RTEX
Realtime Express

Panasonic
ideas for life

NEW

Servo Drive MINAS A5N with **Realtime Express (RTEX)**

Motor Business Unit
Home Appliances Company

200W 200V
Frame Size A

Dimensions: W40 x H150 x D135 mm

Appearance

Power Supply Voltage

Model No.

Front Cover

7segments LED (2digits) Indicator

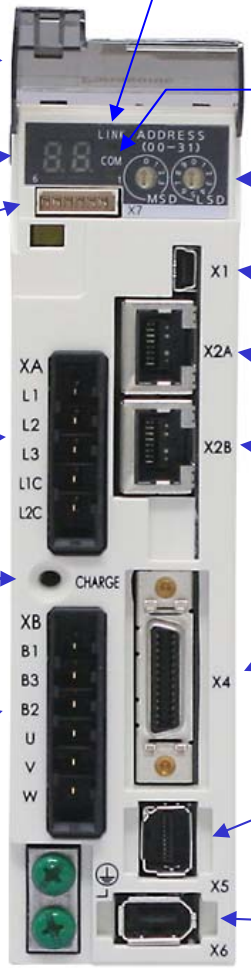
Analog Monitor Connector (X7)
Velocity, Torque …etc.

Power Input Connector (XA)

Charge Lamp of Main Circuit

Regenerative-R and Motor Connector (XB)

Earth Terminals



LINK LED
RTEX wiring trouble

COM LED
RTEX status

Node-Address Setting RSW (2digits)
Range: 00-31

USB Connector (X1)
For PANATERM, MINI-B 5pin

RTEX RX Connector (X2A)
From a front node TX

RTEX TX Connector (X2B)
To a rear node RX

I/O Connector (X4)
Sensor inputs, Alarm output …etc.
Half pitch **26pin**

Linear Encoder Connector (X5)
Panasonic Serial or A/B/Z-pulse

Encoder Connector (X6)
Panasonic Serial

Red: Changes from A4N

Compatibility with A4N

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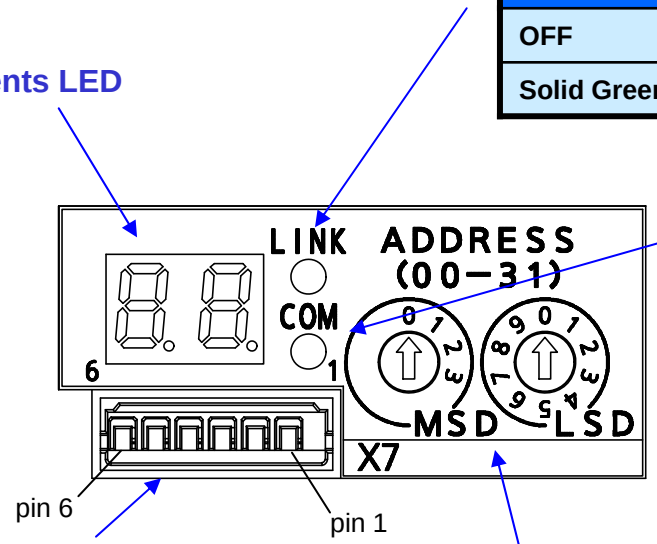
	Item	Compatibility	Descriptions
Installing	The Size of Drive	Yes	The same screw pitch
Wiring	Power Input Connector	Almost	For frame-size A and B, the number of pins changed from 4 to 5
	Motor Connector	Yes	
	Encoder Connector (X6)	Yes	
	Linear Encoder Connector (X5)	No	Connector type changed
	I/O Connector (X4)	No	From 36pin to 26pin
Encoder	Incremental	No	Resolution changed from 10,000 to 1,048,576p/r
	Absolute	Yes	
Tool	PANATERM	No	From RS232 to USB, Freeware
RTEX	Position Command	Yes	
	Parameter Command	No	Changed to a combination of Category and No.
	Alarm Command	No	Changed to a combination of Main and Sub-code

Front Panel

Inside of Front Cover

LINK LED (Green)

LINK	Network State
OFF	Wiring Not Link
Solid Green	Link



COM LED (Green / Red)

COM	Network State
OFF	Initial
Blinking Green	In Configuration
Solid Green	Established
Blinking Red	Error
Solid Red	Serious Error (Reset needed)

X7: Analog Monitor Connector
Molex 53014-0610 (Note)

Pin #	Symbol	Description
1	AM1	Analog Monitor 1
2	AM2	Analog Monitor 2
3	GND	Signal Ground
4, 5, 6		For Manufacturer use

Address Setting RSW
Range: 00 to 31
Value depends on the controller specification.

Note: Cable side connector
Housing: 51004-0600
Terminal: 50011-8100

7segments LED Display

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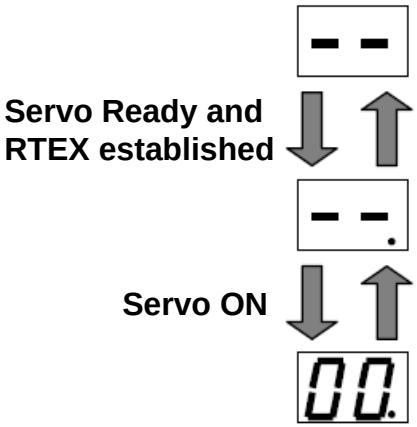
< Normal >



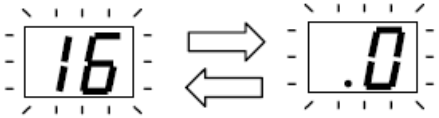
Note:
At power-on, node address is displayed for a moment before this indication.

Alarm ⇅ Cleared

Warning ⇅ Cleared

< Alarm >

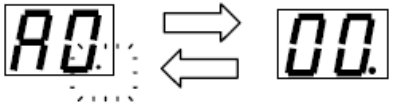
Main Code Sub Code



All blinking

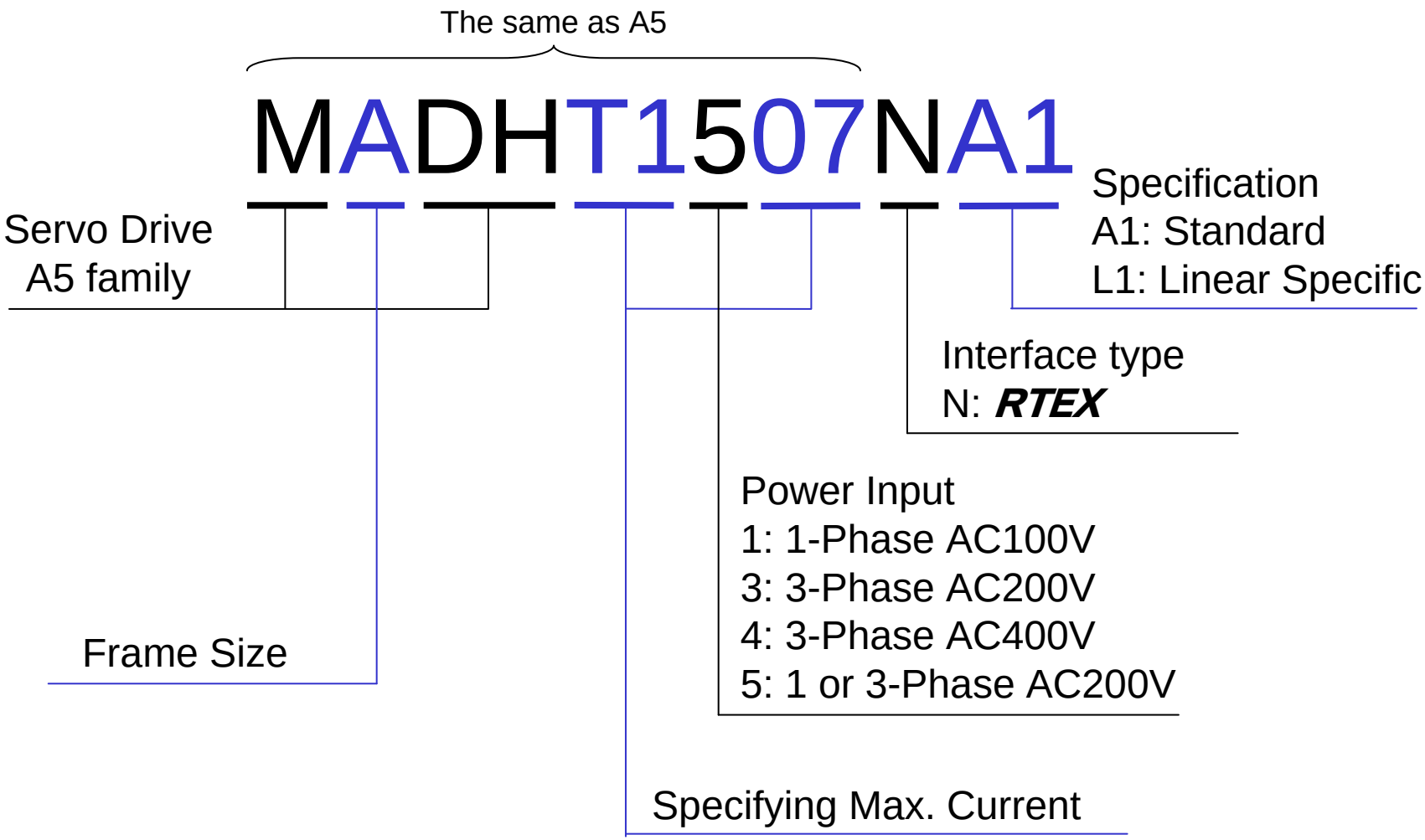
< Warning >

Warning Code (2s) Normal (4s)



Right dot blinking

Structure of Model No.



Lineup

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Rated Output of Motor (W)

Power Input of Drive

	50	100	200	400	750	1k-1.5k	2k	3k	4k-5k	7.5k	11k-15k
1 Phase AC 100-120V	A	A	B	C							
	MADH T1105 NA1	MADH T1107 NA1	MBDH T2110 NA1	MCDH T3120 NA1							
1 or 3 Phase AC 200-240V	A		A	B	C	D					
	MADH T1505 NA1		MADH T1507 NA1	MBDH T2510 NA1	MCDH T3520 NA1	MDDH T5540 NA1					
3 Phase AC 200-230V							E	F	F	G	H
							MEDH T7364 NA1	MFDH TA390 NA1	MFDH TB3A2 NA1	MGDH TC3B4 NA1	MHDH TC3B4 NA1
3 Phase AC 380-480V					D	D	E	F	F	G	H
					MDDH T2412 NA1	MDDH T3420 NA1	MEDH T4430 NA1	MFDH T5440 NA1	MFDH TA464 NA1	MGDH TB4A2 NA1	MHDH TB4A2 NA1

Upper: Frame size
Lower: Typical model No. Depending on combination with motor, see the A5 series brochure.

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Overview of
Realtime Express

Realtime Express (RTEX)

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Advanced Network to realize high-precise real-time performance for Servo Control

Concept

RTEX
Realtime Express

- High Performance & Low Cost
- Simple
- High Reliability
- Easy Development

Features of *RTEX*

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- **Real-time communication** based on 100BASE-TX
- **100Mbps Full duplex**
- Com. period **min. 0.083ms(*1)**
- Up to **32 axes**@0.5ms (*1)
- **Max. 100m length** inter-node cable
- All axes **fully synchronization** (*2) for interpolation
- **Parameter** setting and **monitoring**
- **Less wiring**
- **Low-cost** using Ethernet cable
- **High noise immunity** (IEC61000-4-4 compliant)

RTEX
Realtime Express

*1: Depends on a controller specification.
*2: This sync algorithm is a patent.

System Structure

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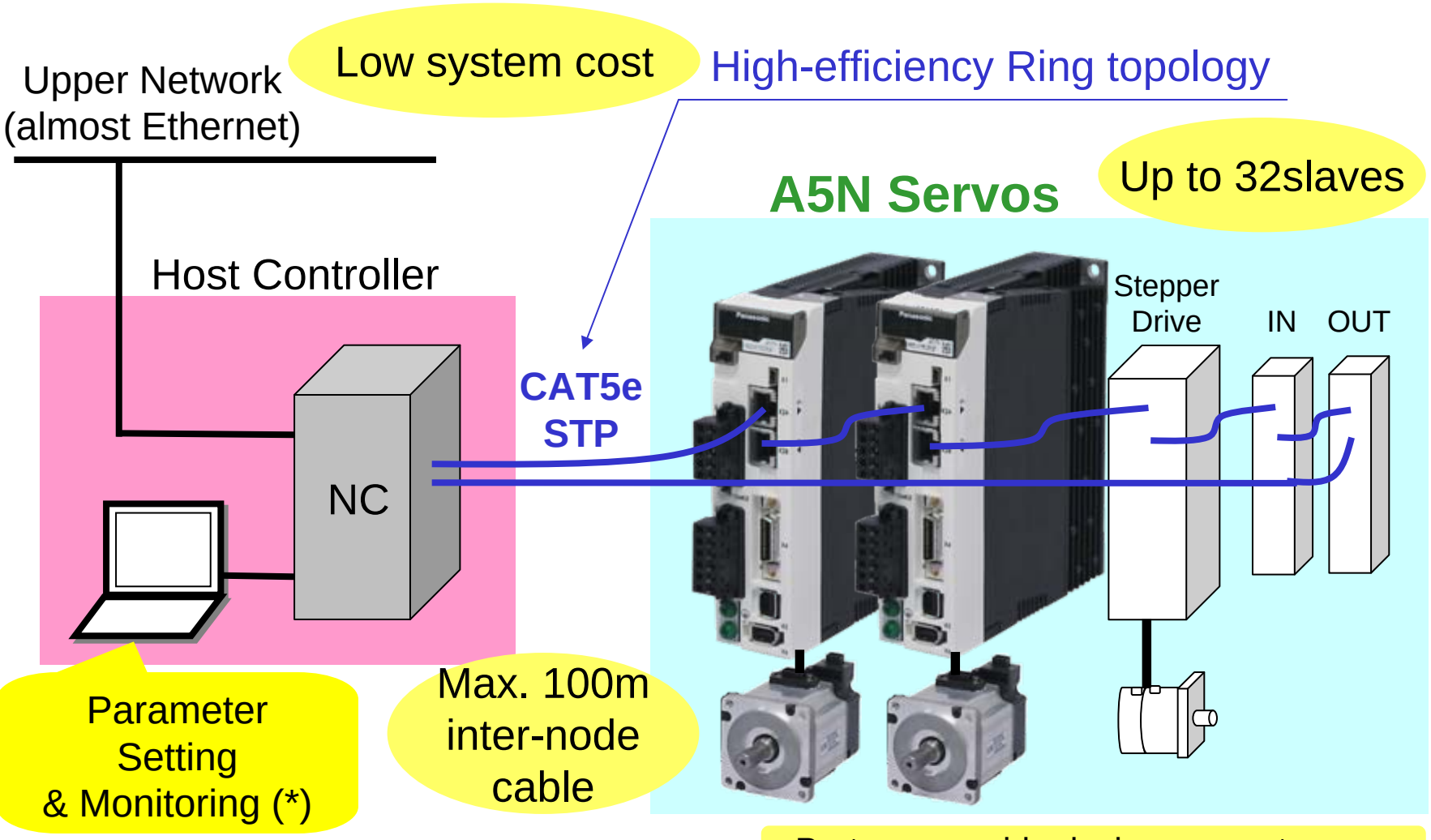

*: Depends on a controller specification

Partners provide devices except servo.

Less Wiring at Multi-Axes

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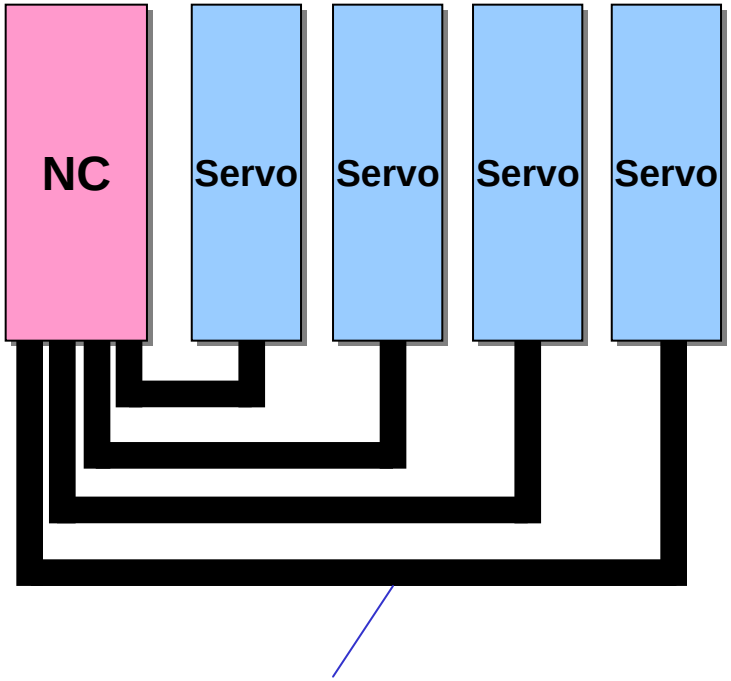
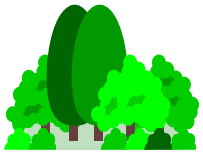
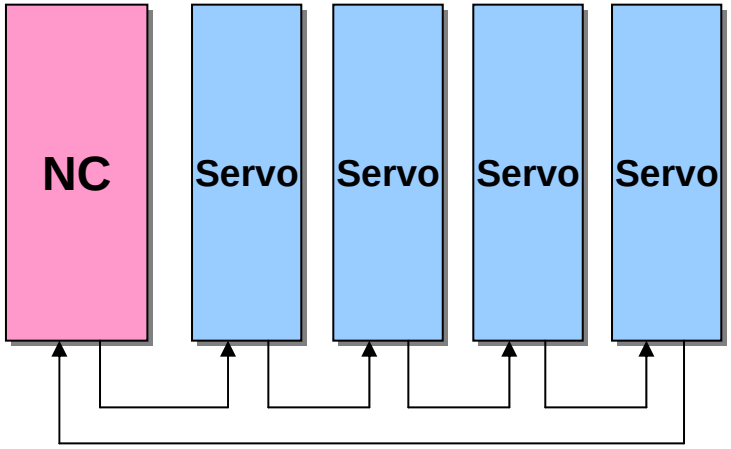
Pulse



Bundle of Many Wires

RTEX





Simple!

Reduced trouble with wiring

Higher benefit in distributed placing

Less Wiring at Single-Axis

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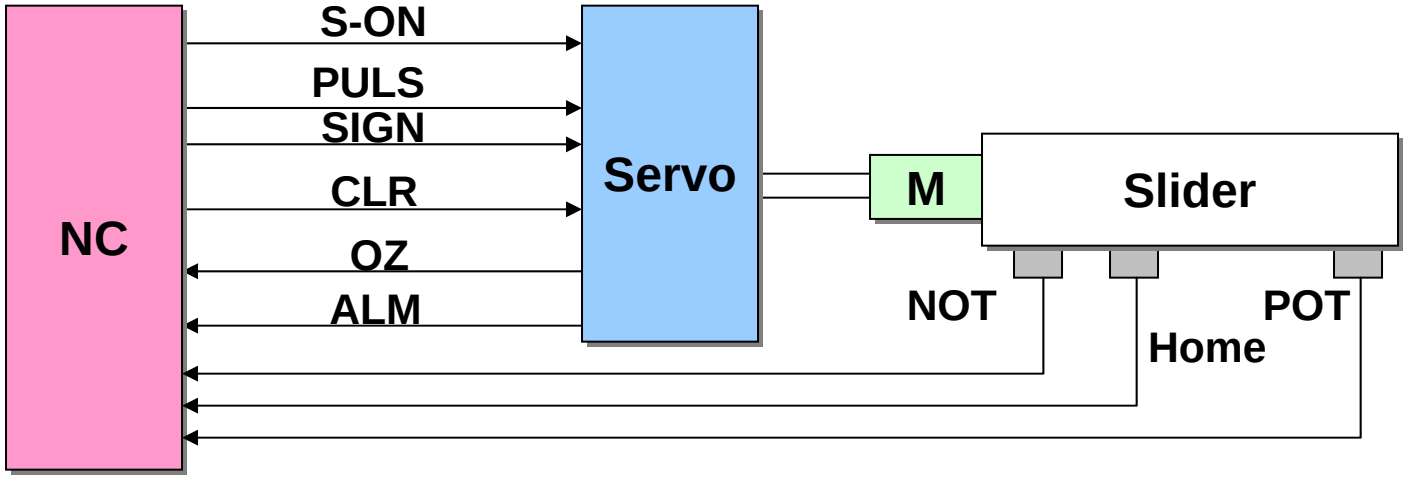
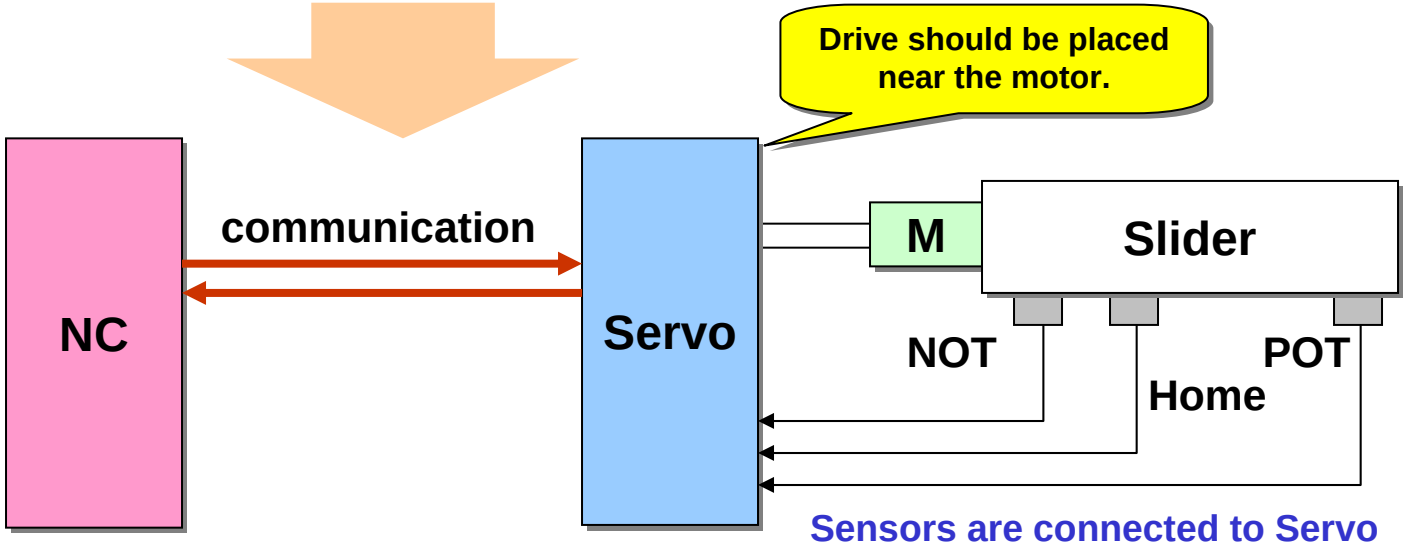
Pulse

Many wires



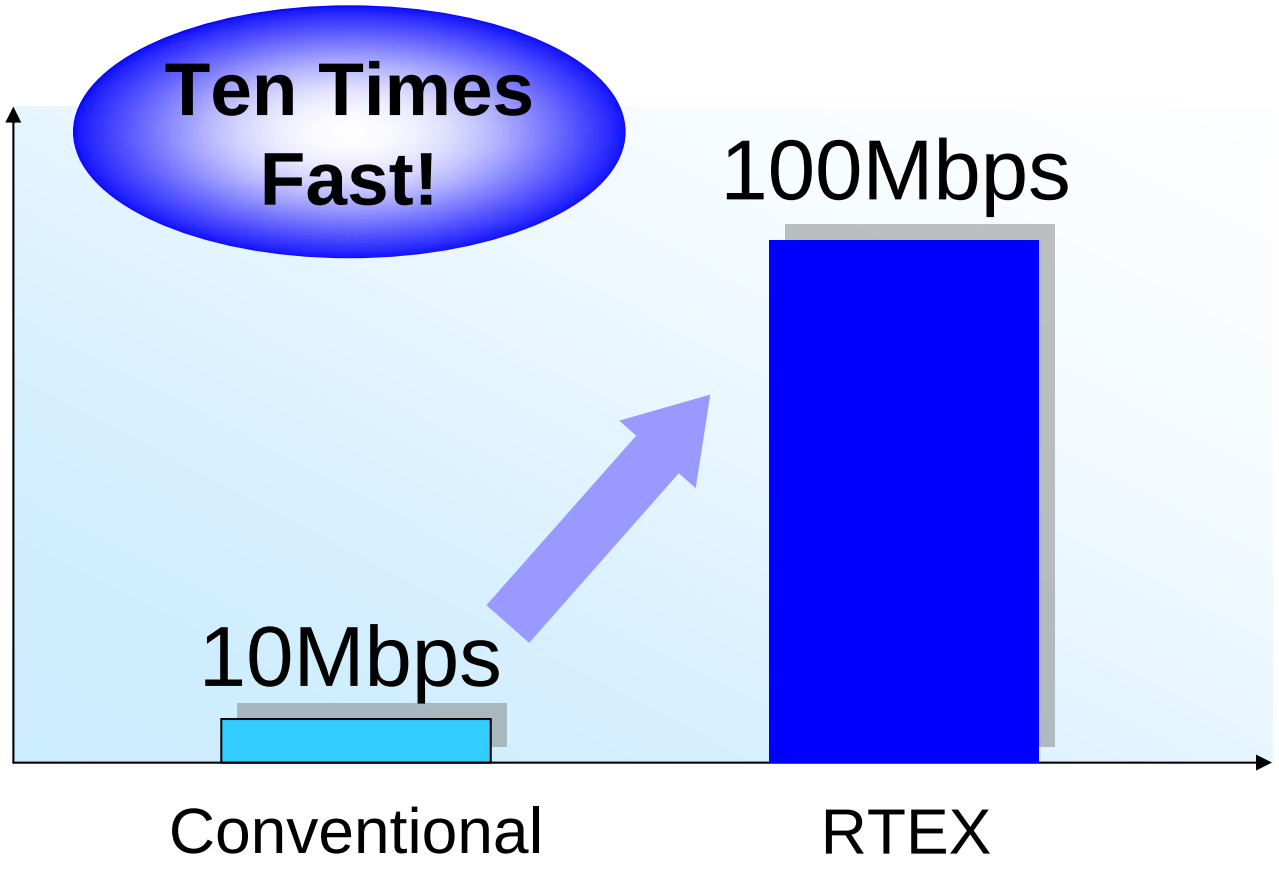
RTEX

Simple!



Sensors are connected to Servo

Ultra High-Speed



Using Low-Cost Cable

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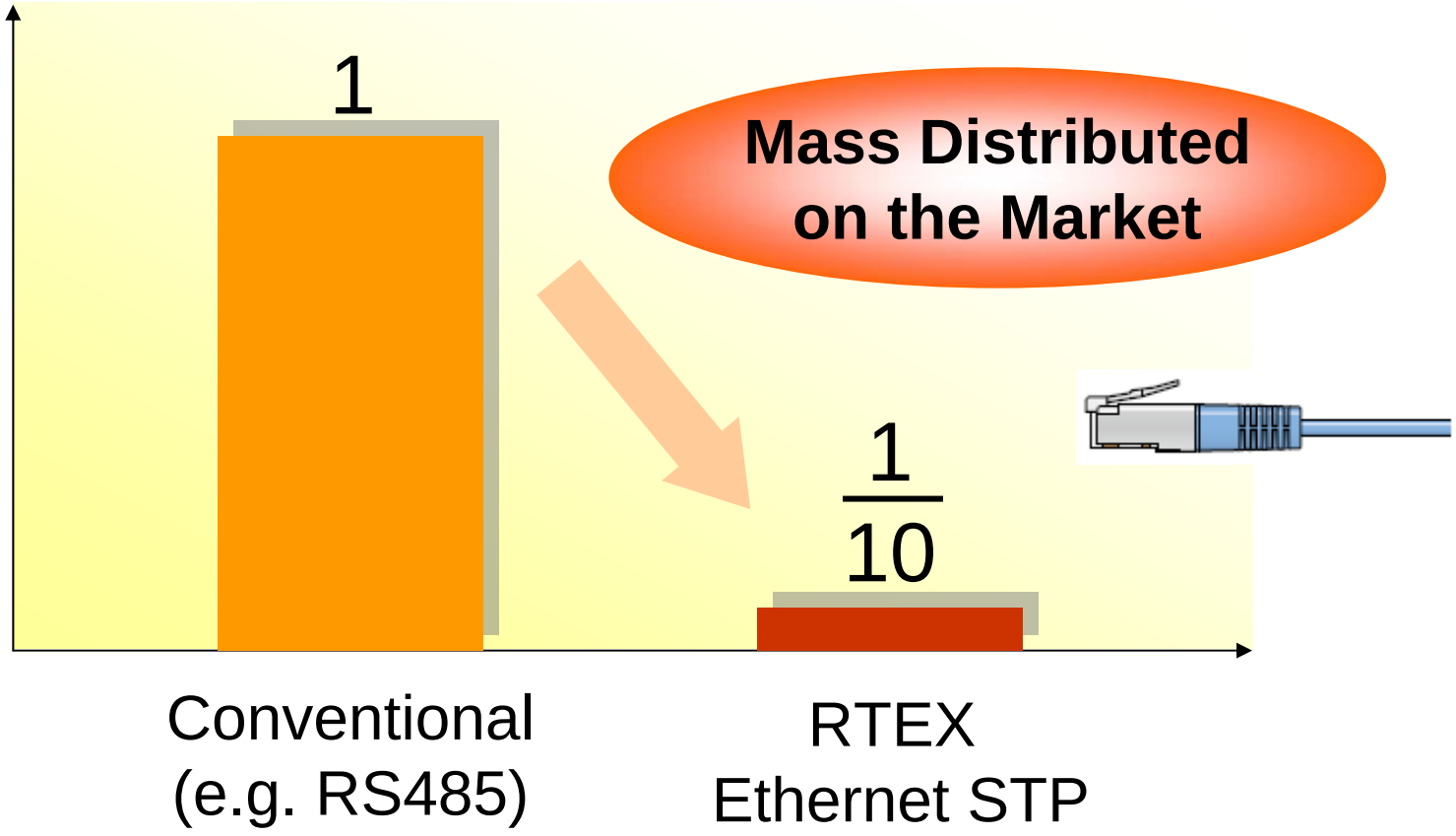
Cost Ratio



Note: An example of 1m length.

Simple Ring Topology

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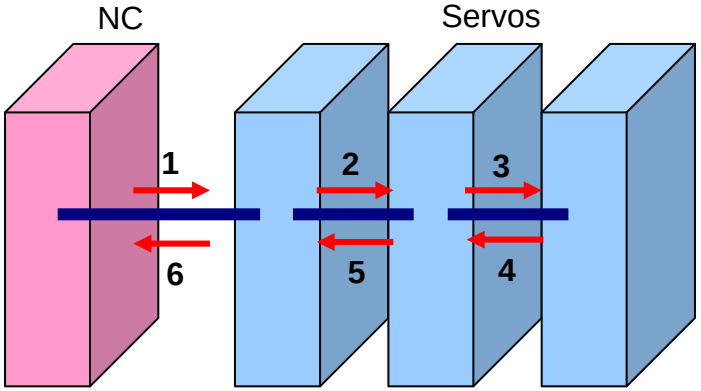
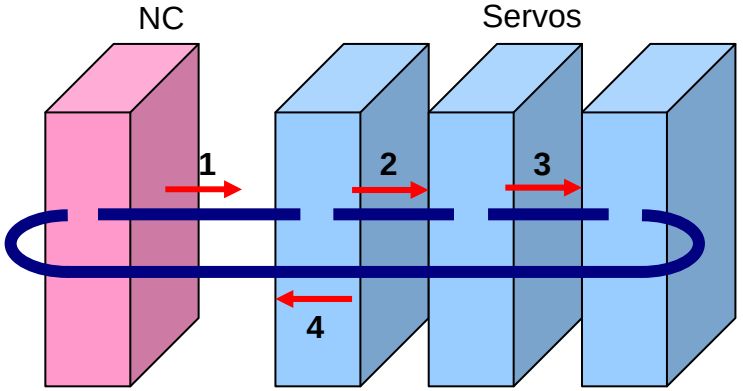
LINE



Bi-directional

RTEX (RING)



Simple One-way (*)

Going via many nodes causes low efficiency.

High Efficiency & Reliability by Simple Data Flow

*: No cross-talk.

Global Collaboration

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Partners provide various devices.

Partners Products

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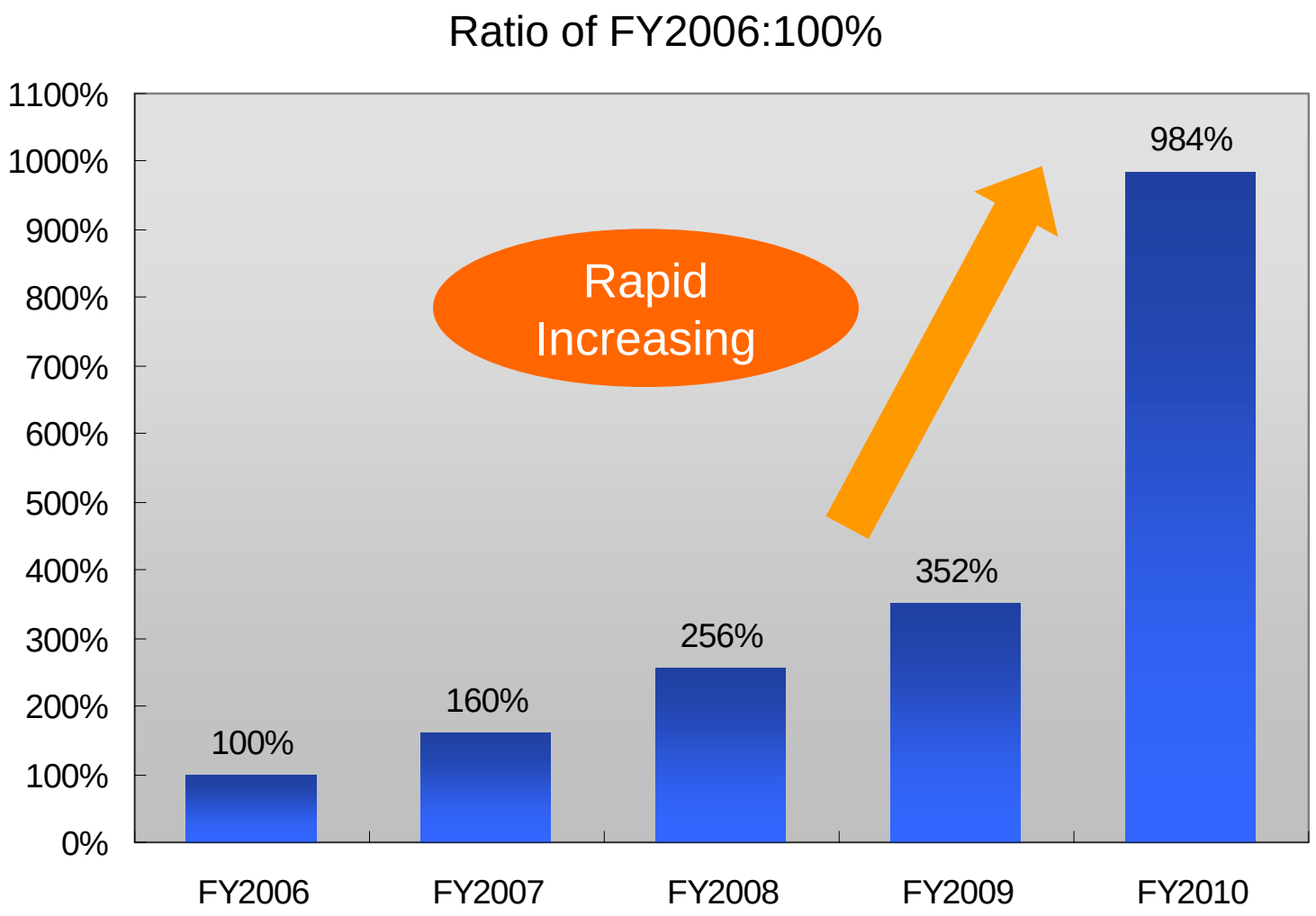
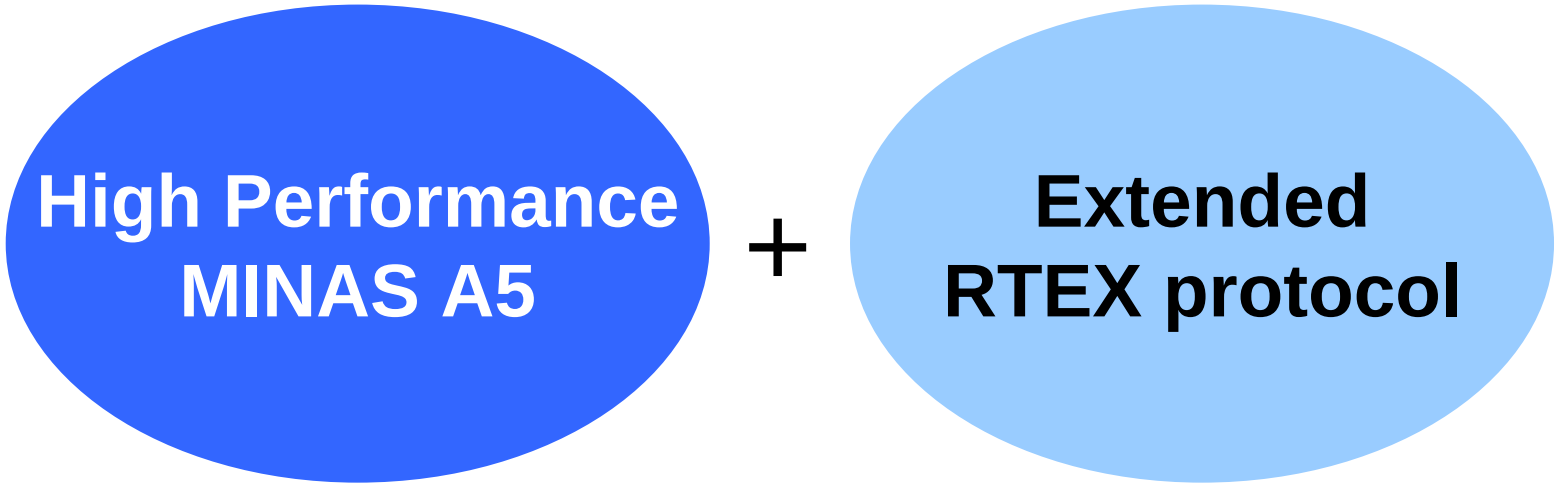
Partner Name	Master				Slave				
	PCI	USB	Stand Alone	PLC	Digital I/O	Analog I/O	Pulse Out	Stepper Drive	Gateway
Asahi Engineering			X					X	
Anywire									X
Cosmo Techs	X				X		X	X	
Soft Servo Systems	X								
Tietech	X			X					
HPtec	X	X			X	X	X		
PEW SUNX				X					
DELTA TAU			X						
Prime Motion			X		X				
AJINEXTEK	X				X	X	X		
AUROTEK	X				X				
BITPASS	X								
COMIZOA	X				X	X	X		
TRIO			X						

Sales Quantity of RTEX Servos



Features of A5N

Evolution from A4N to A5N



Note:
RTEX hardware is not changed.
Basically, A5N is upper compatible with A4N.

Enhanced Performance

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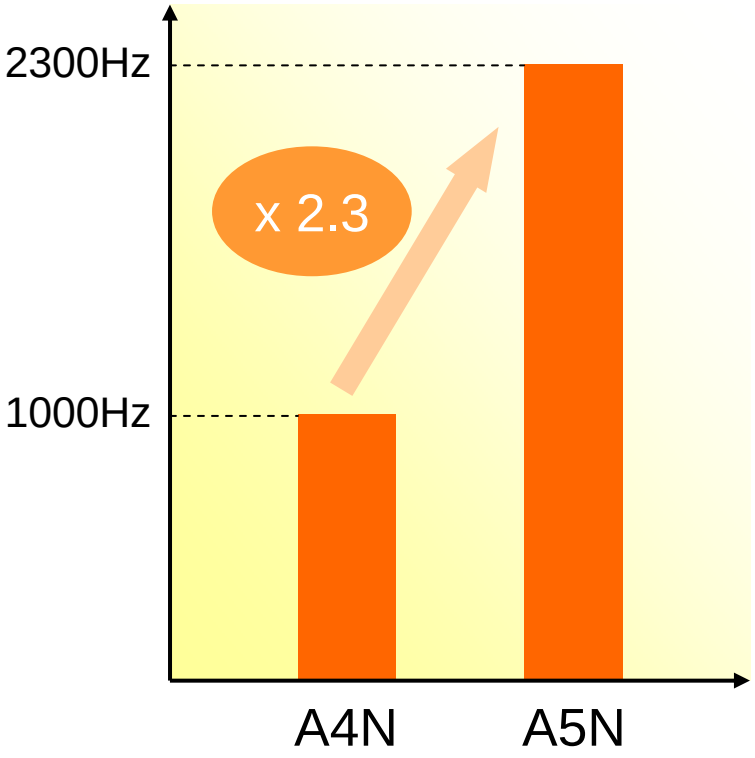
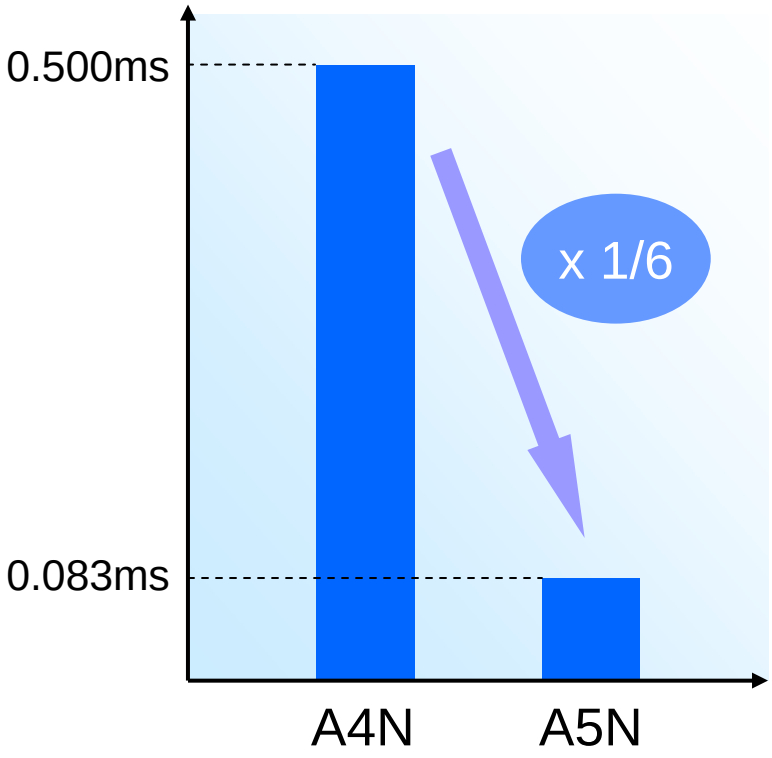
Velocity Response



Communication Period (Min.)



Max. Pulse Frequency

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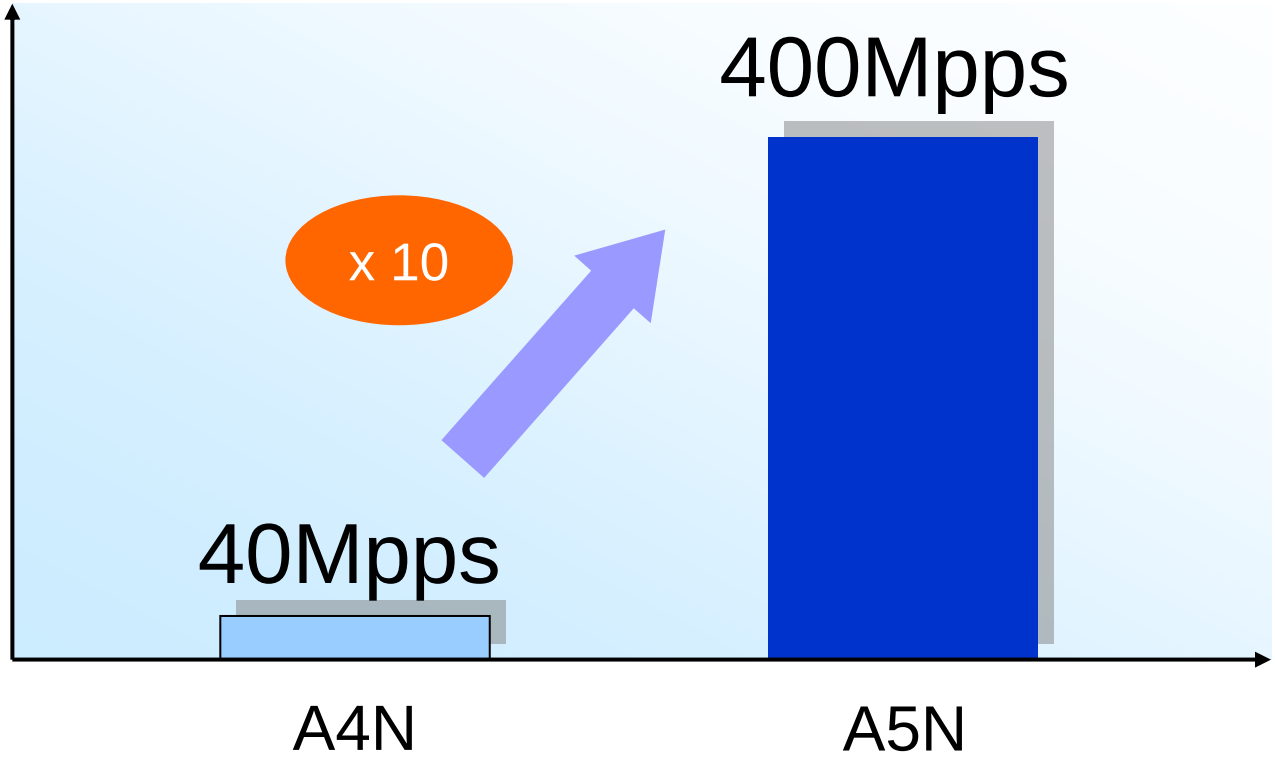
For More High-Resolution
and High-Speed Applications



Note: If using A/B phase linear encoder, it is limited to maximum 4Mpps.

New Functions

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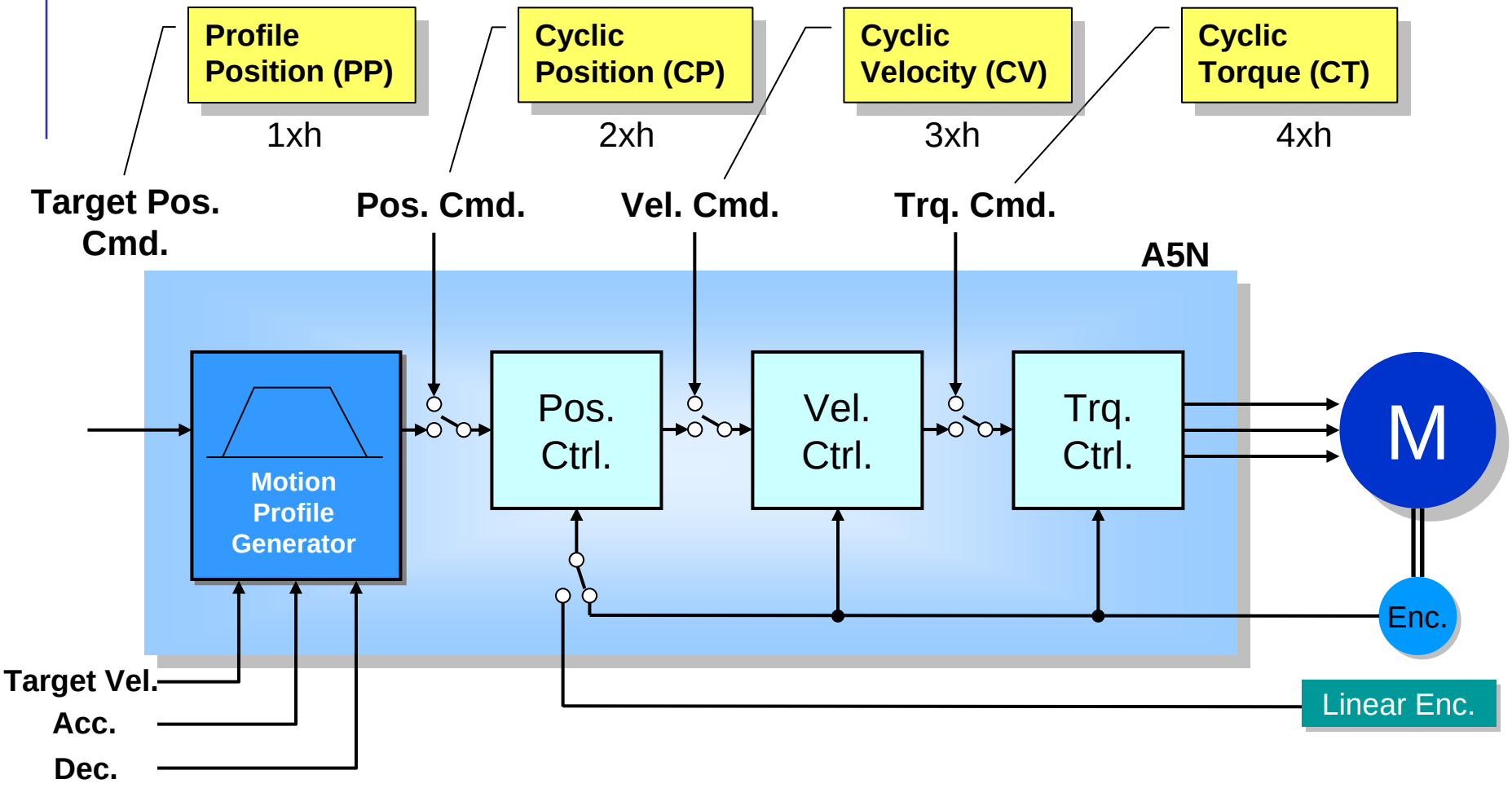
By the Expansion of RTEX spec.

- TPos./Pos./Vel./Torq. All Modes
- Shorter Communication Period
- 32bytes/axis Mode for Monitoring
- Precise Position Latch
- Feed-Forwards from Controller
- Internal Torque Feed-Forward
- A/B-pulse Linear Encoder I/F
- 20bit/r Encoder
- Reduced Vibration by New Current Sensing
- Three-Phase Power Input
- Safety* I/F (Specific model)

By A5 Base

Note *: IEC61800-5-2 STO (Safe Torque Off), IEC61508 SIL2 (Safety Integrity Level 2)

All-in-One Motion I/F



Note: Profile Position is applicable to only PTP control.

Period, Axes and Modes

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Update Period	Com. Period	Max. # of Axes		Available Mode	Full-Closed Control
		16byte mode	32byte mode		
1.000ms	1.000ms	32	16	PP, CP, CV, CT	Available
1.000ms	0.500ms	32	16	PP, CP, CV, CT	Available
0.500ms	0.500ms	32	16	PP, CP, CV, CT	Available
0.166ms	0.166ms	10	-	CP, CV, CT	-
0.166ms	0.083ms	5	-	CP, CV, CT	-

Com. Period: Frame transmitting period
Update Period: Data updating period on frame

Update and Com. Period

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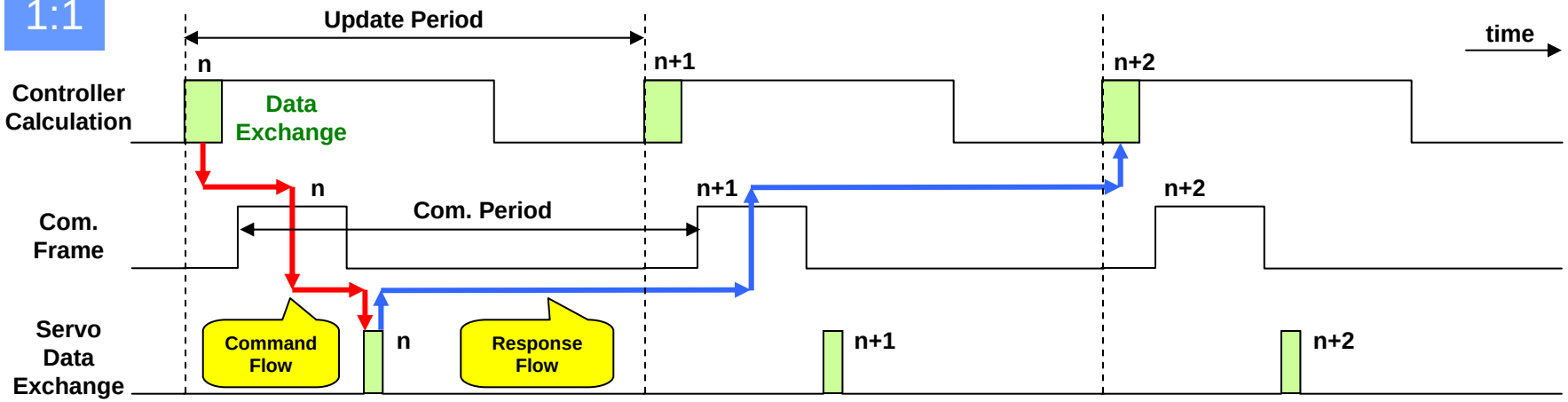
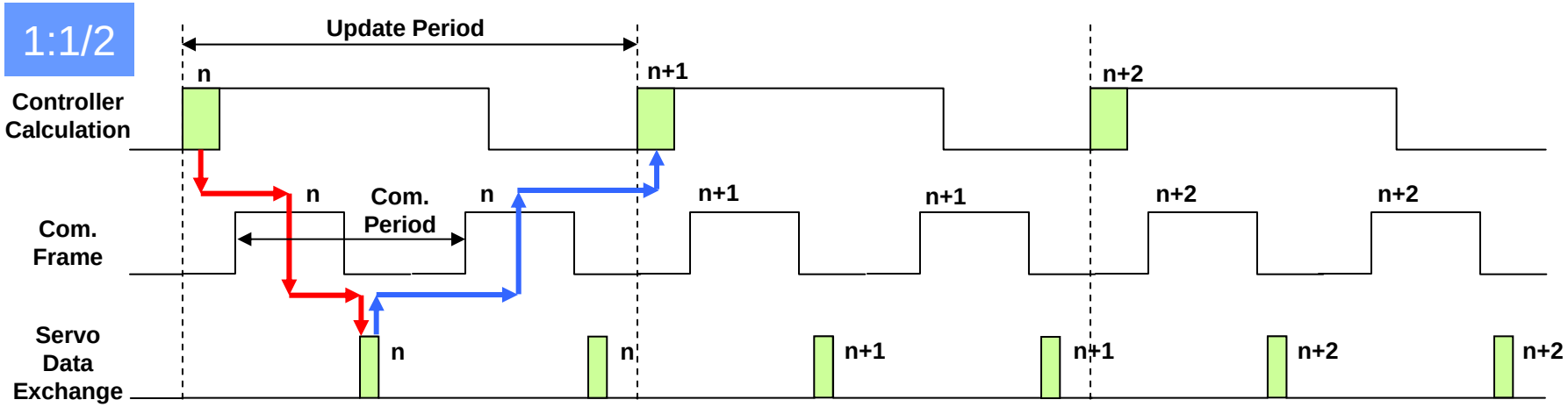
Shorter communication period makes quick response.

1:1



Data Exchange: Data reading and writing to com. ASIC

1:1/2



Note: The command is transmitted two times. If previous data is communication error, later data is used in servo.

Monitoring Item Examples

- Drive Model No.
- Drive Serial No.
- Firmware Version
- Motor Model No.
- Motor Serial No.

- Alarm Code (History)
- Warning Code

- Parameter

More Increased than A4N

- Actual Position
- Actual Velocity
- Torque
- Position Error
- Encoder Resolution
- Command Position
- Latch Position
- Command Velocity
- Re-Generative Ratio
- Over-Load Ratio
- Inertia Ratio
- Rotor Mechanical Angle
- Rotor Electrical Angle
- Absolute Multi-turn Data
- P-N Voltage
- Com Err. Count
- Encoder Com. Err. Count
- X4 Connector Inputs

- Power-ON time
- Drive Temperature
- Encoder Temperature
- Relay Switch Times
- Fan ON Time
- Fan Life Time
- Capacitor Life Time

Precise Position Latch

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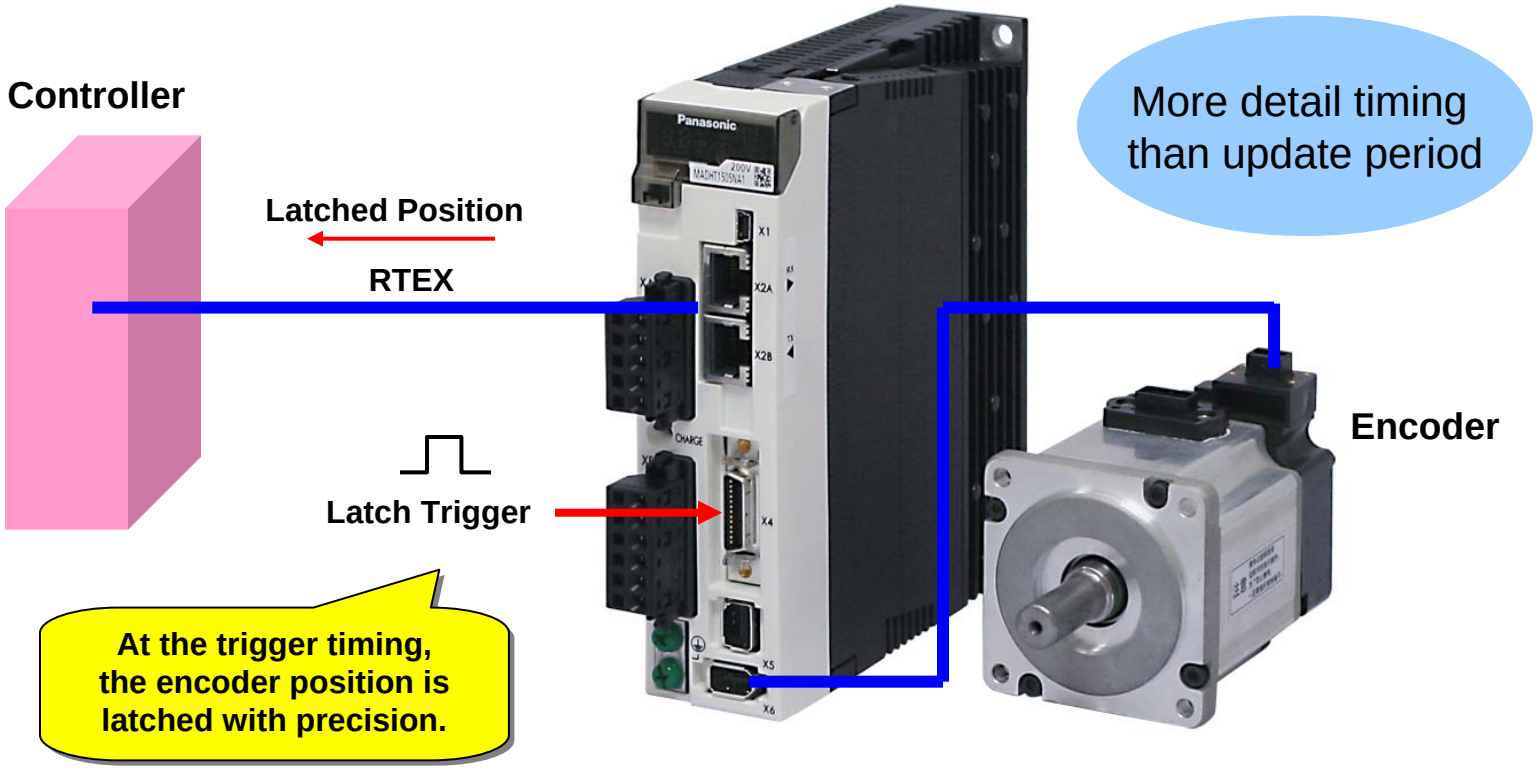
After the encoder position is latched at trigger timing,
it is sent to the controller with RTEX.



2ch available for trigger input

Feed-Forwards from Controller

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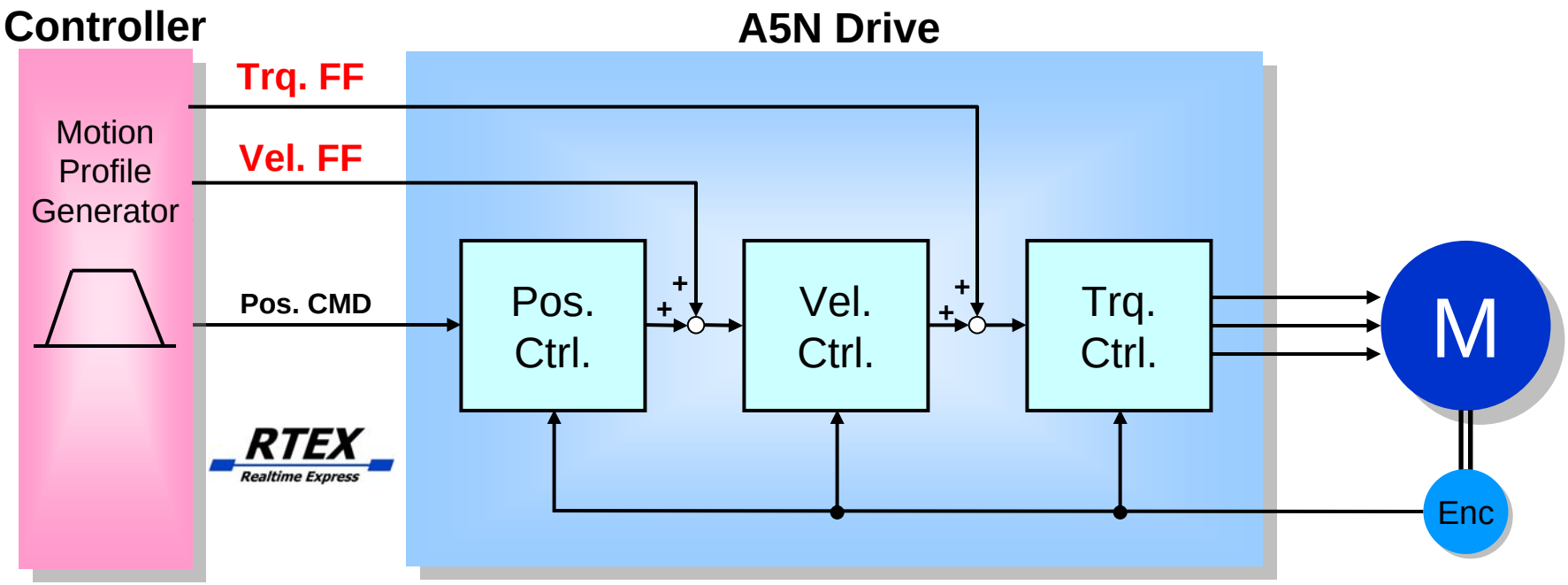
High-resolution feed-forward by controller is effective for both high-response and low-vibration.



Note:
- In 16byte mode, either velocity or torque FF.
- Torque FF is also useful for torque compensation in circular interpolation.

Encoder I/F

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Full-Closed Control

A5N Drive

Motor

Rotary Encoder

Linear Encoder

X5: Serial or A/B/Z

X6: Serial

A/B/Z-pulse supported
Max. 4Mpps

Linear Motor Drive (Specific Model)

A5N Drive

Linear Motor

Linear Encoder

X5: Serial or A/B/Z

X6: CS1 to 3 (Unnecessary in auto-detect mode)

Note: Panasonic does not provide linear motor.

Serial Linear Encoder

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GSI MicroE Systems

Magnescale SPEED × PRECISION

Mitutoyo

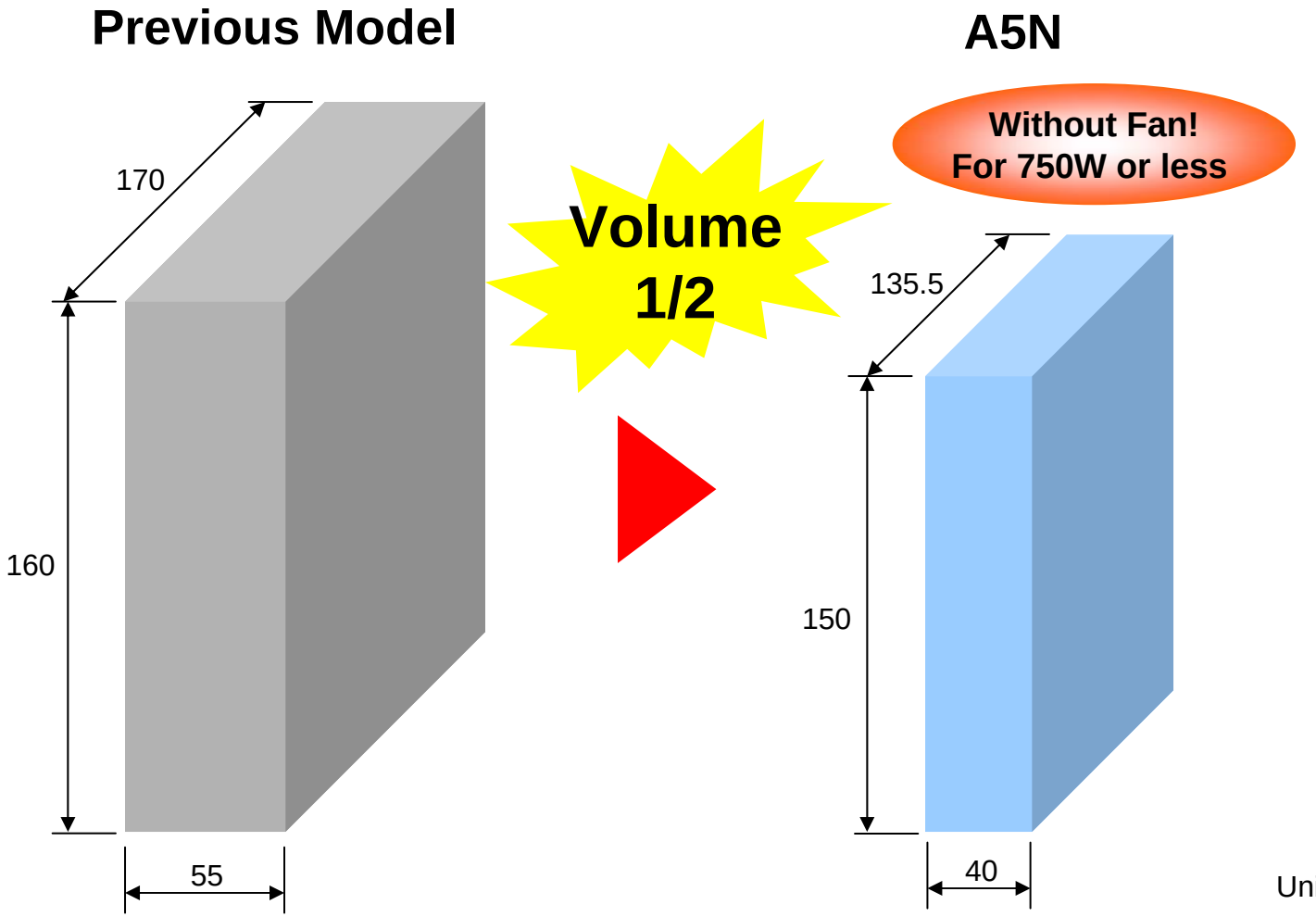
RENISHAW apply innovation™

FAGOR

	Manufacturer	Model	Resolution [um]	Max Speed [m/s]
Incremental	GSI Group	M II 5000	0.1	5
	Magnescale	SL700+PL101RP/RHP	0.1	10
		SL710+PL101RP/RHP	0.1	10
		SR75	0.01 to 1	3.3
		SR85	0.01 to 1	3.3
Absolute	Magnescale	SR77	0.01 to 1	3.3
		SR87	0.01 to 1	3.3
	Mitutoyo	AT573A	0.05	2.5
		ST778A(L)	0.1	5
	Renishaw	RESOLUTE	0.001	0.4
			0.05	20
			0.1	40
	FAGOR	SAP / SVAP / GAP	0.05	2.5
		LAP	0.1	2

Note: Due to max. pulse frequency of servo drive, the resolution and max. speed may be different from linear encoder specifications.

Compact



Note: Comparison with B series (200W, 200V)

Compliance

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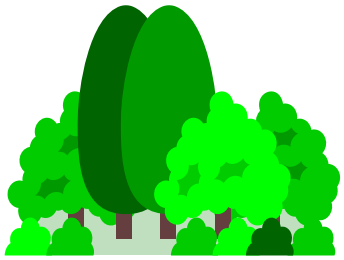
EMC Directive

EN55011	Terminal Disturbance Voltage	group 1, class A
	Radiated Electric Field Strength	group 1, class A
IEC61000-4-2	Electrostatic Discharge	8kV
IEC61000-4-3	Radiated Susceptibility	10V/m
IEC61000-4-4	EFT/Burst	2kV
IEC61000-4-5	Surge	2kV
IEC61000-4-6	Conductive Susceptibility	150kHz-80MHz, 10V
IEC61000-4-11	Voltage Dips	

RoHS



Features of ***RTEX***

Difference from Ethernet

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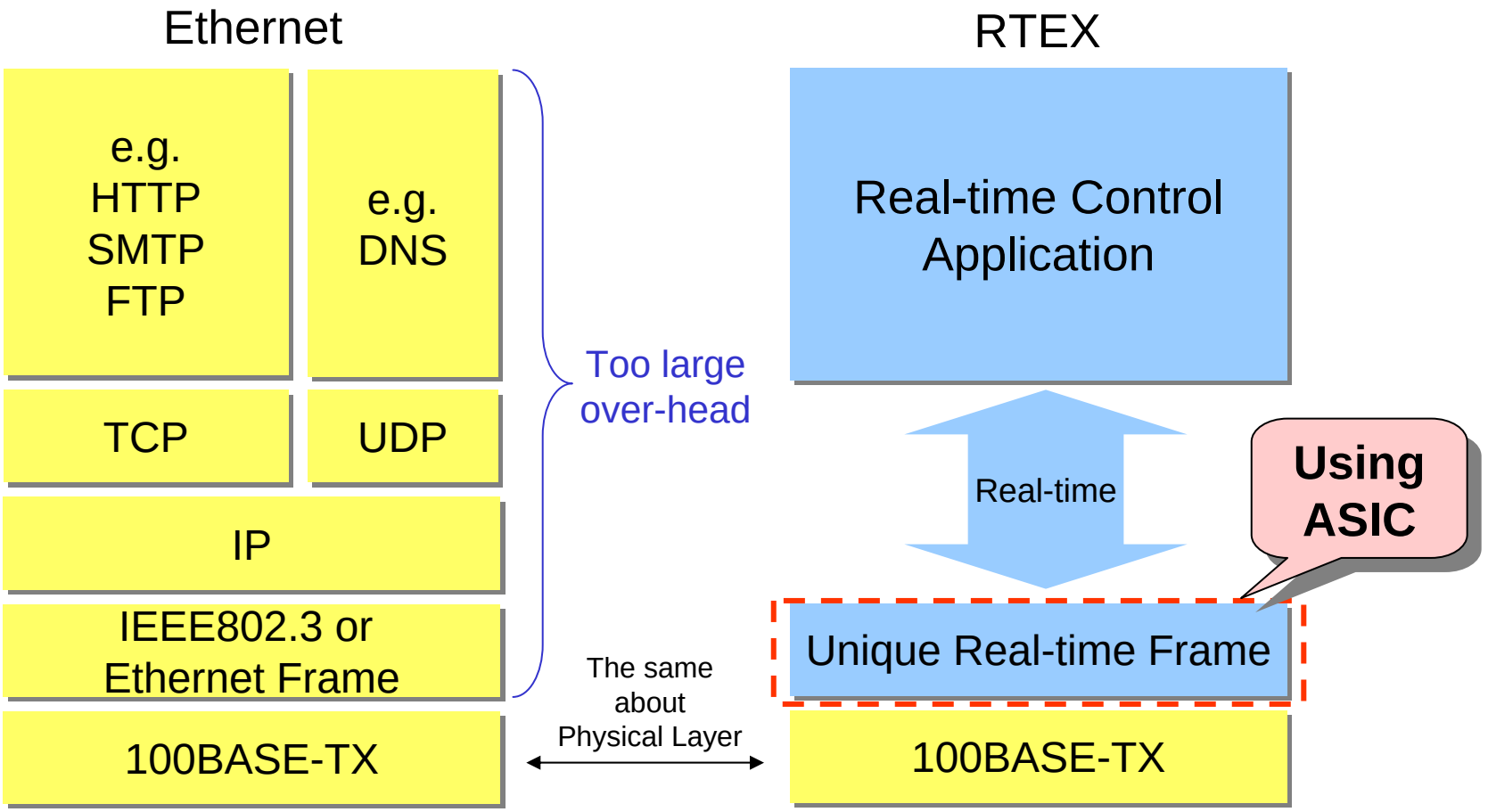
Upper layer optimized for servo control



Note: Ethernet is a registered trademark of Xerox corporation.

Efficient Frame

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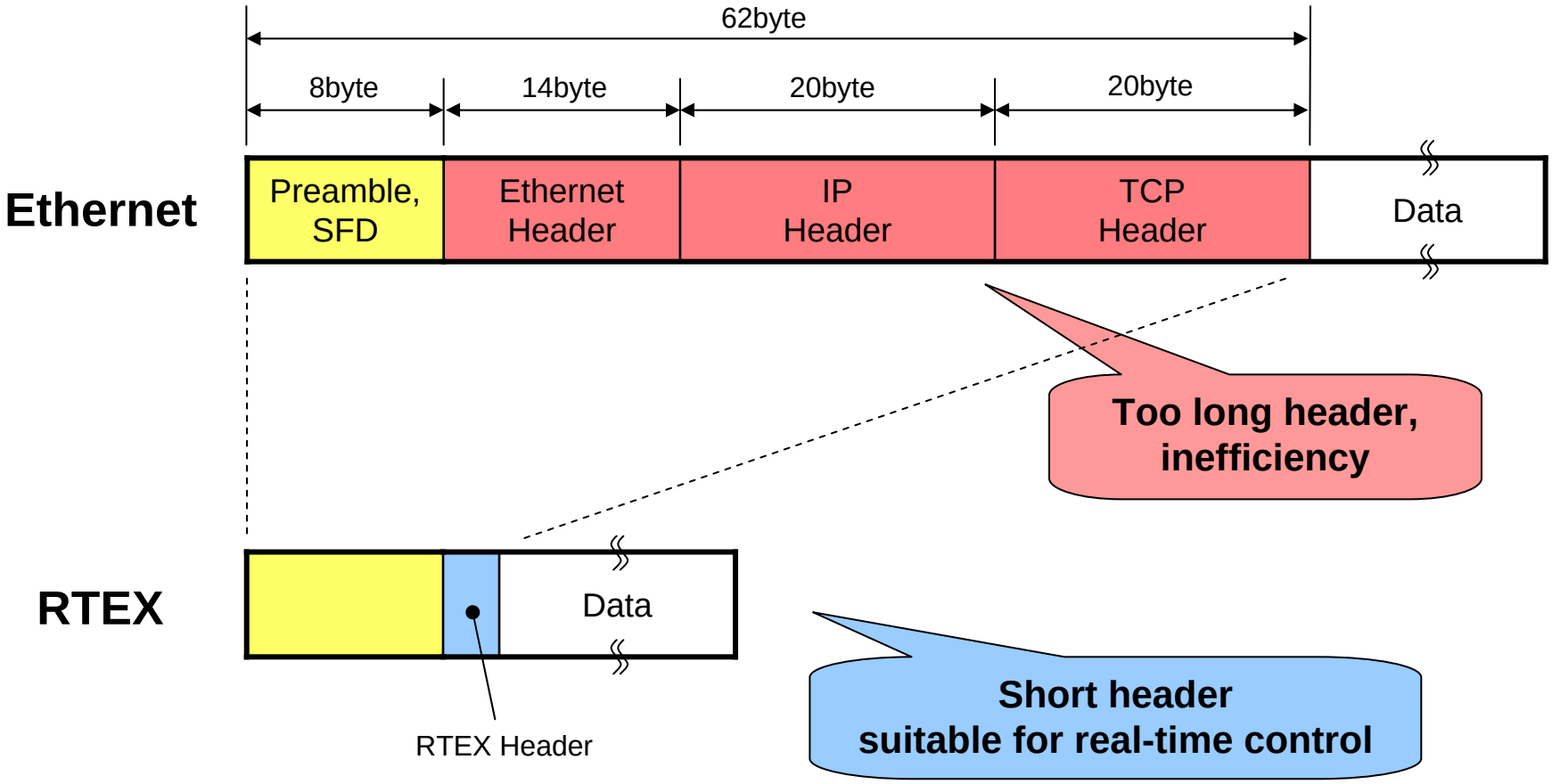
Simplified frame to realize high-speed real-time control



Real-time Communication

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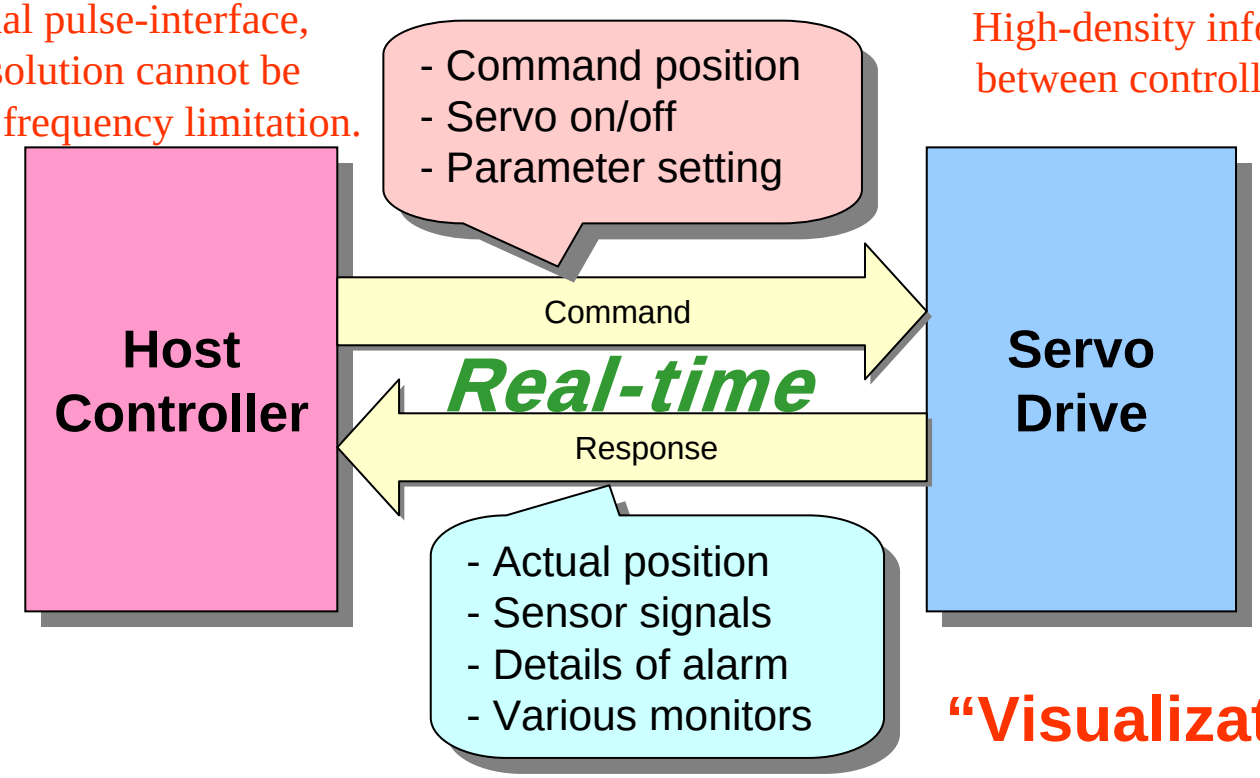
Fast and High Resolution Motion Command

In conventional pulse-interface, command resolution cannot be increased due to frequency limitation.

Parameter Setting and Monitoring

High-density information links between controller and servos.



“Visualization”

Isochronous among Axes

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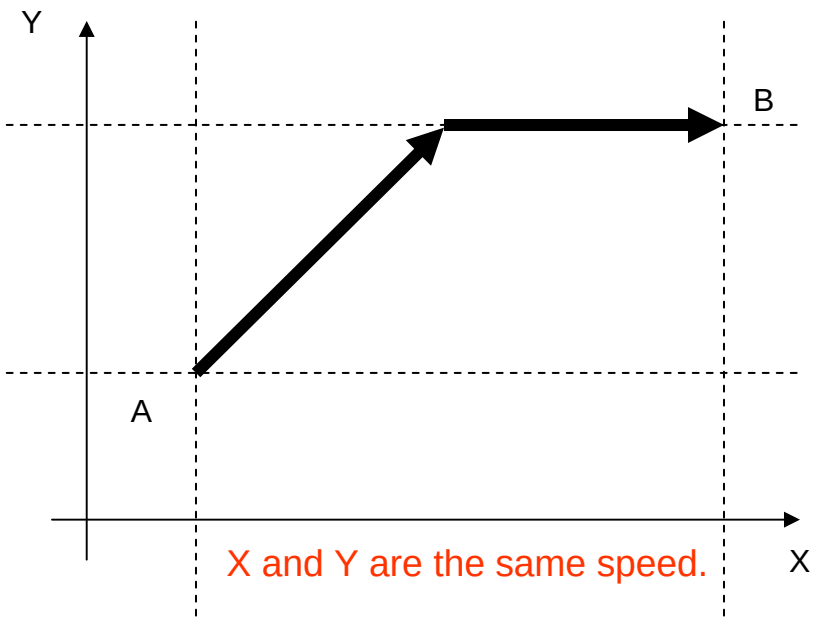
PTP

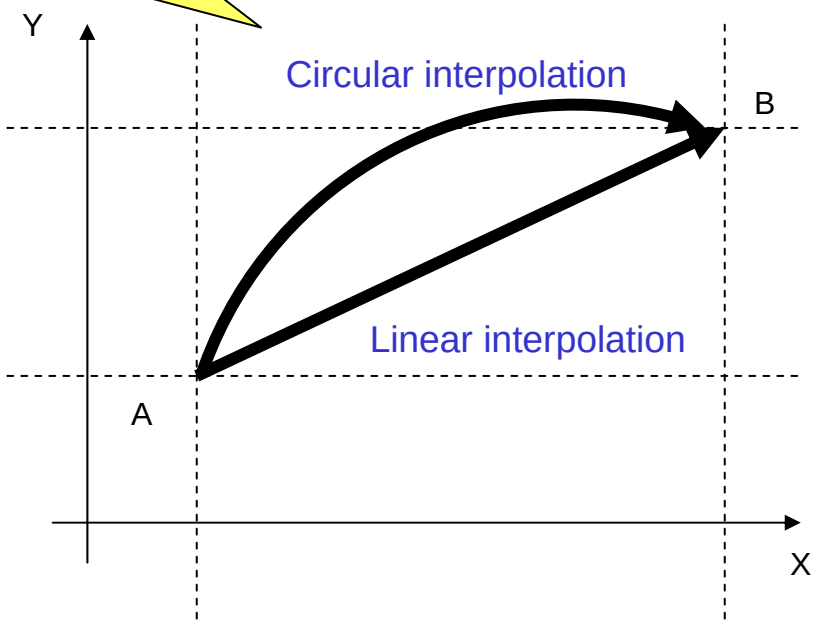
Point To Point

Isochronous enables CP.

CP

Continuous Path





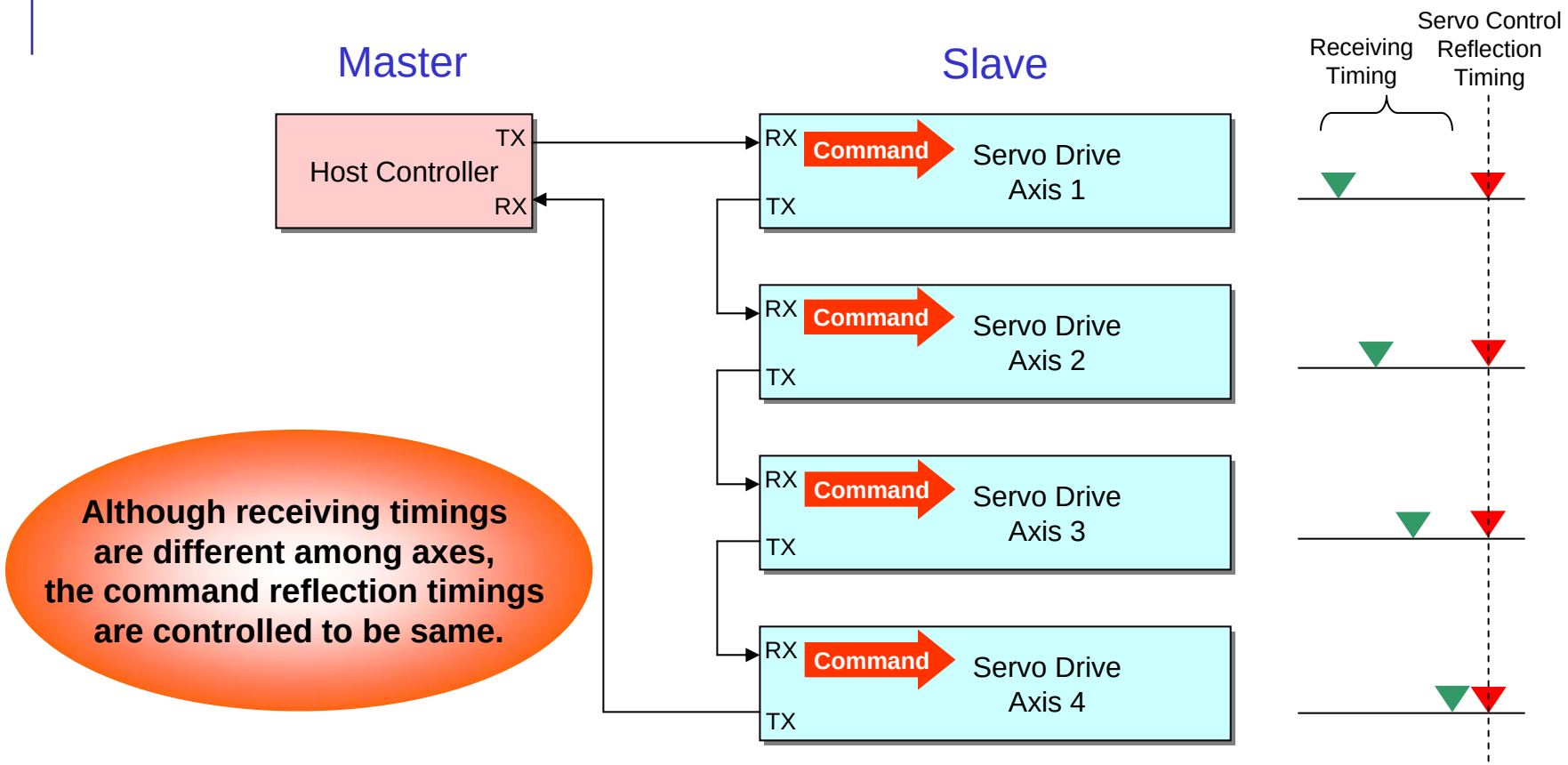
- Separately positioning
- Not corresponding Start/Stop timing between X and Y

- Synchronized positioning
- Corresponding Start/Stop timing

Note: CP control depends on a controller specification, and does not perform with only servo drive.

Isochronous transmission

At the same time, commands are reflected in all servo drives.



Isochronous Accuracy

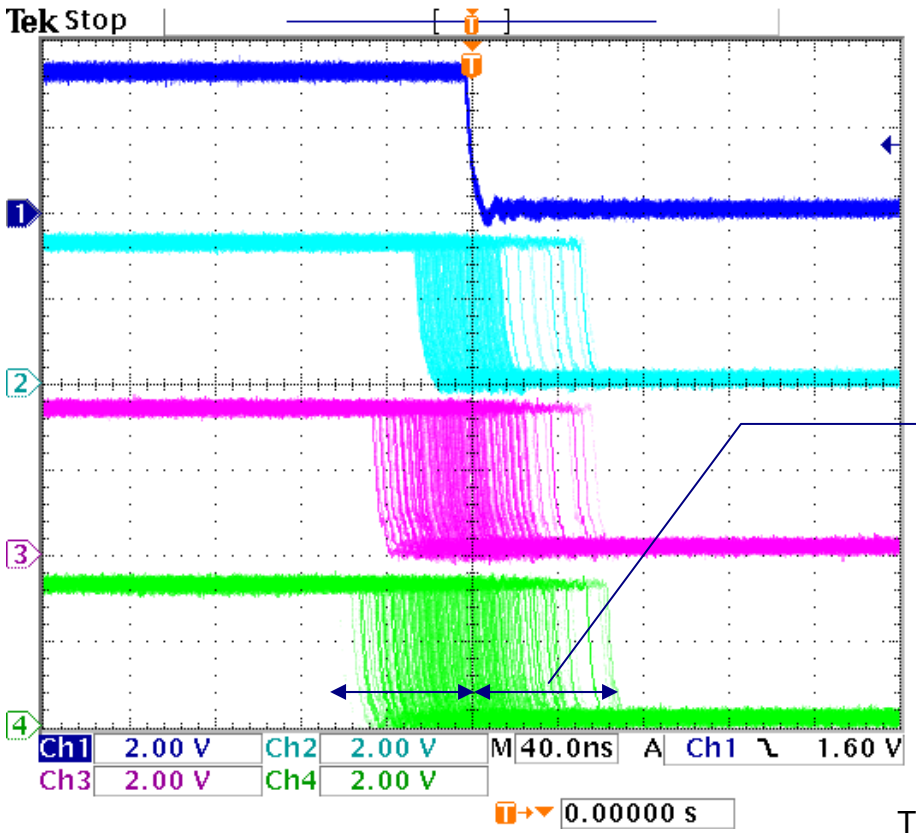
Signals to start servo calculation inside each drive

Axis 1

Axis 2

Axis 3

Axis 4



Jitter: +/- 70ns

The number of axes: 4
Cable length inter-node: 0.3m

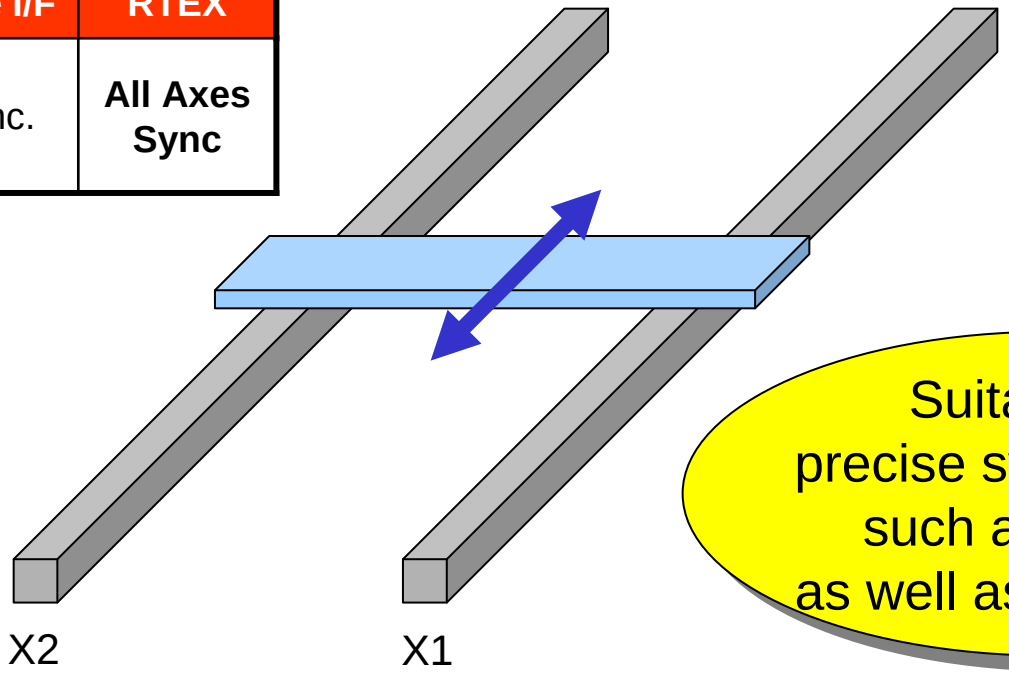
Note: Generally, jitter less than 1us is ideal.

Fully Synchronization

NC is synchronized with all servo controls (position, velocity, current, PWM) with a unique patented algorithm.

Improvement of sync precision among axes!

	Pulse I/F	RTEX
Servo Control	Async.	**All Axes Sync**



Suitable for precise synchronizing such as a gantry as well as CP control.

Pulse and RTEX

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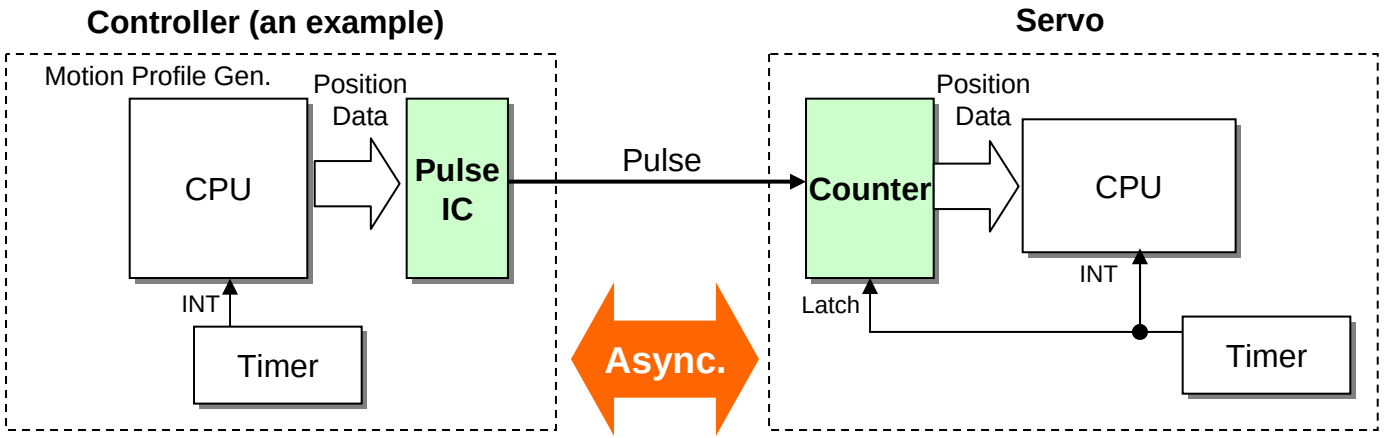
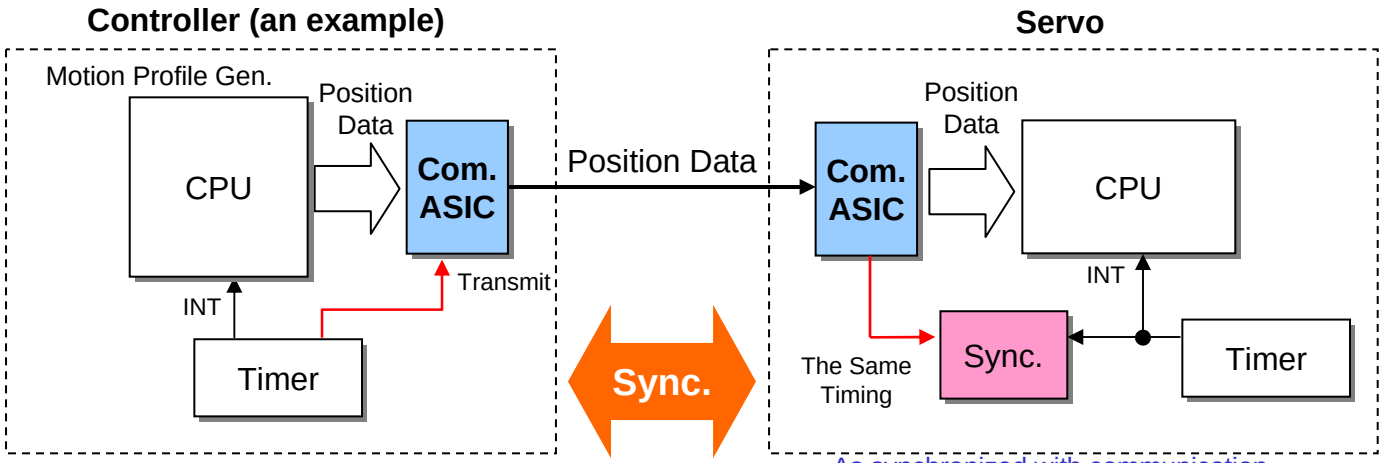
Pulse



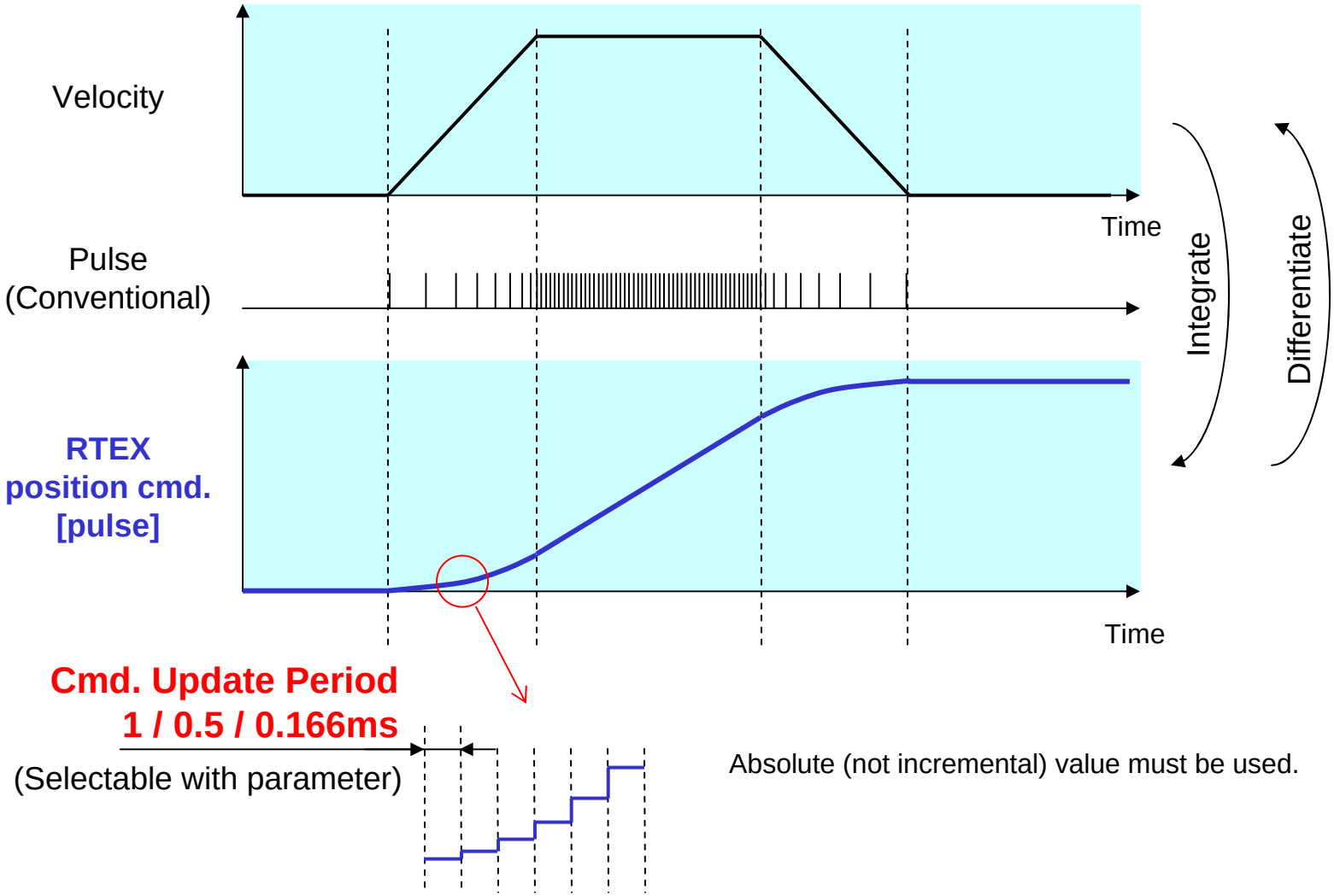
As each servo makes sampling independently, data reflected timings are different among axes.

RTEX



As synchronized with communication, data is reflected at the same time in all axes.

Cyclic Position Command

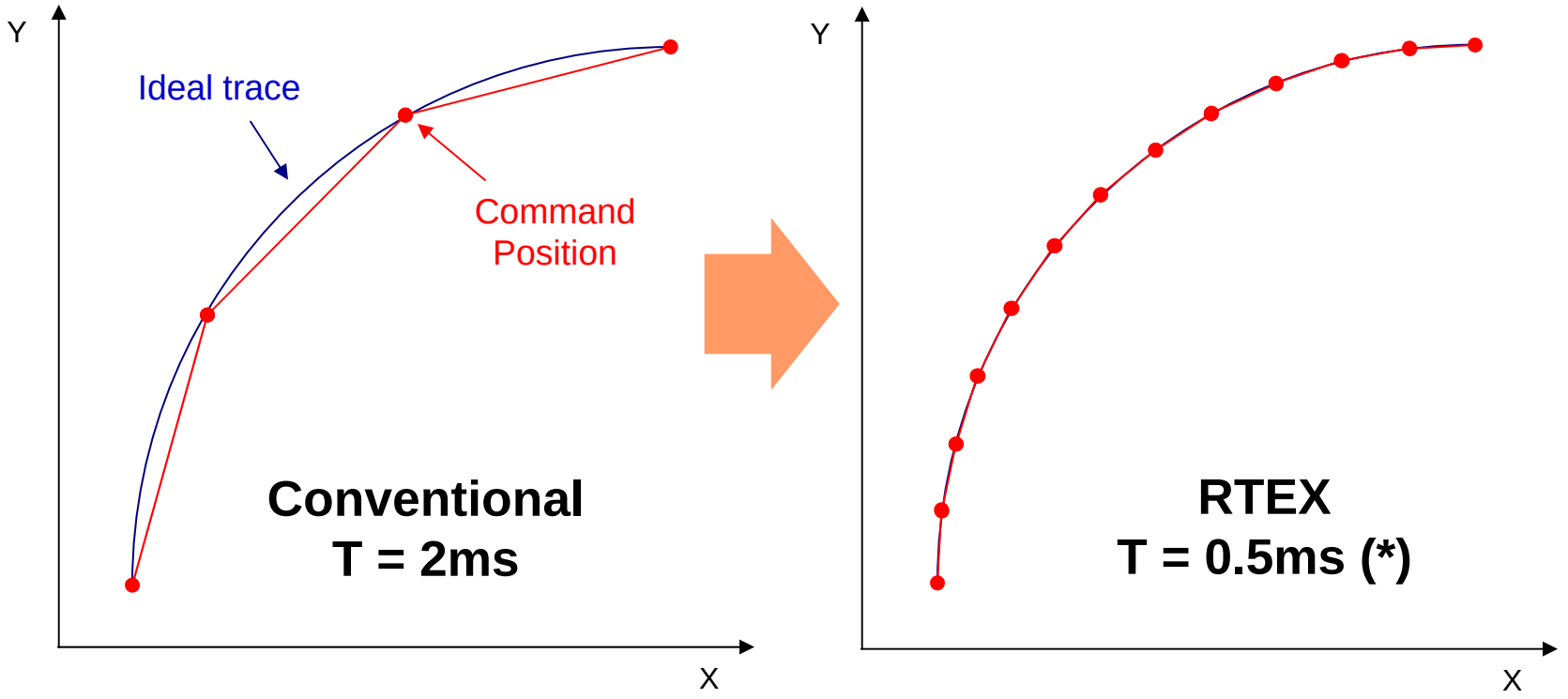


Absolute (not incremental) value must be used.

Shorter Update Period

More Precisely on High-speed CP control

Micro circular interpolation such as dispenser



*: Data update period depends on controller specification.

Shorter Transmission-Time

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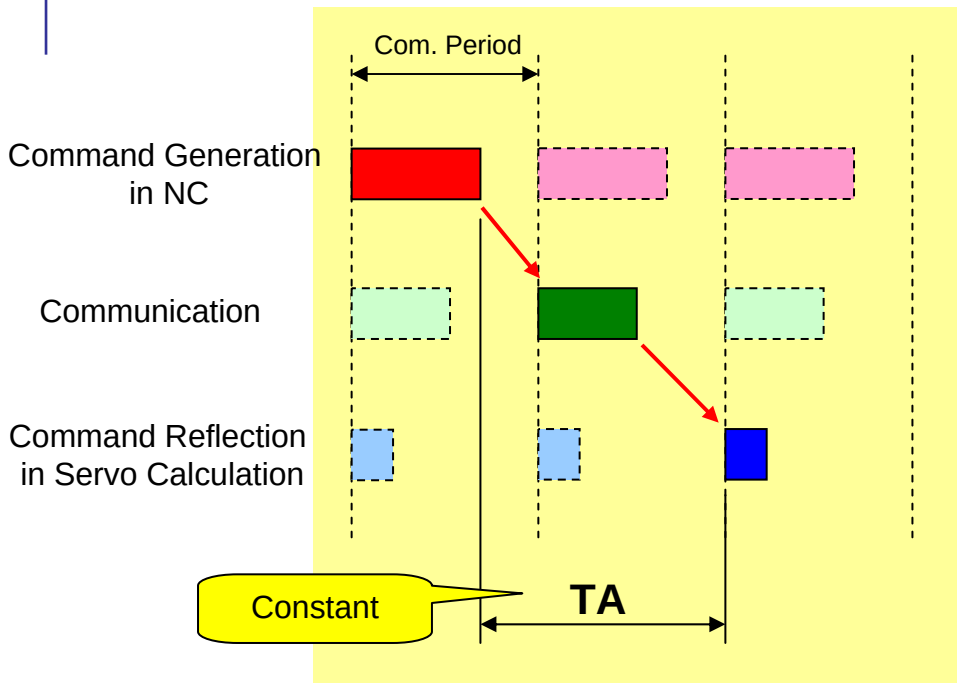
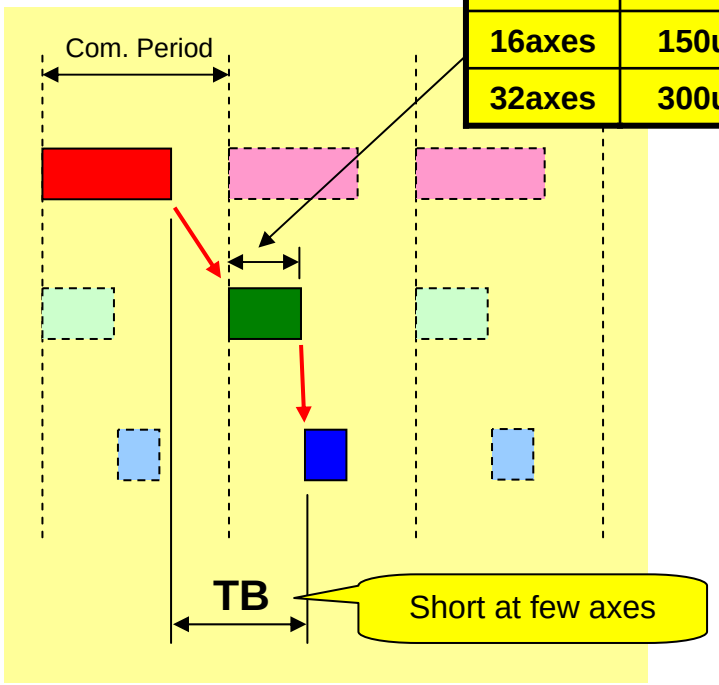
Proportion to # of axes

4axes	38us
8axes	75us
16axes	150us
32axes	300us

Conventional System



RTEX



TA > TB

Commnad is applied to the servo control as soon as after all axes receiving.

Note: The above shows a case when the data update is done with the same period as the communication.

Error Correction

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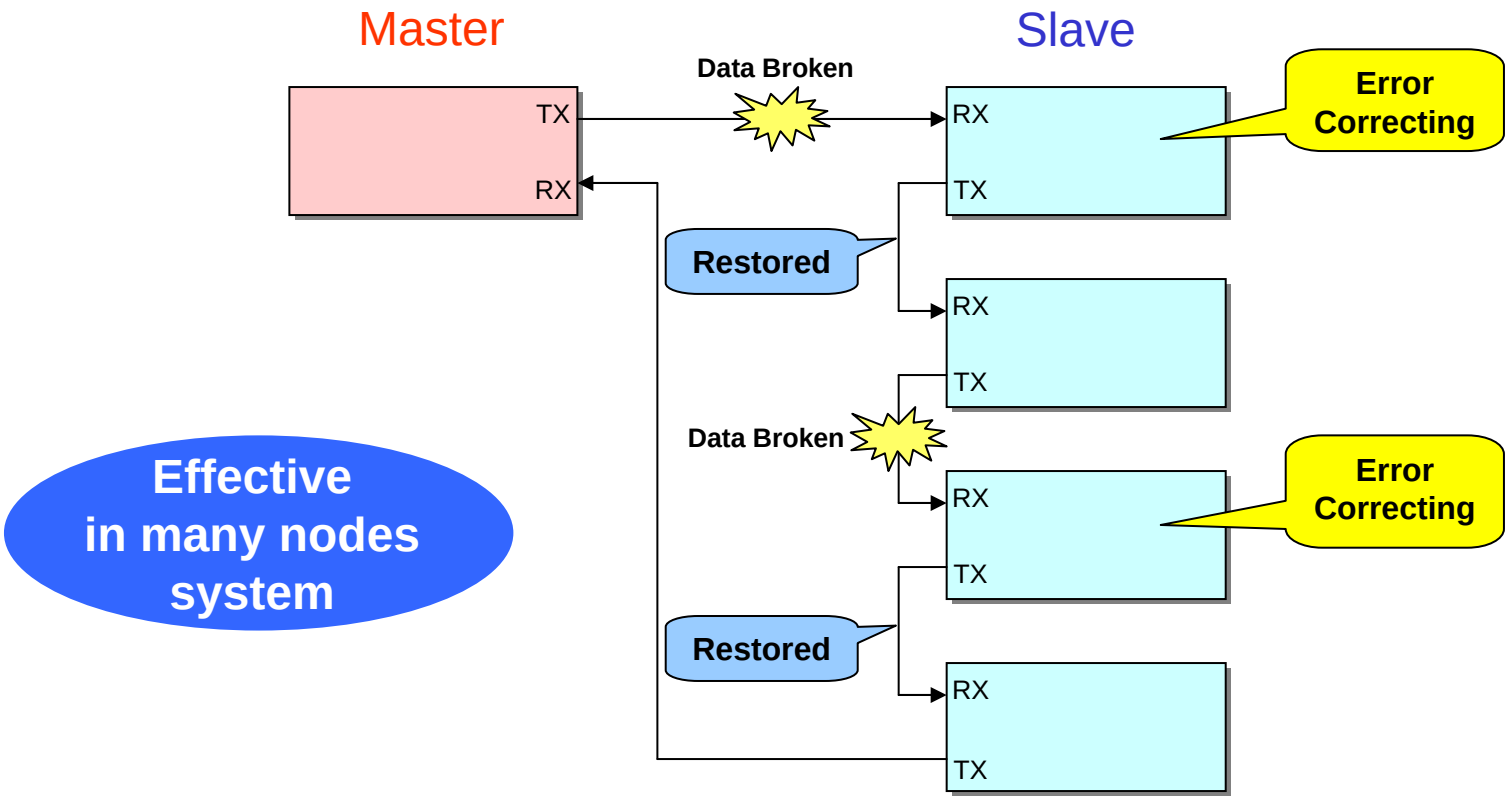
Error corrected at going through nodes.

►►► **Strong Noise Immunity**



Note: Because of limitations of the error correct ability, there is a case where it cannot restore broken data.

Specifications of *RTEX*

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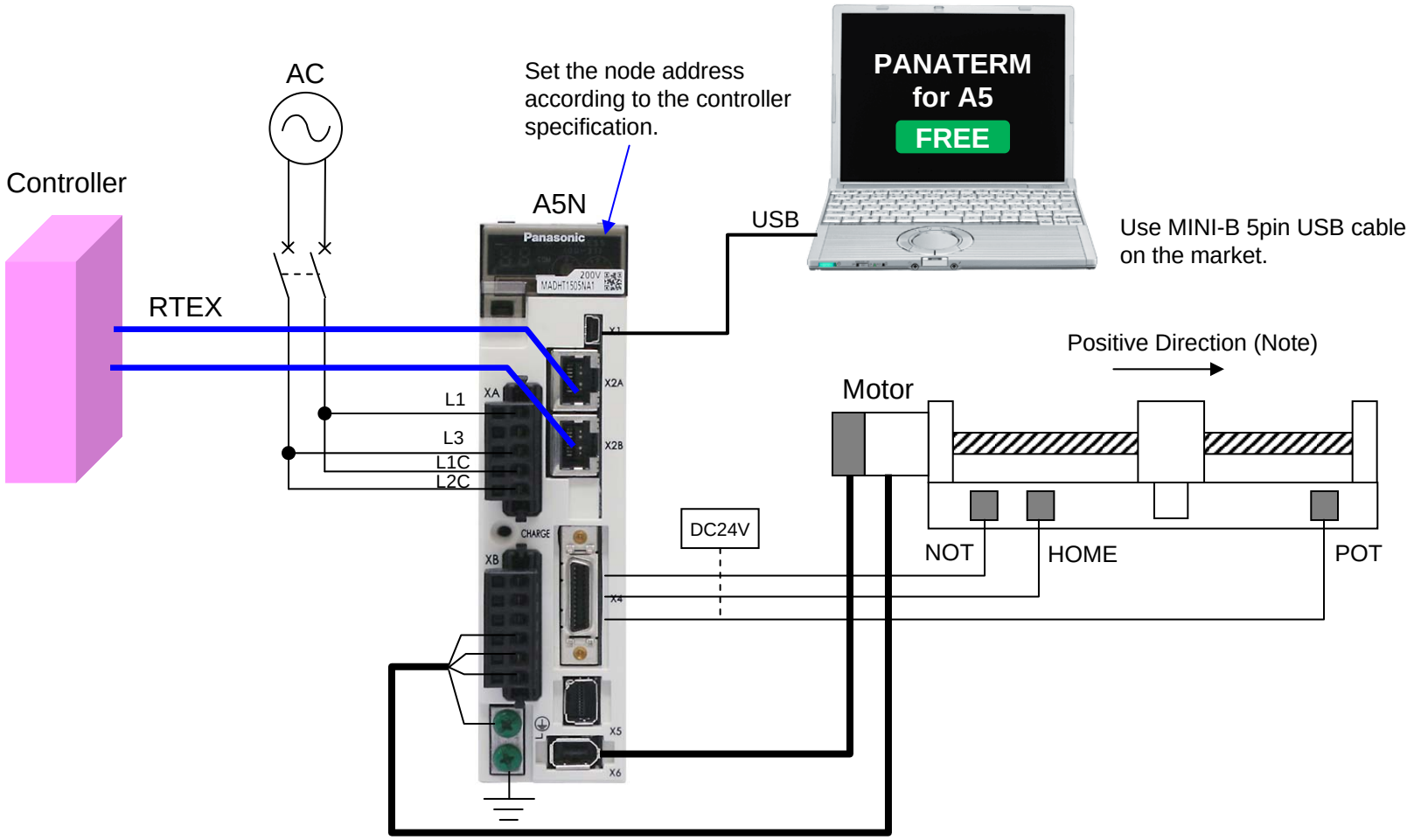
Item	Specifications
Speed	**100Mbps**
Physical Layer	**100BASE-TX full duplex (by IEEE 802.3u)**
Cable	**Shielded Twisted Pair (TIA/EIA-568B CAT5e)**
Topology	**Ring**
Isolation	**Pulse Transformer with common-mode choke**
Connector	**RJ45**
Cable Length	**Inter-node: Max. 100m, Total: Max. 200m**
Noise Immunity	**2.5kV over, IEC61000-4-4 compliant**
Com. Period (*)	**1ms, 0.5ms, 0.166ms, 0.083ms**
Update Period (*)	**1ms, 0.5ms, 0.166ms**
Number of Axes (*)	**Up to 32**
Motion Interface (*)	**Profile Position, Cyclic Position / Velocity / Torque**

*: Depending on controller specification

Test Operation

System Example



Note: With Pr0.00, the positive direction is defined.

Servo Settings

Parameter settings are depend on controller specification.
At least the followings must be set.

Part	Item
Front Panel	Node Address
Pr0.00	Positive Direction
Pr0.01	Control Mode
Pr0.08 - 0.10	Electronic Gear
Pr4.00 - 4.12	I/O Assignment (If necessary)
Pr5.04	Limit Inputs
Pr7.20 - 7.21	Com. and Update Period
Pr7.23	Response Byte3 Structure

Notes:
1. In some controller, parameters are set automatically over RTEX.
2. After setting parameters, write them to EEPROM and turn power off and on.

Operation

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After making sure of correct wiring, power ON.
(Turning-on order depends on controller spec.)

When both LINK and COM LED indicate green,
RTEX communication is established.

According to controller specification,
Servo-ON and Start

Gain tuning with PANATERM

Parameter Setting

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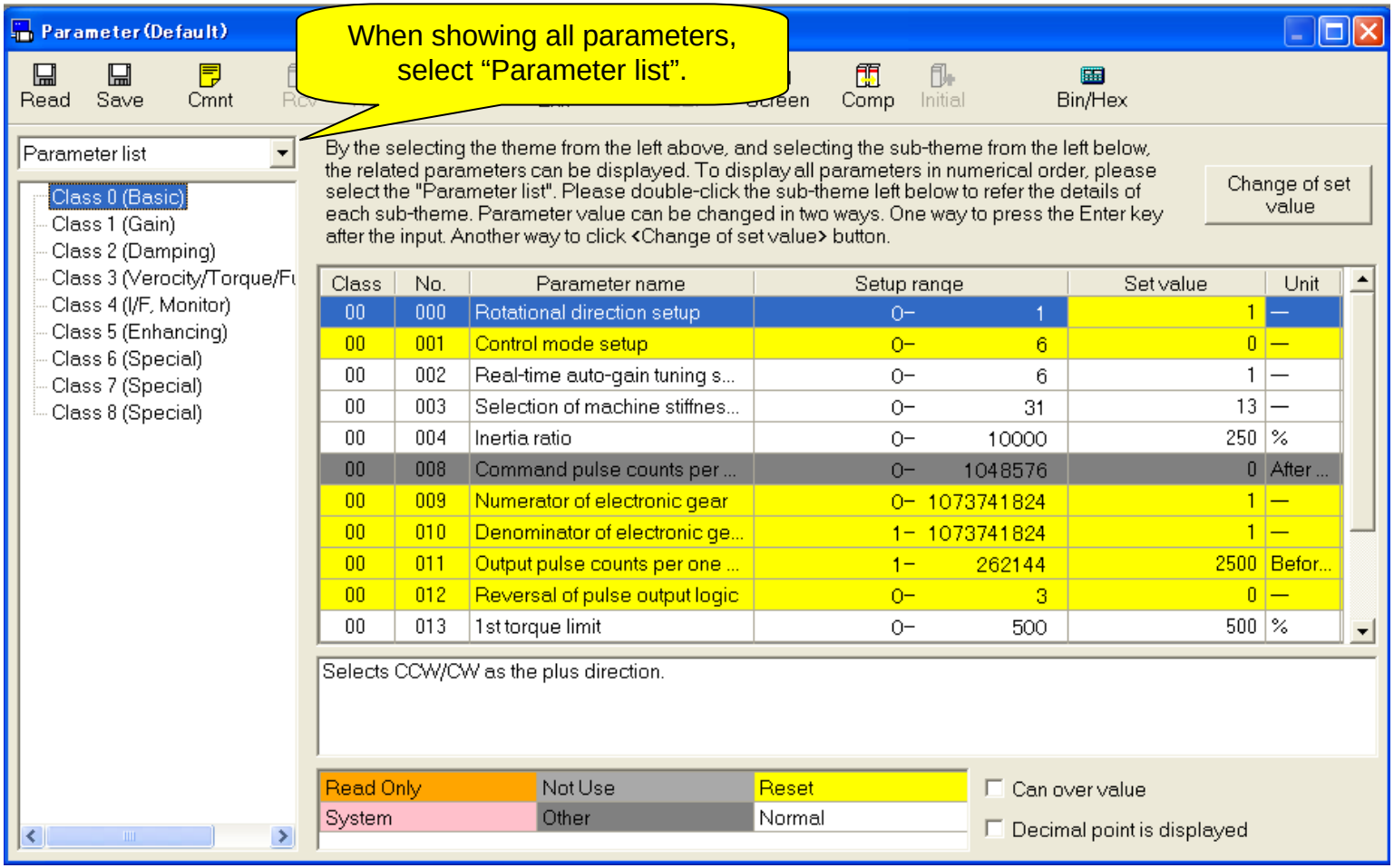
Download PANATERM from the following web site: **FREE**
http://industrial.panasonic.com/ww/i_e/25000/fa_pro_acs_e/fa_pro_acs_e/a5.html



Positive Direction

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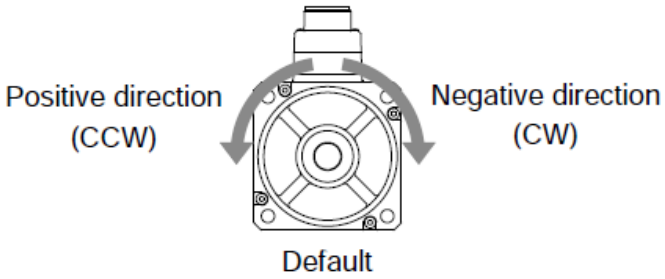
With Pr0.00, define positive direction.

Pr0.00 *	Title	Rotational direction setup			Related control mode	P	S	T	F
	Range	0 to 1	Unit	—	Default	1			

Setup the relationship between the direction of command and direction of motor rotation.

0: Motor turns CW in response to positive direction command (CW when viewed from load side shaft end)

1: Motor turns CCW in response to positive direction command (CCW when viewed from load side shaft end)



Default

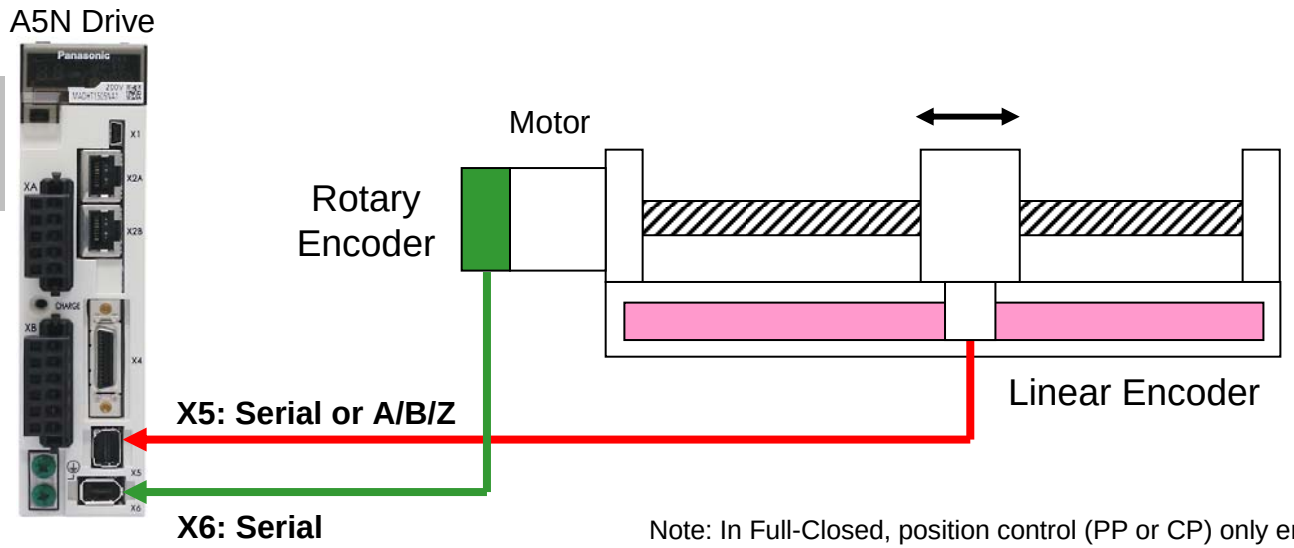
Setup value	Command direction	Motor rotational direction	Positive direction drive inhibit input	Negative direction drive inhibit input
0	Positive direction	CW	Valid	—
	Negative direction	CCW	—	Valid
1	Positive direction	CCW	Valid	—
	Negative direction	CW	—	Valid

Control Mode

In Full-Closed, set Pr0.01 to 6.

	Semi-Closed	Full-Closed
Pr0.01	0	6

Full-Closed Control



Note: In Full-Closed, position control (PP or CP) only enabled.

Electronic Gear

e.g.) When commanding as 10000pulse/r (A4N incremental equivalent), then set the followings:

Pr0.08 = 0, Pr 0.09 = 0, Pr 0.10 = 10000

Pr0.08	Pr0.09	Pr0.10	Command division/multiplication operation
0	0	0 to 1073741824	Command pulse input → Encoder resolution / [Pr0.10 setup value] → Positional command * When Pr0.09 is set to 0, this operation is processed according to setup value of Pr0.10.
	1 to 1073741824	1 to 1073741824	Command pulse input → [Pr0.09 setting] / [Pr0.10 setting] → Positional command * When Pr0.09≠0, this operation is processed according to setup value of Pr0.09 and Pr0.10.

If necessary, with adjusting position command filters (Pr2.22, Pr2.23), smooth out the position command after the electronic gear through.

IN-signals Assignment

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Default settings:

	X4 Name	X4 Pin #	Setting Value (hex)	Setting Signal	Setting Logic
Pr4.00	SI1	5	00323232h	SI-MON5	Normally Open
Pr4.01	SI2	7	00818181h	POT	Normally Closed
Pr4.02	SI3	8	00828282h	NOT	Normally Closed
Pr4.03	SI4	9	002E2E2Eh	SI-MON1	Normally Open
Pr4.04	SI5	10	00222222h	HOME	Normally Open
Pr4.05	SI6	11	00212121h	EXT2	Normally Open
Pr4.06	SI7	12	002B2B2Bh	EXT3	Normally Open
Pr4.07	SI8	13	00313131h	SI-MON4	Normally Open

Note: If homing with edge of HOME, POT or NOT, the assignment must be HOME:SI5, POT:SI6 and NOT:SI7.
If not so, alarm occurs.

OUT-signals Assignment

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Default settings:

	X4 Name	X4 Pin #	Setting Value (hex)	Setting Signal	Remark
Pr4.10	SO1+ SO1-	1 2	00030303h	BRK-OFF	If changing to EX-OUT2, set to 00111111h.
Pr4.11	SO2+ SO2-	25 26	00101010h	EX-OUT1	
Pr4.12	SO3+ SO3-	3 4	00010101h	ALM	Normally Closed

For EX-OUT1 and EX-OUT2 bit layout in RTEX command block, it is the same as A4N.

Limit Operation

With setting Pr5.04 to 1, limit input operation by servo should be disabled because such a operation is normally done by controller.
Even if disabled, limit inputs status can be monitored via RTEX with Pr7.23 setting.

Pr5.04 *	Title	Over-travel inhibit input setup			Related control mode	P	S	T	F
	Range	0 to 2	Unit	—	Default	1			

Set up the operation of the run-inhibition (POT, NOT) inputs.

Setup value	Operation
0	POT → Inhibit positive direction travel NOT → Inhibit negative direction travel
1	Disable POT, NOT
2	POT or NOT input activates Err38.0 Run-inhibition input protection.

Command Update Period

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According to controller specification, both command update period and communication period must be set properly.

Update Period	Com. Period	Setting	
		Pr7.20	Pr7.21
1.000ms	1.000ms	6	1
1.000ms	0.500ms	3	2
0.500ms	0.500ms	3	1
0.166ms	0.166ms	1	1
0.166ms	0.083ms	0	2

	Name	Range	Description
Pr7.20	Communication Period	0 to 12	0: 0.083ms 1: 0.166ms 3: 0.5ms 6: 1.0ms Else: Do not set. (Reserved)
Pr7.21	Ratio of Command Update Period	1 to 2	Command Update / Communication Period 1: 1 2: 2 (Com.=0.5ms case only) } Select

Response byte3

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Response byte3:

Byte	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
3	SI-MON5 /E-STOP	SI-MON4 /EX-SON	SI-MON3 /EXT3	SI-MON2 /EXT2	SI-MON1 /EXT1	HOME	POT /NOT	NOT /POT

With Pr4.00 to 4.07, set the correspondence to X4 connector inputs.

	Name	Range	Description
Pr7.23	RTEX Functional Expansion 2	-32768 to 32767	bit2: In POT/NOT disabled (Pr5.04=1), its status response activation. 0: Status enabled 1: Status disabled (Always 0) bit3: Arrangement of POT/NOT status. 0: POT is bit1, NOT is bit0 1: NOT is bit1, POT is bit0 bit6: Logic of POT/NOT status. 0: Positive logic, Active is 1 1: Negative logic, Active is 0 **Select according to the controller specification.**

Limit Sensors Wiring

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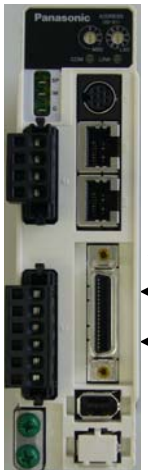
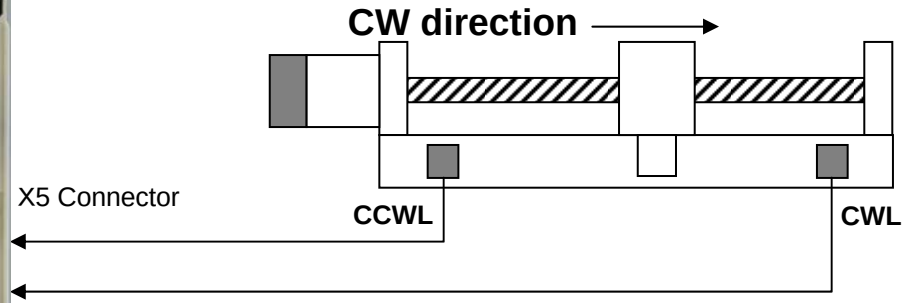
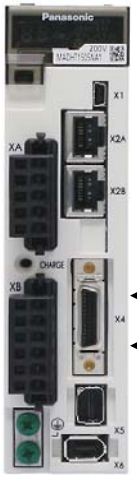
A4N



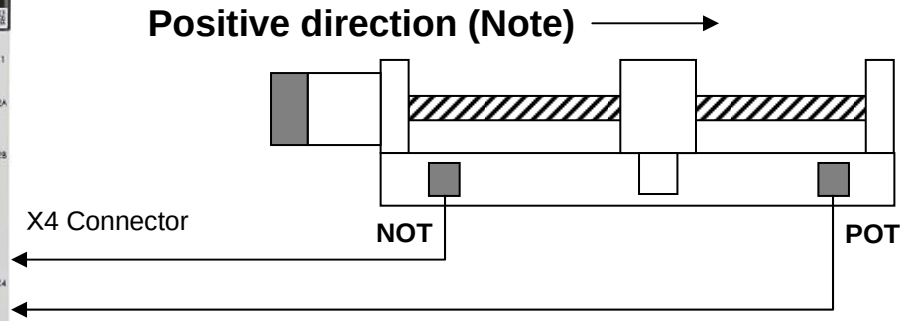
Regardless of parameter setting, physical layout decides wiring.



A5N



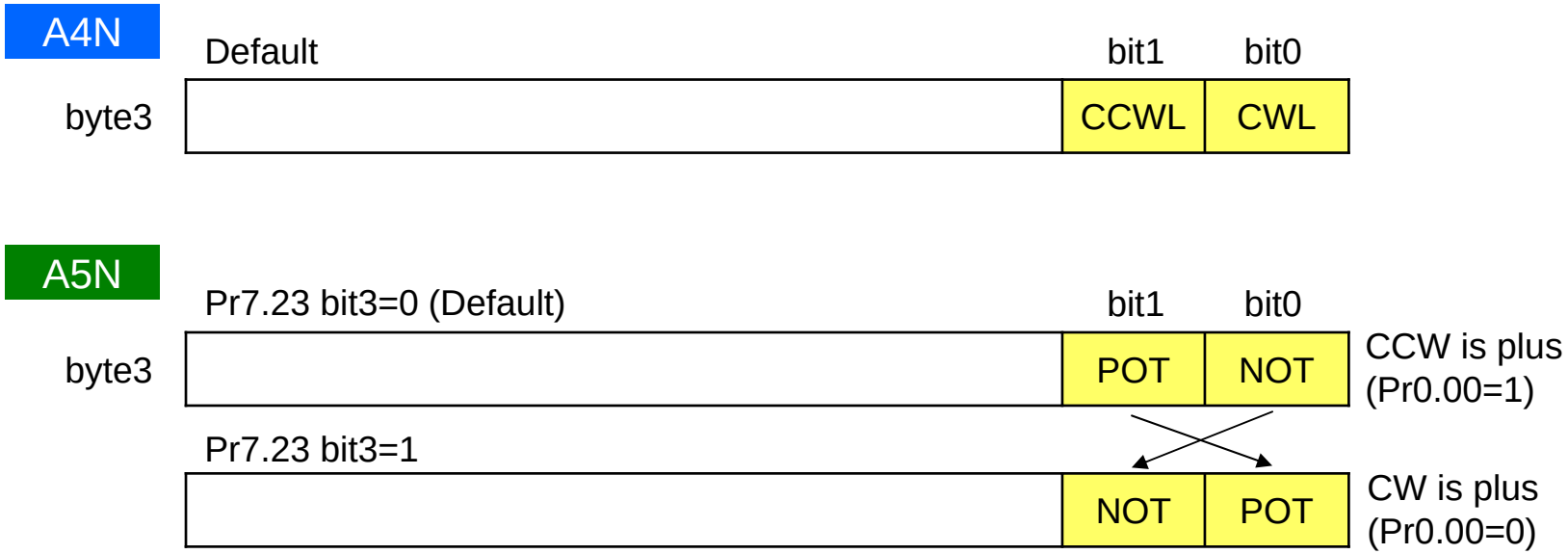
According to parameter setting, wiring is changed.



Note: Positive direction is set with Pr0.00.

Bit Layout of Limit Flags

Even if A4N is used in default setting for bit layout of limit flags,
the default parameter must be changed in A5N when using CW is plus.

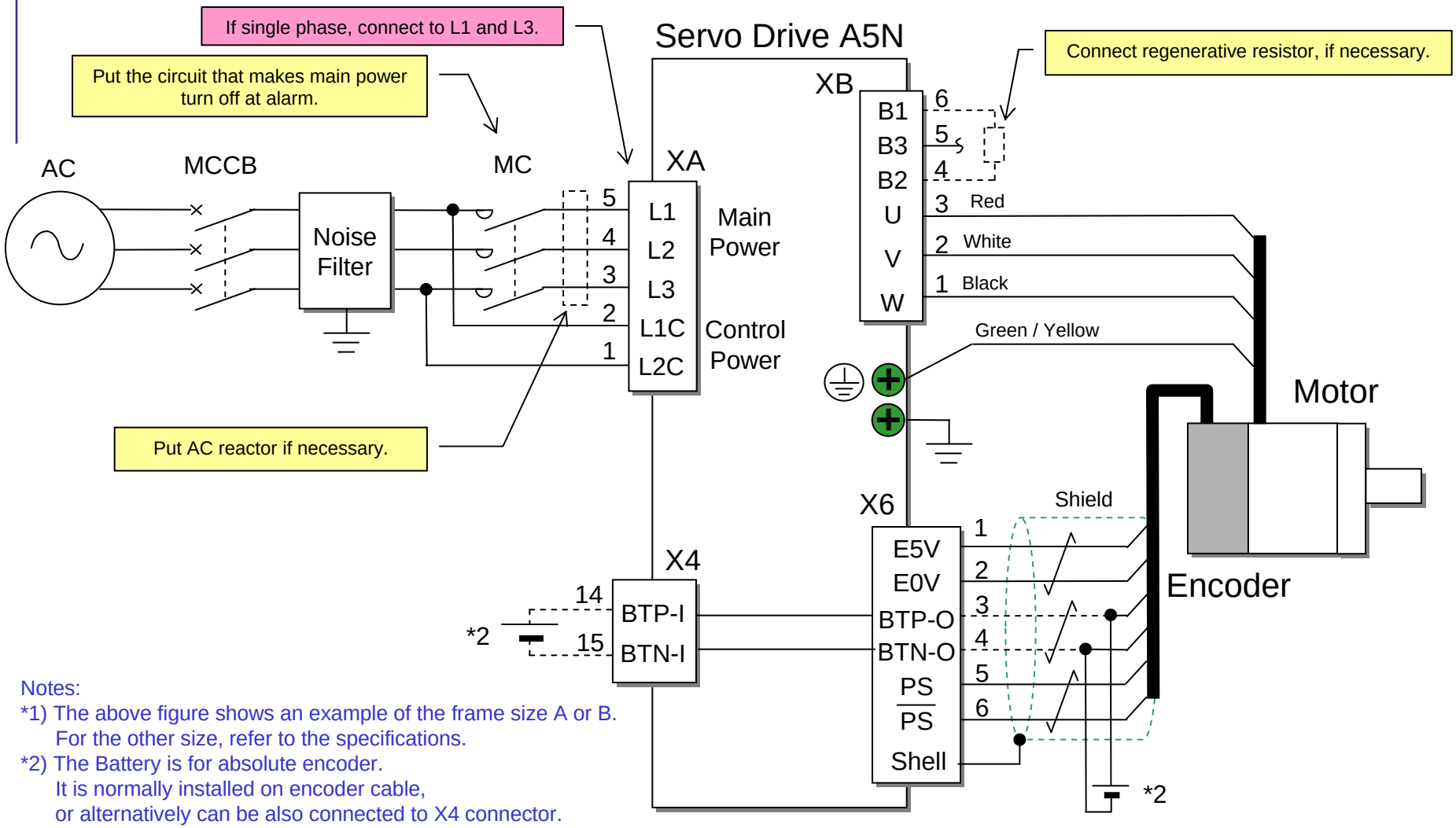


Parameters:

	A4N	A5N
Positive Direction	Pr43	Pr0.00
Bit layout of Limit Flags	Pr43	Pr7.23, bit3

Wiring

Power Supply and Motor



Notes:
*1) The above figure shows an example of the frame size A or B.
For the other size, refer to the specifications.
*2) The Battery is for absolute encoder.
It is normally installed on encoder cable,
or alternatively can be also connected to X4 connector.

Counter-measures for Noise

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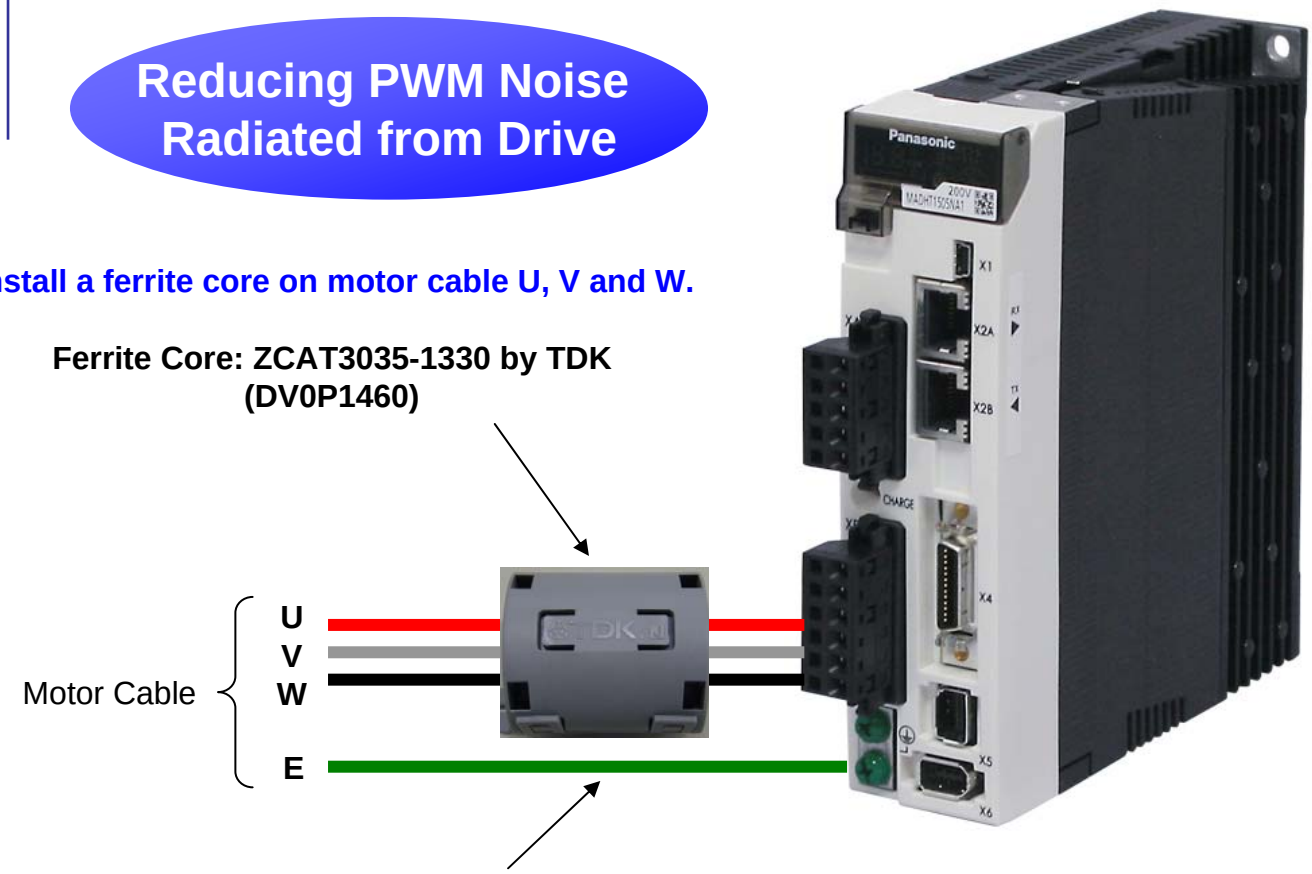
Reducing PWM Noise Radiated from Drive

Install a ferrite core on motor cable U, V and W.

Ferrite Core: ZCAT3035-1330 by TDK (DV0P1460)



Do not install it on E.

Stable Frame Ground

Make the back of chassis tightly contact earthed metal frame. The surface of the metal frame must be kept conductive.

I/O Connector Difference

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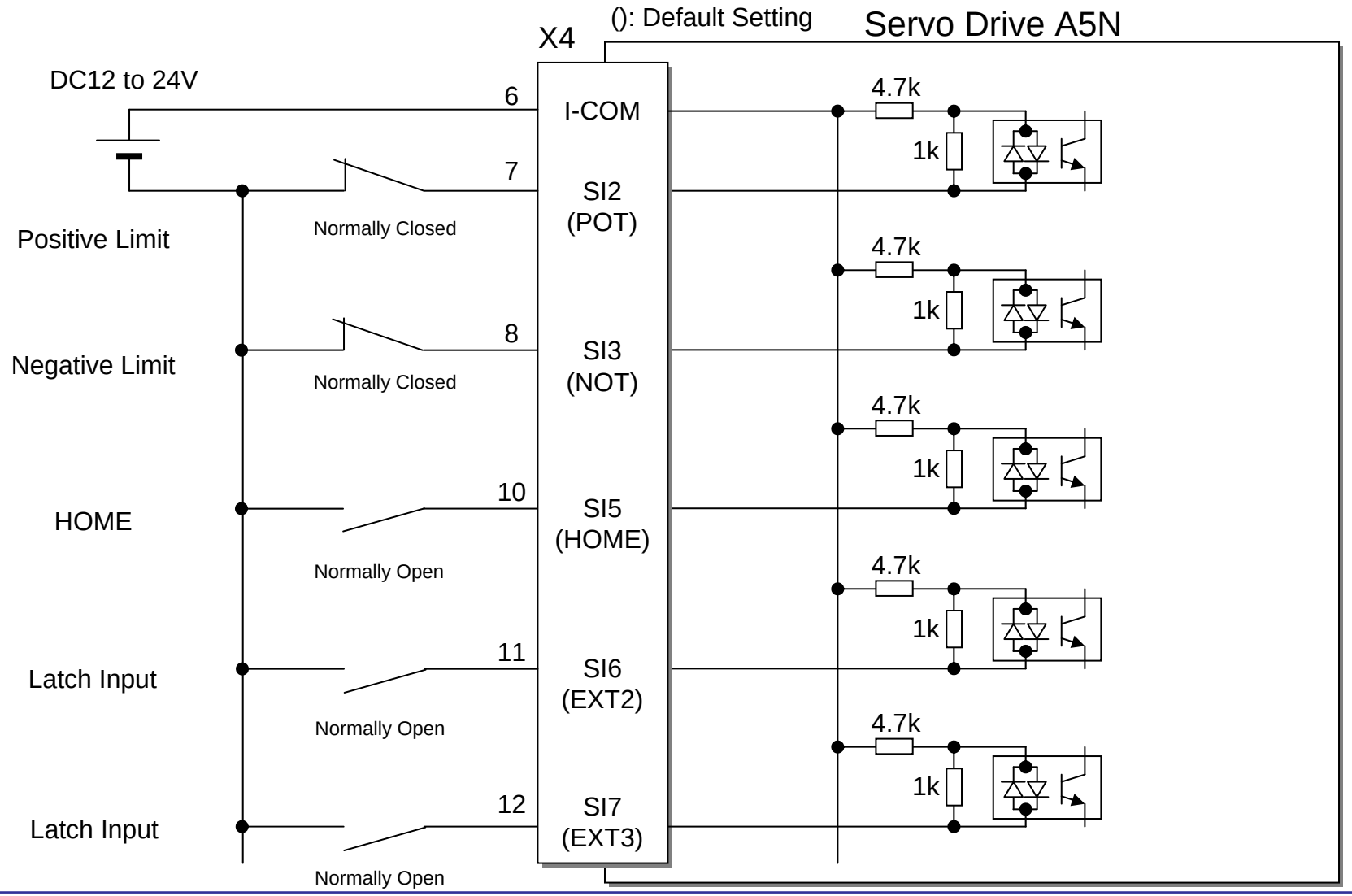
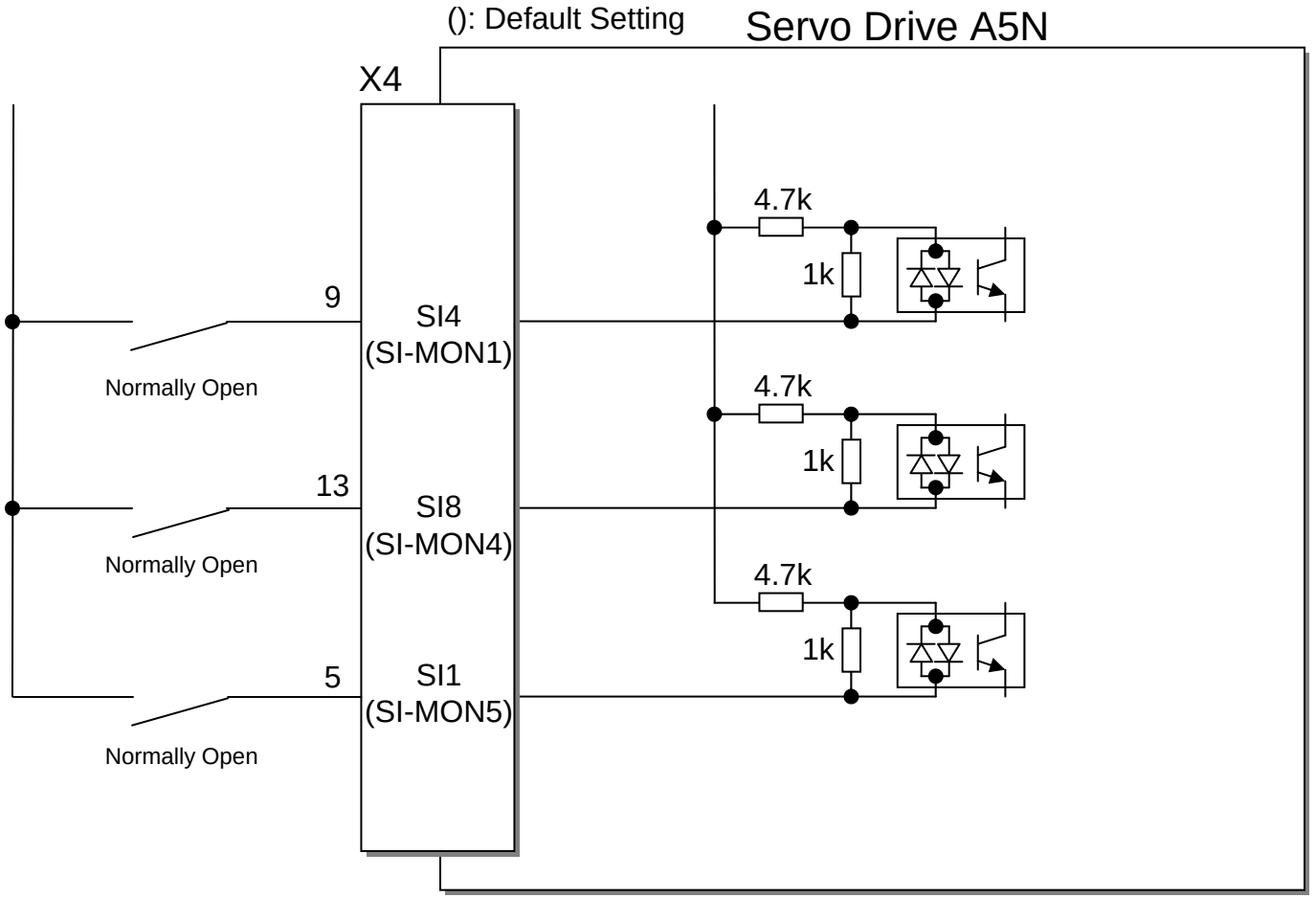
I/O	A4N (36pin)		A5N (26pin)				
	Name	Pin#	Name	Pin#	Default Function	Default Meaning	Remark
IN	I-COM	1	I-COM	6		Input Common	
IN	EMG-STP	2	SI1	5	SI-MON5	General Purpose Input 5	
IN	CCWL	19	SI2	7	POT	Positive Limit	
IN	CWL	20	SI3	8	NOT	Negative Limit	
IN	EX-IN1	5	SI4	9	SI-MON1	General Purpose Input 1	
IN	HOME	21	SI5	10	HOME	Home	
IN	EX-IN2	4	SI6	11	EXT2	External Latch 2	
IN	EX-IN3	3	SI7	12	EXT3	External Latch 3	
IN	EX-IN4/EX-SON	23	SI8	13	SI-MON4	General Purpose Input 4	
IN	Reserved	22					
IN	Reserved	6					
IN	AIN	25	AIN	23		Analog Input	Specific Model Only
IN	GND	24	GND	24		Analog GND	Specific Model Only
	BTP-I	34	BTP-I	14		Battery Plus Input	For Absolute Encoder
	BTN-I	33	BTN-I	15		Battery Minus Input	For Absolute Encoder
OUT	ALM+	15	SO3+	3	ALM+	Alarm +	
OUT	ALM-	16	SO3-	4	ALM-	Alarm -	
OUT	BRK-OFF+	36	SO1+	1	BRK-OFF+	Motor Breake Release +	
OUT	BRK-OFF-	35	SO1-	2	BRK-OFF-	Motor Breake Release -	
OUT	EX-OUT1+	29	SO2+	25	EX-OUT1+	General Purpose Output 1 +	
OUT	EX-OUT1-	30	SO2-	26	EX-OUT1-	General Purpose Output 1 -	
OUT	EX-OUT2+	31					
OUT	EX-OUT2-	32					
OUT	Reserved	17					
OUT	OA+	11	OA+	17		Encoder A +	RS422 Output
OUT	OA-	12	OA-	18		Encoder A -	RS422 Output
OUT	OB+	13	OB+	20		Encoder B +	RS422 Output
OUT	OB-	14	OB-	19		Encoder B -	RS422 Output
OUT	OZ+	9	Reserved	21			RS422 Output
OUT	OZ-	10	Reserved	22			RS422 Output
OUT	GND	26	GND	16		Signal GND	
	FG	18	FG	Shell		Frame GND	
	NC						
	NC						
	NC						
	NC						

Functions of SI1 to 8, and SO1 to 3 are changeable with parameters.

Sensor Inputs



General Purpose Inputs



Note:
Host controller can monitor a state of SI-MONs via RTEX.
These inputs do not influence servo control in the drive.

Sensor Input Example 1

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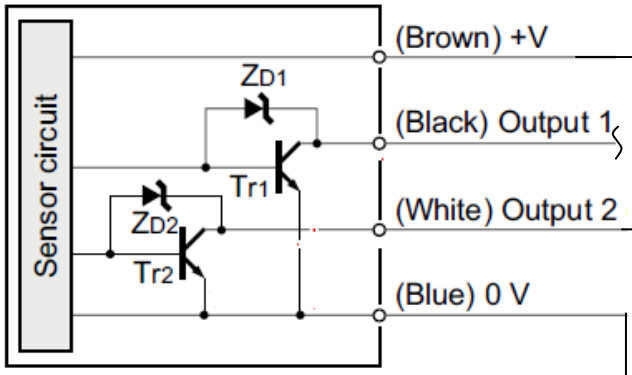
Panasonic Electric Works SUNX

Servo Drive A5N

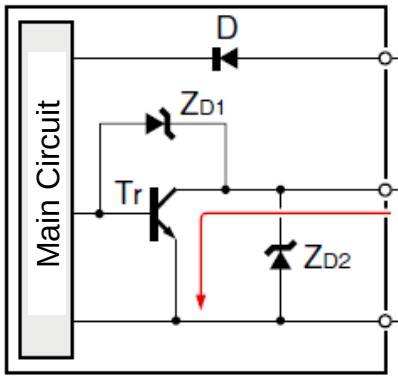
X4

Photo-sensor PM-64 (NPN transistor output)

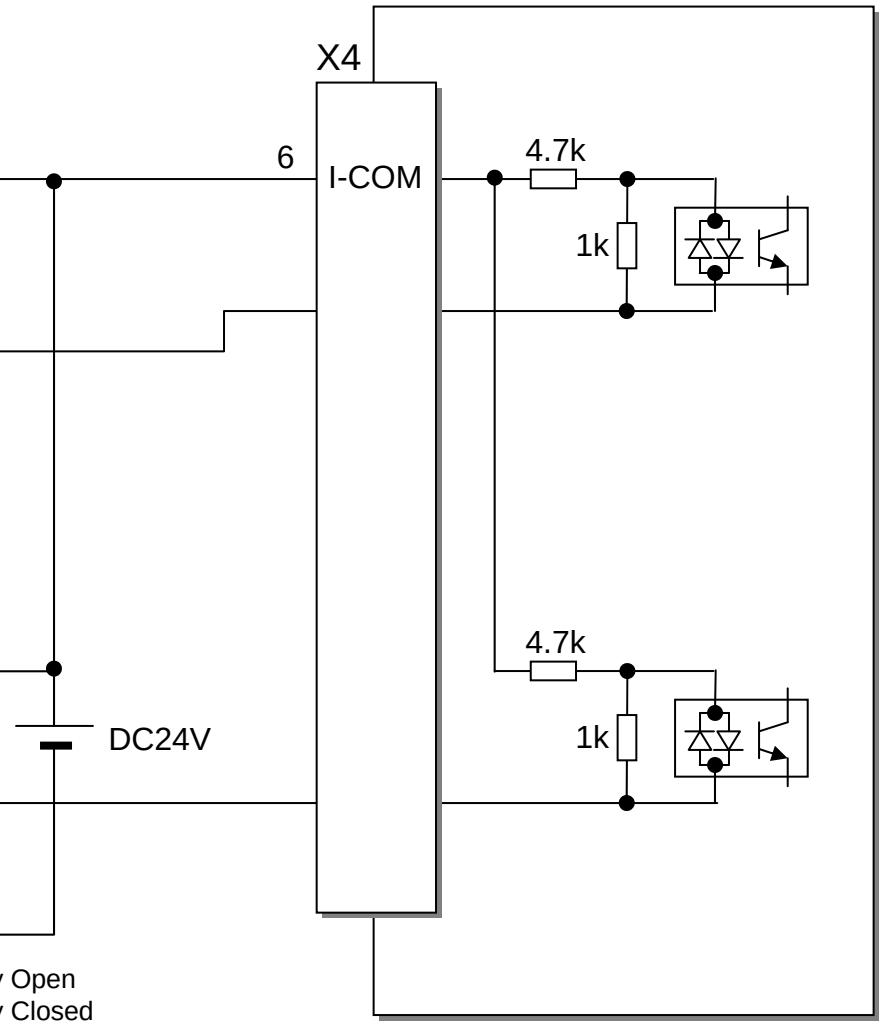


Out1: Normally Closed
Out2: Normally Open

Proximity-sensor GX-F12 (NPN transistor output)

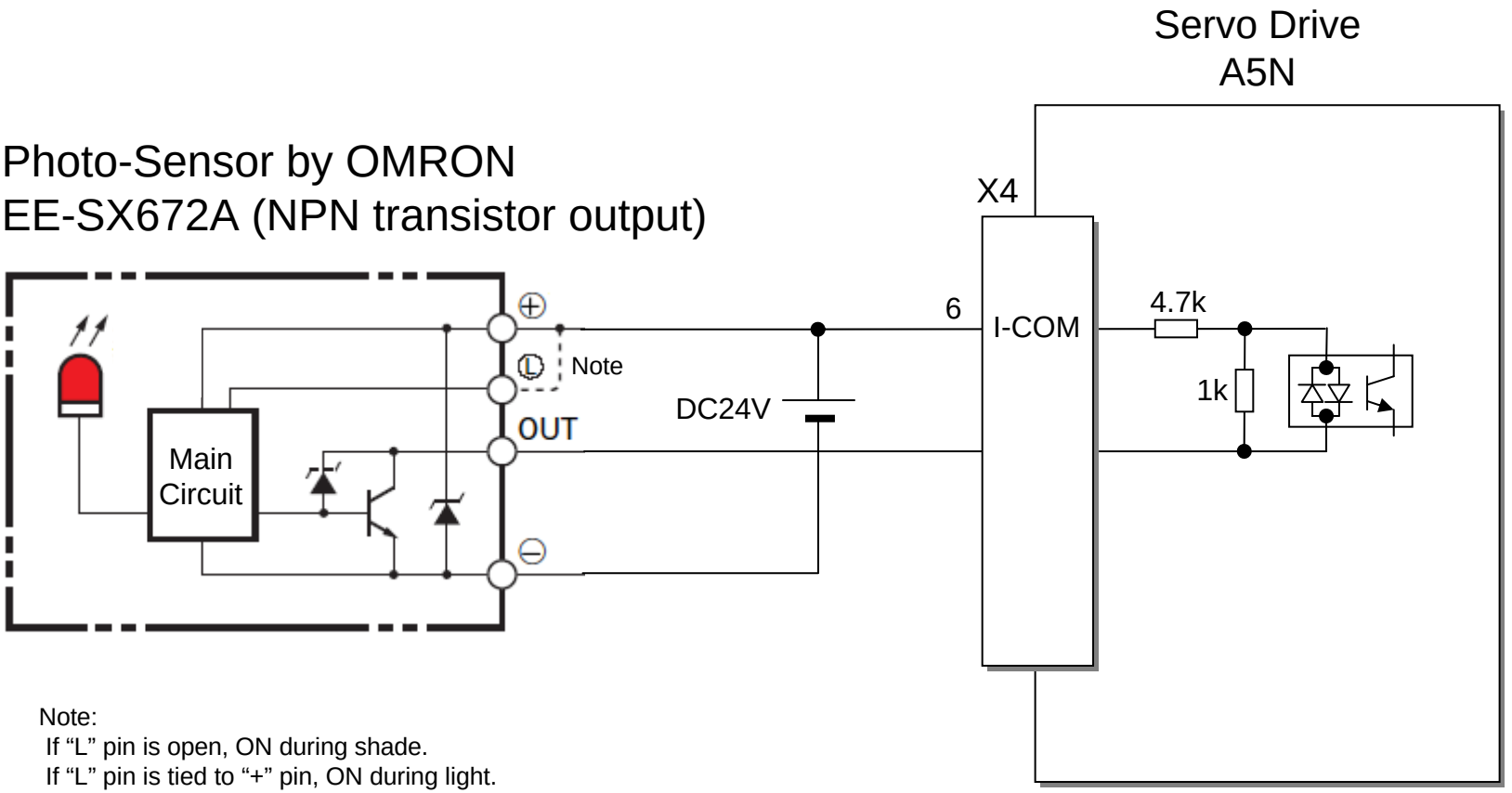


GX-F12A: Normally Open
GX-F12B: Normally Closed



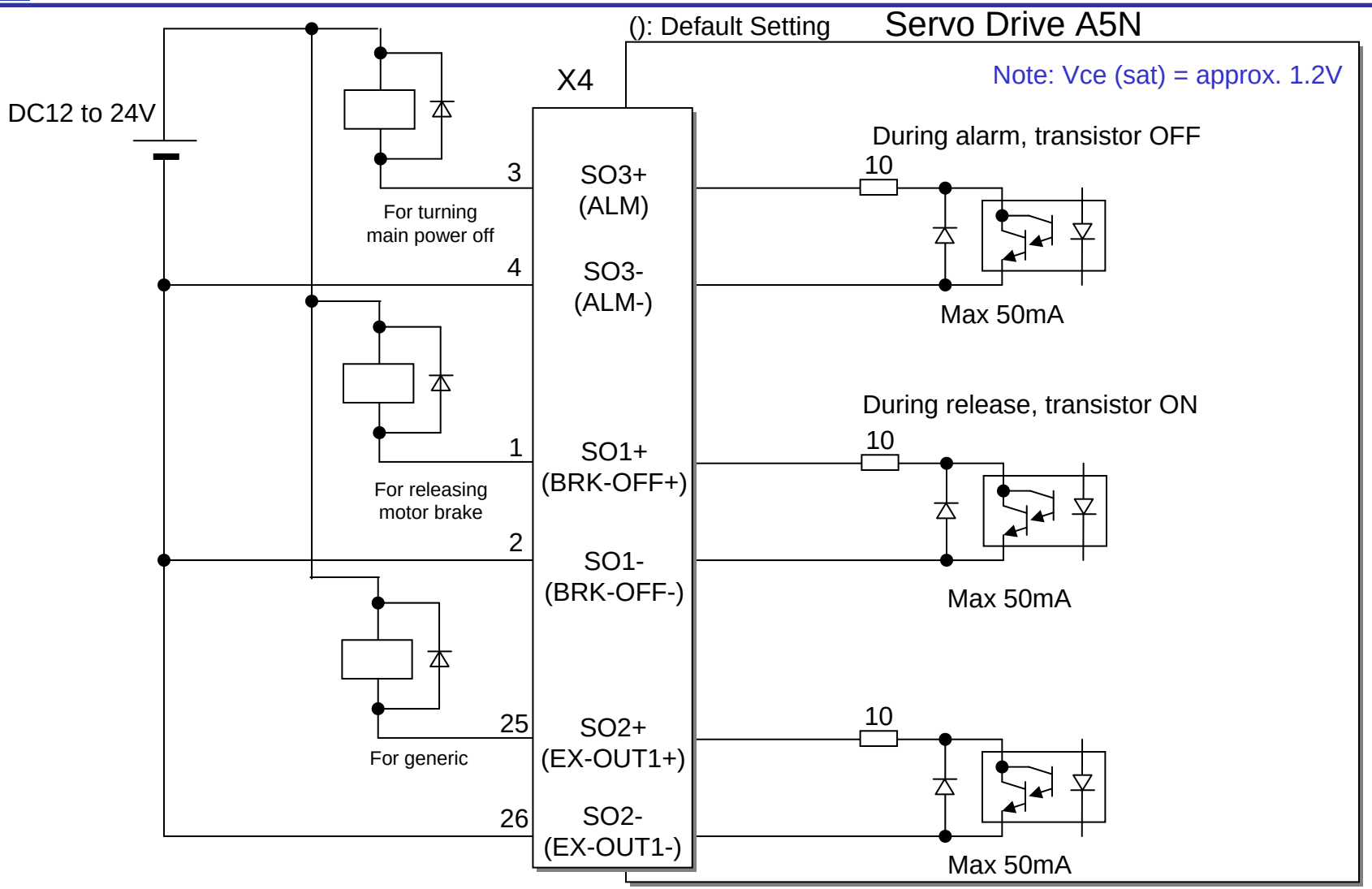
Sensor Input Example 2

Photo-Sensor by OMRON
EE-SX672A (NPN transistor output)

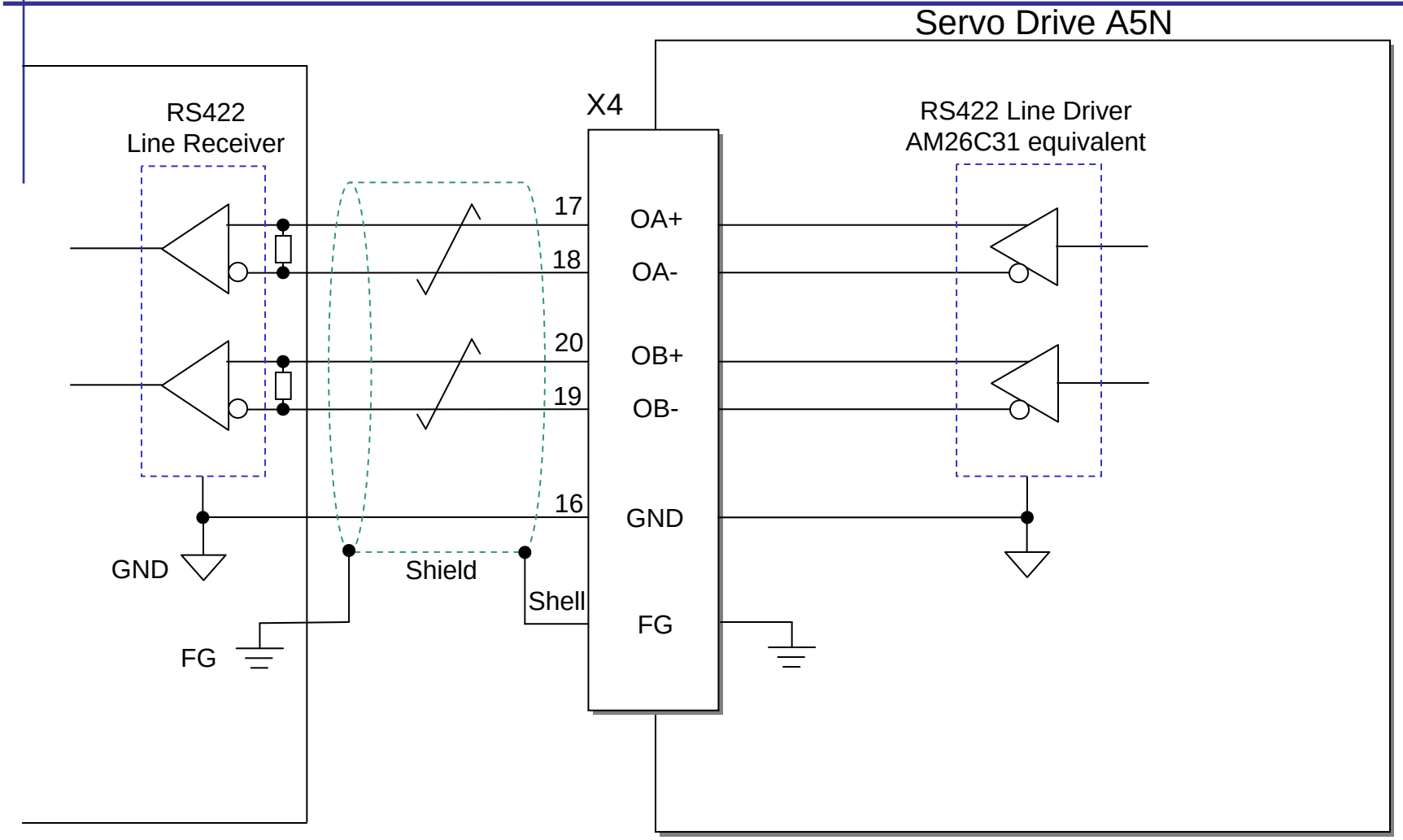


Note:
If “L” pin is open, ON during shade.
If “L” pin is tied to “+” pin, ON during light.

Relay Control Outputs



Encoder Emulation Output



Note: A termination resistor (typ. 330 Ohm) must be put between line-receiver inputs.

Encoder Connector

X5: MUF-RS10DK-GKXR by JST

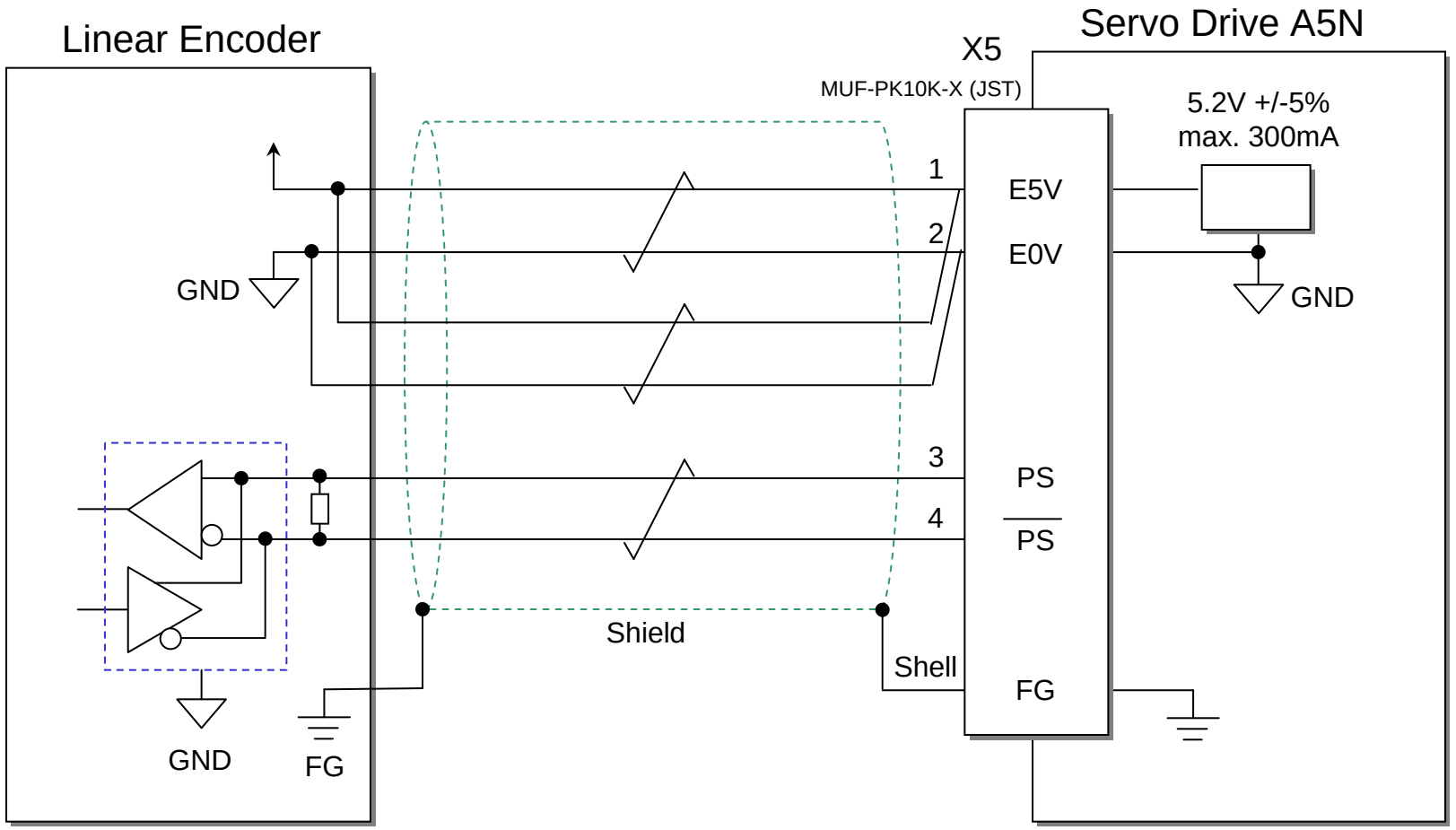
No.	Name	Function
1	E5V	Power Supply Out
2	E0V	
3	PS	Panasonic Style Serial Data
4	/PS	
5	EXA	A-phase In
6	/EXA	
7	EXB	B-phase In
8	/EXB	
9	EXZ	Z-phase In
10	/EXZ	
Shell	FG	Frame Ground

X6: 53460-0629 by Molex

No.	Name	Function
1	E5V	Power Supply Out
2	E0V	
3	BTP	Battery Out for Abs.
4	BTN	
5	PS	Panasonic Style Serial Data
6	/PS	
Shell	FG	Frame Ground

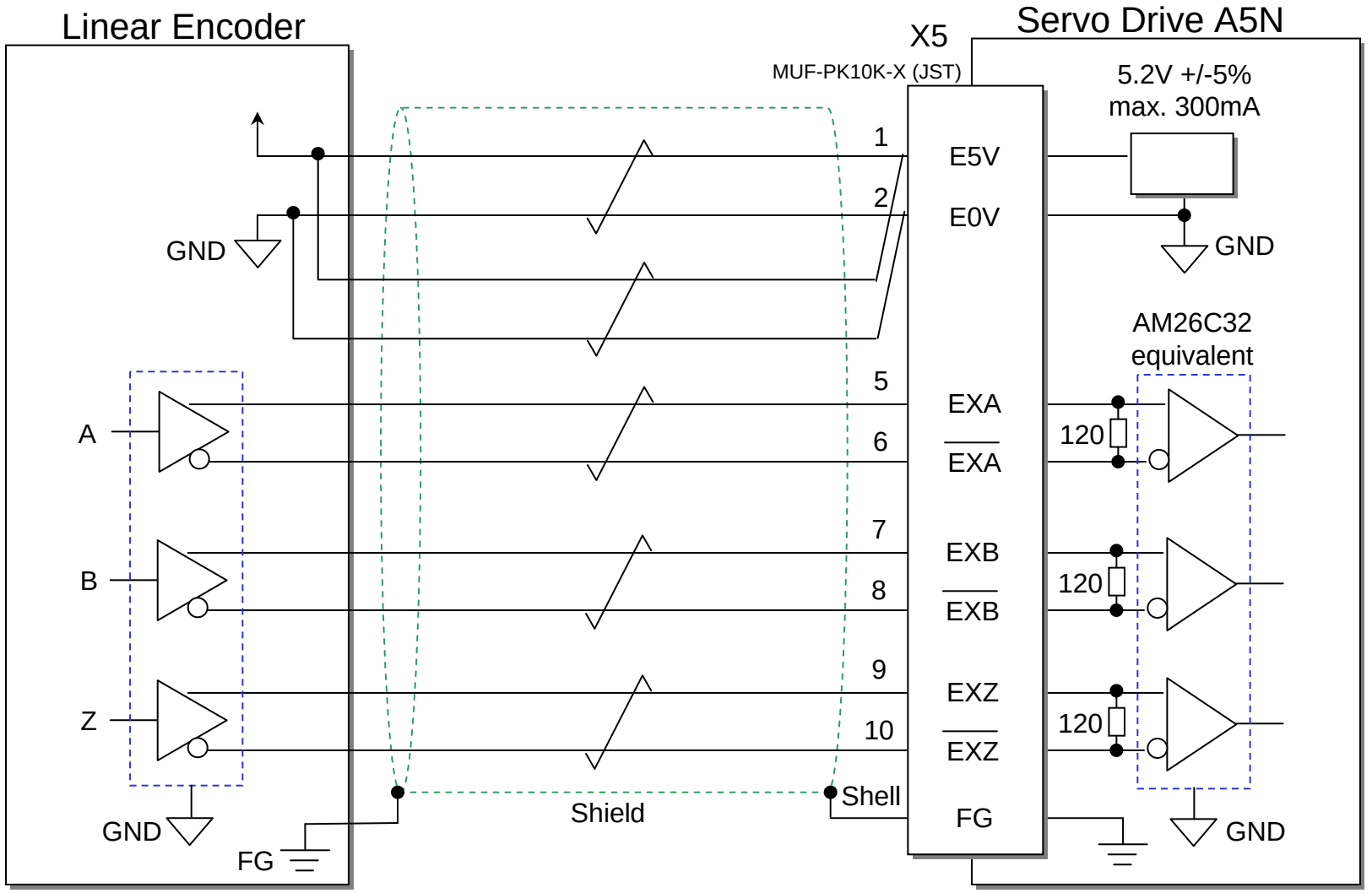
Note:
- "In" "Out" are based on a servo drive.
- In the specific model for linear motor, commutation signals can be connected to X6. Signals of pin #3 to 6 are replaced with #3: NC, #4: CS3, #5: CS2, #6: CS1.
- Cable side connectors
  X5: MUF-PK10K-X (JST)
  X6: 55100-0670 (Molex)

Linear Encoder Serial Signal



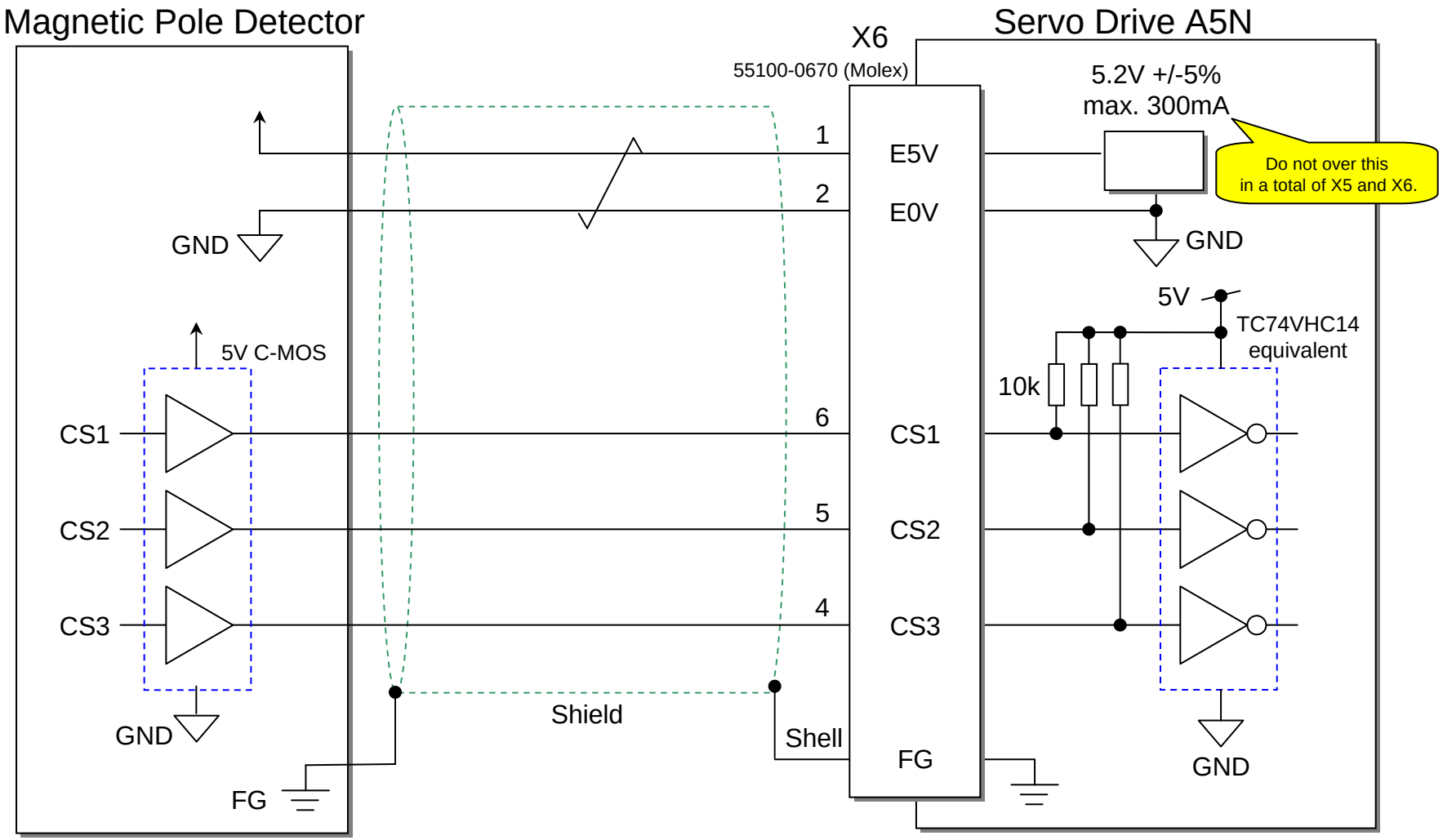
Note: If using an external power supply, E5V(pin#1) must be left unconnected. E0V(pin#2) always must be connected to GND of a linear encoder.

Linear Encoder A/B/Z signals



Note: If using an external power supply, E5V(pin#1) must be left unconnected. E0V(pin#2) always must be connected to GND of a linear encoder.

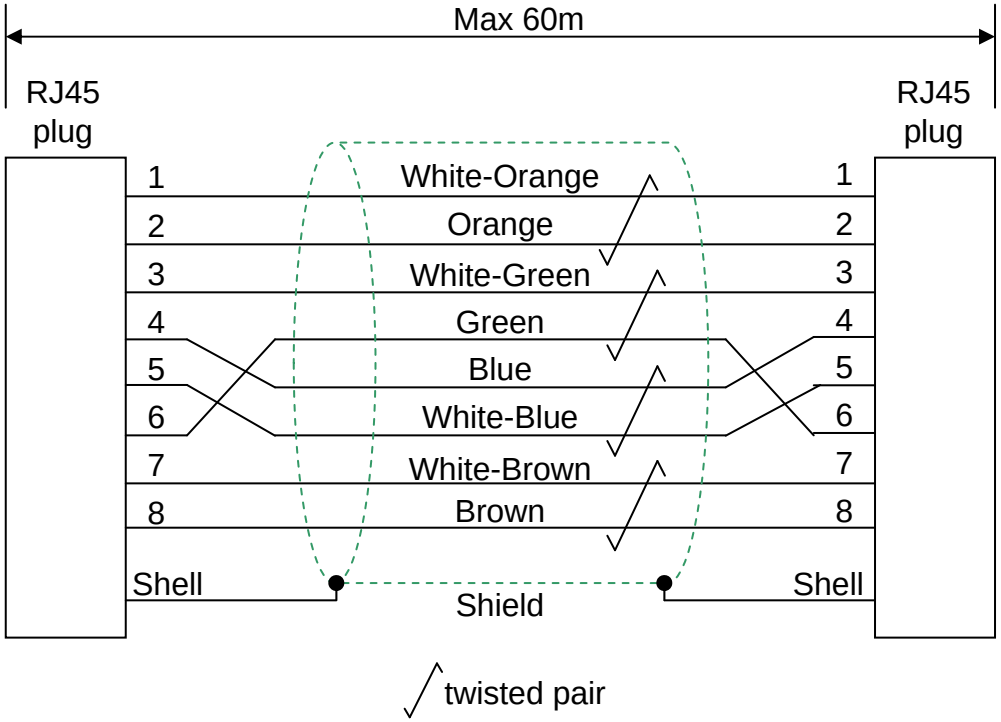
CS Signals (Linear Specific)

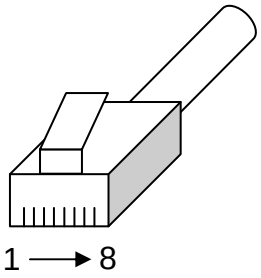


Note: If using an external power supply, E5V(pin#1) must be left unconnected. E0V(pin#2) always must be connected to GND of a pole detector.

Wiring of Com. Cable (4pairs)

“Straight” Wiring





Notes:
- STP(Shielded Twisted Pair cable) conformed to category 5e must be used.
- Colors of the lead wire are defined by TIA/EIA-568B.
- A pair connected to 3-6pin is used as signal line.
- Unused 3 pairs must be also connected to 1-2, 4-5 and 7-8 as the above figure.

Wiring of Com. Cable (2pairs)

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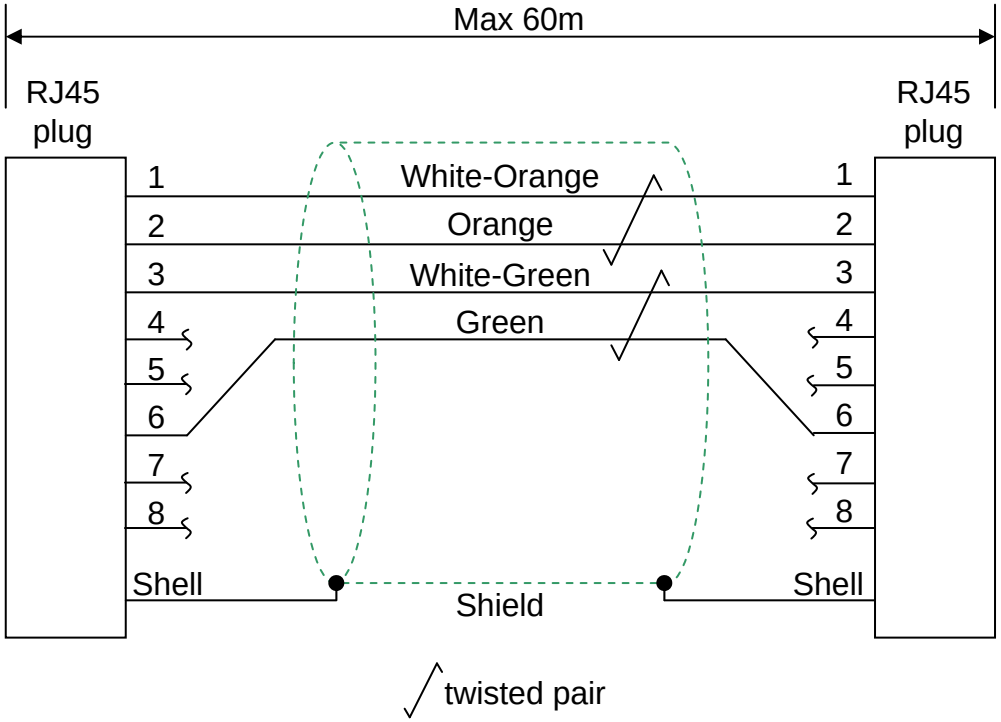
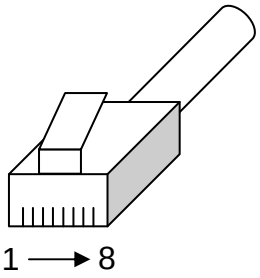
“Straight” Wiring

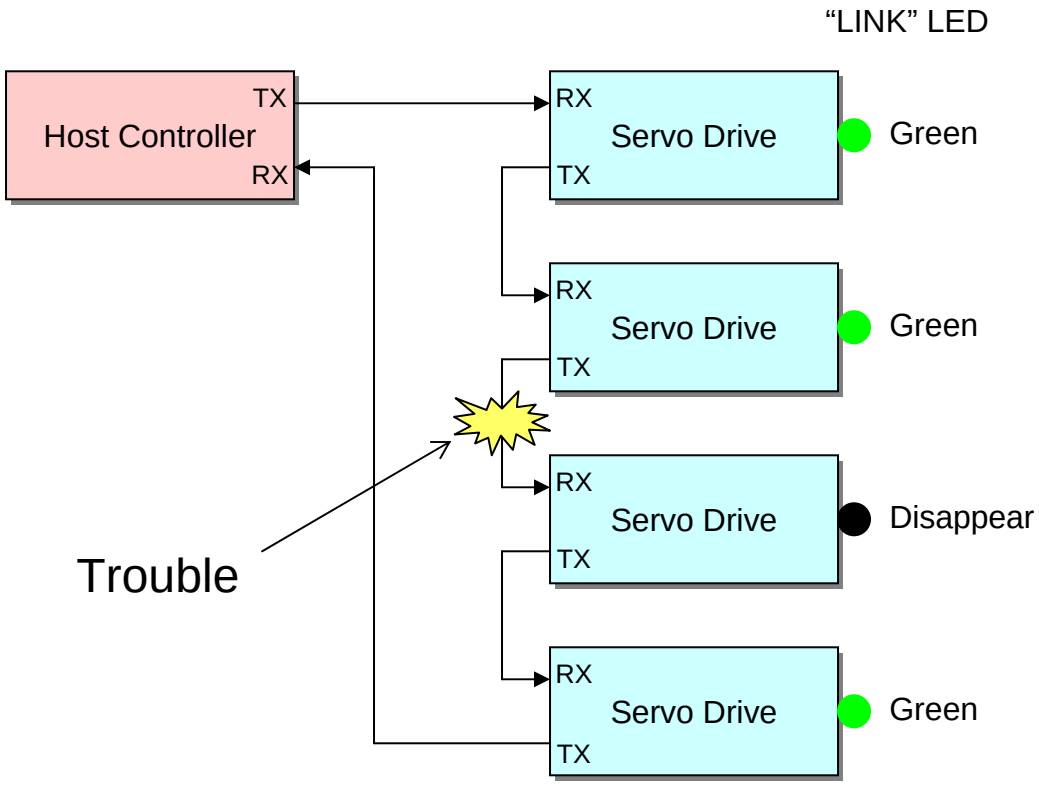




Notes:
- STP(Shielded Twisted Pair cable) conformed to category 5e must be used.
- Colors of the lead wire are defined by TIA/EIA-568B.
- A pair connected to 3-6pin is used as signal line.
- Unused 3 pairs must be also connected to 1-2 as the above figure.

Trouble of Com. Cable

When “LINK” LED is disappear against power ON of all servos, make sure whether there is the trouble such as breaking down with a cable connected to RX of the disappearing servo.



Safety I/F
(Specific Model Only)

STO Overview

The safe torque off (STO) function is a safety function that shuts the motor current and turns off motor output torque by forcibly turning off the driving signal of the servo driver internal power transistor. For this purpose, the STO uses safety input signal and hardware (circuit).

When STO function operates, the servo driver turns off the servo ready output signal (S-RDY) and enters safety state.

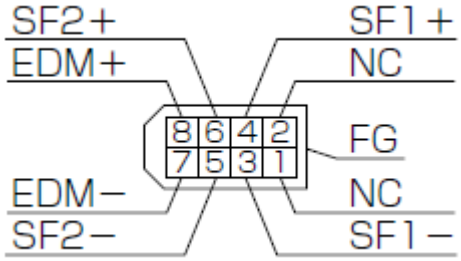
This is an alarm condition and the 7-seg LED on the front panel displays the error code number.

Connector X3:

Application	Symbol	Connector Pin No.	Contents
NC	–	1	Do not connect.
	–	2	
Safety input 1	SF1–	3	These are two independent circuits that turn off the operation signal to the power module to shut off the motor current.
	SF1+	4	
Safety input 2	SF2–	5	
	SF2+	6	
EDM output	EDM–	7	This is an output for monitoring the failure of the safety function.
	EDM+	8	
Frame ground	FG	Shell	Connected with protective earth terminal in the servo driver.

Connector (plug): 2013595-1 (optional, available from Tyco Electronics AMP)

Connector pinning:
Viewed from cable side



Connector X3

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Signal	Symbol	Pin No.	Contents
Safety input 1	SF1+	4	• Input 1 that triggers STO function. This input turns off the upper arm drive signal of power transistor. • When using the function, connect this pin in a way so that the photocoupler of this input circuit turns off to activate STO function.
	SF1–	3	
Safety input 2	SF2+	6	• Input 2 that triggers STO function. This input turns off the lower arm drive signal of power transistor. • When using the function, connect this pin in a way so that the photocoupler of this input circuit turns off to activate STO function.
	SF2–	5	
EDM output	EDM+	8	Outputs monitor signal that is used to check the safety function. Caution This output signal is not a safety output.
	EDM–	7	

When both safety input 1 and 2 are off, i.e. when STO function of 2 safety input channels are active, the photocoupler in EDM output circuit turns on.

Signal	Symbol	Photocoupler logic			
Safety input	SF1	ON	ON	OFF	OFF
	SF2	ON	OFF	ON	OFF
EDM output	EDM	OFF	OFF	OFF	ON

By monitoring the logics (all 4 states) of photocoupler shown in the table above, the external device can determine the status (normal or abnormal) of safety input circuit and EDM output circuit.

Delay Time

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Max. Delay from input off to function activated: 5ms

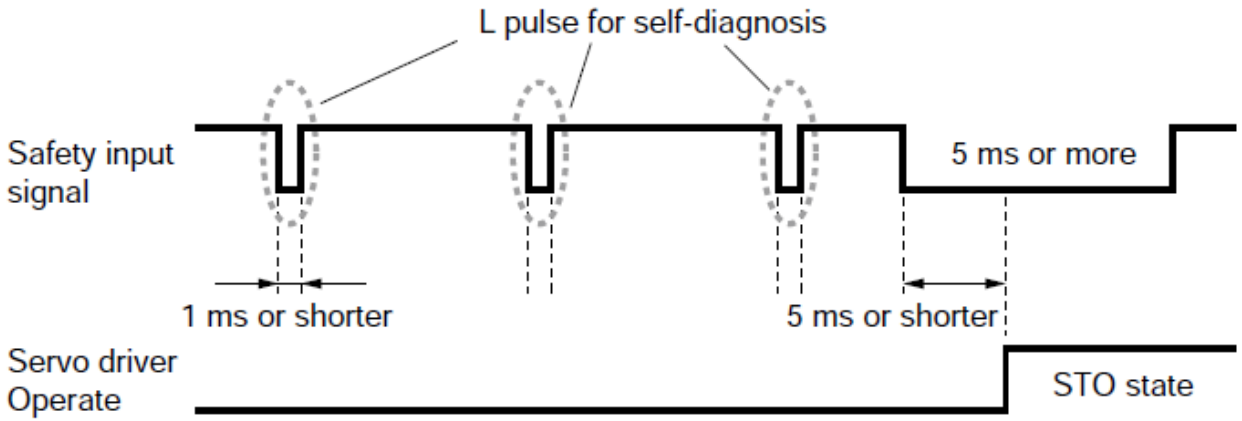
- **Safety equipment self-diagnosis L pulse**

  Safety output signal from the safety controller and safety sensor may include L pulse for self-diagnosis.

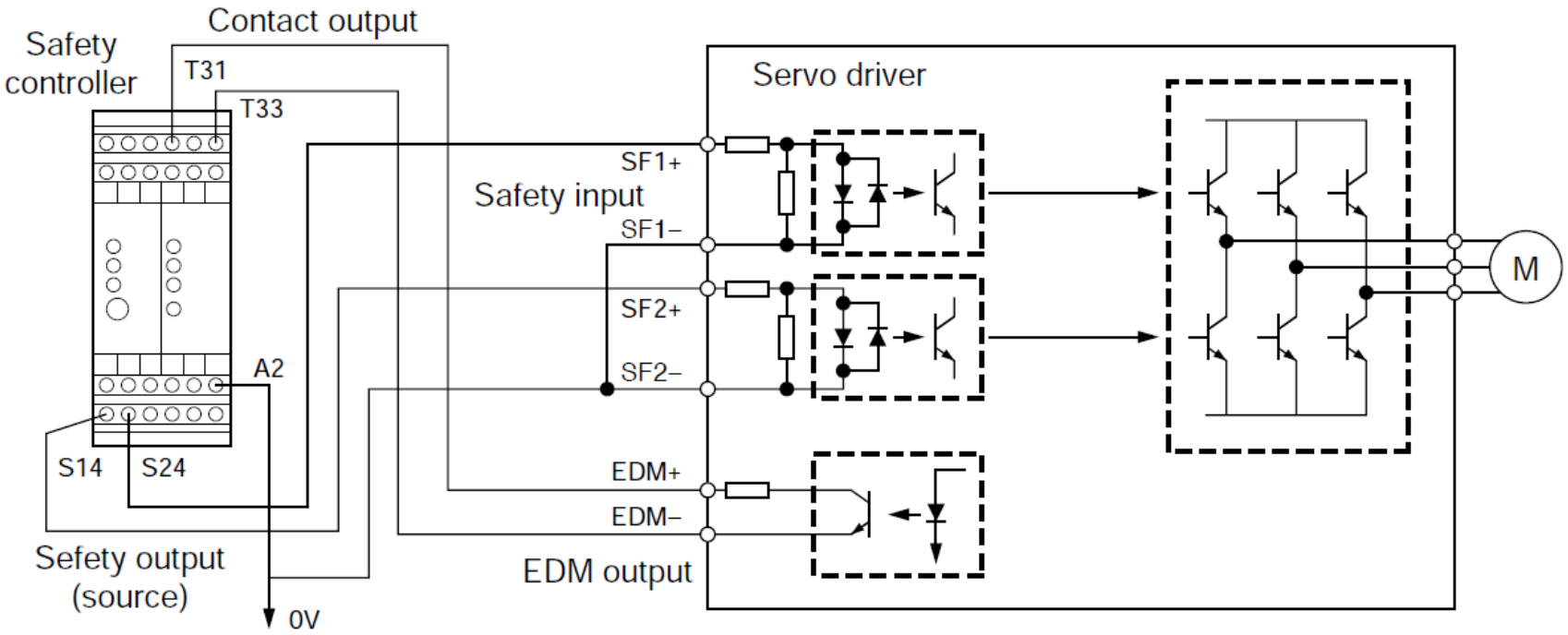
  To prevent the L pulse from mis-triggering STO function, the safety input circuit has **built-in filter that removes the self-diagnosis L pulse.**

  Therefore, if the off period of safety input signal less than 1 ms, the safety input circuit does not detect this "off" event.

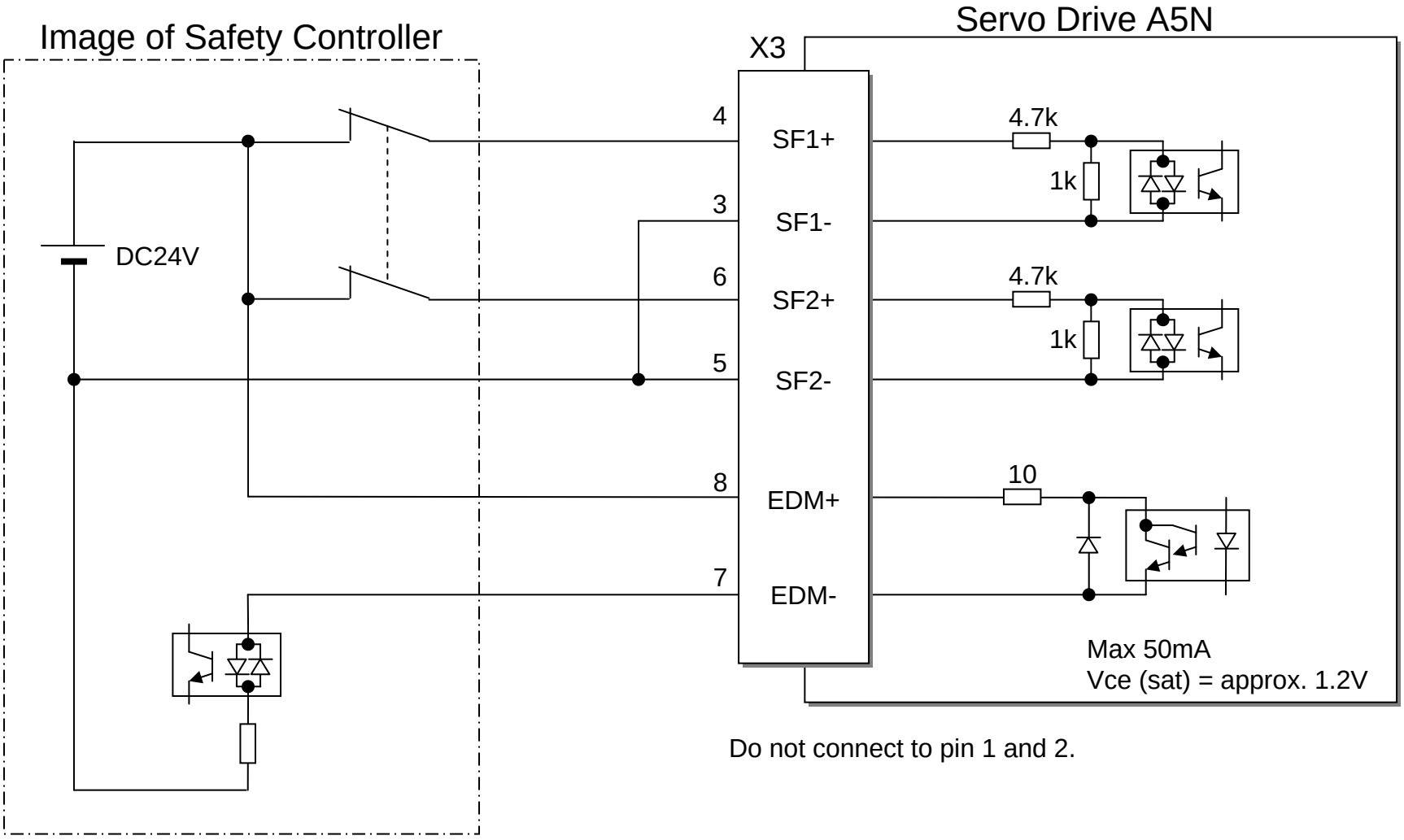
  To validate this "off" period, turn off the input signal for more than 5 ms.



Safety Controller Wiring



Safety Controller Wiring (Cont.)



Do not connect to pin 1 and 2.

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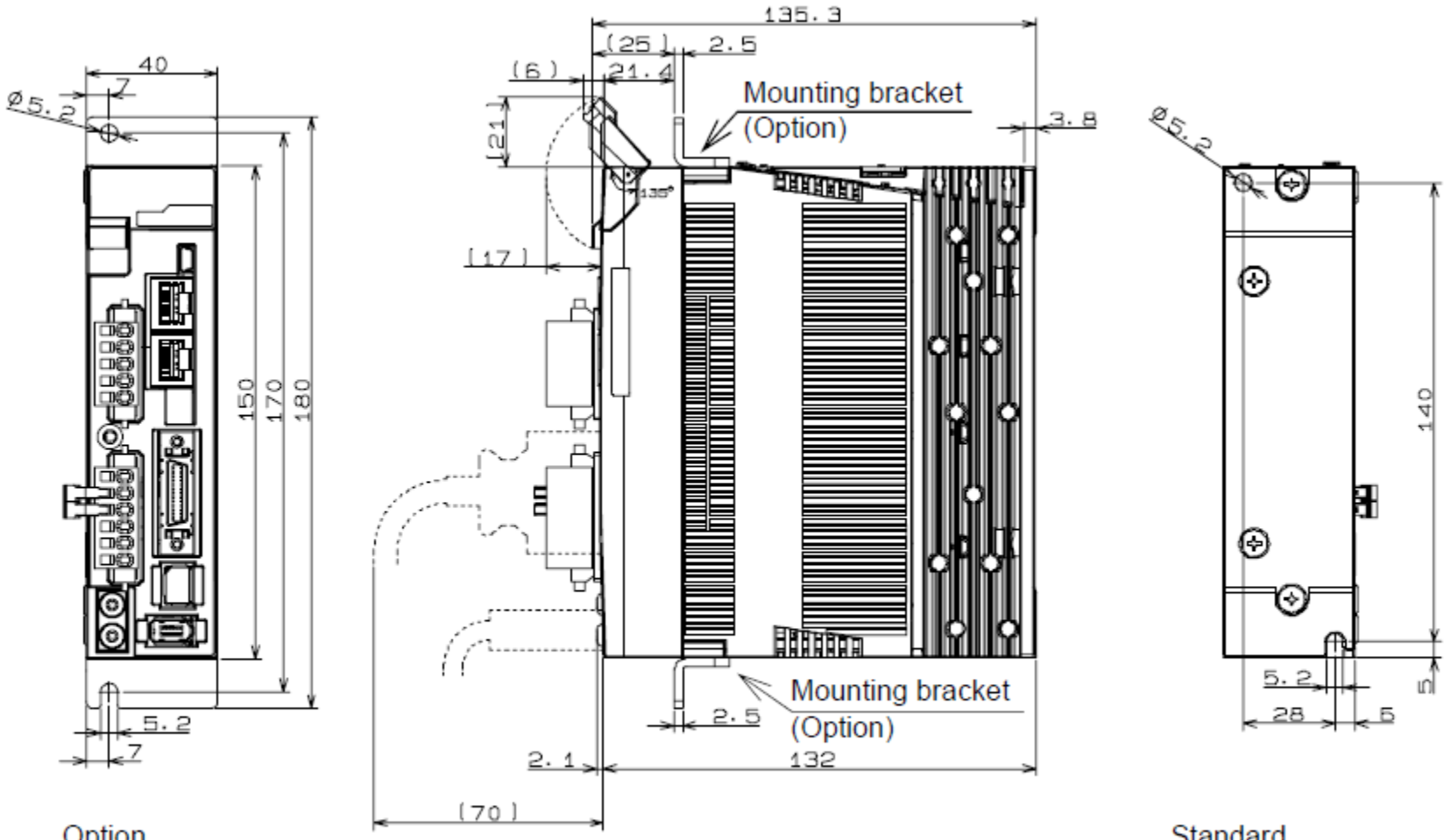
Dimensions in mm

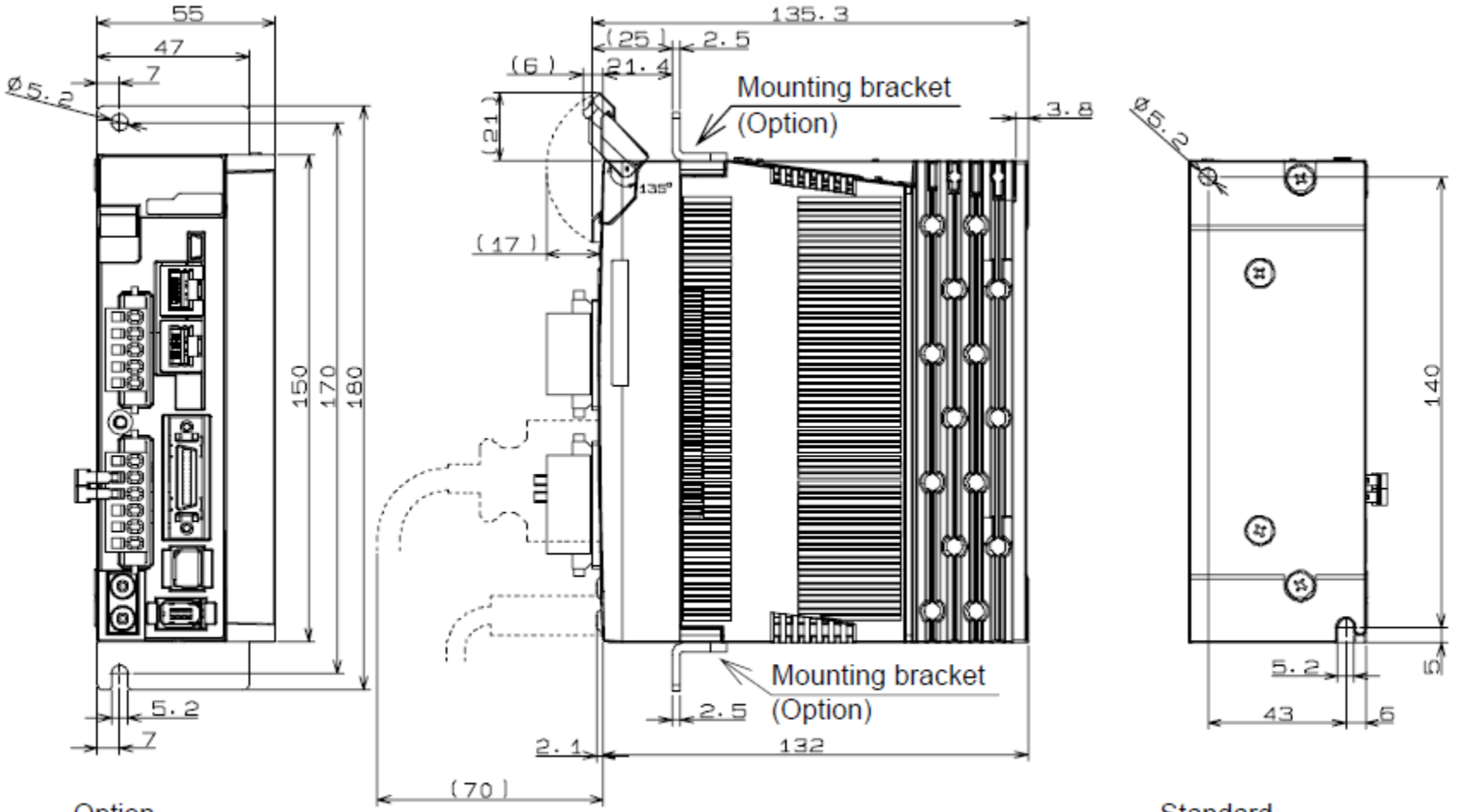
Frame Size A



Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

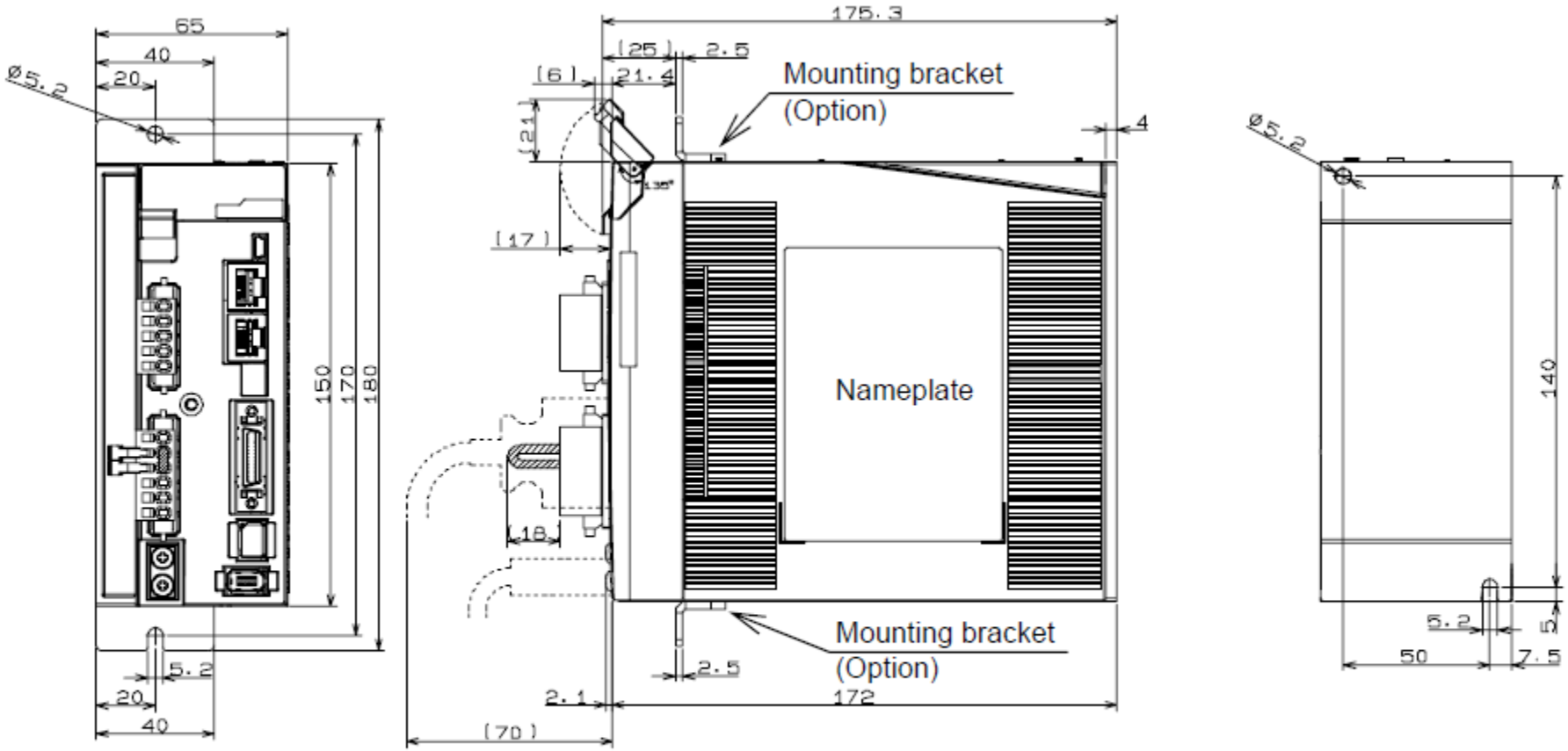
Frame Size B



Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

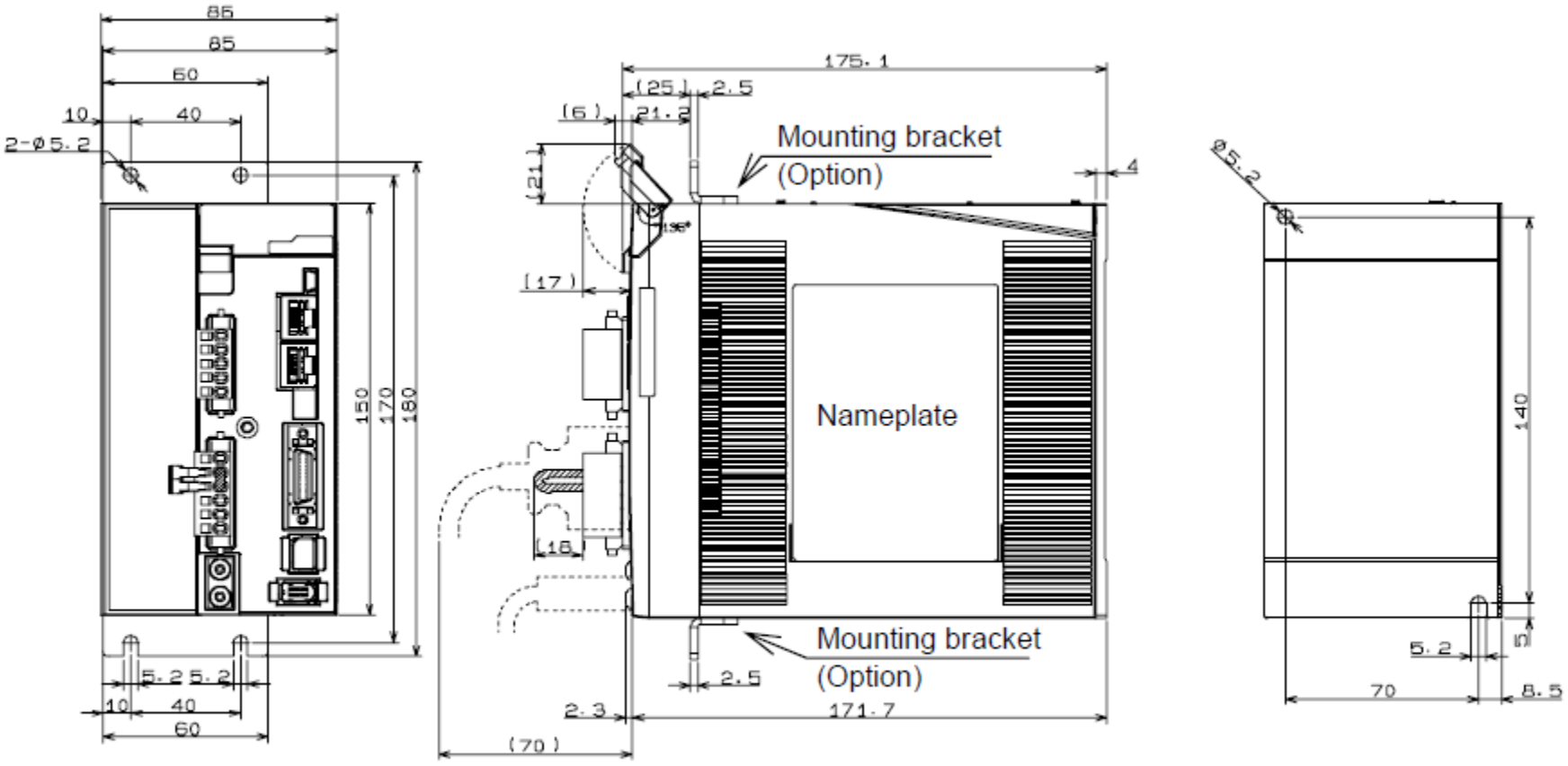
Frame Size C



Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

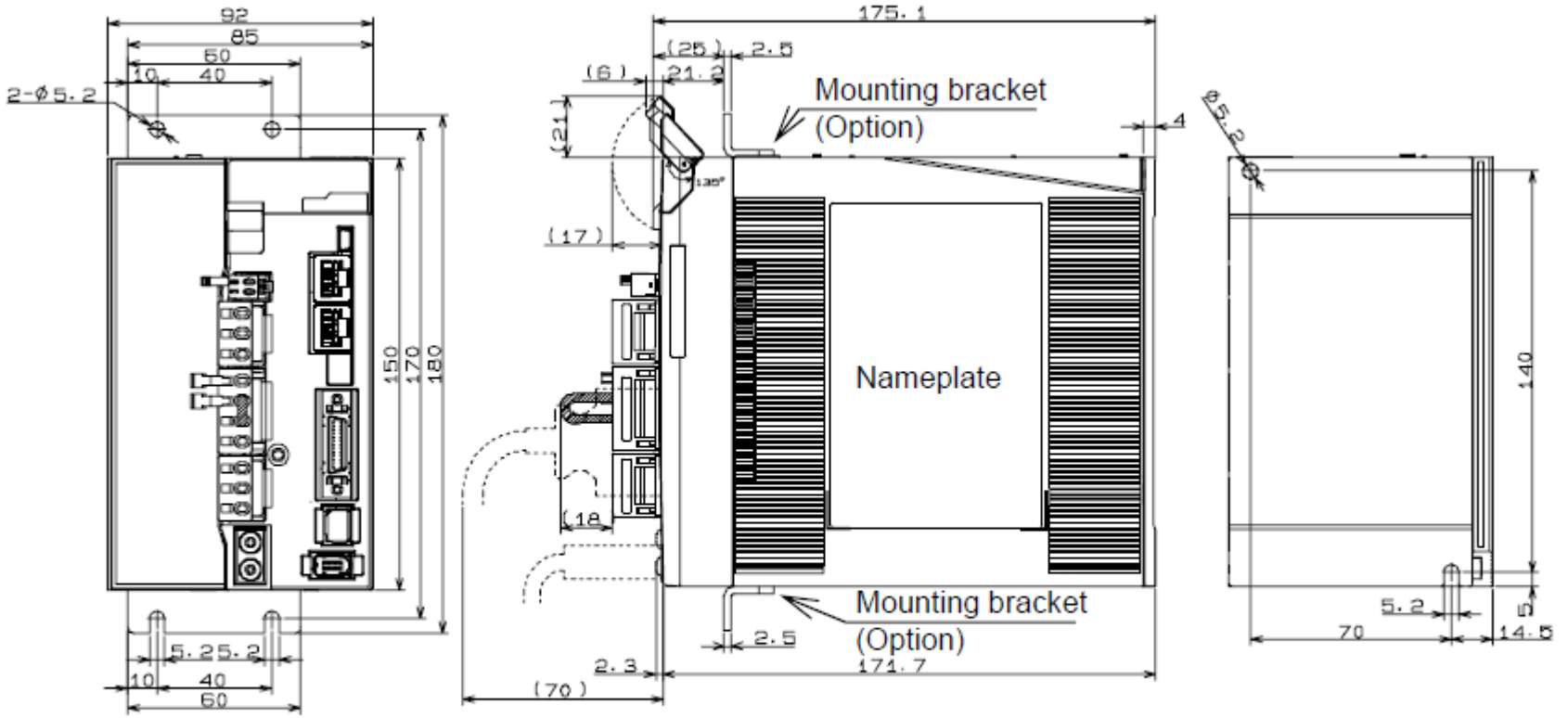
Frame Size D (200V)



Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

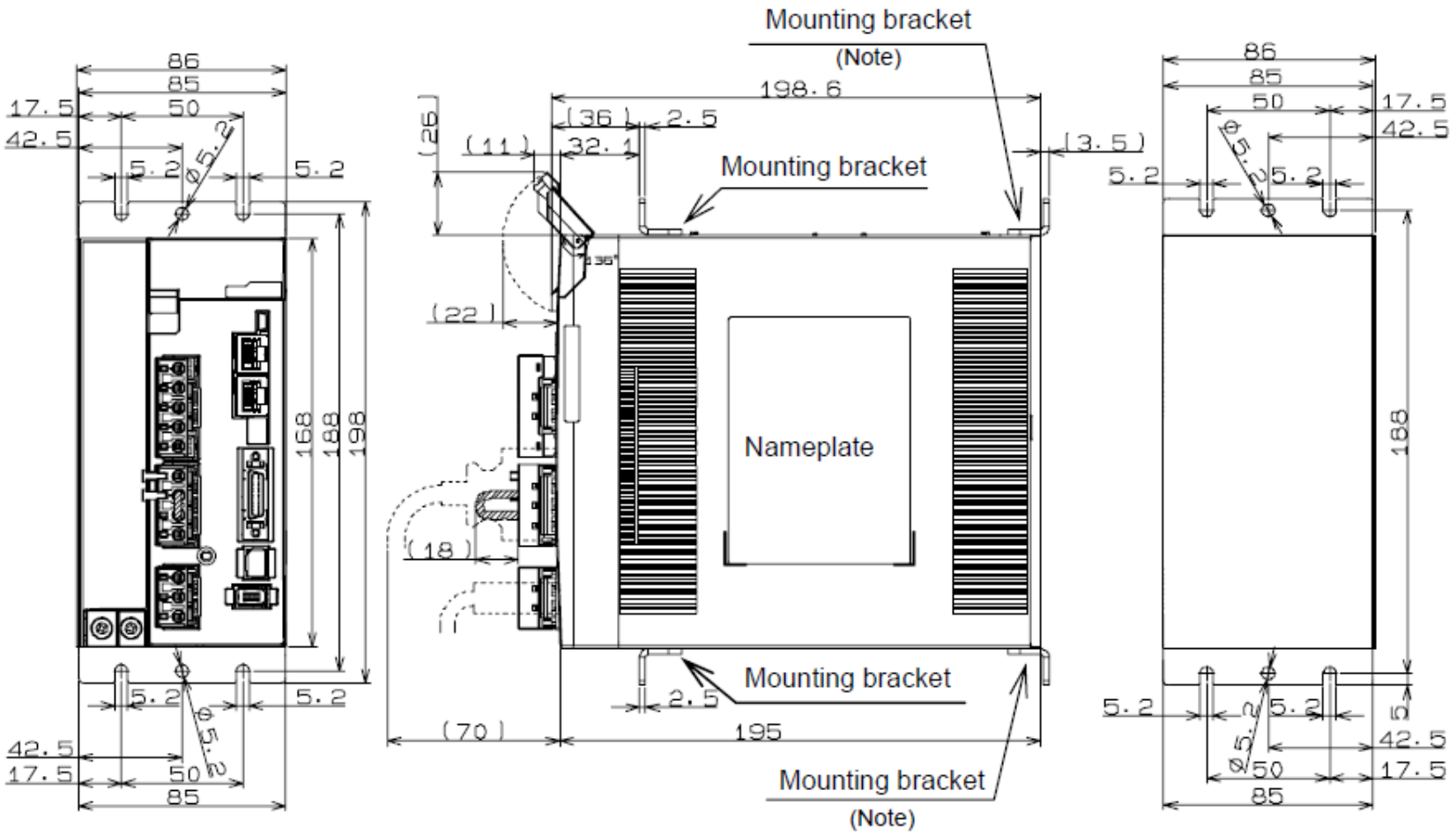
Frame Size D (400V)



Option
Rack-mountable
(front mounting)

Standard
Base mounting type
(rear mounting)

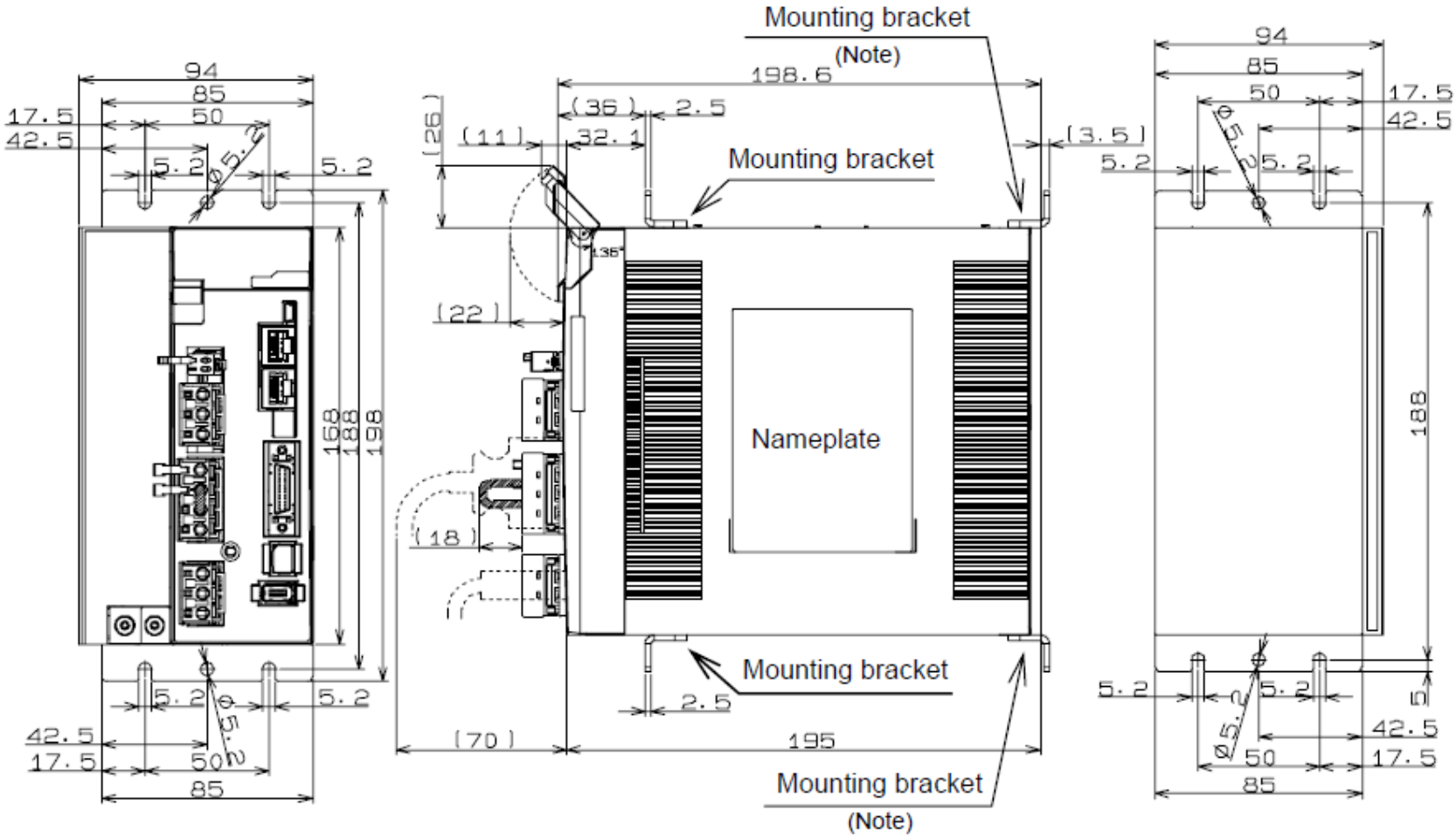
Frame Size E (200V)



Standard
Rack-mountable
(front mounting)

Replace the brackets
Base-mountable
(rear mounting)

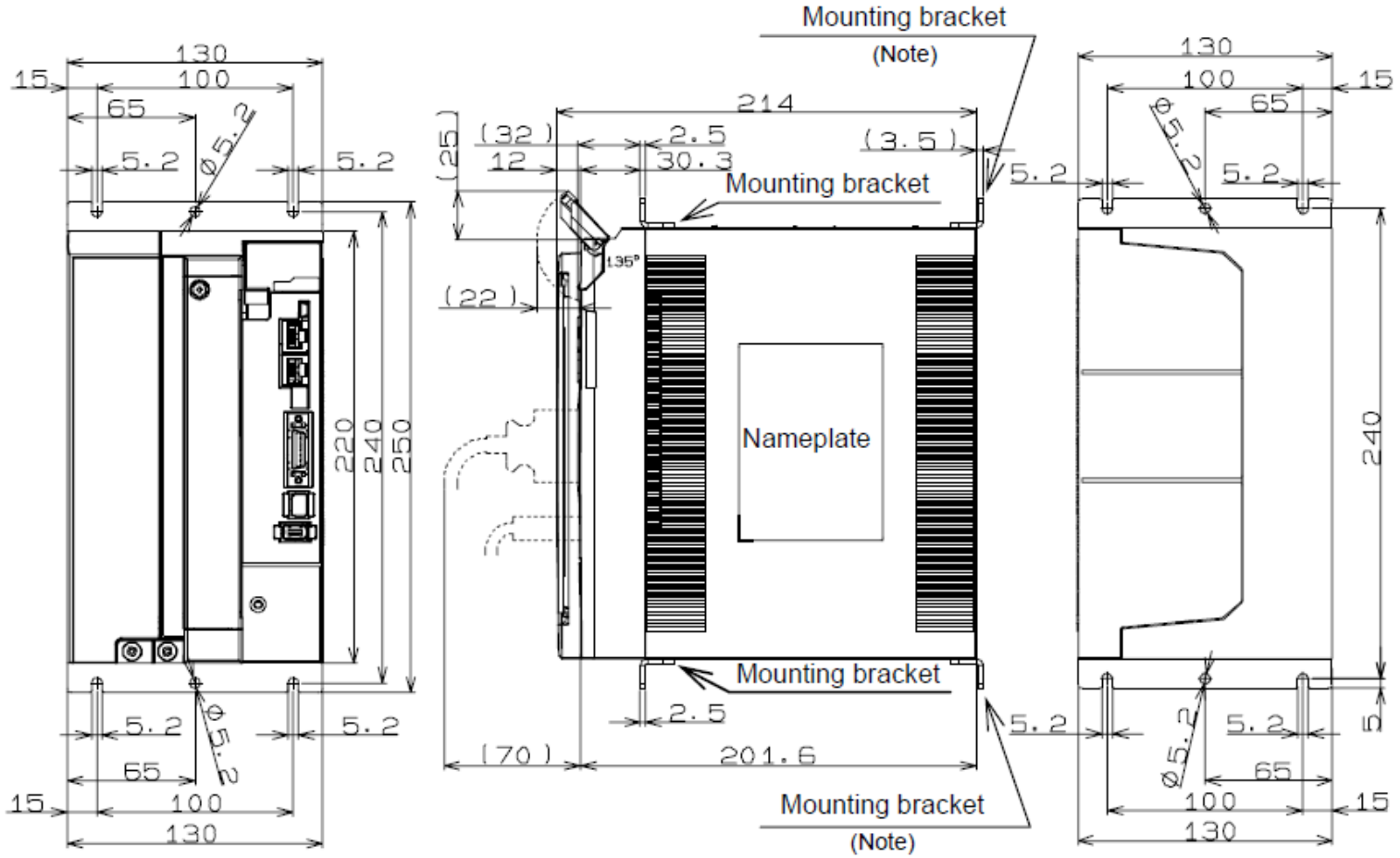
Frame Size E (400V)



Standard
Rack-mountable
(front mounting)

Replace the brackets
Base-mountable
(rear mounting)

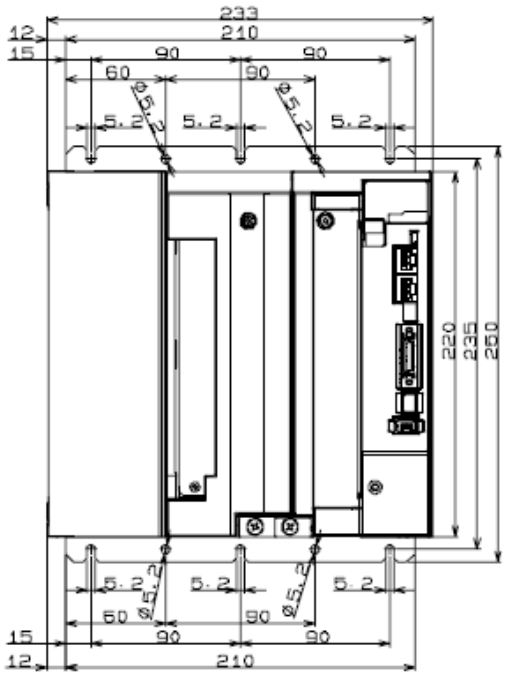
Frame Size F



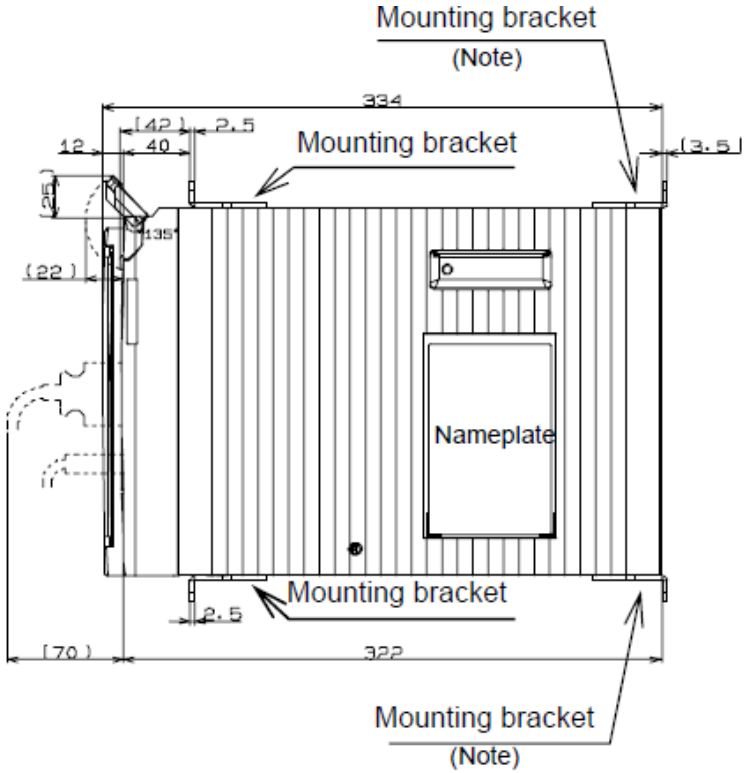
Standard
Rack-mountable
(front mounting)

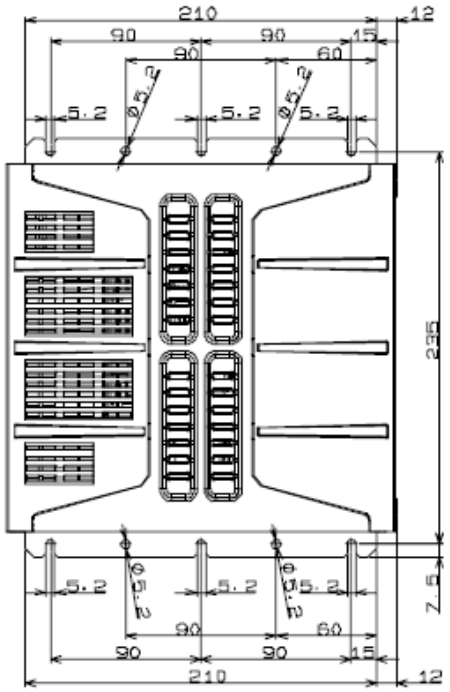
Replace the brackets
Base-mountable
(rear mounting)

Frame Size G



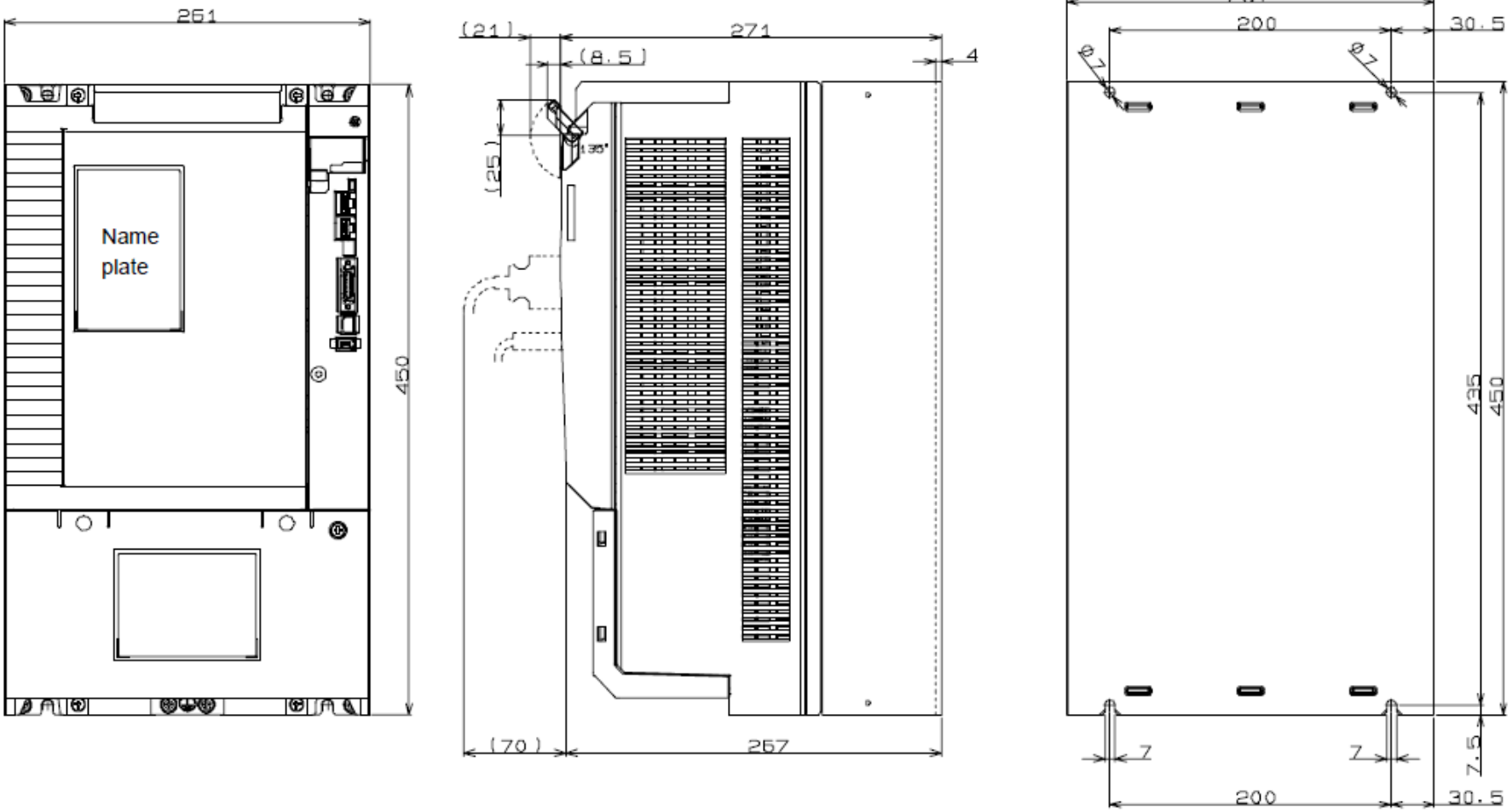
Standard
Rack-mountable
(front mounting)





Replace the brackets
Base-mountable
(rear mounting)

Frame Size H


261
Name plate
450
(21)
271
(8.5)
4
(25)
135°
(70)
267
261
200
30.5
Ø7
Ø7
435
450
7
7
7.5
200
30.5

Appendix

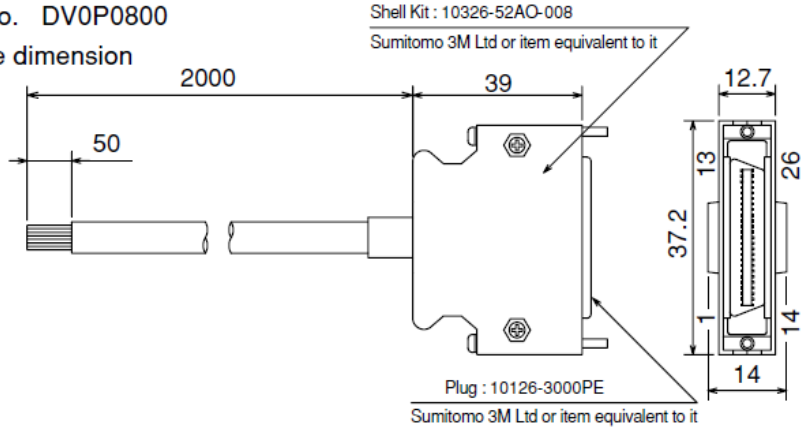
Optional Cable and Connector

Except for X4 connector, the options are in common with A5 series.
For X4, the followings for E series should be used.

X4 Cable

(1) Part No. DV0P0800

(2) Outline dimension



(3) Table of Wiring

Pin No.	Color of Core Wire	Pin No.	Color of Core Wire	Pin No.	Color of Core Wire
1	Orange (red 1)	10	Pink (black 1)	19	Pink (red 2)
2	Orange (black 1)	11	Orange (red 2)	20	Pink (black 2)
3	Gray (red 1)	12	Orange (black 2)	21	Orange (red 3)
4	Gray (black 1)	13	Gray (red 2)	22	Gray (red 3)
5	White (red 1)	14	Gray (black 2)	23	Gray (black 3)
6	White (black 1)	15	White (red 2)	24	White (red 3)
7	Yellow (red 1)	16	White (black 2)	25	White (black 3)
8	Yellow (black 1)	17	Yellow (red 2)	26	Orange (black 3)
9	Pink (red 1)	18	Yellow (black 2)		

For example, the color of the wire, Orange (Red 1) means that the lead wire is colored in orange with one red dot mark.

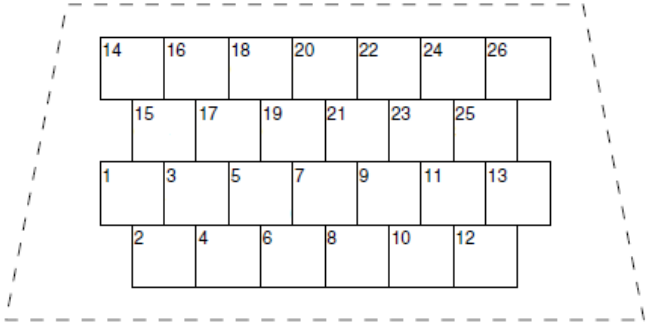
X4 Connector

(1) Part No. DV0P0770

(2) Components

Name	Manufacturer's part No.	Number	Manufacturer
Connector	10126-3000PE	1	Sumitomo 3M Ltd
Connector Cover	10326-52A0-008	1	

(viewed from the soldering side of the connector)



X4 Pin Configurations

No.	Name (Default)
1	SO1+ (BRK-OFF+)
2	SO1- (BRK-OFF-)
3	SO3+ (ALM+)
4	SO3- (ALM-)
5	SI1 (SI-MON5)
6	I-COM
7	SI2 (POT)
8	SI3 (NOT)
9	SI4 (SI-MON1)
10	SI5 (HOME)
11	SI6 (EXT2)
12	SI7 (EXT3)
13	SI8 (SI-MON4)

No.	Name (Default)
14	BTP-I
15	BTN-I
16	GND
17	OA+
18	OA-
19	OB-
20	OB+
21	Reserved Output
22	Reserved Output
23	AIN
24	GND
25	SO2+ (EX-OUT1+)
26	SO2- (EX-OUT1-)

Specific model only

Note: Shield of cable should be connected to shell of the connector.

Com. ASIC “MNM1221”

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If you develop RTEX products, this ASIC is needed.

Simple Protocol & Easy Development

Ref. Schematics, Example Codes, …etc. Available

	Specifications
Ordering No.	**DV0P444-9**
Packing Quantities	90pcs
Power Supply Voltage	3.3V
Consumption	Max. 100mA (For reference)
Operating Ambient Temp	-40 to +85 degree C
Package	LQFP100pin 14 x 14mm Lead Pitch 0.5mm
RoHS	Compliant
Operating Mode	Master / Slave

Note:
- You are subject to limitation that you must not compete with Panasonic products.
- To provide the technical documents, NDA is needed.
- For further information, please contact us.

Implement Example

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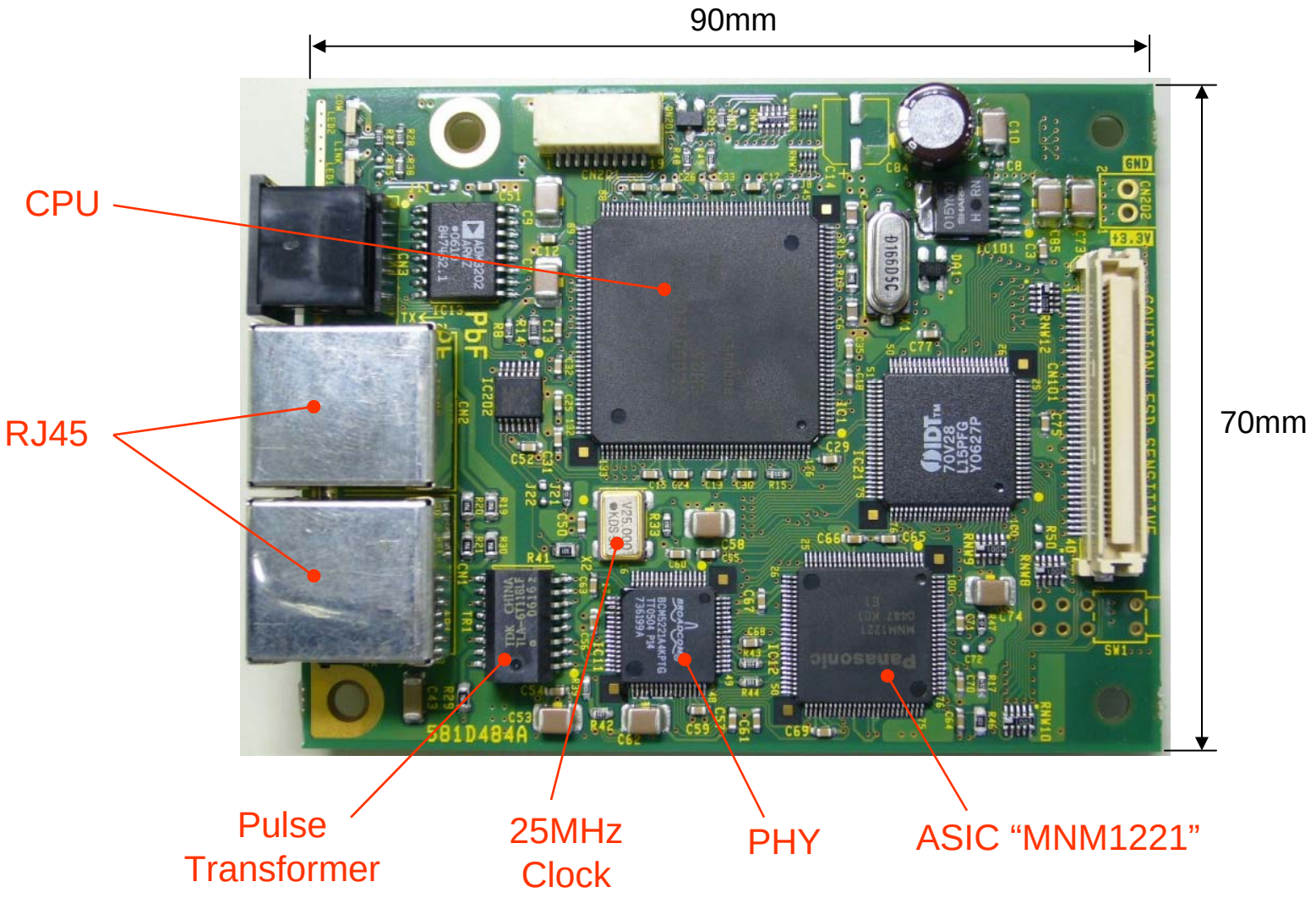

RTEX Monitoring Tool

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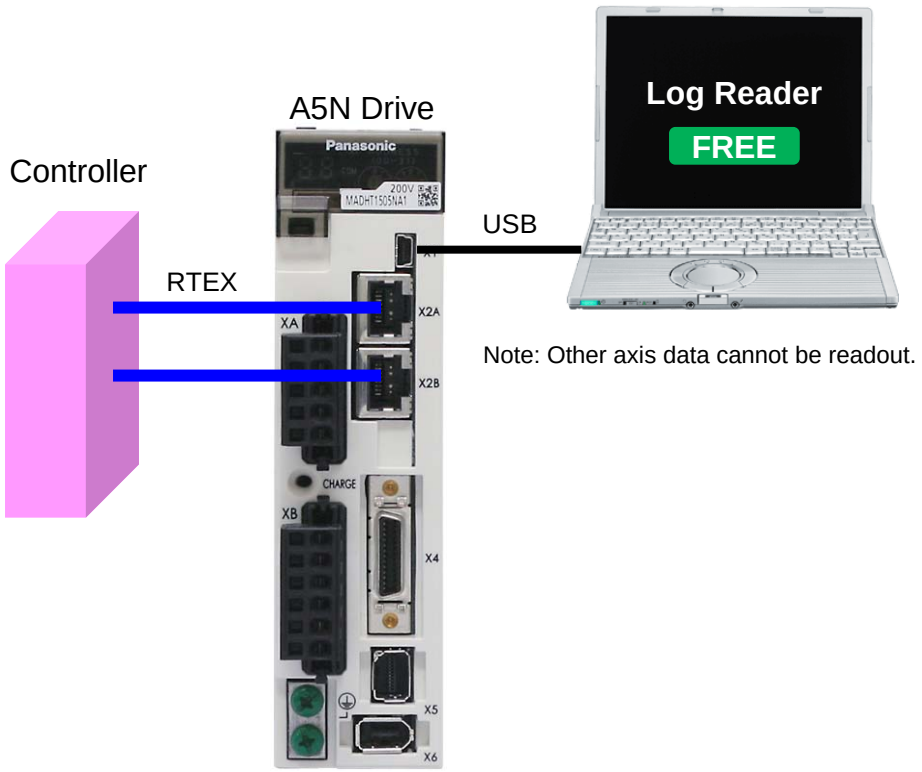
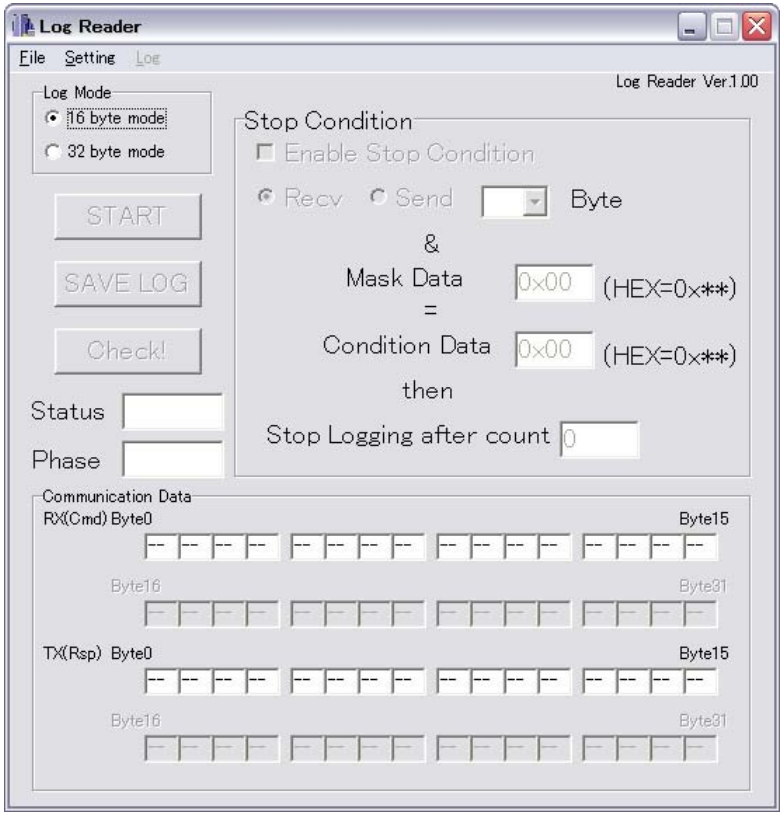
"Log Reader" is to readout own communication data logged on memory inside the drive.
As another tool, a partner Cosmo Techs provides "RTEX Analyzer".



Note: Other axis data cannot be readout.



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