RTEX
Realtime Express

Panasonic
ideas for life

Servo Drive MINAS-A4N with Realtime Express (RTEX)

Panasonic Corporation

200W 200V

Panasonic
ideas for life

Overview

Realtime Express (RTEX)

Panasonic
ideas for life

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

Concept

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

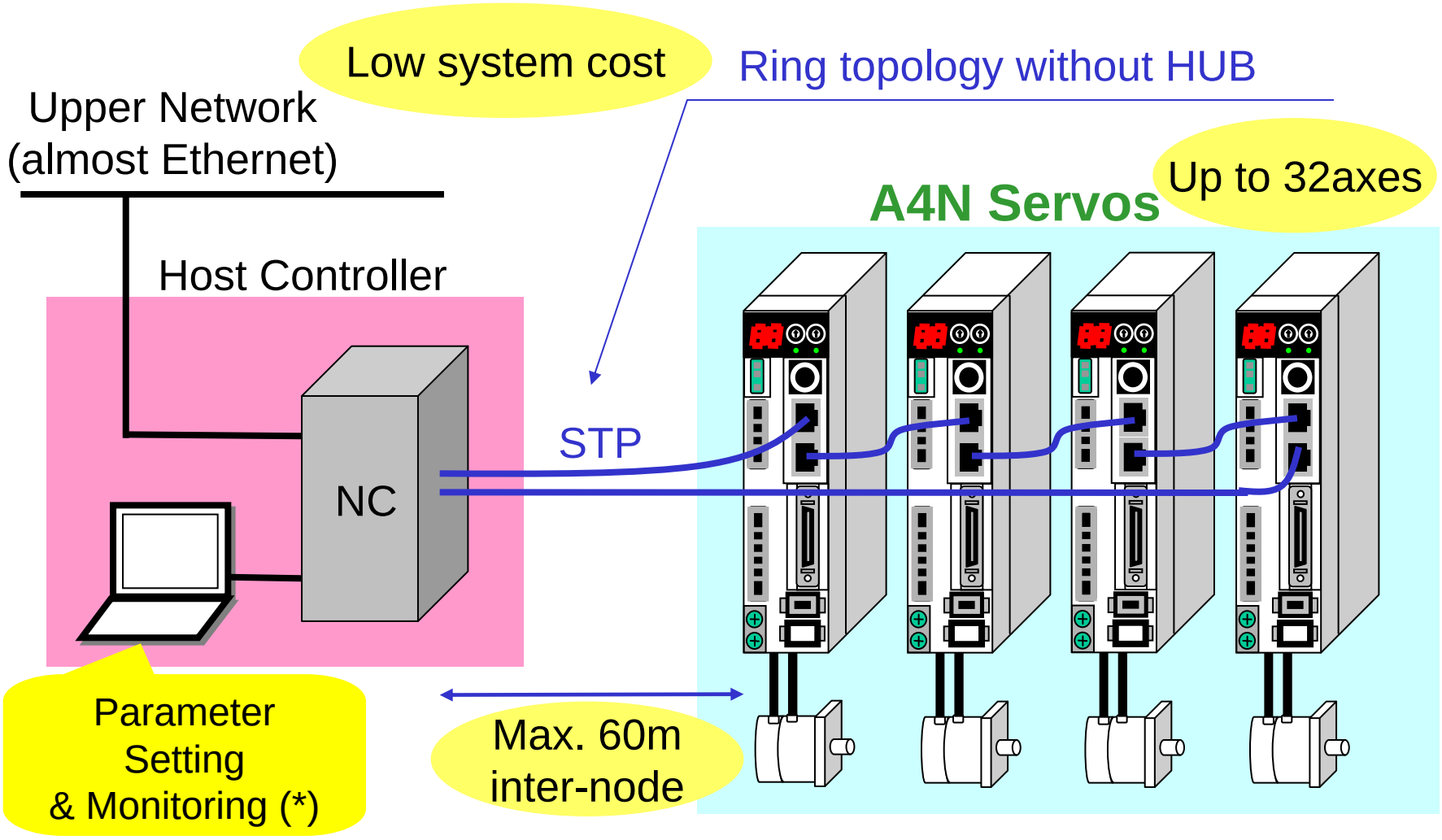
Features of *RTEX*

Panasonic
ideas for life

- **Real-time communication** based on 100BASE-TX
- **100Mbps Full duplex**
- **0.5ms cycle** with up to **32 axes** (*1)
- **Max. 60m length** inter-node cable
- All axes **fully synchronization** (*2) for interpolation
- **Parameter** setting and **monitoring**
- **Less wiring**
- **Low cost** system using shielded twisted pair cable
- **High noise immunity** (IEC61000-4-4 compliant)

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

System Structure



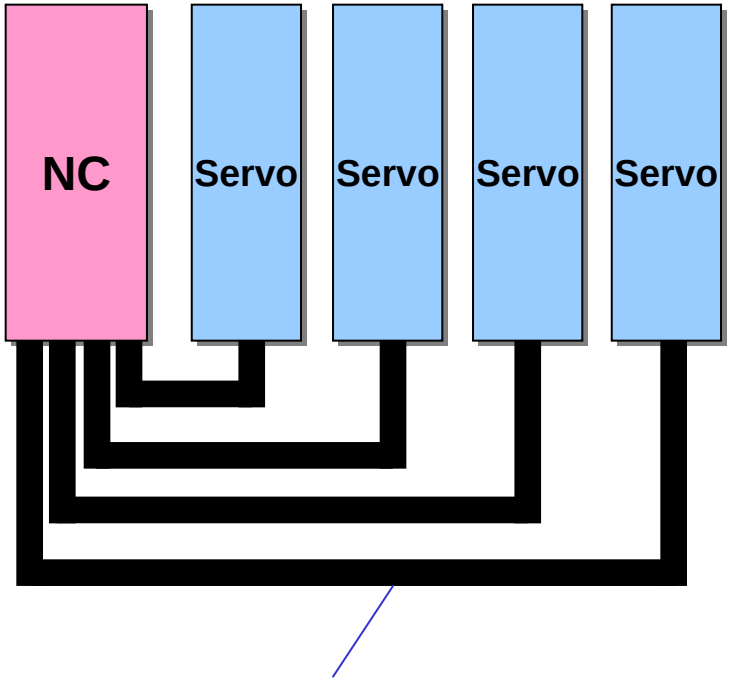
*: Depends on a controller specification

STP: Shielded Twisted Pair cable

Less Wiring at Multi-Axes

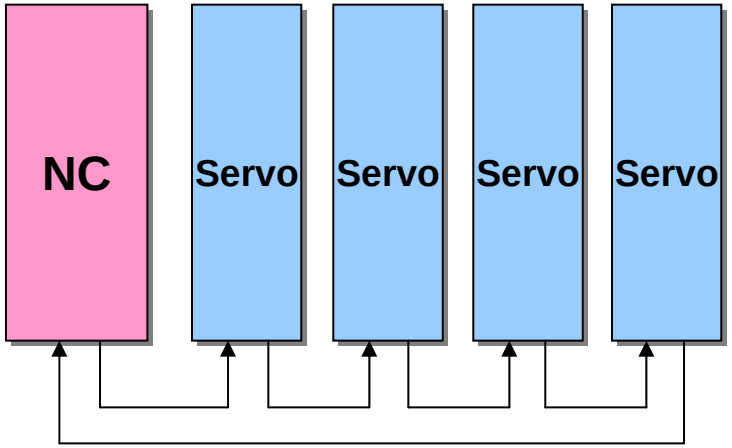
Panasonic
ideas for life

Pulse I/F



Bundle of Many Wires

RTEX



Simple!

Reduced trouble with wiring

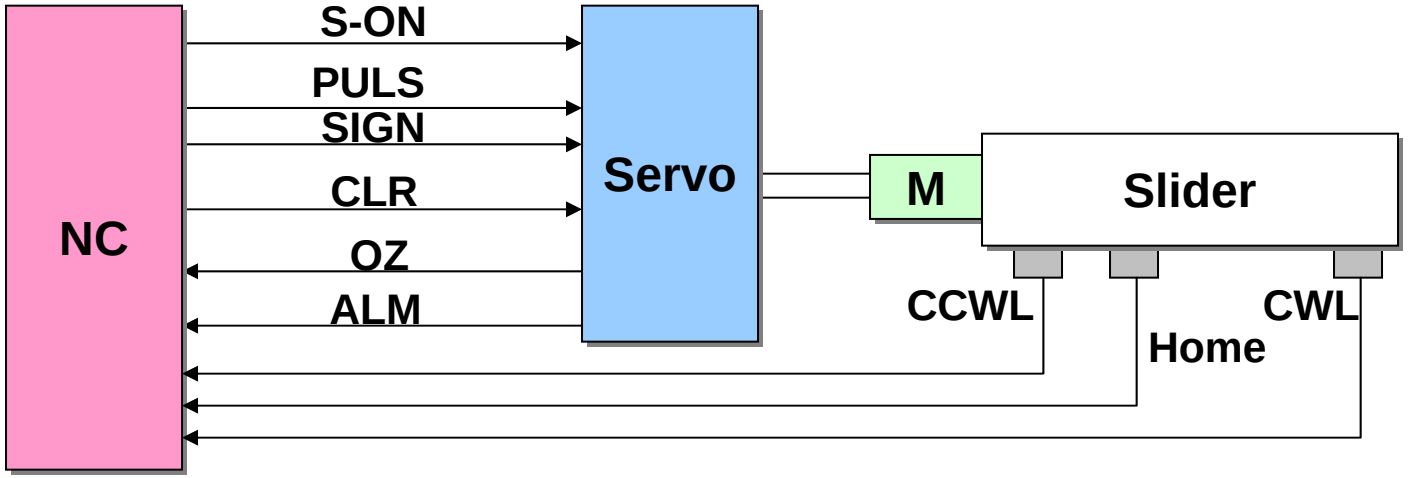
High benefit in distributed placing

Less Wiring at Single-Axis

Panasonic
ideas for life

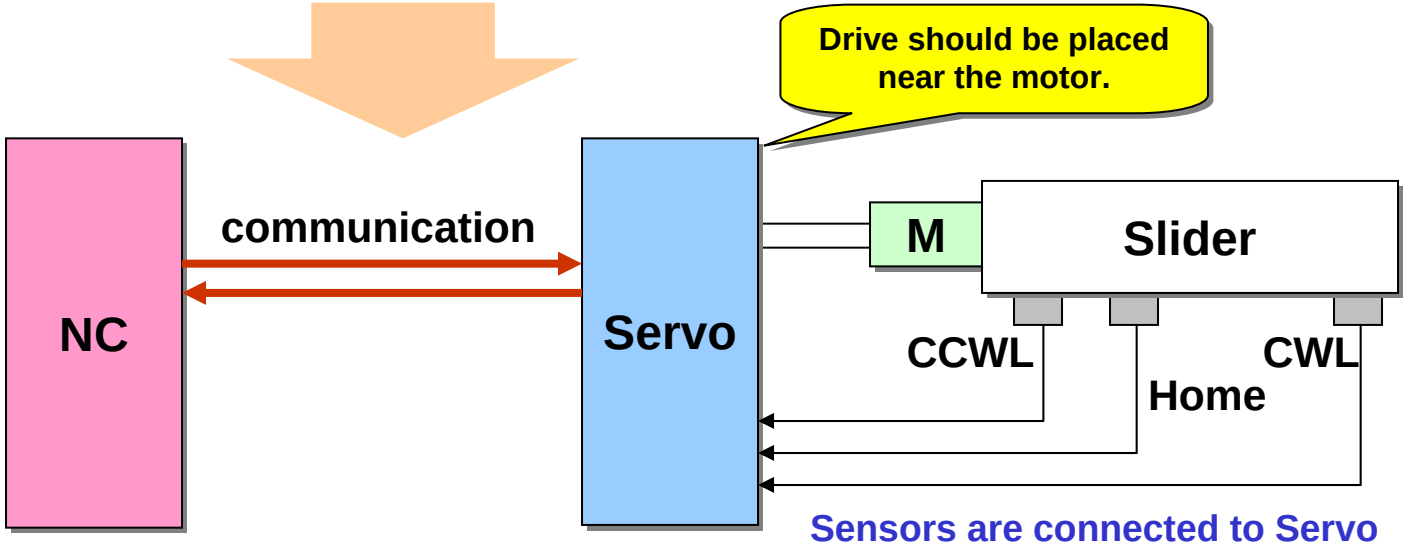
Pulse I/F

Many wires



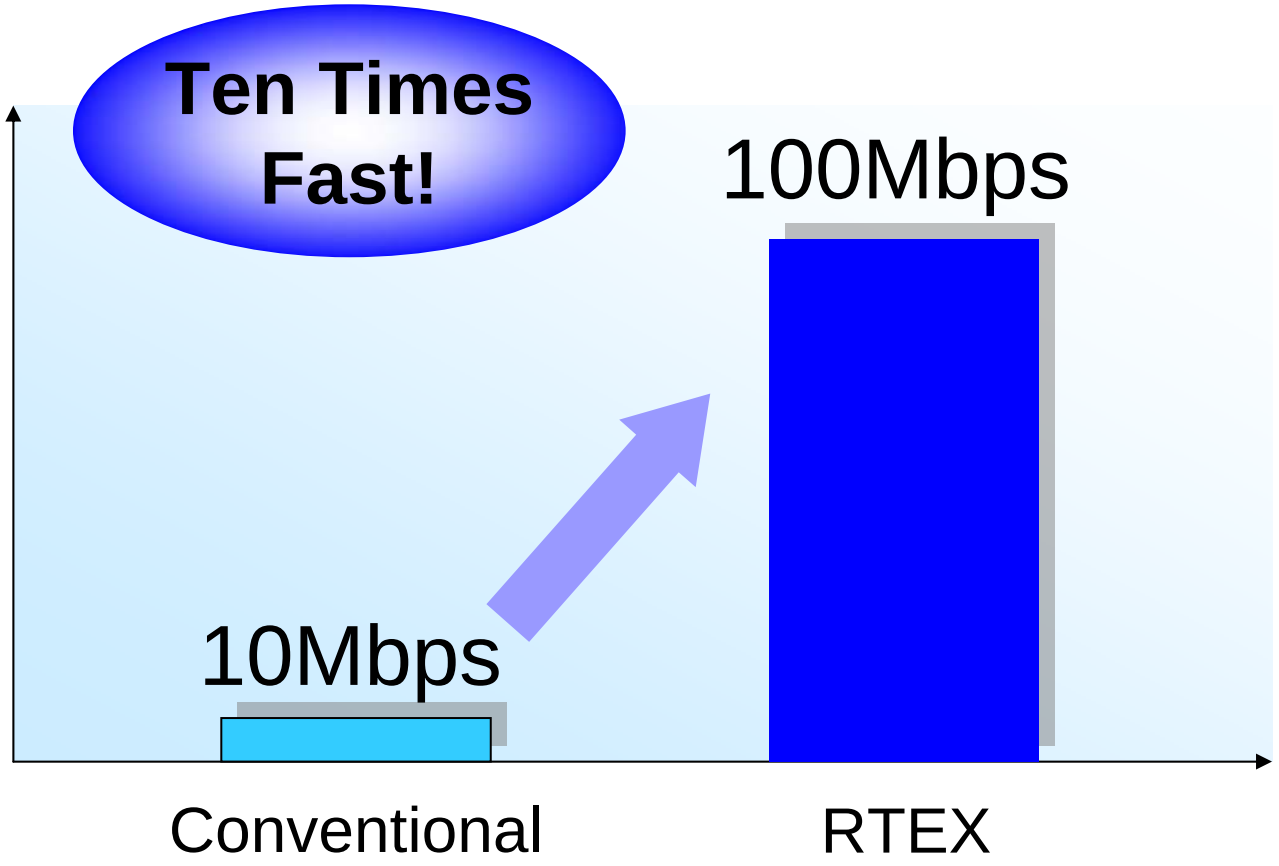
RTEX

Simple!



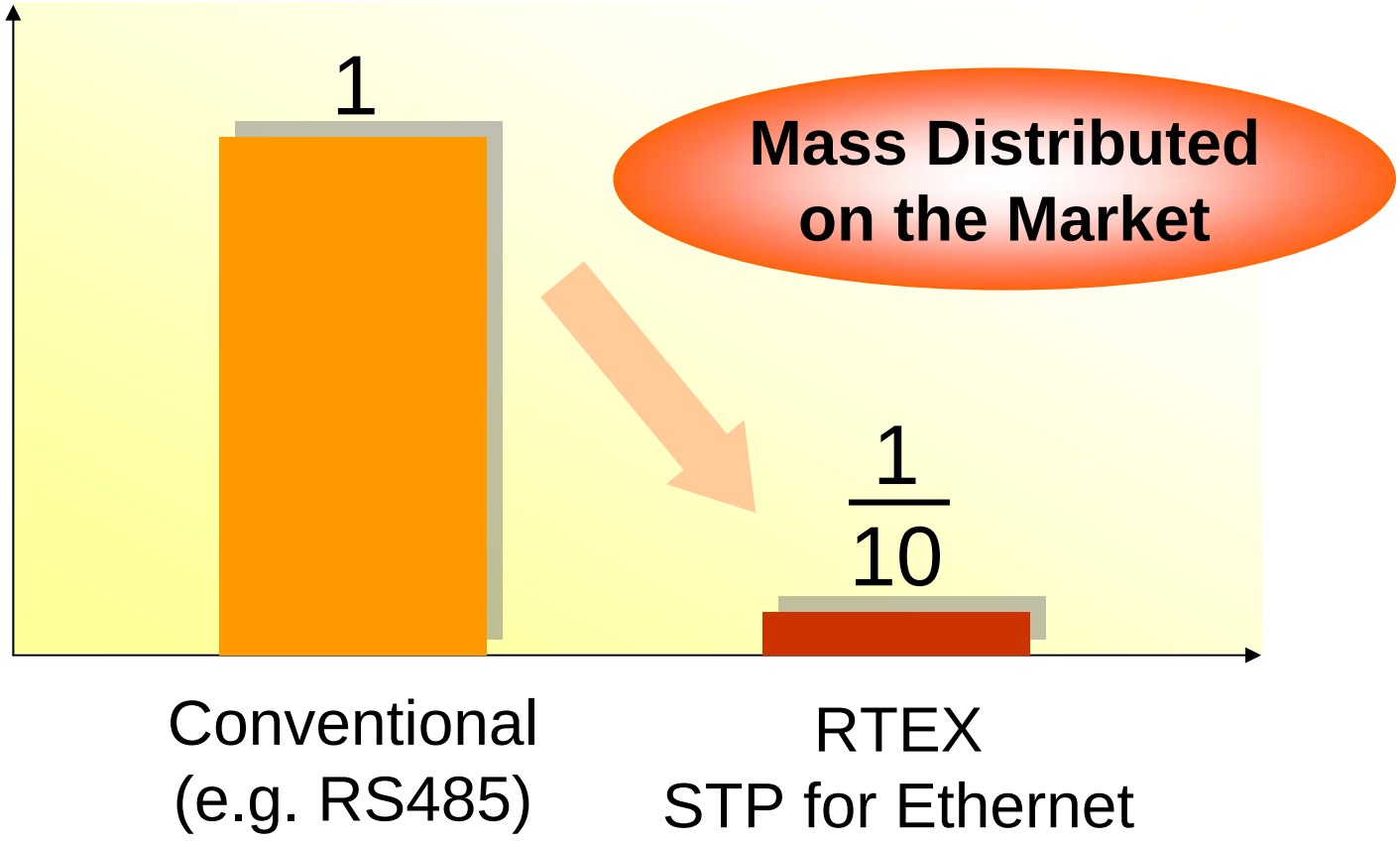
Sensors are connected to Servo

Ultra High-Speed



Using Low-Cost Cable

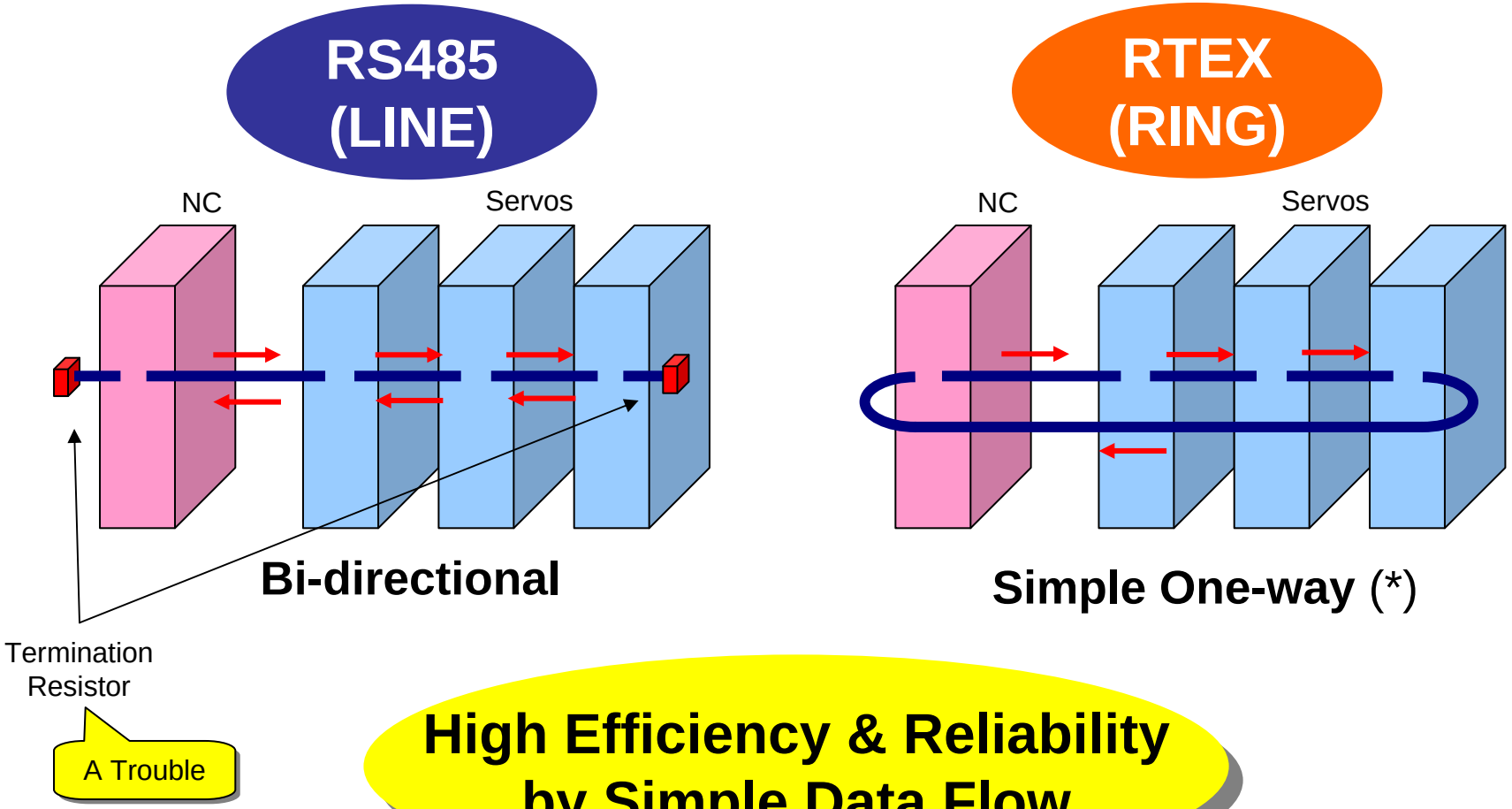
Cable Cost Ratio



Note: An example of 1m length.

Simple Ring Topology

Panasonic
ideas for life



High Efficiency & Reliability by Simple Data Flow

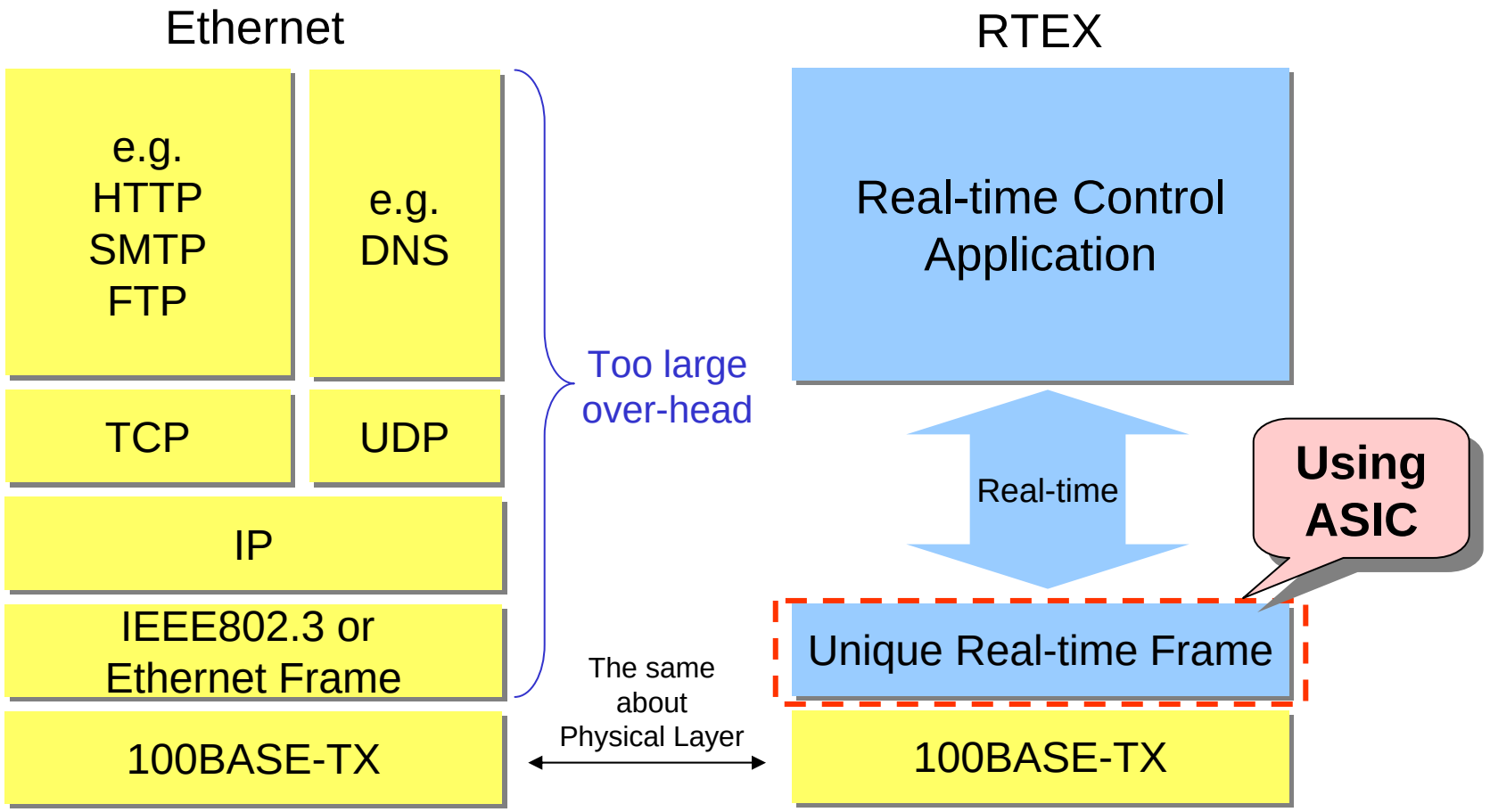
*: No cross-talk.

Features of ***RTEX***

Difference from Ethernet

Panasonic
ideas for life

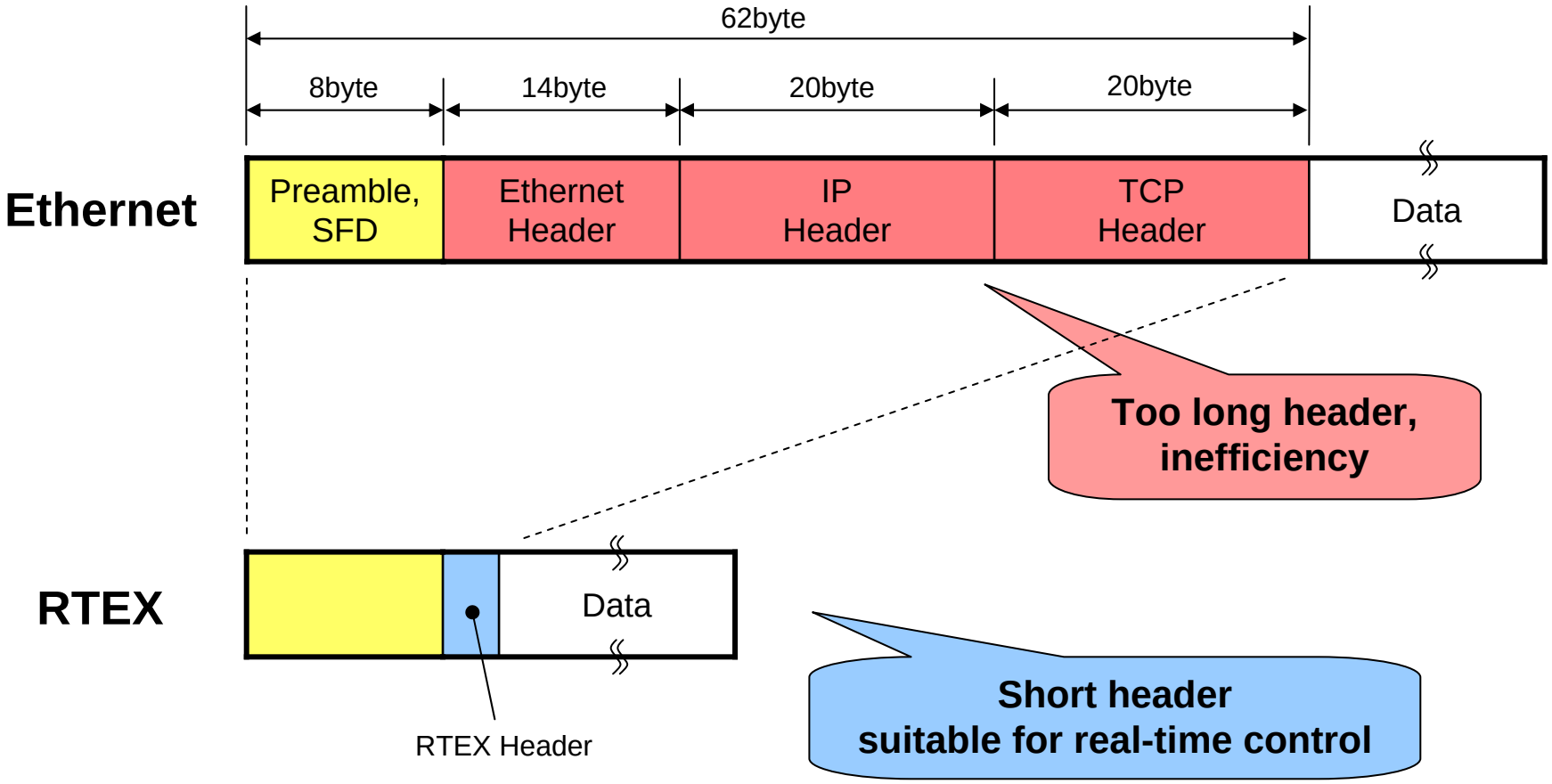
Upper layer optimized for servo control



Note: Ethernet is a registered trademark of Xerox corporation.

Efficient Frame

Simplified frame to realize high-speed real-time control



Real-time Communication

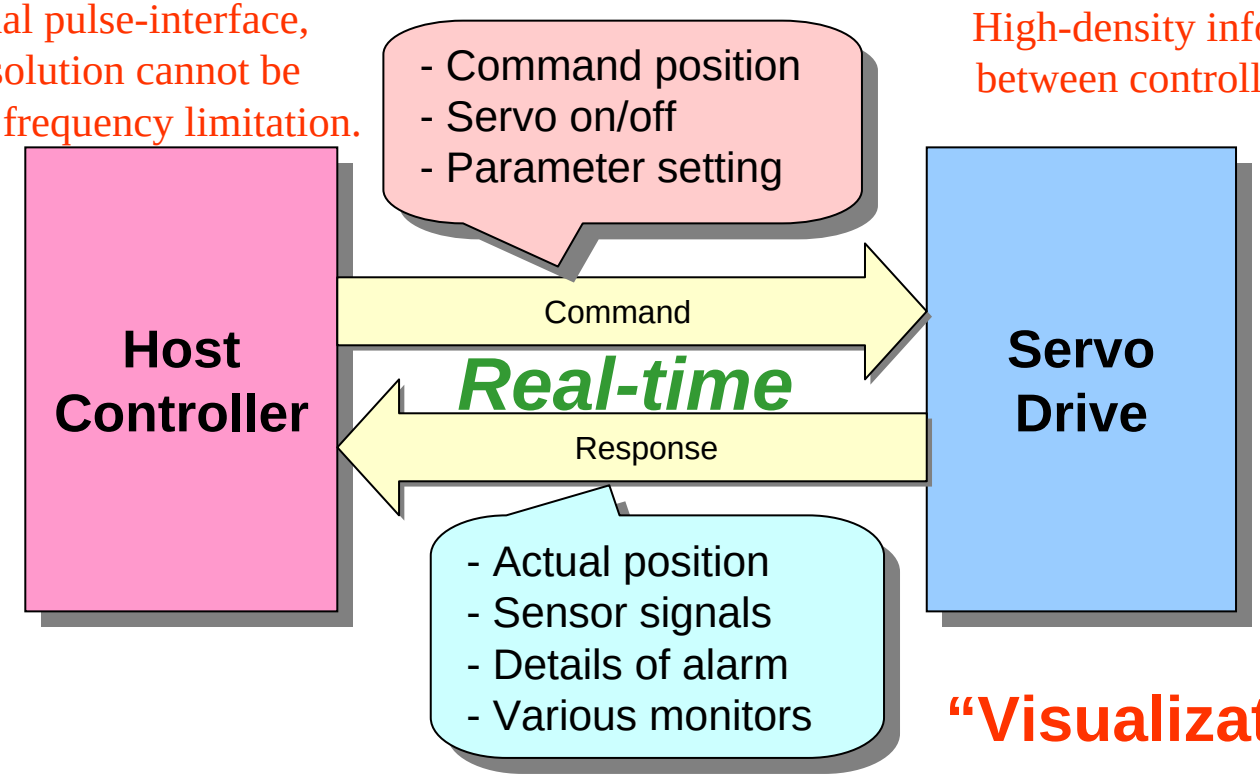
Panasonic
ideas for life

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

Panasonic
ideas for life

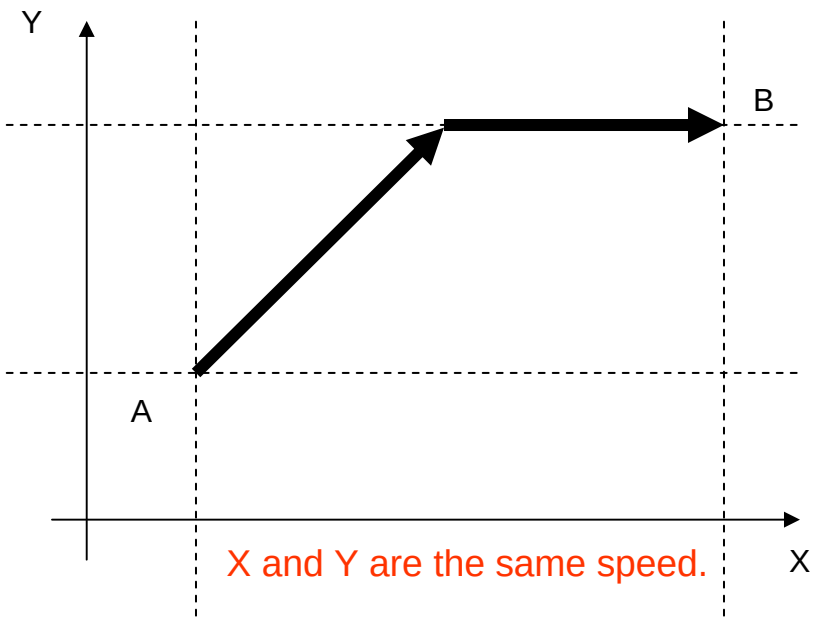
PTP

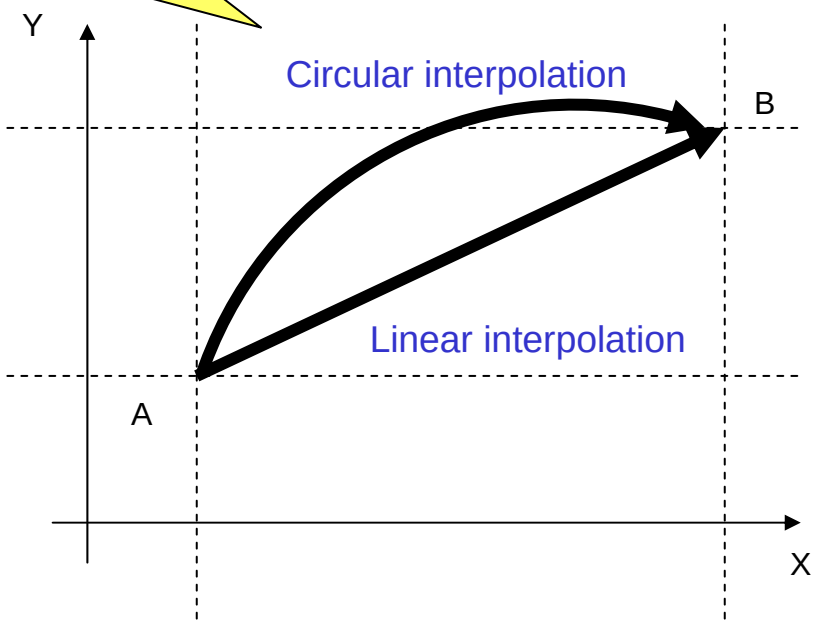
Point To Point

Isochronous enables CP.

CP

Continuous Path





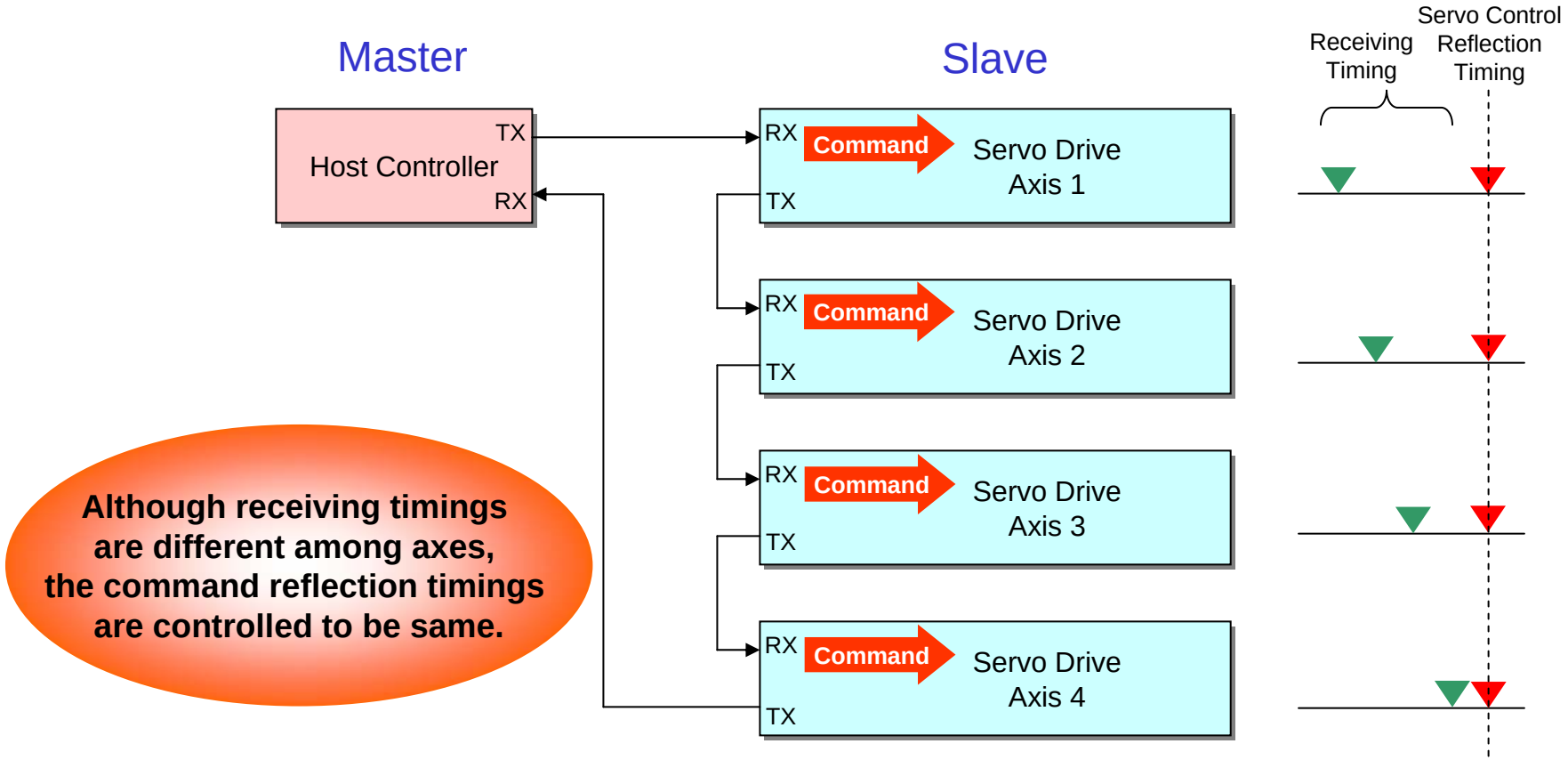
- Separately positioning
- Not corresponding Start/Stop timing between X and Y

- 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

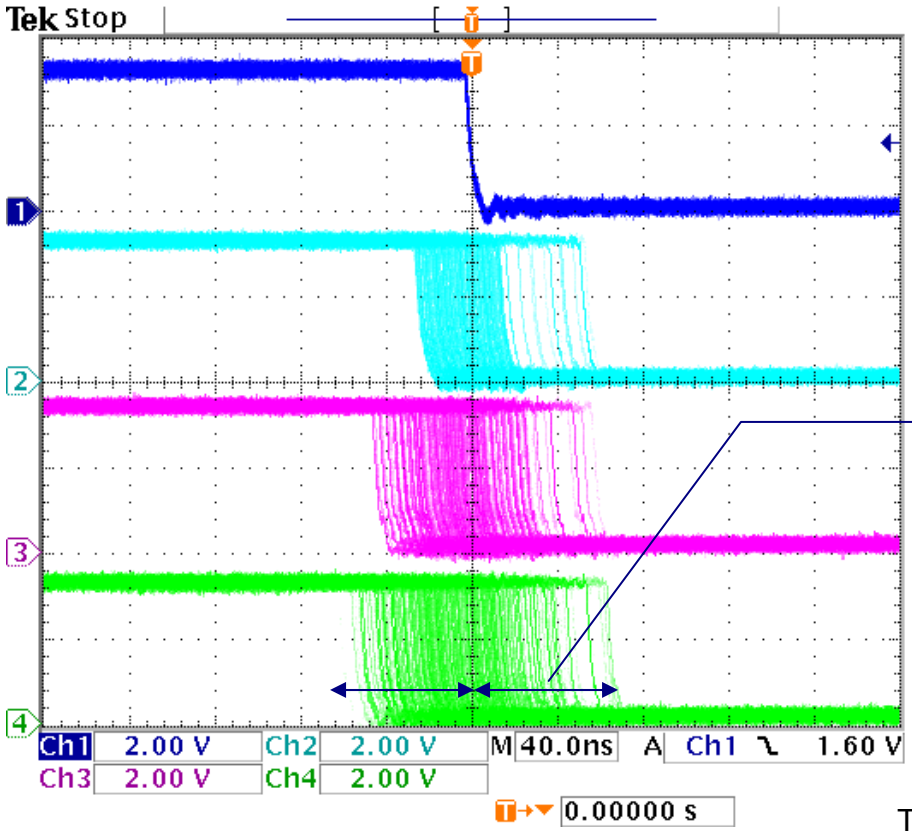
Signals to start servo calculation inside each drive

Axis 1

Axis 2

Axis 3

Axis 4



Jitter: +/- 70ns

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

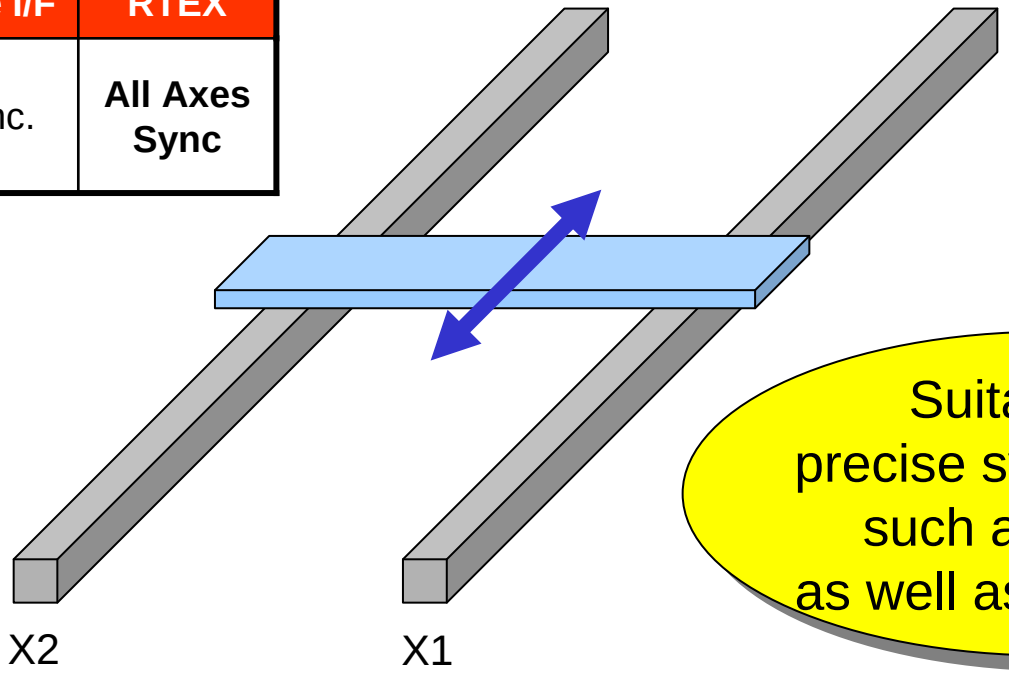
Note: Generally, jitter less than 1us is ideal.

Fully Synchronization

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

Improvement of sync precision among axes!

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



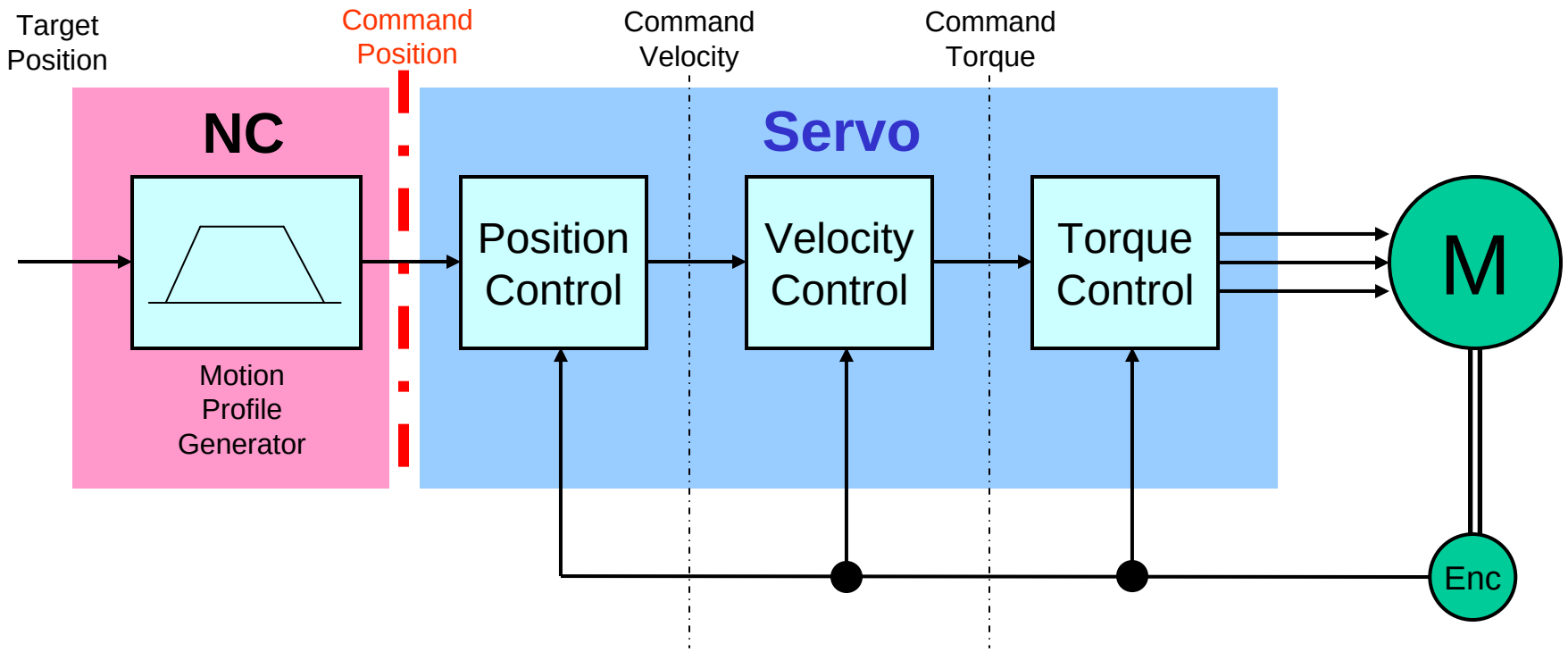
Suitable for precise synchronizing such as a gantry as well as CP control.

Interface and Com. Cycle

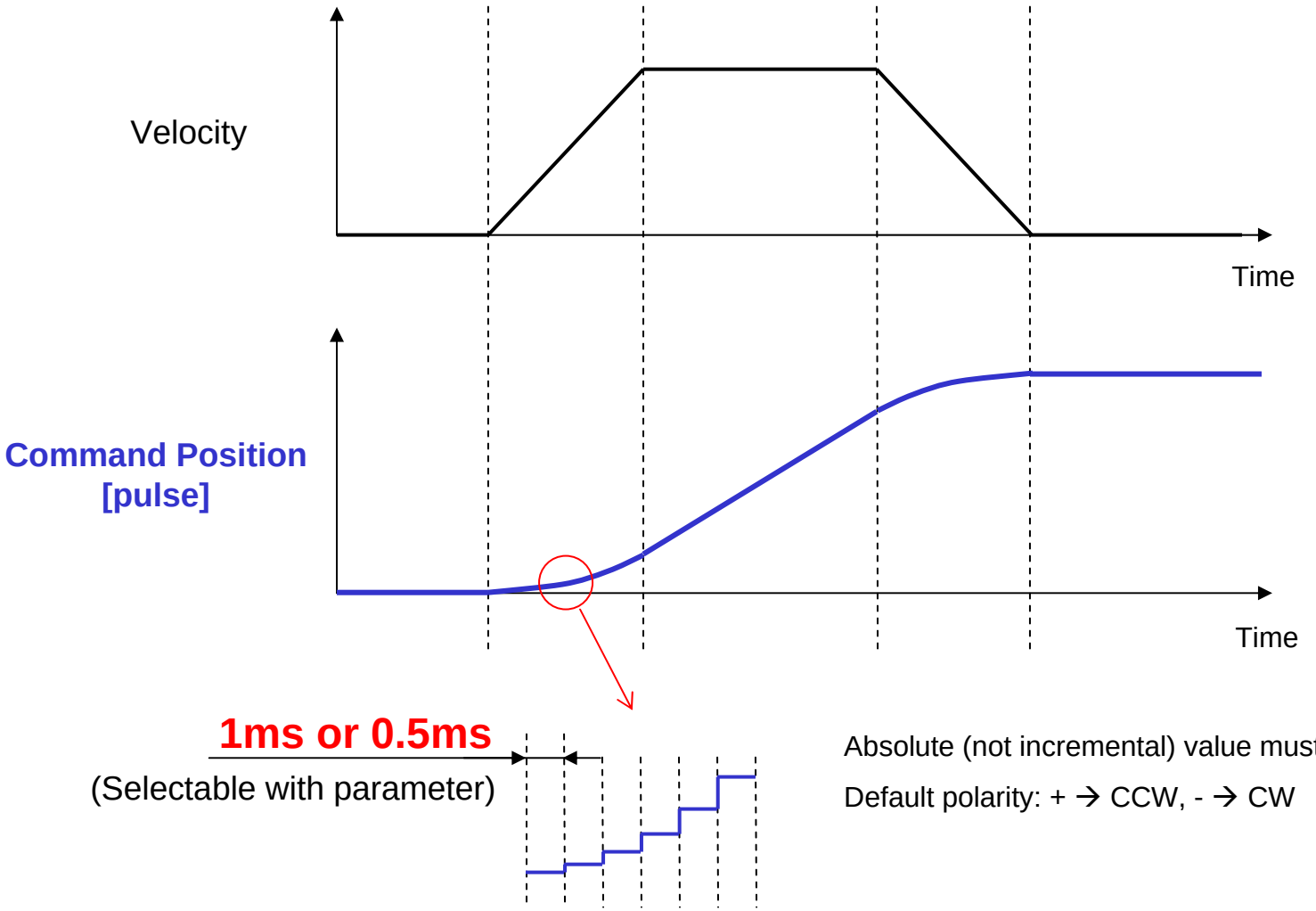
Panasonic
ideas for life

Position command with 0.5ms com. cycle

Shorter delay of transmission makes high servo performance.



Interface Data



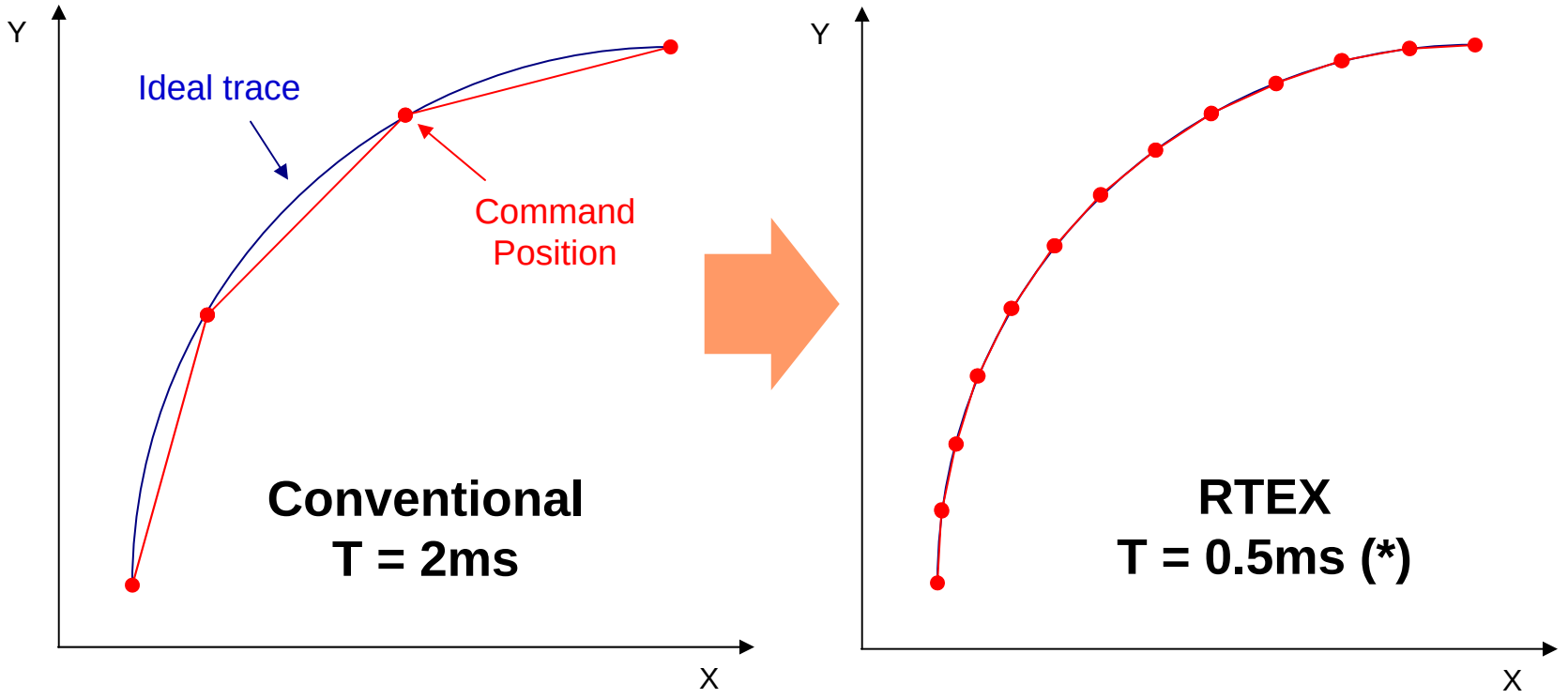
Absolute (not incremental) value must be used.

Default polarity: + → CCW, - → CW

Shorter Update Period

More Precisely on High-speed CP control

Micro circular interpolation (e.g. Dispenser)



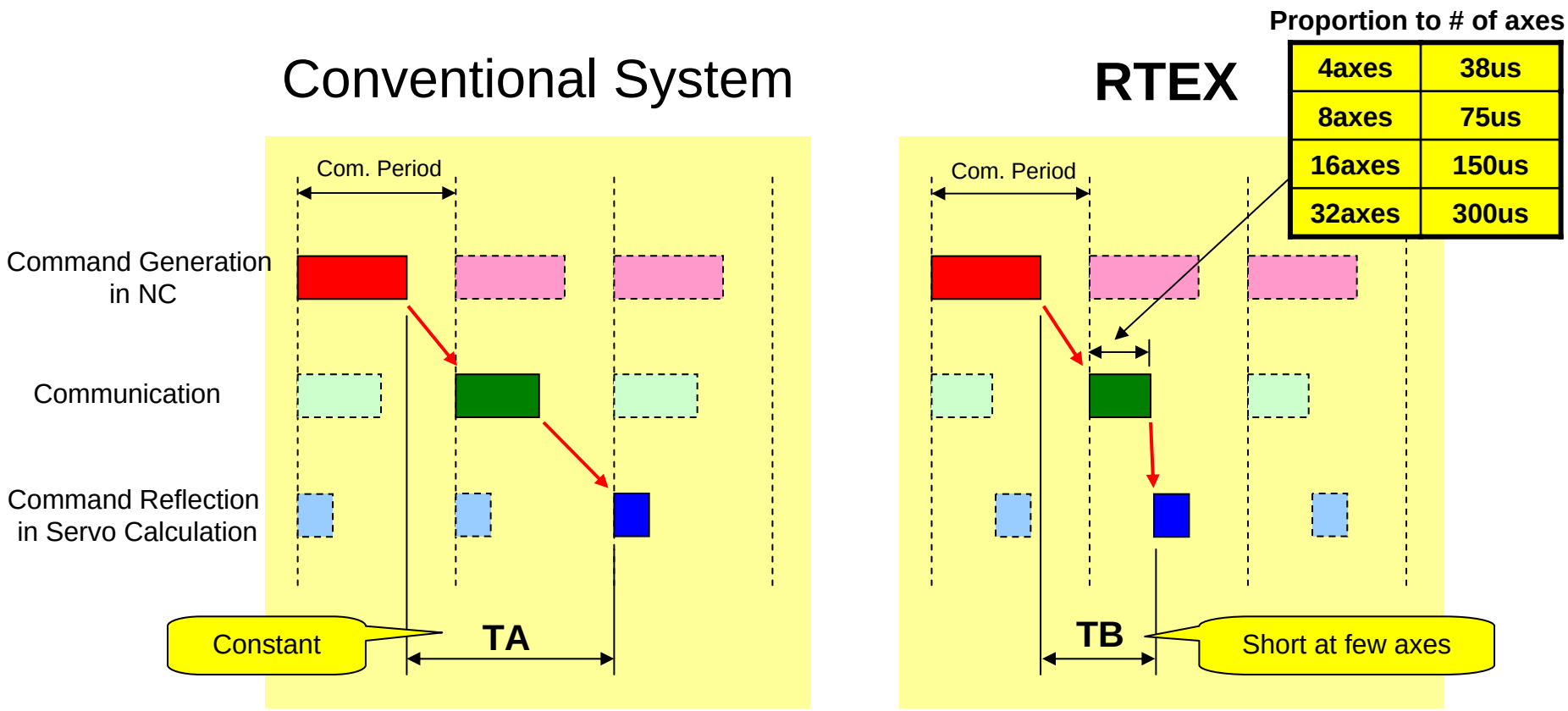
*: Data update period depends on controller specification, and is either 1ms or 0.5ms.

Shorter Transmission-Time

Panasonic
ideas for life

Proportion to # of axes

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



TA > TB

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

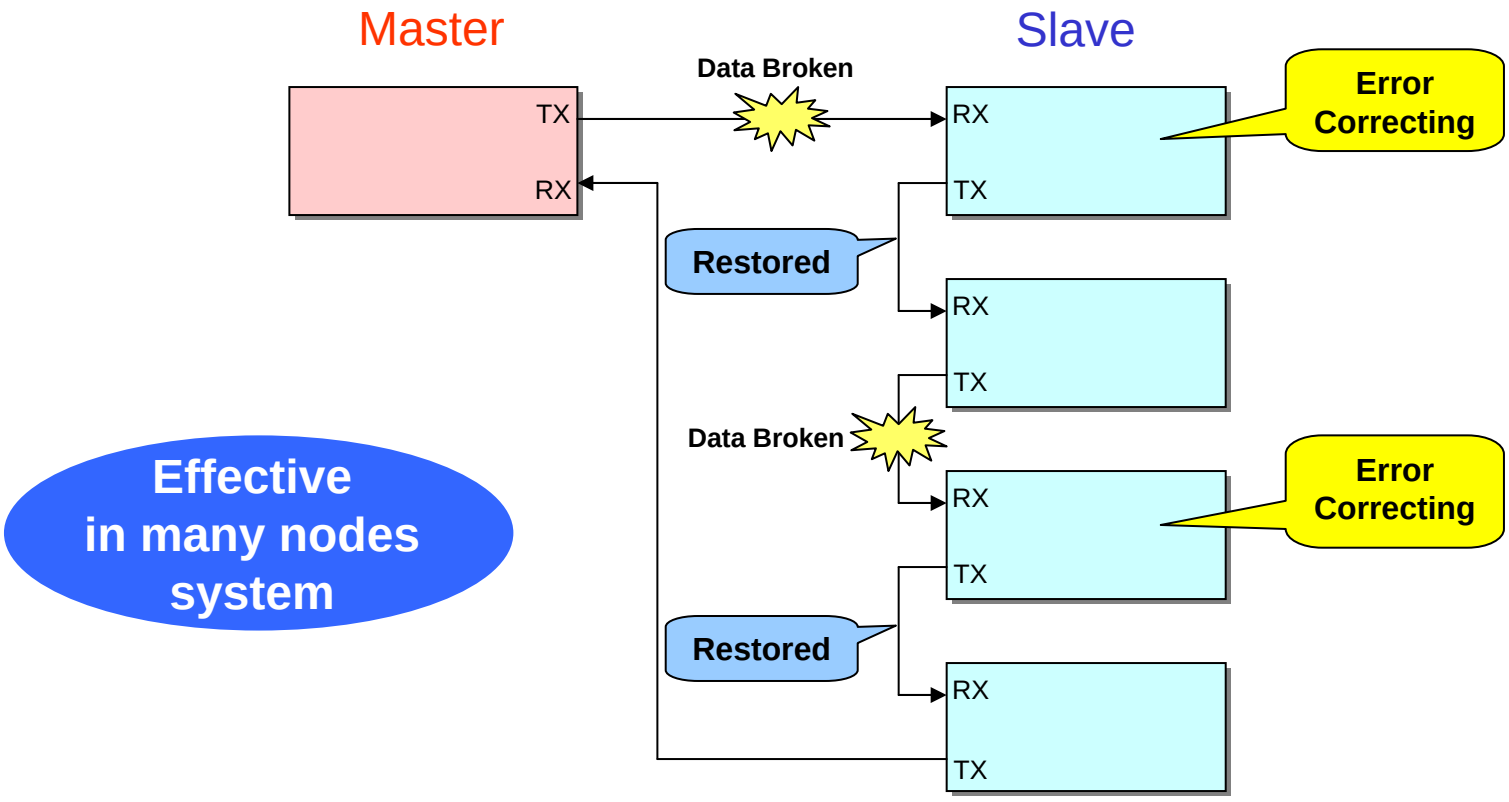
Note: The above shows a case when the data update is done with the same period as the communication.

Error Correction

Panasonic
ideas for life

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*

Panasonic
ideas for life

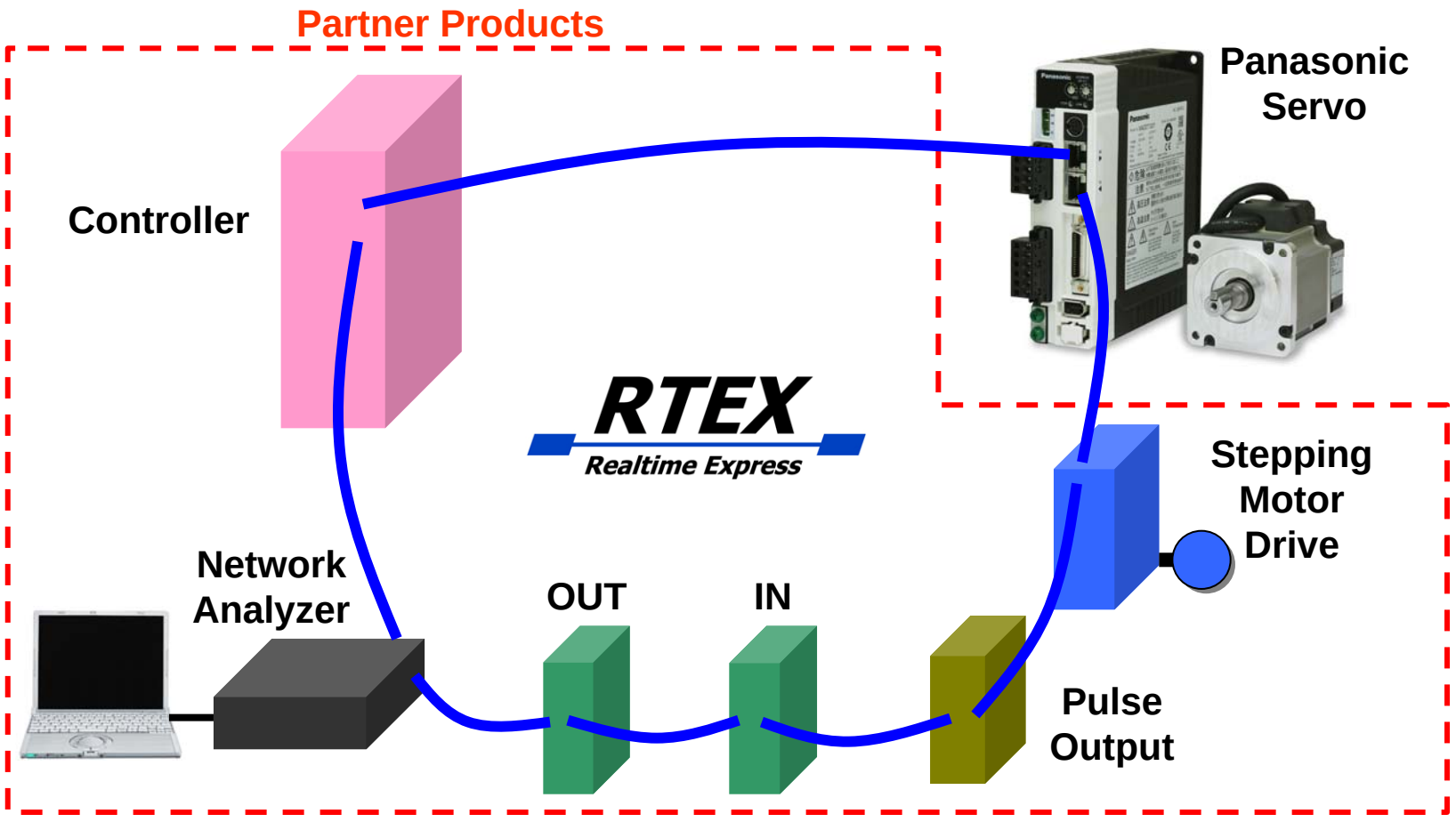
Item	Specifications
Speed	**100Mbps**
Physical Layer	**100BASE-TX full duplex (by IEEE 802.3u)**
Cable	**Shielded Twisted Pair (TIA/EIA-568B CAT5e or more)**
Topology	**Ring**
Isolation	**Pulse Transformer with common-mode choke**
Connector	**RJ45**
Cable Length	**Inter-node: Max. 60m, Total: Max. 200m**
Noise Immunity	**2.5kV over, IEC61000-4-4 compliant**
Com. Cycle (*)	**0.5ms (data update: 1ms or 0.5ms)**
Number of Axes (**)	**Up to 32**
Motion Interface (*)	**Position Command**

* Note: For standard model of A4N

** Note: Depending on specification of host controller

Collaboration

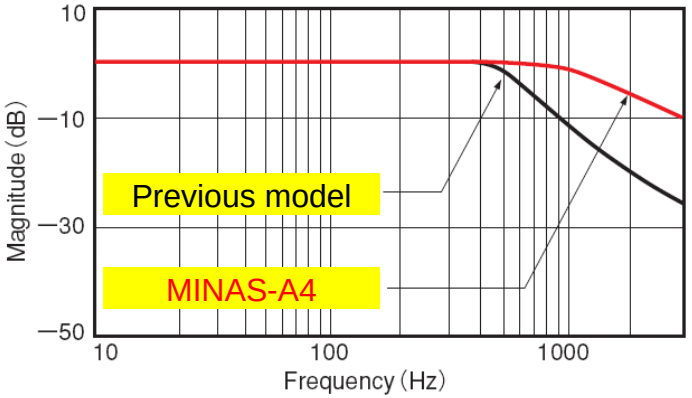
Products except servo are provided by partners.

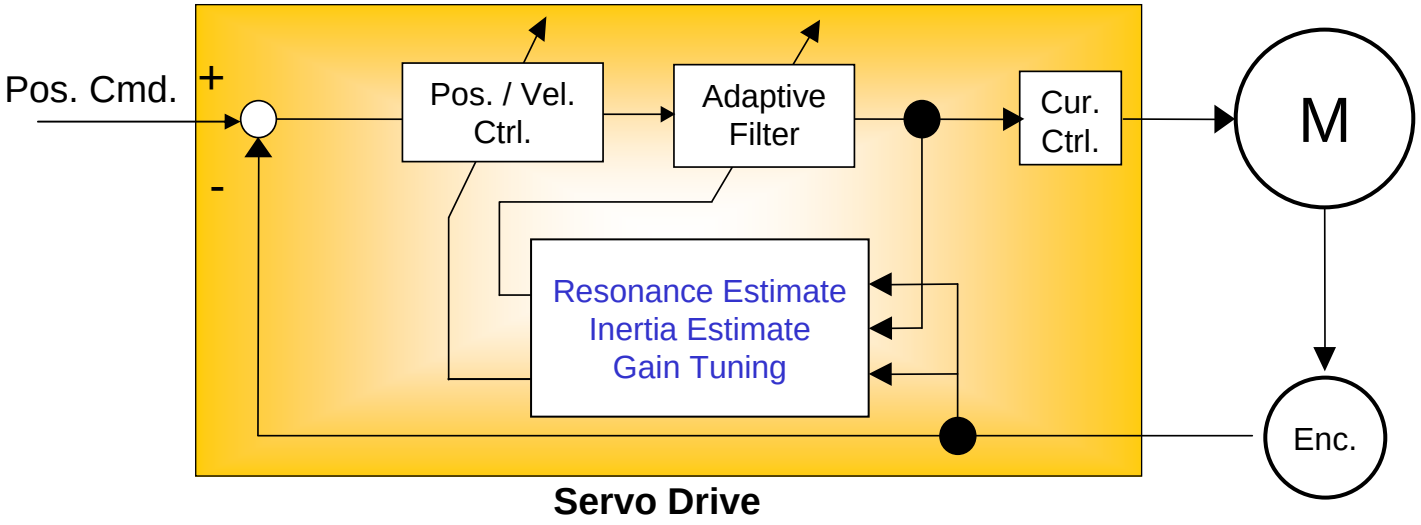


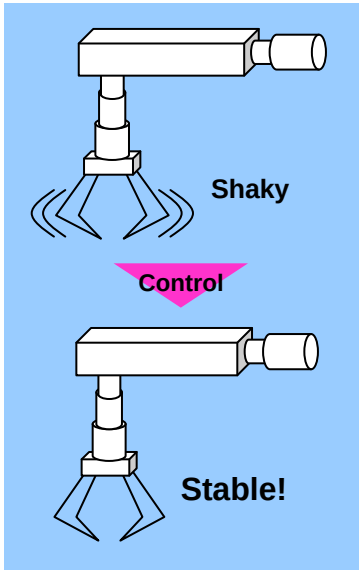
Features of Servo

Features of A4 (Base of A4N)

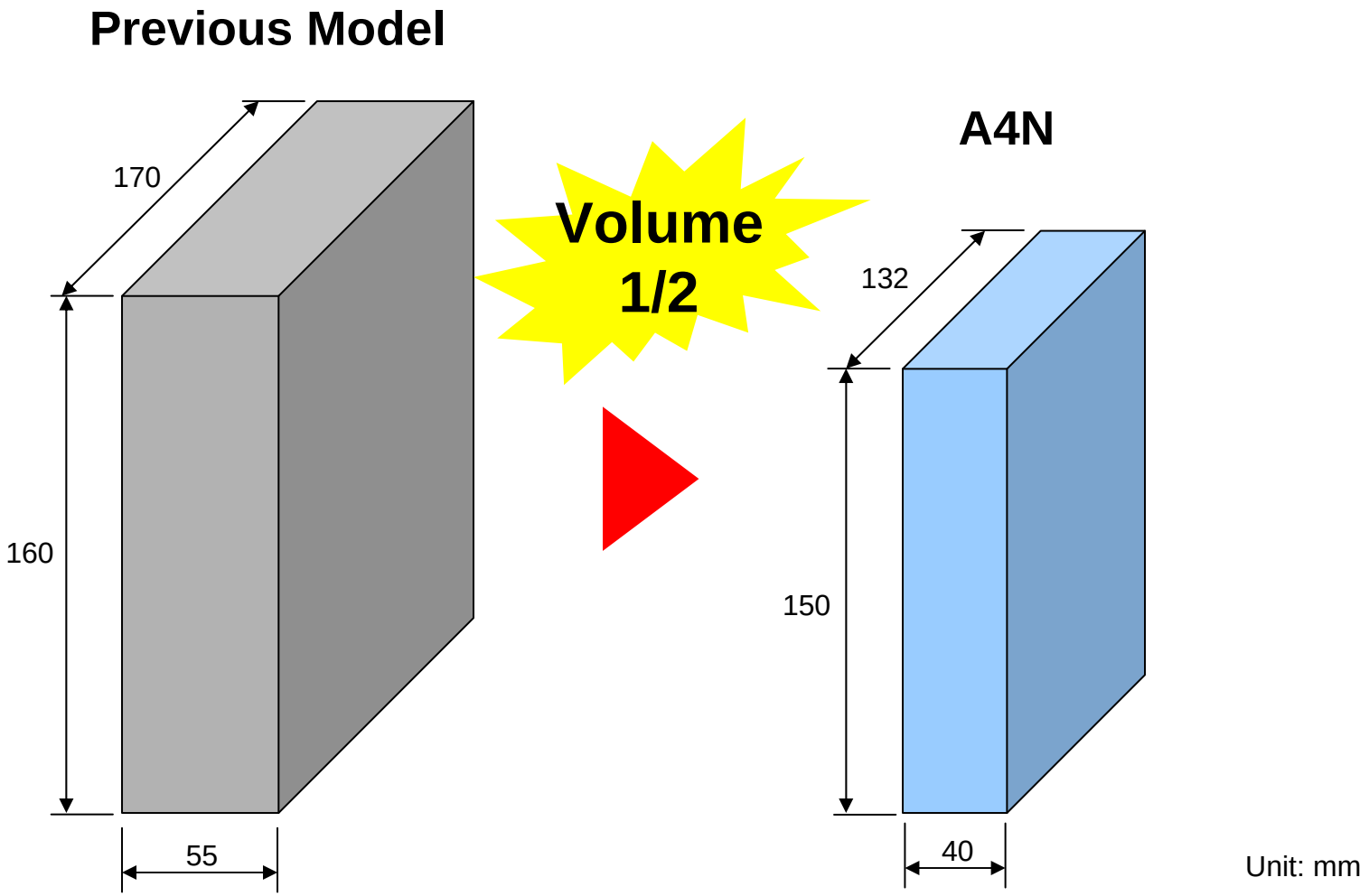
- 1000Hz velocity response
- Advanced real-time automatic gain-tuning
- Vibration reduction control







Compact



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

Setup Tools (Optional)

Setup Software
“PANATERM”
DV0P4460

Parameter Setting
Monitoring
Wave Form
Freq. Analyzing
etc.

Connect with RS232(X4)

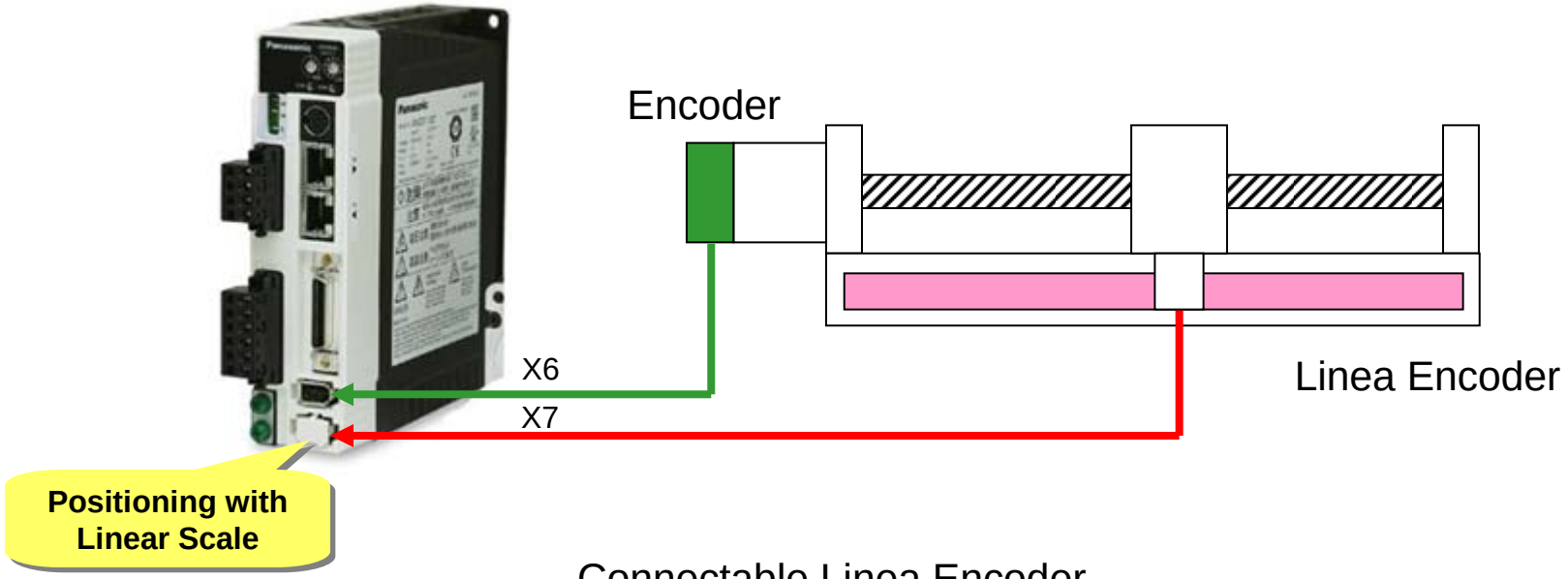
Alternative

Handy Console
DV0P4420

Parameter Setting
Monitoring
Jogging
etc.

Full-Closed Control

High precision full-closed control system



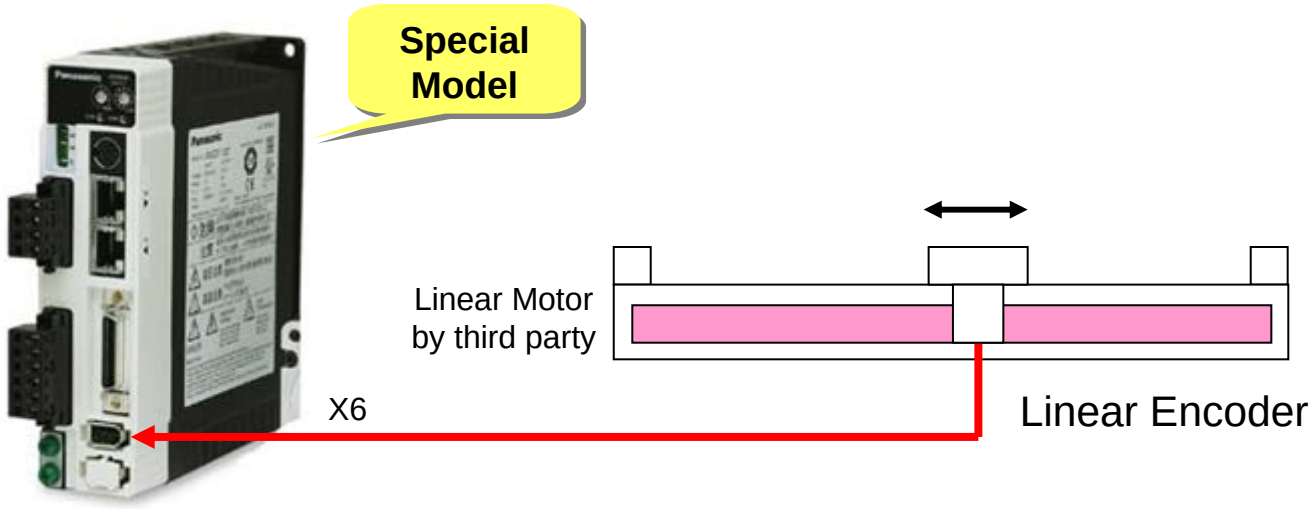
Connectable Linea Encoder

	Mitsutoyo		Sony Manufacturing Systems		
	AT573A	ST771A / ST773A	SR75 / SR85	SR77 / SR87	SL710 + PL101-RP
Type	Absolute	Absolute	Incremental (*)	Absolute	Incremental (*)
Resolution	0.05um	0.5um / 0.1um	0.05 to1um	0.05 to 1um	0.1um

Note: For incremental, the special model of servo is needed.

Linear Motor Drive

Special servo drive for linear motor can be provided.



Notes:
- Panasonic do not provide linear motor.
- The linear encoder is the same as for full-closed control.
- Because of limitations of servo drive, the combination of resolution and max. speed are as follows:
  max 2m/s at 0.05um
  max 5m/s at 0.5um

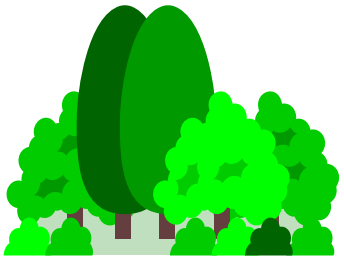
Compliance

- UL, cUL
- TUV
- CE

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



Appearance

Appearance

Model No.

Front panel

Analog monitor pins

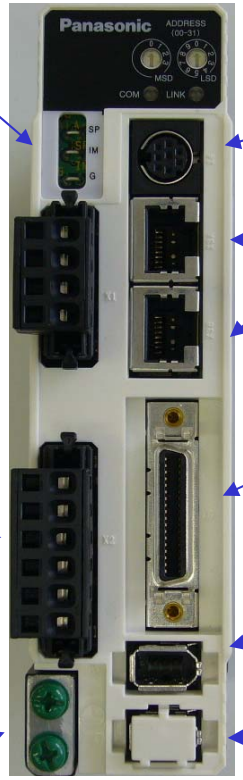
X1: Power supply

pin4	L1
pin3	L3
pin2	L1C
pin1	L2C

X2: Motor connector

pin6	RB1
pin5	RB3
pin4	RB2
pin3	U
pin2	V
pin1	W

Earth terminal



X4: RS232 (MINI-DIN 8pins)

X3: Com. connector (RJ45)

X5: Sensors connector (Half pitch 36pins)

X6: Encoder connector (6pins)

X7: Linear encoder connector (6pins)

Front Panel

Panasonic
ideas for life

Servo ON

Easy decimal setting

Servo OFF

7segments LED

Address Setting RSW

LINK Status (Green)

Com. Status (Green / Red)

Note: If alarm, the error code is indicated on 7segments LED with blinking.

Appearance of Size A to D

Panasonic
ideas for life

A B C D

A	B	C	D
W 40	W 55	W 65	W 85
H150	H150	H150	H150
D132	D132	D172	D172

A to C: Fan less
D or more: With built-in fan

Unit: mm

Lineup

Panasonic
ideas for life

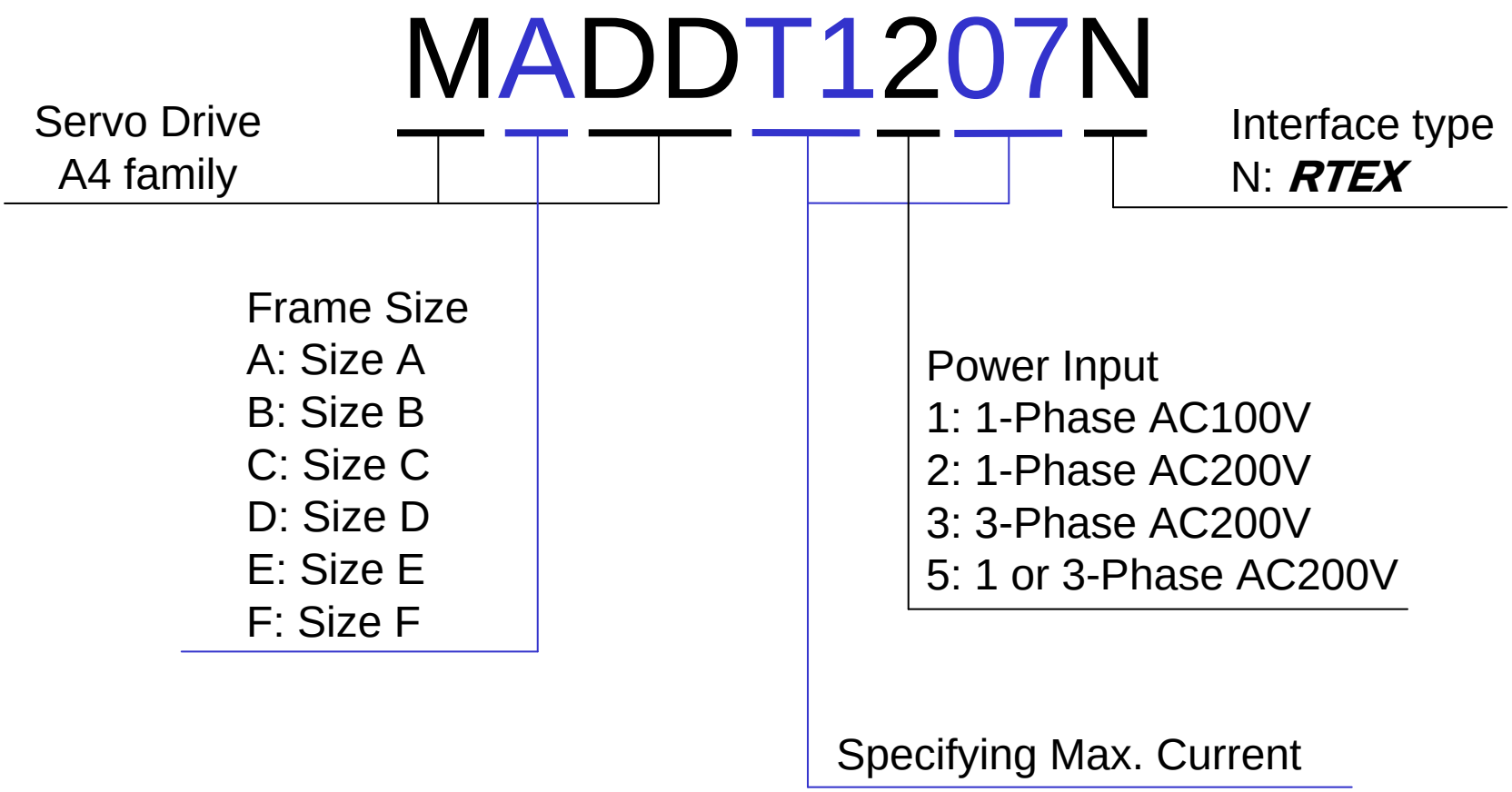
Rated Output of Motor

Power Input of Drive

	50W	100W	200W	400W	750W	1kW	1.5kW	2kW	3kW	4kW	5kW	7.5kW
1 Phase AC 100-115V	A	A	B	C								
	MADD T1105N	MADD T1107N	MBDD T2110N	MCDD T3120N								
1 Phase AC 200-240V	A		A	B								
	MADD T1205N		MADD T1207N	MBDD T2210N								
1 or 3 Phase AC 200-240V					C	D						
					MCDD T3520N	MDDD T5540N						
3 Phase AC 200-230V								E	F	F		G
								MEDD T7364N	MFDD TA390N	MFDD TB3A2N		MGDD TC3B4N

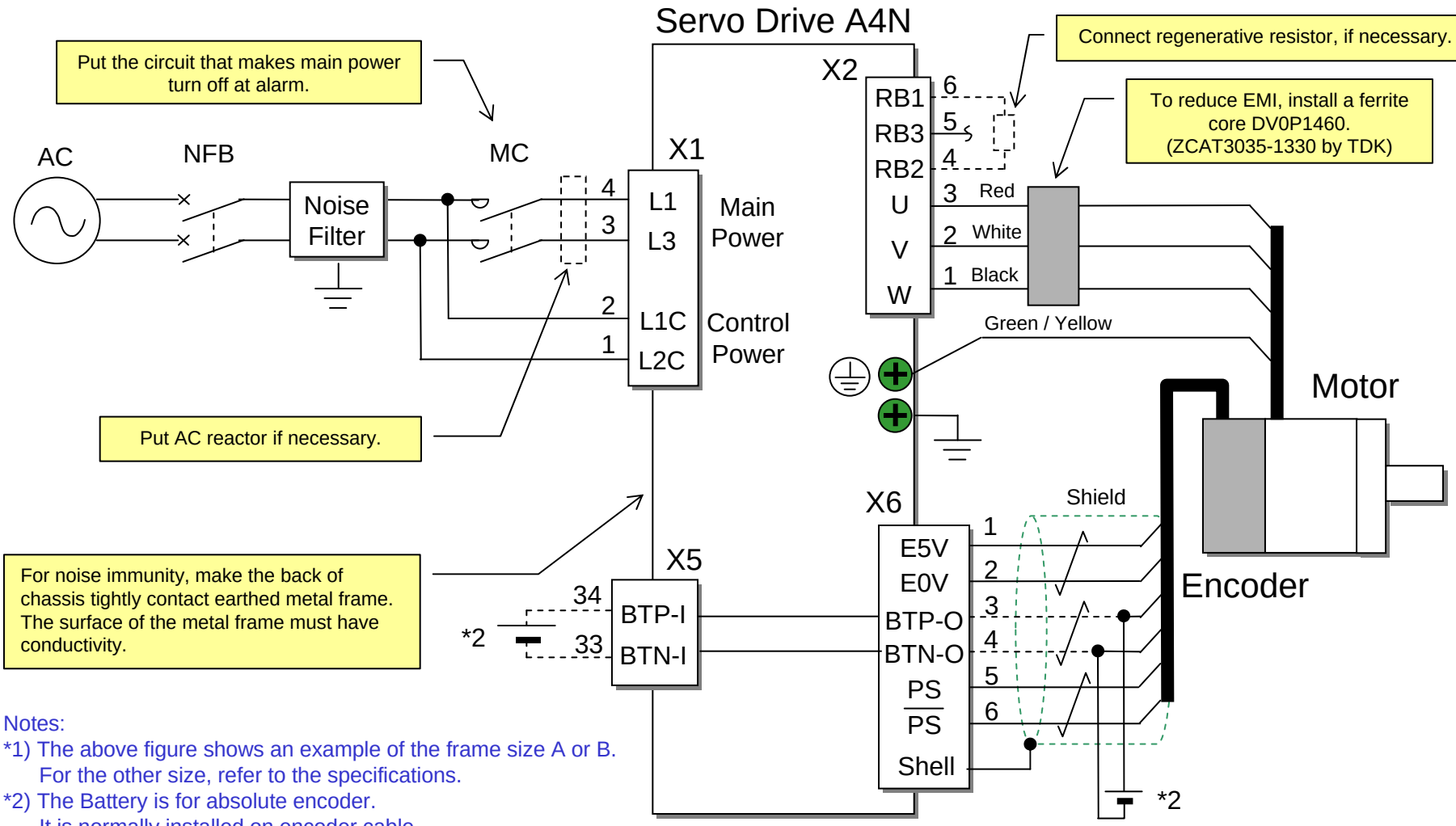
Upper: Frame size
Lower: Typical model No. (Depending on combination with motor)

Structure of Model No.



Wiring

Power Supply and Motor



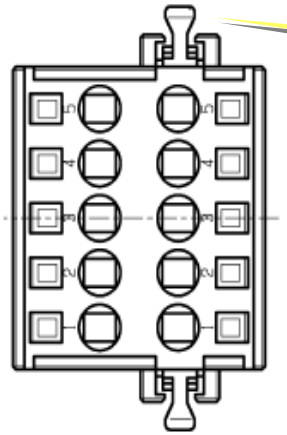
Notes:

*1) The above figure shows an example of the frame size A or B.
For the other size, refer to the specifications.

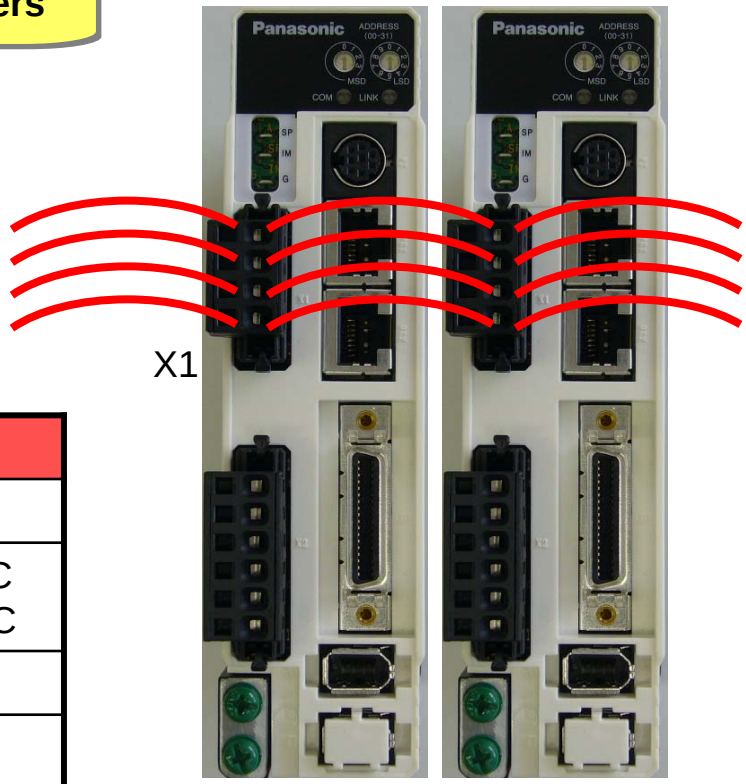
*2) The Battery is for absolute encoder.
It is normally installed on encoder cable,
or alternatively can be also connected to X5 connector.

Daisy Chain of Power

Using dual connector, Daisy Chain is possible.



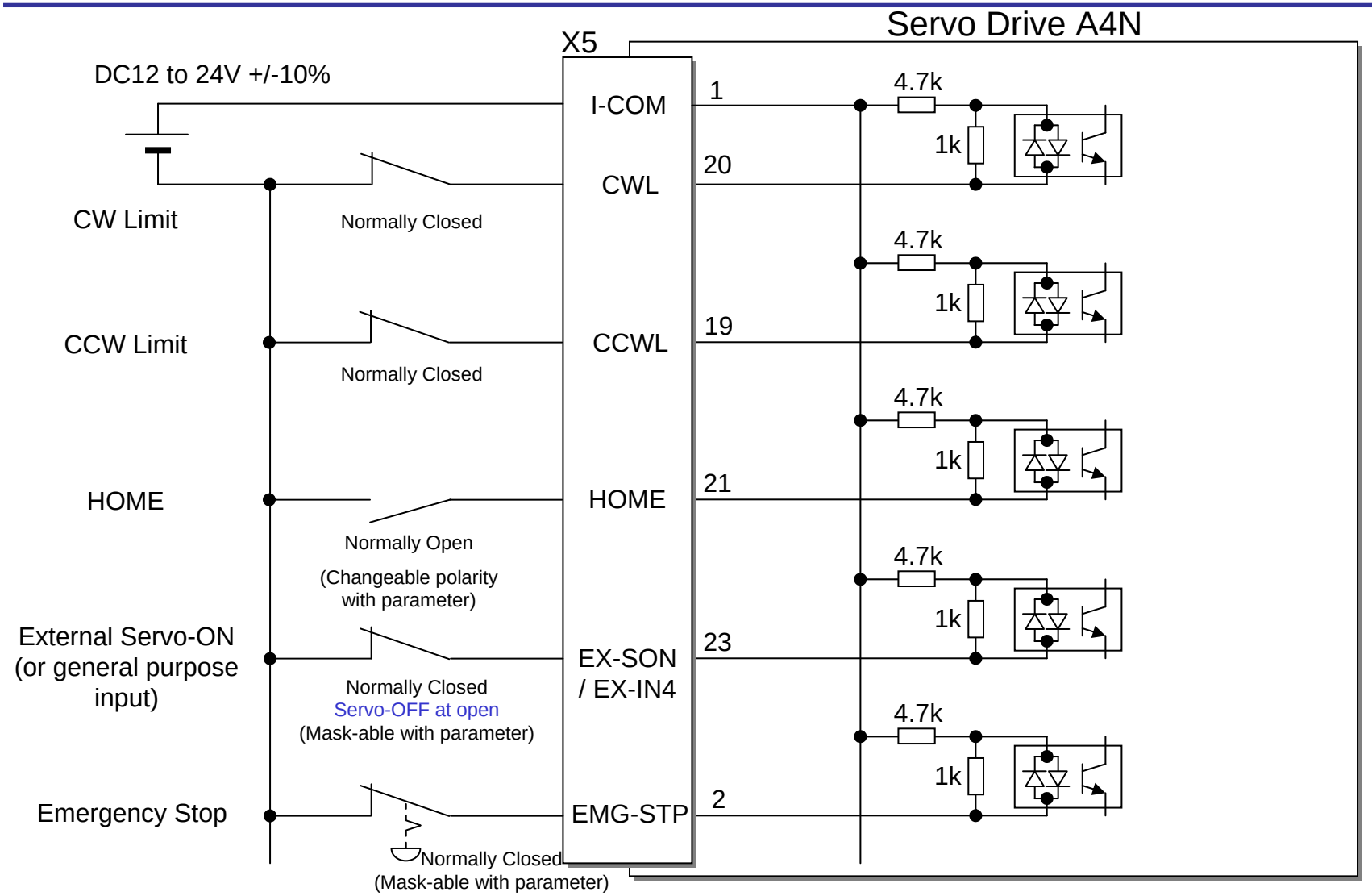
With locking levers



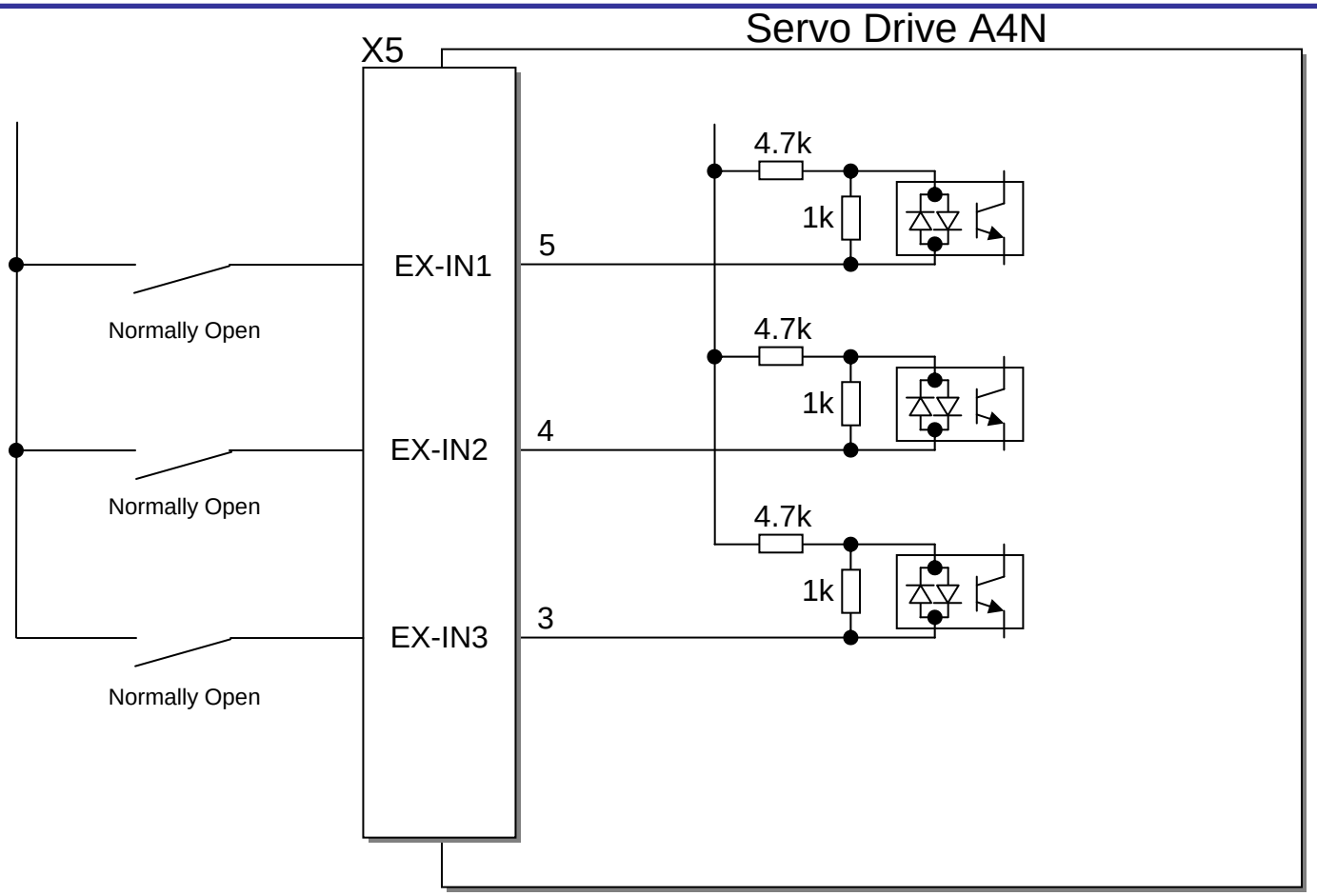
Specifications of connector:

	Description
Manufacturer	J.S.T. Mfg.
Model No.	4pole (for A, B size): 04JFAT-SAXGSA-C 5pole (for C, D size): 05JFAT-SAXGSA-C
Wire Size	AWG#14 to #18
Remark	This is not an accessory of the drive, so it is provided by yourself.

Sensor Inputs



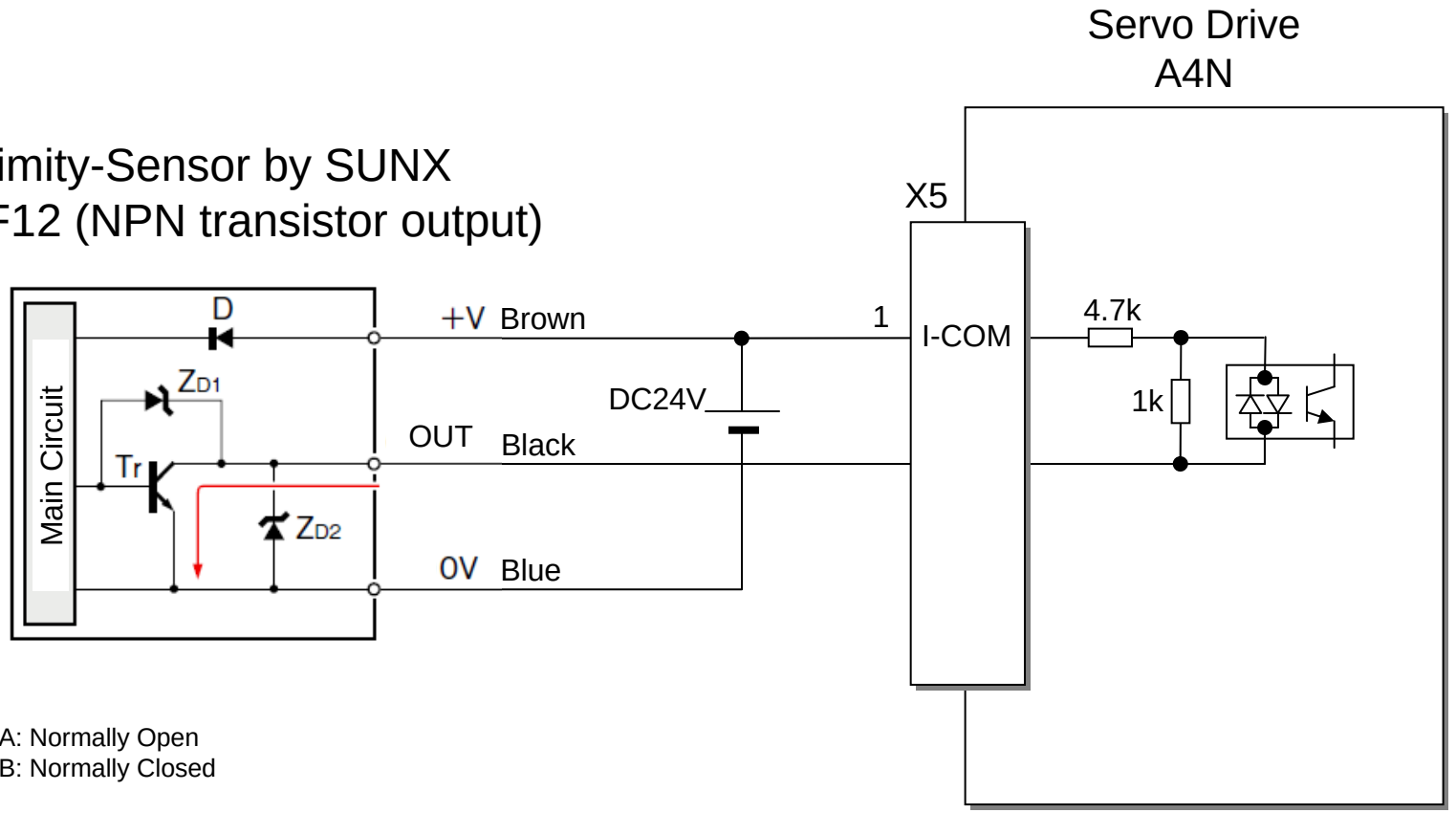
General Purpose Inputs



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

Sensor Input Example 1

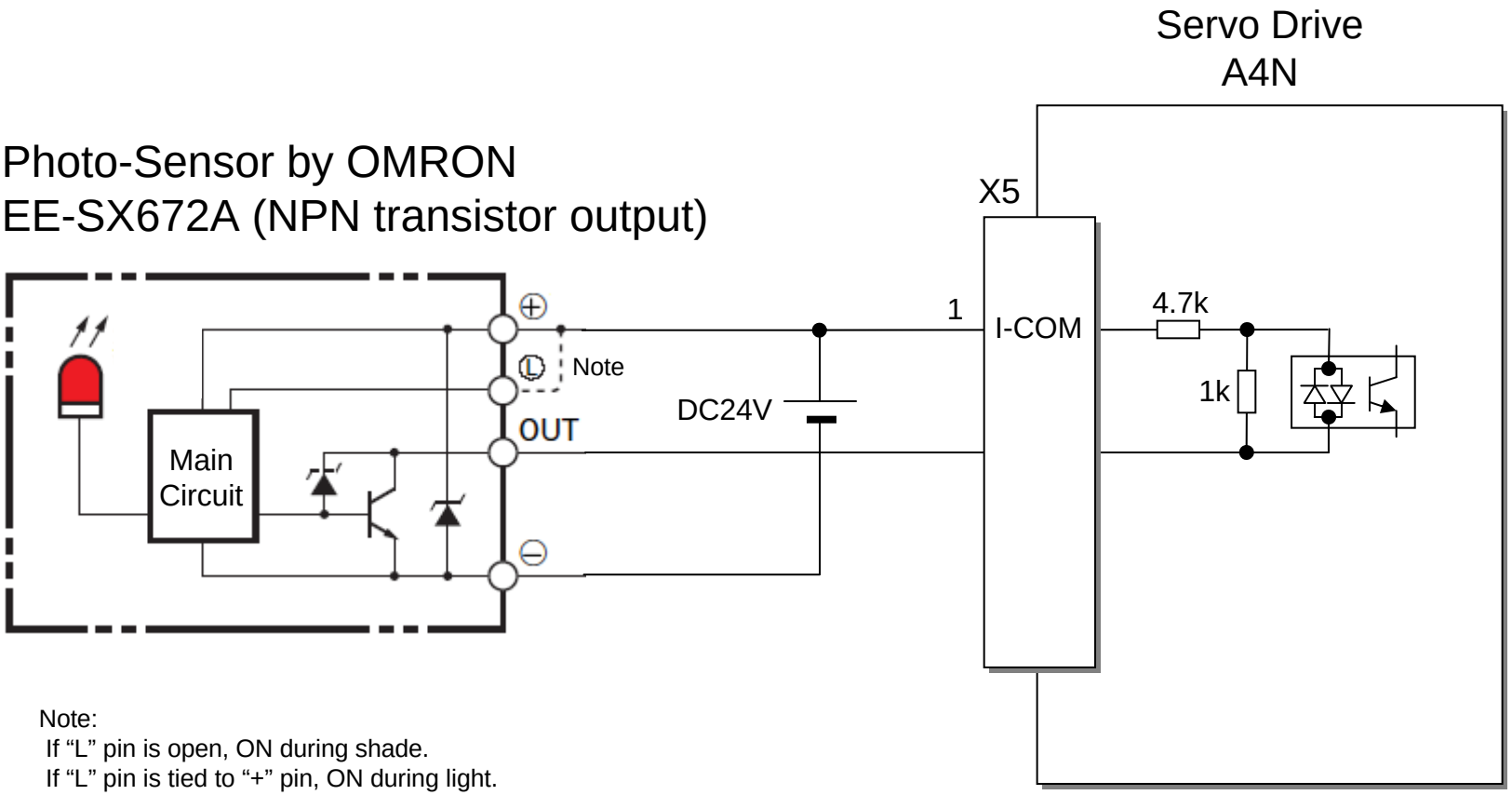
Proximity-Sensor by SUNX
GX-F12 (NPN transistor output)



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

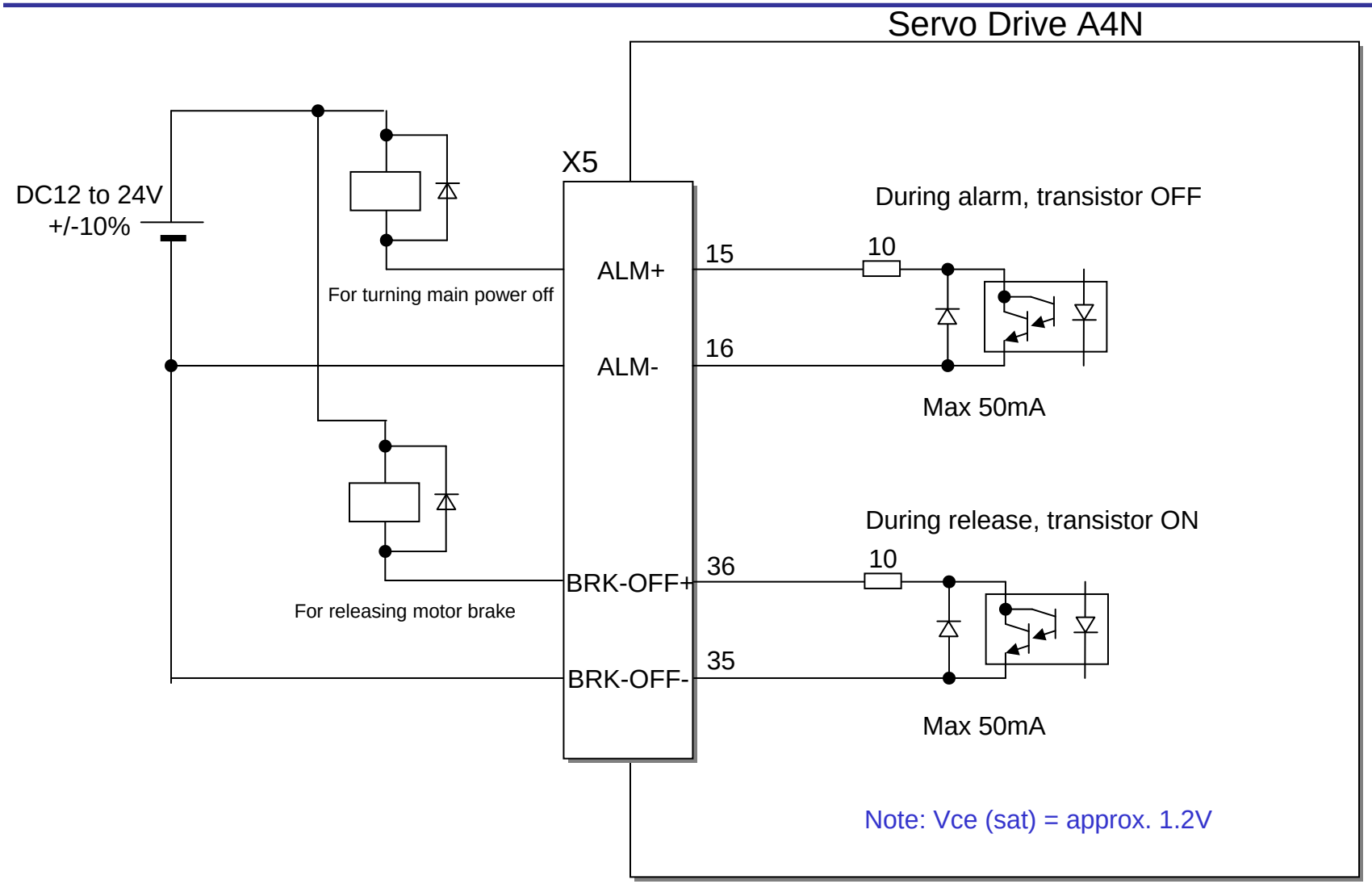
Sensor Input Example 2

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

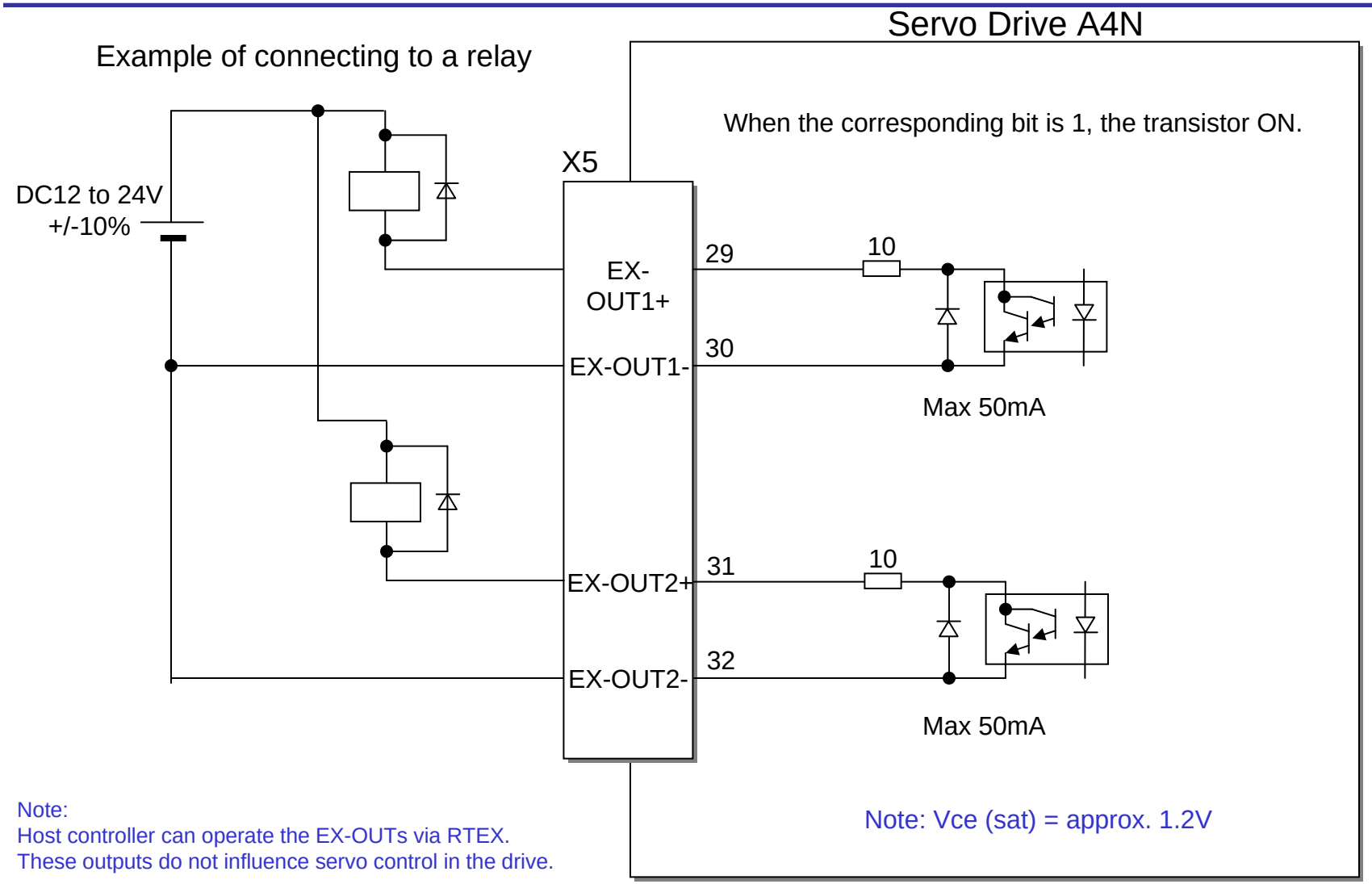


Note:
If “L” pin is open, ON during shade.
If “L” pin is tied to “+” pin, ON during light.

Relay Control Outputs

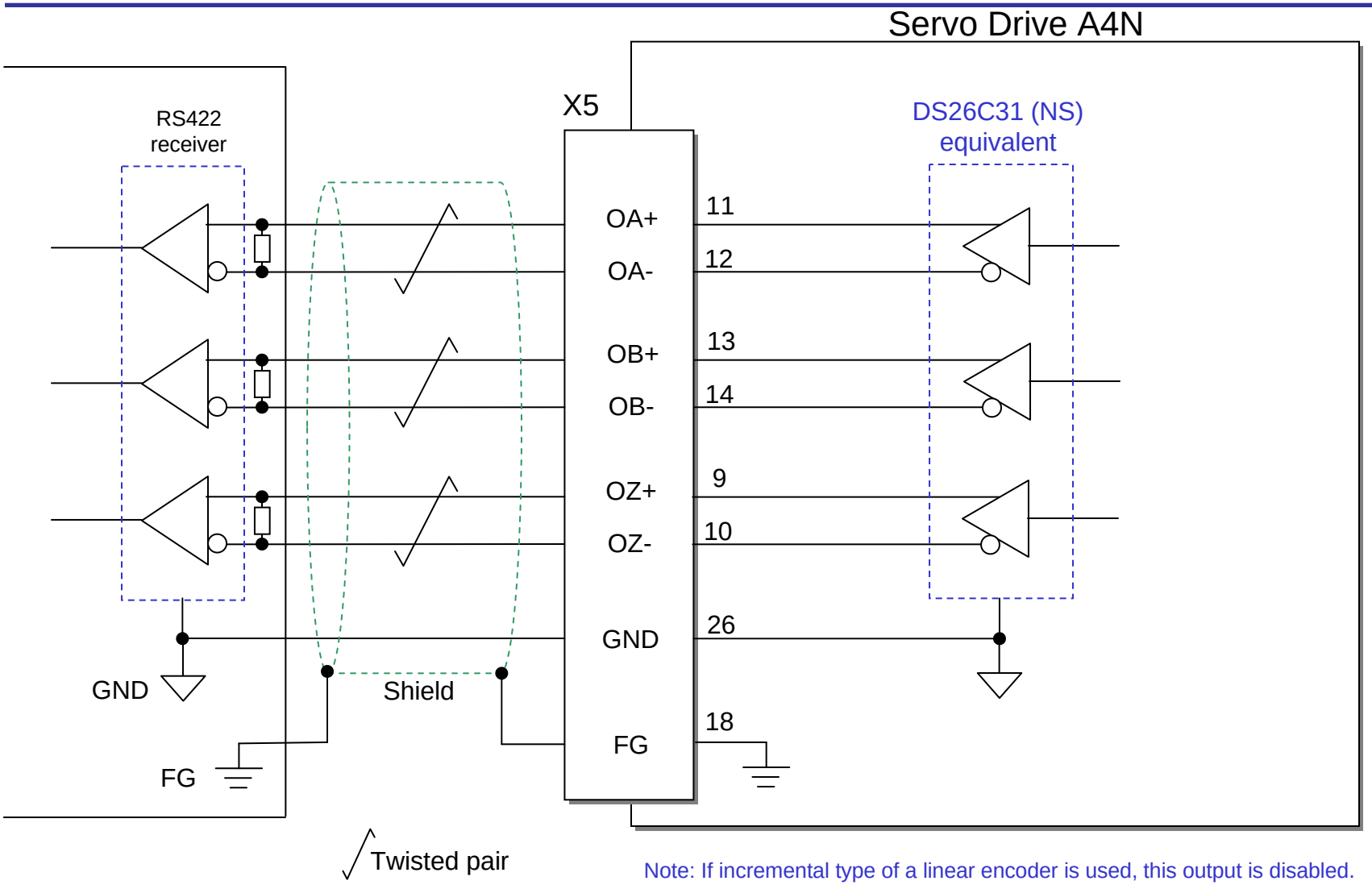


General Purpose Outputs



Note:
Host controller can operate the EX-OUTs via RTEX.
These outputs do not influence servo control in the drive.

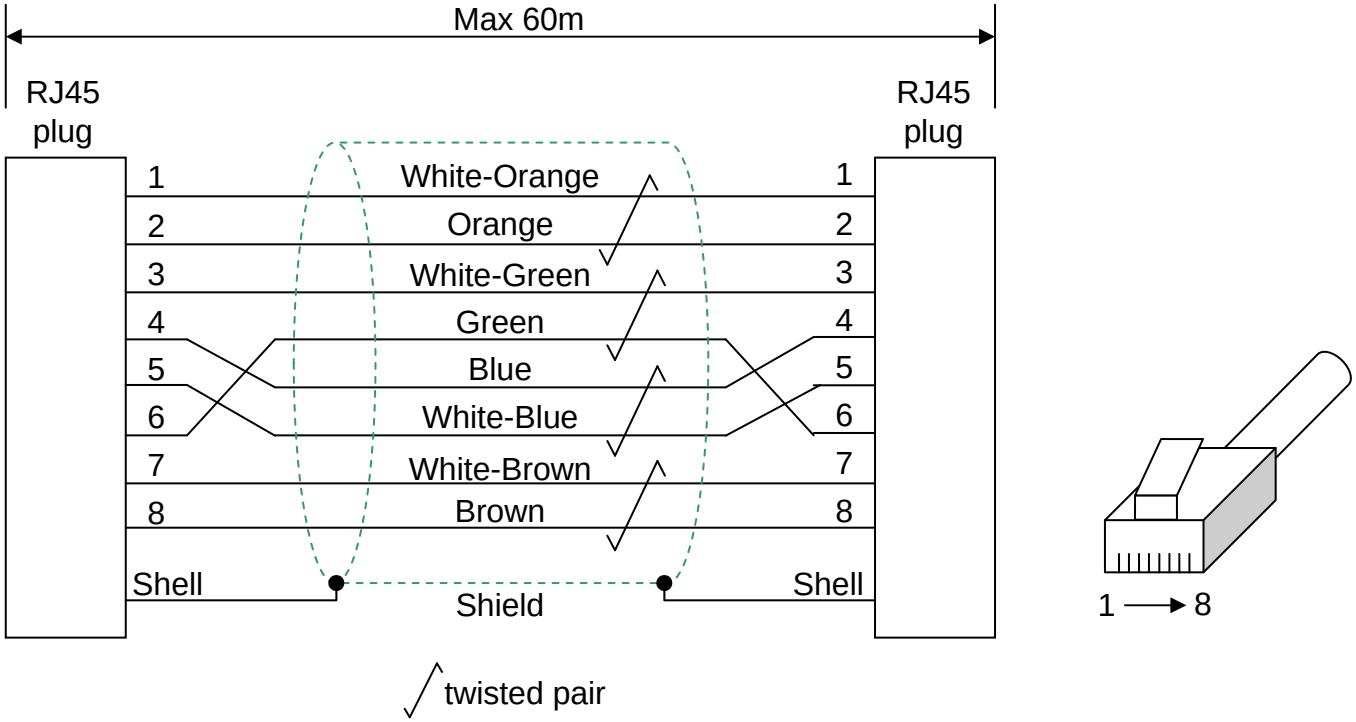
Encoder Signal Outputs



Note: If incremental type of a linear encoder is used, this output is disabled.

Wiring of Com. Cable (4pairs)

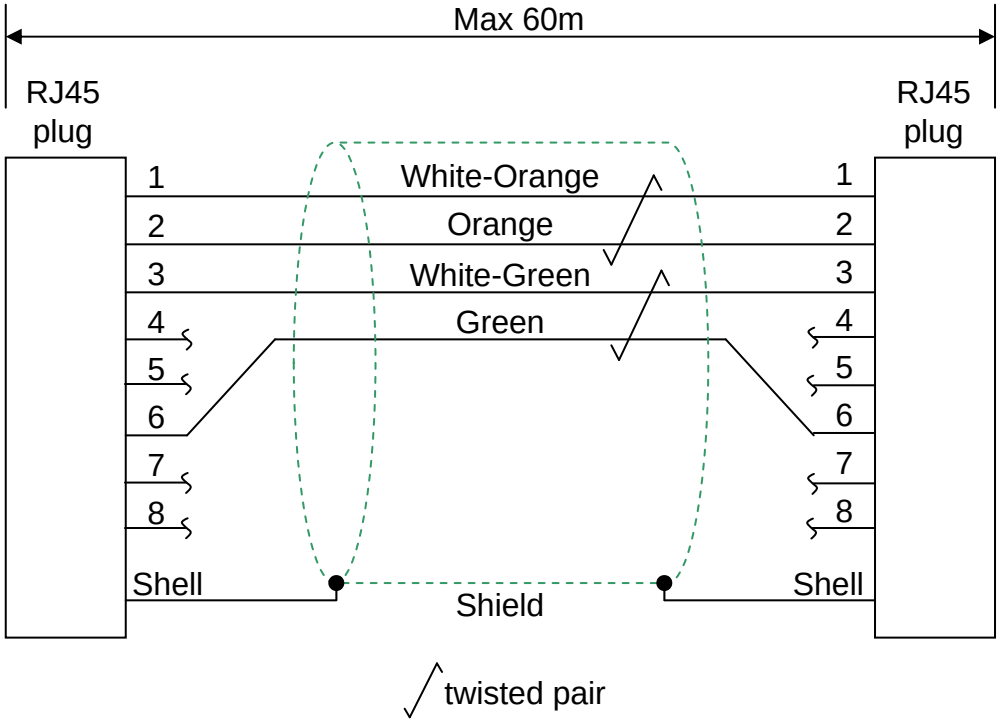
“Straight” Wiring

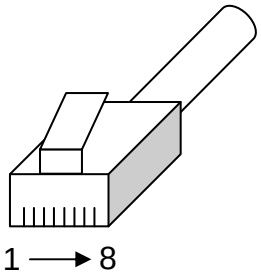


Notes:
- STP(Shielded Twisted Pair cable) conformed to category 5e or more must be used.
- Colors of the lead wire are defined by TIA/EIA-568B.
- A pair connected to 3-6pin is used as signal line.
- Unused 3 pairs must be also connected to 1-2, 4-5 and 7-8 as the above figure.

Wiring of Com. Cable (2pairs)

“Straight” Wiring

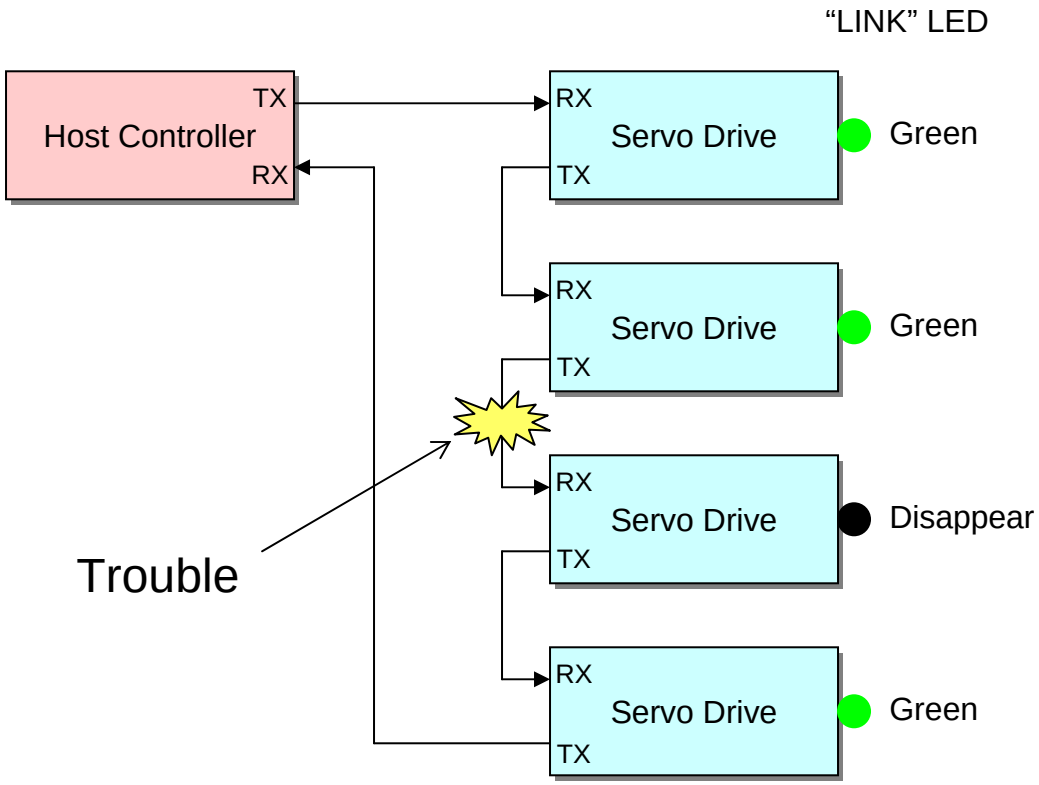




Notes:
- STP(Shielded Twisted Pair cable) conformed to category 5e or more must be used.
- Colors of the lead wire are defined by TIA/EIA-568B.
- A pair connected to 3-6pin is used as signal line.
- Unused 3 pairs must be also connected to 1-2 as the above figure.

Trouble of Com. Cable

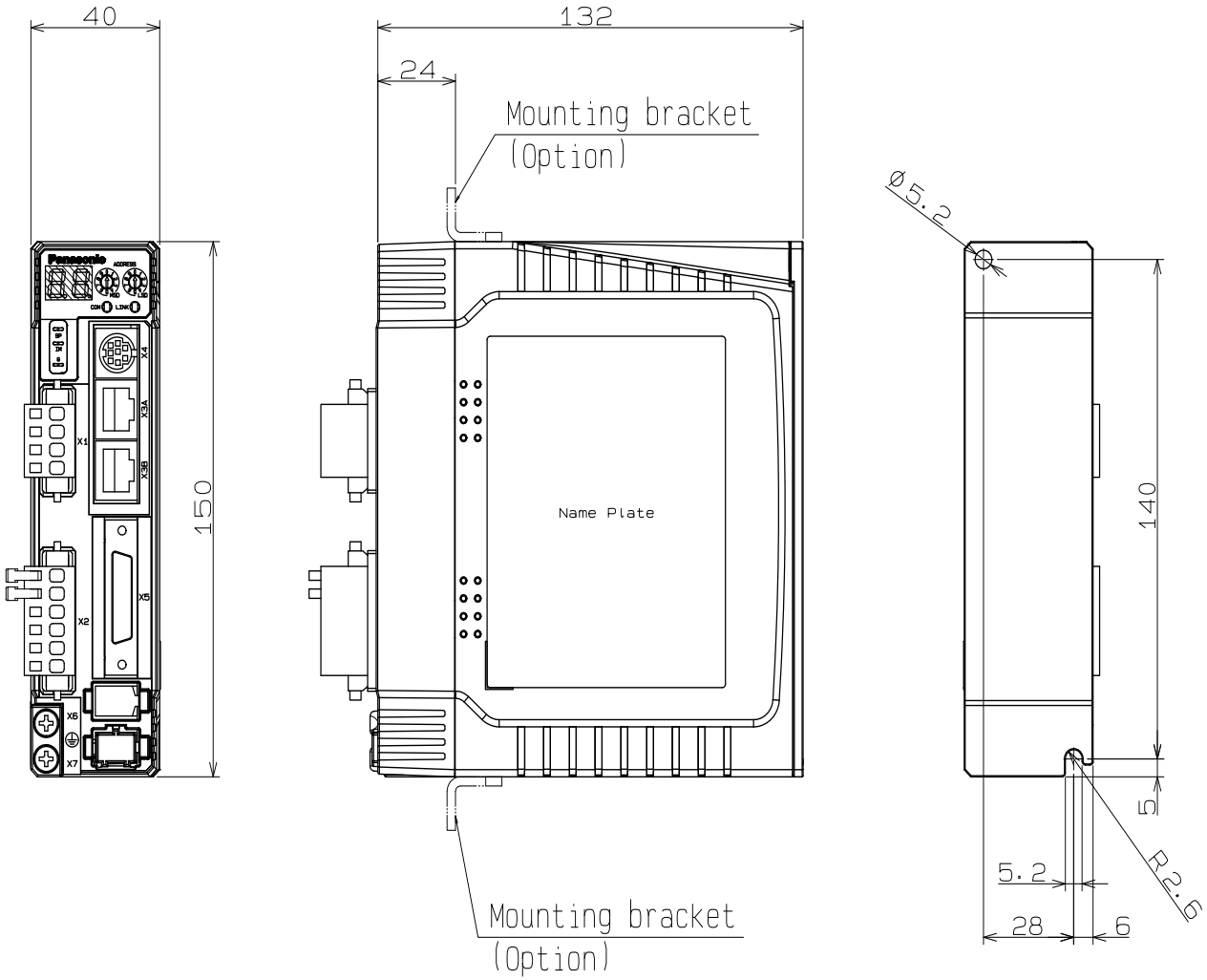
When “LINK” LED is disappear against power ON of all servos, make sure whether there is the trouble (e.g. breaking down) with a cable connected to RX of the disappearing servo.



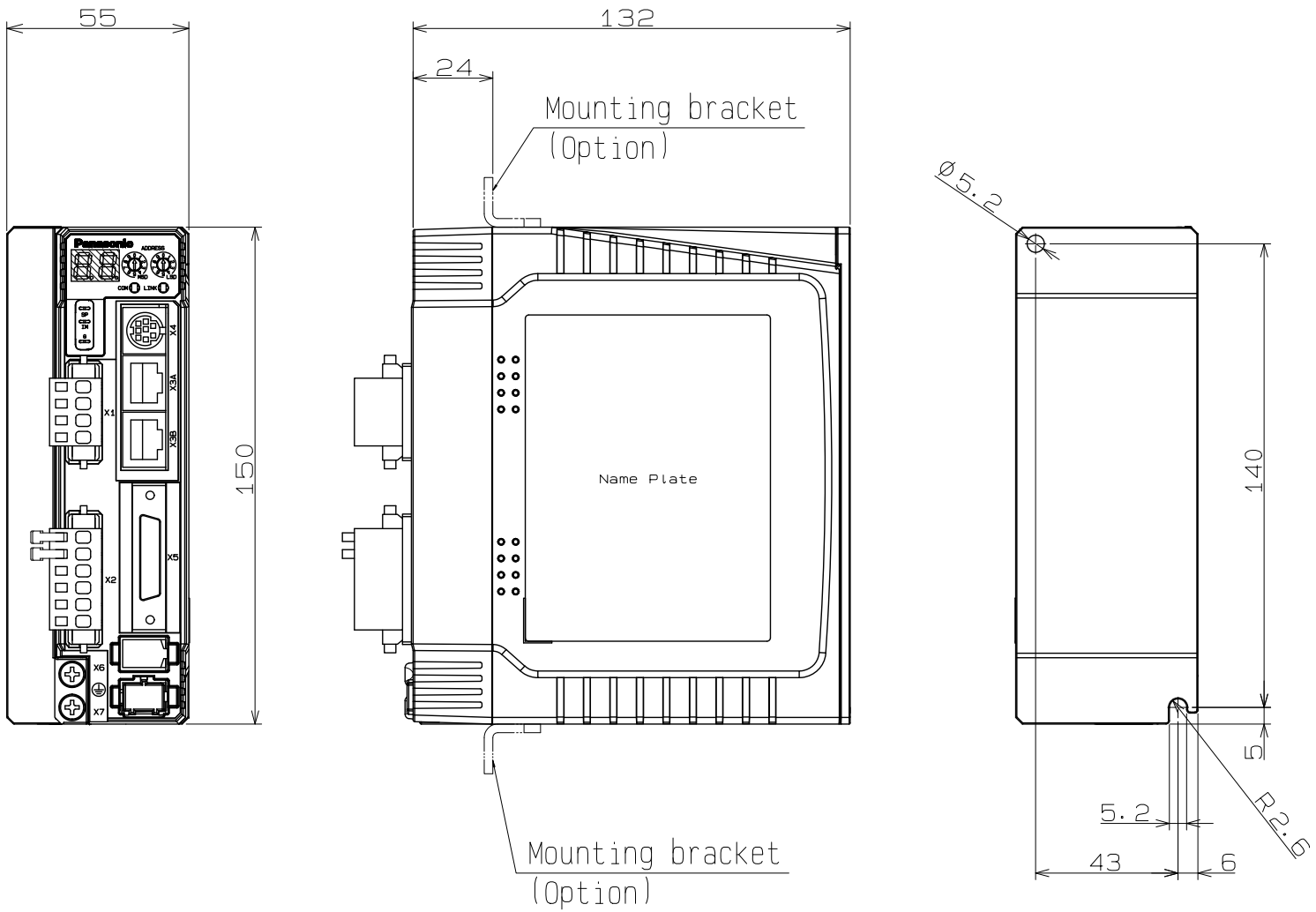
Dimensions

(unit: mm)

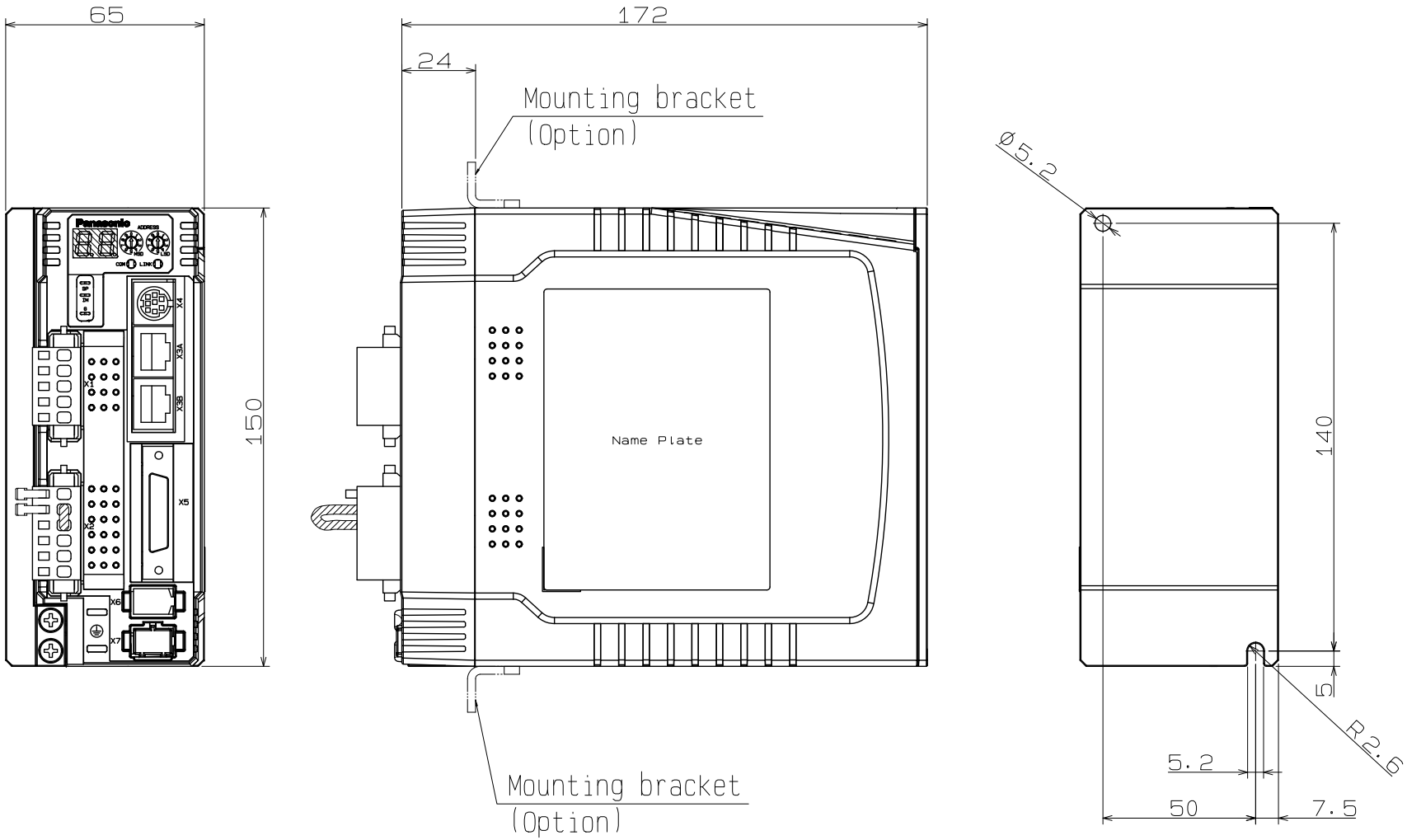
Size A



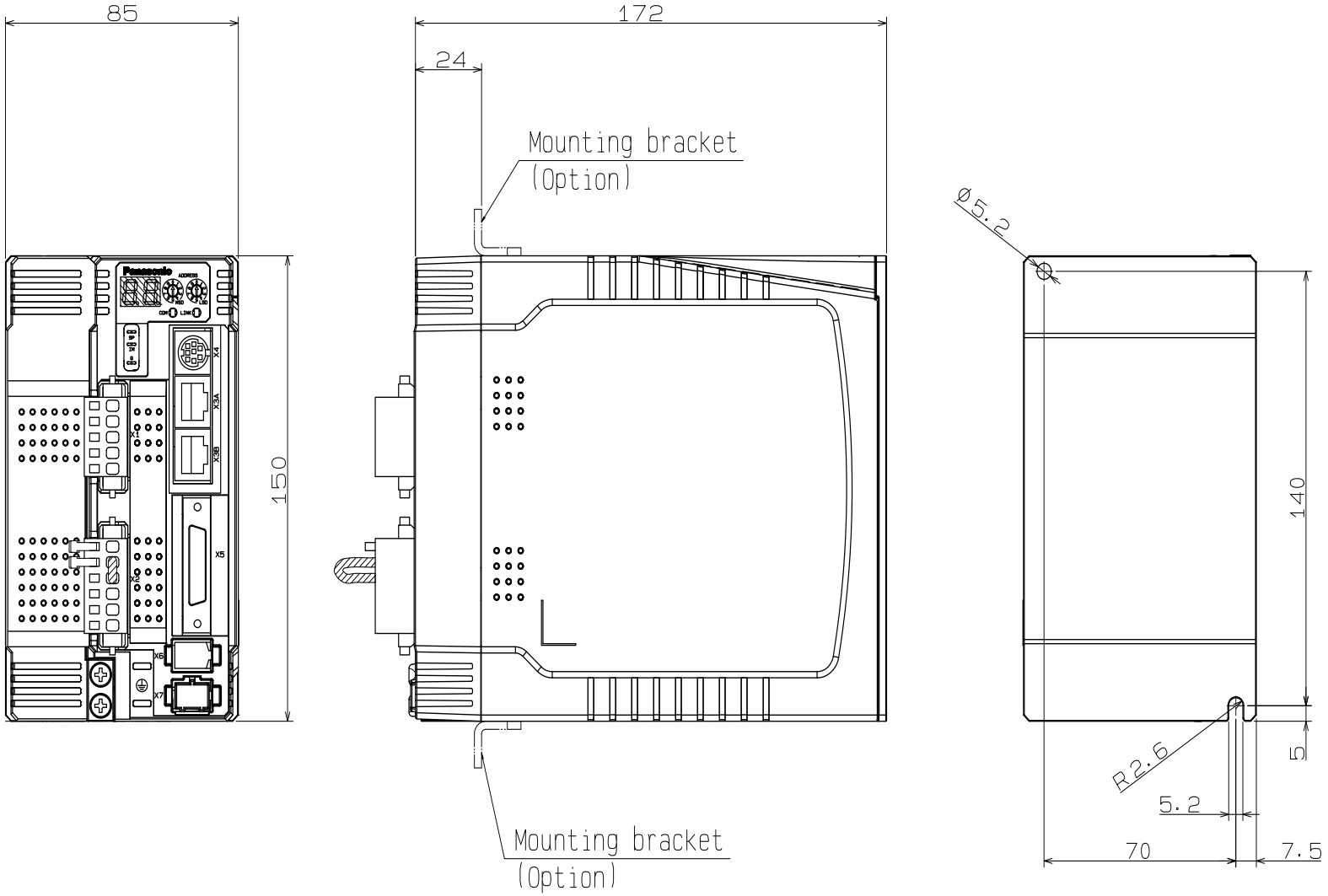
Size B



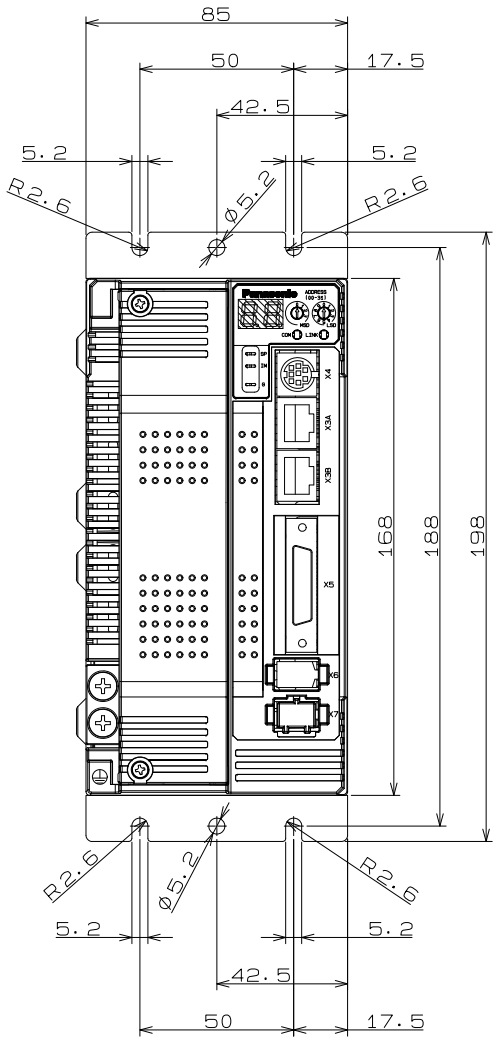
Size C

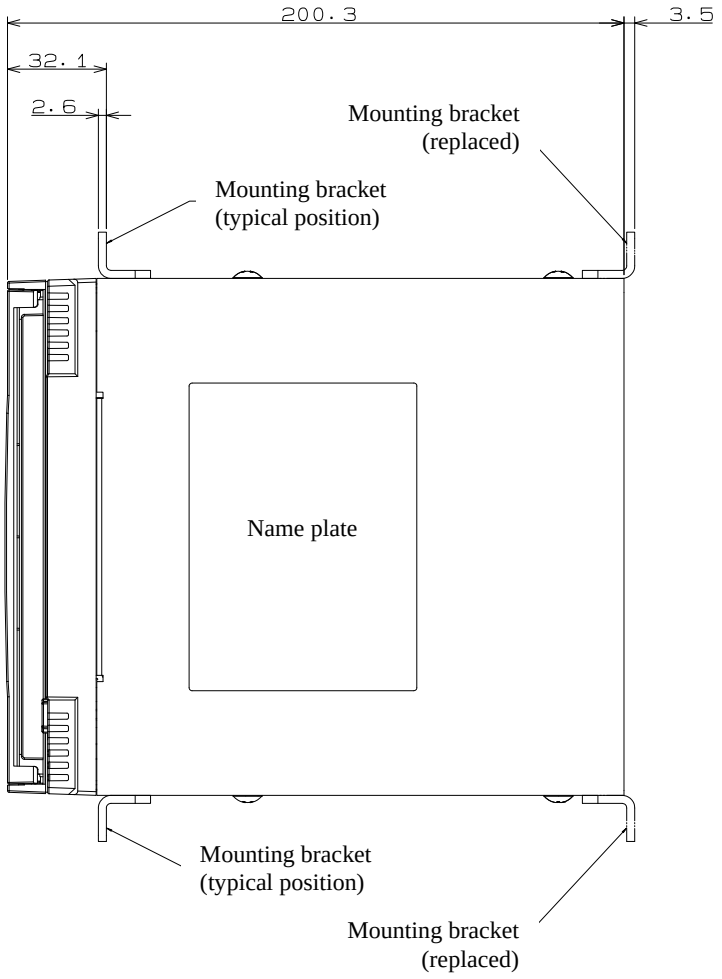


Size D

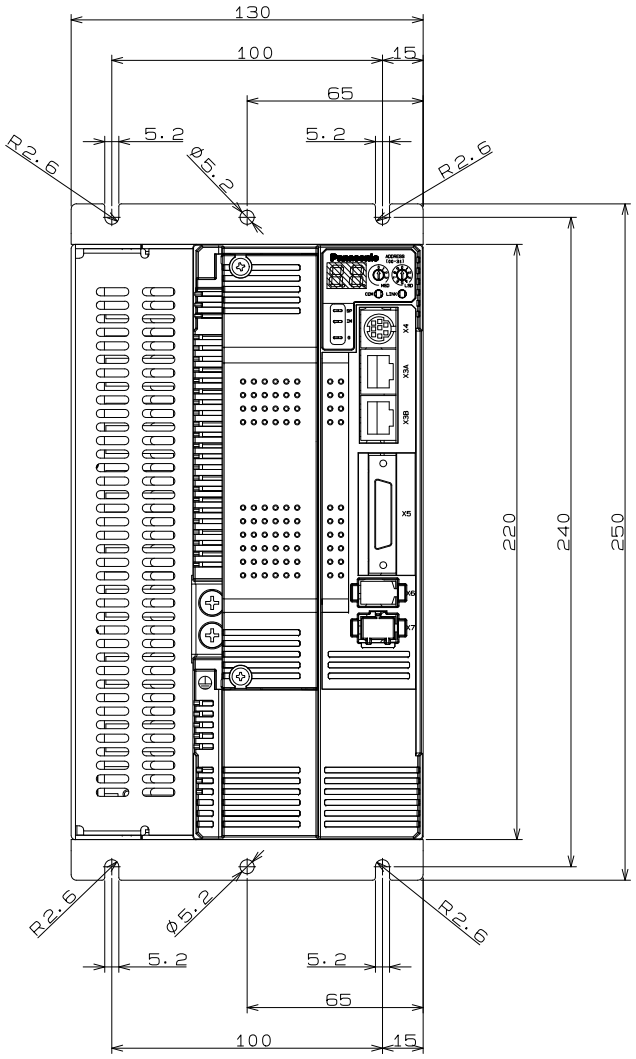


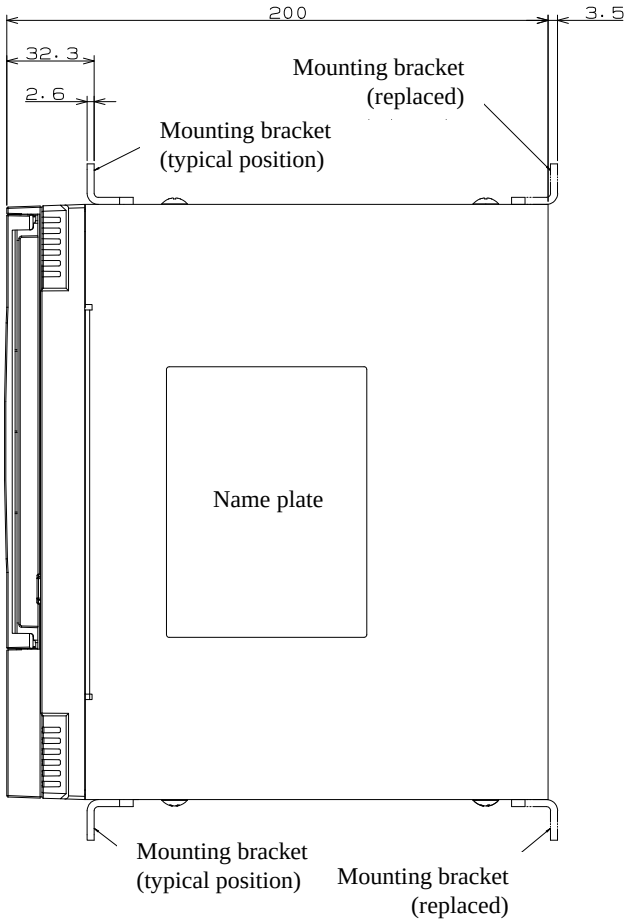
Size E



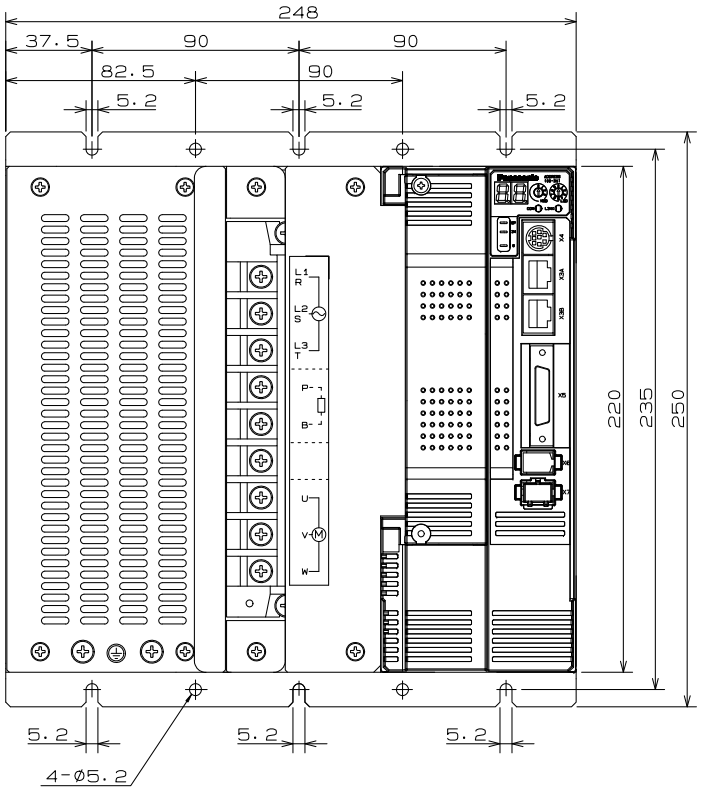


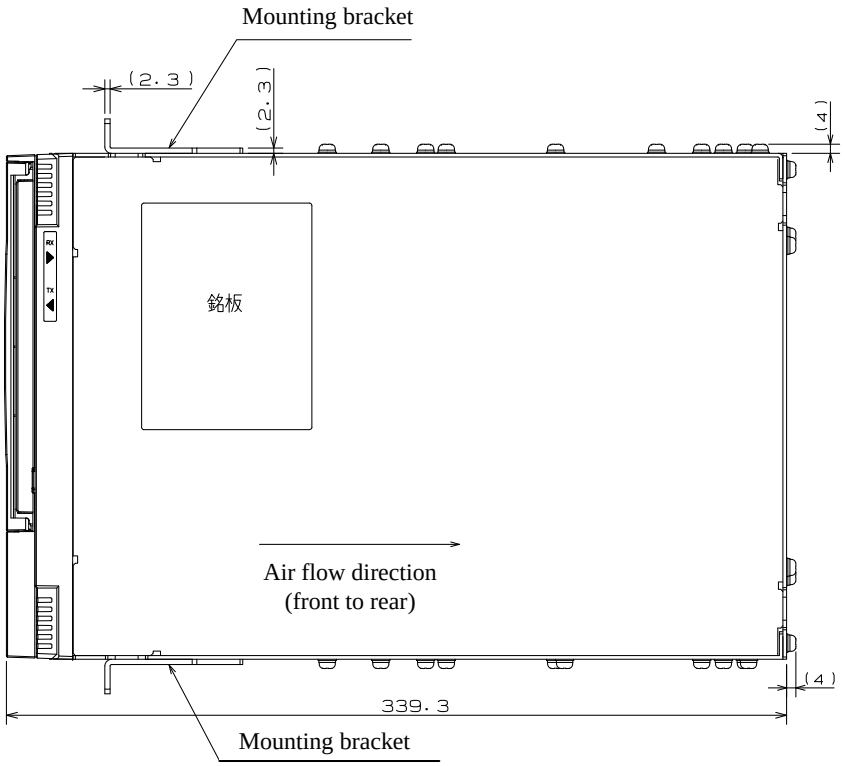
Size F





Size G





Panasonic
ideas for life

Options

Cable and Connector

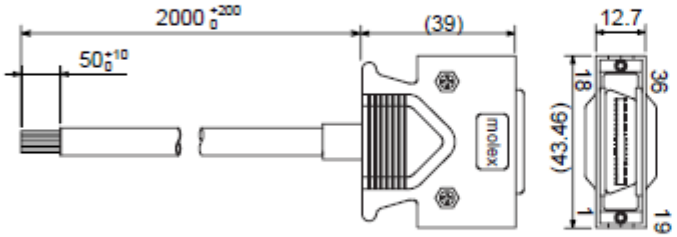
Panasonic
ideas for life

Except for X5 connector, the options are in common with A4.
For X5, the followings for A4P should be used.

X5 Cable

1) Model No. DV0P4510

2) Dimensions



<Remarks>
Color designation of the cable
e.g.) Pin-1 Cable color : Orange
(Red1) : One red dot on the cable

3) Table for wiring

Cable of 2m is connected.

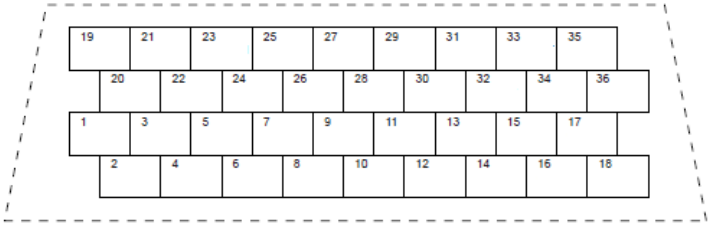
Pin No.	color	Pin No.	color	Pin No.	color
1	Orange (Red1)	13	Gray (Red2)	25	White (Red3)
2	Orange (Black1)	14	Gray (Black2)	26	White (Black3)
3	Gray (Red1)	15	White (Red2)	27	Yellow (Red3)
4	White (Red1)	16	White (Black2)	28	Yellow (Black3)
5	White (Black1)	17	Yellow (Red2)	29	Pink (Red3)
6	Gray (Black1)	18	Yellow (Black2)	30	Pink (Black3)
7	Yellow (Red1)	19	Pink (Red2)	31	Orange (Red4)
8	Yellow (Black1)	20	Pink (Black2)	32	Orange (Black4)
9	Pink (Red1)	21	Orange (Red3)	33	Gray (Red4)
10	Pink (Black1)	22	Orange (Black3)	34	Gray (Black4)
11	Orange (Red2)	23	Gray (Red3)	35	White (Red4)
12	Orange (Black2)	24	Gray (Black3)	36	White (Black4)

X5 Connector

1) Model No. DV0P4500
2) Components

Title	Part No.	Quantity	Manufacturer	Note
Connector	54306-3611 or 54306-3619 (lead-free)	1	Molex Inc.	For CN X5 (36-pins)
Connector cover	54331-0361	1		

3) Pin disposition (36 pins) (viewed from the soldering side)



X5 Pin Configurations

Panasonic
ideas for life

No.	Name
1	I-COM
2	EMG-STP
3	EX-IN3
4	EX-IN2
5	EX-IN1
6	Reserved
7	NC
8	NC
9	OZ+
10	OZ-
11	OA+
12	OA-
13	OB+
14	OB-
15	ALM+
16	ALM-
17	Reserved
18	FG

No.	Name
19	CCWL
20	CWL
21	HOME
22	Reserved
23	EX-SON / EX-IN4
24	Reserved
25	Reserved
26	GND
27	NC
28	NC
29	EX-OUT1+
30	EX-OUT1-
31	EX-OUT2+
32	EX-OUT2-
33	BTN-I
34	BTP-I
35	BRK-OFF-
36	BRK-OFF+

Note: Do not connect to “Reserved” or “NC”.