



ZEF004780809

Toshiba Corporation
Unified Controller
nv Series

ABSOCODER CONVERTER for TC-net I/O

AB933N
Specifications and Instruction Manual

Applicable sensor

MRE-32SP061
MRE-G[]SP061
MRE-32SP074
MRE-G[]SP074
MRE-32SP097
MRE-G[]SP097
MRE-32SP101
MRE-G[]SP101



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INTRODUCTION

Thank you very much for purchasing our product.

Before operating this product, be sure to carefully read this manual so that you may fully understand the product, safety instructions and precautions.

- Please submit this manual to the operators actually involved in operation.
- Please keep this manual in a handy place.

RELATED MANUALS

AB933N is a module intended to be used with TC-net I/O.

You should read the following manuals related to the Toshiba Corporation Unified Controller nv Series together with this manual.

- Controller Unit Instruction Manual (6F8C1220)
- Functional Manual (6F8C1221)
- High-speed Serial I/O System TC-net I/O Instruction Manual (6F8C1240)

COPYRIGHT

The Unified Controller nv Series is a registered trademark of Toshiba Corporation.

Other companies' and products' names are the trademark or registered trademark of each company.

GENERAL SAFETY RULES



● Application Limitation


This product is not designed to be used under any situation affecting human life. When you are considering using this product for special purposes such as medical equipment, aerospace equipment, nuclear power control systems, traffic systems, and etc., please consult with NSD.

This product is designed to be used under the industrial environments categorized in Class A device. The supplier and user may be required to take appropriate measures.



● Signal Words

Safety precautions in this guide are classified into DANGER and CAUTION.




Symbol	Meaning
 DANGER	Incorrect handling may cause a hazardous situation that will result in death or serious injury.
 CAUTION	Incorrect handling may cause a hazardous situation that will result in moderate injury or physical damage.




Instructions accompanied by a symbol  **CAUTION** may also result in serious damage or injury. Be sure to follow the all instructions accompanied by the symbol.

● Graphic Symbols




Symbol	Meaning
	Indicates prohibited items.
	Indicates items that must be performed to.

1. Handling Precautions



 DANGER	
	- Do not touch components inside of the module; otherwise, it will cause electric shock. - Do not damage the cable by applying excessive load, placing heavy objects on it, or clamping; otherwise, it will cause electric shock or fire.
	- Turn the power supply OFF before wiring, transporting, and inspecting the modules; otherwise, it may cause electric shock. - Provide an external safety circuit so that the entire system functions safely even when the module is faulty. - Connect the grounding terminal of the module; otherwise, it may cause electric shock or malfunction.

 CAUTION	
	- Do not use the module in the following places; water splashes, the atmosphere of the corrosion, the atmosphere of the flammable vapor, and the side of the combustibility. Doing so may result in fire or the module may become faulty.
	- Be sure to use the module and the ABSOCODER sensor in the environment designated by the general specifications in the manual. Failure to do so may result in electric shock, fire, malfunction or unit failure. - Be sure to use the specified combination of the ABSOCODER sensor, module and sensor cable; otherwise, it may cause fire or module malfunction.




2. Storage

 CAUTION	
	- Do not store the module in a place exposed to water, or toxic gas and liquid.
	- Be sure to store the module in designed temperature and humidity range, and do not exposed to direct sunlight. - Be sure to consult with NSD when any module is stored for long periods.



3. Transport



 CAUTION	
	- Do not hold the cable or shaft of the ABSOCODER sensor during transport; otherwise, it will cause injury or malfunction.

4. Installation




 CAUTION	
	- Do not step on the ABSOCODER sensor or place heavy objects on the module; otherwise, it will cause injury or malfunction. - Do not block the exhaust port or allow any foreign matter to enter the module ; otherwise, it will cause fire or module failure.
	- Be sure to secure the module and the ABSOCODER sensor with the provided brackets; otherwise, it may cause malfunction, injury, or drop. - Be sure to secure the specified distance between the module and the control cabinet or other equipments; otherwise, it may cause malfunction.

5. Wiring




 DANGER	
	- Be sure to secure the terminal block firmly; otherwise, it will cause fire. - Be sure to mount the terminal cover provided with the module, before supplying the power, starting operation after the installation, and wiring; otherwise, it may cause electric shock.

 CAUTION	
	- Be sure to keep the sensor cable, control cable, and communication cable at least 300 mm away from the main circuit and power line; otherwise it may cause injury or malfunction. - Be sure to connect all cables correctly; otherwise, it may cause injury or malfunction. - Be sure to firmly connect the external I/O connectors and sensor connectors; otherwise, it may cause incorrect inputs and outputs or injury.



6. Operation

 CAUTION	
	<ul style="list-style-type: none">- Do not change the module's function switch settings during the operation; otherwise, it will cause injury.- Do not approach the machine after instantaneous power failure has been recovered. Doing so may result in injury if the machine starts abruptly
	<ul style="list-style-type: none">- Be sure to check that the power supply specifications are correct; otherwise, it may cause module failure.- Be sure to provide an external emergency stop circuit so that operation can be stopped with power supply terminated immediately.- Be sure to conduct independent trial runs for the module before mounting an ABSOCODER sensor to the machine; otherwise, it may cause injury.- When an error occurs, be sure to eliminate the cause, ensure safety, and reset the error before restarting operation; otherwise, it may cause injury.

7. Maintenance and Inspection

 CAUTION	
	<ul style="list-style-type: none">- Do not disassemble, remodel, or repair the unit; otherwise, it will cause electric shock, fire, and unit malfunction.
	<ul style="list-style-type: none">- The capacitor of the power line deteriorates through prolonged use. We recommended that the capacitor be replaced every five years to prevent secondary damage.

8. Disposal

 CAUTION	
	<ul style="list-style-type: none">- Be sure to handle the module or the ABSOCODER sensor as industrial waste while disposing of it.

REVISION HISTORY

The Document No. appears at the upper right of this manual's cover page.

Document No.	Date	Revision Description
ZEF004780800	17, Nov., 2009	1st Edition Japanese document: ZEF004780400
ZEF004780801	8, Jan., 2010	2nd Edition Japanese document: ZEF004780401
ZEF004780802	27, Jul., 2010	3rd Edition Japanese document: ZEF004780402
ZEF004780803	7, Sep., 2010	4th Edition Japanese document: ZEF004780403
ZEF004780804	12, May., 2011	5th Edition Japanese document: ZEF004780404
ZEF004780805	5, Oct., 2011	6th Edition Japanese document: ZEF004780405
ZEF004780806	5, Jun., 2013	7th Edition Japanese document: ZEF004780406
ZEF004780807	2, Feb., 2015	8th Edition Japanese document: ZEF004780407
ZEF004780808	16, Feb., 2016	9th Edition Japanese document: ZEF004780408
ZEF004780809	30, Aug., 2016	10th Edition Japanese document: ZEF004780409

1. OVERVIEW

1. OVERVIEW

1-1. Overview

The AB933N module is an ABSOCODER converter for the TC-net I/O System of the Toshiba Corporation Unified Controller nv Series. Combine the module with a multi-turn type ABSOCODER sensor to have the detected absolute position data converted into binary codes.

1-2. Features

The AB933N module has the following features:

(1) High reliability

An absolute position detection format ensures accurate position detection even if a power interruption or unexpected noise condition occurs. An origin returning operation is not required.

(2) ABSOCODER sensors can be connected to two axes

One module can perform position detection for two axes. This contributes to space saving inside the control cabinet.

(3) 200 μ s high-speed response

Position detection will be run every 200 μ s regardless of the PLC scan time and the TC-net I/O updating timing.

(4) Origin setting function

Any required machine position can be registered as the origin, by using the "Origin setting" switch on the panel or with an external-input origin setting signal.

(5) Error detection function

When an error occurs, the monitor LED on the module panel will indicate error information. In addition, status data input is provided so that error information can be retrieved into the host controller.

(6) Applicable with JKPEV-S cable

A commercially available cable (JKPEV-S 1.25mm² x 5P) can be used between the module and ABSOCODER sensor.

(7) Compliance with CE standards

The AB933N module complies with CE (EMC Directive) standards.

(8) Compliance with KC mark (Korea Certification Mark)

The AB933N module complies with KC mark. (It is only certified under the Radio Waves Act of South Korea.) KC mark is the same directives as CE marking. For more details, refer to "APPENDIX 1. CE MARKING".

1. OVERVIEW

1-3. Terminology

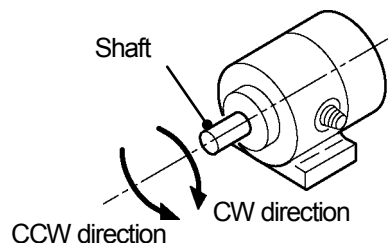
(1) ABSOCODER

"ABSOCODER" is a generic name referring to the type of sensing device that detects rotational and linear displacement as well as speed and acceleration in an absolute format and outputs them digitally (or analogously). "ABSOCODER" comprises a detection unit that converts displacement into a variation in magnetic resistance and a conversion unit that inputs an alternating-current energization signal into the detection unit and then issues an absolute-format data according to the output signal returned from the detection unit. ABSOCODER sensors can be divided into two types, the rotary type that detects rotational position and the linear type that detects linear position. The module has a built-in conversion unit so as to be able to use an ABSOCODER sensor.

(2) Position Data "Increase Direction"

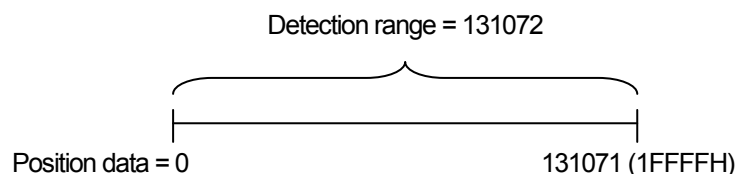
The position data increases or decreases according to the ABSOCODER sensor's shaft rotative direction. Use the "Position Data Increase Direction" parameter switch on the back of the module to change the direction in which the position data value increases.

- CW: The position data value will increase when the shaft turns in the clockwise direction as viewed from the shaft end.
- CCW: The position data value will increase when the shaft turns in the counterclockwise direction as viewed from the shaft end.



(3) Position data

"Position data" refers to a value which indicates where within the detection range the machine is currently located. The position data is expressed as a 17-bit binary code.



The position data range detectable by an ABSOCODER sensor is 0 to 131071 (0 to 1FFFFH).

2. SYSTEM CONFIGURATION

2. SYSTEM CONFIGURATION

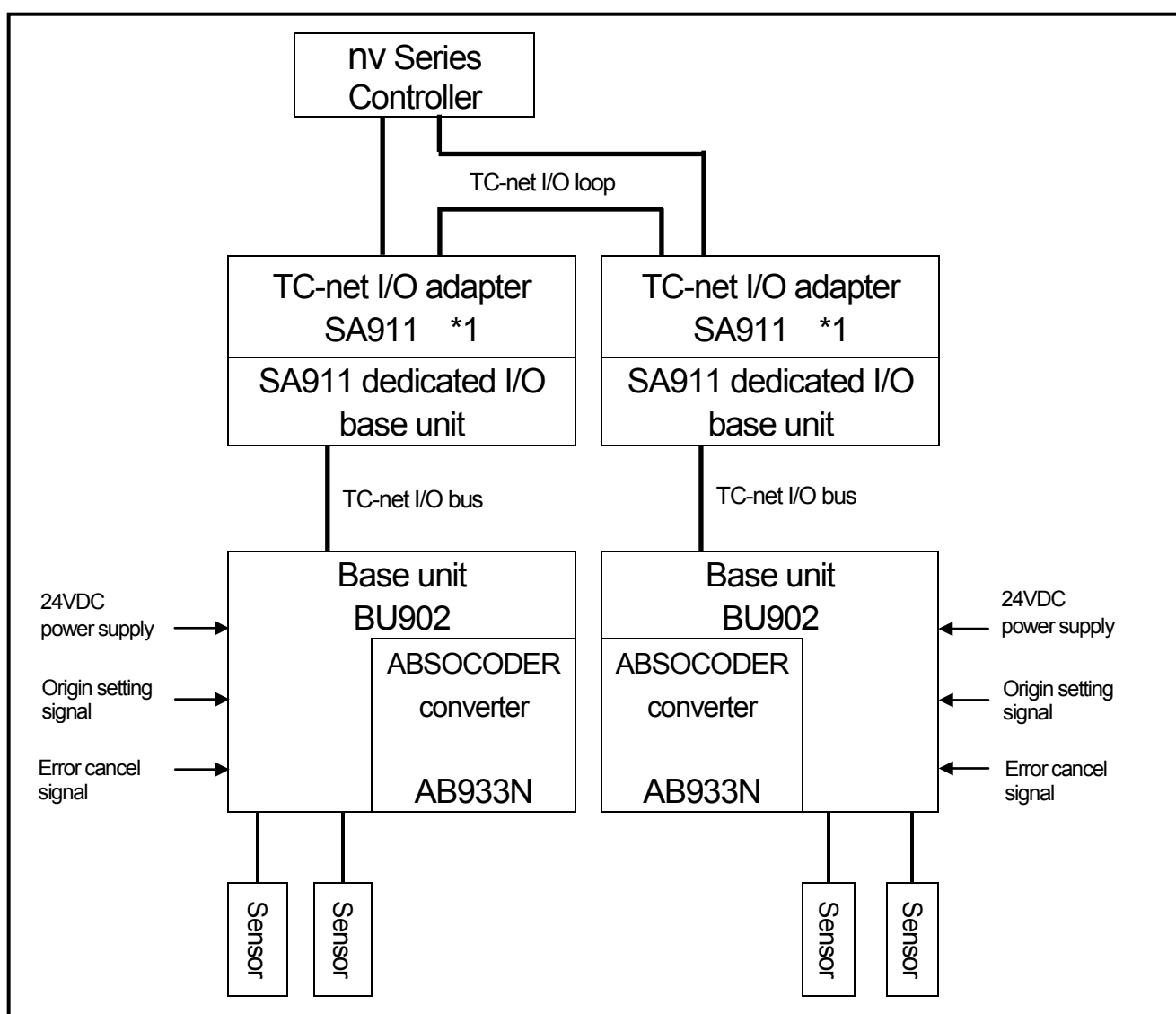
2-1. System Configuration

The following chart shows the system configuration of the Toshiba Corporation Unified Controller nv Series with a AB933N module installed.

To use any other type of system configuration, contact NSD Corporation.

For details about TC-net I/O, refer to the High-speed Serial I/O System TC-net I/O Instruction Manual (Toshiba Corporation).

Figure 2.1 System Configuration



*1: SA911 can be replaced with SA912. For more details, contact your NSD representative.

NOTES

Use the general I/O base unit BU902 for the AB933N module.
Do not use any other types of base units.

2. SYSTEM CONFIGURATION

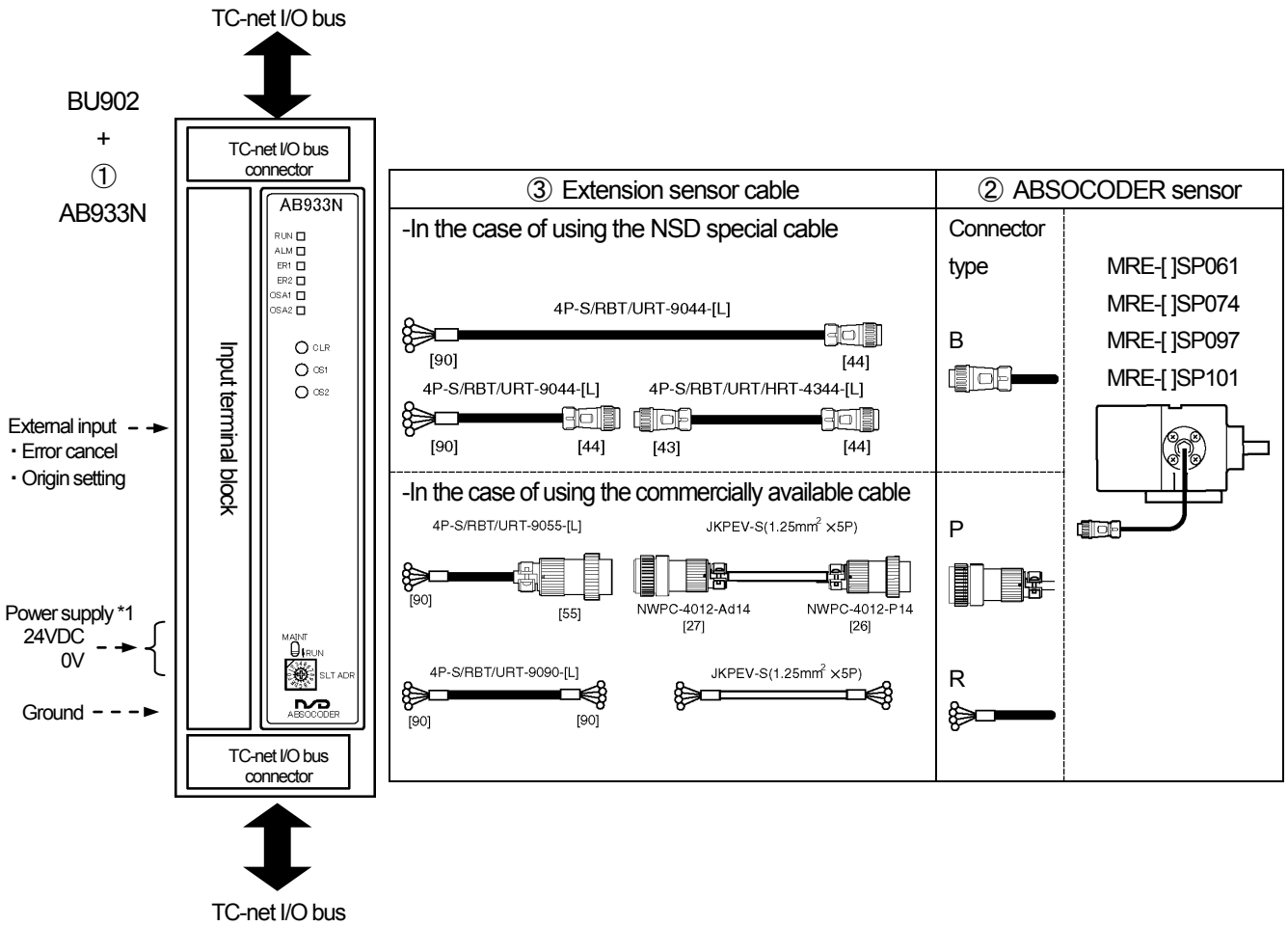
- MEMO -

2. SYSTEM CONFIGURATION

2-2. Connection Configuration

The following figure indicates connection configuration of the AB933N module.

● Connection configuration



*1: The 24VDC power supply on the input terminal block is intended for both external inputs and sensors.
Be sure to provide 24VDC even if no external input is used.


2. SYSTEM CONFIGURATION

●Model List

◆Converter

No.	Model	Description
①	AB933N	Position data 17bit binary code output A Toshiba base unit BU902 is required. It should be separately provided by the user.

◆ABSOCODER sensor

No.	Model	Description
②	MRE-[1]SP061FK[3]	General environment type Mounting format: Flange-mount type With Interconnecting cable 2m [1]: Total number of turns 32, G64, G128, G160, G256, G320
	MRE-[1]SP074[2] K [3][L]-G	Compact size heavy duty type, SUS [1]: Total number of turns 32, G64, G128, G160, G256, G320
	MRE-[1]SP097[2] K [3][L]-G	Heavy duty type, spheroidal graphite iron castings [1]: Total number of turns 32, G64, G128, G160, G256, G320, G512, G1280, G2048
	MRE-[1]SP101[2] K [3][L]-G	Heavy duty type, SUS [1]: Total number of turns 32, G64, G128, G160, G256, G320, G512, G1280, G2048, G2560, G3072
	[2]: Mounting format F: Flange-mount type L: Base-mount type M: Face-mount type (Only available for MRE-SP074)	
K: Input shaft (sunk key) 		
[3]: Connector type B: Standard connector for the NSD special cable (NJW-2012PM8, manufacturer: Nanaboshi Electric Mfg.Co,Ltd.) P: Large connector for JKPEV-S cable (NWPC-4012-Ad12, manufacturer: Nanaboshi Electric Mfg.Co,Ltd.) R: Crimping terminals for JKPEV-S cable and the NSD special cable (R1.25-4)		
[L]: Interconnecting sensor cable length (m): 2, 5, 10, 20		
G: Silicon oil injected, no code: no oil injected		

◆Extension sensor cable

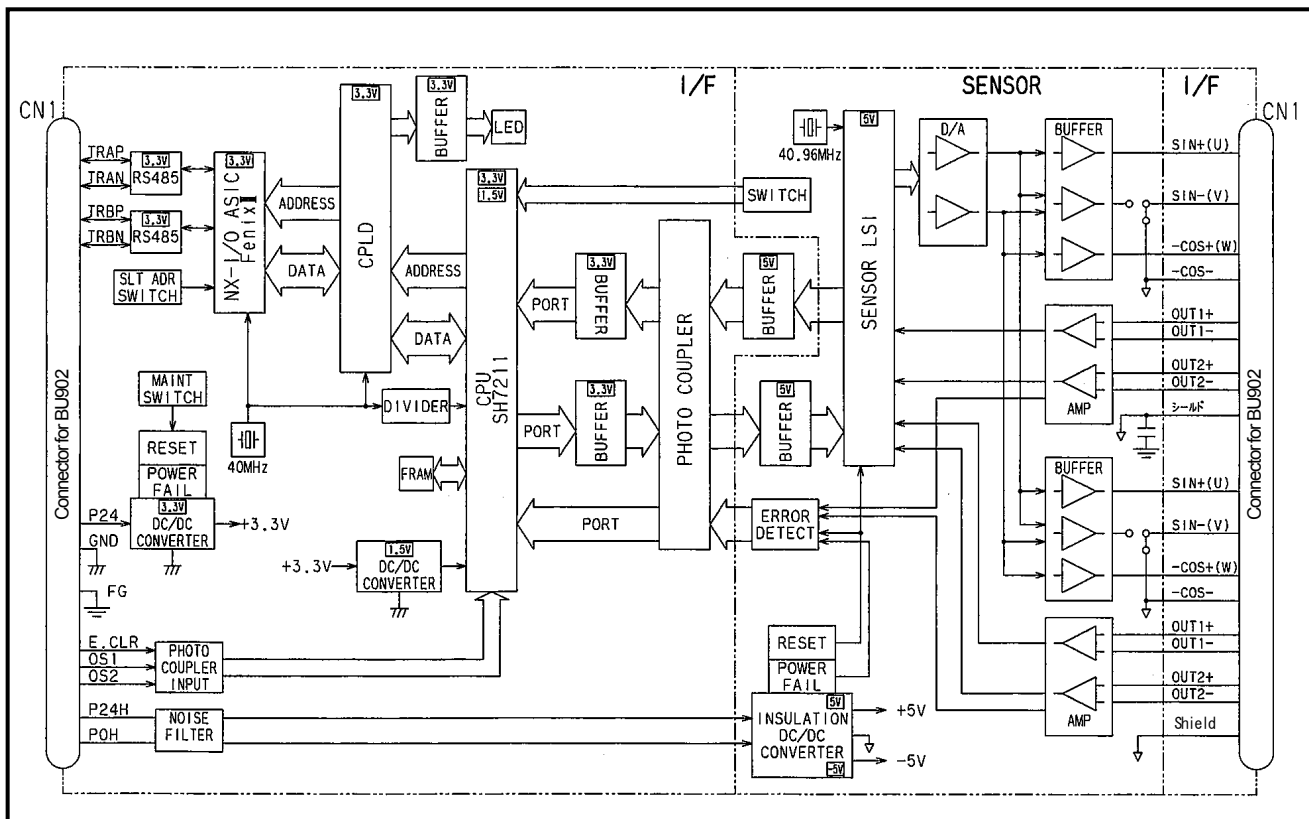
No.	Model	Description	
③	4P-S-9044-[L]	Standard cable, standard connector	
	4P-RBT-9044-[L]	Robotic cable, standard connector	
	4P-URT-9044-[L]	Semi-heat-resistant robotic cable, standard connector	
	4P-S-4344-[L]	Standard cable, standard connector	
	4P-RBT-4344-[L]	Robotic cable, standard connector	
	4P-URT-4344-[L]	Semi-heat-resistant robotic cable, standard connector	
	4P-HRT-4344-[L]	Heat-resistant robotic cable, standard connector	
	4P-S-9055-[L]	For JKPEV-S cable	Standard cable, large connector
	4P-RBT-9055-[L]		Robotic cable, large connector
	4P-URT-9055-[L]		Semi-heat-resistant robotic cable, large connector
	4P-S-9090-[L]	For JKPEV-S cable	Standard cable, crimping terminal
	4P-RBT-9090-[L]		Robotic cable, crimping terminal
	4P-URT-9090-[L]		Semi-heat-resistant robotic cable, crimping terminal
JKPEV-S(1.25mm ² × 5P)		Commercially available cable	

2. SYSTEM CONFIGURATION

2-3. Internal Block Diagram

Shown below is the internal block diagram of an AB933N module.

Figure 2.2 Internal block diagram



2. SYSTEM CONFIGURATION

- MEMO -

3. INSTALLATION CONDITIONS and PRECAUTIONS

3. INSTALLATION CONDITIONS and PRECAUTIONS

Installation procedures and precautions for AB933N modules and ABSOCODER sensors are described.

For details about base unit installation, TC-net I/O bus cable connection and the startup and shutdown procedures, refer to the High-speed Serial I/O System TC-net I/O Instruction Manual (Toshiba Corporation).

3-1. AB933N Module Installation Conditions and Precautions

When installing AB933N modules, the following conditions and precautions should be observed.

●Installation site

- (1) Avoid sites where the unit is exposed to direct sunlight.
- (2) The ambient temperature should never exceed a 0 to 55°C range.
- (3) The ambient humidity should never exceed a 10 to 95% RH range.
- (4) Do not install the unit in areas where condensation is likely to occur (high humidity with extreme temperature changes).
- (5) Avoid sites where dust is excessive.
- (6) Do not install in areas with an excessive amount of salt and/or metal chips.
- (7) Do not install in areas where flammable and/or corrosive gases are present.
- (8) Avoid areas where splashing water, oil or chemicals are likely to occur.
- (9) Avoid areas where vibration and shocks are excessive.

●Installation cautions

- (1) Avoid dropping or making a major impact on the AB933N module.
- (2) Do not remove the AB933N module's printed circuit board from the case.
- (3) During cable connection, be careful not to allow cable debris or any other foreign objects to get inside the AB933N module.
- (4) Install inside the control cabinet.
- (5) In order to improve noise resistance, install as far away as possible from high-voltage and power cables.

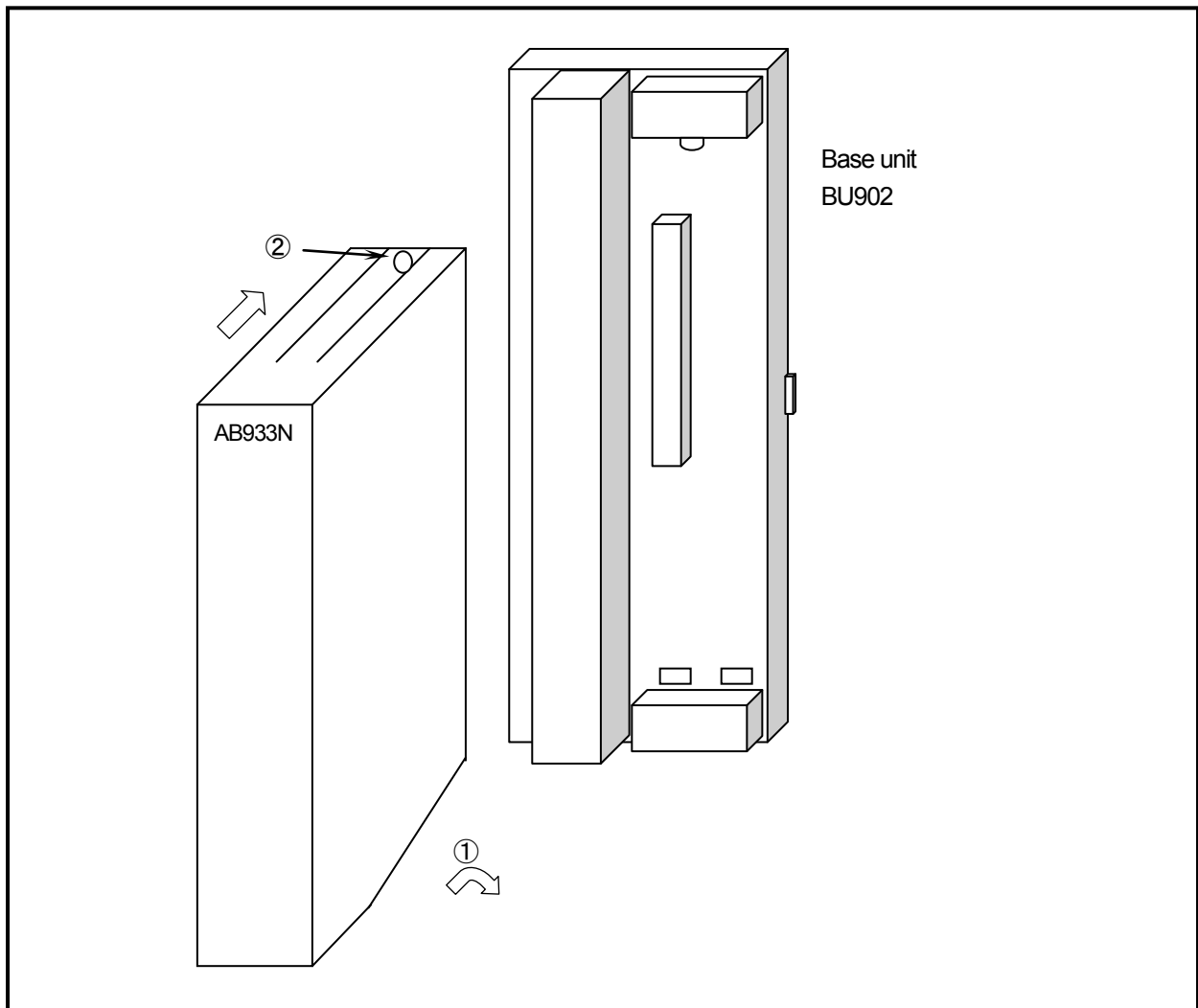
3. INSTALLATION CONDITIONS and PRECAUTIONS

3-2. Installing the AB933N Module

This section explains about the installation of an AB933N module to the base unit (BU902).

●Installation

- (1) Hook the module to the slot on the bottom of the AB933N module in the lower part of the base unit, and rotate it to fit the connector.
- (2) Secure it to the base unit with the fixing screw on the top of the AB933N module.



3. INSTALLATION CONDITIONS and PRECAUTIONS

3-3. ABSOCODER Sensor Installation Conditions and Precautions

The installation conditions and precautions for ABSOCODER sensor are described in this section.

● Handling of Turn-type ABSOCODER sensor

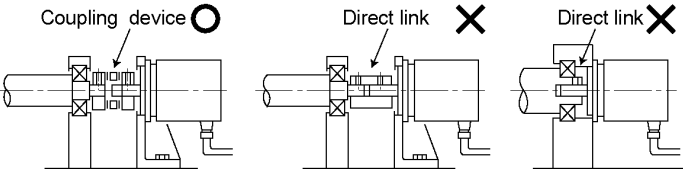
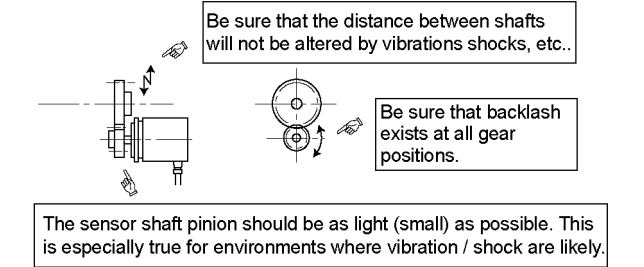
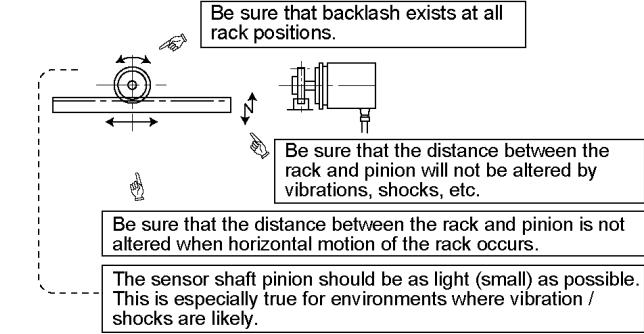
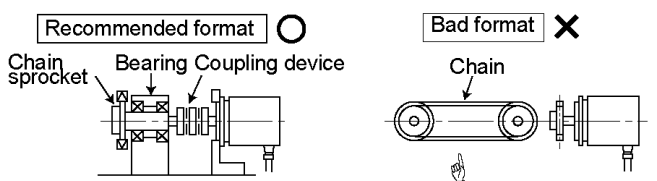
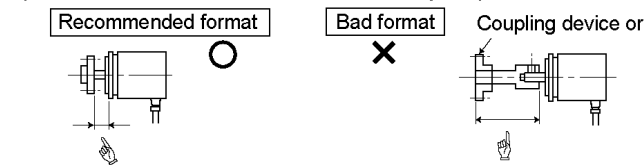
Item	Explanation
1) Main unit	<p>Never drop the Sensor, or subject it to excessive forces or shocks.</p>
2) Cable	<p>Avoid stepping on, or applying excessive stress to the cable.</p>

● Mounting of Turn-type ABSOCODER sensor

Item	Explanation	Precaution
1) Mounting	For details regarding mounting dimensions, refer to each ABSOCODER sensor dimensions.	
2) Cable port	<p>Cable port should face downward.</p>	
3) Cable	<p>The bend radius for movable parts should never be less than 75 mm(ϕ 150) (robotic cable).</p>	Do not use the standard cable for movable parts. (Use robotic cable.)
4) Wiring	<p>The sensor cable should be located at least 300mm away from power lines and other lines which generate a high level of electrical noise.</p>	

3. INSTALLATION CONDITIONS and PRECAUTIONS

● Mounting of Turn-type ABSOCODER sensor

Item	Explanation	Precaution
<p>1) Coupling of machine shaft and sensor shaft</p>	<p>Be sure to use a coupling device to link the 2 shafts.</p>  <p>Coupling device ○ Direct link ✕ Direct link ✕</p>	<p>A "direct-link" format will result in shaft fatigue and / or breakage after long periods. Therefore, be sure to use a coupling device to link the shafts.</p>
<p>2) For gear-type linkage</p>	<p>If a gear linkage is used, be sure that some backlash exists.</p>  <p>Be sure that the distance between shafts will not be altered by vibrations shocks, etc..</p> <p>Be sure that backlash exists at all gear positions.</p> <p>The sensor shaft pinion should be as light (small) as possible. This is especially true for environments where vibration / shock are likely.</p>	<p>Incorrect gear mounting can result in shaft bending or breakage.</p>
<p>3) For rack and pinion type linkage</p>	<p>Be sure that backlash exists at all rack positions.</p>  <p>Be sure that backlash exists at all rack positions.</p> <p>Be sure that the distance between the rack and pinion will not be altered by vibrations, shocks, etc.</p> <p>Be sure that the distance between the rack and pinion is not altered when horizontal motion of the rack occurs.</p> <p>The sensor shaft pinion should be as light (small) as possible. This is especially true for environments where vibration / shocks are likely.</p>	<p>Incorrect rack and pinion mounting can result in shaft bending or breakage.</p>
<p>4) Chain or timing belt linkage</p>	<p>When a chain or timing belt linkage format is used, there is an inherent risk of the shaft's load being increased by the resulting tension. Therefore, a bearing should be used, with the shafts being linked by a coupling device immediately behind the bearing.</p>  <p>Recommended format ○ Bad format ✕</p> <p>Chain sprocket Bearing Coupling device Chain</p> <p>This linkage format is also applicable to the "rack-and-pinion" and "gear" methods shown above.</p> <p>Even a small amount of tension can produce a considerable load on the shaft.</p>	
<p>5) Shaft mounting position</p>	<p>The shaft should be attached to the coupling device or gear at a point which is as near to the sensor body as possible.</p>  <p>Recommended format ○ Bad format ✕ Coupling device or</p> <p>This distance should be as short as possible. When this distance is short, the load placed on the bearing by vibrations / shocks is slight.</p> <p>Never use an extended shaft format.</p>	

3. INSTALLATION CONDITIONS and PRECAUTIONS

● Coupling of Turn-type ABSOCODER sensor

Item	Explanation	Precaution
<p>1) Coupling device selection precaution</p>	<p>1. When selecting a coupling, consider factors such as the design mounting error, the coupling tolerance error, and the sensor's permissible shaft load.</p> <div style="text-align: center;"> <p>Mounting error < Coupling tolerance error < Coupling shaft permissible load < Sensor shaft load</p> <p>Eccentric → Load produced by eccentric condition. → Radial load</p> <p>Deflection → Load produced by deflection. → Radial load</p> <p>Shaft direction displacement → Force produced by shaft direction displacement. → Thrust load</p> </div> <p>2. If the selected coupling device is larger than necessary (when used in high vibration/shock environments), the load which is applied to the shaft by the vibrations/shocks will be increased by the weight of the coupling device.</p> <p>3. Be sure to select a coupling device with an adequate transmission torque surplus relative to the sensor shaft's torque.</p>	<p>The selection of a larger coupling than necessary will increase the shaft load which is caused by the mounting error amount. Excessive force applied to the shaft can deform the coupling and reduce durability.</p>
<p>2) Coupling device installation precaution</p>	<p>Avoid bending or damaging the coupling.</p> <div style="text-align: center;"> </div>	

3. INSTALLATION CONDITIONS and PRECAUTIONS

3-4. Replacing the AB933N Module

This section provides precautions when replacing an AB933N module.

- (1) AB933N modules can be replaced while the system is energized or not energized.
When replacing them while the system is energized, set the maintenance switch to the up (MAINT) position for the AB933N module.
When the maintenance switch is set to MAINT, the AB933N module stops communication. It is just like removing the AB933N module in terms of the signal. Therefore, major failure occurs in the AB933N module.
- (2) If the module parameter is set for "I/O node fallback is not operated", the controller will shut down as soon as the AB933N module's maintenance switch is set to the upper position ("MAINT"). To avoid this, set the parameter for "I/O node fallback is operated".
- (3) Loosen the fixing screw on the top of the AB933N module, and rotate the module downward to pull it off.
- (4) Upon replacement, note the following.
 - Make sure that the replaced AB933N module is the same model.
 - Make sure to use the same setting for the hexadecimal rotary switch (SLT ADR) and parameter switches on the back of the module as before replacement.
 - After installing the AB933N module, set the maintenance switch to the down (RUN) position.
- (5) Make sure to carry out origin setting as required after replacing the AB933N module.
Refer to 5-5 about the origin setting.

 **NOTES**

Do not install a non-AB933N module to a base unit set up for AB933N.
Do not install an AB933N module to a base unit set up for a non-AB933N module.
The module and/or the sensors may become damaged or fail.

 **NOTES**

Before touching the AB933N module or inserting or removing the transmission cable, wear a wrist strap and white cotton gloves. Ground the wrist strap to remove static electricity.
Otherwise, it may cause damage or failure of the module.

 **NOTES**

When placing the AB933N module during replacement, use a conductive mat.
Ground the conductive mat.
Otherwise, it may cause damage or failure of the AB933N module.

 **NOTES**

When setting the maintenance switch to MAINT, specify "Fallback is operated" to prevent the controller from going down.
When the maintenance switch is set to MAINT, the AB933N module communication stops and major failure occurs.
The controller goes down if no fallback is specified.

4. EXTERNAL WIRING

4. EXTERNAL WIRING

The power supply, ABSOCODER sensors and the external input signals should be connected to the base unit (BU902). Shown below is the BU902 terminal block configuration.

Terminal No.	Signal Names	Wire Color *1	Descriptions	
1	SIN+	Brown	Axis 1 sensor signal	Connect the Axis 1 ABSOCODER sensor.
2	SIN-	Red		
3	-COS+	Orange		
4	-COS-	Yellow		
5	OUT1+	Green		
6	OUT1-	Blue		
7	OUT2+	Violet		
8	OUT2-	Gray		
9	Shield	Shield		
10	NC			Do not connect anything.
11				
12				
13				
14				
15				
16				
17				
18				
19	SIN+	Brown	Axis 2 sensor signal	Connect the Axis 2 ABSOCODER sensor.
20	SIN-	Red		
21	-COS+	Orange		
22	-COS-	Yellow		
23	OUT1+	Green		
24	OUT1-	Blue		
25	OUT2+	Violet		
26	OUT2-	Gray		
27	Shield	Shield		
28	NC			Do not connect anything.
29				
30				
31				
32	Error cancel	Input signal	This signal is used for error cancelling. Error status will be cancelled when the signal input comes on.	
33	Axis 1 origin setting		This signal is used for origin setting. Axis 1 position data value will be set to "0" when the signal input comes on.	
34	Axis 2 origin setting		This signal is used for origin setting. Axis 2 position data value will be set to "0" when the signal input comes on.	
35	P24	Power supply	Connect the power for external inputs and the sensors.	
36	Z24			

*1: A wire color indicates the color of the NSD extension sensor cable.

NOTES

The power supply (P24, Z24) is intended for both external inputs and the sensors.
Be sure to provide 24VDC even if no input signal is used.

NOTES

Observe the tightening torque.
If it is too loose, it may come off. If the tightening torque is out of specified range, it may be broken off.
M3.5 screw : 0.8 to 1.2 N·m

4. EXTERNAL WIRING

4-1. ABSOCODER Sensor Connection

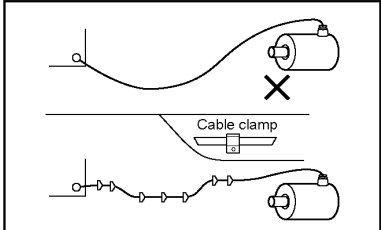
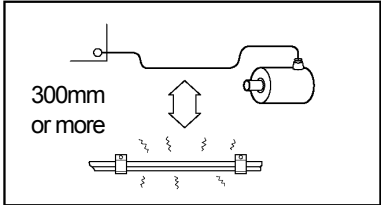
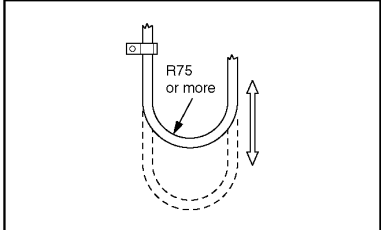
This section explains about ABSOCODER sensor connection.

4-1-1. Sensor Cable Wiring Precautions

●Sensor cable length

The length of the extendable cable has a limitation depending on the models of ABSOCODER sensor and sensor cable. For more details, refer to "8-2. ABSOCODER Sensor Specifications".

●Wiring precautions

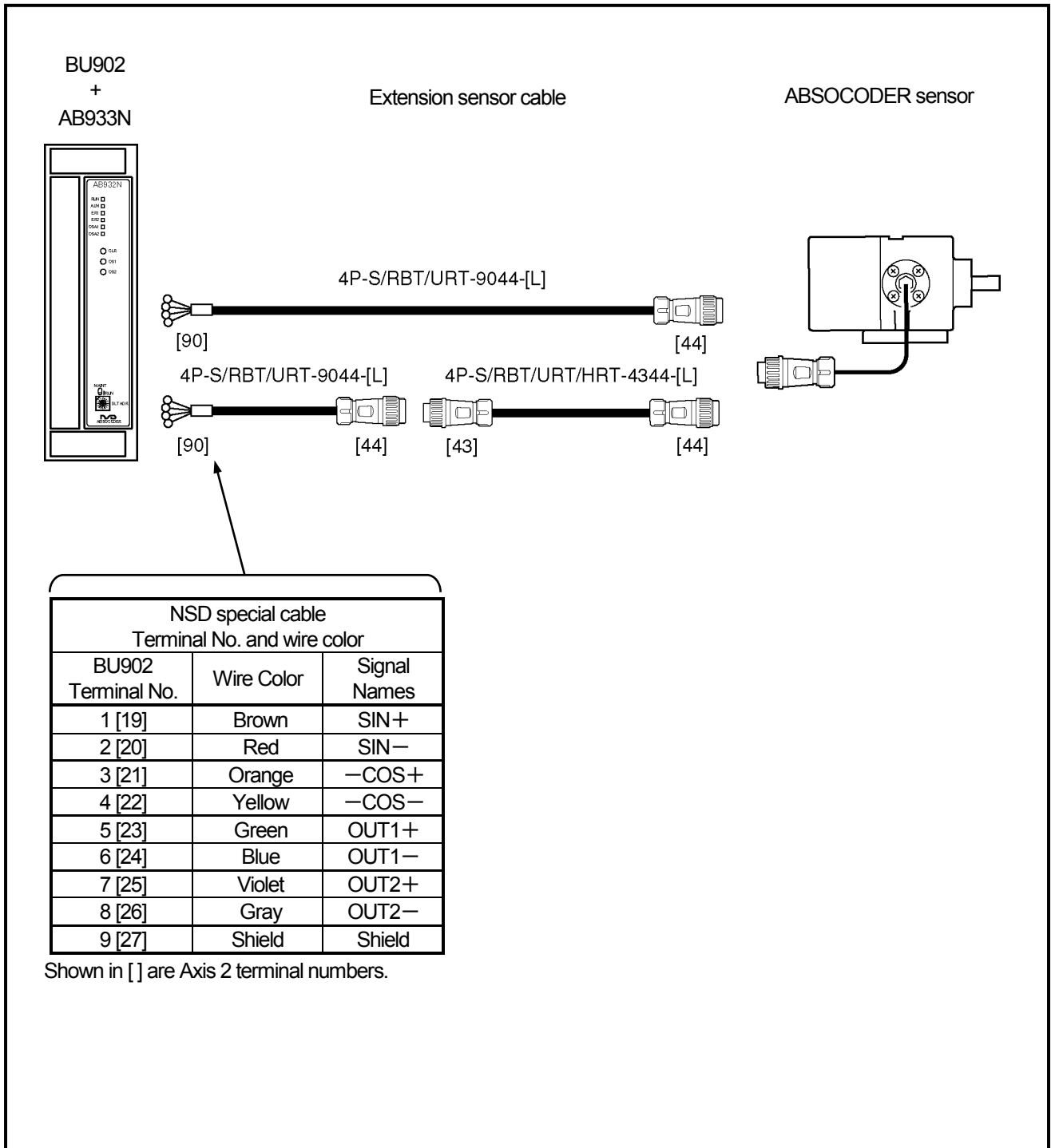
- (1) The sensor cable should be clamped as shown in the right figure to prevent excessive tension from being applied to the cable connectors.

- (2) The sensor cable should be located at least 300mm away from power lines and other lines which generate a high level of electrical noise.

- (3) If the cable is moved under the state of bending like a horseshoe, a robotic cable should be used.
The bend radius should never be less than 75 mm.


4. EXTERNAL WIRING

4-1-2. Connection Configure Example of the Sensor Cable

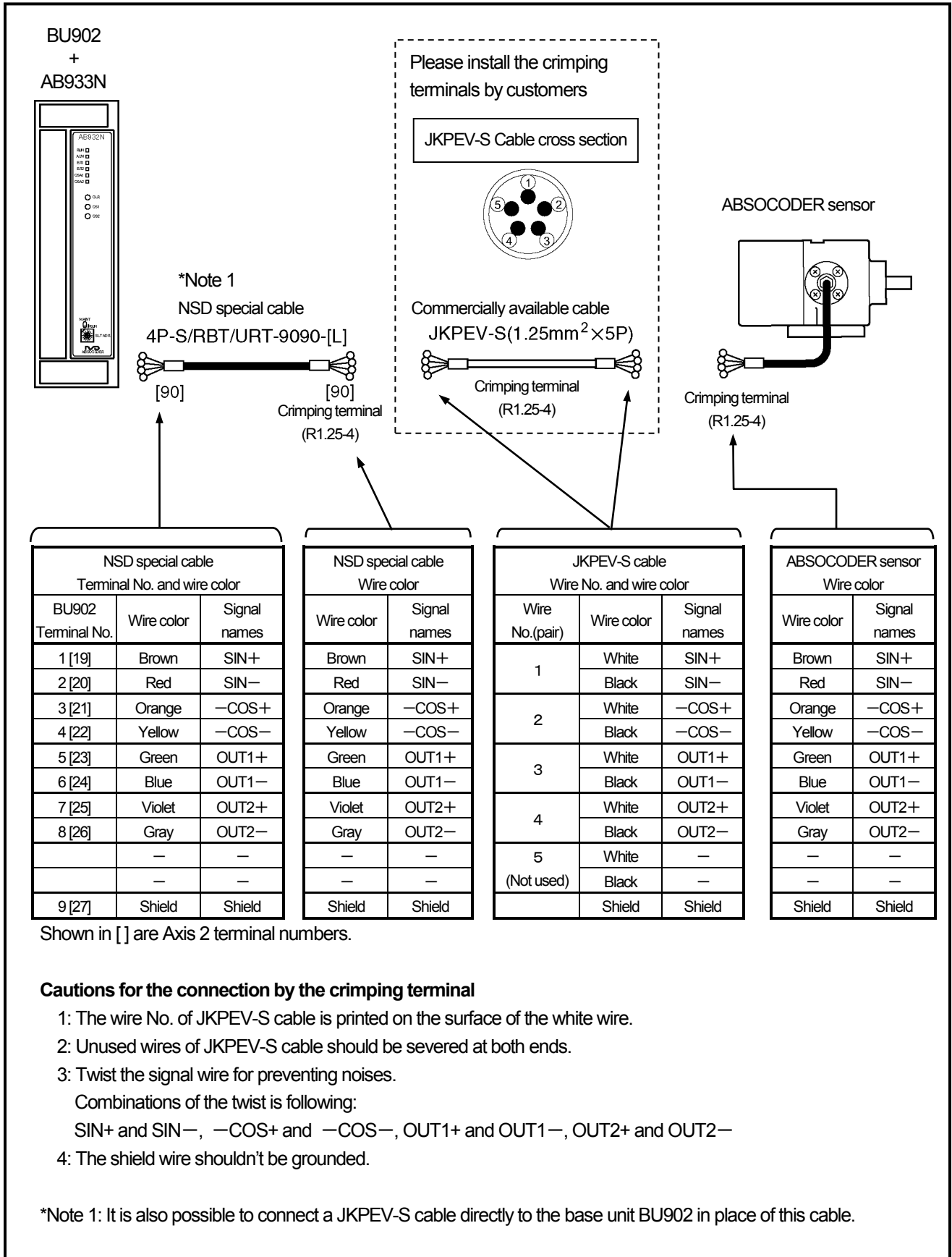
Indicates the connection configure example when using the NSD special cable and commercially available cable.

● In the case of using the NSD special cable



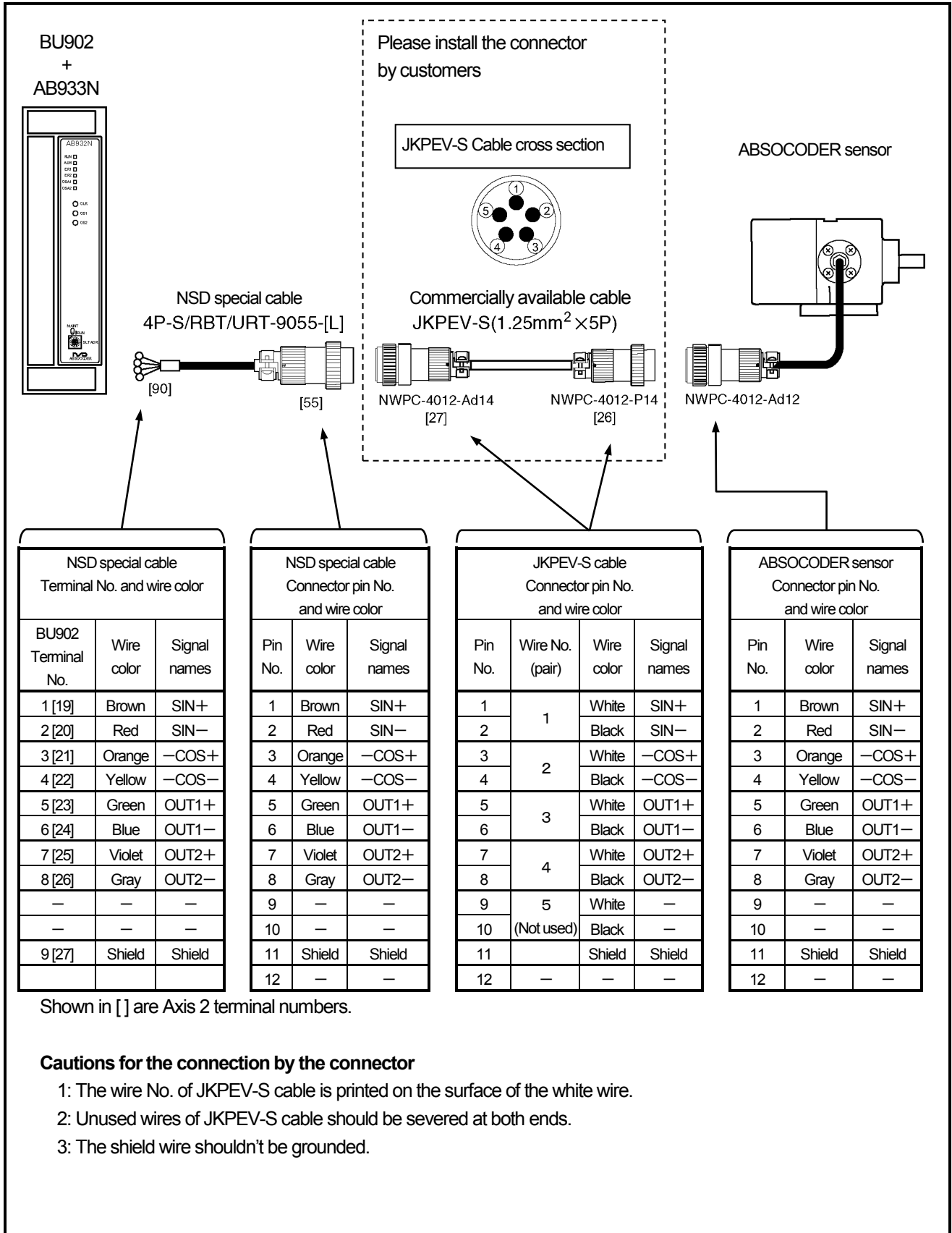
4. EXTERNAL WIRING

- In the case of using the commercially available cable (JKPEV-S 1.25mm² × 5P) and connecting with crimping terminals



4. EXTERNAL WIRING

● In the case of using the commercially available cable (JKPEV-S 1.25mm² × 5P) and connecting with a connector



4. EXTERNAL WIRING

4-2. Input Signal Wiring

For input signal wiring, make sure to use a cable sized in the range of 0.75 to 2 mm².

4-3. Power Supply Connection

Describes about the power supply connection.

- (1) The power supply should be isolated from the commercial power supply.
- (2) Choose the power supply capacity which is more than twice the power consumption.
- (3) Avoid sharing the power supply with a magnet, solenoid or any other type of device that can potentially cause electrical noise.
- (4) Twist the power cable for preventing noises.
- (5) The power cable should be as thick as possible to minimize voltage drops.

5. FUNCTION

5. FUNCTION

5-1. Function List

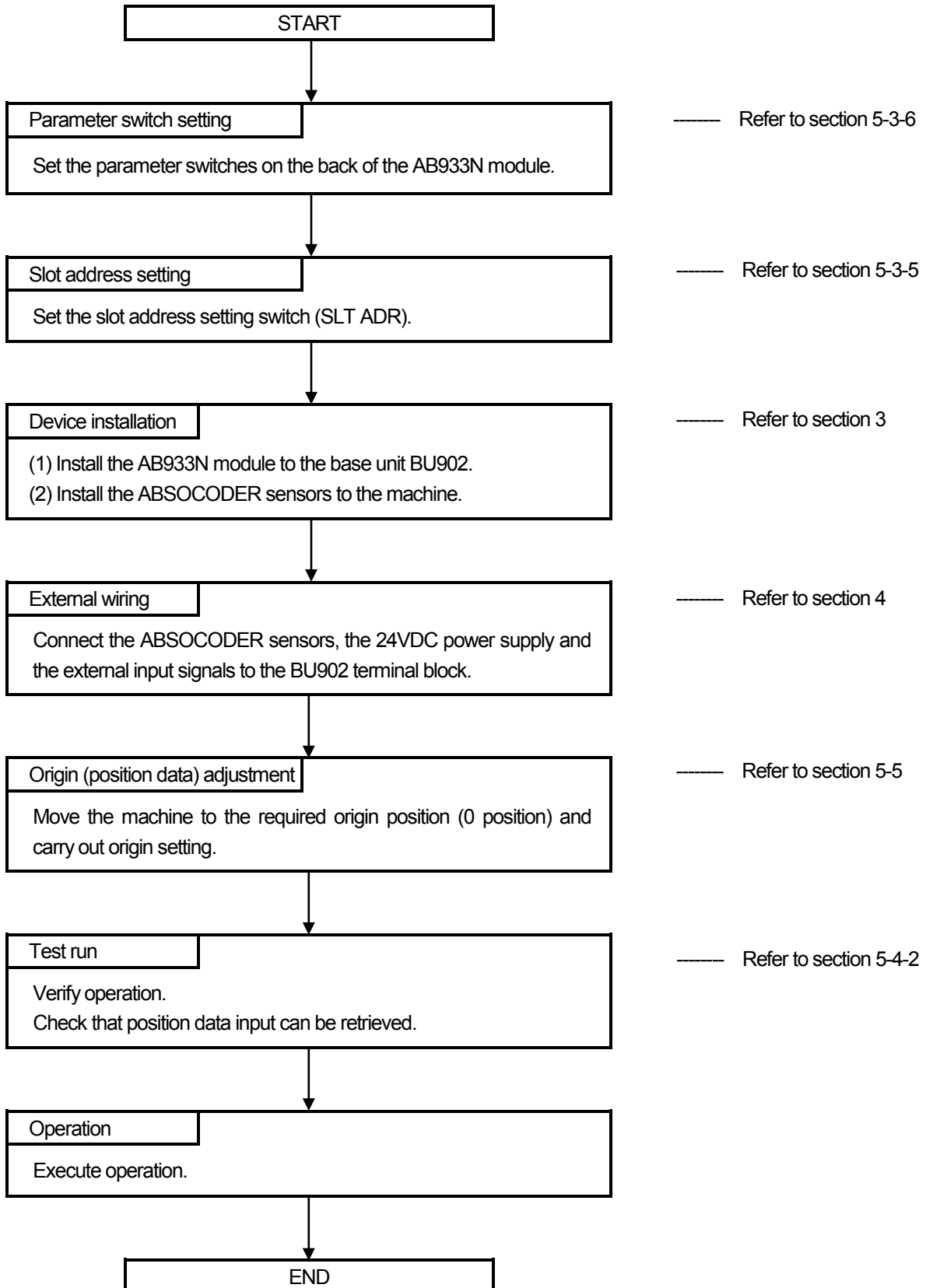
As shown in table 5.1, the AB933N module functions.

Table 5.1 Function List

Items	Descriptions
Position data detection function	The machine position will be detected using the ABSOCODER sensor.
Origin setting function	The position data value will be corrected to "0" upon any of the following actions: <ul style="list-style-type: none">- Turning the external-input "origin setting" signal ON.- Pressing the "Origin setting" switch on the panel.- Operating the control program to set the "origin setting command" output bit (OS) to "1".

5. FUNCTION

5-2. Operation Sequence

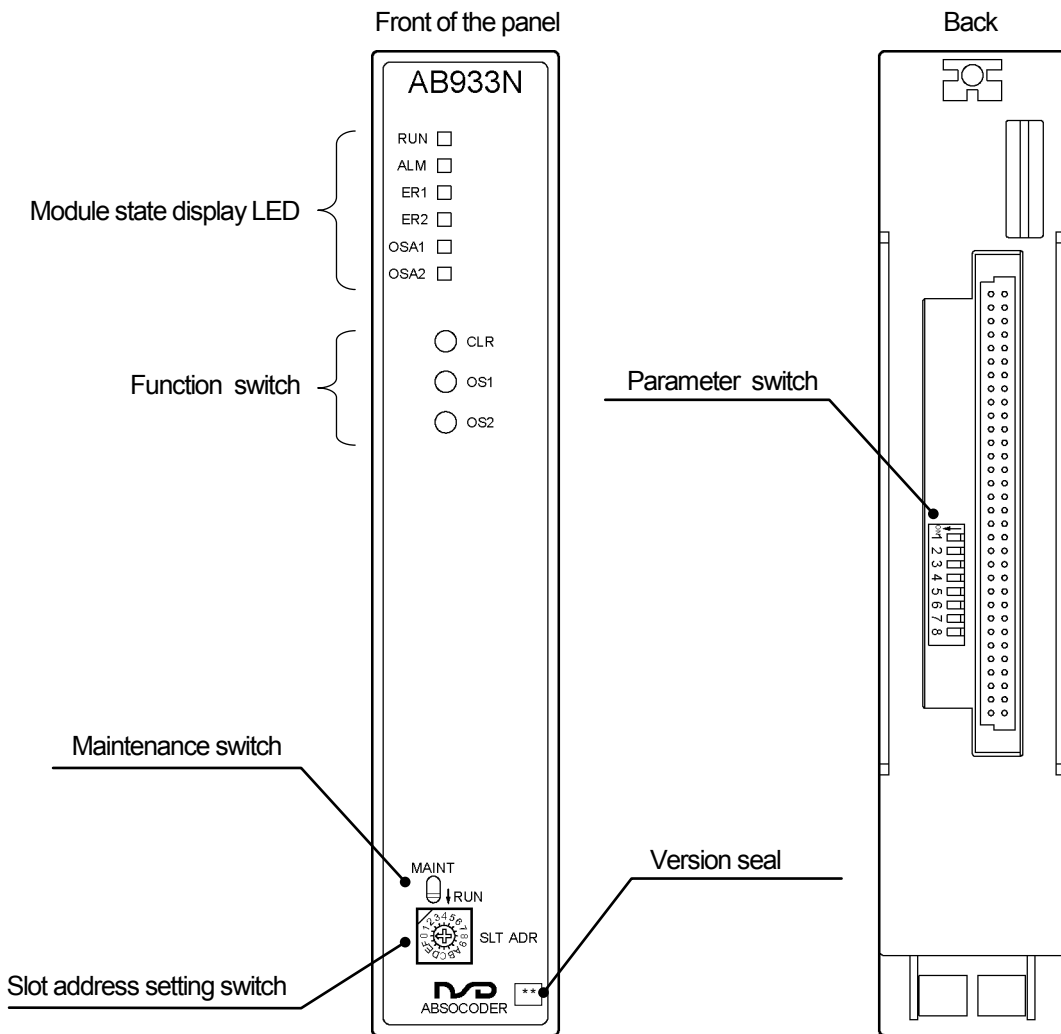


5. FUNCTION

5-3. NOMENCLATURE

This section explains about the AB933N module component names and functions.

5-3-1. Component Names



5. FUNCTION

5-3-2. Module State Display LED

Shown below is the list of LEDs provided on the AB933N module panel and the description of what each LED indicates. Refer to 7-1 for the details of the errors indicated.

LED name		Description
RUN	Normal	ON : Module is normal or in maintenance (maintenance switch in the upper position) Blinking : Waiting for setting
ALM	Alarm	ON : Transmission error or in maintenance (maintenance switch in the upper position)
ER1	Axis 1 error	ON : Axis 1 sensor disconnected error Blinking : Sensor power error or storage memory error. OFF : Axis 1 normal
ER2	Axis 2 error	ON : Axis 2 sensor disconnected error Blinking : Sensor power error or storage memory error. OFF : Axis 2 normal
OSA1	Axis 1 origin setting answerback	ON : During Axis 1 origin setting (The LED will remain on while the external input signal, the switch on the panel or the output bit is ON.)
OSA2	Axis 2 origin setting answerback	ON : During Axis 2 origin setting (The LED will remain on while the external input signal, the switch on the panel or the output bit is ON.)

REMARKS

If ER1, ER2, OSA1 and OSA2 come ON all at the same time, it indicates that a CPU watch dog timer error has occurred.

5-3-3. Function Switch

This section explains about the function switches on the AB933N module panel.

Switch Name		Description
CLR	Error cancel	Pressing this switch will cancel the current AB933N module error.
OS1	Axis 1 origin setting	Pressing this switch will set the Axis 1 position data value to "0". *1
OS2	Axis 2 origin setting	Pressing this switch will set the Axis 2 position data value to "0". *1

*1: To enable these switches, the "Origin Setting" parameter switch on the back of the module should be set to the "ON" (Enabled) position. Refer to 5-3-6 for parameter switch details.

Refer to 5-5 for origin setting timing.

5. FUNCTION

5-3-4. Maintenance Switch (MAINT)

This switch is used only when the module is inserted or removed online.

Insertion or removal is performed when the switch is set to the up (MAINT) position to separate the module from the system.

When insertion is complete, the switch is returned to the down (RUN) position for normal operation.

Attempting to insert or remove the module in the online status with the maintenance switch in the RUN position may result in erroneous data detection.

To avoid wrong operation, use a precision screwdriver to operate the maintenance switch that is behind the front panel.

5-3-5. Slot Address Setting Switch (SLT ADR)

A slot address for each I/O module is set to a different value. Up to 16 units of I/O module can be connected to the same TC-net I/O bus using setting values from 0 to F.

The values of the slot address setting switches of the I/O module connected to the same TC-net I/O bus must be set to different values. If the same setting value is used, it will not function normally.

5. FUNCTION

- MEMO -

5. FUNCTION

5-3-6. Parameter Switch (back of the panel)

This section explains about AB933N module parameter switches

SW No.	Parameter Name	Switch setting	Description
1	Axis 1 disabled	ON : Disabled OFF : Enabled	When this switch is set to the ON position, error will not occur even if Axis 1 sensor is not connected. *1
2	Axis 1 position data increase direction	ON : CCW direction OFF : CW direction	Specify the direction in which the Axis 1 position data should increase.
3	Axis 1 position data shift	ON : Enabled OFF : Disabled	When this switch is set to the "ON" position, the total number of Axis 1 position data divisions will change from 131072 to 65536. The valid position data bits in the input data will be D0 to D15.
4	Origin setting	ON : Enabled OFF : Disabled	The origin setting function will be enabled when this switch is set to the "ON" position. *2
5	Axis 2 disabled	ON : Disabled OFF : Enabled	When this switch is set to the ON position, error will not occur even if Axis 2 sensor is not connected. *1
6	Axis 2 position data increase direction	ON : CCW direction OFF : CW direction	Specify the direction in which the Axis 2 position data should increase.
7	Axis 2 position data shift	ON : Enabled OFF : Disabled	When this switch is set to the "ON" position, the total number of Axis 2 position data divisions will change from 131072 to 65536. The valid position data bits in the input data will be D0 to D15.
8	Reserved	*3	

*1: When "Axis Disabled" (SW1, 5) is "ON: Disabled", both the position and the status inputs of the correspondent axis will be "0".

*2: When the "Origin Setting" switch is set to the "OFF" (Disabled) position, the input data will be as follows:

- Position data: The origin setting function will be disabled, and an origin-unset position data (raw data) will be stored.
- Status: The following Status bits will be "0" at all times.
 - "Origin Unset" (BOS): 0 (Set)
 - "Origin Setting Possible" (OSR): 0 (Origin Setting Impossible)

*3: This switch is normally fixed at OFF.

However, designate the following settings according to your software version of the module when the ABSOCODER sensor continuously rotates the same direction.

- Turn "ON" this switch when the version seal of the front panel is "[*A] (software version: V1.0)".
- Turn "OFF" this switch when the version seal of the front panel is "[*B] (software version: V1.1)".

●Factory setting

The factory setting is as follows:

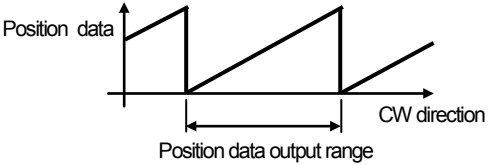
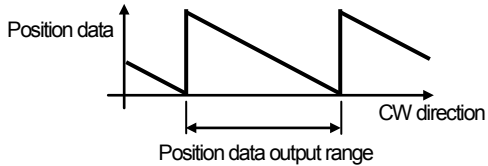
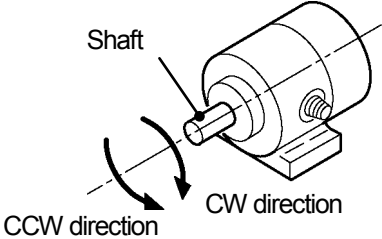
SW4: ON

SW1 to 3, 5 to 8: OFF

5. FUNCTION

● Position data increase direction setting (Switches No. 2 and No. 6)

The position data increases or decreases according to the ABSOCODER sensor's shaft rotative direction.

Description	Position data transition
<p>OFF: CW direction</p> <p>The position data value will increase when the shaft turns in the clockwise direction as viewed from the shaft end.</p>	 <p>The graph shows 'Position data' on the vertical axis and 'CW direction' on the horizontal axis. The data value increases linearly as the shaft rotates clockwise. A horizontal double-headed arrow below the graph indicates the 'Position data output range'.</p>
<p>ON :CCW direction</p> <p>The position data value will increase when the shaft turns in the counterclockwise direction as viewed from the shaft end.</p>	 <p>The graph shows 'Position data' on the vertical axis and 'CW direction' on the horizontal axis. The data value increases linearly as the shaft rotates counterclockwise. A horizontal double-headed arrow below the graph indicates the 'Position data output range'.</p>
 <p>The diagram shows a 3D perspective of the sensor's shaft. A curved arrow indicates 'CCW direction' (counterclockwise) and another curved arrow indicates 'CW direction' (clockwise) as viewed from the shaft end.</p>	

5. FUNCTION

5-4. Input and Output Data

5-4-1. I/O Word List

Each of the input data and output data into the AB933N module are separately assigned to one of the I/O word numbers listed below.

I/O word No.	Input data (AB933N to PLC)	I/O word No.	Output data (PLC to AB933N)
0	Axis 1 position data lower	0	Reserved
1	Axis 1 position data higher, status	1	Axis 1 command
2	Axis 2 position data lower	2	Reserved
3	Axis 2 position data higher, status	3	Axis 2 command

REMARKS

When "Axis Disabled" (SW1, 5) of the parameter switch is "ON: Disabled", both the position and the status inputs of the correspondent axis will be "0".

5-4-2. Input Data

The absolute position data (0 to 131071: 131072 divisions) detected by the ABSOCODER sensor will be stored in the 17-bit binary code format. Error information will be stored in the Status bits.

Axis 1 data

I/O word No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Position data																

I/O word No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	/ER	PF	SE	0	RDY	OSR	ME	BOS	0	0	0	0	0	0	0	D16
Status								Position data								

Axis 2 data

I/O word No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Position data																

I/O word No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
3	/ER	PF	SE	0	RDY	OSR	ME	BOS	0	0	0	0	0	0	0	D16
Status								Position data								

NOTES

When an error is present, the position data will become unstable. Before retrieving a position data, check that the RDY signal input is "1: Normal".

5. FUNCTION

● Status

The "Status" bits store error information,
Refer to 7-1 for the details of the errors indicated.

Bit	Signal Name (Status Name)	Indication	Description
8	BOS Origin unset	1: Unset 0: Set	The origin is unset. *1
9	ME Storage memory error	1 : Error 0 : Normal	A storage memory error has occurred.
10	OSR Origin setting possible	1: Origin setting possible 0: Origin setting impossible	Origin setting can be performed.
11	RDY Position data normal	1: Normal 0: Error	The position data is normal.
12	Reserved	0: Fixed	
13	SE Sensor disconnected error	1: Error 0: Normal	Sensor cable is not connected.
14	PF Sensor power supply error	1 : Error 0 : Normal	Sensor power has error.
15	/ER Error	1: Normal 0: Error	Error "ME", "SE" or "PF" has occurred.

- *1: The origin will be unset in any of the following situations:
- When power is turned on for the first time after purchase.
 - When the error status has been cancelled after a storage memory error.

Errors other than "Origin Unset" can be cancelled by one of the following actions:

- Pressing the function switch "CLR" on the module panel.
- Turning the external-input error cancelling signal ON.
- Setting the RES command output to "1".

To resolve an "Origin Unset" error, move the machine to the desired origin position (0 position) and set the origin by one of the following methods.

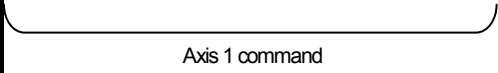
- Pressing the function switch "OS1" or "OS2" on the module panel.
- Turning the external-input origin setting signal ON.
- Setting the OS command output to "1".

5. FUNCTION

5-4-3. Output Data

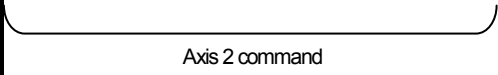
Axis 1 data

I/O word No. 0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

I/O word No. 1	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	OS1	RES	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																

Axis 2 data

I/O word No. 2	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

I/O word No. 3	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	OS2	RES	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																

●Command

Commands can be used for origin setting or error cancelling.

Bit	Signal Name (Command Name)	Indication	Description
8 to 13	Reserved	0: Fixed	
14	RES Error cancel	1: Enabled 0: Disabled	Resolve the error cause and set this bit to "1" to change the "Status" error indicator (ME, SE or PF) to "Normal" (level detection). The error for both axes will be cancelled when Bit 14 (RES command) of either a Axis 1 or Axis 2 is set to "1:Enabled".
15	OS (OS1, OS2) Origin setting command	1: Enabled 0: Disabled	The position data value will change to "0" when this bit is set to "1" (level detection). The position data value will not change from "0" while this bit is "1".

NOTES

Origin setting attempts will not be accepted when error remains unresolved (/ER=0).

Refer to 5-5 for origin setting timing.

5. FUNCTION

5-5. Origin Setting Operation

Completing the origin setting operation will change the position data value to "0".

The origin will be unset in the following situations. Carry out origin setting as required.

- When power is turned on for the first time after purchase.
- When the error status has been cancelled after a storage memory error.

The Origin Unset (BOS) bit will change to "0" upon origin setting completion.

To set the origin, move the machine to the desired origin position ("0" position) and perform any of the following:

- Press the function switch "OS1" or "OS2" on the module panel.
- Turn the external-input origin setting signal ON.
- Set the OS command output to "1".

Turning the origin setting signal ON (or setting the OS command to "1") will cause the position data to change to "0". The position data will not change from "0" while the signal is ON.

Refer to the following steps when generating a control program:

- (1) Move the machine to the desired origin position.
- (2) Check that the OSR input is "1" and then set the OS command output to "1".
- (3) Check that the position data value is "0" and then set the OS command back to "0".



NOTES

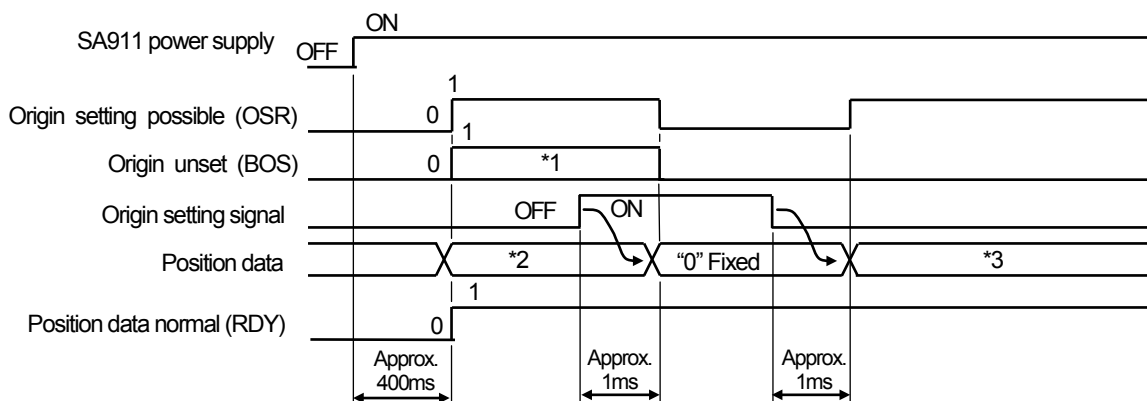
Origin setting can also be carried out by performing any of the following actions with the origin setting signal ON.

- Turning the power on.
- Switching the maintenance switch from "MAINT" to "RUN".

However, origin setting attempts will not be accepted when error remains unresolved (/ER=0).

● Timing chart

The chart below indicates the origin setting timing:



*1: Position data can be retrieved without completing the origin setting procedure.

*2: Data before origin setting is completed.

*3: Data after origin setting is completed.

5. FUNCTION

5-6. Error Cancelling Operation

Errors other than "Origin Unset" can be cancelled by performing one of the following actions after resolving the error cause:

- Pressing the function switch "CLR" on the module panel.
- Turning the external-input error cancelling signal ON.
- Setting the RES command output to "1".

The response time is approximately 1ms when cancelling the error.

To cancel an "Origin Unset" error, refer to 5-5.

6. INSPECTIONS

6. INSPECTIONS

The inspection should be conducted once every 6 months to a year.

Any inspected items which do not satisfy the criteria shown below should be repaired.

Inspection item	Inspection description	Criteria	Remark
Power supply	Measure the voltage fluctuation of the power supply to determine if it is within the prescribed range.	Within 20.4 to 26.4VDC	Tester
Ambient Conditions	Check the ambient temperature.	ABSOCODER sensor MRE-[]SP061: -20 to +80°C MRE-[]SP074: -20 to +120°C MRE-[]SP097: -20 to +120°C MRE-[]SP101: -20 to +120°C Converter: 0 to +55°C	Thermometer
	There should be no accumulation of dust.	None	
Mount Conditions	Verify that the sensor is securely mounted.	There should be no looseness.	Visual Inspection
	Verify that the sensor shaft is securely coupled to the machine shaft.	There should be no looseness.	
	Check for severed cables.	Cable should appear normal.	
	Is sensor cable connector securely connected?	There should be no looseness.	
	Are sensor cable connection terminal screws tightly fastened?	There should be no looseness.	
	Are BU902 terminal screws tightly fastened?	There should be no looseness. Tightening torque M3.5 screw : 0.8 to 1.2 N·m	

7. TROUBLESHOOTING

7. TROUBLESHOOTING

Error causes and countermeasures are described below.

7-1. Error List

When an error has occurred related to the AB933N module or the ABSOCODER sensor, the module state display LED "ER1" or "ER2" will come on (or blink) and the input data states will change.

Refer to the following list to resolve the error.

Status (input data)			Module state display LED ER1, ER2	Probable cause	Detection timing	Error cancel procedure
Bit	Signal Name	Indication				
8	BOS Origin unset	1: Unset 0: Set	OFF	When power is turned on for the first time after purchase.	After power-on Upon error occurrence	Complete origin setting
				When a storage memory error has been cancelled.		
9	ME Storage memory error	1: Error 0: Normal	Blinking	Memory data has been changed due to external noise, etc.	After power-on	Perform error canceling after resolving the error cause
12	Reserved	0: Fixed				
13	SE Sensor disconnected error	1: Error 0: Normal	ON	Sensor connector is loose.	Any time	Perform error canceling after resolving the error cause. Replace the sensor. Replace AB933N.
				Sensor cable crimp terminal is loose.		
				ABSOCODER sensor failure		
				AB933N module failure		
14	PF Sensor power supply error	1: Error 0: Normal	Blinking	Sensor power is not on.	Any time	Perform error canceling after resolving the error cause. Replace the power supply. Replace AB933N.
				Sensor power supply has been delayed.		
				Sensor power has been instantaneously off.		
				Sensor power has failed		
15	/ER Error	1:Normal 0: Error	—	Error "ME", "SE" or "PF" has occurred.	Any time	Perform error canceling after resolving the error cause.
—	Watchdog timer error	—	ER1, ER2, OSA1 and OSA2 on	AB933N module failure	Any time	Replace AB933N.

7. TROUBLESHOOTING

NOTES

The origin will be unset after a storage memory error is cancelled (BOS = 1).
Carry out origin setting as required when an error has been cancelled.

About error cancelling and origin setting methods, refer to 5-6, "Error Cancelling Operation", and 5-5, "Origin Setting Operation".

NOTES

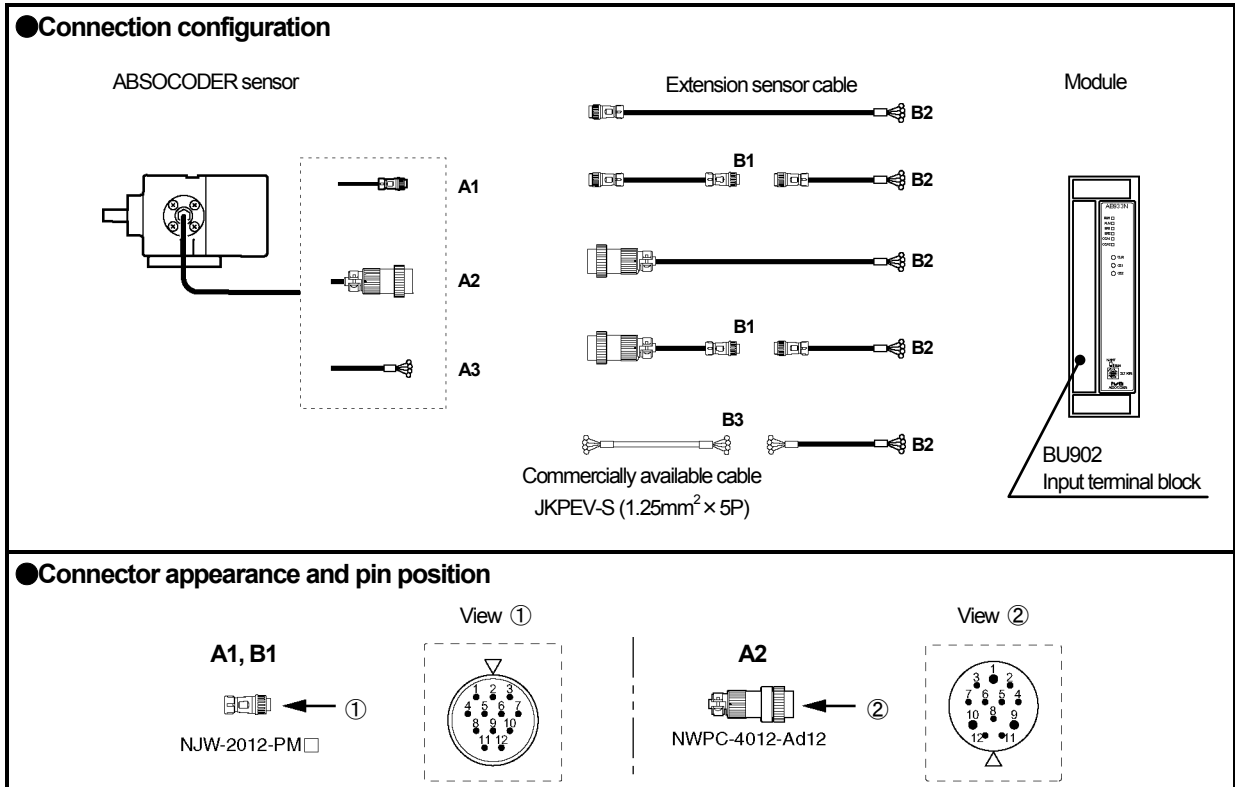
1. The error status will be automatically cancelled as soon as the error cause is resolved with the error cancel signal ON.
2. If "ME" is detected with the error cancel signal ON, the ME status will not change but "BOS" will change to "1: Unset".
3. When error "SE" or "PF" is present, the SE or PF status will be "1: Error" even if the error cancel signal is ON.

7. TROUBLESHOOTING

7-2. ABSOCODER Sensor Check List

●Applicable ABSOCODER sensor models

MRE-32SP061	MRE-G[]SP061
MRE-32SP074	MRE-G[]SP074
MRE-32SP097	MRE-G[]SP097
MRE-32SP101	MRE-G[]SP101



●Connector pin position and standard coil resistance ranges (at 25°C)

Check position						Signal names	Standard coil resistance [Ω]	
A1, A2, A3, B1		B2		B3			MRE-32SP061	MRE-32SP074, 097, 101 MRE-G[]SP061,074,097,101
Pin No.	Wiring color	Terminal No. *1	Wiring color	Wire No. (pair)	Wiring color			
1	Brown	1 [19]	Brown	1	White	SIN+	92 to 102	82 to 90
2	Red	2 [20]	Red		Black	SIN-		
3	Orange	3 [21]	Orange	2	White	-COS+	92 to 102	82 to 90
4	Yellow	4 [22]	Yellow		Black	-COS-		
5	Green	5 [23]	Green	3	White	OUT1+	10 to 20	15 to 27
6	Blue	6 [24]	Blue		Black	OUT1-		
7	Violet	7 [25]	Violet	4	White	OUT2+	15 to 25	15 to 27
8	Gray	8 [26]	Gray		Black	OUT2-		
9	-	-	-	5	White	-		
10	-	-	-		Black	-		
11	Shield	9 [27]	Shield	-	Shield	Shield		
12	-	-	-	-	-	-		

*1: These are BU902 terminal numbers. Shown in [] are Axis 2 terminal numbers.

The above standard coil resistance ranges are referential data to assist wiring disconnection diagnosis and are not product specification values. There may be no wiring disconnection even when the resistance measurement is out of the standard resistance range.

7. TROUBLESHOOTING

●Continuity check

[Measurement method]

Measure resistance at Point A or B using a circuit tester or other appropriate device.

Have Point A connected to measure Point B.

If the connector is off, identify the line by the wiring color.

[Check details]

Refer to the previous page for the connector pin number.

Check position	Criterion	Check position	Criterion
Between brown and red	The measured value should be in the range of the standard coil resistance. *1	Between brown and orange, green, violet, shield	∞
Between orange and yellow		Between orange and green, violet, shield	
Between green and blue		Between green, violet and shield	
Between violet and gray		Between violet and shield	
		Between frame and each wire or shield	

*1: If a check is done at Point B, the measurement value will be [Standard coil resistance + extension sensor cable resistance].

Extension sensor cable resistance value

The resistance value of the NSD special cable is 0.2Ω/m (loop resistance).

The resistance value of the JKPEV-S cable is 0.034Ω/m (loop resistance).

Consider resistance variations due to temperature, which, relative to the standard temperature (25°C), increases 0.4% when the temperature rises 1°C and decreases 0.4% when the temperature falls 1°C.

●Insulation check

[Measurement method]

Measure using a 500 VDC megger.

[Check details]

Refer to the previous page for the connector pin number.

Check position	Criterion
Between brown and orange, green, violet, shield	10MΩ or more
Between orange and green, violet, shield	
Between green, violet and shield	
Between violet and shield	
Between frame and each wire or shield	

NOTES

1. Make sure to disconnect the ABSOCODER sensor from the AB933N module before carrying out insulation checks.
2. If there is a risk that energization may cause damages to the electronic circuits in and around the machine, remove the ABSOCODER sensor from the machine.
3. After completing the checks, short-circuit between the pins to discharge remaining voltage before connecting the ABSOCODER sensor to the AB933N module.

8. SPECIFICATIONS

8. SPECIFICATIONS

8-1. AB933N Module Specifications

8-1-1. General Specification

Items		Specifications
Power supply voltage	For TC-net I/O (supplied to SA911)	24VDC (+10%, -15%)
Power consumption		0.1A or less (at 24VDC)
Power supply voltage	For sensors and external inputs (supplied to BU902)	24VDC (+10%, -15%)
Power consumption		0.2A or less (at 24VDC)
Allowable instantaneous blackout time		1ms or less
Withstand voltage		500 VAC, 60Hz for 1 minute between external DC power terminals and ground
Vibration resistance		$5 \leq f < 9$ Hz : Half amplitude 3.1 mm $9 \leq f < 150$ Hz : Constant acceleration 9.8m/s ²
Ambient operating temperature		0 to +55°C (No freezing)
Ambient operating humidity		10 to 95 %RH (No condensation)
Pollution degree	*1	2 or less
Ambient operating environment		Free from corrosive gases and excessive dust
Ambient storage temperature		-40 to +70 °C
Ambient storage humidity		10 to 95 %RH (No condensation)
Operating altitude	*2	2000m or less
Grounding		Must be securely grounded (ground resistance of 100 Ω or less)
Construction		Inside control cabinet
Outside dimension		35mm(W) × 185mm(H) × 95mm(D) [Refer to dimensions for details.]
Mass		Approx. 0.4kg

*1: This index indicates the degree to which conductive material is generated in the environment where the equipment is used. In pollution degree 2, only non-conductive pollution occurs. Temporary conductivity may be produced due to condensation.

*2: Do not use or store this module under pressure higher than the atmospheric pressure of altitude 0m. Failure to observe this may cause a malfunction.

8. SPECIFICATIONS

8-1-2. Performance Specification

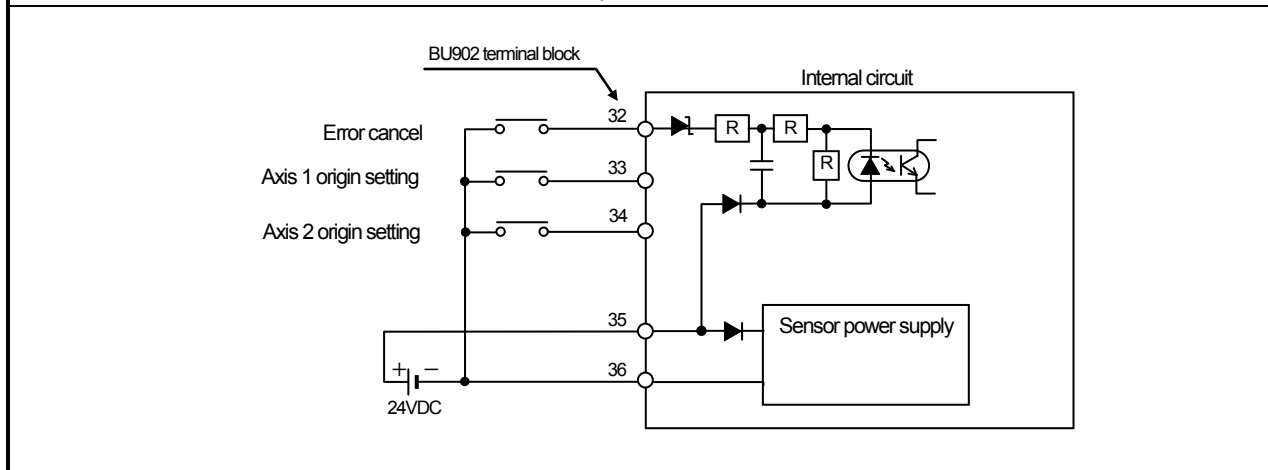
Items	Specifications
Number of detection axes	2
Position detection format	Absolute position detection
Isolation format	Photo-coupler isolation (between TC-net I/O circuit and sensor circuit)
Total number of divisions	131072(2^{17}) [4096 divisions x 32 turns] to [42.6 divisions x 3072 turns] For more details, refer to "8-2. ABSOCODER Sensor Specifications".
Function	Position data detection function, Origin setting function
Error detection function	Sensor disconnected error (SE), Sensor power supply error (PF), Origin unset (BOS), Storage memory error (ME), CPU watchdog timer error
Module state display LED	RUN(green), ALM(red), ER1(red), ER2(red), OSA1(green), OSA2(green)
Data storage method	Storage in a non-volatile memory (FRAM)
Position data sampling time	0.2ms
Number of I/O channels	Input: 4 words, Output: 4 words
External connection	Connect to BU902 terminal block
Applicable standard	CE Marking (EMC directive) KC mark (Korea Certification Mark)

8. SPECIFICATIONS

8-1-3. External Input Specification

Items		Specifications
Number of input points		3 points (Origin setting: 2, Error cancel: 1)
Isolation format		Photo-coupler isolation
Rated input voltage		24VDC (+10%, -15%)
Input voltage range		20.4 to 26.4VDC *1
Rated input current		5.2 mA
ON voltage		16.8VDC or more
OFF voltage		6VDC or less
Response time	OFF→ON	0.04 ms
	ON→OFF	0.2 ms

Input Circuit



*1: This power is intended for both external inputs and sensors.

8. SPECIFICATIONS

8-2. ABSOCODER Sensor Specifications

(1) MRE-[]SP061

Items		Specifications					
Sensor model		MRE-32SP061	MRE-[]SP061				
			[]: Total number of turns, and with a gear(G) or without gear				
			[G64]	[G128]	[G160]	[G256]	[G320]
Total number of turns		32	64	128	160	256	320
Divisions / turn		4096	2048	1024	819.2	512	409.6
Total number of divisions		131072 (2 ¹⁷)					
Mass		1.5kg	1kg				
Linearity error		0.7° Max.	1.4° Max.	2.8° Max.	3.5° Max.	5.6° Max.	7.0° Max.
Moment of inertia GD ² /4(J)		6.7 × 10 ⁻⁶ kg·m ² (6.8 × 10 ⁻⁵ kgf·cm·s ²)	3.9 × 10 ⁻⁶ kg·m ² (4 × 10 ⁻⁵ kgf·cm·s ²)				
Starting torque		4.9 × 10 ⁻² N·m or less (0.5kgf·cm or less)					
Permissible shaft load	Radial	98N (10kgf)					
	Thrust	49N (5kgf)					
Permissible mechanical speed		2000r/min	3600r/min				
Bearing life		4.5 × 10 ⁴ h (at 2000r/min)	1.5 × 10 ⁴ h (at 3600 r/min)				
Ambient temperature	Operating	-20 to +80°C					
	Storage	-30 to +90°C					
Vibration resistance		2.0 × 10 ² m/s ² (20G)	98m/s ² (10G)				
		200Hz, up/down 4 h, forward/back 2 h, conforms to JIS D 1601 standard					
Shock resistance		4.9 × 10 ³ m/s ² (500G)	2.9 × 10 ³ m/s ² (300G)				
		0.5 ms, up/down/forward/back X 3 times each, conforms to JIS C 5026 standard					
Protection rating		IP65, conforms to JEM 1030 standard					
Interconnecting cable		2m					
Max. sensor cable length	4P-S	200m	300m				
	4P-RBT/URT /HRT	100m	150m				
	JKPEV-S (1.25mm ² × 5P)	200m	300m				
Surface treatment		Case: electroless nickel plated Cap: anodic oxide coated	Anodic oxide coated				
Material		Case: steel Cap: aluminum	Aluminum				

8. SPECIFICATIONS

(2) MRE-[]SP074

Items		Specifications					
Sensor model		MRE-[]SP074					
		[]: Total number of turns, and with a gear(G) or without gear					
		[32]	[G64]	[G128]	[G160]	[G256]	[G320]
Total number of turns		32	64	128	160	256	320
Divisions / turn		4096	2048	1024	819.2	512	409.6
Total number of divisions		131072 (2 ¹⁷)					
Mass		Flange-mount type: 3.5+0.1 x cable length (m) kg Base-mount type: 5.5+0.1 x cable length (m) kg Face-mount type: 3.0+0.1 x cable length (m) kg					
Linearity error		0.6° Max.	1.2° Max.	2.4° Max.	3.0° Max.	4.8° Max.	6.0° Max.
Moment of inertia GD ² /4(J)		$3.3 \times 10^{-5} \text{kg} \cdot \text{m}^2$ ($3.4 \times 10^{-4} \text{kgf} \cdot \text{cm} \cdot \text{s}^2$)					
Starting torque		$9.8 \times 10^{-2} \text{N} \cdot \text{m}$ or less (1 kgf·cm or less)					
Permissible shaft load	Radial	98N (10kgf)					
	Thrust	49N (5kgf)					
Permissible mechanical speed		4000r/min					
Bearing life		$8 \times 10^4 \text{h}$ (at 4000r/min)					
Ambient temperature	Operating	-20 to +120°C					
	Storage	-30 to +120°C					
Vibration resistance		$2.0 \times 10^2 \text{m/s}^2$ (20G) 200Hz, up/down 4 h, forward/back 2 h, conforms to JIS D 1601 standard					
Shock resistance		$4.9 \times 10^3 \text{m/s}^2$ (500G) 0.5 ms, up/down/forward/back X 3 times each, conforms to JIS C 5026 standard					
Protection rating		IP67, conforms to JEM 1030 standard					
Interconnecting cable		2 · 5 · 10 · 20m					
Max. sensor cable length	4P-S	300m					
	4P-RBT/URT /HRT	150m					
	JKPEV-S (1.25mm ² × 5P)	300m					
Surface treatment		Not treated					
Material		Stainless					

8. SPECIFICATIONS

(3) MRE-[]SP097 / MRE-[]SP101

Items		Specifications										
Sensor model		MRE-[]SP097 / MRE-[]SP101										
		[]: Total number of turns, and with a gear (G) or without gear										
		[32]	[G64]	[G128]	[G160]	[G256]	[G320]	[G512]	[G1280]	[G2048]	*1 [G2560]	*1 [G3072]
Total number of turns		32	64	128	160	256	320	512	1280	2048	2560	3072
Divisions / turn		4096	2048	1024	819.2	512	409.6	256	102.4	64	51.2	42.6
Total number of divisions		131072 (2 ¹⁷)										
Mass		7+0.1 x cable length (m) kg										
Linearity error		0.6° Max.	1.2° Max.	2.4° Max.	3.0° Max.	4.8° Max.	6.0° Max.	9.6° Max.	24° Max.	38.4° Max.	48° Max.	56° Max.
Moment of inertia GD ² /4(J)		3.3 × 10 ⁻⁵ kg·m ² (3.4 × 10 ⁻⁴ kgf·cm·s ²)										
Starting torque		9.8 × 10 ⁻² N·m or less (1 kgf·cm or less)										
Permissible shaft load	Radial	1.5 × 10 ² N (15kgf)										
	Thrust	78N (8kgf)										
Permissible mechanical speed		4000r/min										
Bearing life		8 × 10 ⁴ h (at 4000r/min)										
Ambient temperature	Operating	-20 to +120°C										
	Storage	-30 to +120°C										
Vibration resistance		2.0 × 10 ² m/s ² (20G) 200Hz, up/down 4 h, forward/back 2 h, conforms to JIS D 1601 standard										
Shock resistance		4.9 × 10 ³ m/s ² (500G) 0.5 ms, up/down/forward/back X 3 times each, conforms to JIS C 5026 standard										
Protection rating		IP67, conforms to JEM 1030 standard										
Interconnecting cable		2 · 5 · 10 · 20m										
Max. sensor cable length	4P-S	300m										
	4P-RBT/URT /HRT	150m										
	JKPEV-S (1.25mm ² × 5P)	300m										
Surface treatment		MRE-[]SP097: coated (epoxy resin) MRE-[]SP101: not treated										
Material		MRE-[]SP097: Cast iron MRE-[]SP101: stainless										

*1: MRE-G2560SP097 and MRE-G3072SP097 cannot be selected.

8. SPECIFICATIONS

8-3. Sensor Cable Specification

Items	Specifications			
Model code	4P-S	4P-RBT	4P-URT	4P-HRT
Cable type	Standard cable	Robotic cable	Semi-heat-resistant robotic cable	Heat-resistant robotic cable
Diameter	$\phi 8$			
Operating temperature range	-5~+60°C		-5~+105°C	0~+150°C
Insulator	Irradiated cross linked formed polyethylene	ETFE plastic (resin)		
Sheath	Polyvinyl chloride mixture		Heat-resistant polyvinyl chloride mixture	Fluonlex
Construction	8-core, 2 pairs without shield + 2 pairs with shield			
Color of sheath	Gray	Black		
Advantage	Extensible for long distances	Superior flexibility; ideal for moving place		Heat treatment and flexible; ideal for moving place

REMARKS

Contact your NSD representative when the extension cable combines different types of cables.

8. SPECIFICATIONS

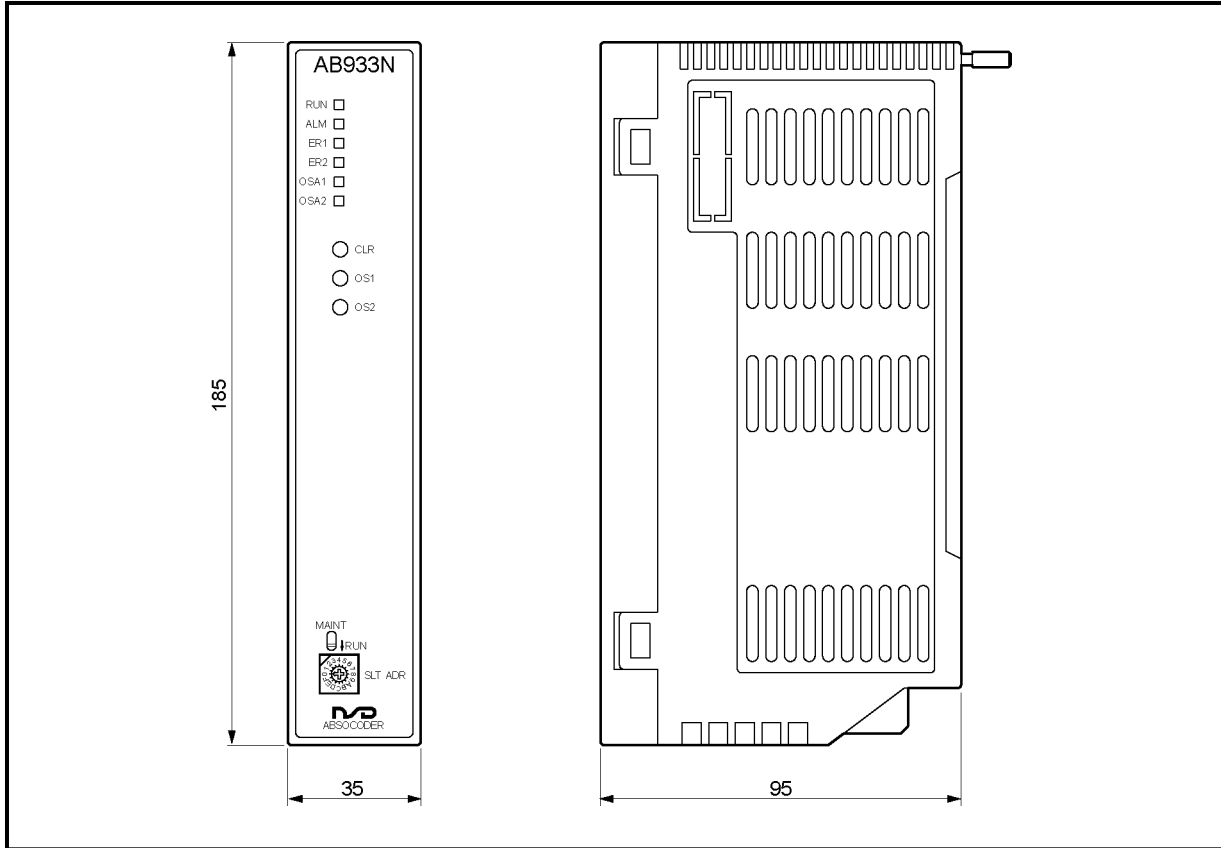
- MEMO -

9. OUTER DIMENSIONS

9. OUTER DIMENSIONS

9-1. AB933N Module

Units: mm

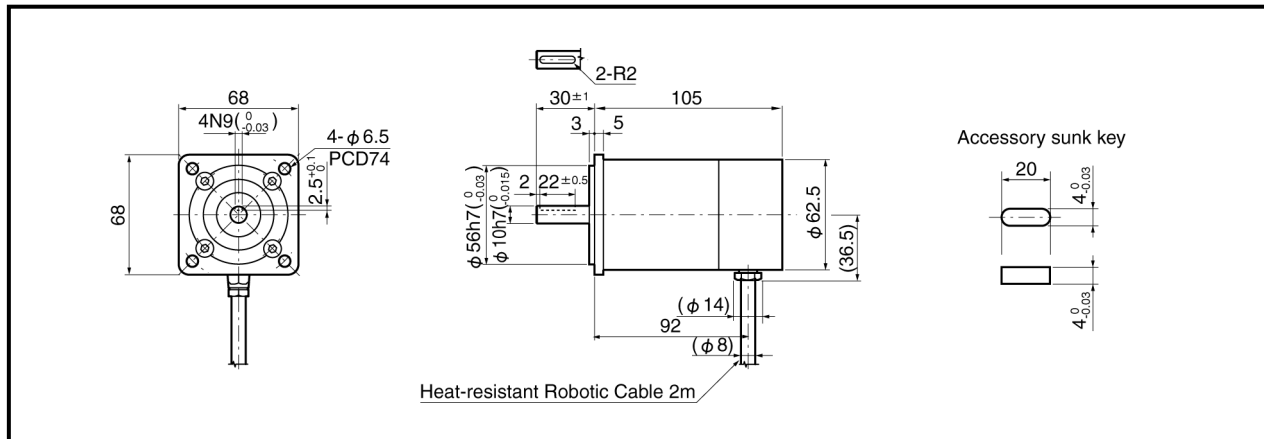


9. OUTER DIMENSIONS

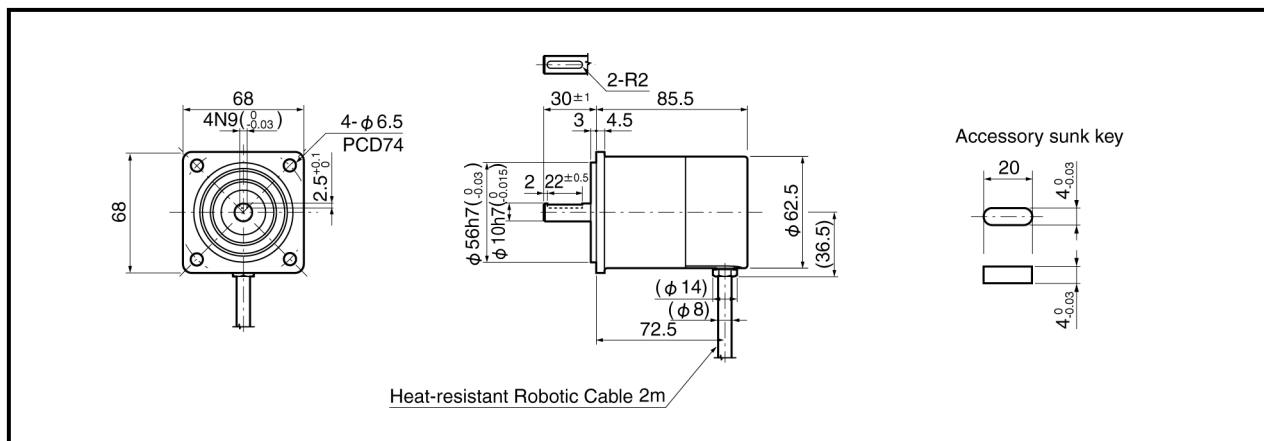
9-2. ABSOCODER Sensor

(1) MRE-32SP061FK[] (Flange-mounting type)

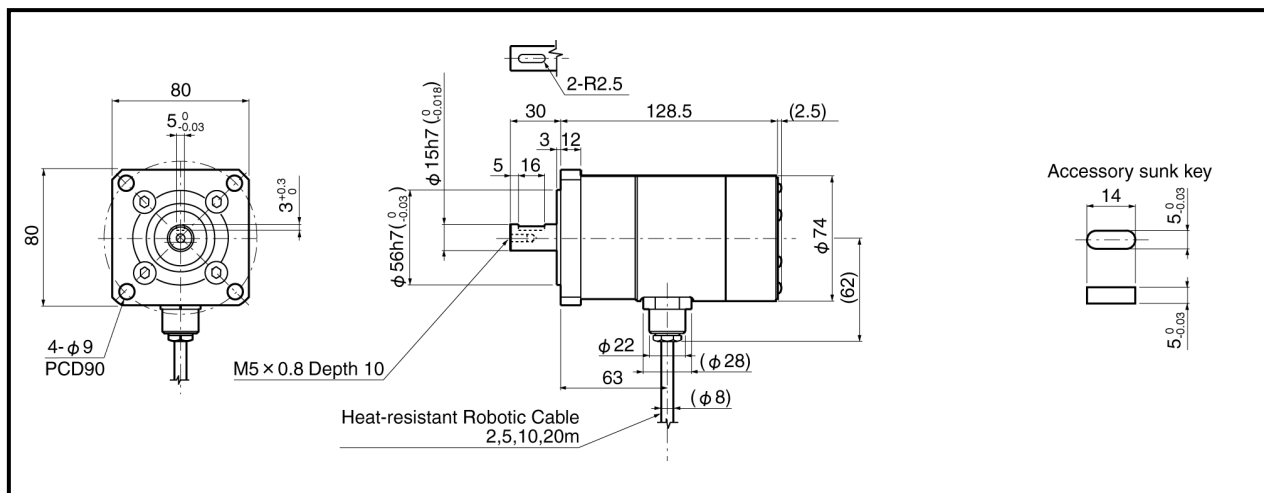
Units: mm



(2) MRE-G[]SP061FK[] (Flange-mount type)



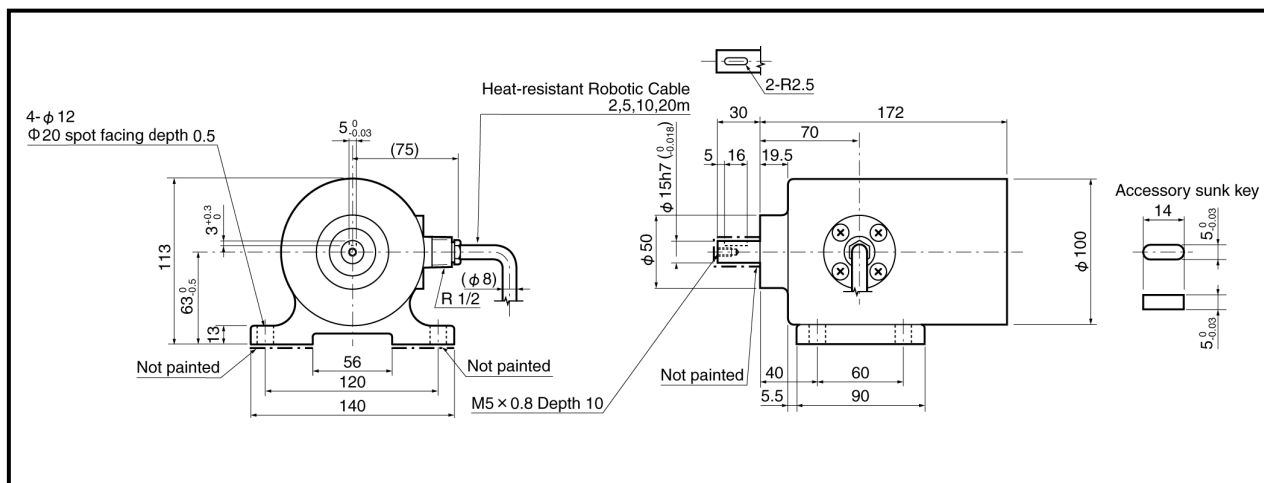
(3) MRE-[]SP074FK[] (Flange-mount type)



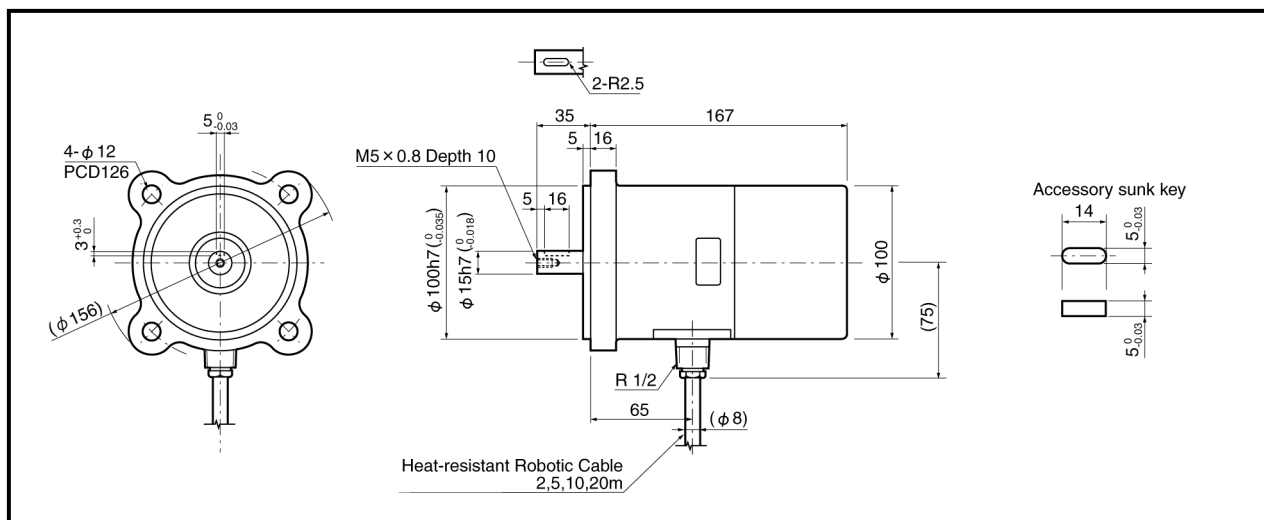
9. OUTER DIMENSIONS

(7) MRE-[]SP097LK[] (Base-mount type)

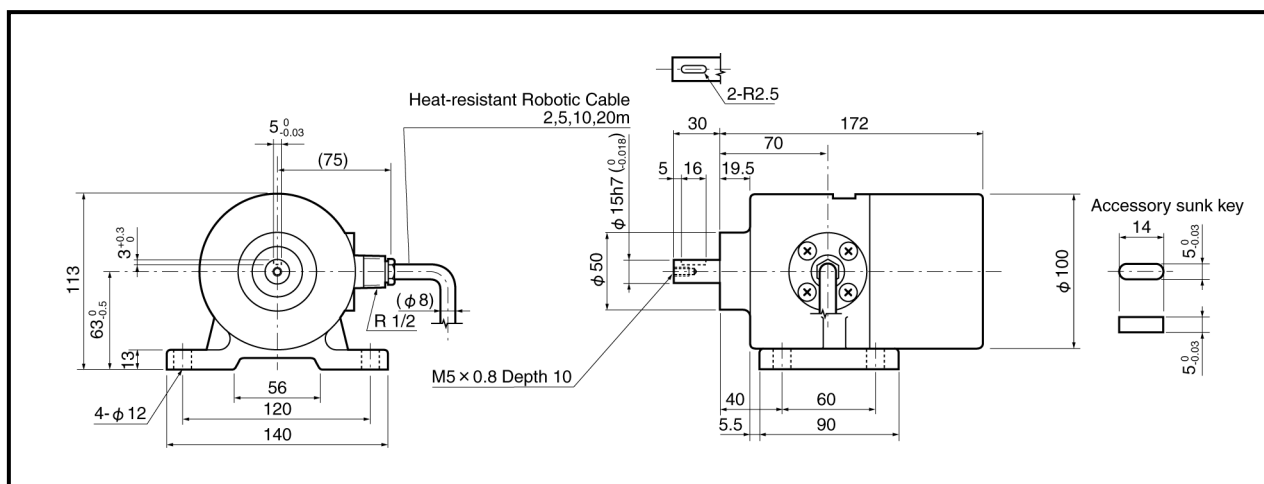
Units: mm



(8) MRE-[]SP101FK[] (Flange-mount type)



(9) MRE-[]SP101LK[] (Base-mount type)

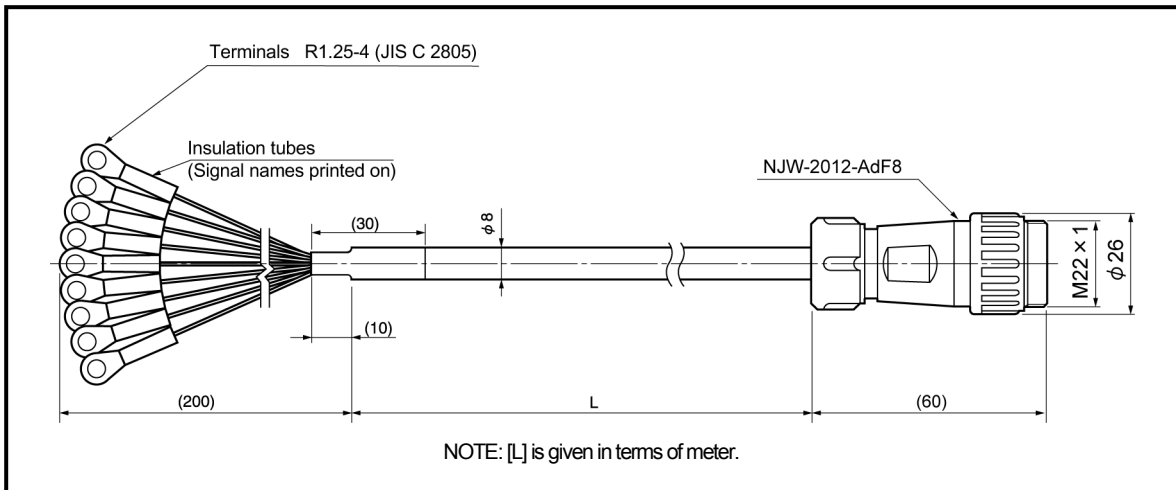


9. OUTER DIMENSIONS

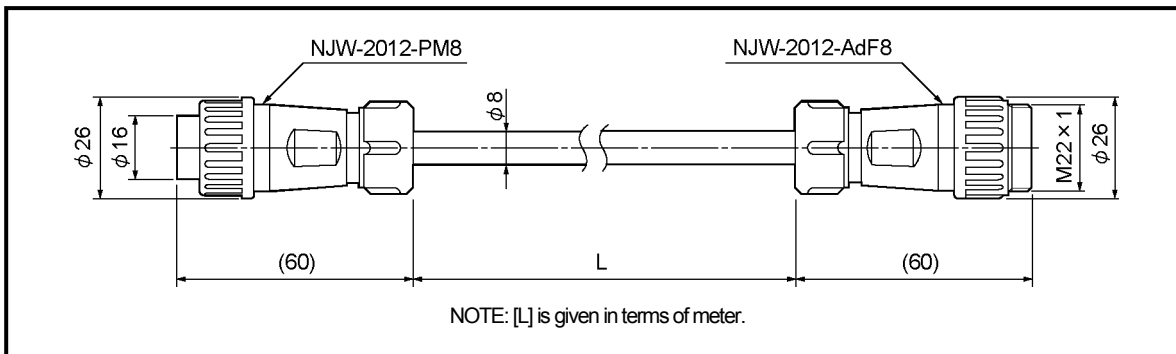
9-3. Extension Sensor Cable

(1) 4P-S-9044-[L] / 4P-RBT-9044-[L] / 4P-URT-9044-[L]

Units: mm



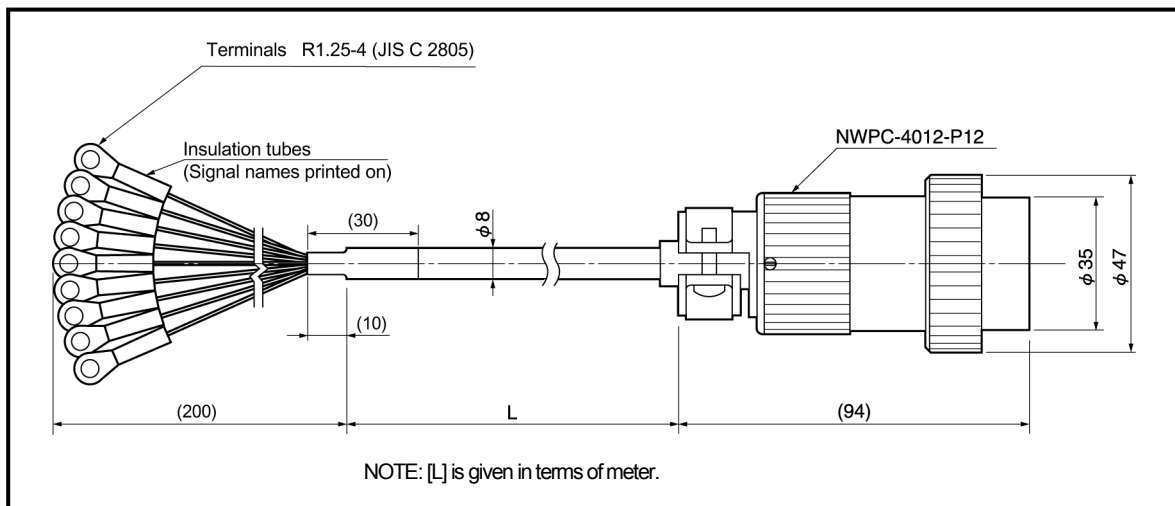
(2) 4P-S-4344-[L] / 4P-RBT-4344-[L] / 4P-URT-4344-[L] / 4P-HRT-4344-[L]



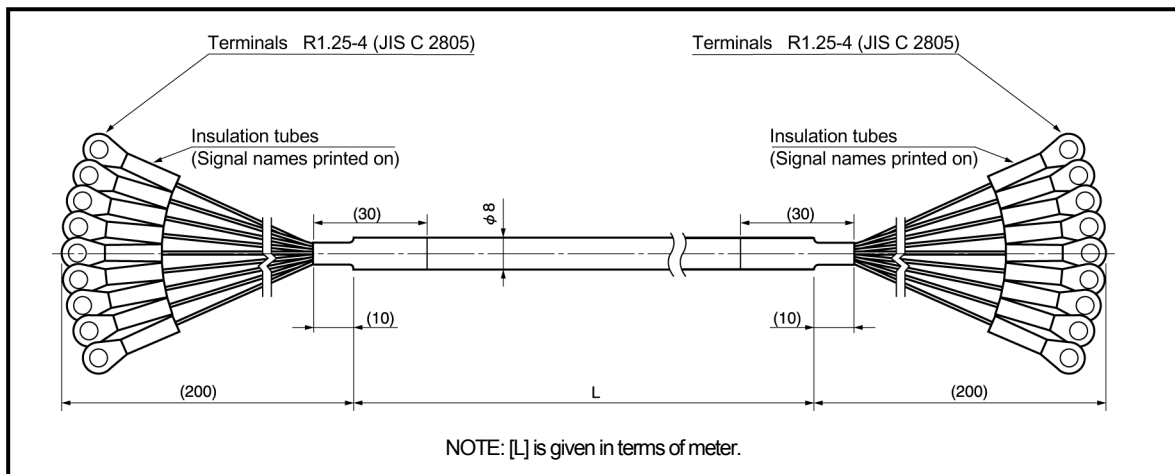
9. OUTER DIMENSIONS

(3) 4P-S-9055-[L] / 4P-RBT-9055-[L] / 4P-URT-9055-[L]

Units: mm



(4) 4P-S-9090-[L] / 4P-RBT-9090-[L] / 4P-URT-9090-[L]



APPENDIX

APPENDIX 1. CE MARKING

The AB933N module conforms to EMC directive.

APPENDIX 1-1. EMC Directives

It is necessary to do CE marking in the customer's responsibility in the state of a final product.
The customer should confirm EMC compliance of the machine and the entire device because EMC changes configuration of the control cabinet, wiring, and layout.

APPENDIX 1-2. EMC Directive and Standards

Conforms to Table 01 (see below) of EMC standards and testing.

Table 01 EMC Standard and Testing

Standard No.	Testing item	Name
EN61000-6-4	EN55016-2-3	Radiated disturbance
EN61000-6-2	EN61000-4-2	Electrostatic Discharge
	EN61000-4-3	Radiated, Radio frequency, Electromagnetic Field
	EN61000-4-4	Electrical Fast Transient / Burst
	EN61000-4-5	Surge Immunity
	EN61000-4-6	Conducted Disturbances, Induced by Radio-Frequency Fields
	EN61000-4-8	Power Frequency Magnetic Field

APPENDIX 1-3. Low Voltage Directive

The low voltage directive is out of the range because the AB933N module is activated by 24VDC power supply.

APPENDIX

APPENDIX 1-4. Measures for EMC Compliance and Restriction

In this section, restrictions are described for conforming the AB933N module to the EMC Directive.
 For conforming the Toshiba Corporation Unified Controller nv Series to the EMC Directive, contact Toshiba Corporation.

- ① Install the zippertubing around the cable when the sensor cable is used in 30m or more.
 The shield of zippertubing should be grounded.

Recommendation zippertubing

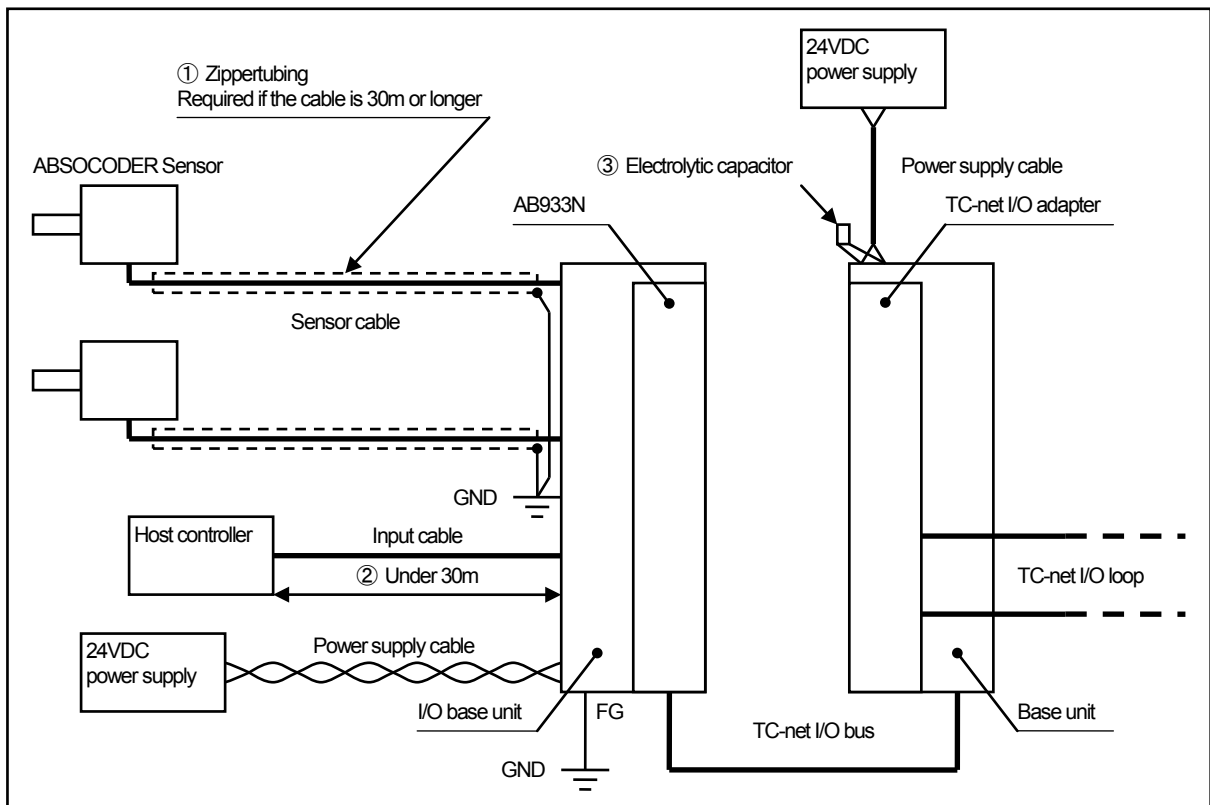
Mounting location	Model	Manufacturer
Sensor cable	MTFS 20φ	ZIPPERTUBING(JAPAN), LTD.

- ② The length of input cable must be under 30m.

- ③ Install the electrolytic capacitor between 24V terminal and 0V terminal of the base unit for the TC-net I/O adapter.

Recommendation electrolytic capacitor

Mounting location	Model	Manufacturer
Base unit	UPM1V102MHD6	NICHICON CORPORATION





NSD Group

Manufacturer

NSD Corporation 3-31-28, OSU, NAKA-KU, NAGOYA, JAPAN 460-8302

Distributor

NSD Trading Corporation 3-31-23, OSU, NAKA-KU, NAGOYA, JAPAN 460-8302

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