Contents

1. AGV Construction Procedure

(1) Select the wheel motor

Select the wheel motor based on the estimated gross weight, including the load and the AGV itself, and the expected driving speed during operation.

(2) Select the servo driver

The capacity and model of the servo driver to be used depend on the combination with the wheel motor.

(3) Determine the battery capacity

Determine the battery capacity based on the AGV's operating conditions and selected driver capacity.

If continuous operation over an extended period of time is required, a large-capacity battery is needed; in such a case, the increased weight may also require a change in the selection of the wheel motor.

(4) Calculate the gross weight

1-1 Selection guide for motor capacity

Select an appropriate wheel motor for an AGV consisting of a four-wheel dolly (2 driving wheels and 2 driven wheels (casters, etc.)) by calculating the gross weight, including the load, vehicle body, and battery, and based on the driving speed during operation.

Standard total AGV weight: the following is the standard weights of AGVs with the same load bearing capacity for both driving and driven wheels.

Model	AWR010B-D408	AWR030B-C808	AWR075B-B808	SWR010B	SWR020B	SWR040B
Gross weight	350 [kg]	1200 [kg]	3300 [kg]	350 [kg]	1000 [kg]	2400 [kg]

* In selecting the driven wheels, contact the driven wheel manufacturer or select driven wheels that easily withstand the load applied.

1-2 Battery

The use of batteries for cycle service is recommended.

Batteries for cycle service are best suited for alternate charging and discharging.

1-3 Standard battery capacity

In selecting a battery, use the following calculation formula as a guide to estimate the power capacity required for the servo motor and driver.

M1: Motor 1 workload [W]

M2: Motor 2 workload [W]

Q: Overall efficiency (standard motor efficiency and driver efficiency: 0.6 to 0.7)

D: Drive rate (rate of motor working in a single drive pattern)

T: Operating time [h]

BV: Battery voltage [V]

MA: Power supply current [A] = (M1 + M2) / Q / BV

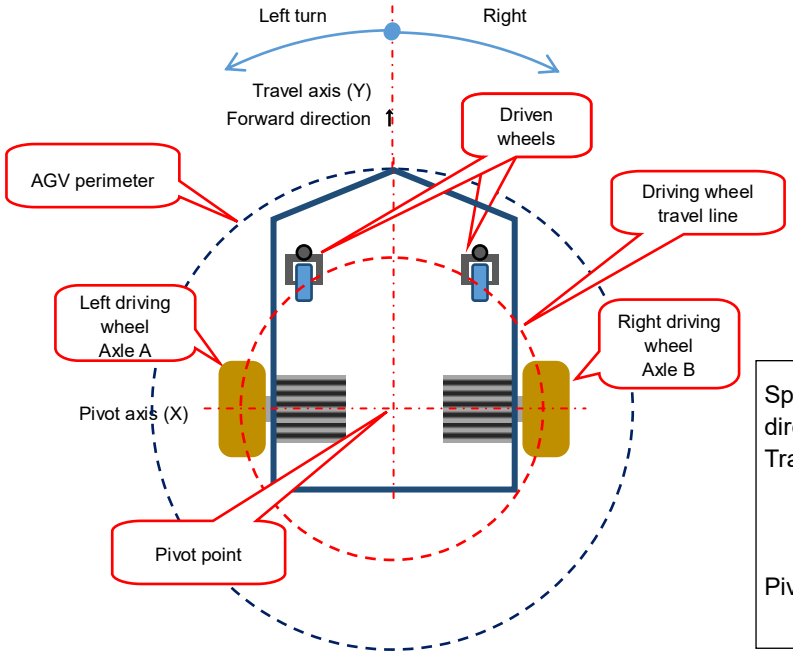
Required capacity [Ah] = MA x (D x T)

Based on the required capacity above, select a battery considering the type, hour rate, and the number of times of charging, as well as other control devices used at the same time.

2 Construction of the Basic AGV Unit (Driver and Motor)

2-1 Motor arrangement

Basic structure of AGV



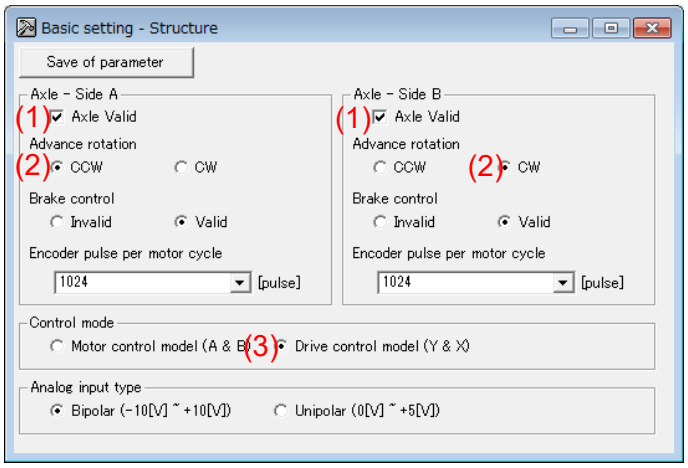
Speed command polarity and driving direction

Travel axis	+ Command: Forward movement
	- Command: Backward movement
Pivot axis	+ Command: Right turn
	- Command: Left turn

In this document, the left driving wheel is referred to as Axle A and the right driving wheel as Axle B in terms of wheel motor arrangement.
The motor shaft rotation direction and the wheel rotation direction may be different in a wheel motor depending on its reducer mechanism. Also consider the control model described in the next section, "Basic driver settings (control model)," when setting the direction of motor rotation.

2-2 Basic driver settings (control model)

From the driver communication software, go to Basic setting and then select Structure to configure the settings for the above AGV on this menu.



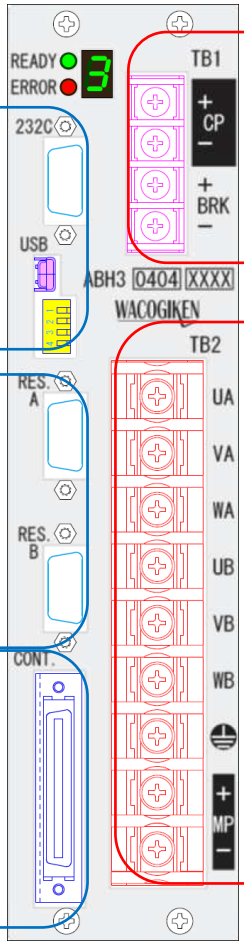
(1) Axle Valid
Select both Axle - Side A and Axle - Side B (☑)

(2) Advance rotation
Select the motor rotation direction when driving the AGV forward
* As per the motor arrangement illustrated in Section 2-1:
Set Axle - Side A to [CCW] and Axle - Side B to [CW] for the SWR series.
Set Axle - Side A to [CW] and Axle - Side B to [CCW] for the AWR series.

(3) Control model
Select [Drive control model].

2-3 Connecting the motor and driver

Names of connection terminals on the front panel of the driver



Communication
- RS232C communication connector
- USB communication connector (USB-mini B)
- Communication set-up switch

Resolver input
- RES. A: A - Resolver connector
- RES. B: B - Resolver connector

* Connect with D-SUB connector supplied with driver or optional resolver relay cable

Signal I/O connector CONT.
- Analog command input
- Operation signal input
- Monitor output

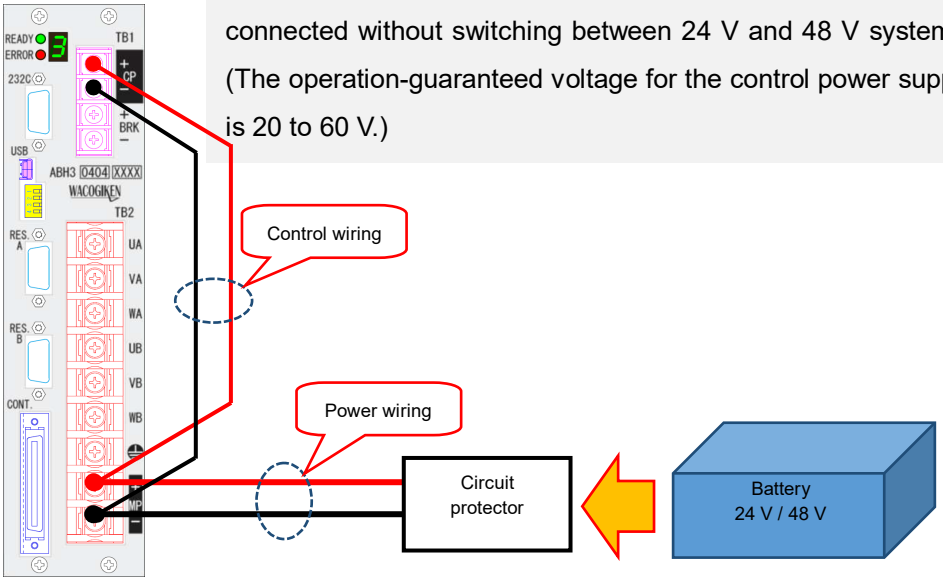
and others

TB1 terminal block for control
- \+ CP: Control power
- −
- \+ BRK: Brake output
- −

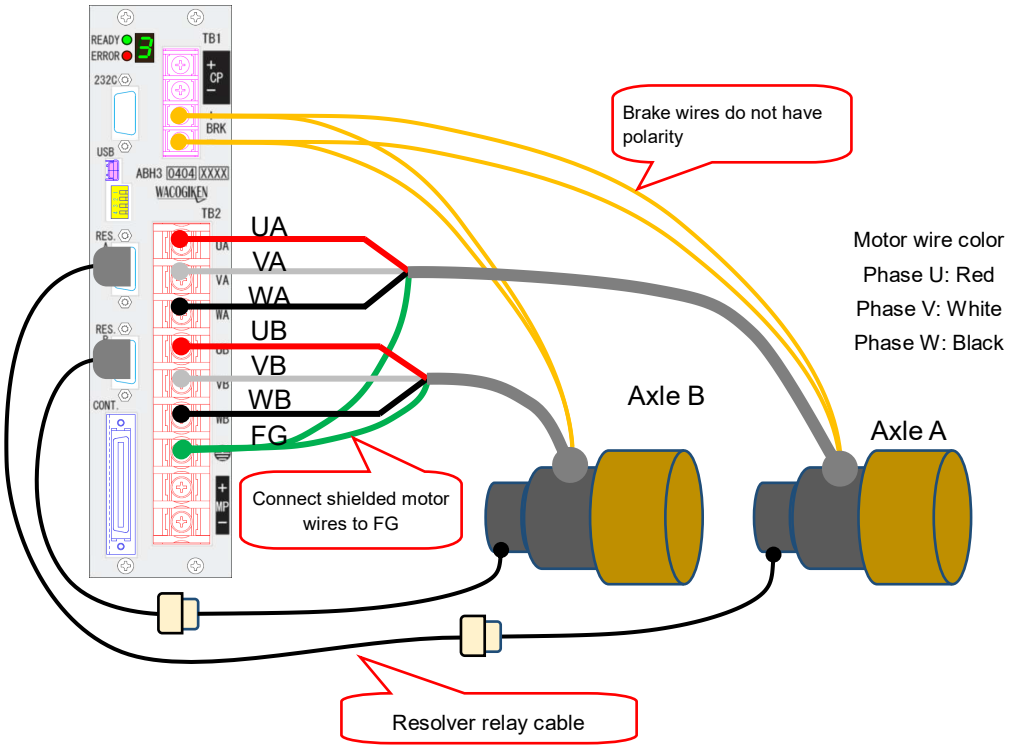
TB2 terminal block for power
- UA: Axle A Phase U motor output
- VA: Axle A Phase V motor output
- WA: Axle A Phase W motor output
- UB: Axle B Phase U motor output
- VB: Axle B Phase V motor output
- WB: Axle B Phase W motor output
- FG: Frame ground
- \+ MP: Main power input
- −

Sample power wiring

Both the control and main power for the ABH3 driver can be connected without switching between 24 V and 48 V systems. (The operation-guaranteed voltage for the control power supply is 20 to 60 V.)



Wheel motor wiring



The motor's resolver wire connector and the driver's resolver connector are different models.
The use of optional resolver relay cables is recommended.

* The two thermal wires (green; 0.3 mm^2) coming out of the motors do not need to be connected as this equipment is protected by electronic thermal overload protection.

2-3-1 Signal I/O connectors

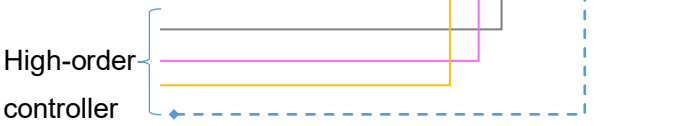
(1) Analog inputs

No.	Connector PIN name	Signal function - Drive control model	
1	Analog input 0+	Travel speed command input	Inputs command voltage when using analog travel commands
2	Analog input 0-		
3	Analog input 1+	Pivot speed command input	Inputs guide sensor signals
4	Analog input 1-		
5	Analog input 2+	Not used	
6	Analog input 2-		
7	Analog input 3+	Not used	
8	Analog input 3-		

Sample guide sensor (ME-9100W-D) connection

Guide sensor (ME-9100W-D)	
Cable color	Function
Brown	+ Power supply
Gray	Derailment output
Peach	BR branch mode selection
Yellow	BL branch mode selection
Black	Deviation output
Blue	Power supply | Signal common
Green	- Power supply
Shielded	Shielded

Signal I/O connector	
PIN no.	Signal function
1	Travel speed command input +
2	Travel speed command input -
3	Pivot speed command input +
4	Pivot speed command input -
21	Test purpose power supply output +15[V]
22	Test purpose power supply output +15[V]
24 (18)	GND



* Connect the guide sensor's derailment output and branch mode selection wires to a high-order controller (e.g. PLC) for course derailment detection and branch control. (For more information on how the control is performed, refer to the guide sensor manual.)

* The dashed lines indicate a connection example where the analog inputs are travel speed commands. In such a case, connect the voltage command from the high-order controller. This wiring is not necessary when using internal commands (default).

(2) Control signal inputs (basic settings)

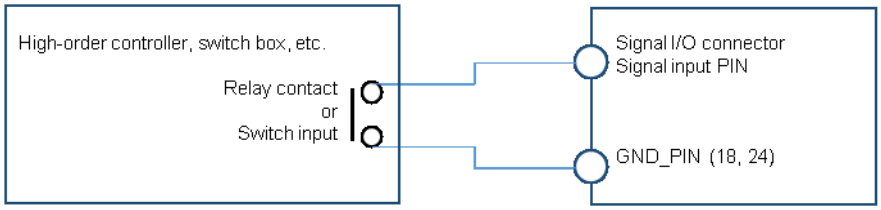
No.	Pin name	Signal function - Drive control model	
20	Error reset	Reset of error input	For the input of driver error reset Shuts off the motor output (servo OFF) upon ON input.
28	Digital input #0	Y - Servo on	Releases the brake to enable servo control of the target axis (X/Y).
40	Digital input #10	X - Servo on	
29	Digital input #1	Y - Start	Enables the command input for the target axis (X/Y).
41	Digital input #11	X - Start	
30	Digital input #2	Release of brake	Releases the brake upon X/Y servo OFF.
31	Digital input #3	—	
32	Digital input #4	Y - Data selector 0	Selects the command data for the target axis (X/Y). Up to 8 groups of command data, including command speed (analog command or internal speed) and acceleration/deceleration settings, can be registered.
33	Digital input #5	Y - Data selector 1	
36	Digital input #8	Y - Data selector 2	
44	Digital input #14	X - Data selector 0	
45	Digital input #15	X - Data selector 1	
48	Digital input #18	X - Data selector 2	
37	Digital input #9	Y - Command polarity	Reverses the polarity of command values. ・Travel commands are used to switch between forward and backward travel. ・Pivot commands switch the polarity based on guide sensor characteristics or mounting direction.
49	Digital input #19	X - Command polarity	
34	Digital input #6	Y - Addition polarity	Analog inputs #2 and #3 can be used as offset inputs to increase/decrease command value.
35	Digital input #7	Y - Addition to command	
46	Digital input #16	X - Addition polarity	
47	Digital input #17	X - Addition to command	
42	Digital input #12	—	Not used
43	Digital input #13	—	

* Digital inputs, including fixed inputs and interlock setting, can be changed from the digital input menu, accessible from Communication Software - Signal Settings.

Sample input circuits

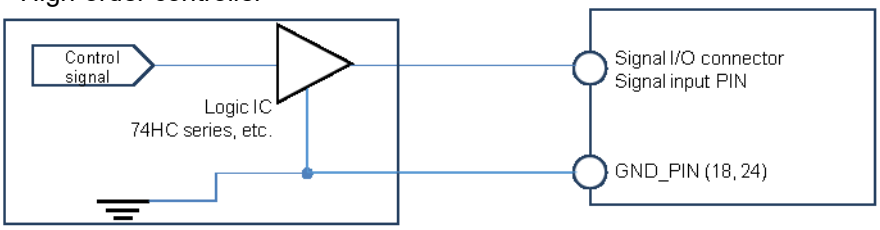
Contact input ・OFF input Input terminal not connected (Open: 5 V input by internal pull-up resistor)
・ON input Connects input terminal to GND_PIN (Closed: 0 V input)

Sample circuit



Voltage input ・OFF input Inputs 3.5 V or more to input terminal
・ON input Inputs 1.5 V or below to input terminal (V_{IL} = 0 V, I_{IL} = -1.5 mA)

Sample circuit High-order controller



(3) Output signals

No.	Connector PIN name	Signal function - Drive control model	
9	Analog output 1	Analog monitor output 1	Outputs control status, such as motor speed and torque, upon ±10 V analog output.
10	GND		
11	Analog output 2	Analog monitor output 2	
12	GND		
13	Digital output #0	Error output	Outputs "L" upon driver error status
50	Digital output #7	Alarm output	Outputs "L" upon driver warning status
14	Digital output #1	Code 0	Indicates driver error/alarm status with 4-bit code
15	Digital output #2	Code 1	
16	Digital output #3	Code 2	
25	Digital output #6	Code 3	
17	Digital output #4	READY output	Indicates servo ON status
19	Digital output #5	BUSY output	Indicates AGV drive status
21	+15 [V] output	Test purpose power supply output +15 [V] -15 [V] +5 [V]	Can be used for guide sensor power supply or test purpose analog input, etc.
22	-15 [V] output		
23	+5 [V] output		
18 24	GND		
26	Axle A ENC A-phase output	Axle A encoder output	Outputs 1024 two-phase pulses per motor rotation. A-phase leading phase in the AGV forward travel direction.
27	Axle A ENC B-phase output		
38	Axle B ENC A-phase output	Axle B encoder output	
39	Axle B ENC B-phase output		

* The items and output logics for digital outputs can be changed from the digital output menu,

accessible from Communication Software - Signal Settings.

○ Analog monitor output

Outputs driver control values in analog values.

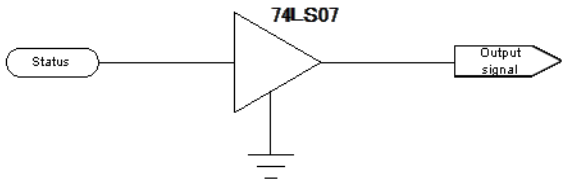
Analog monitor output is used by connecting to a monitor display by a digital multimeter or an ADC input of a high-order controller.

○ Signal output

The signal outputs indicate the driver's control status; drive status is indicated by a READY/BUSY output while the warning/error status is indicated by an alarm, error, or code output.

The signal outputs are used by connecting to a monitor display by an LED indicator or a high-order controller input.

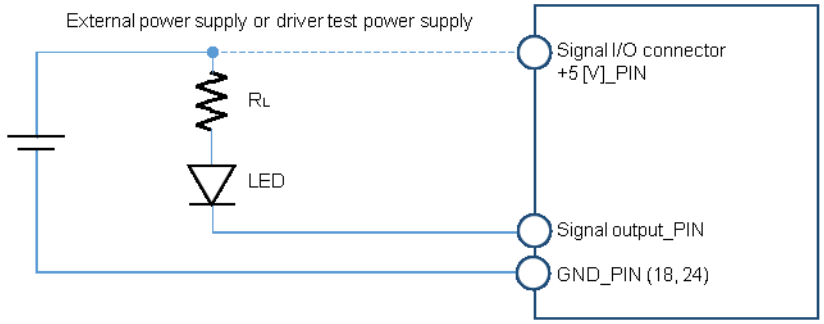
Signal output circuit Open-collector output



Signal output definitions

OFF output	Output transistor OFF Output logic: H level
ON output	Output transistor ON Output logic: L level

Sample LED indicator connection



* R_L is selected based on power supply and LED or characteristics.

○ Signal output function

- READY outputOutput turns ON when servo is ON while the motor is in driving state.
- BUSY output Output turns ON when drive command is not "0" while the motor is in driving state (READY: ON).

READY output	BUSY output	Motor/AGV operation
OFF	OFF	Servo OFF; Brake maintained state
ON	OFF	Servo ON; Stop state due to drive command "0"
OFF	ON	Invalid
ON	ON	Servo ON; Drive state due to drive command

- Alarm output Output turns ON upon driver warning status (motor drive status is maintained)
- Error output Output turns ON upon driver error status (forced servo OFF)
- Code output Outputs warning/error code linked to alarm/error output.

Name	Error Alarm	Output signal						
		Order of priority	Error output	Alarm output	Error/Alarm code			
					3	2	1	0
A - Mecha-lock	Error	5	ON	OFF	OFF	OFF	OFF	OFF
B - Mecha-lock	Error	6	ON	OFF	OFF	OFF	OFF	ON
Over heat	Error	2	ON	OFF	OFF	OFF	ON	OFF
Brake error	Error	1	ON	OFF	OFF	OFF	ON	ON
A - Resolver error	Error	3	ON	OFF	OFF	ON	OFF	OFF
B - Resolver error	Error	4	ON	OFF	OFF	ON	OFF	ON
A - Short circuit	Error	9	ON	OFF	OFF	ON	ON	OFF
B - Short circuit	Error	10	ON	OFF	OFF	ON	ON	ON
Low voltage (Control voltage)	Error	0	ON	OFF	ON	OFF	OFF	OFF
Over voltage	Error	0	ON	OFF				
Parameter error	Error	0	ON	OFF				
A - PDU identify signal error	Error	0	ON	OFF				
B - PDU identify signal error	Error	0	ON	OFF				
Low voltage (Main voltage)	Alarm	14	OFF	ON	ON	OFF	OFF	ON
A - Electrical thermal	Error	7	ON	OFF	ON	OFF	ON	OFF
	Alarm	15	OFF	ON				
B - Electrical thermal	Error	8	ON	OFF	ON	OFF	ON	ON
	Alarm	16	OFF	ON				
A - Over velocity,	Error	12	ON	OFF	ON	ON	OFF	OFF
A, Y - Velocity saturated	Alarm	17	OFF	ON				
B - Over velocity,	Error	13	ON	OFF	ON	ON	OFF	ON
B, X - Velocity saturated	Alarm	18	OFF	ON				
A - Current saturated	Alarm	19	OFF	ON	ON	ON	ON	OFF
B - Current saturated	Alarm	20	OFF	ON	ON	ON	ON	ON

* Errors indicated in red require a driver restart. (Reset of error input is disabled)

2-4 Operation tests (motor unit drive test, wiring check, etc.)

After completing the assembly of the AGV and the wiring between the wheel motors and driver, perform operation tests for connection signals and motors before driving the AGV. Operation tests should be performed by connecting the driver to a computer via a communication cable and using communication tool software. By providing a driver power supply that is a stabilized power supply with a current limiting function, separate from the AGV power source (e.g. battery) and which can input the control power supply and main power supply separately, damage to a motor or the driver can be prevented in case of incorrect wiring.

* When checking the motor drive, it is necessary to take safety precautions, such as idling the wheels by lifting the AGV off the ground or floor.
* While communication software settings are changed in each check procedure, do not press the [Save of parameter] button on an operation menu in order to enable the restoration of the initial settings by restarting the driver.

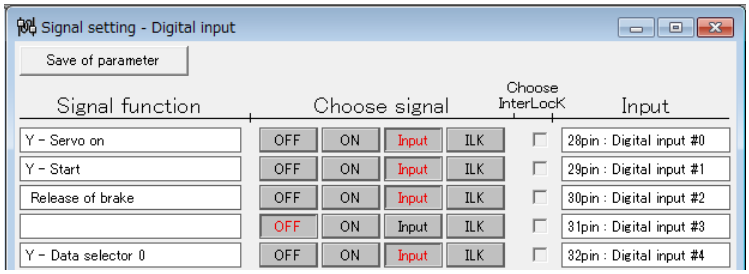
2-4-1 Checking the signals

Turn on the control power (24 to 48 V) to check the operation of each connection signal.

(1) Brake release check

When you turn ON the brake release input by signal input from the communication tool software, you will hear a click in the motor and be able to turn the wheel with your hand. The wheel motors may feel more or less heavy due to the gears that are built in; however, when the brake is engaged, you cannot manually turn it from the wheel side. The operation is common to both axles. If only one of the axles does not turn, it may be due to incorrect wiring or a wheel motor failure. If both axles do not turn, a driver failure or a power supply capacity shortage can be suspected.

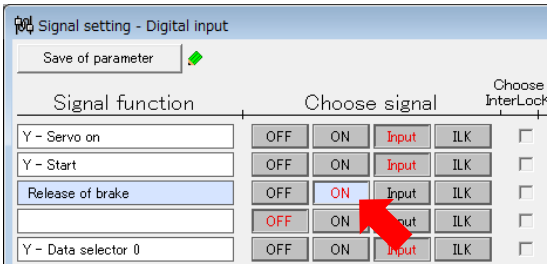
Initial settings Brake signal is operated by the 30pin: Digital input #2 signal I/O connector.



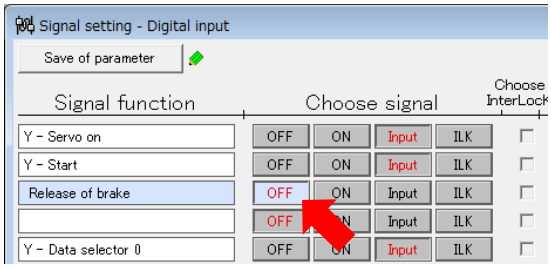
Brake engages at OFF input (H)

Brake released at ON input (L)

Release brake: Select ON



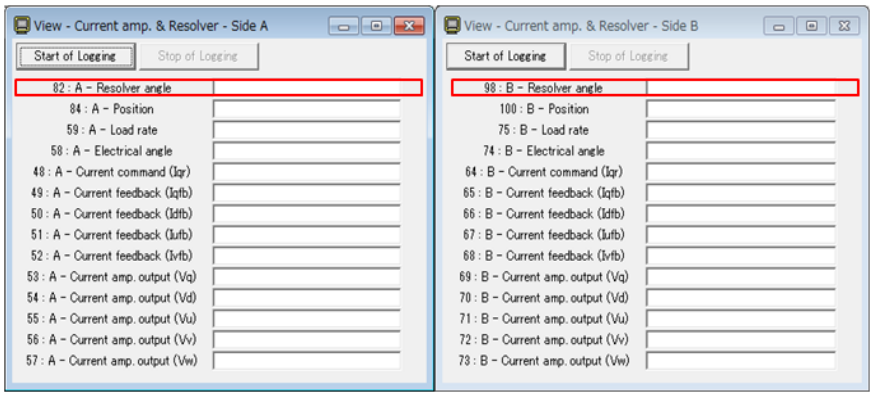
Engage brake: Select OFF



(2) Resolver wiring check

While the brake is released, check that the resolver angle of the axle changes on the communication tool software when the corresponding wheel is turned. If the resolver angle

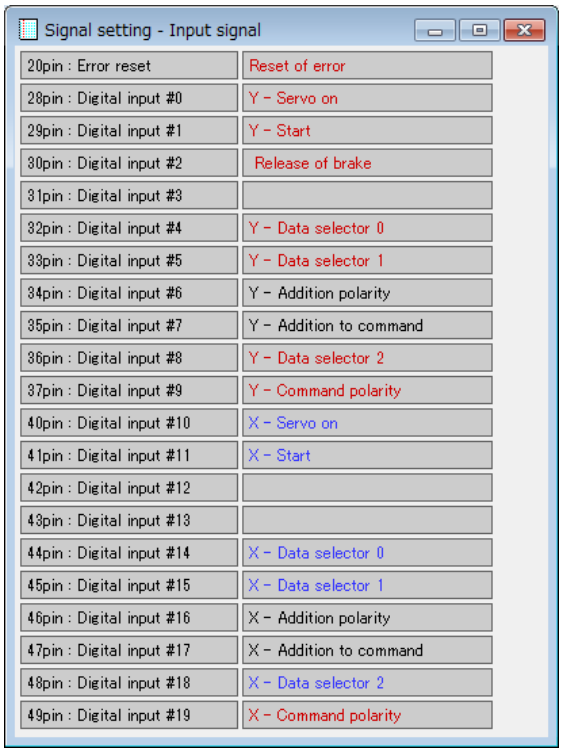
of the axle that is not the one turned changes, the driver's connection is incorrect.
If a resolver error occurs when the control power is turned on or when the wheel is turned, the resolver's signal wiring is incorrect.



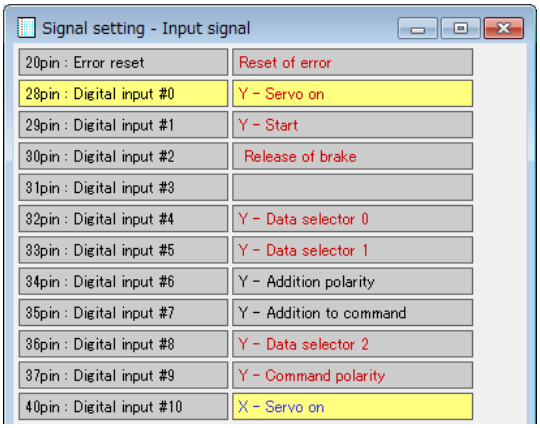
The direction of wheel rotation and increase/decrease of angle depend on the motor model (gear structure).

(3) Signal input check

Using the communication tool software, check that the driver recognizes the signals input to the signal I/O connectors.

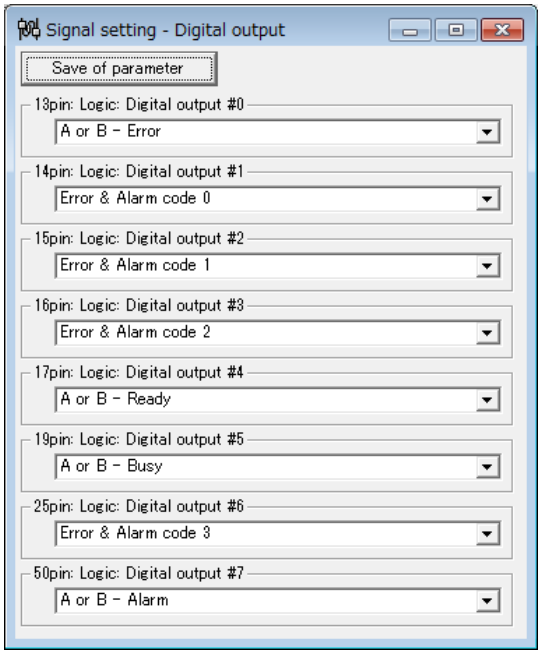


When an input signal for a signal I/O connector is given an ON input, the corresponding item is indicated in yellow.
In the example below, the 28 pin shows the ON input state.
Y/X - Servo on is set to the 28 pin input by digital input.



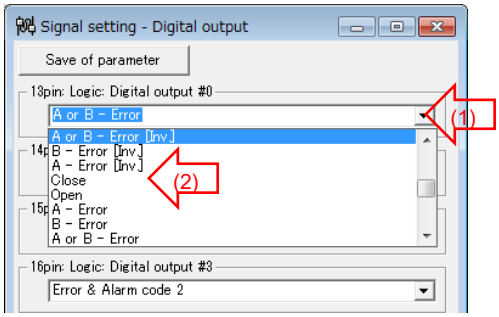
(4) Output signal check

Using the communication tool software, operate the signals output from a signal I/O connector to check that the connecting circuit is functioning correctly.

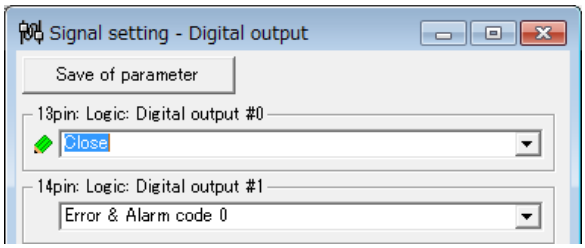


Checking the 13 pin output

(1) Open the output selector field.



(2) Select [Close] to close (ON output) the corresponding output pin.



(3) Selecting [Open] will open the corresponding output pin (OFF output).

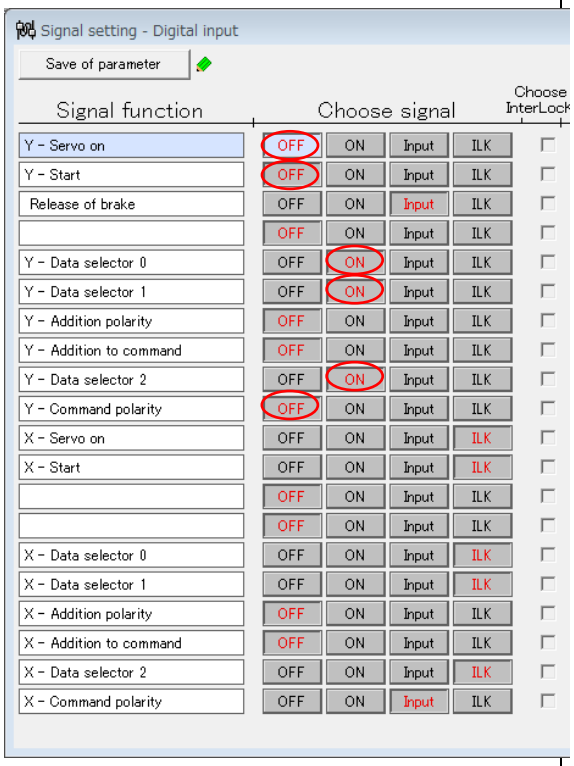
2-4-2 Checking the motor drive

Turn on the main power (24 to 48 V) and drive the motors one by one from the communication tool software to check the direction of rotation vis-à-vis the speed command.

1) Change the signal settings so that drive can be operated from the communication tool software.

・Set Y - Servo on, Y - Start, and Y - Command polarity to OFF.

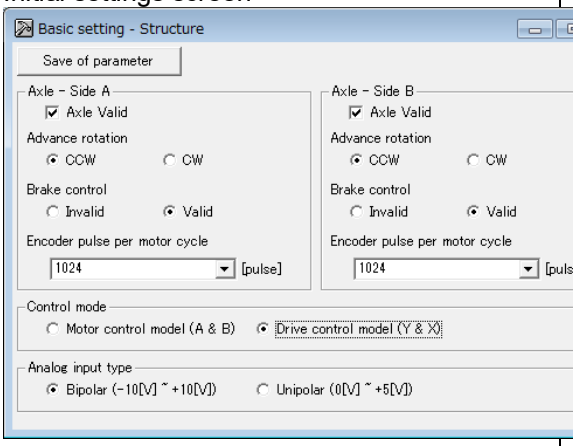
・Set Y - Data selector 0, 1, and 2 to ON, and select internal data #7.



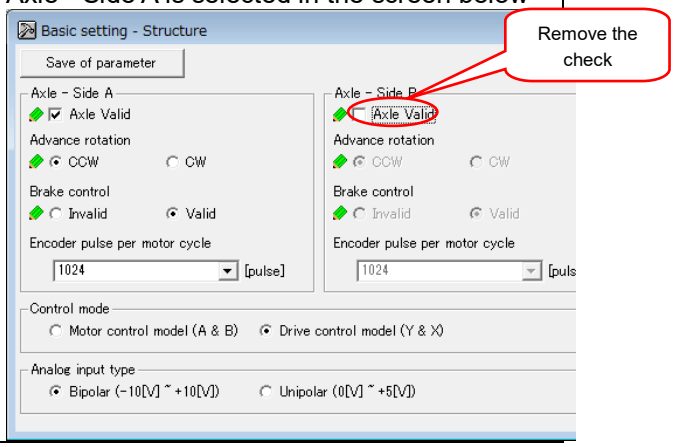
2) Select the drive axle.

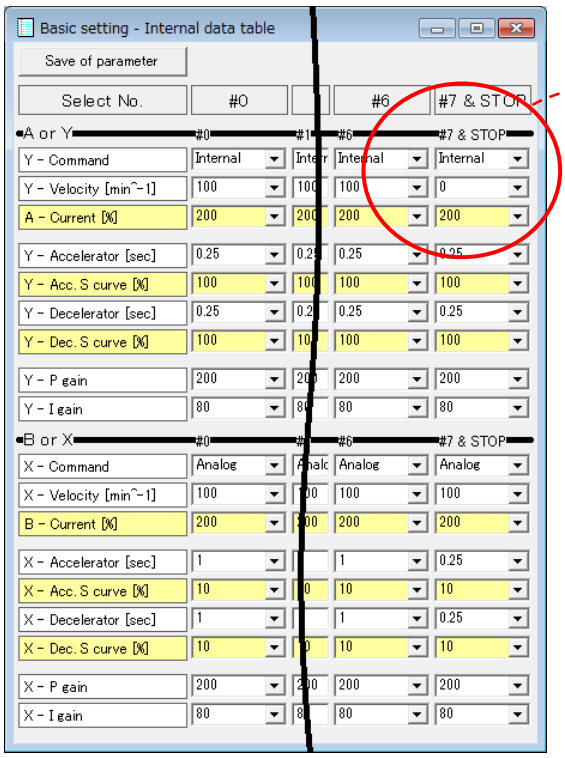
・From Basic setting, go to the Structure menu and select the axle to drive by selecting the corresponding checkbox.

Initial settings screen

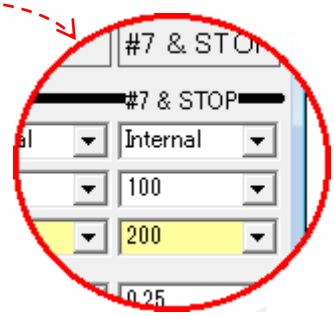


Axle - Side A is selected in the screen below



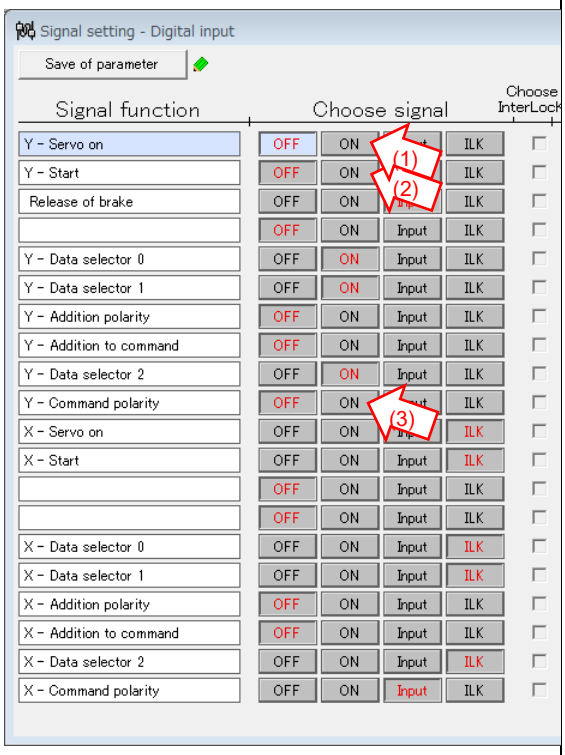


3) Set the speed command.

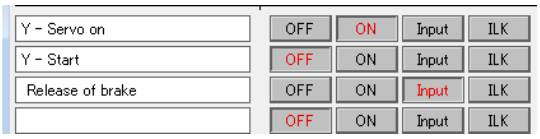


Change the Y - Velocity [min^{-1}] to 100 from 0 under [#7 & STOP].

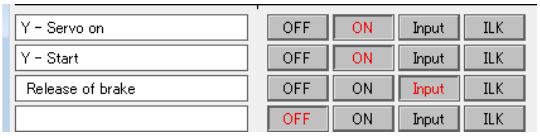
4) Start drive.



(1) Servo ON OFF -> ON
Brake is released, and servo is locked.



(2) Start OFF -> ON
2) The selected axle rotates.
Because the other axle is disabled and stopped, the rotation speed is double the Y-axis speed set in 3) above (motor shaft speed).



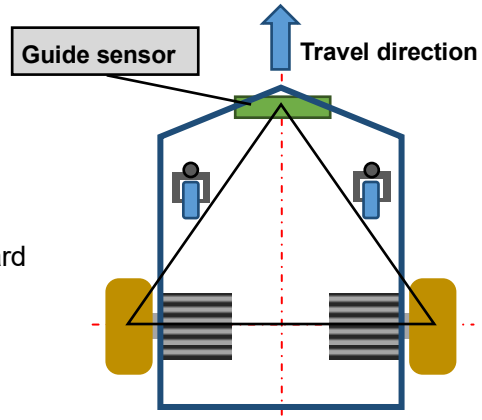
(3) The direction of wheel rotation is as follows based on the Y - Command polarity:
・When OFF, forward travel direction of AGV
・When ON, backward travel direction of AGV

3 Automated Travel

An example of an automated AGV travel set-up using a magnetic guide sensor.

3-1 Installing a magnetic guide sensor

The guide sensor should be installed in a position where the center of the guide sensor forms the vertex of a isosceles triangle with the line connecting the driving wheels as the base, as shown in the illustration.
This creates a stable straight travel and curve tracing capability during travel and a good right-left balance of the pivot path.
For the height of guide sensor from the floor, the installation angle to the vehicle, and other installation requirements, refer to the guide sensor installation manual. The guide sensor must be installed facing the direction of travel.
To back the AGV over the guide tape, another guide sensor is required for the direction of backward travel.
In this case, the guide sensor signal is selected and input to the driver based on the direction of travel (forward/backward) using a relay circuit, etc.



3-2 Path correction by a guide sensor

As per the guide sensor (ME-9100W) connection example shown in section 1-3, the driver reads the guide sensor signal (deviation output) as a pivot command and corrects the positional deviation from the guide tape.
Select analog command when selecting internal data selector.
If the polarity of deviation output is reversed due to the orientation of the guide sensor installation, adjust it using the X - Command polarity.

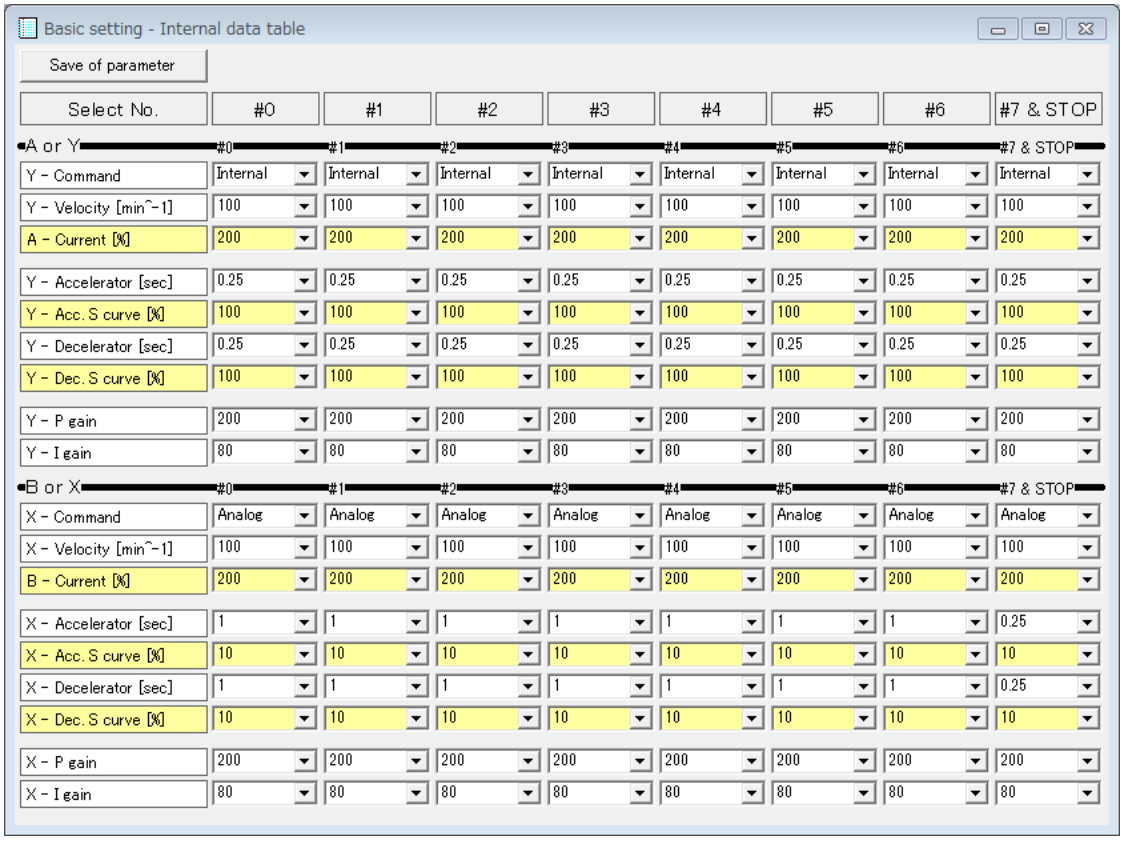
3-3 Using the address sensor

By using the address sensor (e.g. ME-1014S), the AGV can detect the address tape affixed on the floor and use the information to change its speed or path.
This is controlled by the high-order sequencer counting the detected address tape, and outputting the driver's internal data selector signal corresponding to the count. The driver selects the internal data based on the input signal and controls the drive using the pre-set speed and acceleration/deceleration settings. The high-order sequencer drives the AGV on a branched path by combining the guide sensor's branch mode signal in its operation.

3-4 Speed control

Using the communication software, the AGV's speed is controlled by the settings on the Basic setting - Internal data table menu.
The internal data can be set in a group from #0 to #7, including Y-axis (travel direction), X-axis (pivot direction), command speed, acceleration/deceleration, and gain. A group is selected by a selector signal input when the start signal is ON.
When the start signal is OFF (stop), the speed command is "0," which results in rapid stop; however, the values of internal data #7 is read for the acceleration/deceleration and gain settings upon treating the selection signal input as invalid.

Internal data menu screen



(1) Command

Select a command input mode.

When internal command is selected, the speed limit setting is applied as the speed command value. When analog command is selected, the analog input is used as the command input.

(2) Velocity

When internal command is selected, the speed command value is used. When analog command is selected, the command input gain is used as the speed limit.

The command input gain indicates the command speed when the analog input value is the maximum input voltage.

Because the set value is expressed in motor speed, the AGV drive speed needs to be converted using the wheel diameter and drive unit gear ratio, and for pivot speed, also applying the distance between the wheels.

(3) Current

The current limit value for a drive motor is set as a rated current ratio. ([100[%]] with rated current)

Normally, the motor's maximum current is used.

The motor's maximum current information is provided in Motor information in the status display of the communication software.

Set the same Control Model value for both Axle A and Axle B.

(4) Accelerator

This parameter slows down the change in the speed command value in the direction of acceleration.

Set the time that it takes to reach the maximum rotation speed from 0 [min^{-1}] in the direction of acceleration.

(5) Acceleration S curve

This constant limits the change in acceleration that can be calculated from the accelerator value set in (4) above and produces an S-curve acceleration pattern.
For an acceleration from 0 [min^{-1}] to the maximum rotation speed, when set to [100(%)], this setting generates an acceleration pattern with a triangular acceleration profile that does not have a constant acceleration region. If this is set to less than 100(%), the acceleration pattern will be a trapezoidal acceleration profile with a constant acceleration region.

(6) Decelerator

This parameter slows down the change in the speed command value in the direction of deceleration.
Set the time that it takes to reach 0 [min^{-1}] from the maximum rotation speed.

(7) Deceleration S curve

Similarly to (5) above, this constant produces an S-curve deceleration pattern.

* About the acceleration/deceleration settings

The acceleration/deceleration settings are a function that generates an acceleration/deceleration pattern to accommodate the speed change that occurs with command switching, in order to smoothly accelerate/decelerate the AGV to the target speed.

The Y-axis acceleration/deceleration is adjusted according to the travel speed and load characteristics.
When carrying liquid or any load prone to collapsing, the acceleration/deceleration constant and the S curve value should respectively be set to larger values in order to minimize the impact on the load by smooth acceleration/deceleration.
After carrying the load, when returning with an empty dolly or carrying back load that is less susceptible to shock and vibrations, the acceleration/deceleration constant and the S curve value can be smaller in order to reduce transportation time.

On the other hand, in the X axis, because the acceleration/deceleration settings are delay elements for guide sensor-based path correction, a large value can cause meandering or course deviation. The acceleration/deceleration constant depends on the installation position of the guide sensor and the X-axis speed limit, but as reference, it should be set to 1 second or less, and the S curve value should be set to 10(%) or below.

(8) Proportional gain

This parameter determines the responsiveness to speed commands.
Responsiveness increases as the value is increased, but if the value is too large, it causes instable operation and motor vibration.

(9) Integral gain

This parameter determines the responsiveness to speed deviation.
Larger values produce faster responses and hence increases rigidity; however, when driving machines that have vibration elements, such as significant load inertia or backlash, such conditions can cause vibrations.

* The appropriate proportional gain and integral gain values depend on the load conditions and mechanical factors. Therefore, adjust these values while checking for vibrations (responses to speed commands) in operation tests using actual load.

3-5 Drive control

AGV drive control is performed by operating the control signal input via PLC or other controllers.

3-5-1 Servo control signal

The motor output from the driver is controlled by a Reset of error input and X/Y - Servo on signals.

(1) Reset of error input

This input resets a driver error. Normally it is used as an OFF input.
An ON input triggers a forced servo OFF, which also allows for its use as an emergency stop input by an analog circuit. However, because this occurs simultaneously with braking, the stop is instantaneous without any deceleration control.

(2) X/Y - Servo on

This signal releases the brake and starts the motor control.

(3) Brake

This input signal is valid when servo is OFF. Brake is released when an ON input is received.
This signal is used when freeing the wheels for AGV operation check or for moving the AGV to its course.

3-5-2 Command control signal

Command mode, command value and control parameter are set by X/Y - Start and data selector signals.

(1) X/Y - Start

An ON (start) input enables the control settings, including the command input, acceleration/deceleration, and gain that are specified by a data selector input.
An OFF (stop) input maintains the stop status by motor control, with the speed command as "0." In this case, the internal data #7 & STOP is read to apply the corresponding acceleration/deceleration and gain settings.

(2) Data selector 0, 1, and 2

A combination of signal inputs is used to specify the internal data number for selecting the command input and control settings.

(3) Command polarity

This signal switches the polarity of the command input.
The Y - Command polarity is used to switch between forward and backward travel, and the Y - Command polarity is used to switch the pivot direction when using internal commands and to match the polarity of the guide sensor when using analog commands.

3-6 Emergency stop

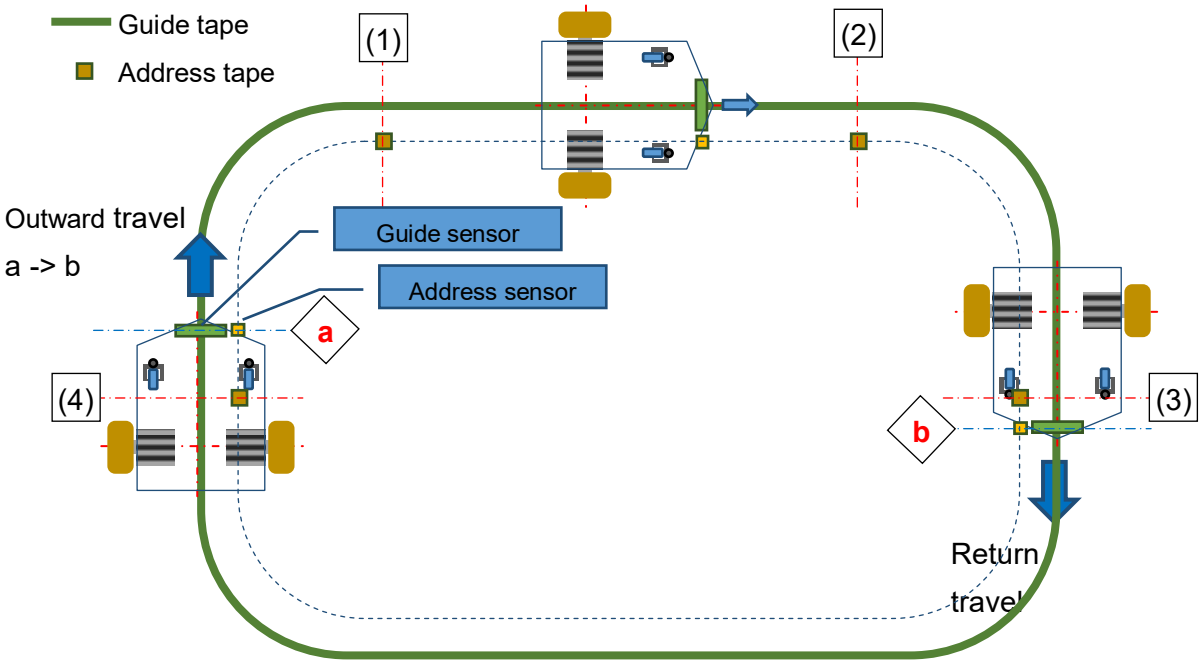
This emergency stop function is used to stop the AGV when it runs off the course or comes

into contact with a person or other object.
This function monitors sensor signals via a high-order controller (e.g. PLC) and operates the driver's servo control signals and start signals based on the degree of risk. In case of a high-risk situation, such as that may involve personal injuries and/or property damage, the AGV stops instantly by servo OFF (with simultaneous braking) or by main power shutoff. In case of a low-risk situation, such as course deviation, the AGV can be stopped (start signal OFF) upon deceleration; however, in either case, the AGV should be designed so that it can stop with enough time and space considering the sensor accuracy and the risks.

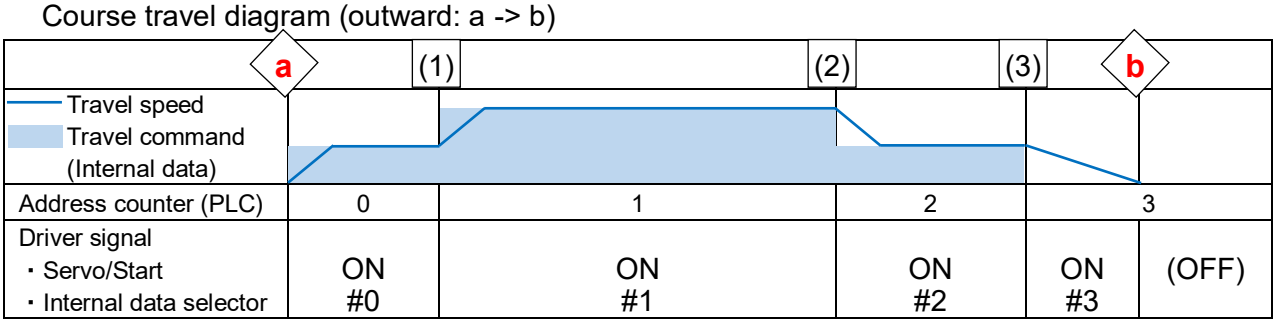
* Course deviation can be detected by a derailment output from the guide sensor (ME-9100W).
The "H" level derailment output is produced when the guide sensor moves out the range of detection due the AGV deviating to the right or left of the magnetic tape or when the distance between the guide sensor and magnetic tape exceeds the specified value and renders the detection of the magnetic tape impossible.

3-7 Example of automated travel

In this sample course, Point **a** is the loading point and Point **b** is the unloading point.



Course travel diagram (outward: a -> b)



Address counter (PLC)	0	1	2	3	
Driver signal ・Servo/Start ・Internal data selector	ON #0	ON #1	ON #2	ON #3	(OFF)

PLC control procedure

i AGV waits at starting point **a** (Waiting for Start operation)

Servo/Start signal: OFF

ii AGV starts operation (PLC operation input)

Address counter cleared (0)

Driving starts with internal data selector signal #0 and Servo/Start signal ON.

iii Address sensor reads address tapes (1) (2) (3)

The address counter is counted up, and the internal data selector signal is updated based on the counter value.

iv AGV stops and waits

Stop point **b** is adjusted by the deceleration setting in internal data #3 and the address sensor position.

After the address sensor detects (3) and the timer expires, Servo/Start signal OFF is output, and the AGV waits.

v Return travel start operating (PLC operation input)

Address counter is counted up.

Driving starts with internal data selector signal #1 and Servo/Start signal ON.

vi Address sensor reads address tape (4)

Similarly to steps iii and iv, the address counter is counted up and the stop operation is performed.

Internal data #4 is used to set shorter deceleration time.

* In this example, no load is carried in the return travel, and therefore the AGV travels to point **a** without any speed change at the curves.
Stop point **a**, as is the case with stop point **b**, needs adjustment with the deceleration settings and address sensor position. If the same internal data (or data with same settings) used for stopping at point **b** is selected in step vi, deceleration starts from faster motion, which makes the stopping distance longer than the distance the AGV travels from (3) to point **b**.

Sample internal data settings

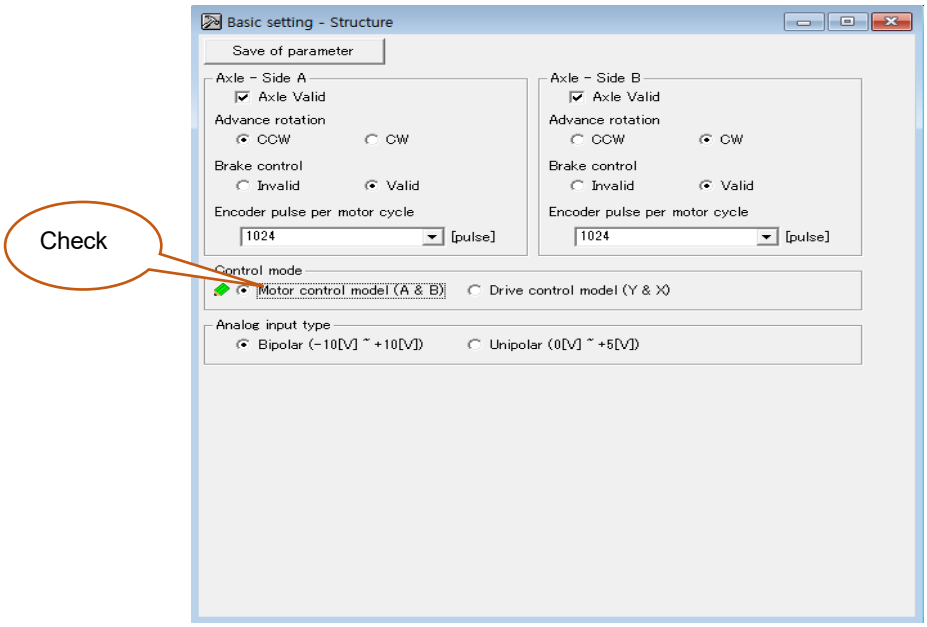
Select No.	#0	#1	#2	#3	#4
Y - Command	Internal	Internal	Internal	Internal	Internal
Y - Velocity	500	1000	500	0	0
A - Current	200	200	200	200	200
Y - Accelerator	5	5	∗1	∗1	∗1
Y - Acc. S curve	0	0	0	0	0
Y - Decelerator	∗1	∗1	5	10	5
Y - Dec. S curve	0	0	0	0	0
Select No.	#0	#1	#2	#3	#4
X - Command	Analog	Analog	Analog	Analog	Analog
X - Velocity ∗2	1000	1000	1000	1000	1000
B - Current	200	200	200	200	200
X - Accelerator	0.5	0.5	0.5	0.5	0.5
X - Acc. S curve	10	10	10	10	10
X - Decelerator	0.5	0.5	0.5	0.5	0.5
X - Dec. S curve	10	10	10	10	10

∗1 Not read in this example.

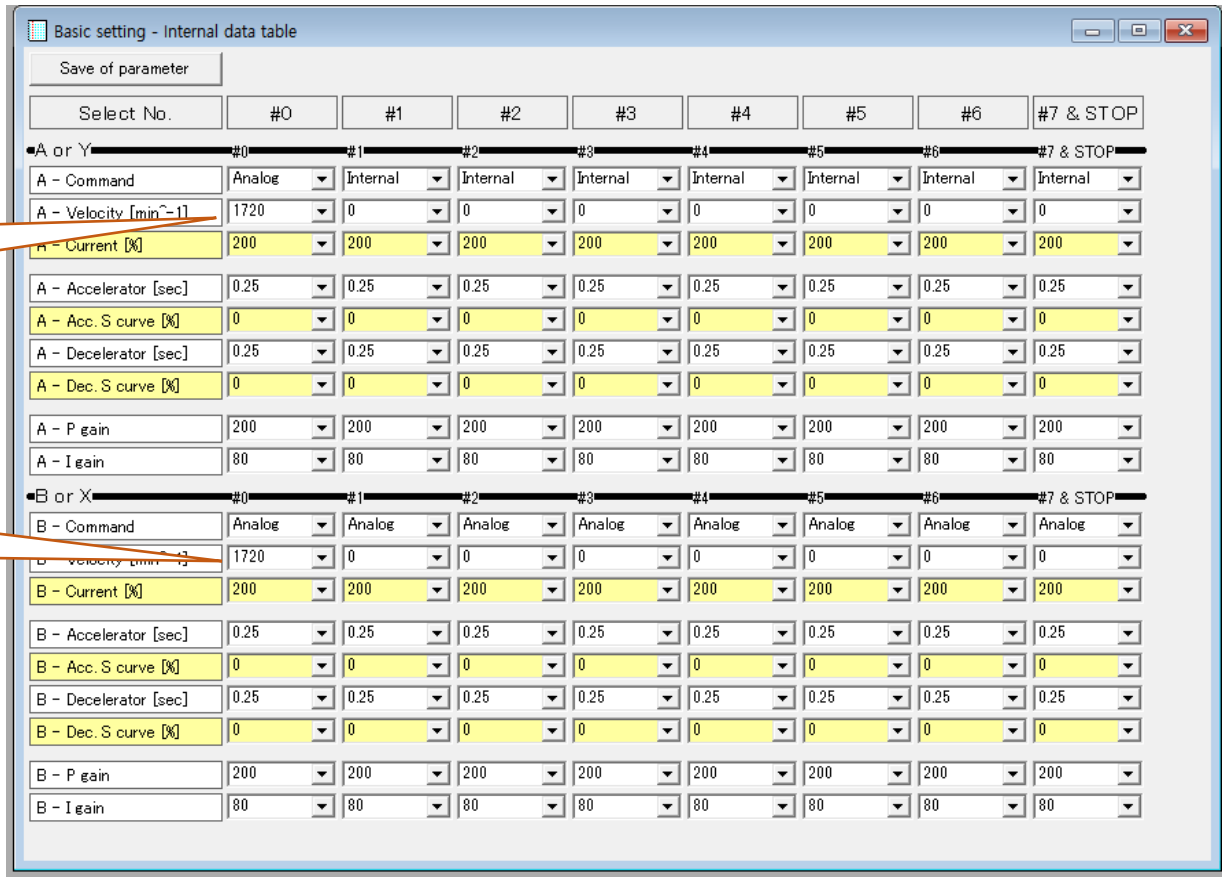
∗2 X - Velocity is the guide sensor input command gain.
Requires individual adjustment if the AGV sways or deviates from the course due to the relationship with the Y-axis speed.

4. Analog Input Control

a) Signal I/O connectors Pin No 1.2.3.4……±0~10V



b)


Basic setting - Internal data table
Save of parameter
Select No.
#0
#1
#2
#3
#4
#5
#6
#7 & STOP
A or Y
A - Command
A - Velocity [min^-1]
A - Current [%]
A - Accelerator [sec]
A - Acc. S curve [%]
A - Decelerator [sec]
A - Dec. S curve [%]
A - P gain
A - I gain
B or X
B - Command
B - Current [%]
B - Accelerator [sec]
B - Acc. S curve [%]
B - Decelerator [sec]
B - Dec. S curve [%]
B - P gain
B - I gain
Rated speed of the motor
Rated speed of the motor