consideration the weight of this product and trays.



■ To mount stays on the frame, use their mounting holes, and mount them using a tightening torque of 12 to 15 N·m.

＊For details, refer to the description related to stays on P.73.

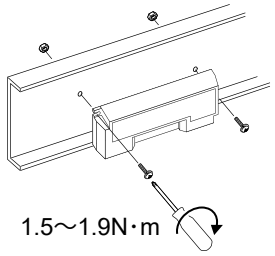
7. Installation/Wiring

Mounting driver cards

Mounting driver cards

Use the included screws and nuts to mount driver cards on the conveyor frames or control panel.

■ Recommended tightening torque: 1.5 to 1.9N·m



Mounting sensors, control devices, and power supply units

Mounting sensors, control devices, and power supply units

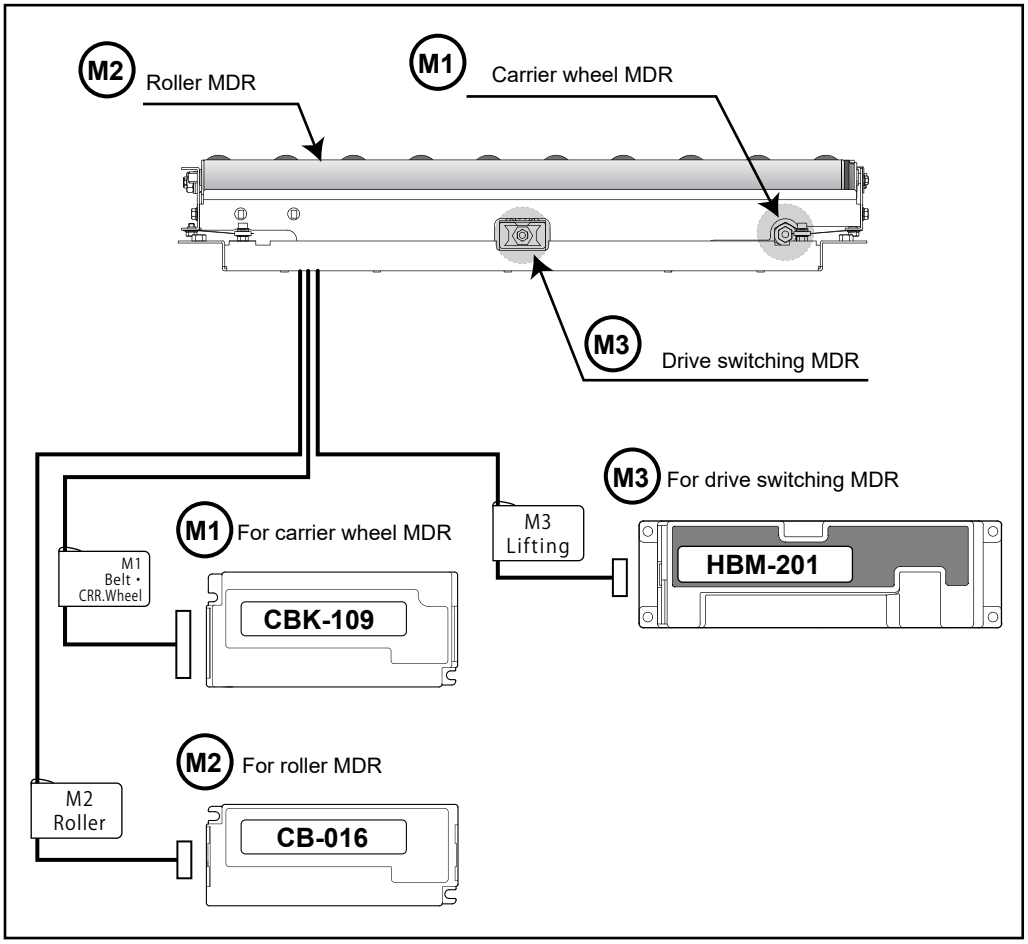
Mount customer-prepared zone sensor and area sensor for loading and discharging, as well as power supply units, and PLCs.

7-3.
Wiring

Connection between the F-RAT main unit and driver cards

Connection between the F-RAT main unit and driver cards

- Refer to the labels for cables coming from the F-RAT main unit, and securely connect the MDR connectors and driver cards.
- When using extension cables, securely connect them to the MDR connectors, as well as to the driver card connectors.



7. Installation/Wiring

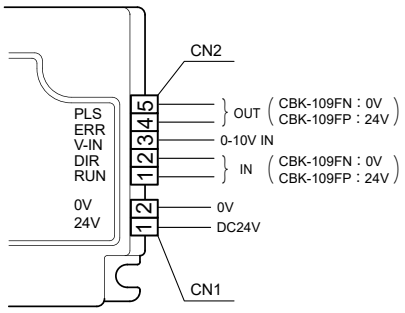
Wiring for CBK-109

〔CBK-109〕
M1：For carrier wheel transfer

CBK-109

■ Connector descriptions

CN1 (Power)	#2	0V
	#1	DC24V

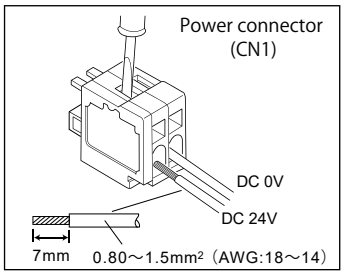


Functions				Detailed descriptions
CN2 (Control)	#5	Output	Motor pulse output	・Outputs 2-pulse signal per rotation of the internal motor. ・NPN open collector output. ・Attach protection resistance so that the output is 25 mA or less. ・Protection resistance of 100 Ω is included inside driver cards. ・If output is connected to inductive load (Ex. Relay coil , solenoid , actuator , etc .), make sure to protect output from Back voltage with a free-wheeling diode.
	#4	Output	Error signal output	・Detects MDR errors, and outputs. ・Settings for normal output and error output can be specified using ON/OFF on DIP-SW1#4. ・Open collector output. ・Attach protection resistance so that the output is 25 mA or less. ・Protection resistance of 100 Ω is included inside driver cards. ・If output is connected to inductive load (Ex. Relay coil , solenoid , actuator , etc .), make sure to protect output from Back voltage with a free-wheeling diode.
	#3	Analog input	MDR external speed setting	The transfer speed can be set by the voltage input of 0 - 10V.
	#2	Input	MDR rotation direction switching	The transfer direction can be switched.
	#1	Input	MDR RUN/STOP	Required for RUN/STOP signals.

Power connector (CN1)

1 Connect the 24V DC and 0V DC cables to CN1 (2 pin).

■ Do not connect multiple power cables to one pole. Failure to follow this could result in electric shock, short circuit, and/or damage due to the capacity of connectors being exceeded. (Connector capacity: 10 A)
■ Do not connect the 24V DC and 0V DC cables incorrectly.
■ Do not connect cables when connectors are plugged in.

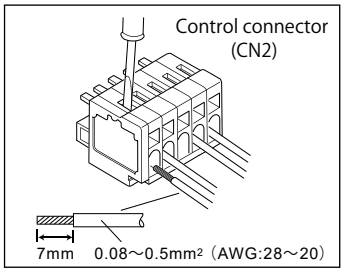


Control connector (CN2)

2 Connect each cable to CN2 (5 pin).

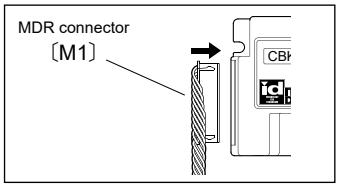
＊Refer to the above, and perform wiring according to operation.

■ Use the same voltage to be input to CN2#1 (MDR RUN/STOP) and CN2#2 (MDR rotation direction) as the power supply voltage. (Connector capacity: 4A)



Connecting to driver cards

3 Connect the power connector (CN1), control connector (CN2), and M1 MDR connector to driver cards.



For more details on CBK-109, please download the driver card user manual from our web page.

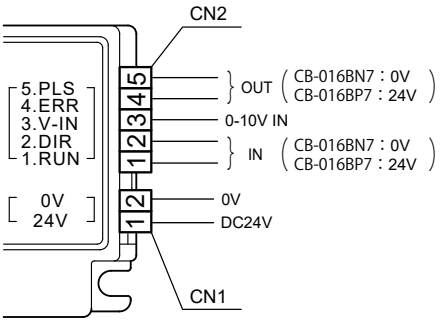
ITOH DENKI Home > Documents > Technical documentation
https://www.itoh-denki.com/technical-support/technical-documentation/

7. Installation/Wiring

Wiring for CB-016

〔CB-016〕
M2：For roller transfer

CB-016



■ Connector descriptions

CN1 (Power)	#2	0V
	#1	DC24V

Functions				Detailed descriptions
CN2 (Control)	#5	Output	Motor pulse output	・Outputs 2-pulse signal per rotation of the internal motor. ・NPN open collector output. ・Attach protection resistance so that the output is 25 mA or less. ・Protection resistance of 100 Ω is included inside driver cards.
	#4	Output	Error signal output	・Detects MDR errors, and outputs. ・Settings for normal output and error output can be specified using ON/OFF on DIP-SW1#4. ・Open collector output. ・Attach protection resistance so that the output is 25 mA or less. ・Protection resistance of 100 Ω is included inside driver cards. ・If output is connected to inductive load (Ex. Relay coil , solenoid , actuator , etc .), make sure to protect output from Back voltage with a free-wheeling diode.
	#3	Analog input	MDR external speed setting	The transfer speed can be set by the voltage input of 0 - 10V.
	#2	Input	MDR rotation direction switching	The transfer direction can be switched.
	#1	Input	MDR RUN/STOP	Required for RUN/STOP signals.

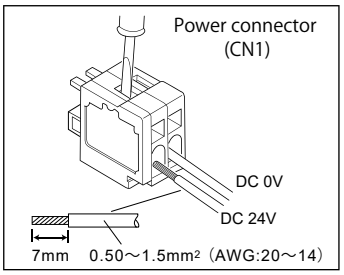
Power connector (CN1)

1 Connect the 24V DC and 0V DC cables to CN1 (2 pin).

■ Do not connect multiple power cables to one pole. Failure to follow this could result in electric shock, short circuit, and/or damage due to the capacity of connectors being exceeded. (Connector capacity: 10 A)

■ Do not connect the 24V DC and 0V DC cables incorrectly.

■ Do not connect cables when connectors are plugged in.

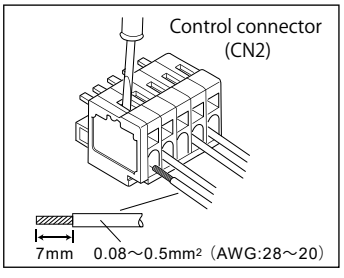


Control connector (CN2)

2 Connect each cable to CN2 (5 pin).

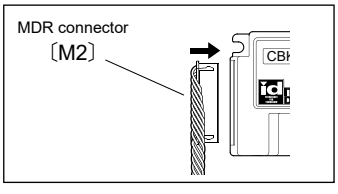
＊Refer to the above, and perform wiring according to operation.

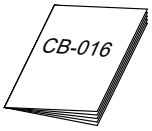
■ Use the same voltage to be input to CN2#1 (MDR RUN/STOP) and CN2#2 (MDR rotation direction) as the power supply voltage. (Connector capacity: 4A)



Connecting to driver cards

3 Connect the power connector (CN1), control connector (CN2), and M2 MDR connector to driver cards.





For more details on CB-016, please download the driver card user manual from our web page.

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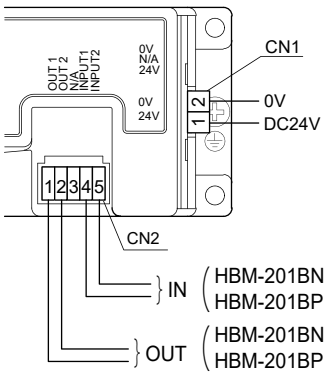
7. Installation/Wiring

〔HBM-201〕
M3：For drive switching

Wiring for HBM-201

HBM-201



■ Connector descriptions

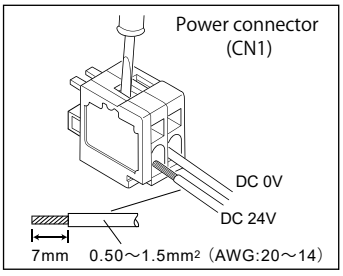
CN1 (Power)	#2	0V
	#1	DC24V

		Functions		Detailed descriptions
CN2 (Control)	#5	Input	Carrier wheel surface switch input	・Carrier wheel and roller transfer surface are switched by inputting signal ・Teaching* settings can be performed when both #4 and #5 are ON
	#4	Input	Roller surface switch input	
	#3	—	Unused	
	#2	Output	Carrier wheel surface standby output	・Teaching* has not completed when both #1 and #2 are ON (when the power is turned on) ・Transfer surfaces are being switched, and teaching is in operation when both #1 and #2 are OFF ・Open collector output
	#1	Output	Roller surface standby output	

Power connector (CN1)

1 Connect the 24V DC and 0V DC cables to CN1 (2 pin).

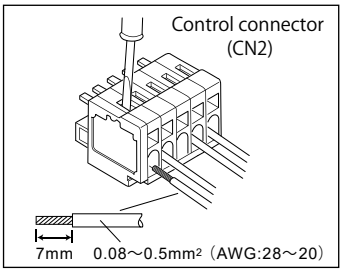
■ Do not connect multiple power cables to one pole. Failure to follow this could result in electric shock, short circuit, and/or damage due to the capacity of connectors being exceeded. (Connector capacity: 10 A)
■ Do not connect the 24V DC and 0V DC cables incorrectly.
■ Do not connect cables when connectors are plugged in.



Control connector (CN2)

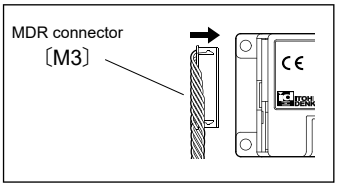
2 Connect the above four cables.

■ Use the same voltage to be input to CN2#1 as the power supply voltage.
(Connector capacity: 4A)
■ The maximum output current value for remote output is 25mA on #1 and #2



Connecting to driver cards

3 Connect the power connector (CN1), control connector (CN2), and M3 MDR connector to driver cards.



Term

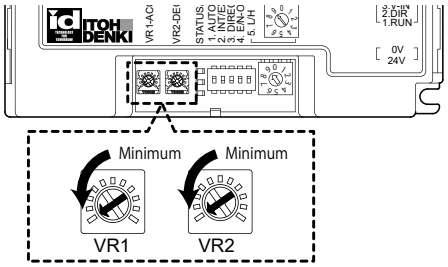
* Teaching
Operation to perform the initial setting of the transfer surface position.
Teaching must be performed after the power is turned on.

7. Installation/Wiring

Setting driver cards

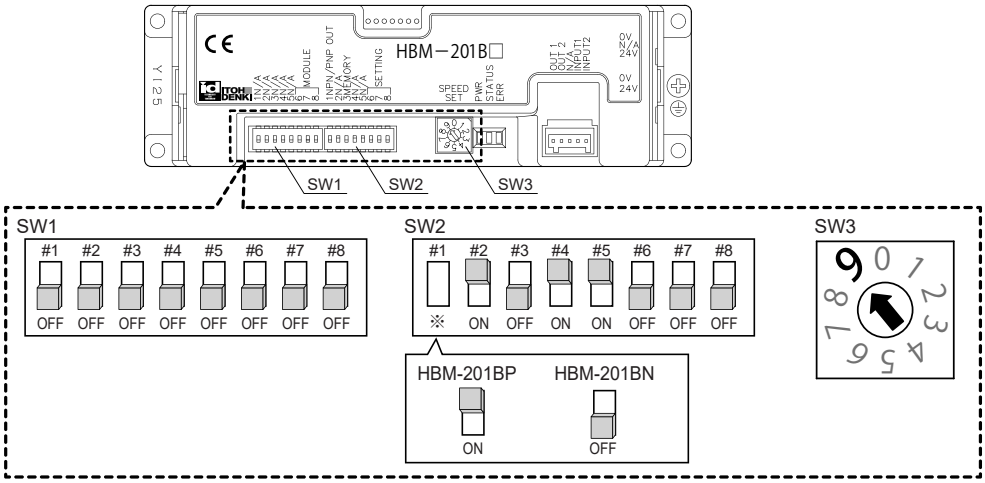
Settings for M1: CBK-109／M2: CB-016

Turn the driver card volume to the following (factory setting).



Settings for M3: HBM-201

Turn the driver card DIP switch and rotary switch to the following (factory setting).



Connecting to power supply units

Connecting to power supply units

The power is supplied to driver cards from the power connector (CN1).
Connect customer-prepared power cables of zone and area sensors for loading and discharging.

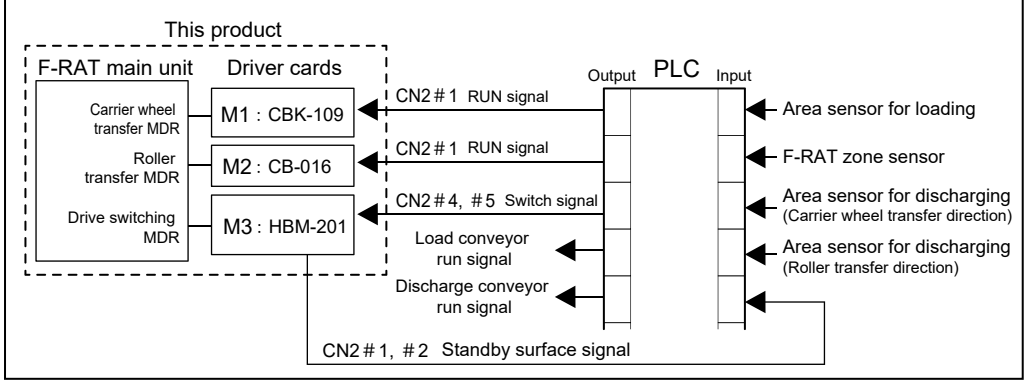
Connecting signal cables of driver cards/sensors to PLCs

Connecting signal cables of driver cards/sensors to PLCs

Connect signal cables of driver cards to controllers, such as PLCs.
Connect customer-prepared signal cables of zone and area sensors for loading and discharging.

— Connection example —

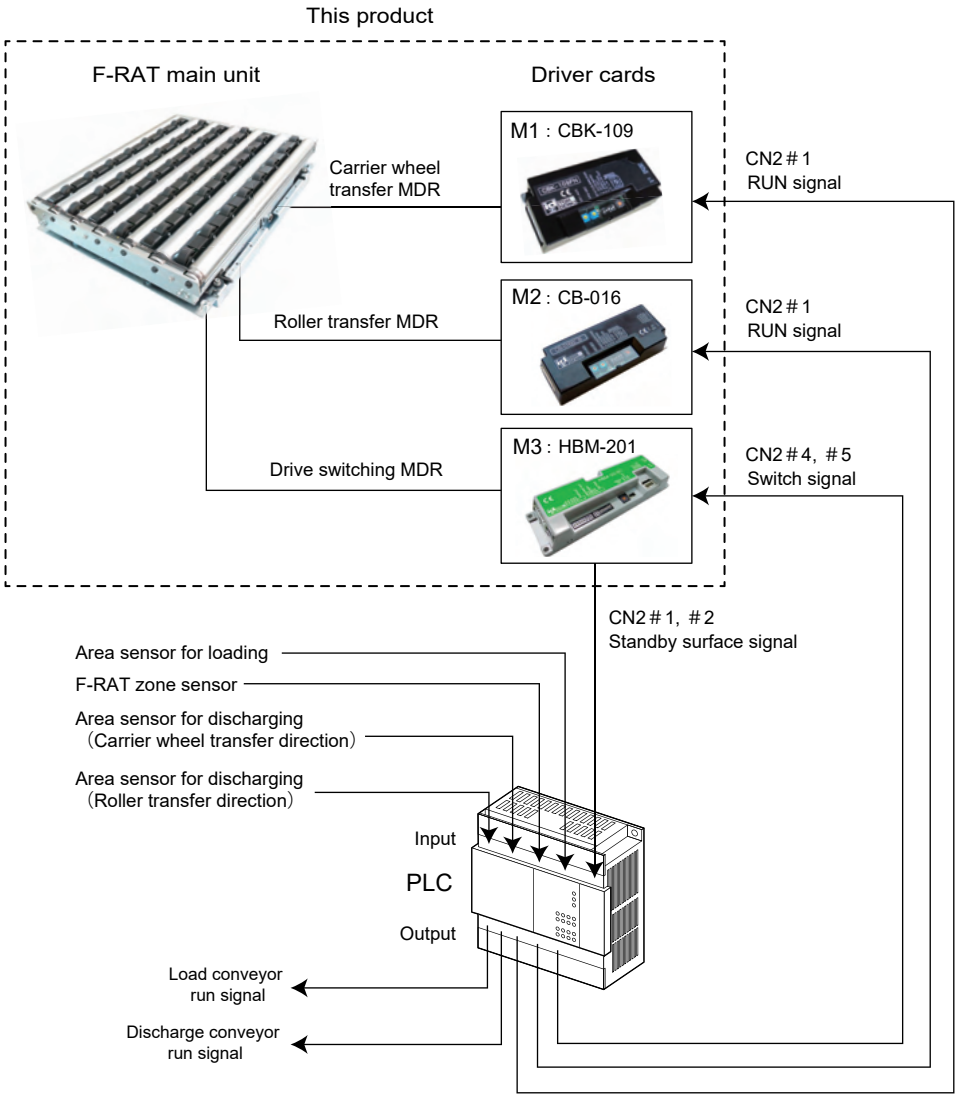
The following is an example. For input and output of each signal, perform wiring according to your operation.



8. Control/Operation

8. Control/Operation

Device configuration image



Label description	MDR code	Driver card
M1 *	Carrier wheel transfer MDR	CBK-109
M2 *	Roller transfer MDR	CB-016
M3 *	Drive switching MDR	HBM-201

* Refer to the labels for cables coming from the F-RAT main unit.

Term

Zone sensor
A sensor to detect the existence of trays within the zone

Area sensor
A sensor to detect load and discharge of trays

8. Control/Operation

8-1. Basic operation

Operation image

About control

■ F-RAT uses MDR for each of carrier wheel transfer, roller transfer, and transfer surface switch (3 axes in total). Make sure to control to allow each axis to run independently.

Turn on the power

HBM-201 Signal output from CN2#1, CN2#2

Set the initial position of the transfer surface (Teaching)

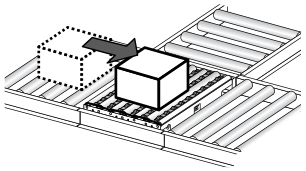
HBM-201 Signal input to CN2#4, CN2#5

Start teaching

HBM-201 Signal output from CN2#1
No signal output from CN2#2

Preparing reception (teaching) complete
＊The roller surface is set in the initial position.

Load

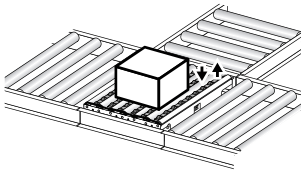


Run the roller transfer MDR

Area sensor for loading ON → OFF

Stop running the roller transfer MDR (loading complete)

Switch the transfer surface to the diverting direction
(Roller transfer→ Carrier wheel transfer)



HBM-201 Signal input to CN2#5

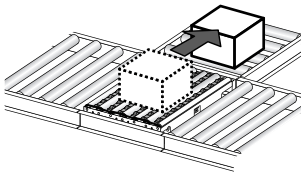
Start to switch to the carrier wheel surface

HBM-201 No signal output from CN2#1
Signal output from CN2#2

HBM-201 Stop signal input to CN2#5

Switching to the carrier wheel surface complete

Discharge

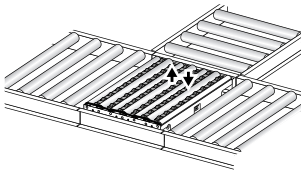


Run the carrier wheel transfer MDR

Area sensor for discharge ON → OFF

Stop running the carrier wheel transfer MDR (loading complete)

Prepare reception
(Transfer surface switch)
(Carrier wheel transfer→Roller transfer)



HBM-201 Signal input to CN2#4

Start to switch to the roller surface

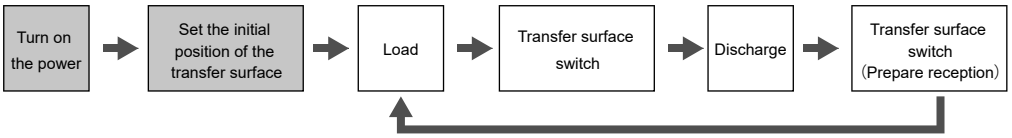
HBM-201 Signal output from CN2#1
No signal output from CN2#2

HBM-201 Stop signal input to CN2#4

Switching to the roller surface (preparing reception) complete

8. Control/Operation

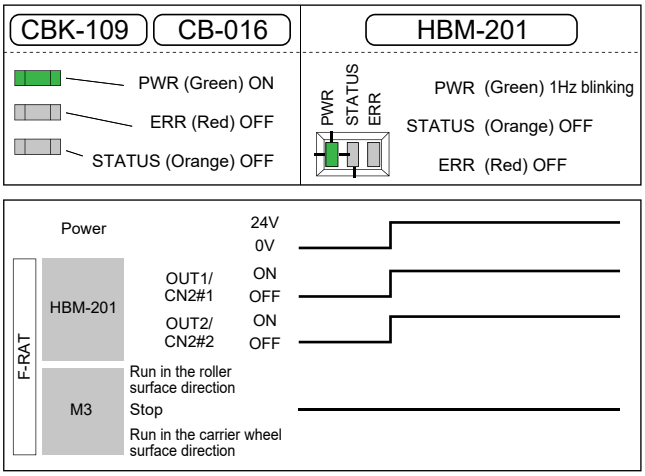
8-1. Basic operation

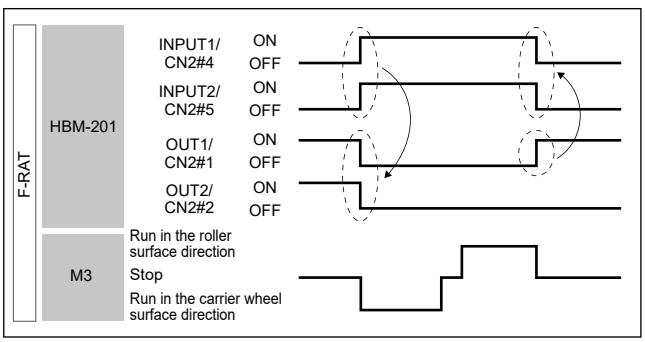


■ The following operation is for when the rotation direction setting SW1#3 for CB-016 and CBK-109 is OFF (factory setting).
Loading and discharging directions will be changed depending on the SW1#3 setting and signal input to CN2.
【Refer to 8-2. Switching the transfer direction on P.45.】

Transfer flow chart (when using the roller for loading, and carrier wheel for discharging)

	F-RAT operation	Signal input/output	
Turn on the power		Turn 24V DC on HBM-201 Signal output from CN2#1, CN2#2	After the power is turned on, the LED display are indicated as below.
Set the initial position of the transfer surface (Teaching)	Start the transfer surface switch operation Stop the transfer surface switch operation (Transfer surface setting complete) ＊The roller surface is set in the initial position.	HBM-201 Signal input to CN2#4, CN2#5 HBM-201 Stop signal output from CN2#1, CN2#2 HBM-201 Signal output from CN2#1 NO YES HBM-201 Stop signal input to CN2#4, CN2#5	F-RAT zone sensor Transfer surface switch When preparing reception is complete, the roller surface is set on standby.

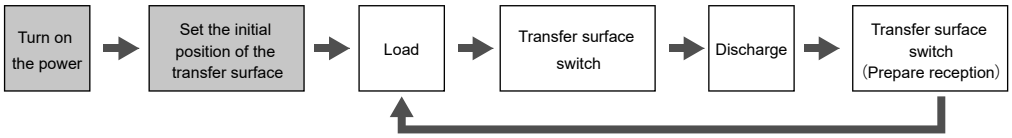


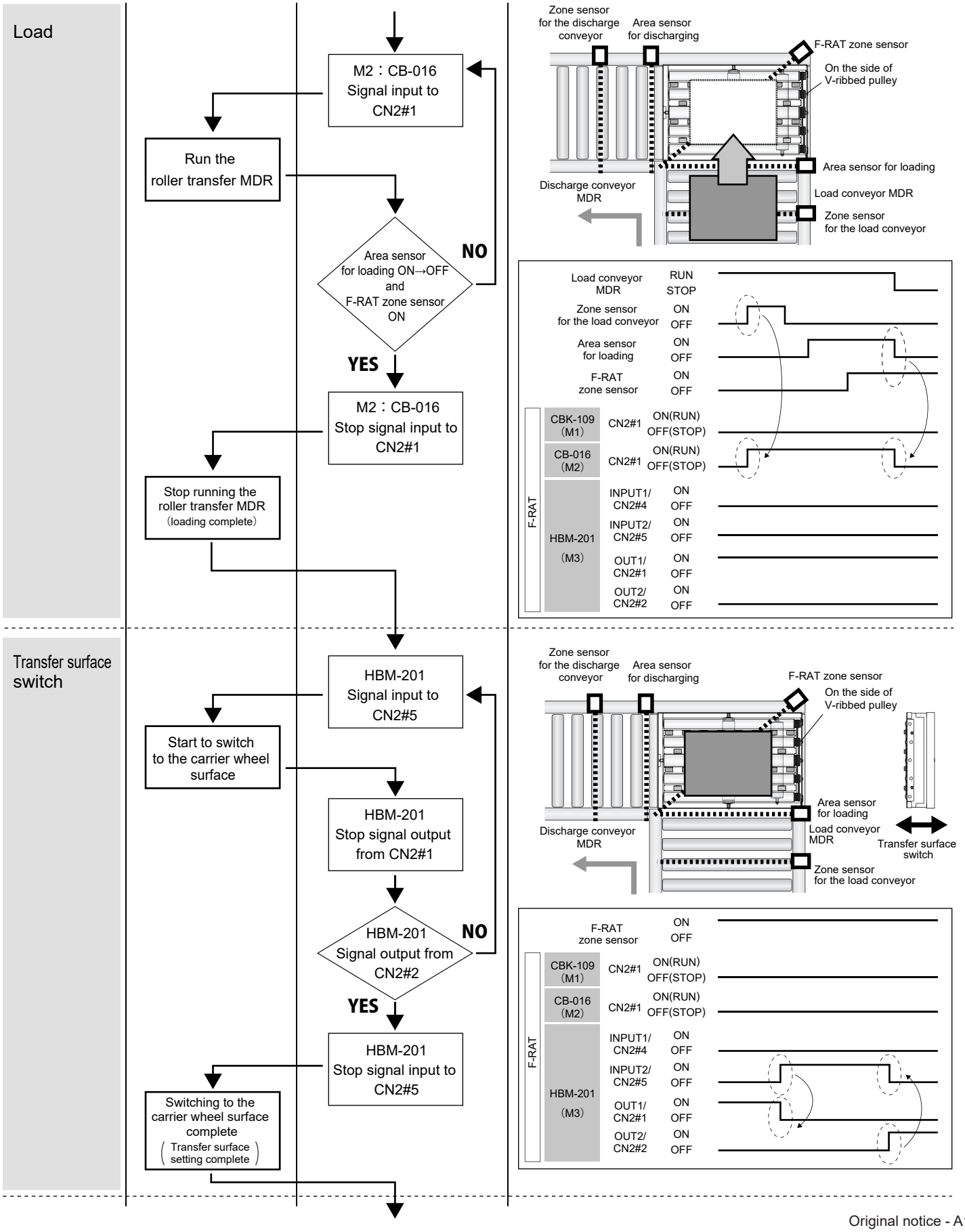


Term

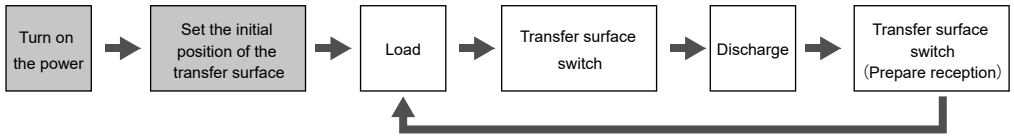
Teaching
Operation to perform the initial setting of the transfer surface position.
Teaching must be performed when the power is turned on.

8. Control/Operation

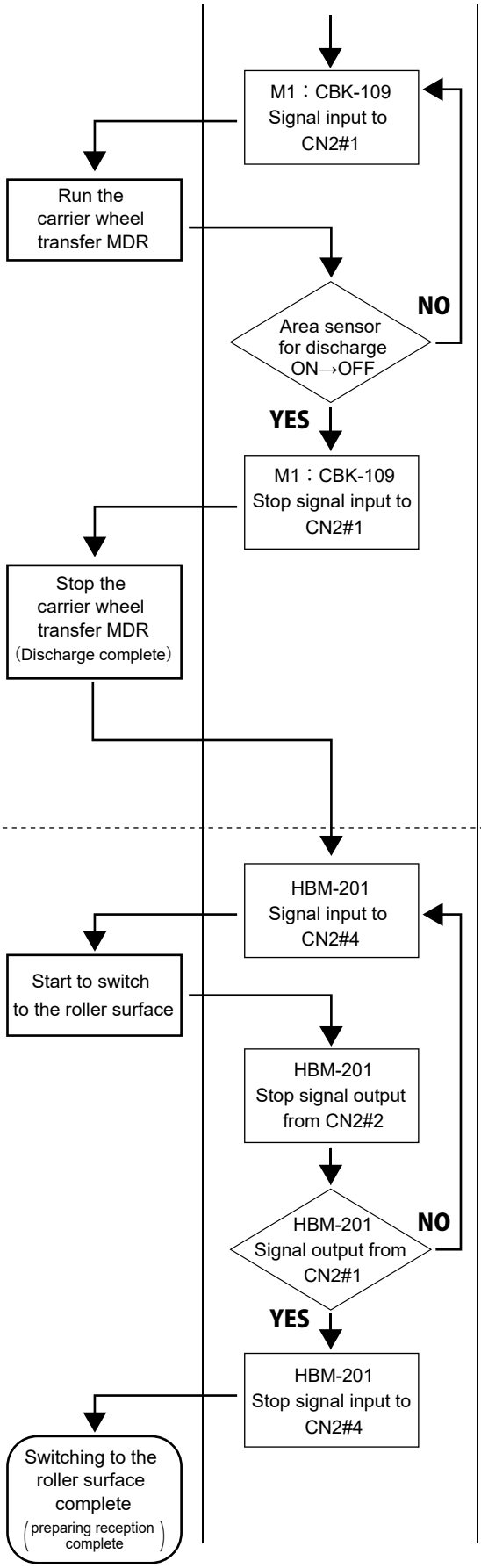


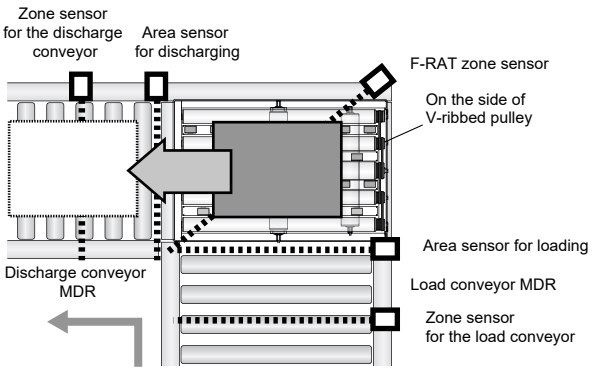


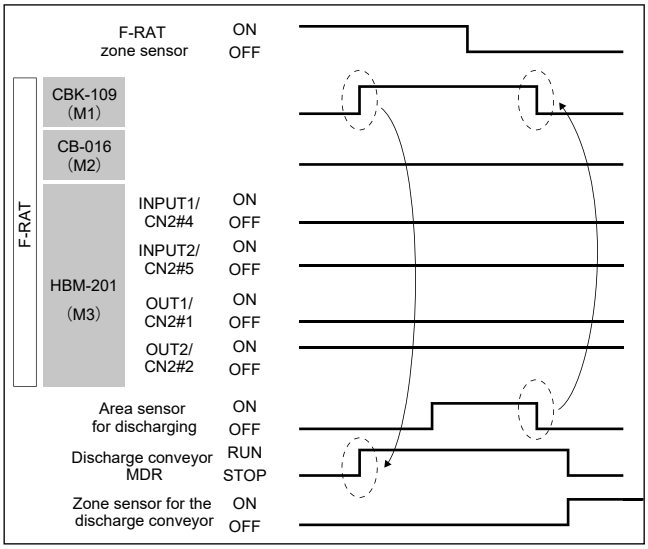
8. Control/Operation



Discharge

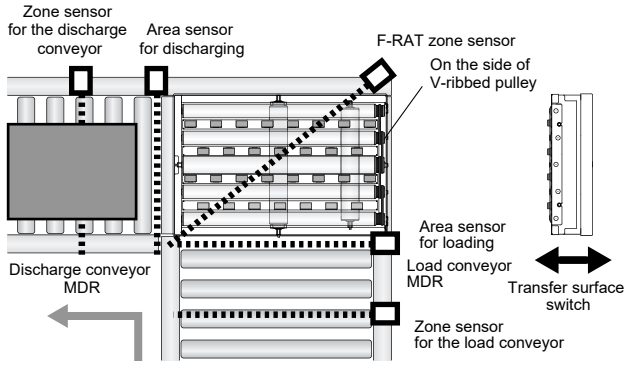


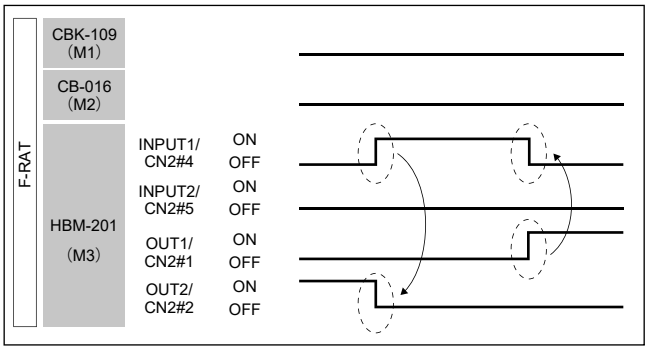




Transfer surface switch

(Prepare reception)





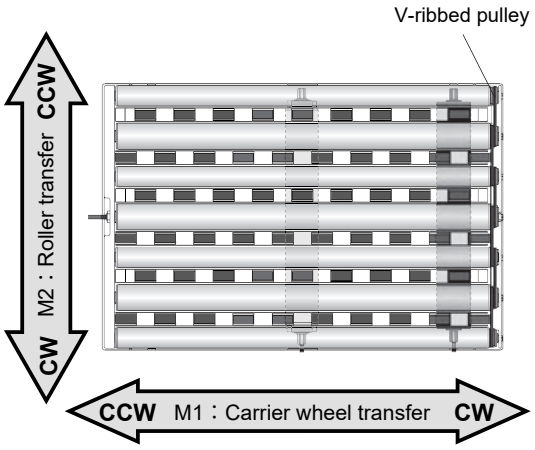
8. Control/Operation

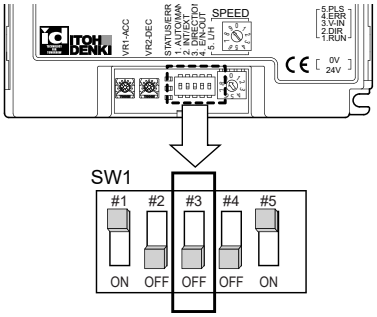
8-2.
Switching the transfer direction
〔M1:CBK-109 / M2:CB-016〕

Switching the transfer direction

The transfer direction can be set by DIP-SW on the driver card, and signal input.

■ When changing the direction, check the F-RAT main unit installation direction.
■ The transfer direction cannot be changed by SW1#3 during transfer (while MDR is running). Change the direction when MDR stops.

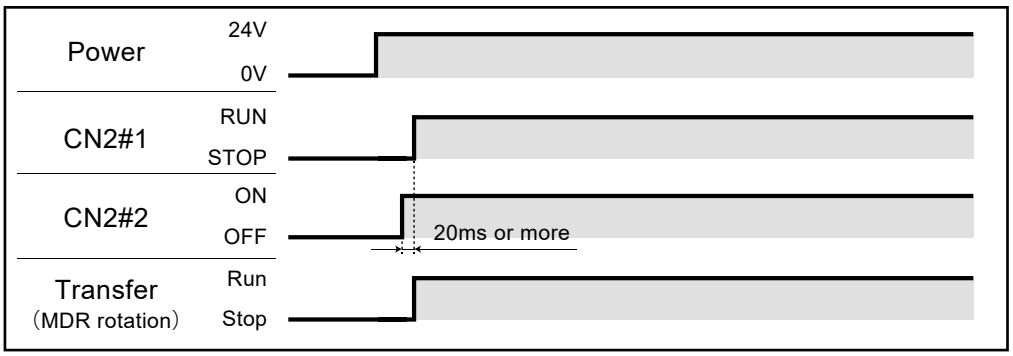




	SW1 # 3	
	ON	OFF (factory setting)
CN2# 1 2 3 4 5 ← IN	CW	CCW
CN2# 1 2 3 4 5 ← IN	CCW	CW

Transfer/Stop in the CW direction＊ by inputting signal

＊When DIP-SW1#3 is OFF

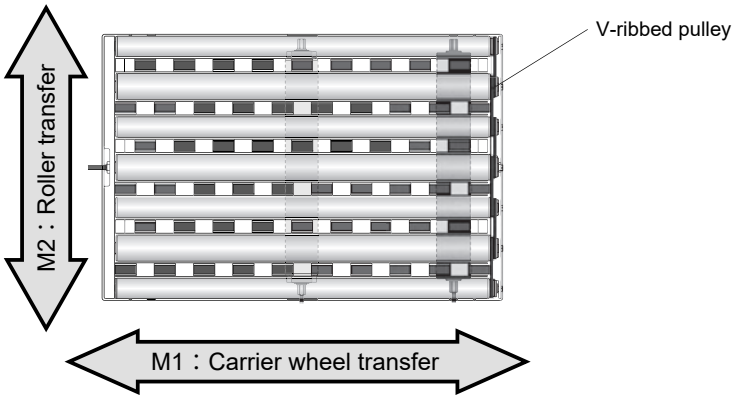


8. Control/Operation

8-3.
Changing the transfer speed
〔M1:CBK-109 / M2:CB-016〕

Changing the transfer speed

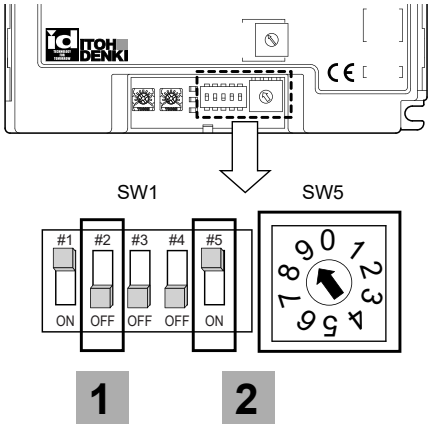
There are two types of settings to change speed: the internal speed setting to change the speed by switches on the driver card, and the external speed setting to change the speed by inputting the analog voltage to CN2#3.



Internal speed setting

1 Set SW1#2 to OFF.

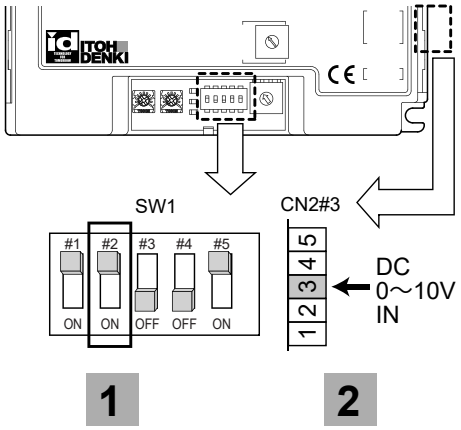
2 Set SW1#5 and SW5.



External speed setting

1 Turn SW1#2 ON.

2 Input the voltage to CN2#3.



■ The speed can be changed even during transfer (when RUN signal is being input).

8. Control/Operation

8-3. Changing the speed

〔M1:CBK-109 / M2:CB-016〕

Speed chart (m/min)

［M1：Carrier wheel speed］

Speed accuracy: ±3%

	SW1#5：ON										SW1#5：OFF									
SW5	9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0
Setting	61.5	56.4	53.9	51.3	48.7	46.2	41.1	38.4	35.9	33.4	30.8	28.2	25.6	23.1	20.5	18.0	15.5	12.8	10.3	7.7
Rated	59.8	56.4	53.9	51.3	48.7	46.2	41.1	38.4	35.9	33.4	30.8	28.2	25.6	23.1	20.5	18.0	15.5	12.8	10.3	7.7
External voltage Input (V)	9.6 ∫ 9.9	9.1 ∫ 9.4	8.6 ∫ 8.9	8.1 ∫ 8.4	7.6 ∫ 7.9	7.1 ∫ 7.4	6.6 ∫ 6.9	6.1 ∫ 6.4	5.6 ∫ 5.9	5.1 ∫ 5.4	4.6 ∫ 4.9	4.1 ∫ 4.4	3.6 ∫ 3.9	3.1 ∫ 3.4	2.6 ∫ 2.9	2.1 ∫ 2.4	1.6 ∫ 1.9	1.1 ∫ 1.4	0.6 ∫ 0.9	0.1 ∫ 0.4

：Factory setting

［M2：Roller speed］

Speed accuracy: ±3%

		SW1#5：ON										SW1#5：OFF									
SW5		9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0
Nominal speed 60 m/min type	Setting	61.7	56.6	54.0	51.4	48.9	46.3	41.2	38.6	36.0	33.4	30.9	28.3	25.7	23.1	20.6	18.0	15.4	12.9	10.3	7.7
	Rated	53.5	53.5	53.5	51.4	48.9	46.3	41.2	38.6	36.0	33.4	30.9	28.3	25.7	23.1	20.6	18.0	15.4	12.9	10.3	7.7
External voltage Input (V)		9.6 ∫ 9.9	9.1 ∫ 9.4	8.6 ∫ 8.9	8.1 ∫ 8.4	7.6 ∫ 7.9	7.1 ∫ 7.4	6.6 ∫ 6.9	6.1 ∫ 6.4	5.6 ∫ 5.9	5.1 ∫ 5.4	4.6 ∫ 4.9	4.1 ∫ 4.4	3.6 ∫ 3.9	3.1 ∫ 3.4	2.6 ∫ 2.9	2.1 ∫ 2.4	1.6 ∫ 1.9	1.1 ∫ 1.4	0.6 ∫ 0.9	0.1 ∫ 0.4

：Factory setting

- ■ Values in “Setting” indicate the speed when trays are not placed on carrier wheels and rollers.
- ■ During operation, the rising time to the setting speed may vary depending on ambient temperature. Perform running operation thoroughly.
- ■ Values described above may differ from the actual transfer speed depending on the weight, material, bottom surface, and/or shape of trays, as well as ambient temperature.

8. Control/Operation

8-4. Switching the transfer surface

〔M3:HBM-201〕

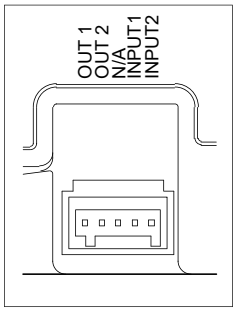
Switching the transfer surface

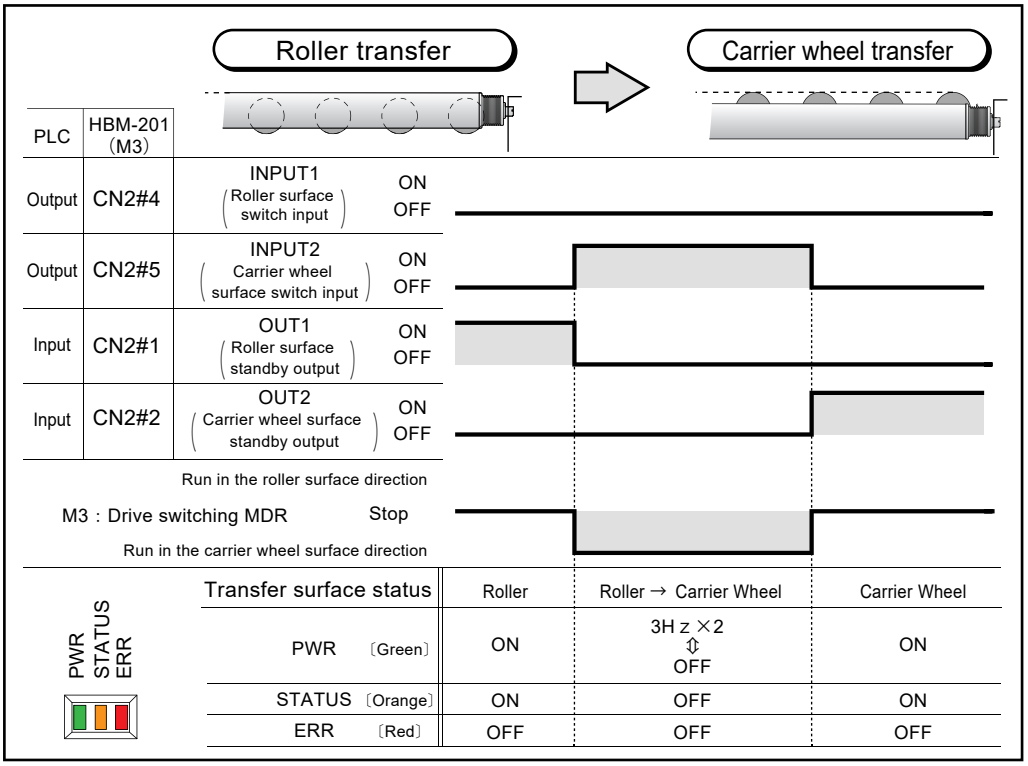
The transfer surface can be switched by inputting the signal to CN2#4 and CN2#5.

■ After the initial position setting (teaching) of the transfer surface, the roller surface is put on standby. To put the carrier wheel surface on standby (use it for reception), the transfer surface needs to be changed using the signal input.
Refer to 8-5. About the initial position setting (teaching) of the transfer surface (P.49)

Roller transfer → Carrier wheel transfer

Refer to CN2

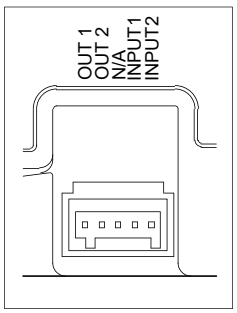


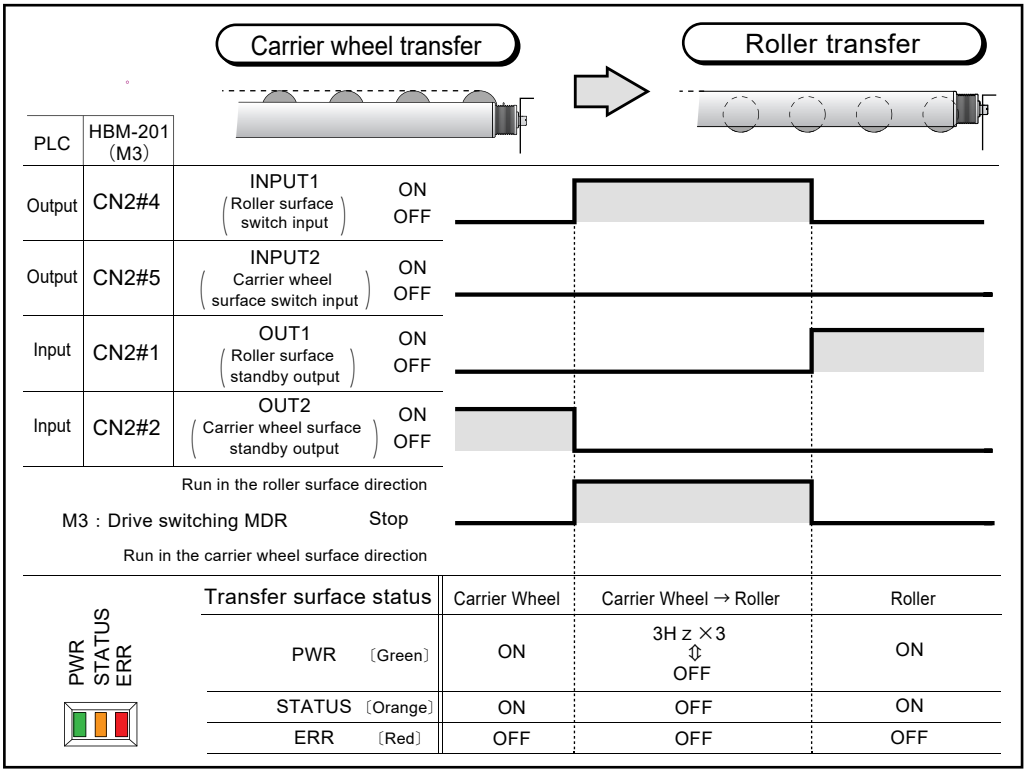


PWR STATUS ERR	Transfer surface status	Roller	Roller → Carrier Wheel	Carrier Wheel
	PWR 〔Green〕	ON	3Hz×2 ⇕ OFF	ON
	STATUS 〔Orange〕	ON	OFF	ON
	ERR 〔Red〕	OFF	OFF	OFF

Carrier wheel transfer→ Roller transfer

Refer to CN2





PWR STATUS ERR	Transfer surface status	Carrier Wheel	Carrier Wheel → Roller	Roller
	PWR 〔Green〕	ON	3Hz×3 ⇕ OFF	ON
	STATUS 〔Orange〕	ON	OFF	ON
	ERR 〔Red〕	OFF	OFF	OFF

■ If the signal input stops when the transfer surface is being switched, operation will be interrupted, and the signal output from both CN2#1 and #2 will stop. When inputting the signal again, operation restarts.

8. Control/Operation

8-5. About the initial position setting (teaching) of the transfer surface

〔M3:HBM-201〕

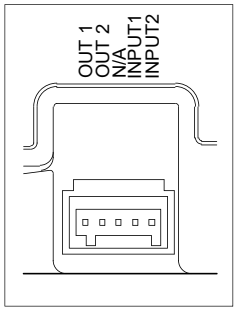
About the initial position setting (teaching) of the transfer surface

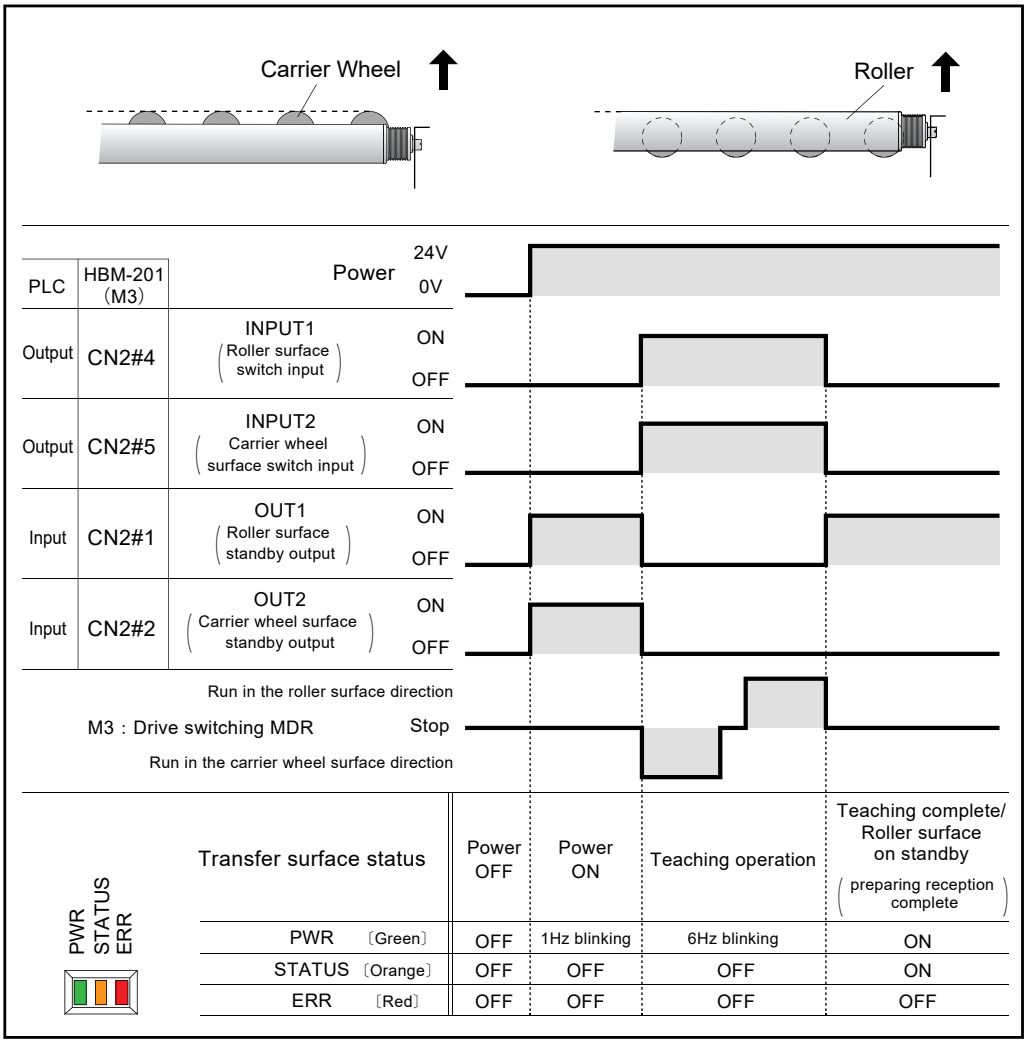
The initial position setting (teaching) of the transfer surface is necessary to set the transfer surface after the power is turned on.

- If teaching has not been set, the transfer surface cannot be switched.
- When teaching fails, both CN2#1(OUT1)(roller surface status output) and CN2#2(OUT2)(carrier wheel status output) are turned ON, which is the same status as when the power is turned on.
  In such case, check that no foreign object is blocking the lifting mechanism, and perform teaching operation again.

Teaching operation

Refer to CN2





PWR STATUS ERR

Transfer surface status	Power OFF	Power ON	Teaching operation	Teaching complete/ Roller surface on standby (preparing reception complete)
PWR 〔Green〕	OFF	1Hz blinking	6Hz blinking	ON
STATUS 〔Orange〕	OFF	OFF	OFF	ON
ERR 〔Red〕	OFF	OFF	OFF	OFF

Term

Teaching

Operation to perform the initial setting of the transfer surface position.
After the power is turned on, perform teaching by inputting signal from the driver card.

8. Control/Operation

8-6. Program example

Operation by loading through roller transfer and discharging through carrier wheel transfer

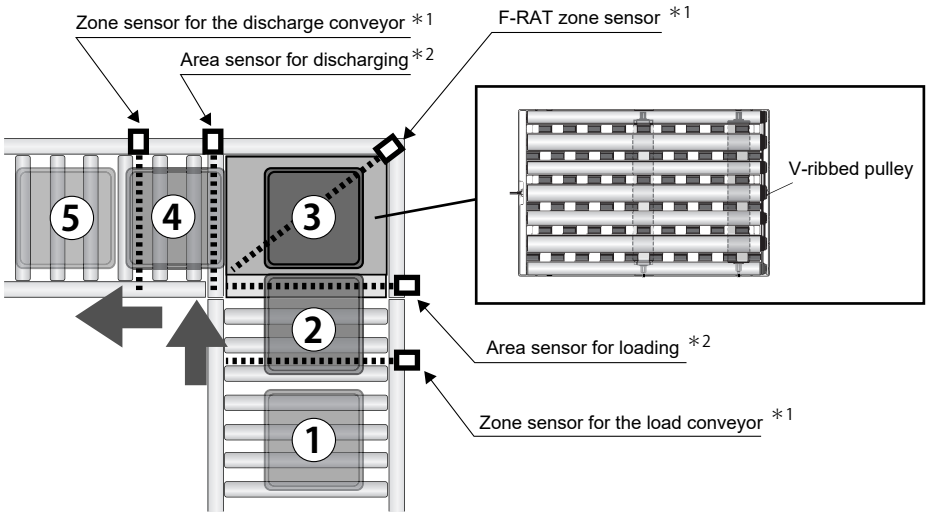
Program example

■ Do not load trays from the roller transfer MDR direction while the carrier wheel status (signal from CN2#2 on HBM-201) is output.
Failure to follow this could result in damage to trays, and malfunction.

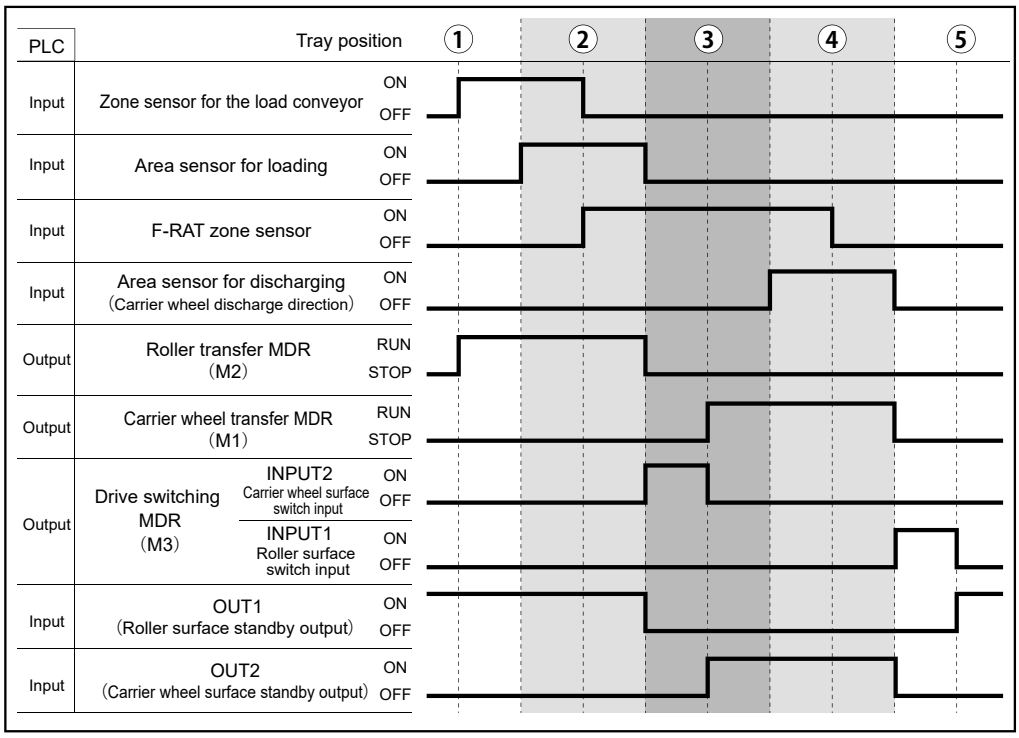
The following time chart is an example.
When in use, control the number of sensors, and/or determine how to place/control sensors depending on your operation.

Basic operation (example)

When loading through roller transfer, discharging through carrier wheel transfer, and standing ready on the roller surface after discharge ends



Time chart example



It is assumed that switches on CBK-109 and CB-016 are used based on the initial settings.

Term

＊1 Zone sensor
A sensor to detect the existence of trays within the zone

＊2 Area sensor
A sensor to detect load and discharge of trays

8. Control/Operation

8-7. What to do before operation

Start-up inspection

To prevent accidents and/or damage to devices during operation, refer to the below before operation, and check the safety.

Items to check before turning on the power

Turn off the power of all connected devices, and perform the following inspection, taking necessary measures.

- Turn off the power, wait a sufficient amount of time, and discharge electricity inside the DC power supply equipment.
- Post warning labels so as to prevent unauthorized persons from turning on the power.

Parts to be inspected	Inspection items	Description of measures
Secured positions of the F-RAT main unit	Screw looseness	Re-tighten screws
Driver card	Damage, deformation	Contact the supplier
	Screw looseness on secured positions	Re-tighten screws
	Mounting failure for driver cards and connectors	Correctly mount connectors
	Damage to cables/Wiring failure	Perform wiring correctly
Idler for roller transfer	External abnormalities, such as scratches or breakage	Refer to P.57 9-2. Before replacement work
Roller transfer MDR	External abnormalities, such as scratches, dents, or breakage	
Roller drive belt for roller transfer	Cracks, looseness, wear on the surface	
Carrier wheel	Cracks, wear on the surface	
Others	Parts deformation, damage	Contact the supplier
	Cable damage	

Items to check after turning on the power

Manually input the signal to driver cards according to inspection contents.

- Perform inspection after completing measures to prevent fingers from getting stuck and/or caught in rollers during trasnfer switching, and/or transfer operation.
- Take safety measures, such as getting ready to shut off the power in the event that something should happen.

Parts to be inspected	Inspection items	Description of measures
Driver card	Abnormal temperature rise	Contact the supplier
	Error check with LED display ＜Normal LED display after the power is turned on＞ Judged as errors if the LED display is other than that below. CBK-109 / CB-016 / HBM-201 } PWR（Green） ON, ERR （Red） OFF	Check error contents, and eliminate the causes. ＊For driver card LED display and error countermeasures, refer to 9-1. Driver card LED display and error countermeasures (P.54).
Idler for roller transfer	Abnormal sound	Refer to P.57 9-2. Before replacement work
	Rotation failure	
Roller transfer MDR	Abnormal sound	
	Decrease from the specified speed	
	Abnormal temperature rise	
Carrier wheel transfer MDR	Abnormal sound	Contact the supplier
	Decrease from the specified speed	
	Abnormal temperature rise（Check ERR LED on driver cards）	
Drive switching MDR	Abnormal sound	
	Abnormal temperature rise（Check ERR LED on driver cards）	
Others	Leakage from equipment	Check grounding on equipment, perform grounding

8. Control/Operation

Trial run

Items to check before the trial run

Check below before the trial run.

- When the roller transfer MDR and/or idlers have been replaced, check that the drive belts have been mounted in the correct groove positions.
- Check all parts are installed.

Performing the trial run

When the start-up inspection has finished, perform the trial run with careful attention to the following points, and check that operation is correctly performed.

■ Prevent other devices around the product from operating.
Other devices incorporated in the system, such as conveyor lines, could create dangerous situations, since trays may start to flow from upstream when the trial run is driven.
Check carefully that other elements in the system will not operate when the product starts running.

■ Make sure to check that wiring, driver card settings, and PLC settings have been carried out correctly before the trial run.

■ During operation, the transfer speed may not reach the specified value depending on ambient temperature.
When the carrier wheel cassette has been replaced, perform running operation thoroughly to eliminate any bends from belts.

9. Maintenance/Inspection

9. Maintenance/Inspection

9-1. Driver card LED display and error countermeasures

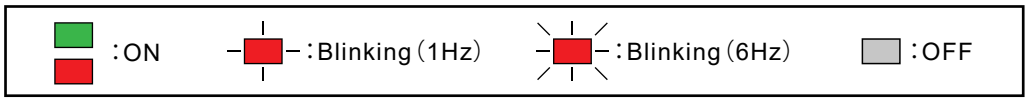
If errors occur with this product, identify the cause of errors, and perform recovery work.

Checking the driver card status

Identify the cause of errors by checking LEDs and error signal output on driver cards, and restore the product.

〔CBK-109〕
For carrier wheel transfer

LED display explanation

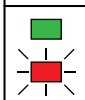


Errors can be checked by PWR (Green), ERR (Red), and signals from CN2#4.

- When error signals have been released by CN2#1 (RUN / STOP), the F-RAT instantly starts up when RUN is input.
- When the power supply voltage becomes insufficient, operation may be disabled, or an unexpected operation may occur.
- To restart the F-RAT, switch the ON → OFF → ON / OFF → ON → OFF / RUN → STOP → RUN signals at intervals of 100 ms or more.

Error details

Ⓜ :Manual recovery setting (SW1#1 ON) / Ⓐ :Automatic recovery setting (SW1#1 OFF <factory setting>)

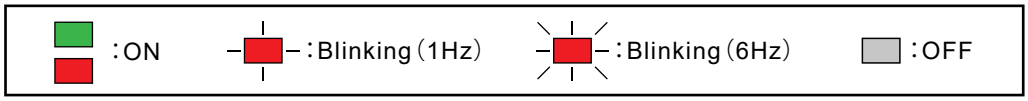
PWR (Green) / ERR (Red)	CN2#4 (Error signal) SW1#4 OFF	CN2#4 (Error signal) SW1#4 ON	Causes	How to release error signals		Recovery operation
	Output	Open	(Normal operation)	—		
	Open	Open	No power supply	Supply 24V DC		Refer to P.34 7-3. Wiring
	Open	Output	Damage to driver cards	Turn off the power, and replace the driver card		Refer to P.32, 34 7-2. Installation 7-3. Wiring
	Open	Output	Thermal error Thermal protection has worked due to a temperature rise of driver cards or MDR	Ⓐ	When one minute has elapsed after decreasing to the recovery temperature, the error signal is released, and the unit starts up instantly	
					After decreasing to the recovery temperature, release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1	
					After decreasing to the recovery temperature, switch ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1
						The unit starts up within 1min
				Ⓜ	After decreasing to the recovery temperature, release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1	
					After decreasing to the recovery temperature, switch ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1
	Open	Output	Connector disconnected	Turn off the power, and connect the connector		Refer to P.34 7-3. Wiring
	Open	Output	MDR disconnection	Turn off the power, and replace the MDR		Refer to P.57 9-2. Before replacement work
	Open	Output	Lock error MDR has been locked, and 0.5sec have elapsed	When 4sec or more have elapsed after an error occurs, release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1		
				When 4sec or more have elapsed after an error occurs, switch ON→OFF→ON or OFF→ON→OFF on CN2#2		Start up the unit by RUN→STOP→RUN on CN2#1
	Open	Output	Low voltage error Power supply voltage has been 15V or less for 1sec, or decreases to 15V or less 5 times within 500ms	Ⓐ	Secure the power supply voltage of 18V or more	The unit starts up instantly
				Ⓜ	After securing the power supply voltage of 18V or more, release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1	
					After securing the power supply voltage of 18V or more, switch ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1
 Blinking twice ⇕ OFF (1.5 sec)	Open	Output	Back EMF error Voltage applied to the MDR has been 40V or more for 2sec, or has been 60V or more for 0.1sec ＊This error may occur when the MDR has rotated at speeds faster than the setting speed.	Ⓐ	Voltage applied to MDR has been 30V or less for 1sec	The unit starts up instantly
				Ⓜ	After voltage applied to MDR has been 30V or less for 1sec, release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1	
					After voltage applied to MDR has been 30V or less for 1sec, switch ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1
	Open	Output	A current of 7A or more flows in the MDR	No error signal		—

Errors will be also released when the power is OFF (for two seconds or more).

9. Maintenance/Inspection

〔CB-016〕
For roller transfer

LED display explanation



Errors can be checked by PWR (Green), ERR (Red), and signals from CN2#4.

- When error signals have been released by CN2#1 (RUN / STOP), the F-RAT instantly starts up when RUN is input.
- When the power supply voltage becomes insufficient, operation may be disabled, or an unexpected operation may occur.
- To restart the F-RAT, switch the ON → OFF → ON / OFF → ON → OFF / RUN → STOP → RUN signals at intervals of 100 ms or more.

Error details

Ⓜ :Manual recovery setting (SW1#1 ON) / Ⓐ :Automatic recovery setting (SW1#1 OFF <factory setting>)

PWR (Green) ERR (Red)	CN2#4 (Error signal) SW1#4 OFF	CN2#4 (Error signal) SW1#4 ON	Causes	How to release error signals		Recovery operation
	Output	Open	(Normal operation)	—		
	Open	Open	No power supply	Supply 24V DC		Refer to P.34 7-3. Wiring
	Open	Output	Damage to driver cards	Turn off the power, and replace the driver card		Refer to P.32, 34 7-2. Installation 7-3. Wiring
	Open	Output	Thermal error Thermal protection has worked due to a temperature rise of driver cards or MDR	Ⓐ	When one minute has elapsed after decreasing to the recovery temperature, the error signal is released, and the unit starts up instantly	
					After decreasing to the recovery temperature, release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1	
					After decreasing to the recovery temperature, switch ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1
						The unit starts up within 1min
				Ⓜ	After decreasing to the recovery temperature, release the error signal, and start up the unit RUN→STOP→RUN on CN2#1	
					After decreasing to the recovery temperature, switch ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1
	Open	Output	Connector disconnected	Turn off the power, and connect the connector		Refer to P.34 7-3. Wiring
	Open	Output	MDR disconnection	Turn off the power, and replace the MDR		Refer to P.57 9-2. Before replacement work
	Open	Output	Lock error MDR has been locked, and 4sec have elapsed	Release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1		
				Switch ON→OFF→ON or OFF→ON→OFF on CN2#2		Start up the unit by RUN→STOP→RUN on CN2#1
	Open	Output	Low voltage error Power supply voltage is 15 V or less	Ⓐ	Secure the power supply voltage of 18V or more	The unit starts up instantly
				Ⓜ	After securing the power supply voltage of 18V or more, release the error signal, and start up the unit by RUN→STOP→RUN on CN2#1	
					After securing the power supply voltage of 18V or more, switch ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1

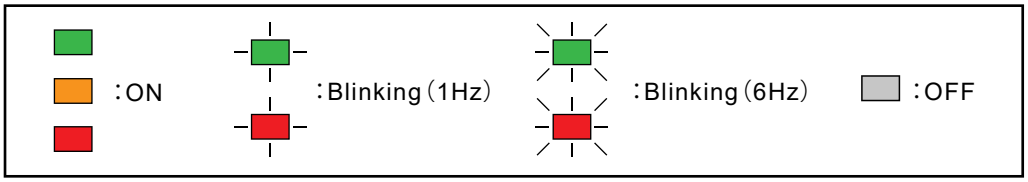
Errors will be also released when the power is OFF (for two seconds or more).

9. Maintenance/Inspection

〔HBM-201〕
For switching the transfer surface

Even if inputting the signal to CN2#4 and #5, but the signal output from CN2#1 and #2 does not change, the following errors have been assumed to occur. Errors can be distinguished by the LED display.

LED display explanation



LED details (information LED)

PWR (green)	ERR (Red)	Description	Causes	Recovery conditions	Recovery operation
■	□	Stop (signals not input)	(Normal operation)	–	
3Hz blinking×3 ⇕ OFF for 480ms	□	When the transfer surface is lifting			
3Hz blinking×2 ⇕ OFF for 480ms	□	When the transfer surface is lifted			
✳	□	During teaching operation			
✳	□	No teaching setting	Teaching setting incomplete	Teaching setting complete	Refer to P.49 8-5. About the initial position setting (teaching) of the transfer surface
✳	■	Thermal error	Driver card temperature is 85°C or more, or MDR temperature is 110°C or more	Driver card temperature is 75°C or less, and MDR temperature is 95°C or less	Take one of among the following measures: ■ Turn CN2#4 (INPUT1) OFF and ON ■ Turn CN2#5 (INPUT2) OFF and ON ■ Turn CN2#4 (INPUT1) and CN2#5 (INPUT2) OFF and ON
✳	■	MDR disconnected	MDR connectors removed	Connect the MDR connectors	
✳	✳	Lock error	MDR has been locked when switching the transfer surface	Eliminate the cause of lock	
□	✳	Low voltage error	The voltage has been 17 V or less for 1sec, or the power connector is connected improperly	Supply a voltage of 17 V or more, or properly connect the power connector again	
□	✳	Fuse blown	Driver card fuse blown	Replace the driver card	Refer to P.32, 34 7-2. Installation 7-3. Wiring

STATUS (Orange) details

STATUS (Orange)	Description
□	No teaching setting/During teaching operation/When the transfer surface is being switched
■	Horizontal surface standby/Tilted surface standby

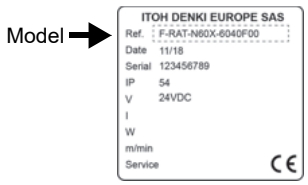
9. Maintenance/Inspection

9-2. Before replacement work

If any abnormalities, such as damaged parts, are found, immediately take actions, including replacement with new parts.

- Check the model of this product, and prepare parts to be replaced with in advance.
- Contact us for repair/replacement of parts other than those mentioned below.

Product label



Replacement parts list

Carrier wheel cassette

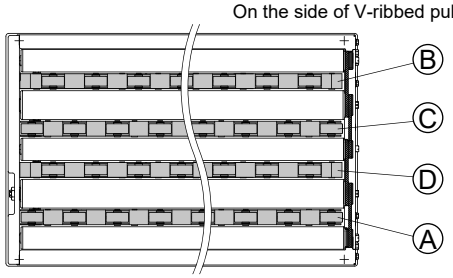
Part number：NX75-CC□□○

□□：60 / 75 / 90
Indicates size (L direction) for the model of this product.
Example) F-RAT-N60X-7540F00

○：A / B / C / D
Indicates type of the cassette.

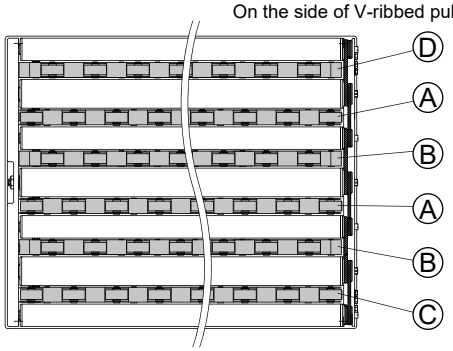
Size □□ 40 type

On the side of V-ribbed pulley



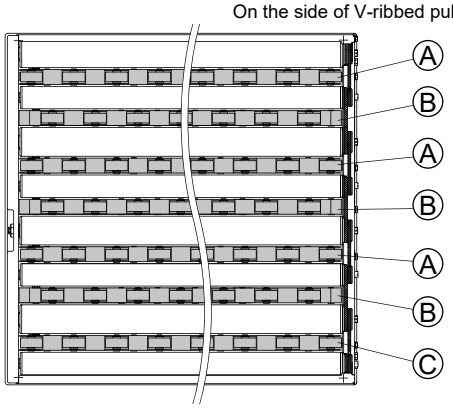
Size □□ 50 type

On the side of V-ribbed pulley



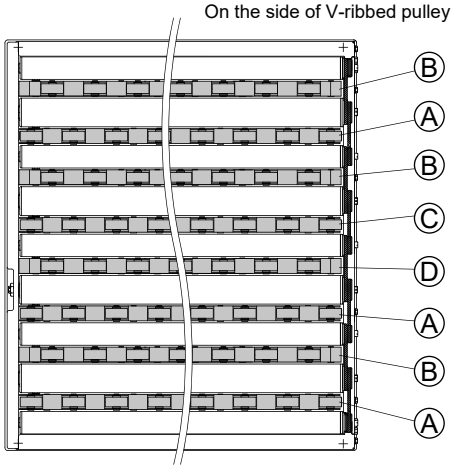
Size □□ 60 type

On the side of V-ribbed pulley



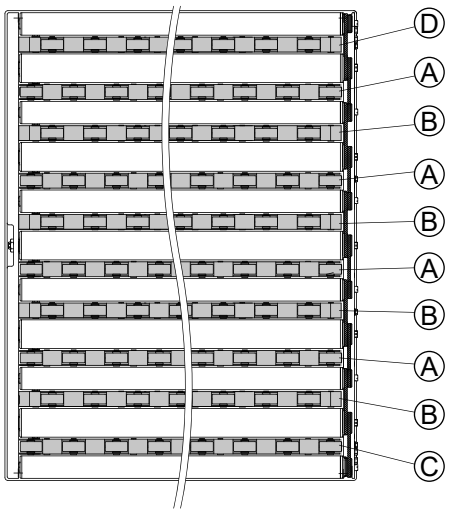
Size □□ 70 type

On the side of V-ribbed pulley



Size □□ 80 type

On the side of V-ribbed pulley



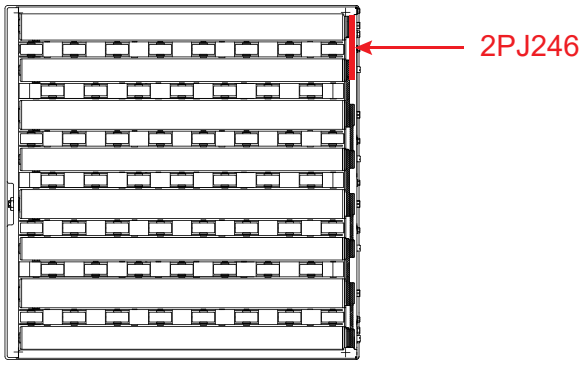
Example) Carrier wheel cassette Type Ⓑ for F-RAT-N60X- 7540F00 : NX75-CC-7 5 Ⓑ

9. Maintenance/Inspection

Parts name	Length L for all size (40→80)	Width	Speed / Ø	Itoh Denki reference
MDR for roller transfer	60XX	All width	60m/min	PM486FE0600542XRNT N000
	75XX	All width	60m/min	PM486FE0600692XRNT N000
	90XX	All width	60m/min	PM486FE0600842XRNT N000
Idler roller for roller transfer	60XX	All width	Ø38	FR380IDZDS0542XRN0 N000
			Ø48,6	FR486IDZHS0542XRN0 N000
	75XX	All width	Ø38	FR380IDZDS0692XRN0 N000
			Ø48,6	FR486IDZHS0692XRN0 N000
	90XX	All width	Ø38	FR380IDZDS0842XRN0 N000
			Ø48,6	FR486IDZHS0842XRN0 N000*
V-ribbed belt	Only for linking Ø38 idler in size XX60			2PJ246
	For the others			2PJ265
Driver card for CB type	For MDR for carrier wheel transfer			CBK-109FP
	For MDR for roller transfer			CB016BP-7
	For MDR for drive switching			HBM-201BP
Driver card for IB type	For MDR for carrier wheel transfer & roller transfer			IB-P02F-P-FT (or IB-E04F-P-FT)
	For MDR for drive switching			HBM-201BP

* for F-RAT Size 9070 and 9080 version F00 and F01 used this free roller reference for Ø48.6

F-RAT-N60X-xxxx	2PJ246	2PJ265
60/75/9040	-	4
60/75/9050	-	6
60/75/9060	1	6
60/75/7570	-	8
60/75/7580	-	10



9. Maintenance/Inspection

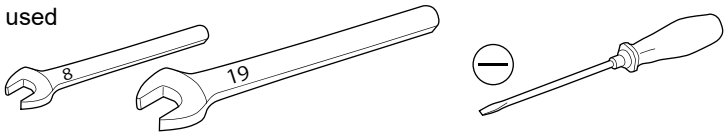
9-3. Replacement of roller transfer MDR/idlers /roller drive belts

If any abnormalities are found in one of the roller transfer MDR, idlers, and/or roller drive belts, replace them according to the following methods.

Before replacement

1 Before replacement, prepare necessary tools.

Tools to be used



8 mm/19 mm wrench　　Slotted screwdriver

2 Turn off the power of all connecting devices.

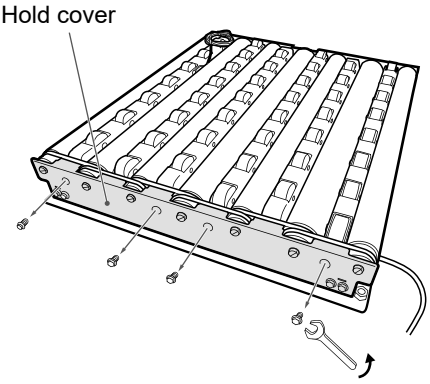
> ■ Shut off the power switch, leave for three minutes or more, and discharge electricity inside the DC power supply equipment.
> ■ Wear protective equipment, such as gloves.

Replacement procedures

Removing roller transfer MDR/idlers/roller drive belts

Remove the hold cover

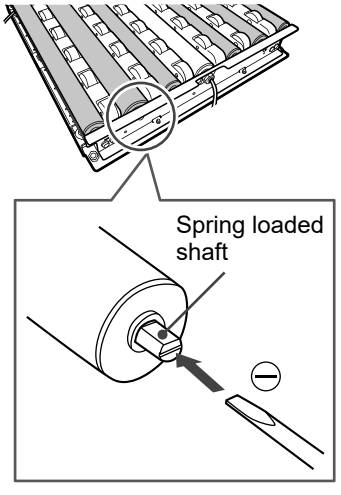
1 Remove the screws at the four positions, and remove the hold cover from the F-RAT main unit.



Remove idlers

Remove idlers in order, from the edge of the module, to the position where the roller transfer MDR, idler, or roller drive belt to be replaced can be removed.

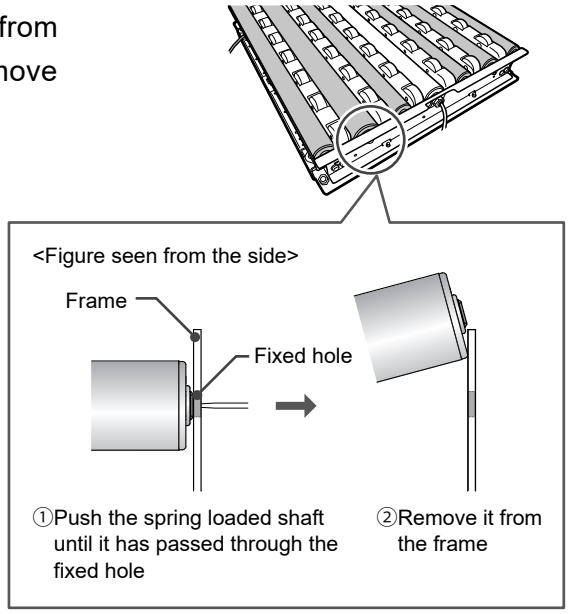
1 Push deeper the spring loaded shaft of the idler using the tip of a slotted screwdriver, etc.



9. Maintenance/Inspection

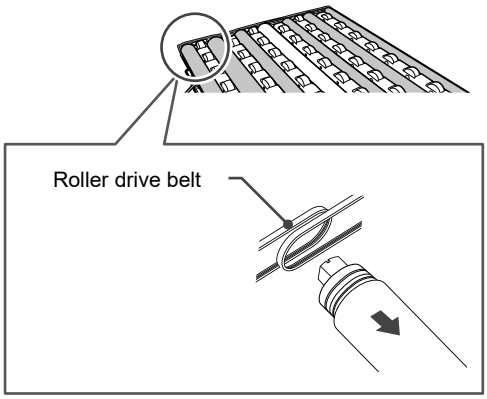
Replacement procedures

2 Slide the spring loaded shaft from the fixed hole (①), and remove the idler from the frame (②)



3 Remove the roller drive belt, and remove the idler

■The roller drive belt can be removed easily by pulling it while turning the idler.

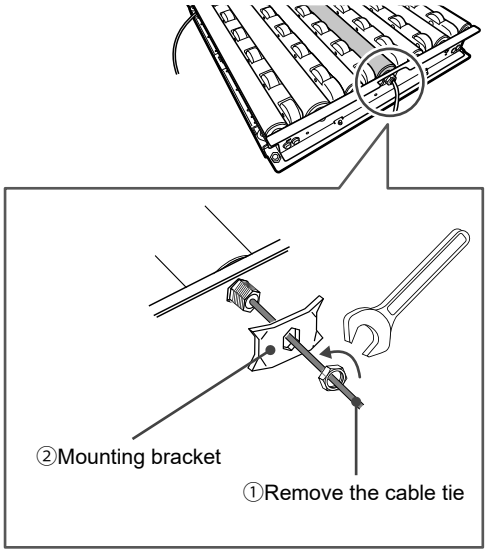


Remove other idlers in the same procedures.

Remove the roller transfer MDR

1 Remove the cable tie securing the power cable (①), and remove the mounting bracket from the power cable (②)

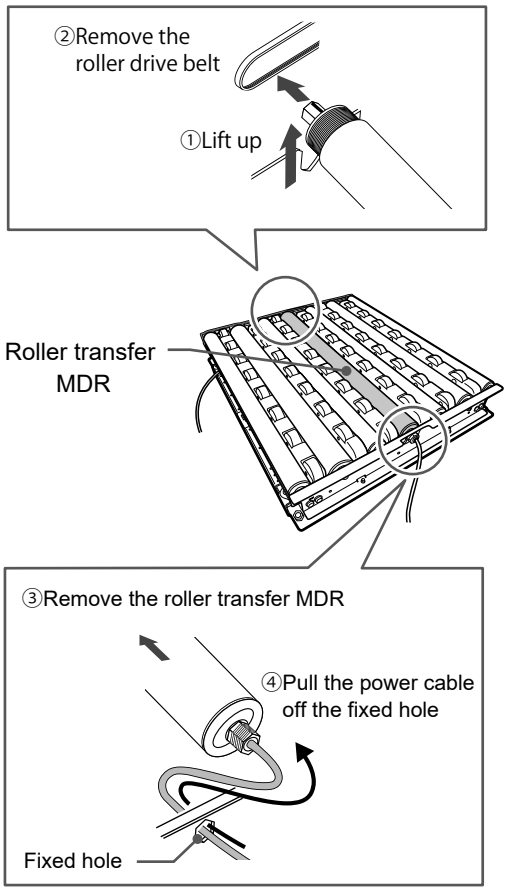
■When removing the mounting bracket, be careful not to damage the cable.



9. Maintenance/Inspection

Replacement procedures

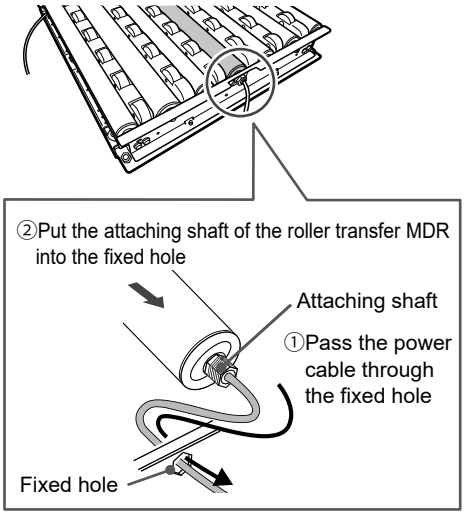
2 Lift up the tip of the roller transfer MDR（①）, and remove the roller drive belt.（②）Remove the roller transfer MDR（③）, and pull the power cable off the fixed hole on the frame（④）



Mounting roller transfer MDR/idlers/roller drive belts

Mount the roller transfer MDR

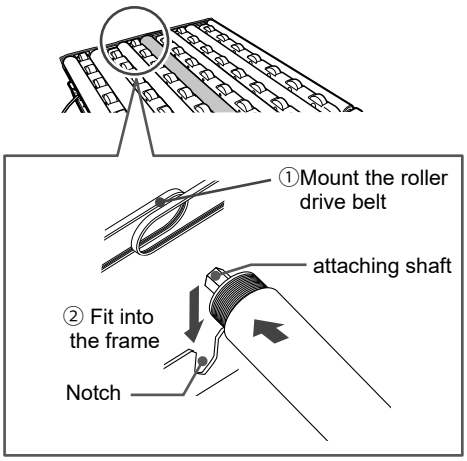
1 Pass the roller transfer MDR power cable through the fixed hole on the frame（①）, and put the attaching shaft into the hole（②）



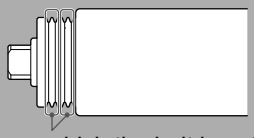
9. Maintenance/Inspection

Replacement procedures

2 Mount the roller drive belt on the V-ribbed pulley of the roller transfer MDR（①）, align the tip of the attaching shaft with the notch shape, and fit it into the frame（②）

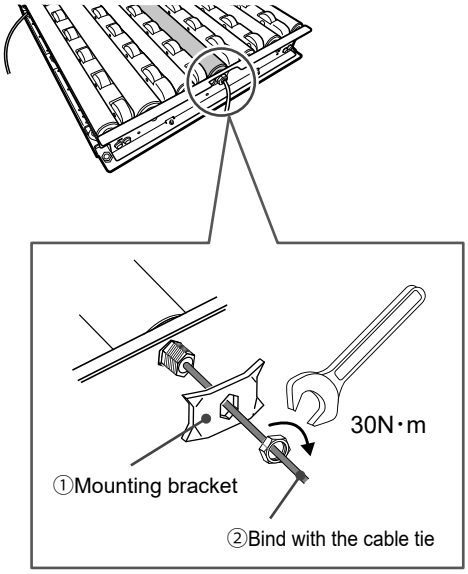


■For the mounting groove position for drive belts, refer to the figure below.



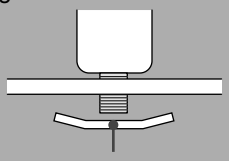
Groove over which the belt is put

3 Fix the mounting bracket（①）, and bind the power cable with the cable tie（②）



■When fixing the mounting bracket, be careful not to damage to the cable.
■Attach the mounting bracket in the direction shown below.

<Figure seen from the side>



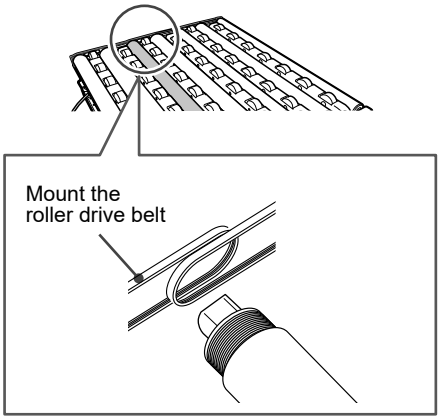
Mounting bracket

■The tightening torque of 30N·m is recommended.

Mount the idler

1 Mount the roller drive belt on the V-ribbed pulley on the idler

■The mounting position of the roller drive belt is the same as that for the roller transfer MDR.

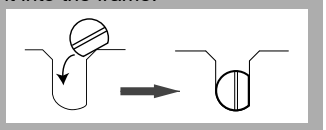


9. Maintenance/Inspection

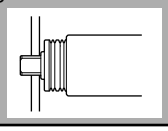
Replacement procedures

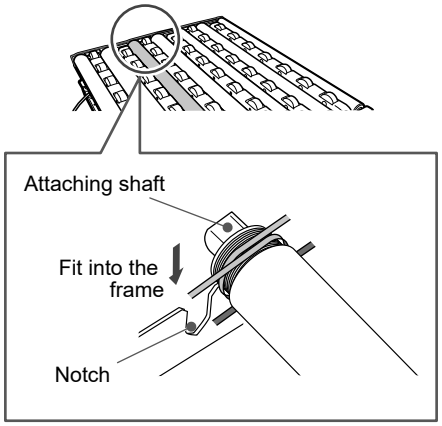
2 Align the tip of the attaching shaft on the side of the belt on the V-ribbed pulley, where the roller drive belt has been mounted, with the notch shape on the frame, and fit it into the frame

■Press the D-shaped cut surface of the axis onto the plate, and fit it into the frame.



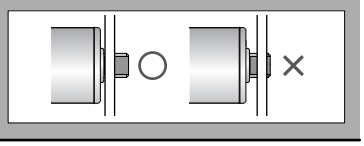
■Check that the attaching shaft has come out of the external side of the frame, as shown in the figure below.

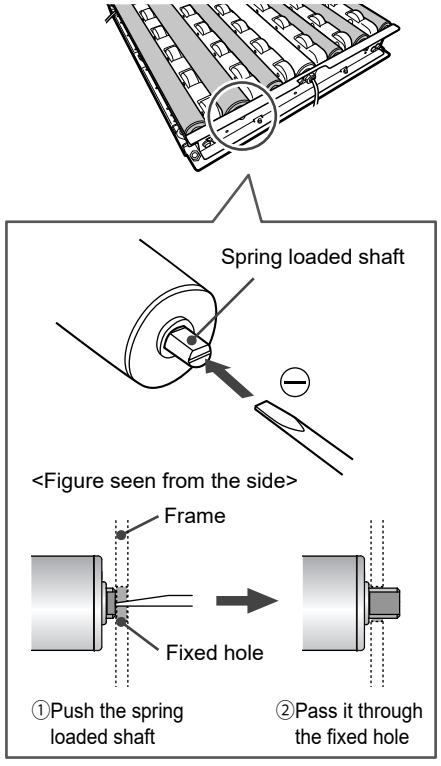




3 Push the spring loaded shaft of the idler by the tip of a slotted screwdriver, etc.（①）, and pass it through the fixed hole（②）

■Check that the spring loaded shaft has sufficiently come out of the external side of the frame, as shown in the figure below.

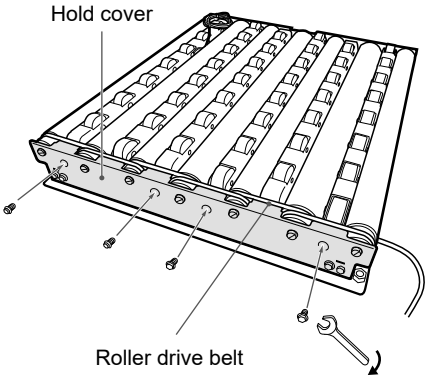




Mount the hold cover

1 Mount the hold cover in the reverse of the procedures on page 59, “Remove the hold cover“.

■Make sure to mount the hold cover so that the roller drive belt can be seen.



9. Maintenance/Inspection

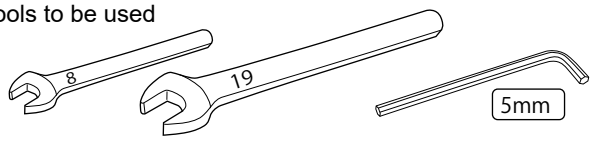
9-4. Replacement of the carrier wheel cassette

If any abnormalities are found in the carrier wheels, replace the whole carrier wheel cassette.

Before replacement

1 Before replacement, prepare necessary tools.

Tools to be used



8 mm/19 mm wrench | 5 mm hex. wrench | Slotted screwdriver

2 Turn off the power of all connecting devices.

- Shut off the power switch, leave for three minutes or more, and discharge electricity inside the DC power supply equipment.
- Wear protective equipment, such as gloves.

Replacement procedure

Removing roller transfer MDR/idlers/roller drive belts

Remove the idlers in order, from the edge of the module to the position where the carrier wheel cassette to be replaced can be removed.

Refer to P.59

9-3. Replacement of roller transfer MDR/idlers/roller drive belts

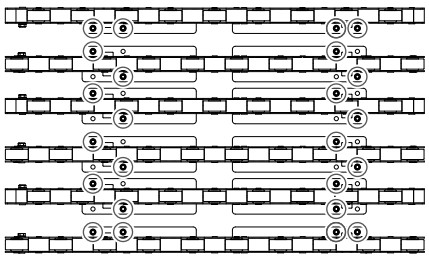
Removing roller transfer MDR/idlers/roller drive belts

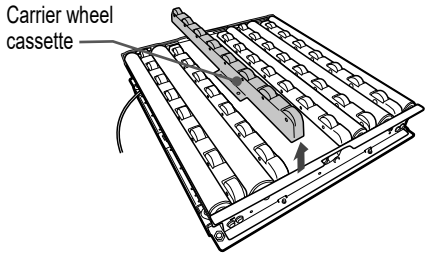
Remove the carrier wheel cassette

1 Remove hex. bolts at four positions circled on the carrier wheel cassette to be replaced, and lift up the cassette.

- When removing hex. bolts, be careful not to drop them and/or the hex. wrench on the lower part of the F-RAT.

Example) For size 7550





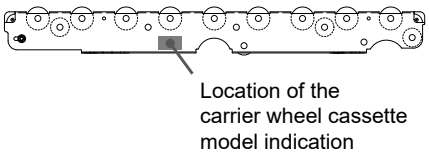
9. Maintenance/Inspection

Replacement procedures

Mounting the carrier wheel cassette on the F-RAT main unit

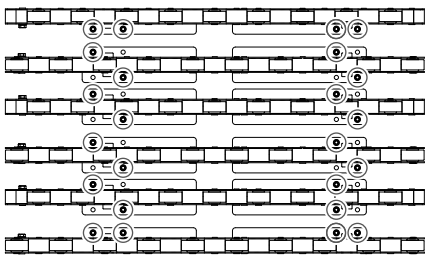
1 Check the model of the removed carrier wheel cassette and replacement carrier wheel cassette.

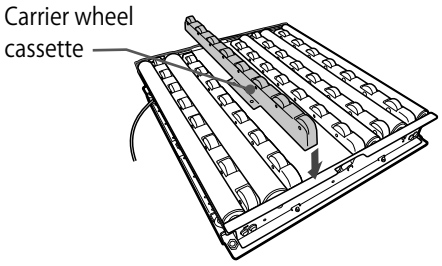
Indication example)
NX-75CC 75A
This part of the carrier wheel cassette is indicated on the product.



2 Mount the replacement carrier wheel cassette with hex. bolts at four positions circled in the figure, and secure it.

■The tightening torque of 11 N·m is recommended. Excessive tightening may result in damage to hex. bolts.





Mounting roller transfer MDR/idlers/roller drive belts

Mount the roller transfer MDR, idlers, and/or roller drive belt that have been removed.

Refer to P.61

9-3.
Replacement of roller transfer MDR/idlers/roller drive belts

Mounting roller transfer MDR/idlers/roller drive belts

10. Troubleshooting

10. Troubleshooting

If you believe the product may be malfunctioning, check the contents described in this section before contacting the supplier and/or asking for repair.

Symptoms

F-RAT does not operate

Items to be checked	Countermeasures	References
Is PWR LED (Green) for each driver card ON? Or, has 24 VDC been supplied in the power connector part of driver cards?	Supply 24V DC.	7. Installation/ Wiring (⇒P.23)
Is ERR LED (Red) for each driver card blinking, or is it ON and is there an error output?	Remove the cause of error, and release the error.	9. Maintenance/ inspection (⇒P.53)
Has each connector been connected correctly? Has wiring been performed properly?	Check wiring, and perform wiring properly if it has not already been done so.	7. Installation/ Wiring (⇒P.23)
Has each driver card type * (NPN input/output / PNP input/output) matched the input and output signals (NPN input/output / PNP input/output) on PLCs? ＊Check the model of driver cards.	Match each driver card type (NPN input/output / PNP input/output) with the input and output signals on PLCs (NPN input/output / PNP input/output).	7. Installation/ Wiring (⇒P.23)
Has the same voltage to be input as the power supply voltage been used?	Use the same voltage to be input as the power supply voltage.	7. Installation/ Wiring (⇒P.23)

The transfer surface cannot be switched, or transfer surface switching operation is incorrect

Items to be checked	Countermeasures	References
Has the initial setting (teaching setting) been performed?	Perform the initial setting (teaching setting).	Initial setting (Teaching setting) (⇒P.49)
Is ERR LED (Red) on the driver card for M3: drive switching blinking, or is it ON and is there an error output?	Remove the cause of error, and release the error.	9. Maintenance/ inspection (⇒P.53)
Has the RUN signal input to the driver card for M3: drive switching corresponded to the transfer surface? Also, is the input timing correct?	Check the signal input and input timing when the transfer surface is switched.	8. Control/ Operation (⇒P.39)
Has the setting of the driver card for M3: drive switching not been changed?	Check the setting of the driver card for M3: drive switching switch.	8. Control/ Operation (⇒P.39)

10. Troubleshooting

Symptoms

When loading, trays get stuck, or cannot be transferred

Items to be checked	Countermeasures	References
Is the load conveyor level the same as the level of the F-RAT?	Align levels of the load conveyor and the F-RAT.	7. Installation/ Wiring (⇒P.23)
When loading by carrier wheels, have they been set on the top of the surface? When loading by rollers, have they been set on the top of the surface?	Set either carrier wheels or rollers on the top of the surface according to the loading direction.	8. Control/ Operation (⇒P.39)
When loading by carrier wheels, have you run the carrier wheel MDR (M1)? When loading by rollers, have you run the roller MDR (M2)? Also, have you run the MDR until loading ends?	Run either carrier wheel MDR (M1) or roller MDR (M2) according to the loading direction until transfer ends.	8. Control/ Operation (⇒P.39)
When loading by carrier wheels, are there any carrier wheels rotating slower than others?	Replace the carrier wheel cassette including the slow rotating wheels.	9. Maintenance/ inspection (⇒P.53)
Has the transfer drive switching MDR (M3) not run at the time of loading?	Do not run the drive switching MDR (M3) until transfer ends.	8. Control/ Operation (⇒P.39)

When discharging, trays get stuck, or cannot be transferred

Items to be checked	Countermeasures	References
Is the discharge conveyor level same as the level of the F-RAT?	Align levels of the discharge conveyor and the F-RAT.	7. Installation/ Wiring (⇒P.23)
When discharging by carrier wheels, have they been set on the top of the surface? When discharging by rollers, have they been set on the top of the surface?	Set either carrier wheels or rollers on the top of the surface according to the discharging direction.	8. Control/ Operation (⇒P.39)
When discharging by carrier wheels, have you run the carrier wheel MDR (M1)? When discharging by rollers, have you run the roller MDR (M2)? Also, have you run the MDR until discharging ends?	Run either carrier wheel MDR (M1) or roller MDR (M2) according to the discharging direction until discharging ends.	8. Control/ Operation (⇒P.39)
When discharging by carrier wheels, are there any carrier wheels rotating slower than others?	Replace the carrier wheel cassette including the slow rotating wheels.	9. Maintenance/ inspection (⇒P.53)
Has the transfer drive switching MDR (M3) not run at the time of discharging?	Do not run the drive switching MDR (M3) until discharging ends.	8. Control/ Operation (⇒P.39)

10. Troubleshooting

Symptoms

- The speed cannot be changed
- The speed setting is incorrect

Items to be checked	Countermeasures	References
To change the carrier wheel speed, have you operated the switch on the driver card for M1: carrier wheels [CBK-109]? To change the roller speed, have you operated the switch on the driver card for M2: rollers [CB-016]?	To change the carrier wheel speed, operate the switch on the driver card for M1: carrier wheels [CBK-109]. To change the roller speed, operate the switch on the driver card for M2: rollers [CB-016].	Changing the transfer speed (⇒P.46)
Have you changed the external speed by the voltage input to CN2#3 on CBK-109/CB-016? Have you changed the internal speed with the switch on CBK-109/CB-016?	Check the external and internal speed settings, and change the speed according to the settings.	Changing the transfer speed (⇒P.46)
When changing the speed by the external voltage, is the power supply 0 V of the external voltage common to 0 V on the driver card?	Use the common power supply 0V.	7. Installation/ Wiring (⇒P.23)

The transfer direction (rotating direction of carrier wheels/rollers) is incorrect

Items to be checked	Countermeasures	References
Is the transfer/diverting direction based on the rotating direction settings for the driver card for M1: carrier wheels/M2: rollers?	Set the correct transfer/diverting direction, and the correct the rotating direction for the driver card for M1: carrier wheels/ M2: rollers.	8. Control/ Operation (⇒P.39)

Appendix

Appendix

Appendix 1. Product specifications

F-RAT main unit specifications

Size **60**□□

		6040	6050	6060	6070	6080
F-RAT main unit	Total length (L) Carrier wheel transfer direction	595mm				
	Total width (W) Roller transfer direction	395mm	495mm	595mm	695mm	795mm
	Weight	32kg	38kg	44kg	52kg	60kg
Maximum load weight		50kg				

Size **75**□□

		7540	7550	7560	7570	7580
F-RAT main unit	Total length (L) Carrier wheel transfer direction	745mm				
	Total width (W) Roller transfer direction	395mm	495mm	595mm	695mm	795mm
	Weight	42kg	48kg	54kg	63kg	71kg
Maximum load weight		50kg				

Size **90**□□

		9040	9050	9060
F-RAT main unit	Total length (L) Carrier wheel transfer direction	895mm		
	Total width (W) Roller transfer direction	395mm	495mm	595mm
	Weight	52kg	58kg	64kg
Maximum load weight		50kg		

∗ Values of the maximum load weight are reference only since they may change depending on tray conditions.
Depending on the bottom shape of trays, they may not be transferred normally, even if they are within the above size range.

Common

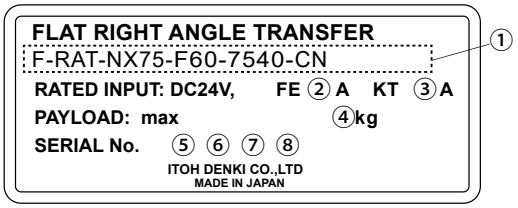
Speed	Carrier wheel	61.6 m/min（PM570KT-55 type）
	Roller	61.7 m/min（PM486FE-60 type）

∗ The above shows the transfer speed when trays are not placed on carrier wheels and rollers with SW1#5 ON / SW5: 9 specified on CBK-109 and CB-016.

■ During operation, the rising time to the setting speed may vary depending on ambient temperature. Perform running operation thoroughly.
■ Values described above may differ from the actual transfer speed depending on the weight, material, bottom surface, and/or shape of trays, as well as ambient temperature.

Installation environment	Ambient temperature	0 to 40ºC (no freezing)
	Ambient humidity	90%RH or less (no condensation)
	Altitude	1,000 m or less
	Atmosphere	No corrosive gas
	Vibration	0.5G or less
	Installation location	Indoor
	Mounting surface tilt (inclination)	0.5% or less
	Sound level	< 70dB
	Pollution degree	2 (according to the definition of IEC60640-1, UL840)

Product label



① Product model
② Rated current values for roller transfer MDR and drive switching MDR
③ Rated current values for carrier wheel transfer MDR
④ Maximum load weight

Serial No. (YY / MM / DD / Lot No.)
⑤ Year (last two digits) ⑥ Month ⑦ Day
⑧ Lot No. (three digits)

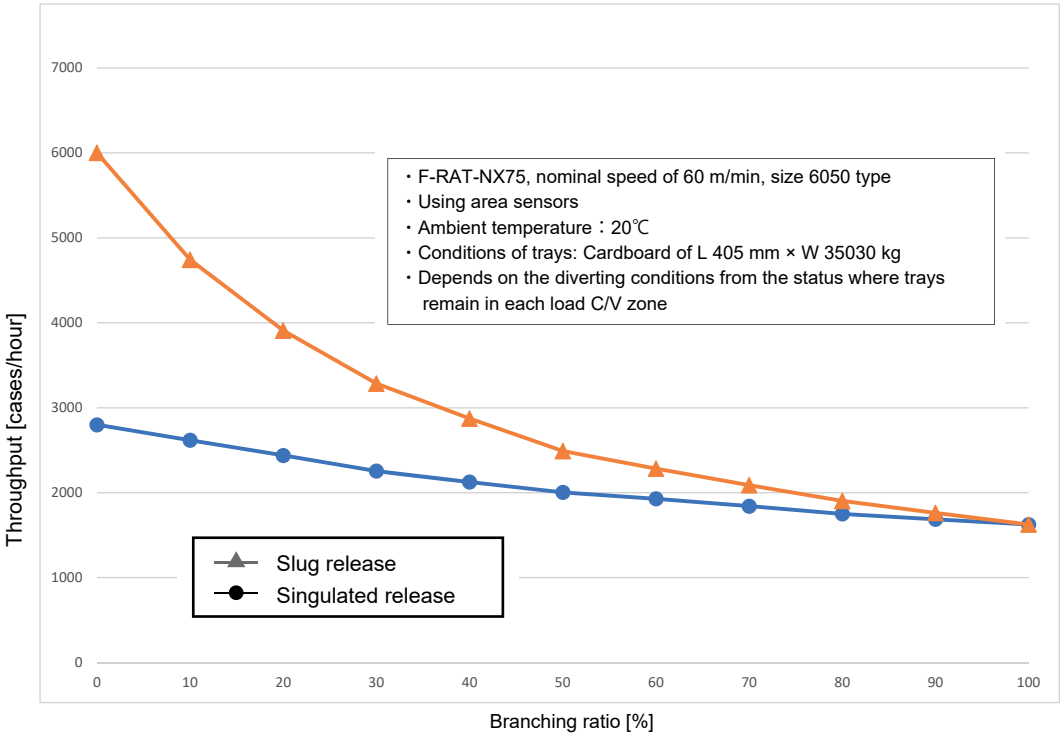
Appendix

Appendix 1. Product specifications

Driver card specifications

		For carrier wheel transfer	For roller transfer	For drive switching
Model		**CBK-109F□** (□=N：NPN, P：PNP)	**CB-016B□7** (□=N：NPN, P：PNP)	**HBM-201B□** (□=N：NPN, P：PNP)
Power supply voltage		24V DC±10%		
Rated voltage		24V DC		
Static current		0.06A	0.03A	0.06A
Starting current		6.6A to 7.4A	4.0A	3.7A to 4.4A
Peak current		30A (1ms or less)	20A (1ms or less)	20A (1ms or less)
Wire diameter (Applicable wires to connectors included as standard)	Power connector (CN1)	0.80 to 1.5mm² (AWG：18 to 14)	0.50 to 1.5mm² (AWG：20 to 14)	0.50 to 1.5mm² (AWG：20 to 14)
	Control connector (CN2)	0.08 to 0.5mm² (AWG：28 to 20)		
Protection		Incorrect wiring protection Built-in 10 A fuse	Incorrect wiring protection Built-in 6.3 A fuse	Incorrect wiring protection Built-in 7 A fuse
Thermal protection		Driver card: 95ºC Motor: 105ºC	Driver card: 95ºC Motor: 105ºC	Driver card: 85ºC Motor: 110ºC
Current limitation		7.0A	4.0A	4.0A
Operating environment	Ambient temperature	0 to 40ºC (no freezing)		
	Ambient humidity	90%RH or less (no condensation)		
	Atmosphere	No corrosive gas		
	Vibration	0.5G or less		
	Installation location	Indoor		
Time from RUN signal input to motor starting		15 msec or less	15 msec or less	—

Transfer throughput



＊ Values on the graph are only references based on our measurement and are not guaranteed.
＊ The stopping distance of trays and throughput depends on the size, material, bottom status of trays, ambient temperature, and/or the speed.

Appendix

Appendix 2.

Options

■ Do not store carrier wheel cassettes in places subject to high temperature, high humidity, and/or direct sunlight. Failure to follow this could result in its lifetime to be significantly shortened.

Carrier wheel cassette

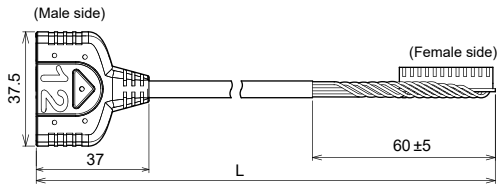
Length	Width	Speed / Ø	Itoh Denki reference
60XX	All width		NX75-CC60X (X: A, B, C or D)*
75XX	All width		NX75-CC75X (X: A, B, C or D)*
90XX	40, 50, 60**		NX75-CC90X (X: A, B, C or D)*

* Each alphabet (A, B, C or D) indicates the type of the cassette. Refer to page 57

Extension cable

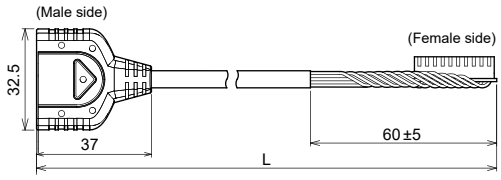
■ CBK-109：12P extension cable length

Model	12P extension cable length
ACE-CBM-G0600	L= 600mm
ACE-CBM-G1200	L=1200mm



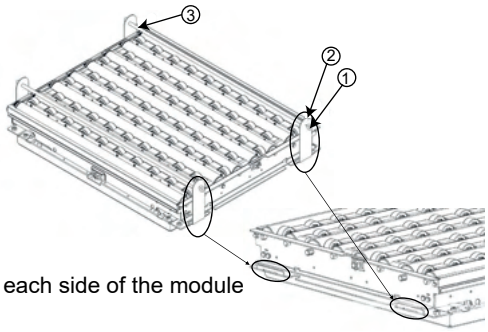
■ CB-016 ／ HBM-201：10P extension cable length

Model	10P extension cable length
ACE-CBM-A0600	L= 600mm
ACE-CBM-A1200	L=1200mm



Handling kit

	Size	Part reference
Handling kit for F-RAT NX75	60xx	NX75-IRT60
	75xx	NX75-IRT75
	90xx	NX75-IRT90



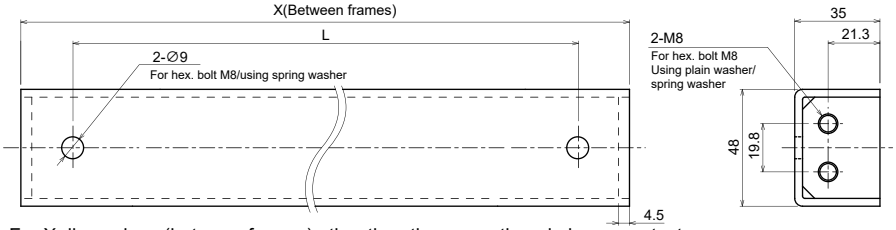
The kit is an composed of :
(1) 4 pcs of eye bolt
(2) 4 pcs of stays for pulling up
(3) 2 pcs of stays
Note that the plate is inserting inside the looms at each side of the module

Stay

(with hex. bolt/plain washer/ spring washer)

Size	Reference	L	X
6040 / 7540 / 9040	-NX75-SP-NX-40-400	370	400
6050 / 7550 / 9050	-NX75-SP-NX-50-500	470	500
6060 / 7560 / 9060	-NX75-SP-NX-60-600	570	600
6070 / 7570	-NX75-SP-NX-70-700	670	700
6080 / 7580	-NX75-SP-NX-80-800	770	800

(mm)



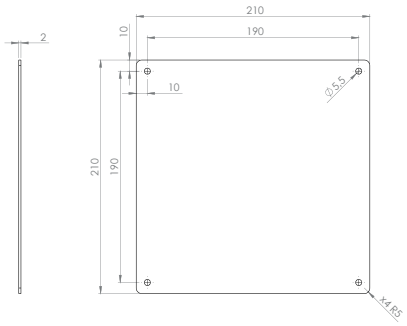
∗ For X dimensions (between frames) other than those mentioned above, contact us.

** For technical information about F-RAT-NX sizes 9070 & 9080 please consult the annex documentation F-RAT FS1 version

Frame cover

	Reference
F-RAT NX75	NX75-FRAME-COVER-0

Note that the plate not included bolt.
Recommended size is M5x8.



Appendix

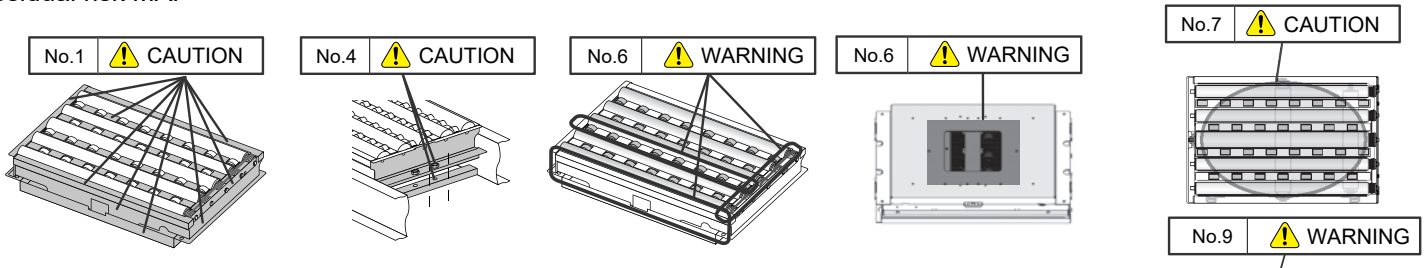
Appendix 3. Residual risk list/MAP

【Seriousness of harm】
WARNING: Indicates that there is a possibility that severe injury or even death may result if protective measures have not been taken
CAUTION: Indicates that there is a possibility that minor injury may result if protective measures have not been taken

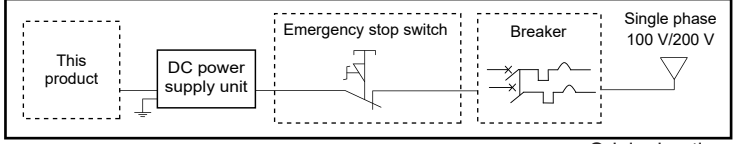
Residual risk list

No.	Operation stage	Work	Qualifications/ education required for work	Locations on machine	Seriousness of harm	Remaining risk factors	Examples of assumed measures	Measures that have been taken independently	Reference page
1	Installation	Unpack/ Carry	Having carefully read the user manual, and having full knowledge of all the contents	Metal parts on the product	CAUTION	Hands may get injured by metal parts of the product	Wear protective equipment, such as gloves, when working.	Described in the instruction manual	10
2	Installation	Carry		No particular location	CAUTION	Carrying the heavy load alone may result in damage to the main machine unit, and/or injury to the body	Have more than one person hold and support the bottom when carrying. Use special tool kit to carry the module with Block and tackle / lanyard.	Described in the instruction manual	73
3	Installation	Carry/ Install		No particular location	CAUTION	Dropping the product or letting it fall when carrying and/or installing may result in damage to the main machine unit, and/or injury to the body	Check safety of installation location in advance, and wear protective equipment, such as protective glasses, footwear, and/or gloves, when working	Described in the instruction manual	10
4	Installation	Install		Bottom of the product	CAUTION	Fingers may get stuck and workers may be injured when securing the main unit on the stay	When putting the main unit on the stay, hold the very bottom of the main unit, and prevent fingers from getting stuck	Described in the instruction manual	32
5	Operation	Trial run		No particular location	CAUTION	At the trial run by the single unit, trays may flow to this product	Stop the surrounding conveyor operation before starting operation	Described in the instruction manual	42
6	Operation	All during operation		Gaps between the moving parts, or moving and fixed parts	WARNING	Workers' fingers and/or hands may get stuck in gaps between the moving parts, or moving and fixed parts of the main unit	Cover the sides of the product with a frame and/or covers. Install protective structures to block the access to the openings at the bottom of the unit.	• Posting of warning and caution labels • Described in the instruction manual	8
7	Operation	All during operation		Top panel of the product	CAUTION	Workers may step on the main unit and lose their footing, or may fall when the main unit moves	Keep workers informed thoroughly about the prohibition of stepping on the machine	Described in the instruction manual	8
8	Operation	All during operation		No particular location	CAUTION	If problems occur, trays may collide with each other, and pop out of the equipment	For example, mount guide rails on the conveyor frames, and prevent trays from popping.	Described in the instruction manual	11
9	During maintenance/ inspection	All during maintenance/ inspection		Power supply part to the product (driver card)	WARNING	Persons turning on the power without notice may result in unexpected operation of the product, and/or injury of workers	Post warning labels so as to prevent unauthorized persons from turning on the power	Described in the instruction manual	12
10	During maintenance/ inspection	All during maintenance/ inspection		No particular location	WARNING	Workers' fingers and/or hands may get stuck in the product, and injured	• Wear protective equipment, such as protective glasses, footwear, and/or gloves • Do not put hands close to rotating parts. • Take off gloves when workers need to get your hands close to rotating parts during operation.	Described in the instruction manual	13

Residual risk MAP



Residual risk for which location on the machine has not been identified			
No.2	CAUTION	No.8	CAUTION
No.3	CAUTION	No.10	WARNING
No.5	CAUTION		

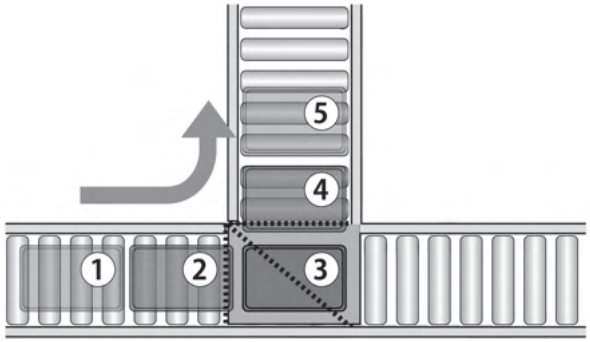


Appendix

Appendix 4.
Transfer capacity

Transfer time = Receiving time (sec) + Transfer surface exchange cycle time (sec) + Discharge time (sec) = **Transfer time**

Receiving time (sec)	Transfer surface exchange cycle time (sec)	Discharge time (sec)	Transfer time
② → ③	③	③ → ④	
Package length (mm) / (Transfer speed* (m/min) /60) x 1000 * Average speed between package in-feed and outfeed	One cycle time = 1,10 sec Cycle time to exchange the transfer surface and then return to start position i.e. wheels → rollers → wheels (sec)	Discharge time (graph 1) + additional time depending on the weight of the package (table1)	From reception of the package until the next package is ready to be transferred on the F-RAT-N75, after the package has been fully discharged.



Graph 1

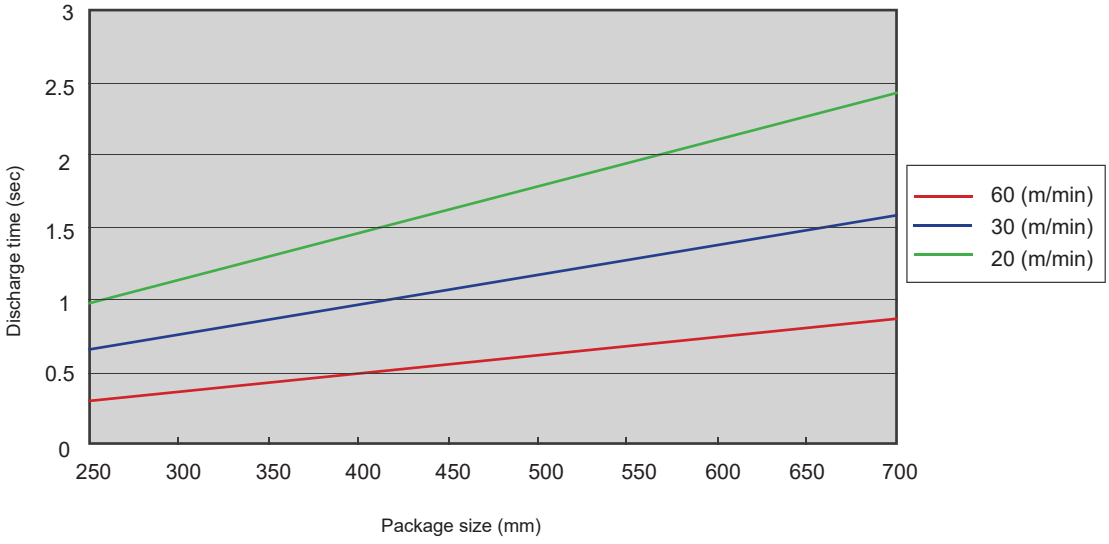


Table 1

Package weight (kg)	10	20	30	40	50
Additional time (sec)	0.1	0.2	0.3	0,4	0,5

Note : Transfer time may vary according to the load, its transfer method (step by step, continuous), upstream and downstream conveyor speed and other factors.

Appendix

Appendix 5.
Incorporation declaration

Incorporation declaration
in accordance with the EC Machinery Directive 2006/42/EC, Annex II B

The manufacturer :
ITOH DENKI CO., Ltd
1146-2 Asazuma-Cho, Kasai, Hyogo 679-0105 Japan

Distributed in Europe by :
ITOH DENKI Europe SAS
490 avenue des Jourdies - PAE les Jourdies - BP 323
74807 St Pierre en Faucigny Cedex - France

hereby declares that the product series:

F-RAT-NX75 transfer module
is an incomplete machine as defined in the EC Machinery Directive and therefore does not fully meet the requirements of this Directive. Service entry is prohibited until the whole machine/system in which it is incorporated is declared to be in compliance with the EC Machinery Directive.

This incomplete machine conforms to the following points of 2006/42/EC Machinery Directive :

1.1.2 Principles of safety integration
1.1.3 Materials and products
1.1.4 Lighting
1.3.2 Risk of break-up during operation
1.3.4 Risks due to surfaces, edges or angles
1.3.8.1 Choice of protection against risks arising from moving transmission parts
1.3.8.2 Choice of protection against risks arising from moving parts involved in the process
1.4.1 REQUIRED CHARACTERISTICS OF GUARDS AND PROTECTIVE DEVICES : General requirements
1.4.2.1 Special requirements for fixed guards
1.5.1 RISKS DUE TO OTHER HAZARDS : Electricity supply
1.5.4 Errors of fitting
1.5.8 Noise
1.6.1 Machinery maintenance
1.7.1 Information and warnings on the machine
1.7.3 Marking of machinery
1.7.4 Instructions
1.7.4.1 General principles of writing the instructions
1.7.4.2 Contents of the instructions

The health and safety requirements of Annex I have been applied. The special technical documents in accordance with Annex VII have been drawn up (and, if appropriate, submitted to the competent authorities).

Person authorized to compile the technical documentation :

ITOH DENKI CO., Ltd
Toshiyuki TACHIBANA
1146-2 Asazuma-Cho, Kasai, Hyogo 679-0105 Japan

ITOH DENKI EUROPE SAS
Masayuki SHIMODA
490 Avenue des Jourdies, 74800 St Pierre en Faucigny - France

EC Directives applied :
- Machinery Directive 2006/42/EC
- European EMC Directive 2014/30/EC
- European RoHS Directive 2011/65/EU

ITOH DENKI EUROPE SAS, undertakes to forward, following a duly motivated request from the national authorities, the relevant information concerning the quasi-machine.

Saint Pierre en Faucigny, 19 July 2021
T. AKASHI, General Director

ITOH DENKI EUROPE S.A.S.

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