IAI
Quality and Innovation

DIGITAL SPEED CONTROLLER

DIGITAL SPEED CONTROLLER TEACHING
REMOTE DIGITAL SPEED CONTROLLER

EC-D□□
TBD-1
TBD-1WL

Instruction Manual First Edition ME3818-1E

Overview	Ch. 1
Specifications	Ch. 2
Connection / Operation	Ch. 3
Environment Setting	Ch. 4
Troubleshooting	Ch. 5
Warranty	Ch. 6
EU Declaration of Conformity	Ch. 7

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please downloaded the user's manual from our website.
You can download it free of charge. User registration is required for the first time downloading.
URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

ELECYLINDER Instruction Manual Configuration

Product name	Instruction manual name	Control number
ELECYLINDER	Quick Start Guide	ME3765
DIGITAL SPEED CONTROLLER	DIGITAL SPEED CONTROLLER Quick Start Guide	ME3810
DIGITAL SPEED CONTROLLER	DIGITAL SPEED CONTROLLER Instruction Manual (this document)	ME3818
PC software	IA-OS First Step Guide * Refer to the guidance feature stored in IA-OS for how to operate	ME0391
PC Software for RC/EC	RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
Touch Panel Teaching Pendant	Applicable for ELECYLINDER TB-02/02D/02E Instruction Manual	ME0355
Touch Panel Teaching Pendant	Applicable for ELECYLINDER TB-03/03E Wireless Link Instruction Manual	ME0375
Touch Panel Teaching Pendant	Applicable for ELECYLINDER TB-03/03E Wireless Link Instruction Manual	ME0376
RCON System	RCON Instruction Manual	ME0384
RSEL System	RSEL Instruction Manual	ME0392
REC System	REC Instruction Manual	ME0394

Product name	Instruction manual name	Control number
ELECYLINDER	Electricity Section	ME3816
ELECYLINDER	Slim and Small	ME3778
ELECYLINDER	Rod Type Dust and Drip Proof	ME3779
ELECYLINDER	Slider Type	ME3793
ELECYLINDER	Rod Type	ME3794
ELECYLINDER	Belt Type	ME3798
ELECYLINDER	Stopper Cylinder	ME3799
ELECYLINDER	Rotary	ME3800
ELECYLINDER	Large Slider	ME3801
ELECYLINDER	Slider Type Cleanroom Specification	ME3804
ELECYLINDER	Gripper	ME3806
ELECYLINDER	Slider Type Dust and Drip Proof	ME3814
ELECYLINDER	Ultra Mini Type	ME3815
ELECYLINDER	Long Stroke Gripper	ME3815
ELECYLINDER	Sleider / Radial Cylinder 20mm width	ME3825
ELECYLINDER	Compact	ME3826
ELECYLINDER	3-finger gripper	ME3829
ELECYLINDER	Vertical Compact Gripper / Dust and Drip Proof Gripper	ME3830

Product name	Instruction manual name	Control number
ELECYLINDER	High Rigidity Slider	ME3833
ELECYLINDER	Wide Slider	ME3834
ELECYLINDER	Rod Type Double Guide	ME3835
ROBO PUMP	-	ME3827

Contents

Safety Guide ····· Intro-1
Precautions for Handling ····· Intro-8
International Standard Compliance ····· Intro-10
Precautions for Handling Wireless Operation ····· Intro-11
Precautions for Axis Operation with Wireless Connection ····· Intro-14
Caution in Installation and Operation of DIGITAL SPEED CONTROLLER ····· Intro-15
Actuator Coordinate System ····· Intro-16

Chapter 1 Overview

1.1 Overview ····· 1-1
1.1.1 Outline of DIGITAL SPEED CONTROLLER ····· 1-1
1.1.2 Features ····· 1-1
1.2 Checking the Product ····· 1-2
1.2.1 Components ····· 1-2
1.2.2 How to Read the Model Nameplate ····· 1-3
1.2.3 How to Read the Model Number ····· 1-4
1.3 Part Names ····· 1-5

Chapter 2 Specifications

2.1 System Configuration ····· 2-1
2.2 Basic Specification ····· 2-11
2.2.1 EC-equipped DIGITAL SPEED CONTROLLER (EC-D□□) ····· 2-11
2.2.2 DIGITAL SPEED CONTROLLER TEACHING (TBD-1) ····· 2-12
2.2.3 REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) ····· 2-14
2.3 Requirements for Use, Storage and Preservation ····· 2-22
2.3.1 Installation Environment ····· 2-22
2.3.2 Storage / Preservation Environment ····· 2-23

Chapter 3 Connection / Operation

3.1 Connection of DIGITAL SPEED CONTROLLER ····· 3-1
3.1.1 Priority in Connection ····· 3-1
3.1.2 Priority in REMOTE DIGITAL SPEED CONTROLLER Connection ····· 3-3
3.1.3 Connection between
DIGITAL SPEED CONTROLLER TEACHING (TBD-1) and ELECYLINDER ····· 3-4
3.1.4 Connection between
REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) and ELECYLINDER ···· 3-5
3.1.5 Change the Connected Axis of
REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) ····· 3-6
3.1.6 Connection between
REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) and ROBO PUMP ····· 3-7
3.2 Transition of Windows ····· 3-8
3.2.1 Transition of Windows at Startup ····· 3-8
3.2.2 Normal Mode ····· 3-9
3.2.3 Test Run Mode ····· 3-10
3.2.4 Setting Change Mode ····· 3-12

3.3 Setup and Adjustment of Operational Condition (AVD) and Stop Position ····· 3-16
3.3.1 Simple Velocity Setting ····· 3-16
3.3.2 Detailed Velocity Setting (AVD Setting) ····· 3-19
3.3.3 Cycle Time Display ····· 3-21
3.3.4 Switching of Test Run Mode ····· 3-23
3.3.5 Test Run ····· 3-25
3.3.6 Position Setting ····· 3-26
3.3.7 Jog Operation and Current Position Reading ····· 3-29
3.3.8 Brake Release, Motor Power ON/OFF ····· 3-31
3.3.9 Pressing Operation Setting ····· 3-33
3.4 ROBO PUMO setting ····· 3-37
3.4.1 Pressure setting ····· 3-37
3.4.2 PIO Pattern setting ····· 3-39
3.4.3 Energy-saving mode setting ····· 3-41
3.4.4 Suction stop level setting ····· 3-43
3.5 Other Features ····· 3-45
3.5.1 Buzzer ····· 3-45
3.5.2 Power-Off Feature ····· 3-46
3.5.3 Operation Lock Feature ····· 3-47

Chapter 4 Environment Setting

4.1 Environment Setting ····· 4-1
4.1.1 Display of Environment Setting Mode ····· 4-1
4.1.2 Language Setting, Brightness Setting ····· 4-2
4.1.3 Operation Volume Tuning ····· 4-5
4.1.4 Connected Axis Fixing / Axis Fixing Release ····· 4-6
4.1.5 Selecting Simple Velocity Setup ····· 4-8
4.1.6 Password Setting / Release ····· 4-9
4.1.7 How to Input Password ····· 4-12

Chapter 5 Troubleshooting

5.1 Troubleshooting Confirmations ····· 5-1
5.1.1 Communication Error between Panel and Controller ····· 5-1
5.1.2 Wireless Communication Error ····· 5-1
5.1.3 Connected to Other Tool ····· 5-2
5.1.4 Error Display ····· 5-2
5.1.5 Error Display List ····· 5-3
5.1.6 ROBO PUMP Alarm ····· 5-4

Chapter 6 Warranty

6.1 Warranty Period ····· 6-1
6.2 Scope of the Warranty ····· 6-1
6.3 Honoring the Warranty ····· 6-1
6.4 Limited Liability ····· 6-2
6.5 Conformance with Applicable Standards/Regulations, etc., and Application Conditions ····· 6-2
6.6 Other Items Excluded from Warranty ····· 6-2

Chapter 7 EU Declaration of Conformity

7.1 EU Declaration of Conformity ····· 7-1

Revision History ····· Post-1

Safety Guide

"Safety Guide" has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the Instruction Manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

Precautions for Handling

1. The Safety Guide attached with the product is intended to permit safe use of the product and thus to prevent risks and property damage. Be sure to read it before handling the product.

2 This instruction manual describes the features and operations of DIGITAL SPEED CONTROLLER.
Refer to an instruction manual for each ELECYLINDER for detail related to the main unit of ELECYLINDER.

3. Do not attempt any handling or operation that is not indicated in this instruction manual.

4. Make sure to secure the ELECYLINDER properly in accordance with this instruction manual.
If the ELECYLINDER is not securely fixed, this may lead to abnormal noise, vibration, breakdown or shortened product life.

5. Make sure to observe the usage conditions and environment of the product.
Operation outside the warranty could cause decreased performance or product breakdown.
Use within the allowable range for each item.

Item	Cautions for use	Problems or breakdowns which may occur if the allowable range is exceeded
Speed and acceleration/deceleration	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life.
Allowable load moment	Use within the allowable range (Static/dynamic)	May lead to abnormal noise, vibration, breakdown, or shortened product life. In extreme cases, flaking may occur on the guide or ball screw.
Overhang load length		Mounting a load with an overhang length greater than the allowable values may lead to vibration or abnormal noise.

6. There are some models that require an interface box separately when wireless communication is to be conducted. Refer to an instruction manual for each ELECYLINDER

7. DIGITAL SPEED CONTROLLER is not applicable for multiple axes connection.

   DIGITAL SPEED CONTROLLER TEACHING (TBD-1) is physically feasible to be connected to a system with several axes existing via such as RCON and SIO converter, however, in case that it is connected to such a system, it can only be connected to an axis with the smallest axis number.

8. DIGITAL SPEED CONTROLLER is not capable of changing the parameters of ELECYLINDER.

   In case of necessity of changing parameters, use the PC teaching software or a teaching pendant applicable for ELECYLINDER.

9. When a setting in ELECYLINDER that the automatic servo-off function is set enabled is performed with a DIGITAL SPEED CONTROLLER in the following version, the display in the PC teaching software or a teaching pendant applicable for ELECYLINDER should get cleared up.
   Transferring data in this condition should make the automatic servo-off function disabled.
   Set up the automatic servo-off function again.

   EC-equipped digital speed controller/ Digital Speed Controller Teaching • • • V.1.40 or less

   Remote digital speed controller • • • V1.01 or less

   (Note) The digital speed controller is not capable of setting up the automatic servo-off function. Updating the digital speed controller is not available for a user. Consult with IAI.

10. In case there is “R1” displayed in the version display window, it shows that the microcomputer (circuit board) has been changed for memory extension.

International Standard Compliance

The DIGITAL SPEED CONTROLLER complies with the following overseas standards.
Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

CE Marking			UL
RoHS3 Directive	EMC Directive	RE Directive (Note1)	
○	○	○	-

If it is necessary to announce EU Declaration of Conformity with this product built in your facility, as this product itself declares the conformity to EU Directives in some specific conditions as stated below, you would be able to utilize this declaration.

EU Directives Applicable for Declaration of Conformity
EMC Directive (2014/30/EU) ····· To be checked in CE marking described in product nameplate.
RoHS3 Directive (2011/65/EU + (EU)2015/863) ····· Same as above.
RE Directive (2014/53/EU)····· To be checked in EU Declaration of Conformity.

There is EU Declaration of Conformity attached to clarify that it complies with RE Directive in [7.1 EU Declaration of Conformity].
This EU Declaration of Conformity may change without notice in case of addition of complying models and change in specifications. Consult with our sales person in charge if necessary.

(Note 1) RE Directive should be applied to Remote DIGITAL SPEED CONTROLLER (TBD-1WL). Certificates and self-declarations regarding the wireless function are handled under the model name below for the wireless circuit board.
MODEL: IABL3827

Precautions for Handling Wireless Operation

REMOTE DIGITAL SPEED CONTROLLER (Model: TBD-1WL) is equipped with a wireless communication PC board. Certificates and self-declarations regarding the wireless function are handled under the model name below for the wireless circuit board.

Model name: IABL3827

This product uses the 2.4GHz radio band known as an ISM band. This frequency range is used by various devices such as microwave ovens and wireless LAN, so that communication may be disrupted by radio disturbance.
Use of this device is permitted within the following countries (regions) only. Use in other countries (regions) requires certification to be obtained based on the laws and regulations of the relevant country (region).

Registered model name		IABL3827
Wireless frequency		2,400～2,483.5MHz
Wireless output		+5dBm
Manufacturer name		株式会社アイエイアイ／IAI CORPORATION
Country of manufacture		Made in Japan
US	Import Corporation Name	IAI America, Inc.
Canada	Import Corporation Name	IAI America, Inc.
EU Member States	Import Corporation Name	IAI Industrieroboter GmbH
China	许可编号	CMIT ID=2018DJ0331
	申请公司名	IAI 株式会社
	机型名	IABL3827
	制造国	日本（Made in Japan）
	进口企业名	IAI（Shanghai）Co., Ltd.
한국／KOREA	식별 부호	R-CRM-IAI-IABL3827
	제조사명	주식회사 IAI
	모델명	IABL3827
	제조국	일본(Made in Japan)
	수입업자명	IA KOREA Corp.
ประเทศไทย / Thailand	ผู้ผลิต	IAI CORPORATION.
	ชื่อโมเดล	IABL3827
	ประเทศผู้ผลิต	ญี่ปุ่น (Made in Japan)
	ผู้นำเข้า	IAI Robot (Thailand) Co., Ltd.
México / Mexico	Número de Certificación	IFT：RCPIATB19-1956
	Nombre de la Empresa Solicitante	IAI Corporation
	Nombre del Modelo	IABL3827
	País de Fabricación	Japón (Hecho en Japón)
	Nombre de la Empresa Importadora	IAI America, Inc.

【日本】

本製品で使用している無線モジュールは、工事設計認証を受けていますので、以下の事項を行うと法律で罰せられることがあります。

・ 無線モジュールを分解/改造すること

【US】

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference and
2. This device must accept any interference received, including interference that may cause undesired operation of the device.

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure limits. This transmitter must not be collocated or operating with any other antenna or transmitter.

【CANADA】

This device complies with Industry Canada licence-exempt RSS standards.

Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence

L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC RF Radiation Exposure Statement:

To comply with IC RF exposure requirements, this device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

Pour se conformer aux exigences de conformité RF canadienne l'exposition, cet appareil et son antenne ne doivent pas étre co-localisés ou fonctionnant en conjonction avec une autre antenne ou transmetteur.

[EU Member States]

- For details of the applicable standards, please refer to above mentioned international standards compliances.

* The product can be used in any country which is a member of EU.

【 한국／KOREA 】

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다

Precautions for Axis Operation with Wireless Connection

REMOTE DIGITAL SPEED CONTROLLER is capable of operating ELECYLINDER in the option model code -WL2 in wireless connection status. For operation with wireless connection, secure safety by following the precautions below before use.

- In case of connecting wireless, prepare a device / circuit to stop the system in case of necessity of emergency stop.
- For axis operation with wireless connection, operation testing (movement to forward and backward ends, jog operation, inching operation) is possible, but the control device is not designed for purposes of automatic operation. Construct a mechanical system based on the risks of the operating environment.
- Carry out risk assessment based on the standard/spec requirements of the machinery for installation. Dangerous operation, such as that requiring an automatic stop when control signals cannot be received (including disabled communication) is not acceptable.
- Stopping axis operation by wireless network cannot be used as a safety feature as defined in EN ISO 13849-1: 2015. It is also not compliant with Safety Category B or Categories 1 to 4 stated in EN ISO 13849-1: 2015.

Caution in Installation and Operation of DIGITAL SPEED CONTROLLER

DIGITAL SPEED CONTROLLER (hereinafter described as "DS") is assumed to be operated in set-up change (1) at startup of equipment and (2) during equipment run, and work is assumed to be done in a safety fence. Touching partly to the moving parts or carrier parts may cause an injury to an operator.
Follow the caution notes below when you operate DS.

1. Grasp the operation range of the moving parts and carrier parts so you may not touch partly to them. Make sure to have only the operators who have got safety education to operate the equipment.
2. If a wired or wireless teaching pendant or PC is connected, there should be "Tool Connected" displayed in the DS display window and operation on DS gets unavailable.
   When you check the display, make sure to grasp the operation range and get away from the range far enough so you may not touch partly to the moving parts or carrier parts.
3. Separate the DS operation part from any moving part or carrier part, install an area sensor such as the light curtain so you would not get caught on finger or hand.
4. ELECYLINDER is set in low speed at 250mm/s or less at delivery for safety. In case you set the speed above 250mm/s, increase the setting speed step by step to consider safe operation.
5. Have two or more operators for operation to secure an operator to watch the work in addition to an operator to operate DS.
   Build up an appropriate safety circuit and equip it with an emergency stop button and an enable switch with three positions. The watcher should stop the equipment immediately in case of any emergency to ensure safety of the DS operator.
6. Build up the safety circuit that does not start up only with power supply or restoration from power outage.
7. Install the actuator with DS considering a position easy to operate or see the DS to secure your body position or posture while operating DS. Failure to do so could hurt your back, neck or wrist.
8. Check that there is no abnormality on the safety circuit or DS itself before you start operating on the DS. Have an appropriate measure when any abnormality is found before start operation.
9. Create a "Operation Standard" necessary to secure safety, educate an operator based on this standard, and have only operators who is well educated with the standard (operators who received safety education).
10. When it is a work in a safety fence, make sure to put up a sign showing "Work on-going in Safety Fence" at a place where the sign can be seen from outside the fence before starting the work.
11. Make sure to secure safety and wear a helmet, safety gloves and safety goggles as necessary.
12. Have a risk assessment conducted so any risks that could be considered get reduced and removed to the acceptable level.

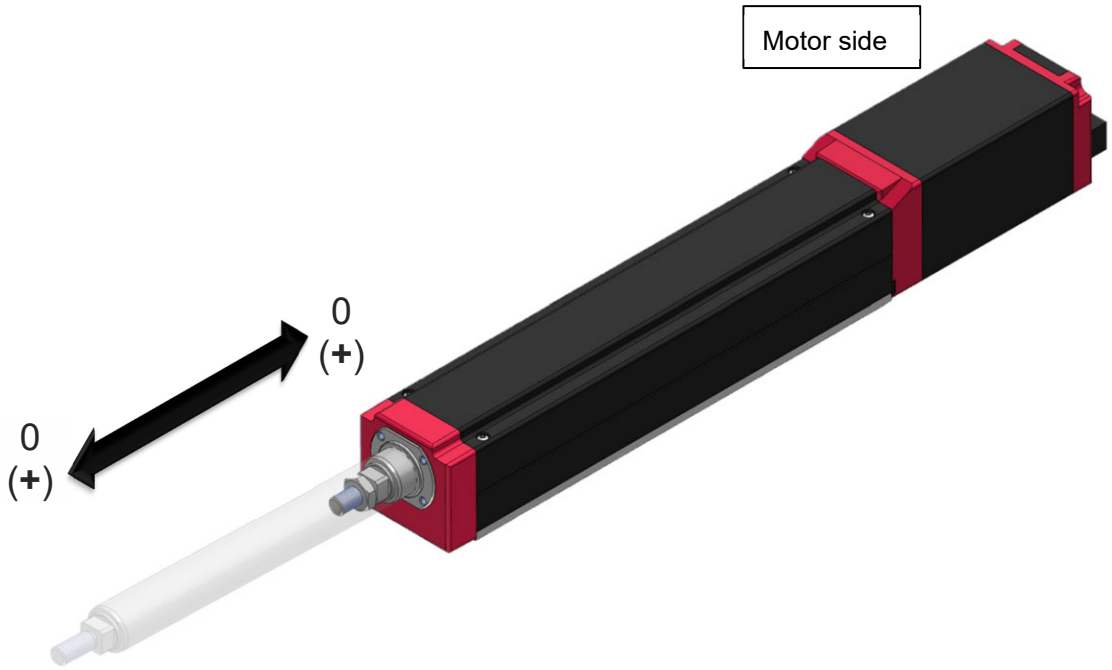
The notes above are the caution notes for installation and operation of DS, but they are also general caution for any case other than use of DS, thus some descriptions could duplicate with "Safety Precautions for Our Products".

Actuator Coordinate System

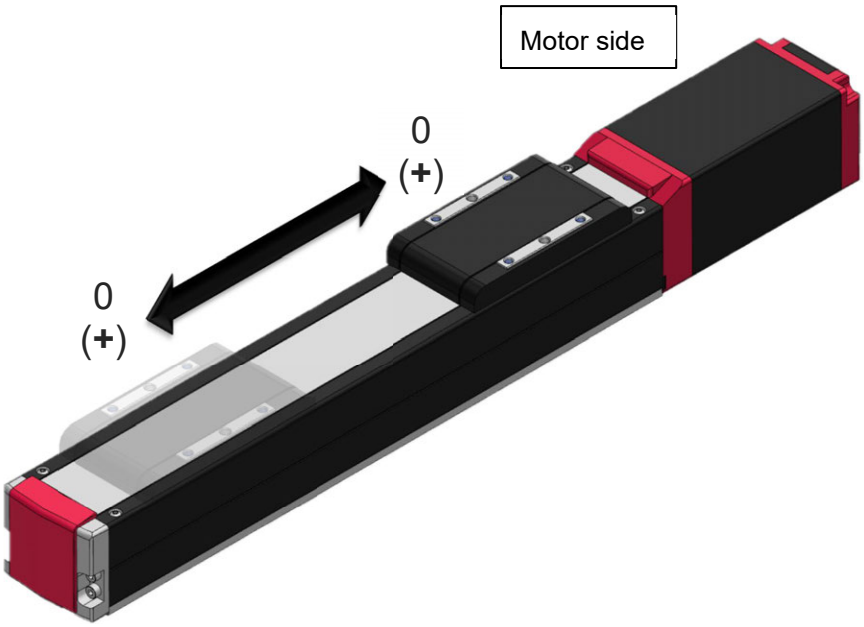
Unless otherwise there is an indication of the home reversed specification (option), the home-return orientation should be on the motor side for the linear axis type and outside (open end) for the gripper type, counterclockwise moving end for the rotary axis type and the opposite motor side for the stopper cylinder type.

The 0 in the figure below shows home. The parentheses show home reverse specification.

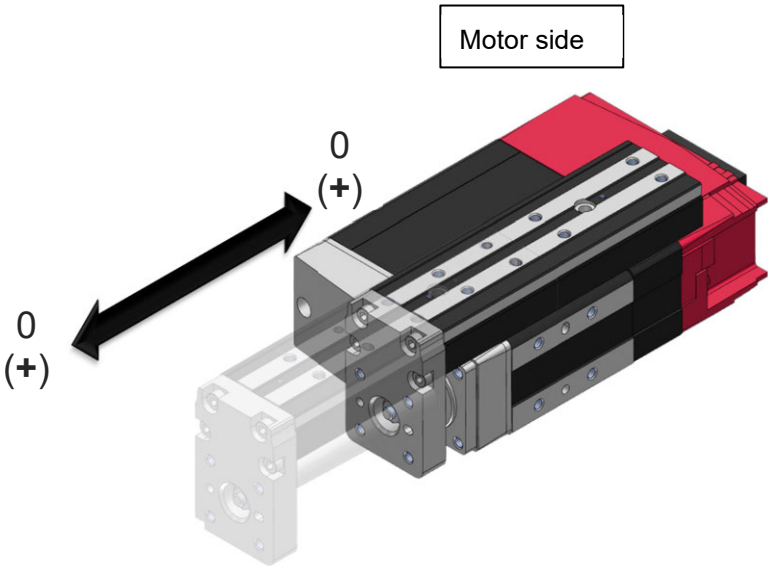
(1) Rod type



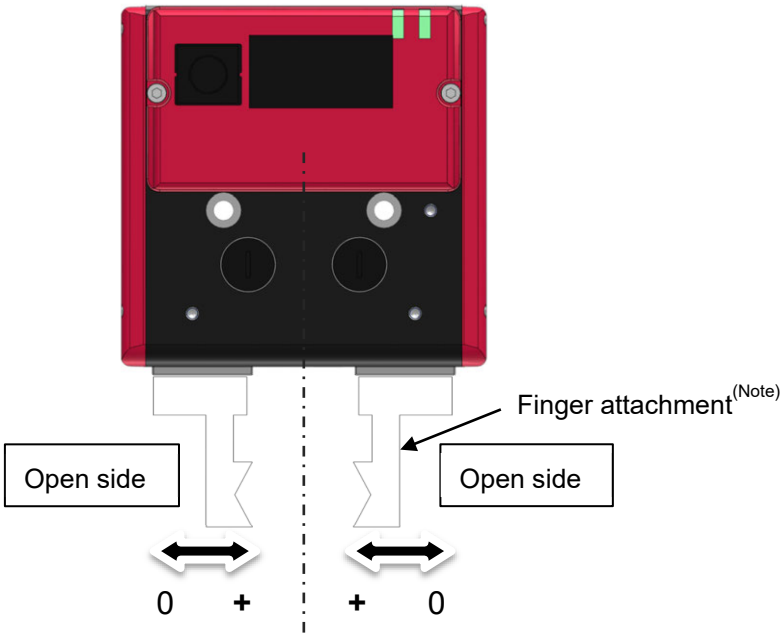
(2) Slider type



(3) Table type

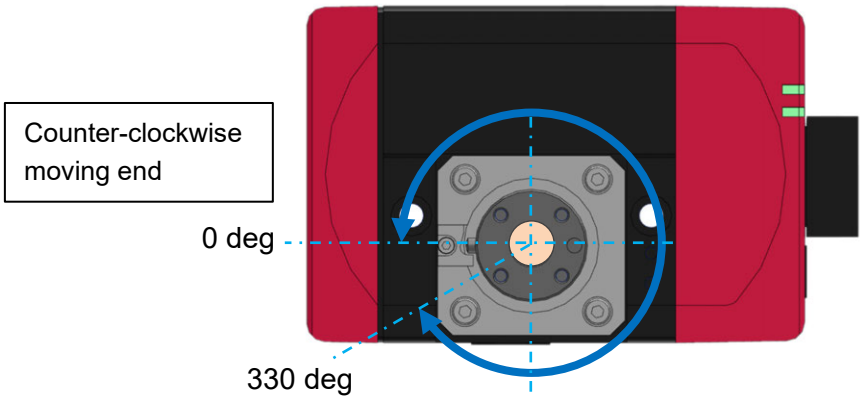


(4) Gripper type



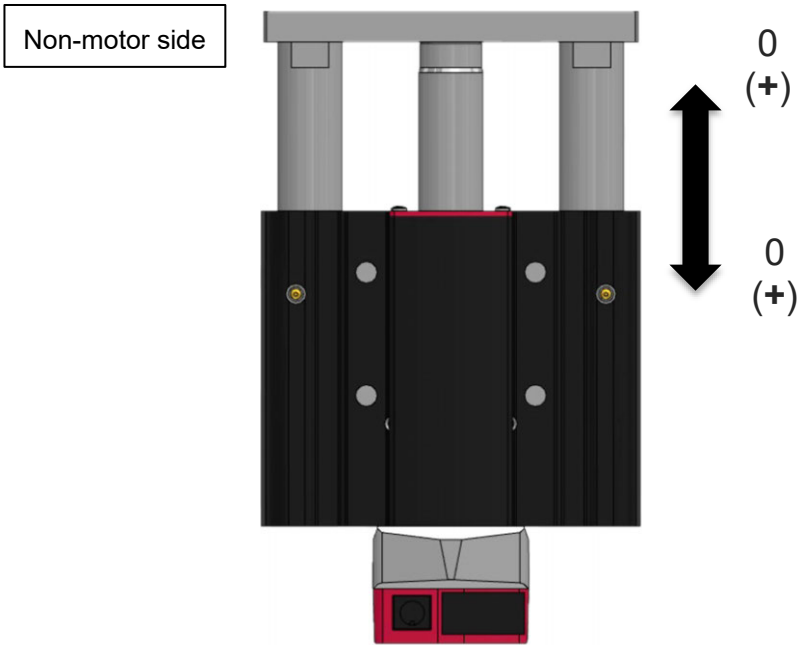
Note The finger attachment is not an accessory for the actuator.
It is to be prepared by the customer.

(5) Rotary type



(330 deg rotation specification)

(6) Stopper Cylinder



DIGITAL SPEED CONTROLLER

Chapter 1

Overview

1.1 Overview ····· 1-1
1.1.1 Outline of DIGITAL SPEED CONTROLLER ····· 1-1
1.1.2 Features ····· 1-1
1.2 Checking the Product ····· 1-2
1.2.1 Components ····· 1-2
1.2.2 How to Read the Model Nameplate ····· 1-3
1.2.3 How to Read the Model Number ····· 1-4
1.3 Part Names ····· 1-5

1.1 Overview

1.1.1 Outline of DIGITAL SPEED CONTROLLER

DIGITAL SPEED CONTROLLER equipped in ELECYLINDER (hereinafter described as EC-equipped DIGITAL SPEED CONTROLLER) is an operation panel capable of setting acceleration, velocity and deceleration (AVD settings) and trial run. A simple operation enables settings and adjustments in minimum time, which can reduce time spent for equipment startup and model switchover. Refer to an instruction manual of each ELECYLINDER for the models capable of equipping.

DIGITAL SPEED CONTROLLER TEACHING (TBD-1) is a type of DIGITAL SPEED CONTROLLER capable of operation regardless of model types or condition of installation by connecting wired to the SIO connector on ELECYLINDER. Therefore, it is available to connect to all types of ELECYLINDER that have already been delivered. It is effective in such a case as when operating a model not applicable for EC-equipped DIGITAL SPEED CONTROLLER such as the rotary, gripper and slim and small types, or when it is difficult to operate EC-equipped DIGITAL SPEED CONTROLLER due to the posture of installation.

REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) is a type of DIGITAL SPEED CONTROLLER for wireless connection. It is capable of operating ELECYLINDER in the wireless connection type installed in a range of 5m or less with a good visibility which is equipped with the wireless feature in the BLE (Bluetooth Low Energy) standard. It will give you an easy connection to ELECYLINDER installed at a place difficult to reach such as inside the equipment or a high position.

1.1.2 Features

The special features of the product are as follows.

- Simple Operation

  The following features are accessible by operating on the operation panel.
  - Velocity and Acceleration/Deceleration Settings (AVD Adjustment), Position Setting and Pressing Operation Setting
  - Trial Run (Forward / Backward) and Jog Operation
  - Brake release

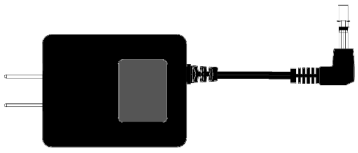
- Easy-to-Use User Interface
  - 1 Window 1 Level as Base, Simple and Intuitive Operation

1.2 Checking the Product

1.2.1 Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

<table>
<tr><th colspan="3">Body</th></tr>
<tr><th>EC-equipped DIGITAL SPEED CONTROLLER</th><th>DIGITAL SPEED CONTROLLER TEACHING</th><th>REMOTE DIGITAL SPEED CONTROLLER</th></tr>
<tr><td>EC-D□□
  </td><td>TBD-1
 
Equipped with 5m Standard Cable</td><td>TBD-1WL
  </td></tr>
<tr><th colspan="3">Accessories</th></tr>
<tr><td>Safety Guide
  </td><td colspan="2">DIGITAL SPEED CONTROLLER Quick Start Guide
  </td></tr>
<tr><td colspan="3">AC adapter
*Indicated in Model Code to
REMOTE DIGITAL SPEED CONTROLLER Enclosed

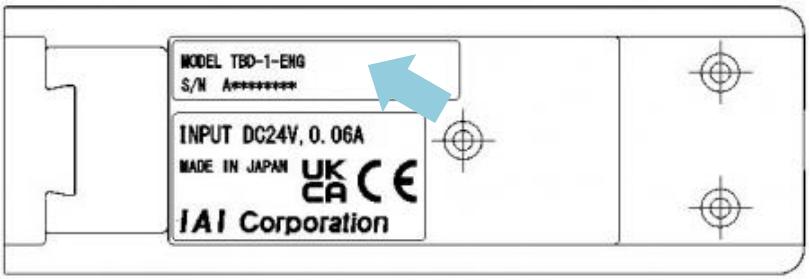
UN318-5928
(For use in Japan, North America, Mexico and Thailand)
UNZ318-5928 (For use in China)
UNE318-5928 (For use in Europe)
UNR318-5928 (For use in Korea)
  </td></tr>
</table>

Options		Maintenance Part
Strap	Magnet Sheet	Battery for Replacement
STR-1 (Note 1) 	MG-1 (Note 1) 	AB-8 (Note 1) (Note 2) 

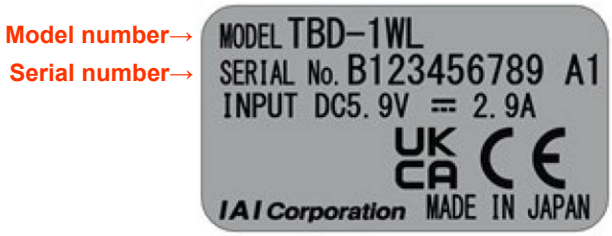
Note 1 Applicable only for REMOTE DIGITAL SPEED CONTROLLER
Note 2 Battery is to be enclosed with main unit

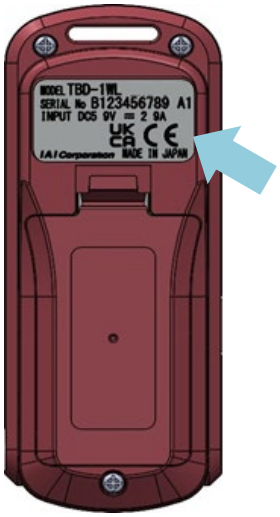
1.2.2 How to Read the Model Nameplate

[DIGITAL SPEED CONTROLLER TEACHING (TBD-1) nameplate position]



[REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) nameplate position]





1.2.3 How to Read the Model Number

- EC-equipped DIGITAL SPEED CONTROLLER

Series		DIGITAL SPEED CONTROLLER	Type	Ball screw lead		Stroke		Power & I/O cable length		Options
EC	-	D	**	*	-	***	-	**	-	**

- DIGITAL SPEED CONTROLLER TEACHING

Series		Type		Options
TBD	—	1	—	Blank ENG CHI

Wired Connection Type

Blank	Display in Japanese
ENG	Display in English
CHI	Display in Chinese

- REMOTE DIGITAL SPEED CONTROLLER

Series		Type		AC Adapter		Options
TBD	—	1WL	—	Blank C E K N	—	Blank ENG CHI

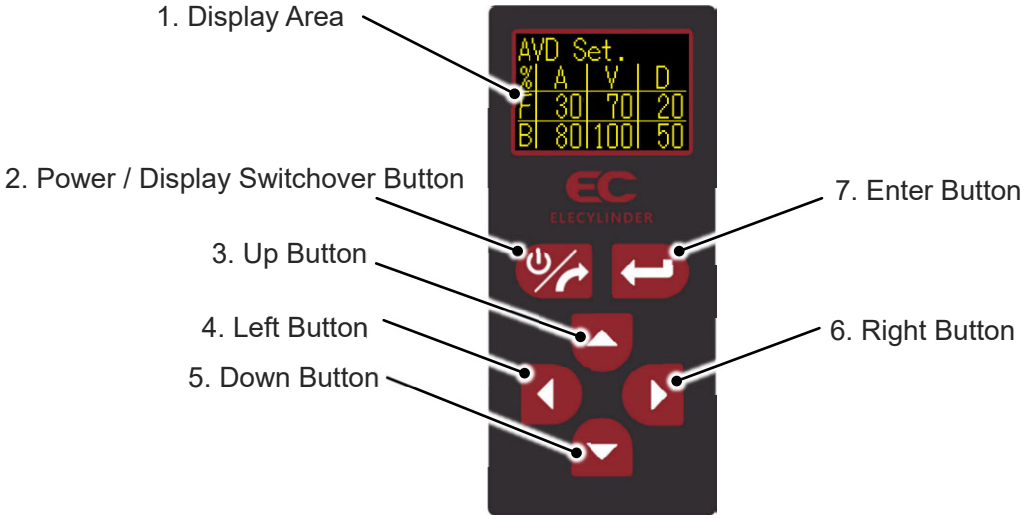
Wireless Connection Type

Blank	Display in Japanese
ENG	Display in English
CHI	Display in Chinese

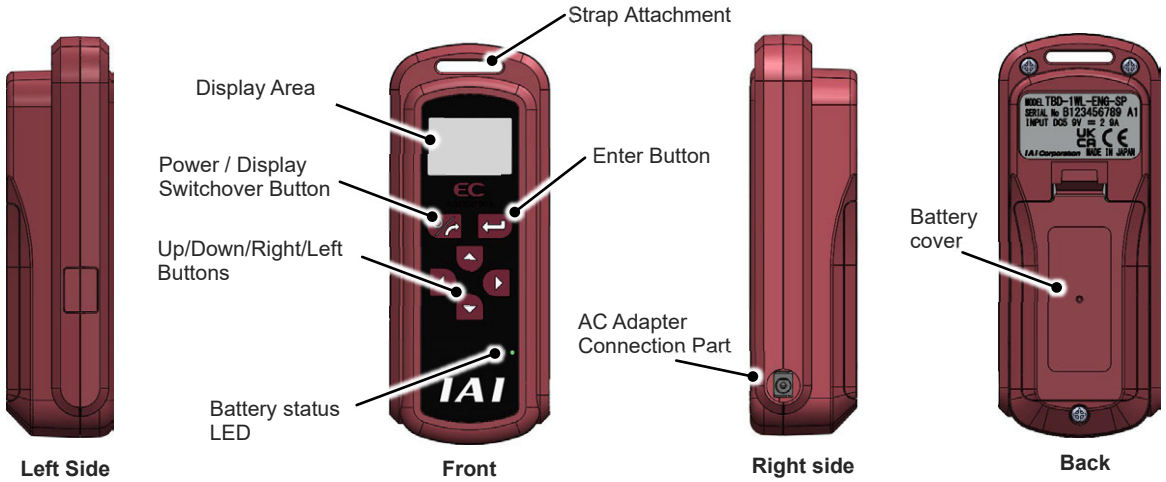
Blank	For use in Japan, North America and Thailand
C	For use in China
E	For use in Europe
K	For use in Korea
N	No AC adapter enclosed

1.3 Part Names

- **DIGITAL SPEED CONTROLLER,**
  DIGITAL SPEED CONTROLLER TEACHING Front Side Each Portion



- **REMOTE DIGITAL SPEED CONTROLLER (Wireless DIGITAL SPEED CONTROLLER)**



DIGITAL SPEED CONTROLLER

Chapter 2

Specifications

2.1 System Configuration ·····2-1

2.2 Basic Specification ····· 2-11

2.2.1 EC-equipped DIGITAL SPEED CONTROLLER (EC-D□□) ····· 2-11

2.2.2 DIGITAL SPEED CONTROLLER TEACHING (TBD-1)····· 2-12

2.2.3 REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL)····· 2-14

2.3 Requirements for Use, Storage and Preservation ····· 2-22

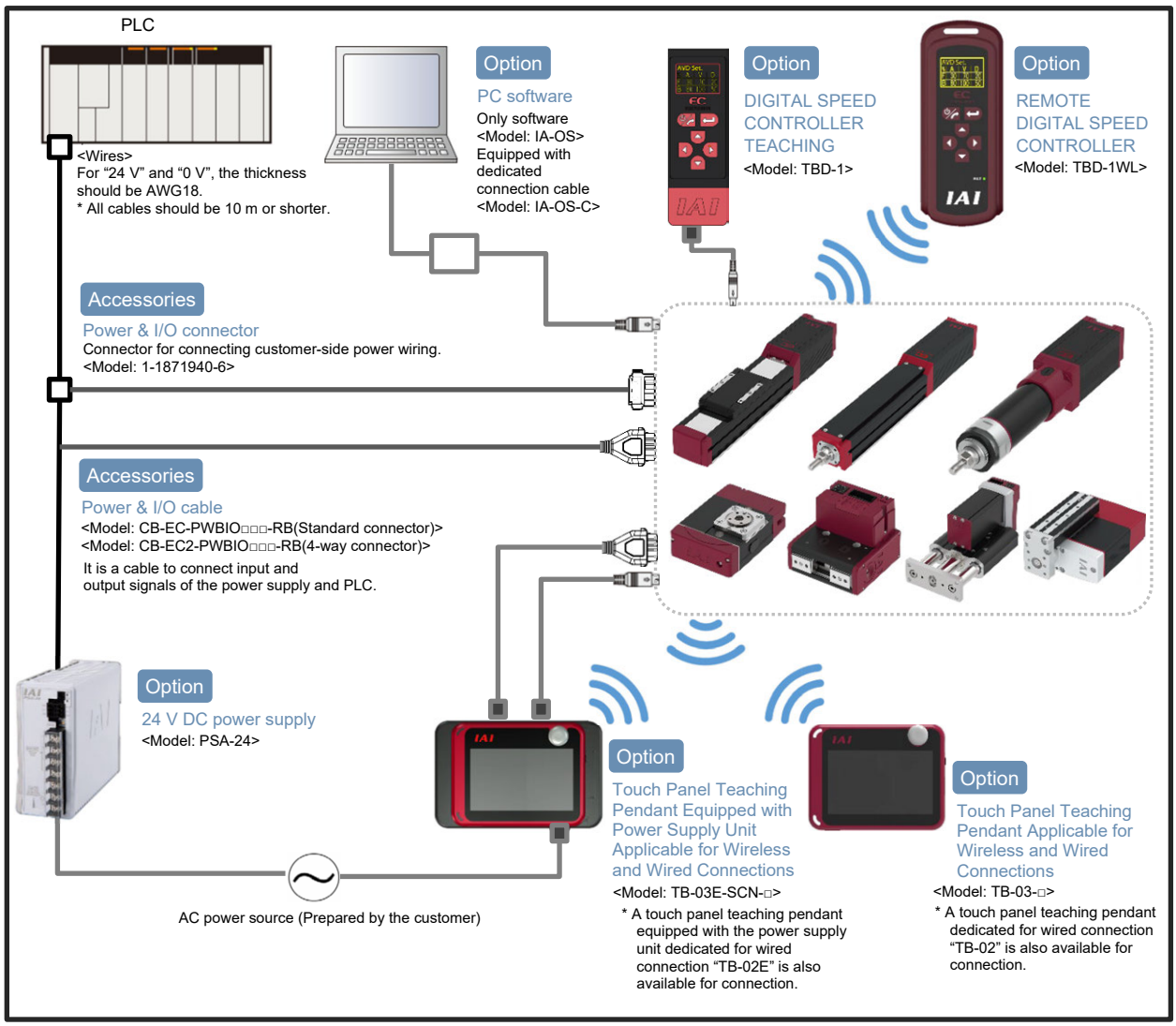
2.3.1 Installation Environment ····· 2-22

2.3.2 Storage / Preservation Environment····· 2-23

2.1 System Configuration

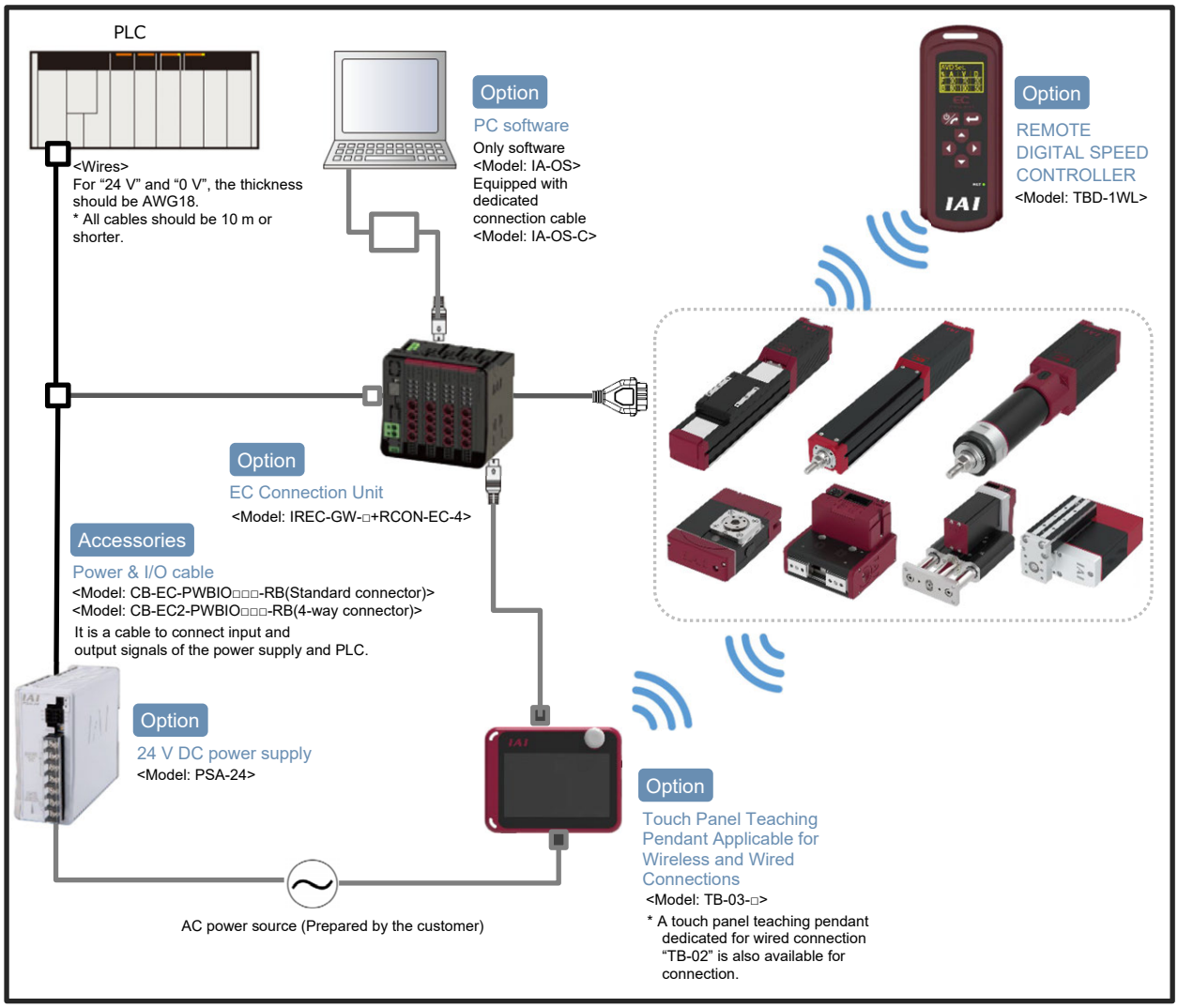
The following shows the system configuration.

[1] ELECYLINDER Equipped with 24V Drive Motor (e.g. High Stiffness Type, Slim and Small Type, Cleanroom Type)

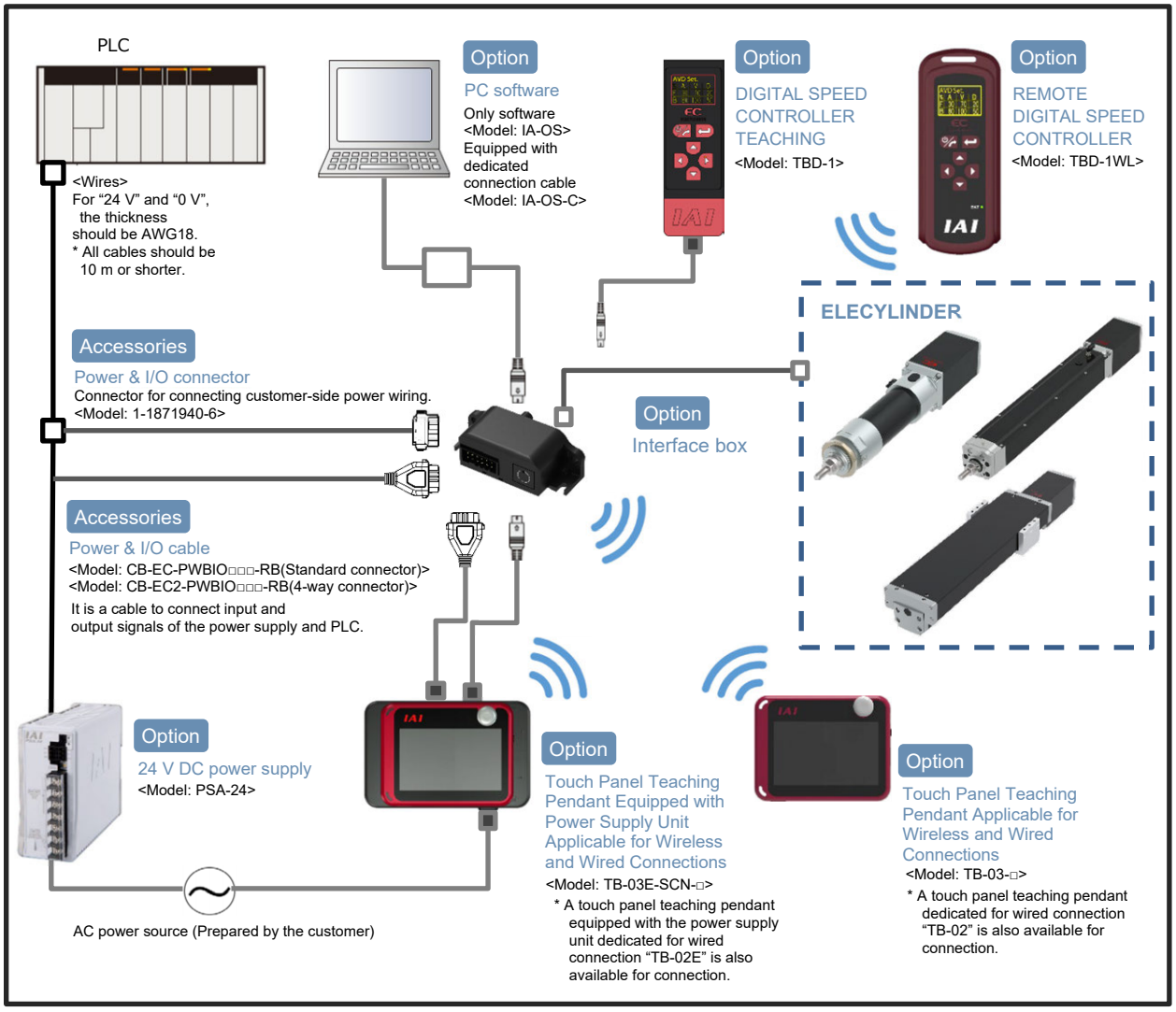


(*) Supply 24V DC to the ELECYLINDER and input a signal from a master device to the ELECYLINDER.
This enables the ELECYLINDER to operate.

● System Construction when RCON Connection Unit Used

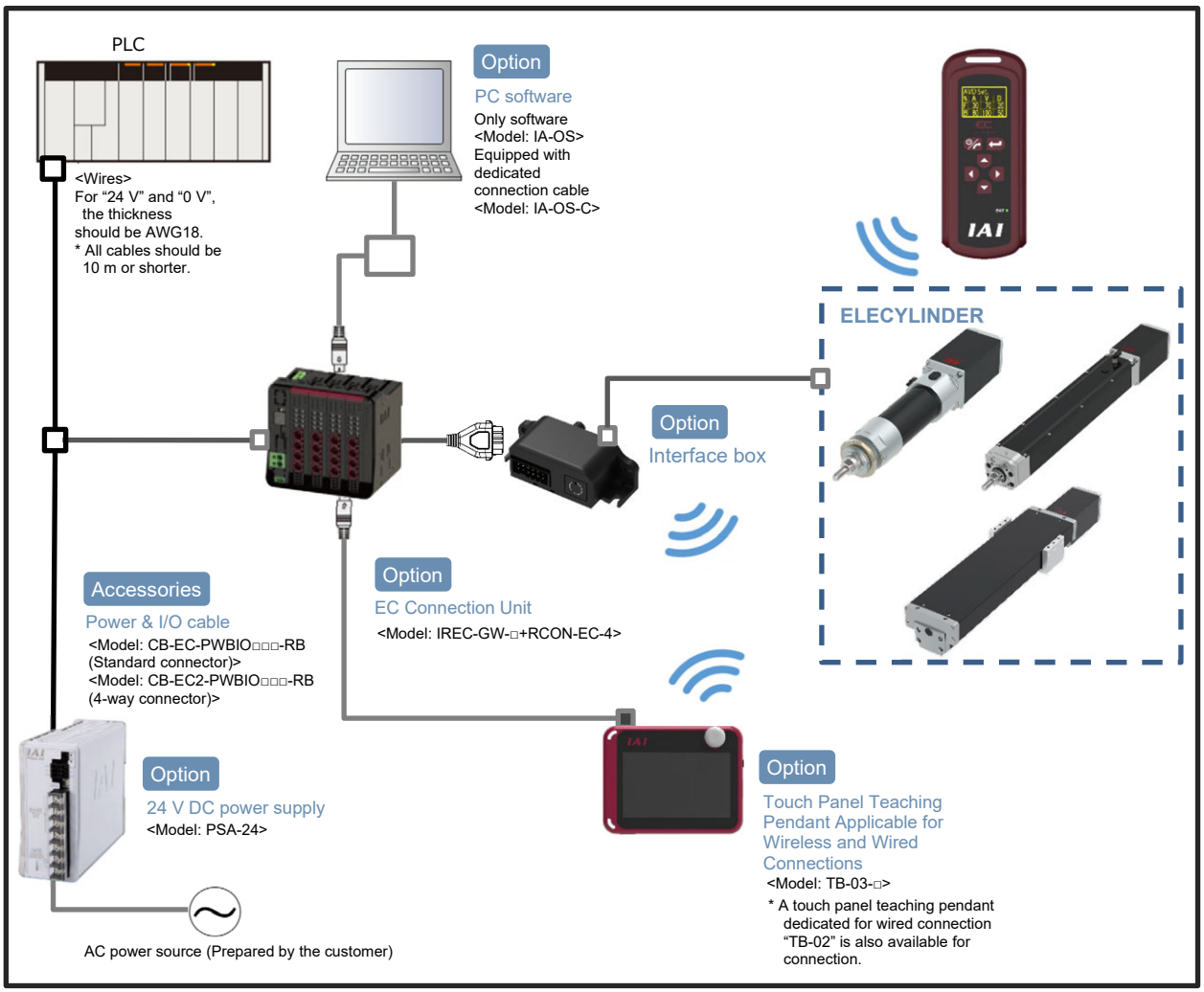


[2] ELECYLINDER dust and drip proof specification

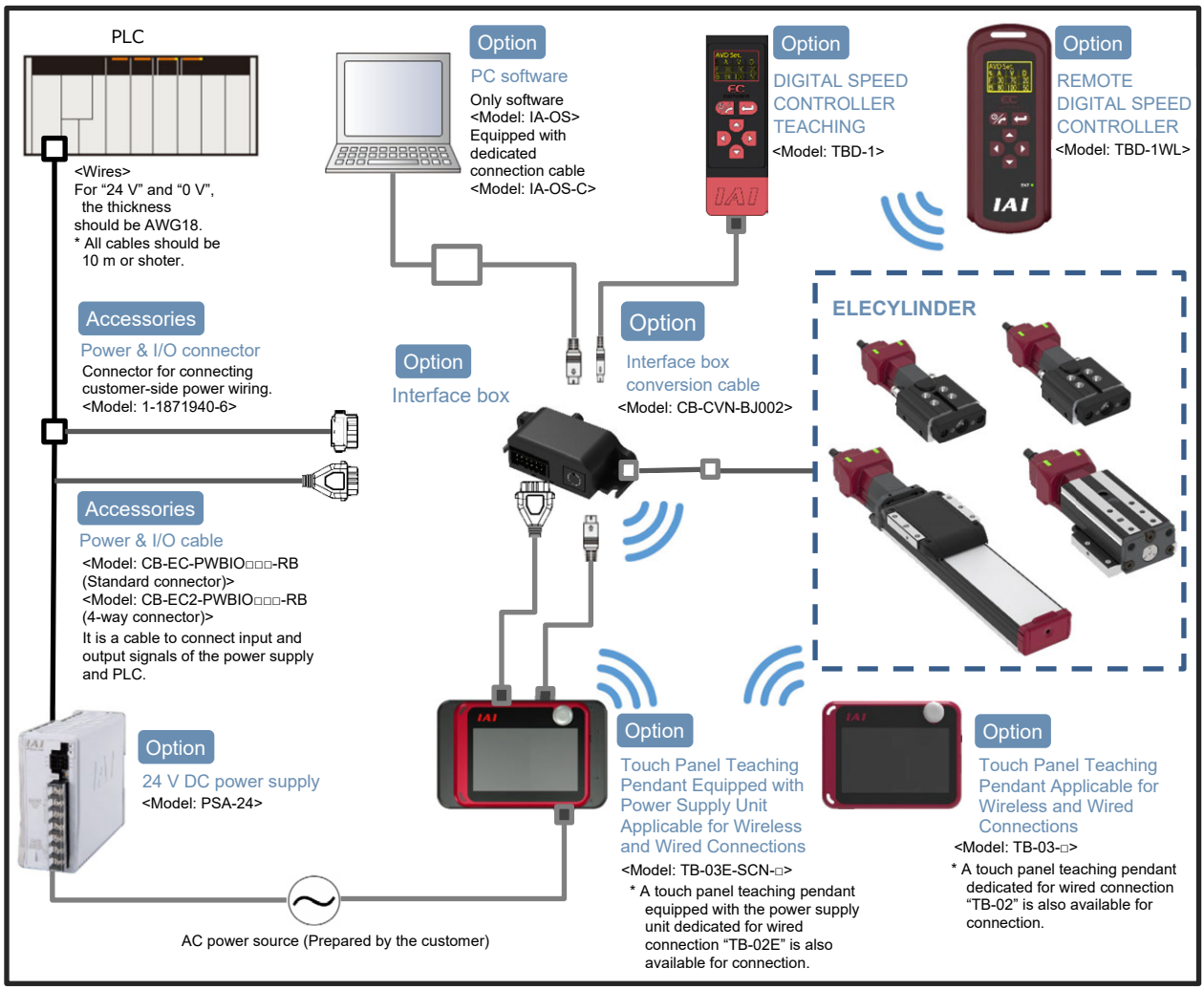


(*) Supply 24V DC to the ELECYLINDER and input a signal from a master device to the ELECYLINDER.
This enables the ELECYLINDER to operate.

- System Construction when RCON Connection Unit Used

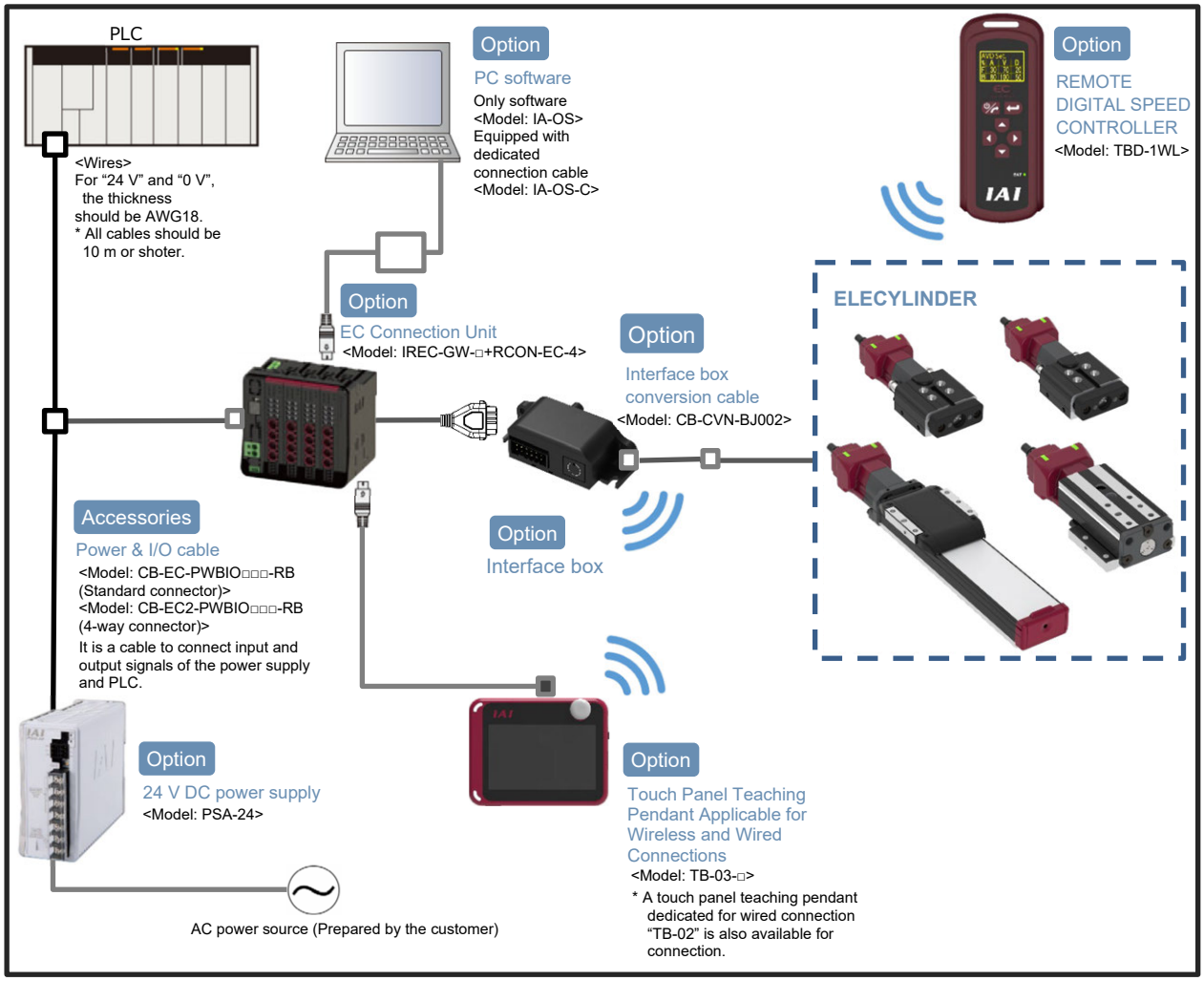


[3] Ultra Mini ELECYLINDER

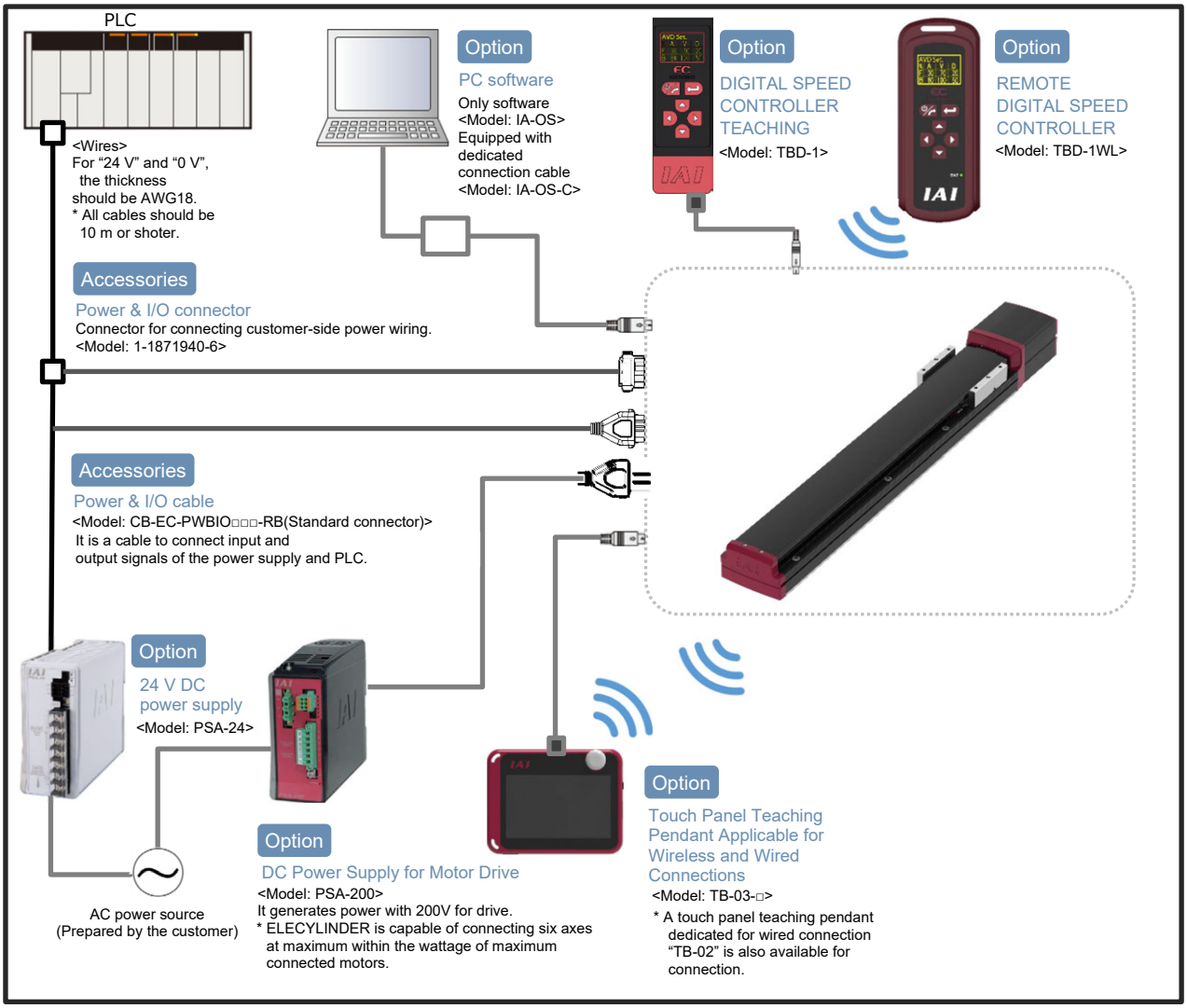


(*) Supply 24V DC to the ELECYLINDER and input a signal from a master device to the ELECYLINDER.
This enables the ELECYLINDER to operate.

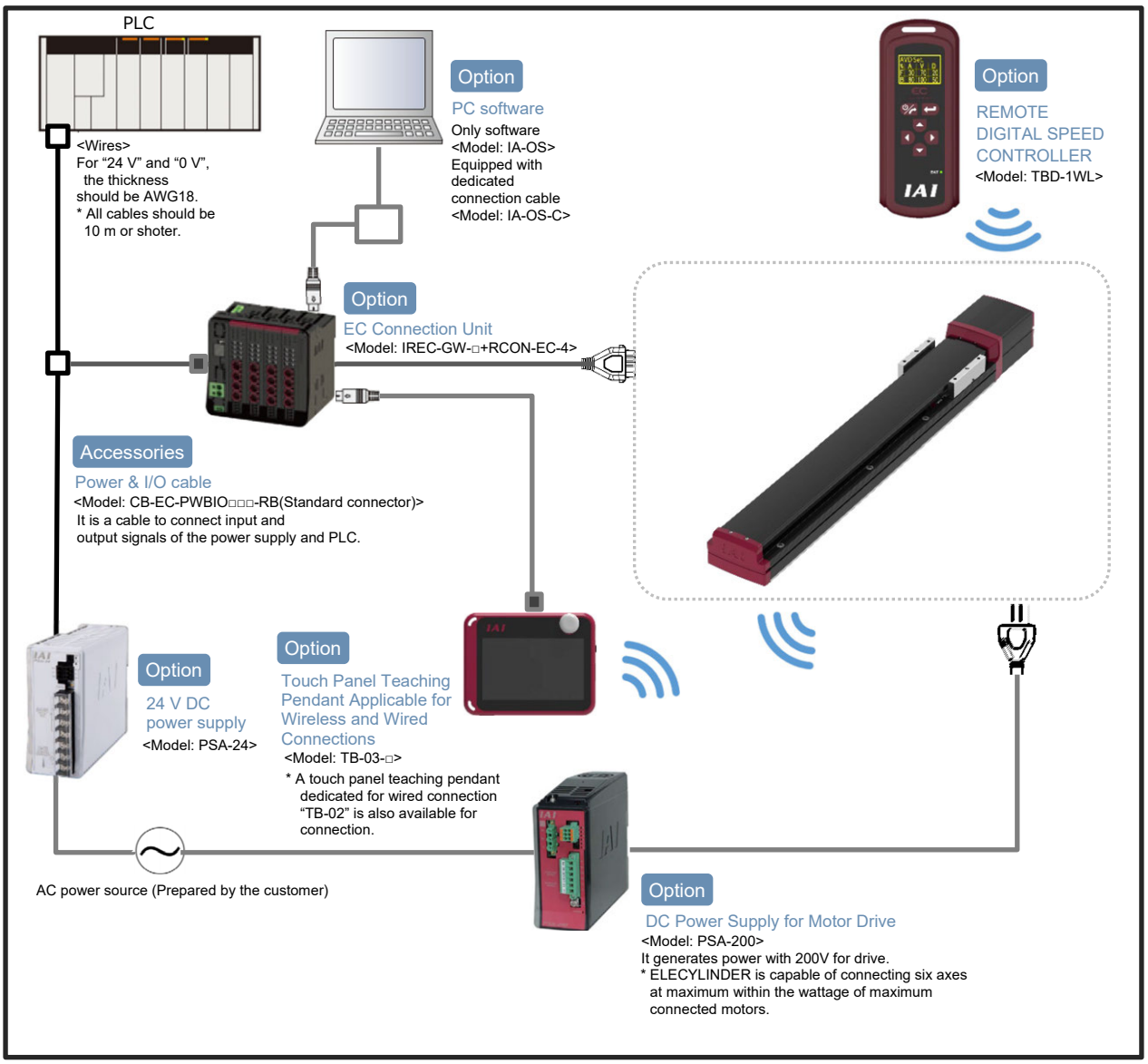
- System Construction when RCON Connection Unit Used



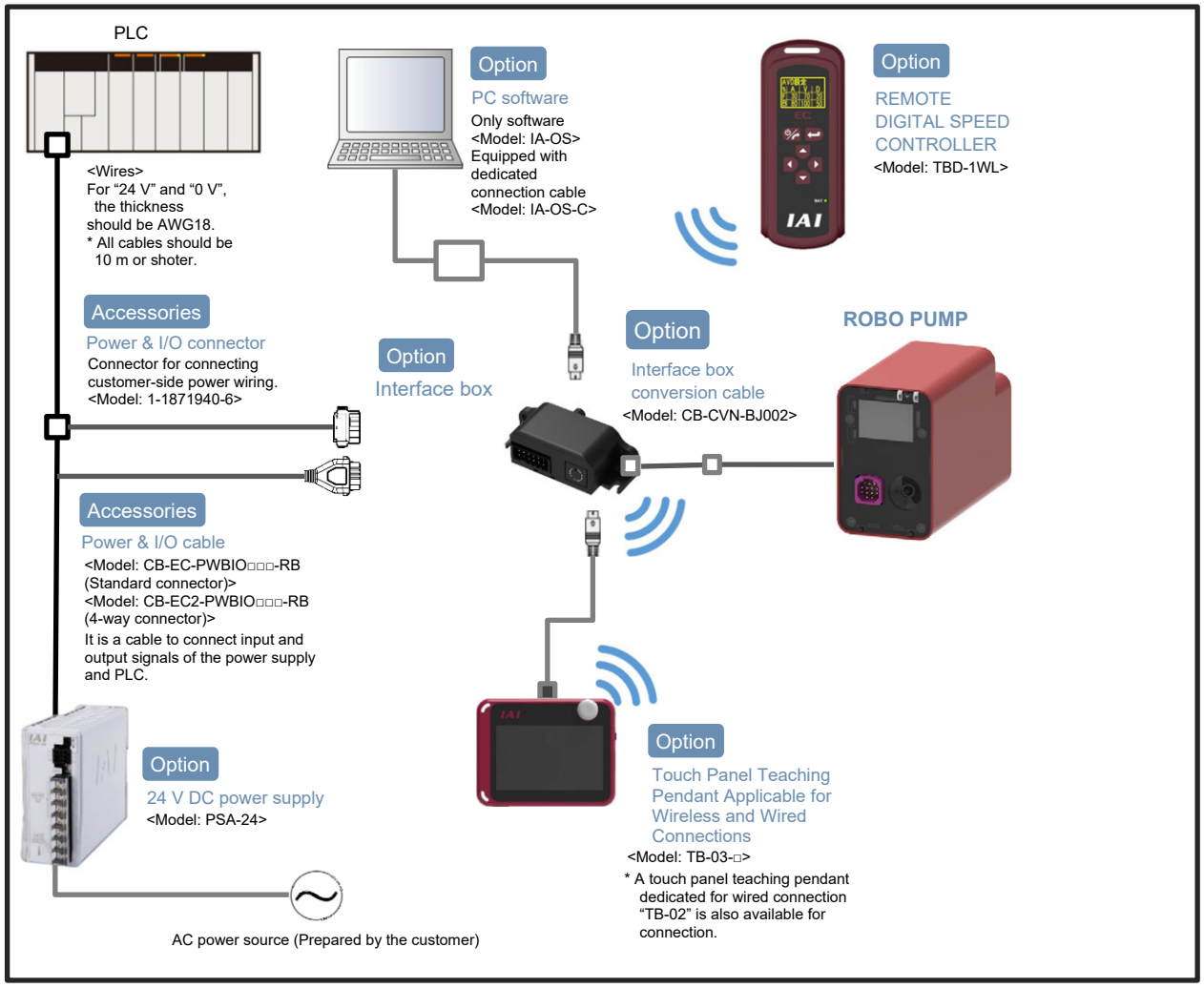
[4] ELECYLINDER Equipped with 200V AC Servomotor



- System Construction when RCON Connection Unit Used

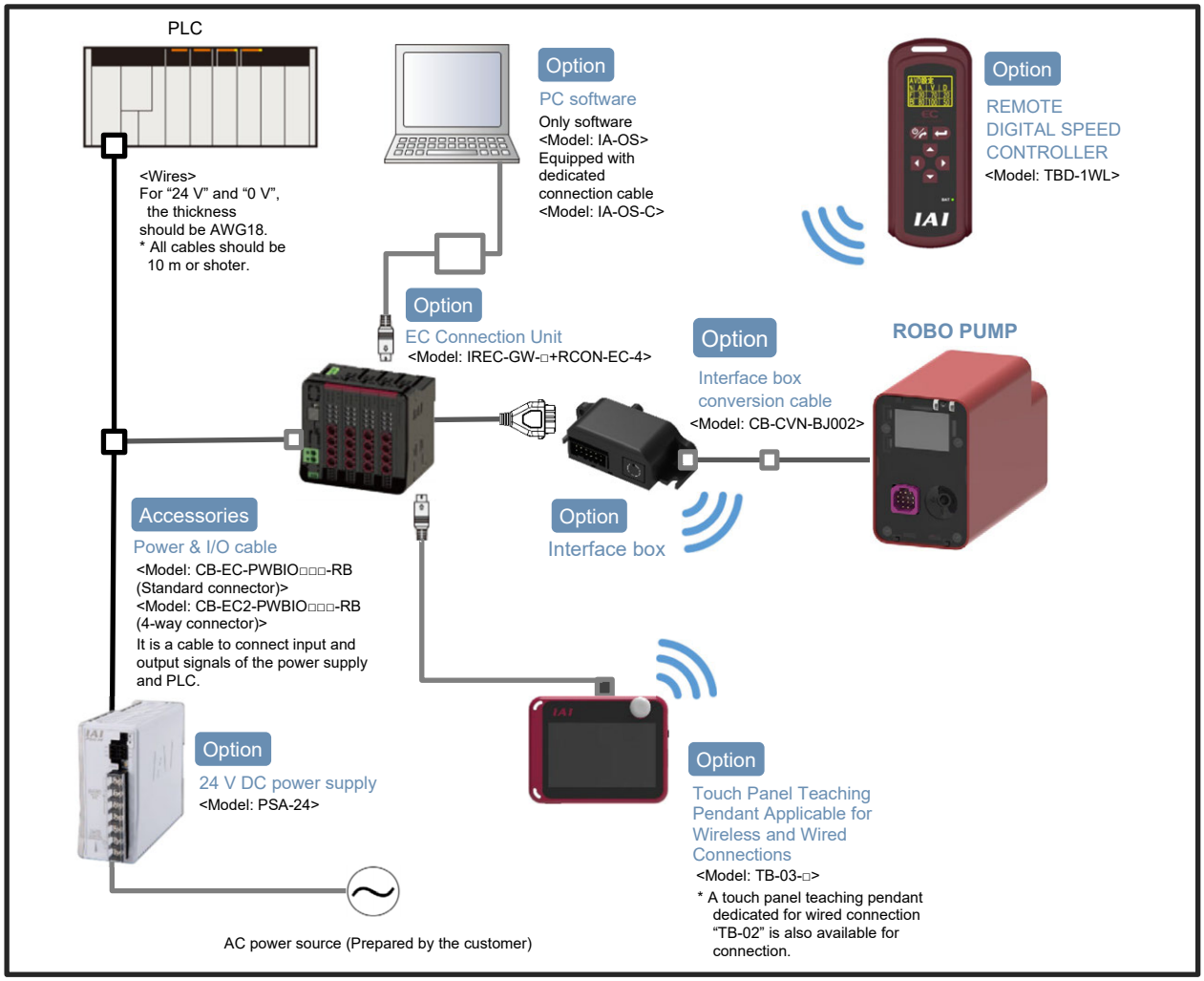


[5] ROBO PUMP



(*) Operation can be made by supplying 24V DC to ROBO PUMP and inputting signals from a host device.

● System Construction when RCON Connection Unit Used



2.2 Basic Specification

2.2.1 EC-equipped DIGITAL SPEED CONTROLLER (EC-D□□)

[1] Basic specification

Item		Content
Power supply voltage		24V DC ±10% (Supplied from controller)
Power supply current		60mA or less
Power consumption		1.5W or less
Display Panel		96 × 64 Dots, OLED Display
Life of OLED Display		Approx. 3 years (Ambient Temperature 40°C, Operated in 24 hours)
Applicable Controller		DIGITAL SPEED CONTROLLER Applicable ELECYLINDER
Operation Volume		ON/OFF Volume Settable in 3 steps, S, M, and L
Serial Communication Interface (Communication with Controller Part)	Communication standard	RS-485 (Modbus protocol compliant)
	Communication speed	230.4kbps

[2] Installation/Operation Conditions

Item	Content
Operating temperature range	0 to 40°C (Non-condensing or freezing)
Surrounding humidity range	85% or less (Non-condensing or freezing)
Storage temperature range	-20 to 70°C
Atmosphere	Avoid corrosive gas and in particular avoid excessive dust
Altitude	1000m or less
Pollution degree	II
Degree of protection	IP20

[3] External view

2.2.2 DIGITAL SPEED CONTROLLER TEACHING (TBD-1)

[1] Basic specification

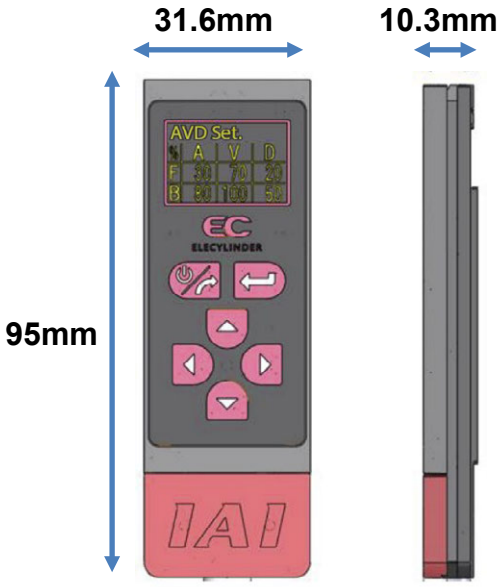
Item		Content
Power supply voltage		24V DC ±10% (Supplied from controller)
Power supply current		60mA or less
Power consumption		1.5W or less
Display Panel		96 × 64 Dots, OLED Display
Life of OLED Display		Approx. 3 years (Ambient Temperature 40°C, Operated in 24 hours)
Applicable Controller		ELECYLINDER
Operation Volume		ON/OFF Volume Settable in 3 steps, S, M, and L
Serial Communication Interface (Communication with Controller Part)	Communication standard	RS-485 (Modbus protocol compliant)
	Communication speed	115.2kbps

[2] Installation/Operation Conditions

Item	Content
Operating temperature range	0 to 40°C (Non-condensing or freezing)
Surrounding humidity range	85% or less (Non-condensing or freezing)
Storage temperature range	-20 to 70°C
Atmosphere	Avoid corrosive gas and in particular avoid excessive dust
Altitude	1000m or less
Pollution degree	II
Degree of protection	IP20

[3] Appearance Dimensions

Item	Content
External dimensions	W 31.6 × H 95 × D 10.3 mm
Cable Length	5m
Mass	Approx. 205 g (Include Cable)
External view	See figure below



2.2.3 REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL)

[1] Basic specification

Item	Content
Power supply voltage	5.9V DC (5.7 to 6.3V DC: Supplied from AC adapter)
Power supply current	70mA (5.9V DC: Supplied from AC adapter)
Display Panel	96 × 64 Dots, OLED Display
Battery Life	Cycle Count 300 times
Life of OLED Display	Approx. 3 years (Ambient Temperature 40°C, Operated in 24 hours)
Applicable Controller	ELECYLINDER WL/WL2 Specification and ROBO PUMP WL Specification
Wireless link / Features	Bluetooth 4.2
Battery charge system	Dedicated AC Adapter：Quick charging system with additional charging when fully charged
Duration for wireless operation	8 Hours (reference)
Duration of charging	Approx. 4 hours
Operation Volume	ON/OFF Volume Settable in 3 steps, S, M, and L

[2] Installation/Operation Conditions

Item	Criteria
Installation method	Mobile System
Ambient operating temperature	0 to 40°C (Non-condensing or freezing)
Ambient operating humidity	85% or less (Non-condensing or freezing)
Ambient storage temperature	-20 to 40°C
Atmosphere	Avoid corrosive gas and in particular avoid excessive dust
Altitude	1000 m or less
Vibration resistance	Frequency: 10～57Hz / Amplitude: 0.075mm Frequency: 57～150Hz / Acceleration: 9.8m/s^2 XYZ directions Sweep time: 10 minutes Number of sweeps: 10 times
Pollution degree	II
Degree of protection	IPX0
Generated heat	0.4W
Cooling method	Natural air-cooling

[3] Appearance Dimensions

Item	Content
External dimensions	W 45 × H 113 × D 30 mm
Mass	Approx. 100 g
External view	See figure below

[4] Power Supply Specifications (Common Specifications for AC Adapters)

Item	Content
Power input voltage range	Single-Phase 100 to 240V±10%
Power supply current	0.4Amax.
Power frequency range	50 / 60Hz±5%
Inrush current	50A (Ambient temperature at 25°C)
Output voltage	5.9V DC (5.7 to 6.3V)
Output current	2.8Amax.

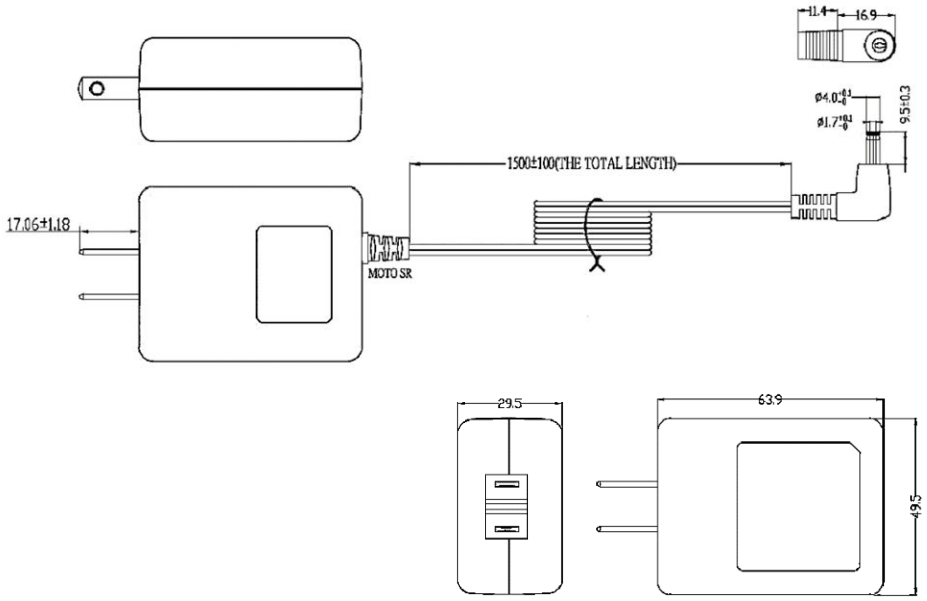
[5] AC Adapter Joint

Connector name: LGP2631-0101F(SMK)
: (JEITA RC-5320A Voltage Classification 2)

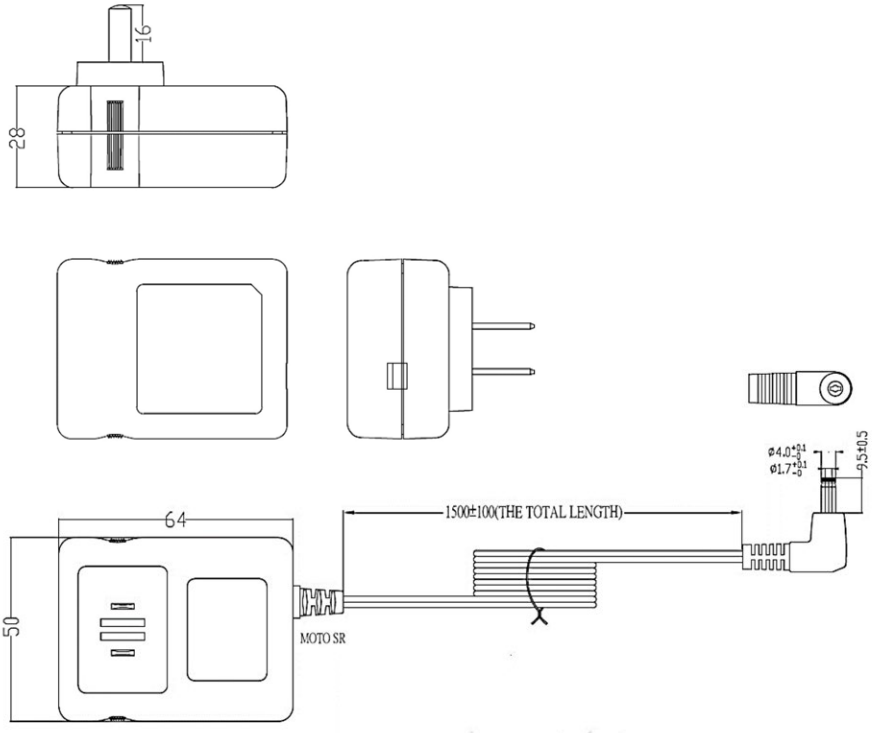
Pin No.	Signal name	Explanation
2	5.9V	Power supply input 5.9V
3	GND	Signal ground
4	GND	Signal ground

[6] AC Adapter Appearance

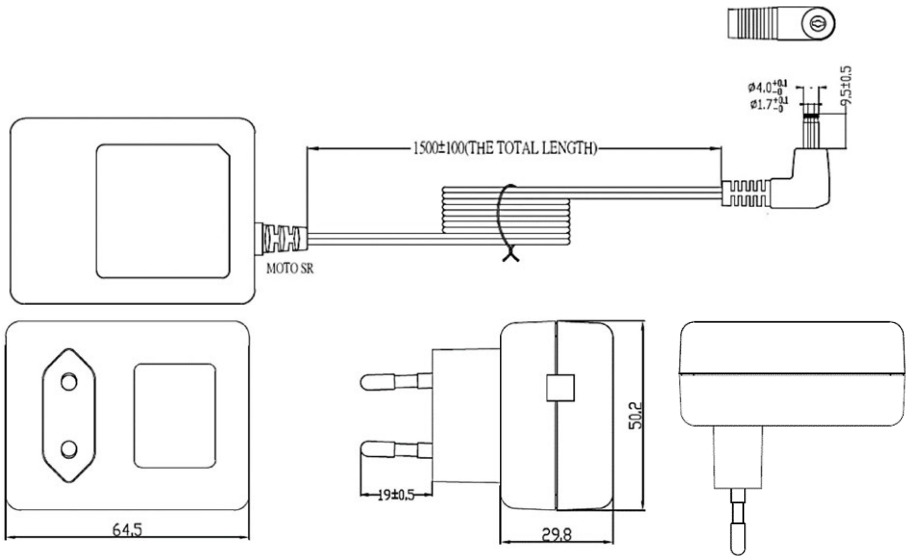
[For use in Japan, North America, Mexico and Thailand: UN318-5928]



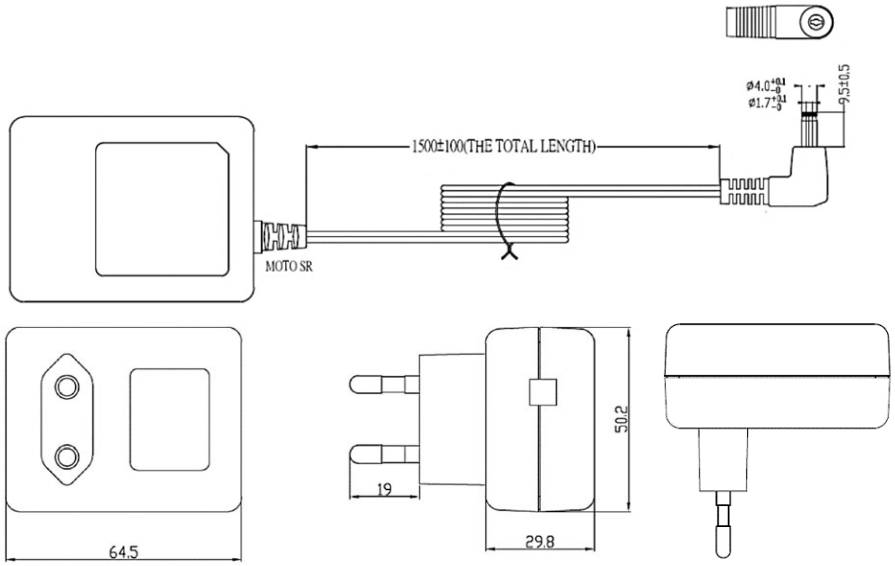
[For use in China: UNZ318-5928]



[For use in Europe: UNE318-5928]



[For use in Korea: UNR318-5928]



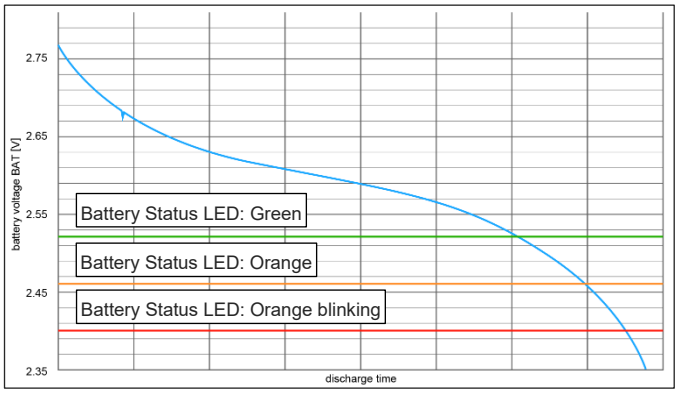
[7] Specifications Related to Battery Charge

- Types of Charger Mode

Charger Mode	Condition of Operation	Contents
Quick Charging of AC Adapter	• AC adapter connected • Battery not fully charged	• Battery should be fully charged from empty in approximately four hours.
AC Adapter Additional Charging	• AC adapter connected • Battery fully charged	• Battery should be remained almost fully charged.

- Battery Status LED Remaining Display

  Below shows the relation between the battery status LED and the battery voltage.
  Be aware that the reference remaining time shown in the battery status LED is just a reference. When the battery remaining is low and the battery charging time is short at a start, the display may show its charge status full once, but it will soon show empty.



- Battery Status LED Display

  The battery LED should illuminate and flash in the specifications shown below depending on the remaining voltage of the battery.

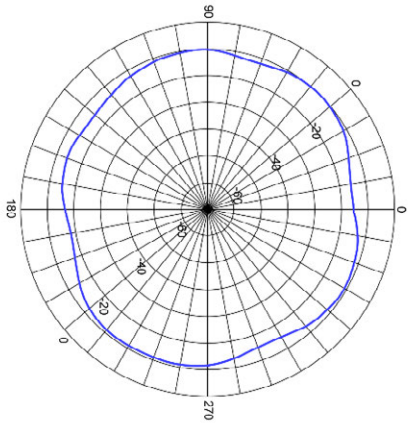
LED Display Color	Power	Status	AC Adapter	Voltage	Remarks
Light OFF	OFF	Power OFF	-	Less than 2.40V	-
Green light blinking	ON	In Fast Charging	Connected	-	-
Green light ON	ON	Fully Charged	-	2.59V or more	Remaining Reference: 6.5 hours
Orange light ON	ON	Charge Status Mid	Not connected	2.52V or more Less than 2.59V	Remaining Reference: 1.5 hours
Orange light blinking	ON	Battery Low	Not connected	2.40V or more Less than 2.52V	Remaining Reference: 0.5 hours
Red light ON	ON	Battery Overvoltage Error	-	3.10V or more	-
		Battery not connected	Connected	-	Power Supply Operation from AC Adapter

[8] Wireless specification

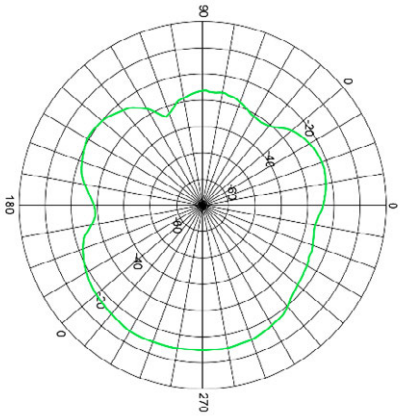
- Specifications (Version, Class)
  Bluetooth 4.2 Class 2

- Reference for Wireless Link Reachable Distance
  It is recommended to have a distance between REMOTE DIGITAL SPEED CONTROLLER and ELECYLINDER of 5m or less with a good visibility.
  The connection may get unstable even in distance of 5m or less depending on the peripheral environment of use.
  Also, be aware that, even if an axis is displayed in the wireless axis select window with distance over 5m, the connection could get unstable as the distance goes far.

- Directivity
  Shown below is the result of directivity measurement in the measurement distance of 3m.



Horizontal direction



Vertical Direction

[9] Optional Items

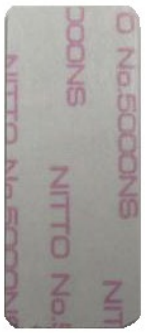
● Strap

Model: STR-1
It is necessary to have an individual delivery and separate preparation.

● Magnet Sheet

Model: MG-1
It is necessary to have an individual delivery and separate preparation.

Magnetized Surface



Adhesive Surface
Double-Sided Adhesive Tape
with Release Paper

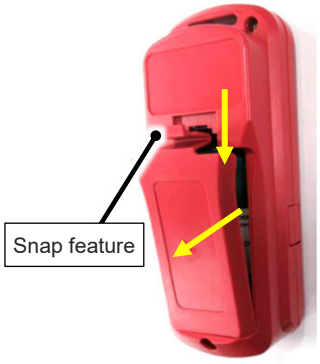
Adhesive Area

- Battery for Replacement

  Model: AB-8
  It is necessary to have an individual delivery and separate preparation.

The way to replace the battery is as shown below.

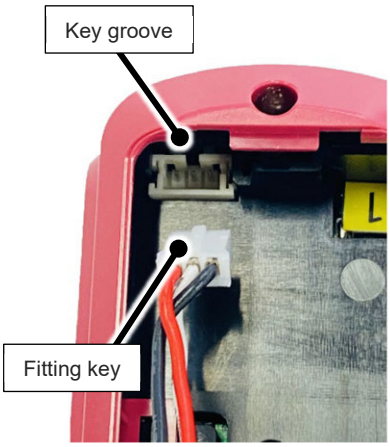
1. Press down the snap feature towards the battery cover and pull up the battery cover.



2. Take the battery out and pull off the connector.

3. Align the fitting key on the connector on the side of the battery for replacement to the key groove on the main body side and insert the connector till it hits to the end.

   When a tool is to be used for insertion, use a tool made of an isolation material such as wood in order to avoid short-circuit.



2.3 Requirements for Use, Storage and Preservation

Usage is possible in environments of pollution degree 2 or equivalent.

Pollution degree 2: Environment in which generally only nonconductive pollution occurs, but temporary conductive pollution may occur due to condensation (IEC 60664-1)

2.3.1 Installation Environment

Use or store the product avoiding a place as described below.

- Where the unit receives radiant heat from strong heat sources such as heat treatment furnaces
- Where the ambient temperature exceeds the range of 0 to 40°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the unit receives direct sunlight
- Where the unit is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of dust, salt or iron (at levels exceeding those typical of an assembly plant)
- Where the unit is subject to splashed water or oil (including oil mist or cutting fluid) or chemical solutions
- Where the body receives impact or vibration
- Where the altitude is more than 1,000m

The unit is used in any of the following locations such as, provide sufficient shielding measures:

- Where noise is generated due to static electricity, etc.
- Where the unit is subject to a strong electric or magnetic field
- Where the unit is subject to ultraviolet or radiation

2.3.2 Storage / Preservation Environment

- The storage / preservation environment should conform to the installation environment of ELECYLINDER.
  However, give especial consideration to the prevention of condensation during long-term storage/preservation.
- Unless especially specified, desiccant is not included in the package at shipping.
  If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures.
- The storage / preservation of ELECYLINDER equipped with DIGITAL SPEED CONTROLLER should be performed in the horizontal orientation.
  If storing in the packaged condition, observe the conditions, if any, regarding storage orientation.
  → Refer to an instruction manual of each model for the status of horizontal orientation.

DIGITAL SPEED CONTROLLER

Chapter 3

Connection / Operation

3.1 Connection of DIGITAL SPEED CONTROLLER ····· 3-1
3.1.1 Priority in Connection ····· 3-1
3.1.2 Priority in REMOTE DIGITAL SPEED CONTROLLER Connection · 3-3
3.1.3 Connection between DIGITAL SPEED CONTROLLER TEACHING (TBD-1) and ELECYLINDER ····· 3-4
3.1.4 Connection between REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) and ELECYLINDER ····· 3-5
3.1.5 Change the Connected Axis of REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) ····· 3-6
3.1.6 Connection between REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) and ROBO PUMP ····· 3-7
3.2 Transition of Windows ····· 3-8
3.2.1 Transition of Windows at Startup ····· 3-8
3.2.2 Normal Mode ····· 3-9
3.2.3 Test Run Mode ····· 3-10
3.2.4 Setting Change Mode ····· 3-12
3.3 Setup and Adjustment of Operational Condition (AVD) and Stop Position ····· 3-16
3.3.1 Simple Velocity Setting ····· 3-16

3.3.2 Detailed Velocity Setting (AVD Setting) ····· 3-19
3.3.3 Cycle Time Display ····· 3-21
3.3.4 Switching of Test Run Mode ····· 3-23
3.3.5 Test Run ····· 3-25
3.3.6 Position Setting ····· 3-26
3.3.7 Jog Operation and Current Position Reading ····· 3-29
3.3.8 Brake Release, Motor Power ON/OFF ····· 3-31
3.3.9 Pressing Operation Setting ····· 3-33
3.4 ROBO PUMO setting ····· 3-37
3.4.1 Pressure setting ····· 3-37
3.4.2 PIO Pattern setting ····· 3-39
3.4.3 Energy-saving mode setting ····· 3-41
3.4.4 Suction stop level setting ····· 3-43
3.5 Other Features ····· 3-45
3.5.1 Buzzer ····· 3-45
3.5.2 Power-Off Feature ····· 3-46
3.5.3 Operation Lock Feature ····· 3-47

3.1 Connection of DIGITAL SPEED CONTROLLER

3.1.1 Priority in Connection

There are three types in SIO communication for ELECYLINDER, "Wired Connection" of TB-02/03 wired connection, PC teaching software, IA-OS and DIGITAL SPEED CONTROLLER TEACHING, "Wireless Connection" of TB-03 Wireless Connection and REMOTE DIGITAL SPEED CONTROLLER, and "EC-equipped DIGITAL SPEED CONTROLLER".

<table>
<tr><th colspan="3">Classification of Communication System for each model</th></tr>
<tr><th>Wired Connection</th><th>Wireless Link</th><th>DIGITAL SPEED CONTROLLER</th></tr>
<tr><td>TB-02/03 Wired link</td><td rowspan="2">TB-03 Wireless Link</td><td rowspan="4">EC-equipped DIGITAL SPEED CONTROLLER</td></tr>
<tr><td>PC software</td></tr>
<tr><td>IA-OS</td><td rowspan="2">REMOTE DIGITAL SPEED CONTROLLER</td></tr>
<tr><td>DIGITAL SPEED CONTROLLER TEACHING</td></tr>
</table>

The priority in the SIO communication line is as shown below.

Wired link ＞ Wireless link ＞ DIGITAL SPEED CONTROLLER

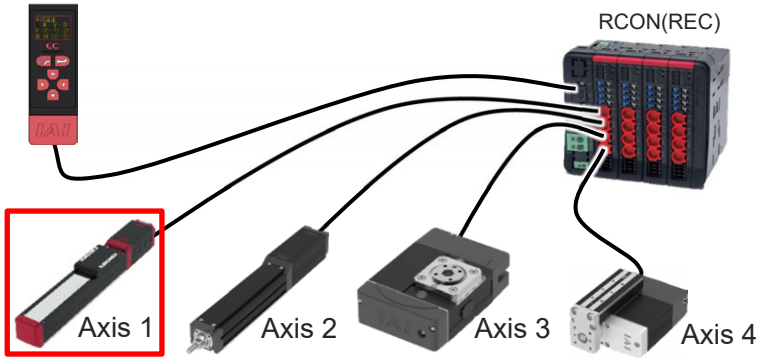
When a tool in higher priority is connected to ELECYLINDER connected with EC-equipped DIGITAL SPEED CONTROLLER or REMOTE DIGITAL SPEED CONTROLLER, an error window showing "Tool Connecting" should be displayed.
While the "Tool Connecting" window is displayed, the panel operation should not be performed for the EC-equipped DIGITAL SPEED CONTROLLER, and it automatically be moved to the AVD Setting window after connection is shut from another tool.
For REMOTE DIGITAL SPEED CONTROLLER, press any button, and a reboot starts and the screen goes to the Select Wireless Axis window automatically.

Other Tool Connecting window

Caution

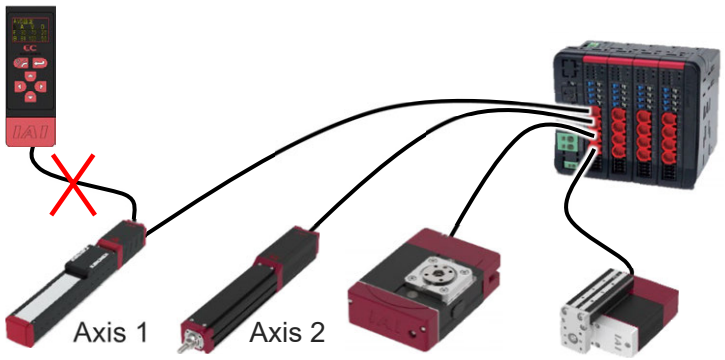
- The DIGITAL SPEED CONTROLLER TEACHING cannot be used in a system that connects to several axes using such as R-unit and SIO converter. Use a Teaching pendant or REMOTE DIGITAL SPEED CONTROLLER.

・When a DIGITAL SPEED CONTROLLER TEACHING is connected to the SIO port on the RCON (REC) gateway unit, communication should be established only with the one in the smallest axis number and other axes cannot be selected.

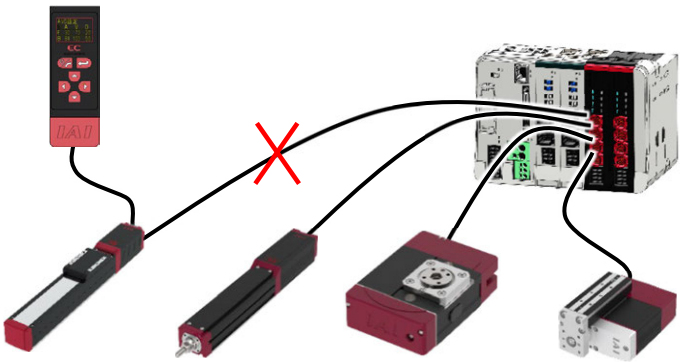


・Communication with Axis 1 Only

・Even if a DIGITAL SPEED CONTROLLER TEACHING is connected directly to ELECYLINDER connected to R-unit, communication or setting change cannot be performed.

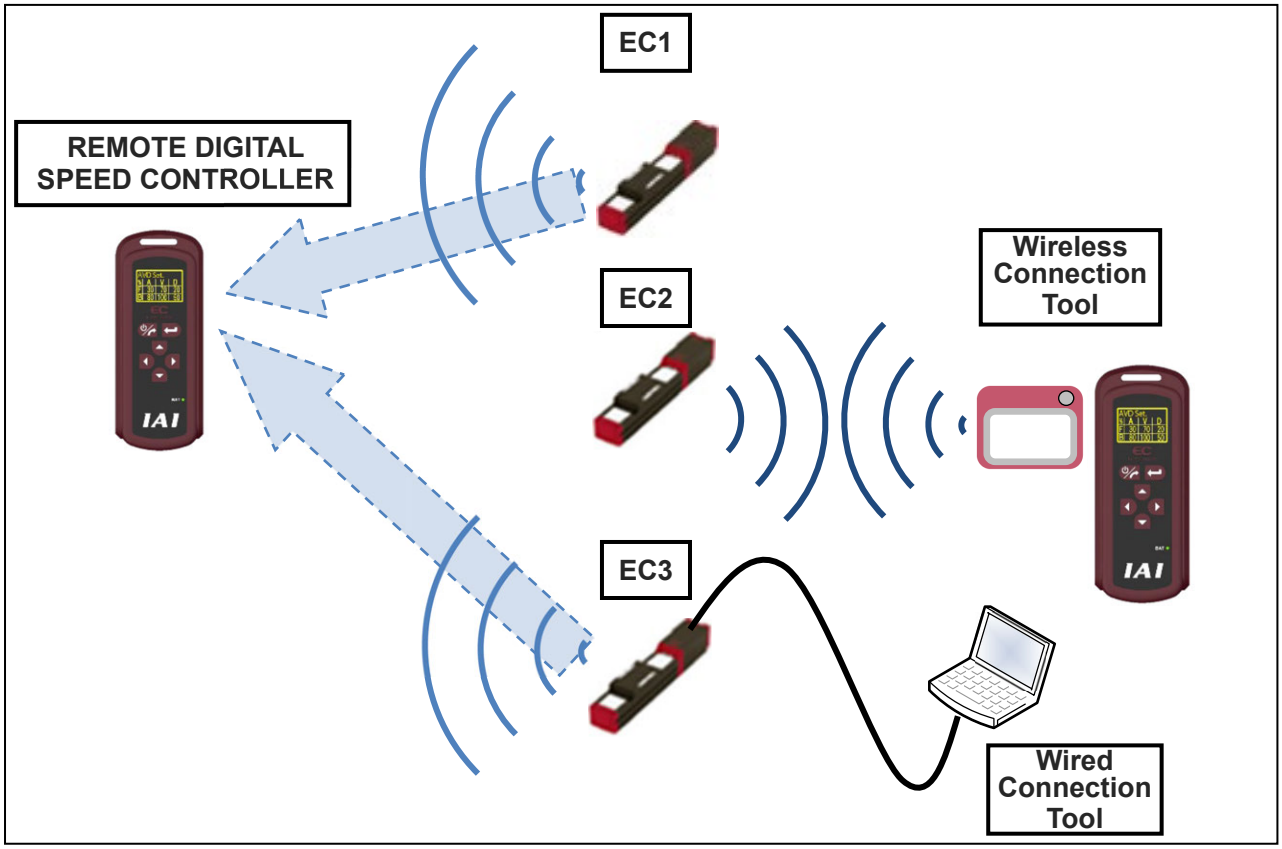


・If a DIGITAL SPEED CONTROLLER TEACHING is connected to ELECYLINDER when the power to RSEL gets turned on, there may be a case when communication between ELECYLINDER and the DIGITAL SPEED CONTROLLER TEACHING gets enabled. At that time, communication between RSEL and ELECYLINDER should not be established and normal operation should not be performed.

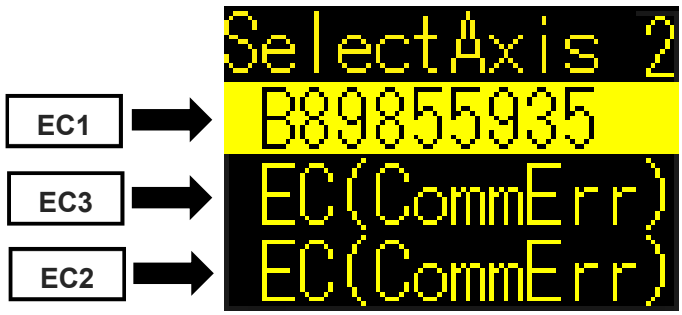


3.1.2 Priority in REMOTE DIGITAL SPEED CONTROLLER Connection

If the wireless connection has already been established with another tool (e.g. TB-03 Wireless Connection or other REMOTE DIGITAL SPEED CONTROLLER) at the start of REMOTE DIGITAL SPEED CONTROLLER (EC2 in Figure), it should not be shown in the list in the Select Wireless Axis window. In case that the wired connection with another tool (e.g. PC teaching software, TB-02/03 Wired Connection or DIGITAL SPEED CONTROLLER TEACHING) has been established (EC3 in Figure) also, it should not be shown in the list in the Select Wireless Axis window.



When the communication gets disconnected after REMOTE DIGITAL SPEED CONTROLLER has started up (including wireless or wired connection with another tool), it should be displayed "EC (CommErr)" in the Select Wireless Axis window, and when it attempts to select this axis, an alarm noise should get generated and would not allow you to connect.



3.1.3 Connection between DIGITAL SPEED CONTROLLER TEACHING (TBD-1) and ELECYLINDER

1. Connect Connection between DIGITAL SPEED CONTROLLER TEACHING (TBD-1).

While the power is off to ELECYLINDER, insert the round connector on the DIGITAL SPEED CONTROLLER TEACHING to the SIO port on the main body of ELECYLINDER (on the interface box for some models).

2. Turn on the power to ELECYLINDER.

DIGITAL SPEED CONTROLLER TEACHING should start up and the Initial Menu window will open.

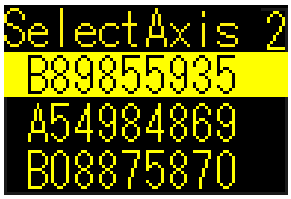
3.1.4 Connection between REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) and ELECYLINDER

1. After the power to ELECYLINDER is turned on, press to turn on the power to REMOTE DIGITAL SPEED CONTROLLER.

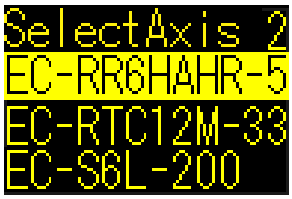
   It is recommended to have a distance between REMOTE DIGITAL SPEED CONTROLLER and ELECYLINDER of 5m or less with a good visibility.

2. REMOTE DIGITAL SPEED CONTROLLER should start up and the Select Wireless Axes window will open.

   Three axes should be displayed in one window.
   (16 axes in 6 windows at max.)
   When an axis you would like to operate is not shown,
   Press or to switch over the page.
   Also, press or to switch over between the serial number display and the axis name display.



Serial number display



Axis name display

Caution

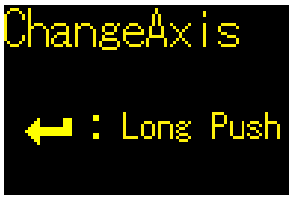
- If using a full-width character in the axis name, it will not be displayed properly and will be shown as "??".
- Any ELECYLINDER already connected wireless or wired to a teaching tool should not be displayed.

3. Select ELECYLINDER to connect with or and press .

   Once succeeded in connection, the Initial Menu window will open.

3.1.5 Change the Connected Axis of REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL)

1. Press while connected wireless with ELECYLINDER to display the Change Selected Axis window and press and hold (for approx. 2s).

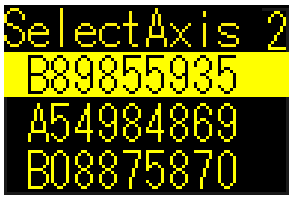


the Select Wireless Axes window will open.

Caution

- When the connected axis fixing feature is enabled, a warning sound should be generated and the screen would not move to the Select Wireless Axis window. Refer to [4.1.4 Connected Axis Fixing / Axis Fixing Release] for how to disable the feature.

2. Select ELECYLINDER to connect with or and press .



Three axes should be displayed in one window.
(16 axes in 6 windows at max.)
When an axis you would like to operate is not shown,
Press or to switch over the page.

3. Select ELECYLINDER to connect with or and press .

Once succeeded in connection,
the Initial Menu window will open.

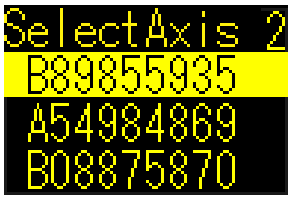
3.1.6 Connection between REMOTE DIGITAL SPEED CONTROLLER (TBD-1WL) and ROBO PUMP

1. After the power to ROBO PUMO is turned on, press to turn on the power to REMOTE DIGITAL SPEED CONTROLLER.

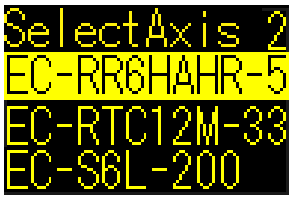
   It is recommended to have a distance between REMOTE DIGITAL SPEED CONTROLLER and ROBO PUMP of 5m or less with a good visibility.

2. REMOTE DIGITAL SPEED CONTROLLER should start up and the Select Wireless Axes window will open.

   Three axes should be displayed in one window.
   (16 axes in 6 windows at max.)
   When an axis you would like to operate is not shown,
   Press or to switch over the page.
   Also, press or to switch over between the serial number display and the axis name display.



Serial number display



Axis name display

Caution

- If using a full-width character in the axis name, it will not be displayed properly and will be shown as "??".
- Any ROBO PUMP already connected wireless or wired to a teaching tool should not be displayed.

3. Select ROBO PUMP to connect with or and press .

   Once succeeded in connection, the Initial window will open.

3.2 Transition of Windows

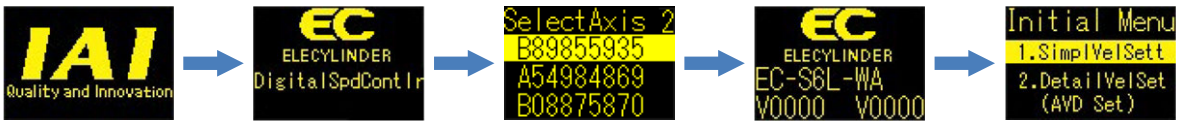
Press "Power / Display Switchover Button" and the screen shifts to the next window, and press "Power / Display Switchover Button" while "Left Button" is held and the screen shifts to the previous window.

Caution

- The windows shown should differ depending on the version of DIGITAL SPEED CONTROLLER.
  Version upgrade is not available for customers. Consult with IAI.

3.2.1 Transition of Windows at Startup

After the IAI logo and the version of DIGITAL SPEED CONTROLLER are displayed, the Select Wireless Axis window should be shown for REMOTE DIGITAL SPEED CONTROLLER and ELECYLINDER or ROBO PUMP to be connected should be selected. Connection should be established with the selected ELECYLINDER or ROBO PUMP, and it goes on to the normal mode.



Note Displayed only for REMOTE DIGITAL SPEED CONTROLLER

- When Connection to ROBO PUMP on REMOTE DIGITAL SPEED CONTROLLER

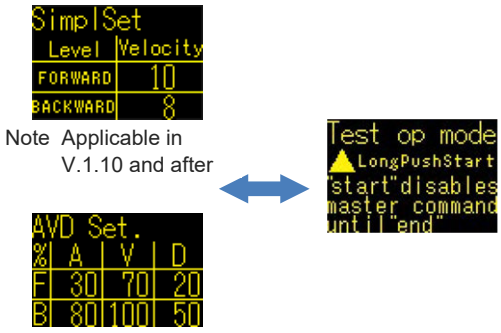
- When Connection not Established with Subject ELECYLINDER during Connected Axis Fixing on REMOTE DIGITAL SPEED CONTROLLER

Press "Power / Display Switchover Button" and search of connected axis should be performed again in 2 seconds.
Once succeeded in connection, it goes on to the normal mode.

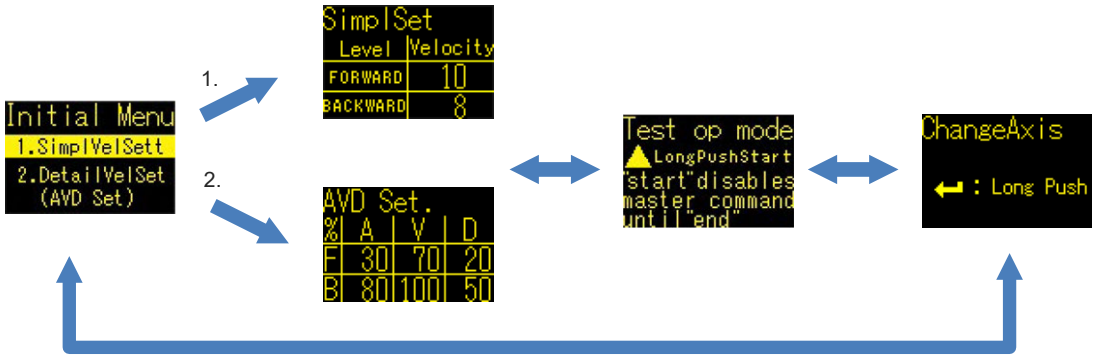
3.2.2 Normal Mode

After selecting the setting mode in the Initial Menu window, "AVD / Simple Velocity Setting window" and "Test Operation mode Start window" should be shown. In REMOTE DIGITAL SPEED CONTROLLER, [Change Selected Axis window] should be displayed after "Test Operation mode Start window".
When it is required to display the Initial Menu window again in EC-equipped DIGITAL SPEED CONTROLLER or DIGITAL SPEED CONTROLLER TEACHING, reboot DIGITAL SPEED CONTROLLER.

- For EC-equipped DIGITAL SPEED CONTROLLER and DIGITAL SPEED CONTROLLER TEACHING



- For REMOTE DIGITAL SPEED CONTROLLER

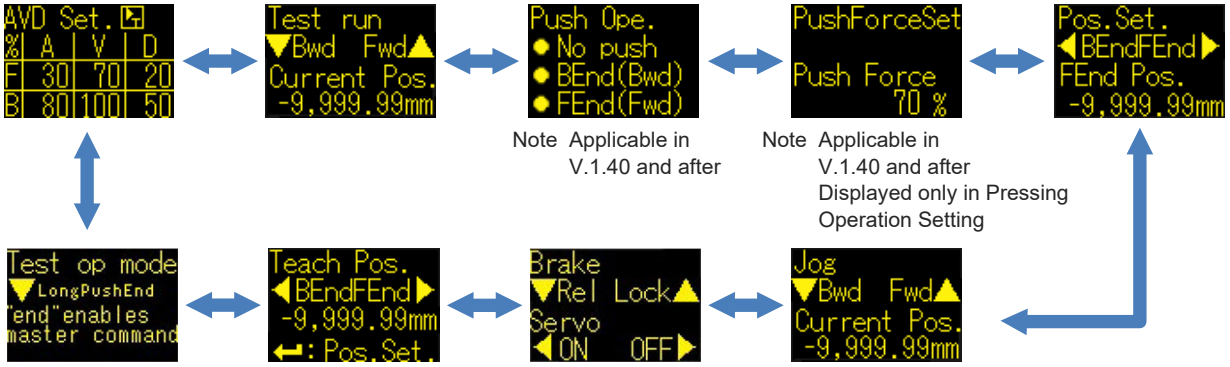


- When Connected to ROBO PUMP on REMOTE DIGITAL SPEED CONTROLLER

3.2.3 Test Run Mode

Press and hold "Up Button" in "Test Operation mode Start window" and the mode gets switched to Test Run mode.
In order to finish Test Run mode, press and hold "Down Button" in "Test Operation mode End window".

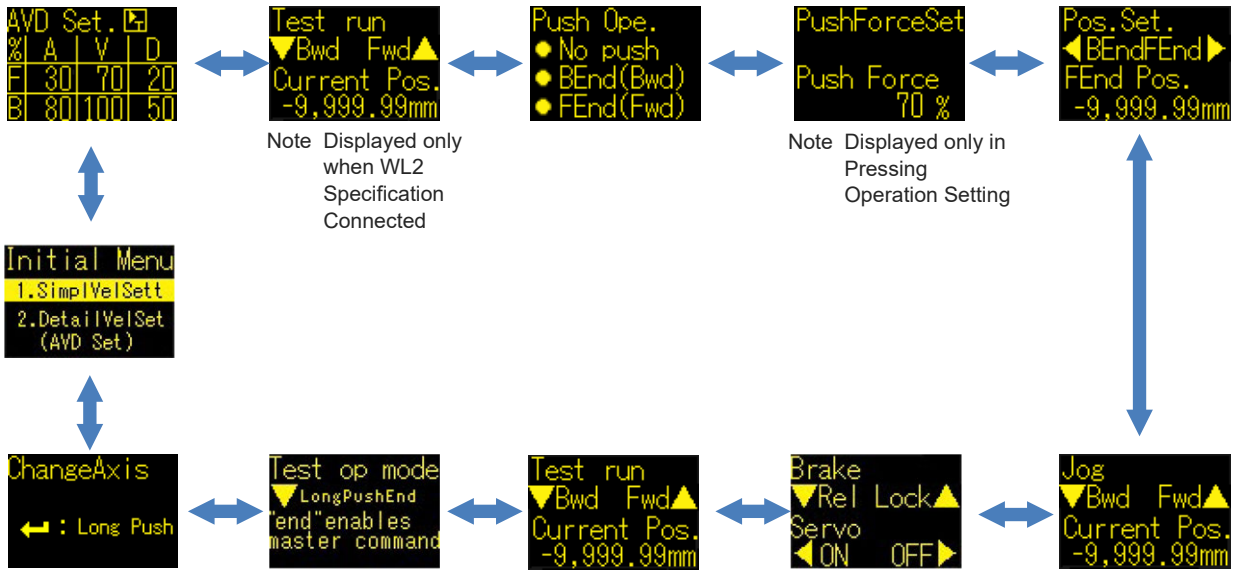
- For EC-equipped DIGITAL SPEED CONTROLLER and DIGITAL SPEED CONTROLLER TEACHING



Note Applicable in V.1.40 and after

Note Applicable in V.1.40 and after
Displayed only in Pressing Operation Setting

- For REMOTE DIGITAL SPEED CONTROLLER

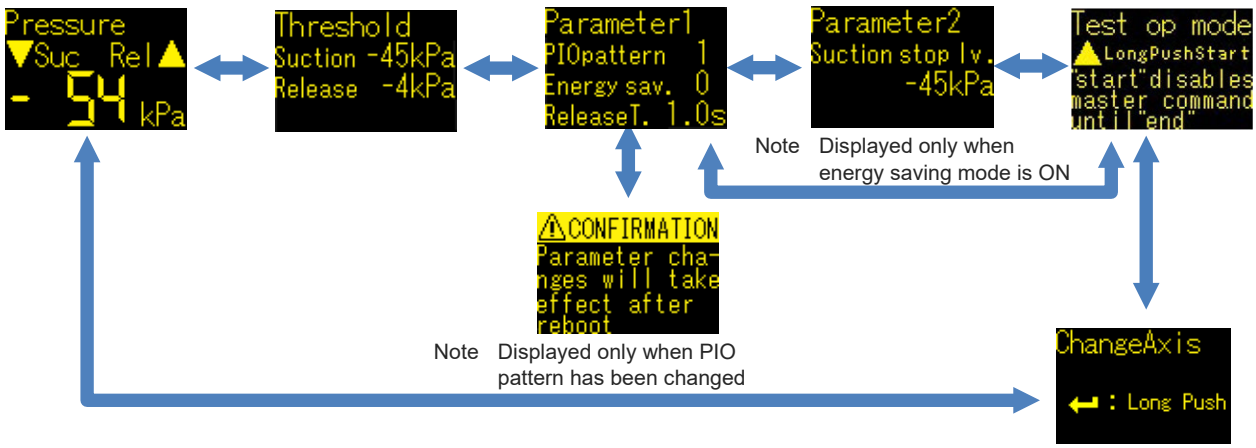


Note Displayed only when WL2 Specification Connected

Note Displayed only in Pressing Operation Setting

Note Displayed only when WL2 Specification Connected

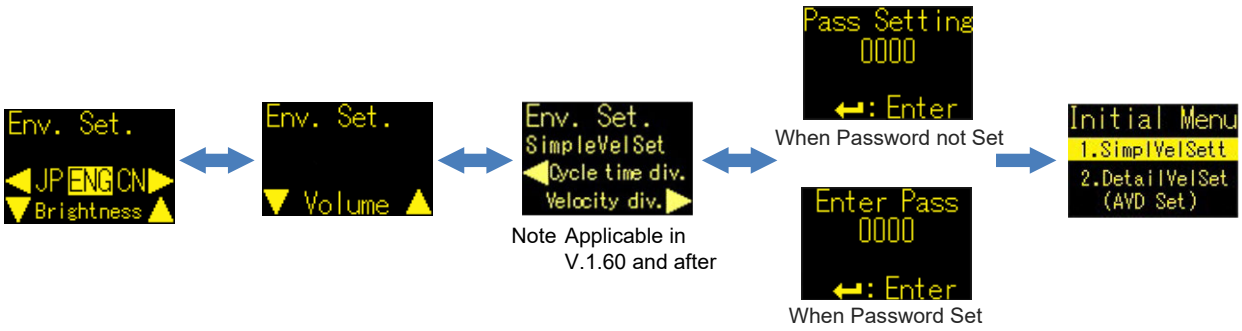
● When Connected to ROBO PUMP on REMOTE DIGITAL SPEED CONTROLLER.



3.2.4 Setting Change Mode

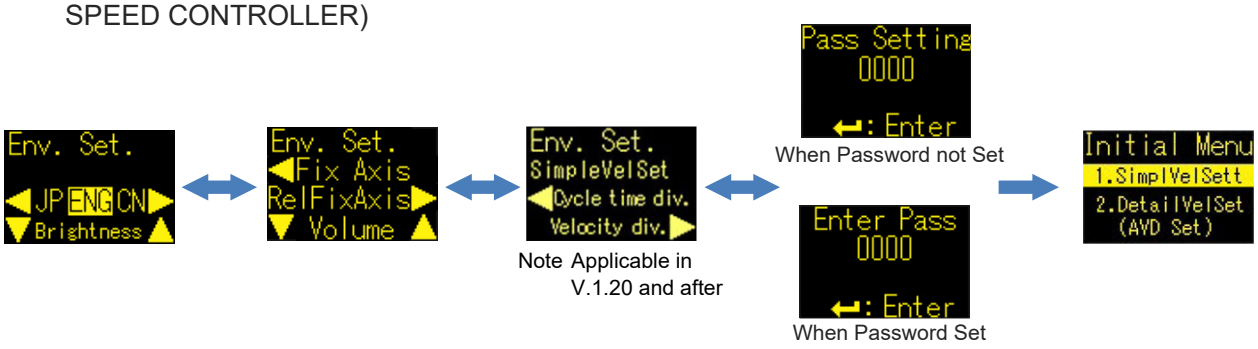
Turn on the power to DIGITAL SPEED CONTROLLER while "Enter Button" is held, and the unit should start up in the Setting Change mode. Also, the screen to be shown may differ depending on the status of DIGITAL SPEED CONTROLLER.

- After Startup (For EC-equipped DIGITAL SPEED CONTROLLER and DIGITAL SPEED CONTROLLER TEACHING)



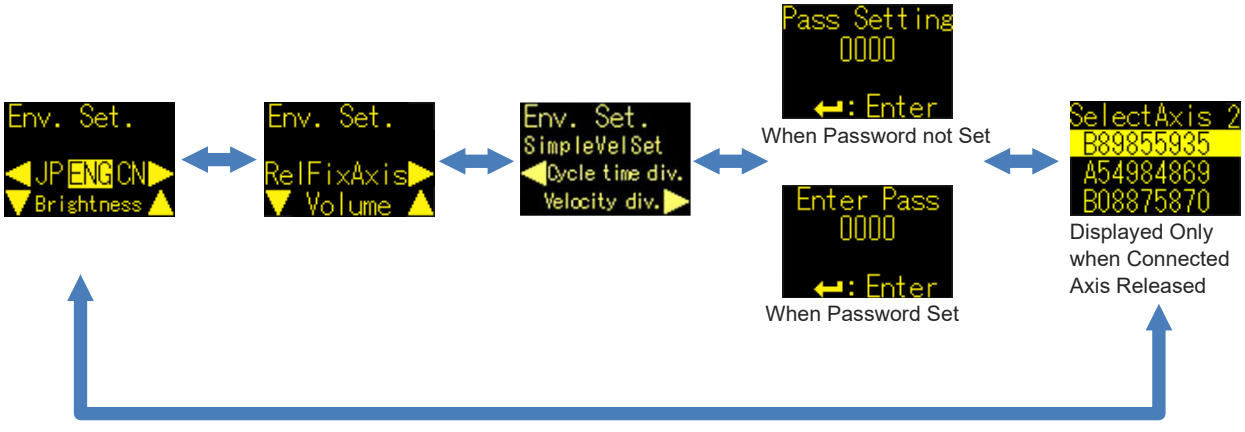
Note Applicable in V.1.60 and after

- After Startup (When Connected to Axis in Connected Axis Fixing in REMOTE DIGITAL SPEED CONTROLLER)



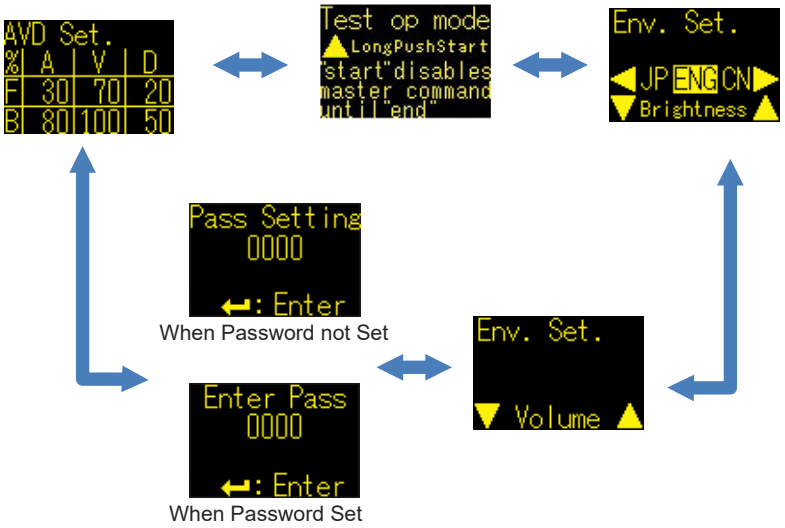
Note Applicable in V.1.20 and after

- After Startup (When in Connected Axis Released in REMOTE DIGITAL SPEED CONTROLLER or Not Connected to ELECYLINDER Indicated for Connected Axis Fixing)

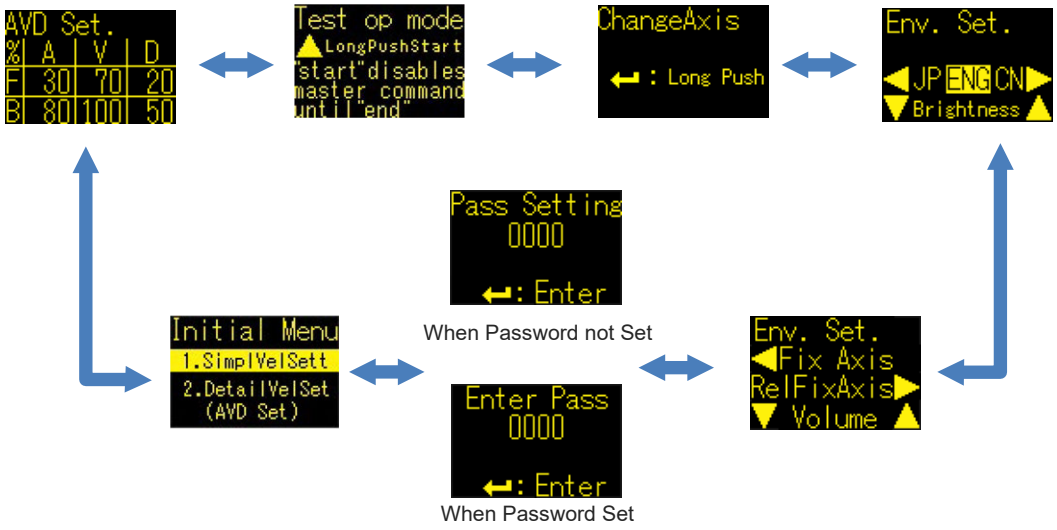


Displayed Only when Connected Axis Released

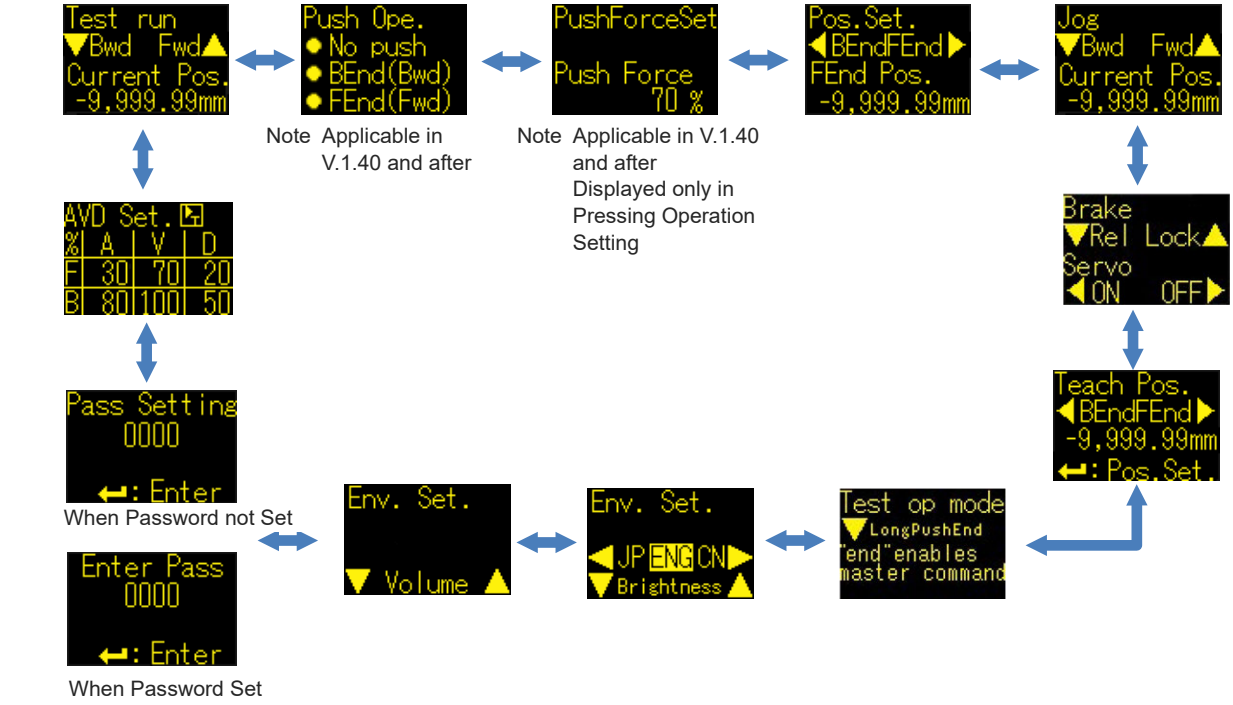
- In Normal mode (For EC-equipped DIGITAL SPEED CONTROLLER and DIGITAL SPEED CONTROLLER TEACHING)



- In Normal mode (For REMOTE DIGITAL SPEED CONTROLLER)



- In Test Run mode (For EC-equipped DIGITAL SPEED CONTROLLER and DIGITAL SPEED CONTROLLER TEACHING)



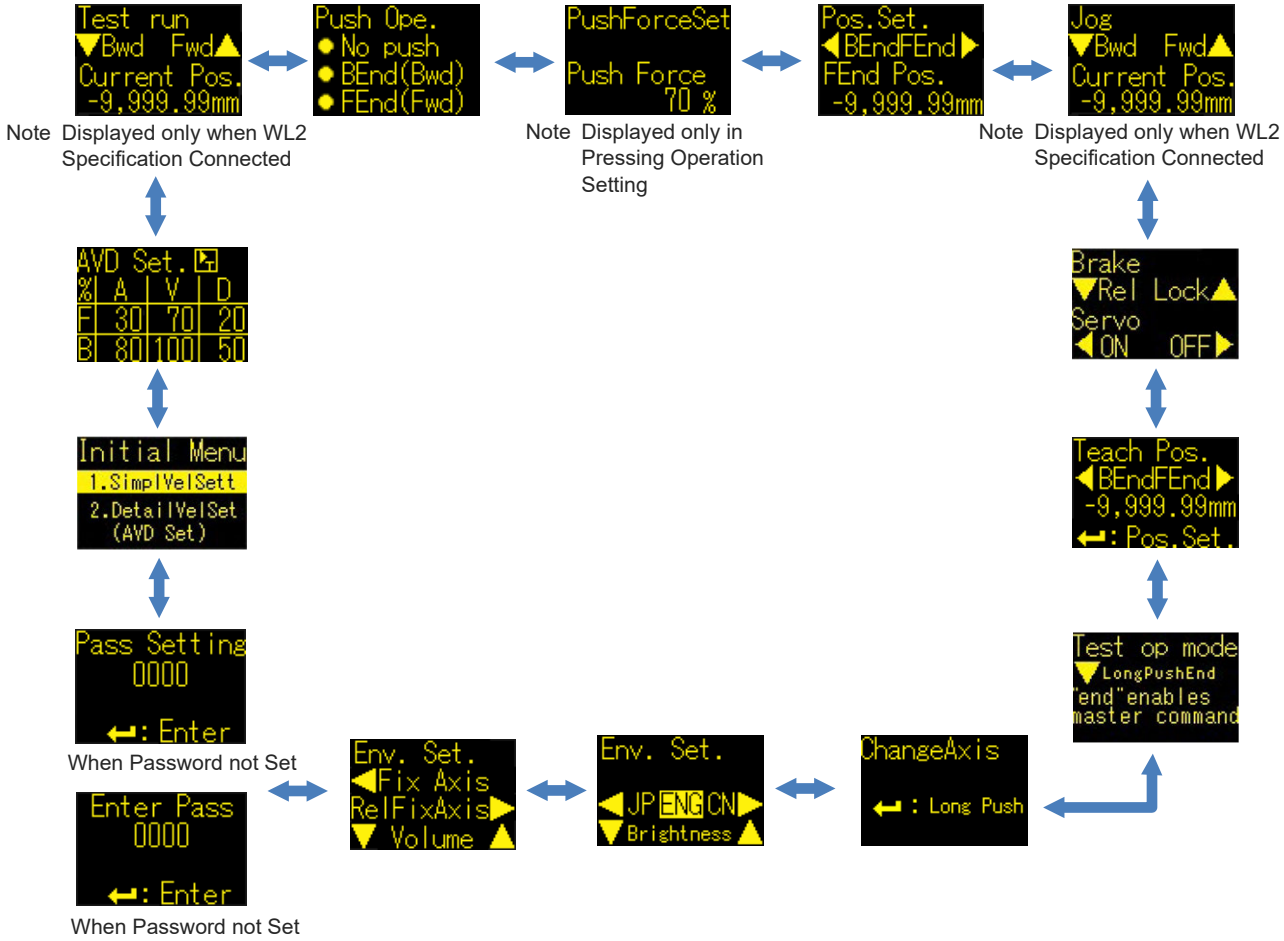
Note Applicable in V.1.40 and after

Note Applicable in V.1.40 and after
Displayed only in Pressing Operation Setting

When Password not Set

When Password Set

- In Test Run mode (For REMOTE DIGITAL SPEED CONTROLLER)



Note Displayed only when WL2 Specification Connected

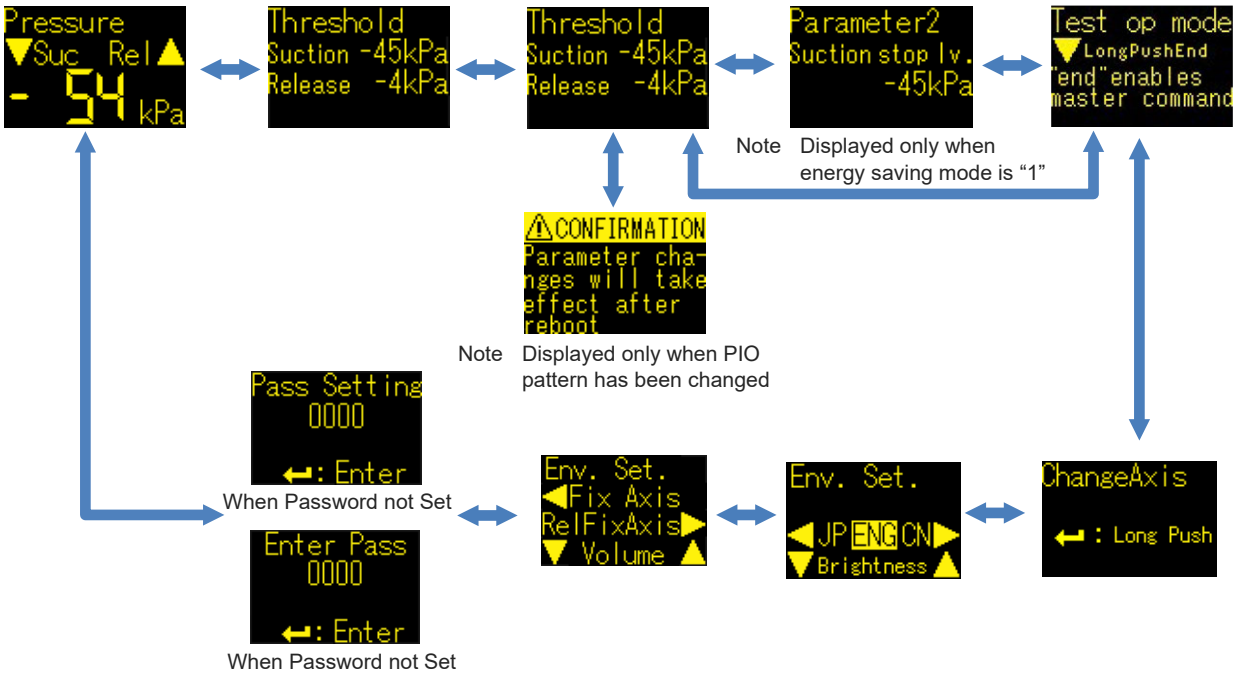
Note Displayed only in Pressing Operation Setting

Note Displayed only when WL2 Specification Connected

When Password not Set

When Password not Set

- In Test Run mode (When Connected to ROBO PUMP on REMOTE DIGITAL SPEED CONTROLLER)



3.3 Setup and Adjustment of Operational Condition (AVD) and Stop Position

3.3.1 Simple Velocity Setting

It is an operation to set up the operating conditions (Velocity) of ELECYLINDER. In the simple velocity setup, the velocity of ELECYLINDER can be set from 10 levels from Lv. 1 to Lv. 10 in a mode set in advance in [4.1.5 Selecting Simple Velocity Setup].

[Cycle Time Split Mode]

Velocity setting to divide the full stroke equally into 10 for the difference between the cycle time of operation in the maximum velocity (Lv. 10) and the cycle time of operation in 10% of the maximum velocity (Lv. 1) can be conducted.

Set the level up and the cycle time should be shortened equally for each pitch. This mode is activated on delivery.

e.g.) EC-S6L-150

Lead 3mm, Stroke 150mm, Max. Velocity 225mm/s

Level	1	2	3	4	5	6	7	8	9	10
Cycle Time [s]	6.71	6.05	5.40	4.74	4.09	3.43	2.78	2.12	1.47	0.81
Velocity [%]	10.0	11.0	12.5	14.0	16.5	19.5	24.0	32.0	47.0	100.0
Velocity [mm/s]	22.5	24.7	28.1	31.5	37.1	43.8	54.0	72.0	105.7	225.0

* When acceleration/deceleration are at 0.3G

[Velocity Split Mode]

A velocity that the maximum velocity is divided equally into 10 should be set. Set the level up and the velocity should increase for each pitch.

* Applicable Version Digital Speed Controller Teaching, EC Equipped Digital Speed Controller: V1.60 and later
Remote Speed Controller: V1.20 and later

e.g.) EC-S6L-150

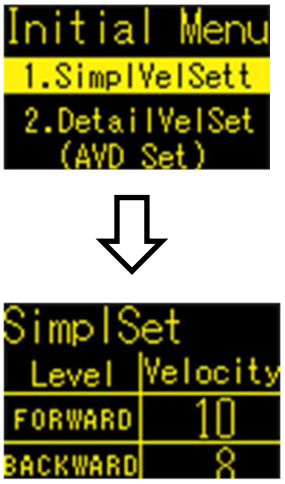
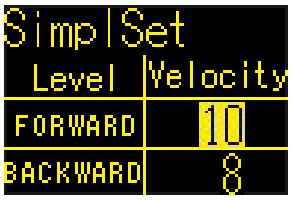
Maximum velocity 225mm/s

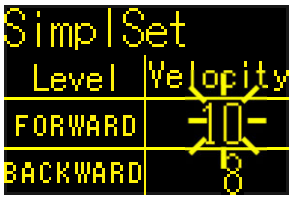
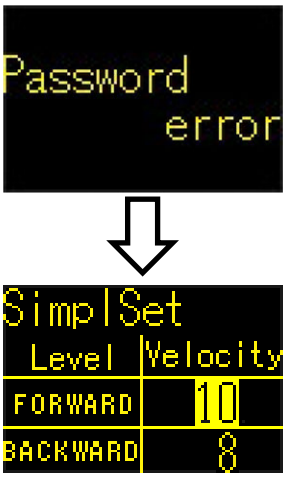
The setting velocity should be 225mm/s * 60.0% = 135.00mm/s for Lv. 6, and 225mm/s * 20.0% = 45.00mm/s.

Level	1	2	3	4	5	6	7	8	9	10
Cycle Time [s]	6.71	3.40	2.30	1.76	1.43	1.22	1.07	0.96	0.88	0.81
Velocity [%]	10	20	30	40	50	60	70	80	90	100
Velocity [mm/s]	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0	202.5	225.0

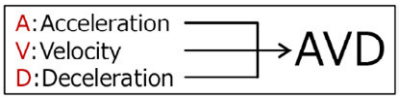
* When acceleration/deceleration are at 0.3G

Setting item	Explanation
Velocity	Set the velocity in 10 steps from 1 to 10.

Step	Operation	Window Display
1	On The Initial Menu window, Press ▲ to select “1. SimplVelSett”. Press ↵ . Simple Velocity Setting window should appear. 	
2	Press ▲ • ▼ , Highlight should move. Select the point to do setting and press ↵ . 	Highlights the selected point. 
3	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	

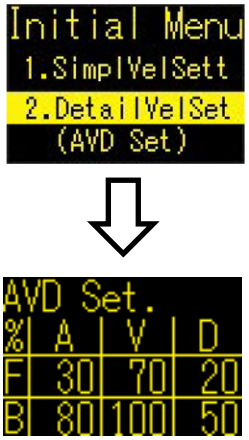
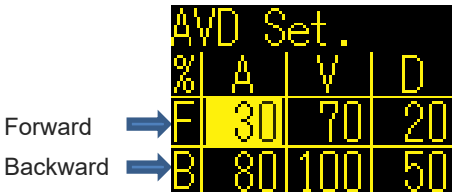
Step	Operation	Window Display
4	**When the Password entered is correct:** The selected portion should flash and the value gets available for change.	
	When the Password entered is Incorrect: An error should come up and the screen goes back to the Simple Velocity Setting window.	
5	The selected portion should flash. Press ▲ or ▼ to change the value. 	The number changes 
6	Press ↵ , A change should be made to a number. 	Indicator stops flashing and getting highlighted. 
	Press ⏻ , The number goes back to the previous with no change. 	Indicator stops flashing and getting highlighted. 

3.3.2 Detailed Velocity Setting (AVD Setting)



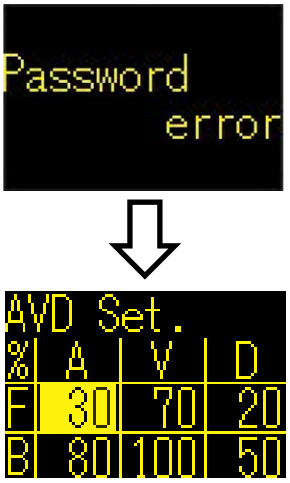
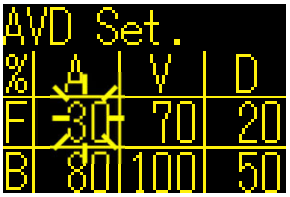
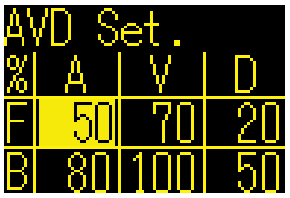
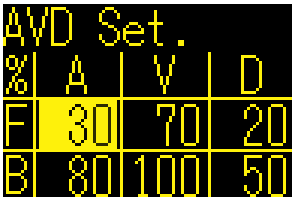
It is an operation to set up the operating conditions (AVD) of ELECYLINDER.
Refer to an instruction manual for each model for the maximum velocity and maximum acceleration/deceleration of each ELECYLINDER.

Setting item	Unit	Explanation
A: Acceleration	%	Set the acceleration between 1 and 100%.
V: Velocity	%	Set the speed between 1 and 100%.
D: Deceleration	%	Set the deceleration between 1 and 100%.

Step	Operation	Window Display
1	On The Initial Menu window, Press ▼ to select “2. DetailVelSet (AVD Set)”. Press ↵ . Detailed Velocity Setting window should appear. 	
2	Press ◀ • ▶ , Highlight should move. Select the point to do setting and press ↵ . 	Highlights the selected point. 
3	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	

<table>
<tr><th>Step</th><th>Operation</th><th>Window Display</th></tr>
<tr><td rowspan="2">4</td><td>When the Password entered is correct:

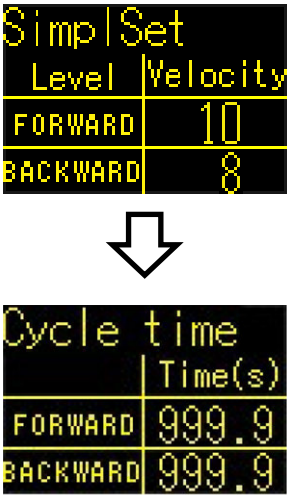
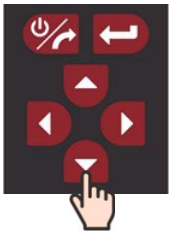
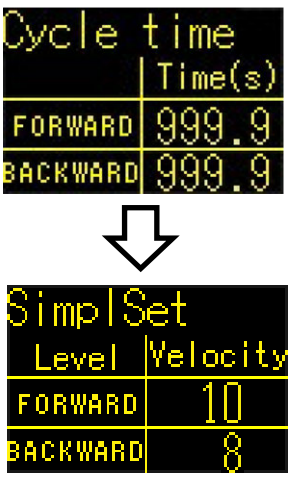
The selected portion should flash and the value gets available for change.</td><td> 
</td></tr>
<tr><td>When the Password entered is Incorrect:

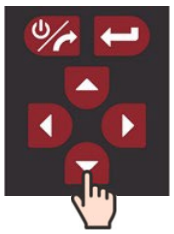
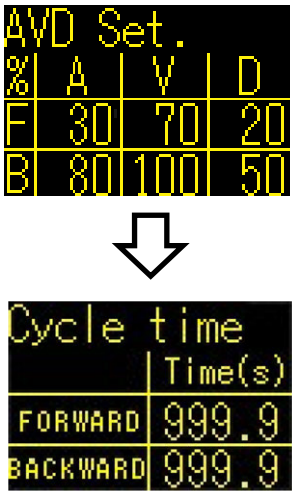
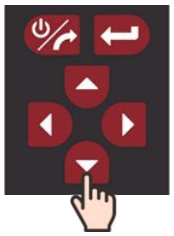
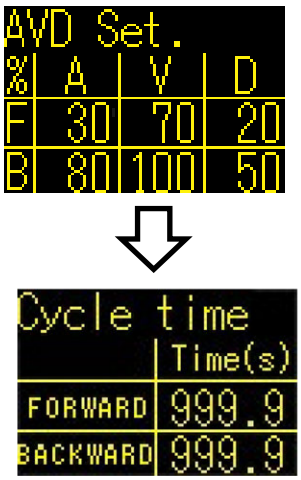
An error should come up and the screen goes back to the Detailed Velocity Setting window.</td><td> 
</td></tr>
<tr><td>5</td><td>Press  or  to change the value.
  </td><td> 
</td></tr>
<tr><td rowspan="2">6</td><td>Press  , A change should be made to a number.
  </td><td>Indicator stops flashing and getting highlighted.
 
</td></tr>
<tr><td>Press  , The number goes back to the previous with no change.
  </td><td>Indicator stops flashing and getting highlighted.
 
</td></tr>
</table>

3.3.3 Cycle Time Display

The cycle time for the forward and backward drives should be figured out from the velocity set in the Simple Setting window and the velocity/acceleration/deceleration set in the AVD setting window, and should be displayed down to the first decimal place.

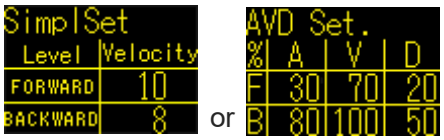
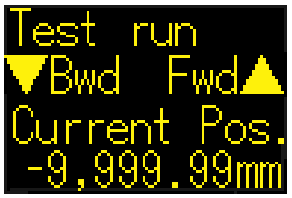
(Note) For the Simple Setting window, the acceleration and deceleration used in the calculation of the cycle time should be taken from the values set in the AVD setting window.

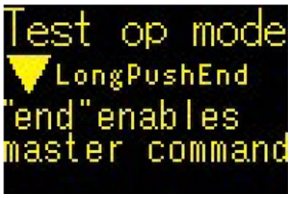
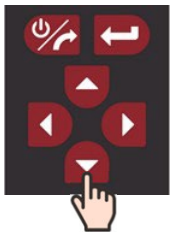
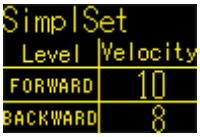
Step	Operation	Window Display
[Cycle Time Display from Simple Setting Window]		
1	Confirm that the Simple Setting window is not flashing (editing status) and press ▶ or ◀ . The display switches to the cycle time display window and the cycle time should be shown. 	
	(Note) If the backward end or forward end is set for the pressing operation, the end that is set for pressing should show negative.	
2	Press either of the buttons from ▲ • ▼ , ◀ and ▶ . The screen goes back to the Simple Setting window. 	

Step	Operation	Window Display
[Cycle Time Display from AVD Setting Window]		
1	Confirm that the Simple Setting window is not flashing (editing status) and press ▲ or ▼ . The display switches to the cycle time display window and the cycle time should be shown. 	
	(Note) The display should show - if the backward end or the forward end setting is established to the pressing operation.	
2	Press either of the buttons from ▲ • ▼ , ◀ and ▶ . The screen goes back to the AVD setting window. 	

3.3.4 Switching of Test Run Mode

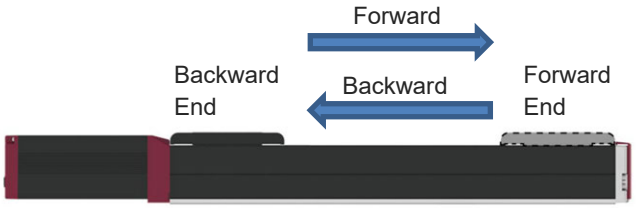
In Test Run mode, the features to run an axis should be shown and the movement commands from DIGITAL SPEED CONTROLLER should become enabled. At this time, ELECYLINDER gets into the teaching mode and any command from the host should get disabled.

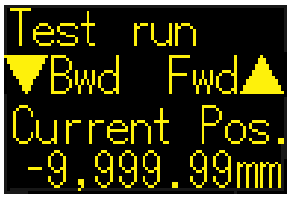
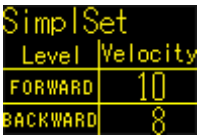
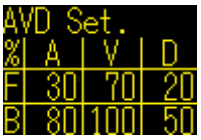
Step	Operation	Window Display
Starting Test Run Mode		
1	Select “1. SimplVelSett” or “2. DetailVelSet (AVD Set)” in the Initial Menu window.	
2	Press  to display Test Operation mode Start window. 	
3	Long-press the  button. The window switches to Test Operation mode. 	 (Note) If REMOTE DIGITAL SPEED CONTROLLER is connected to WL specification type, Pressing Operation Setting window should be displayed.

Step	Operation	Window Display
[Finish Test Operation mode]		
1	Press to display Test Operation mode End window. 	
2	Press and hold and Test Run mode should finish and it switches to Normal mode. 	 or 

3.3.5 Test Run

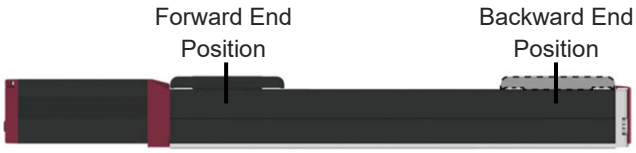
It is an operation to perform forward and backward movement operations.
After setting the operating conditions (Ten steps of velocity or AVD), it is available to check the actual operation.

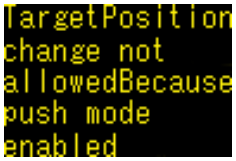


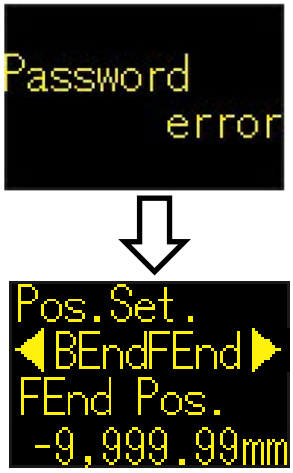
Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
2	Press and hold  or  and the moving part should move while a button is held. The home-return operation should be performed if ELECYLINDER is in a condition of the home-return incomplete. 	Current Position  (Note) If REMOTE DIGITAL SPEED CONTROLLER is connected to WL specification type, it should not be displayed.
3	Switch it over to Nomal mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	 or 

3.3.6 Position Setting

It is an operation to set up the forward end position and the backward end position.
It should be the setting at the pressing start point when the pressing operation is set up.



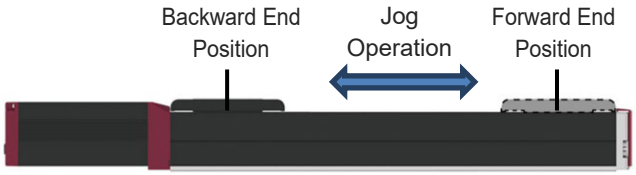
Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
2	Press  to display Position Setting window. 	  Rotary Type
3	Press  or  to select the forward end or backward end, and press  . 	An arrow on a direction selected should flash.   When Pressing Operation Setting
	(Note) When the pressing operation is set, the screen shown on the right should be displayed on DIGITAL SPEED CONTROLLER with V1.30 or earlier, and the setting should not be able to be changed.	
4	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	

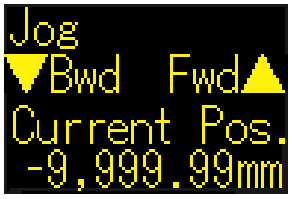
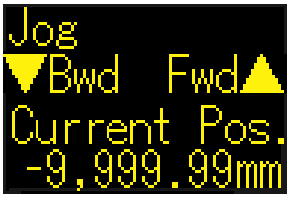
Step	Operation	Window Display
5	**When Password is Correct:** Position setting comes available.	
	When Password is Incorrect: An error should be displayed and the screen goes back to the Position Setting window.	
6	"Digit Setting" and "Number Setting" in order to establish the position setting. [Digit Setting] Press ◀ or ▶ to select a digit. [Number Setting] Press ▲ Number up) or ▼ (Number down) to set a number to the selected digit. 	Setting Position ⇒  Setting Position ⇒ 

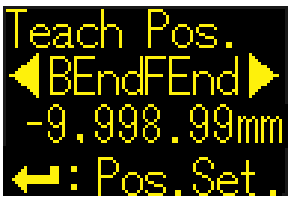
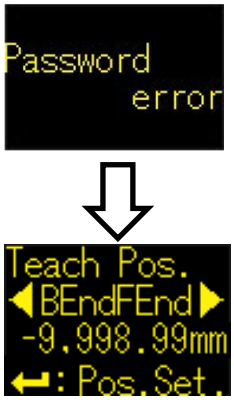
Step	Operation	Window Display
7	Press , A change should be made to a number. 	Setting Position → 
	Press , The number goes back to the previous with no change. 	
8	Finish Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	

3.3.7 Jog Operation and Current Position Reading

It is an operation to move ELECYLINDER with the jog operation and set the current position to the forward end position and the backward end position.

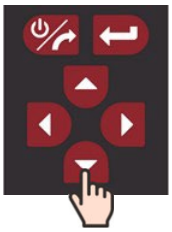


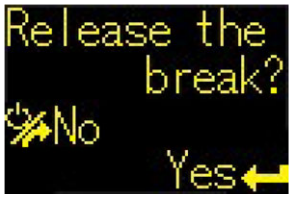
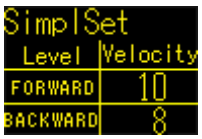
Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
[Jog Operation]		
2	Press  to display Jog window. 	 (Note) If REMOTE DIGITAL SPEED CONTROLLER is connected to WL specification type, it should not be displayed.
3	Press and hold either  (Forward) or  (Back). Inching operation should start by 0.01mm at first. Keep pressing the button, and it starts from 0.01mm/s and the speed gradually escalates up to 100mm/s at the maximum. Release the button and it starts decelerating at that point and will stop. 	Current Position  

Step	Operation	Window Display
[Reading of Position]		
2	Press to display Current Position Reading window. 	
3	Press or to select a direction to read in the current position and press .	An arrow on a direction selected should flash. Reading Position 
4	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	
5	**When Password is Correct:** The current position should be registered at the stopped position in the selected side.	
	When Password is Incorrect: An error should be displayed and the screen goes back to the Current Position Reading window.	
6	Finish Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	

3.3.8 Brake Release, Motor Power ON/OFF

It is an operation to release the brake or turn ON/OFF the motor power.

Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
2	Press (Next Page) to display Brake Release window. 	
[Brake lock]		
3	Press (Lock). The brake should get locked. 	
[Brake Release]		
4	Press (Brake release). 	

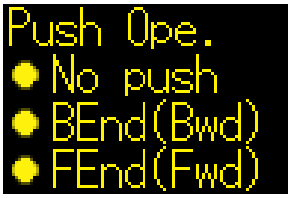
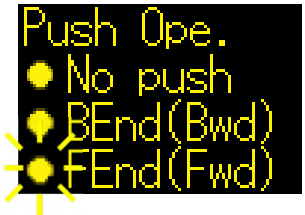
Step	Operation	Window Display
5	A confirmation window for brake release should appear. Press  to the brake should get released.  Press  to the setting should be cancelled. 	
[Motor Power ON]		
6	Press  (Motor Power ON). The servo should get turned ON. 	
[Motor Power OFF]		
7	Press  (Motor Power OFF). The servo should get turned OFF. 	
8	Finish Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	 or 

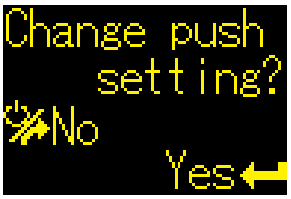
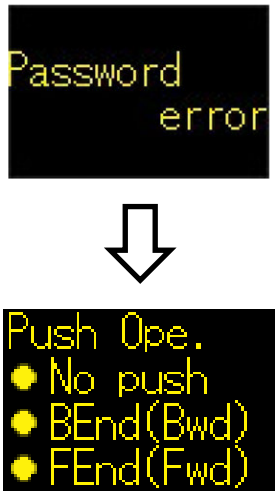
3.3.9 Pressing Operation Setting

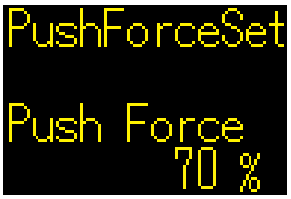
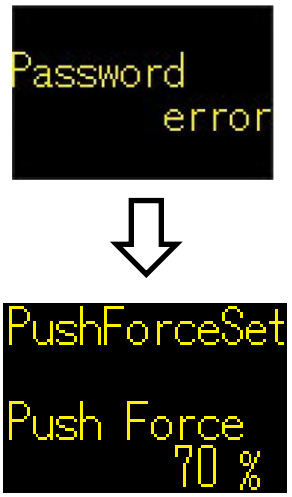
For details of the pressing operation, refer to an instruction manual of each model of ELECYLINDER.

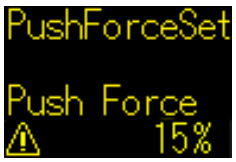
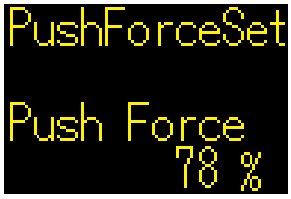
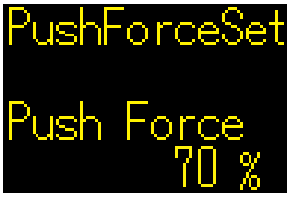
Caution

- When the pressing velocity is less than 20mm/s, the pressing force gets unstable and may not operate as expected.
- DIGITAL SPEED CONTROLLER with the version 1.30 or below is not applicable for setup of the pressing operation. Consult with IAI.
- The pressing operation setting window should not be displayed in the EC belt type or EC large slider type that the pressing setting is not available in the specifications.

Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
Pressing operation setting		
2	Press to display Pressing Operation Setting window. 	
3	Press or to select a direction pressing and press . 	

Step	Operation	Window Display
4	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	
5	**When Password is Correct:** The Change Pressing Setting window should be displayed. Press ↵ and the pressing operation should get set up. 	
	When Password is Incorrect: An error should be displayed and the screen goes back to Pressing Operation Setting window.	

Step	Operation	Window Display
Setting of Pressing Force		
6	Press  while the pressing operation is set to show the Set up Pressing Force window, and press  .	
7	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	
8	**When Password is Correct:** The Set up Pressing Force window should appear and the value should flash.	
	When Password is Incorrect: An error should be displayed and the screen goes back to Pressing Operation Setting window.	

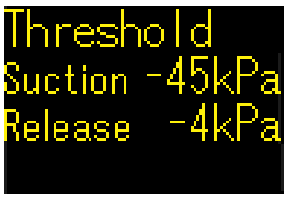
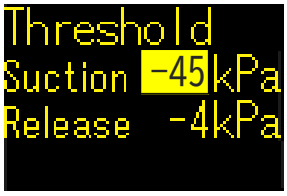
Step	Operation	Window Display
9	Press ▲ or ▼ to set up the value.	
	(Note) The pressing force may fluctuate if it is set in the recommended pressing force range (below 20%).	 Below 20%
10	Press ↵ , A change should be made to a number. 	
	Press ⏻ , The number goes back to the previous with no change. 	
11	Finish Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	

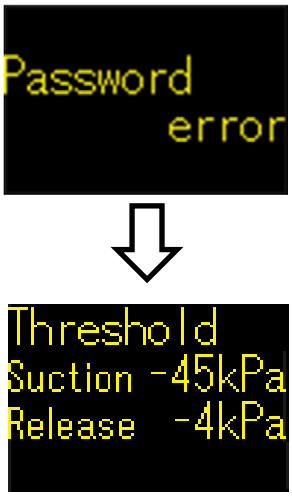
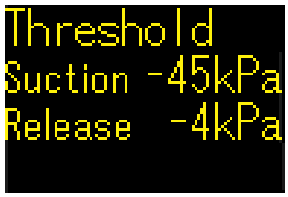
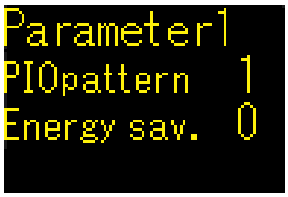
Caution

- When the pressing force setting is decreased from a value at 21% or more with "Down Button" ▼ being pressed, it will not go down across from 20% to 19% unless you release the button once and press "Down Button" ▼ again to get into the non-recommended range.

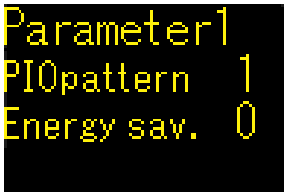
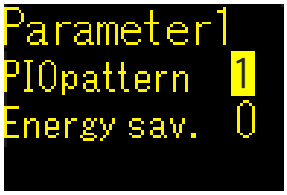
3.4 ROBO PUMO setting

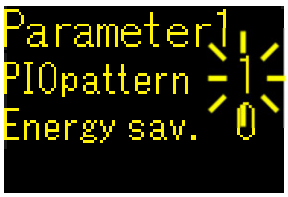
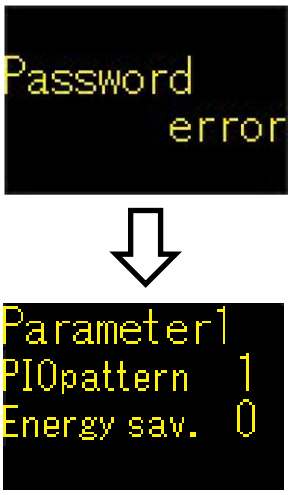
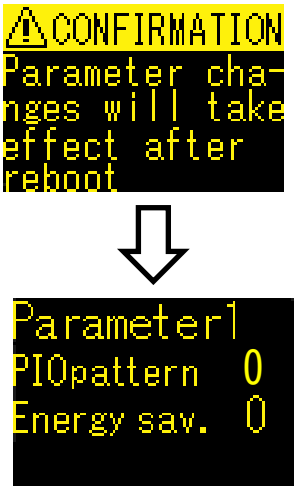
3.4.1 Pressure setting

Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
2	Press  to display Pressure Setting window. 	
3	Press  or  to select a suction or release and press  . 	
4	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	

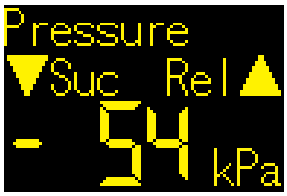
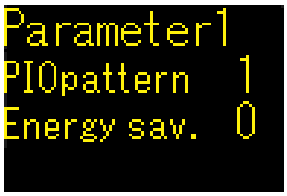
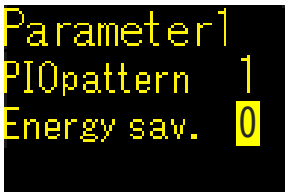
Step	Operation	Window Display
5	**When Password is Correct:** The pressure setting change window should get displayed again and the value should blink.	
	When Password is Incorrect: An error should be displayed and the screen goes back to Pressure setting window.	
6	Press ▲ or ▼ to set up the value.	
7	Press ↵ , A change should be made to a number. 	
	Press ⏻ , the window should shift to Parameter change window. 	

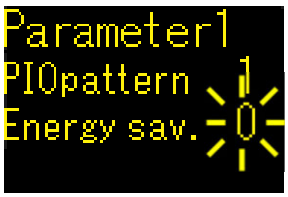
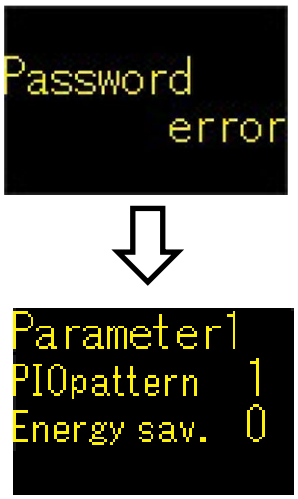
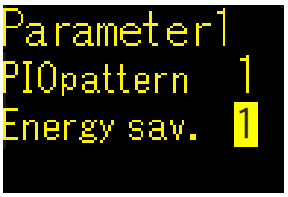
3.4.2 PIO Pattern setting

Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
2	Press  to display parameter change 1 window. 	
3	Press  or  to select a PIO pattern and press  . 	
4	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	

Step	Operation	Window Display
5	**When Password is Correct:** The parameter change 1 window should get displayed again and the value should blink.	
	When Password is Incorrect: An error should be displayed and the screen goes back to prameter change 1 window.	
6	Press  or  to set up the value. For the details of PIO pattern, refer to [ROBO PUMP instruction manual (ME3827)].	
7	Press  and a confirmation window should come up. Press  , A change should be made to a number. Reboot ROBO PUMP and the parameter change should be reflected.	

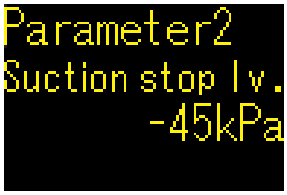
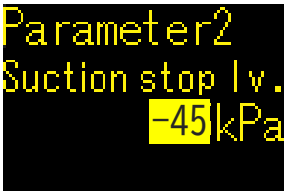
3.4.3 Energy-saving mode setting

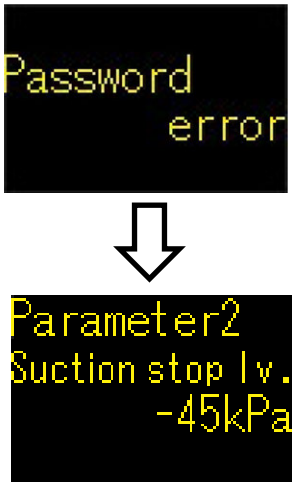
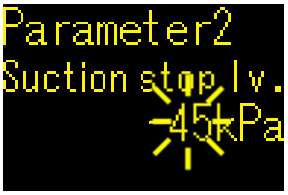
Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
2	Press  to display parameter change 1 window. 	
3	Press  or  to select a Energy-saving mode and press  . 	
4	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	

Step	Operation	Window Display
5	**When Password is Correct:** The parameter change 1 window should get displayed again and the value should blink.	
	When Password is Incorrect: An error should be displayed and the screen goes back to prameter change 1 window.	
6	Press or to set up the value. For the details of Energy-saving mode, refer to [ROBO PUMP instruction manual (ME3827)].	
7	Press , A change should be made to a number.	

3.4.4 Suction stop level setting

when the Energy-saving mode is enabled, the setting of the suction stop level can be established. For the details of suction stop level, refer to [ROBO PUMP instruction manual (ME3827)].

Step	Operation	Window Display
1	Switch it over to Test Run mode. For how to switch it over, refer to [3.3.4 Switching of Test Run mode].	
2	Press to display parameter change 2 window. 	
3	Press or to select a suction stop level and press . 	
4	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	

Step	Operation	Window Display
5	**When Password is Correct:** The parameter change 2 window should get displayed again and the value should blink.	
	When Password is Incorrect: An error should be displayed and the screen goes back to prameter change 2 window.	
6	Press ▲ or ▼ to set up the value.	
7	Press ↵ , A change should be made to a number.	

3.5 Other Features

3.5.1 Buzzer

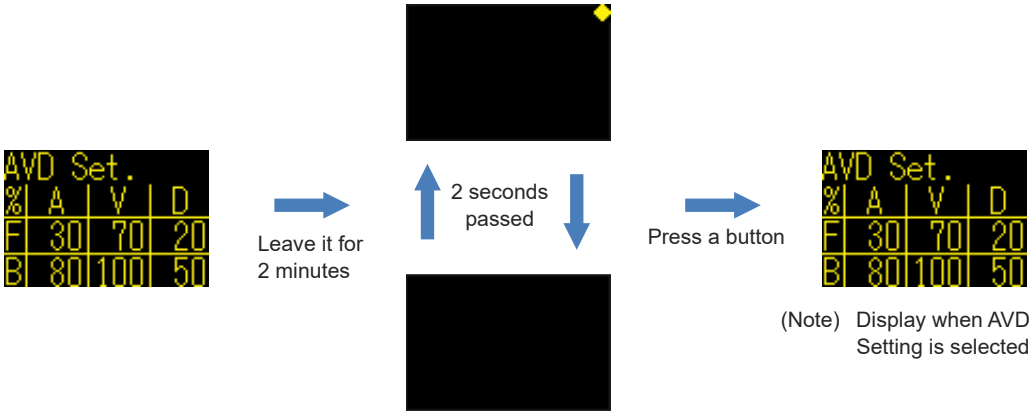
DIGITAL SPEED CONTROLLER generates a buzzer in button operation or for warning in wrong input.
The type of buzzer and the condition when each type of buzzer is generated are described as follows:

		Condition of Buzzer Generation
Type of Sound	Warning Sound (Pip Pip Pip)	• When a button is pressed during operation locked • Target position was attempted to be edited towards a position set as the pressing position in advance • A value that exceeds the software stroke limit was attempt to input at position setting • Connection attempt to ELECYLINDER not available for wireless connection of REMOTE DIGITAL SPEED CONTROLLER (disconnected, in wired connection) • was held in the Change Connected Axis window during the wireless connected axis fixing on REMOTE DIGITAL SPEED CONTROLLER • Read-in not available while the read-in of the current position is conducted • Password error
	Long Sound (Peep)	• Normal mode and trial run mode switched • Operation lock was locked and released • Alarm reset command sent • Read-in of current position conducted • At password setting, password compulsorily released • Selected axis fixed / axis fixing released • "Power / Display Switchover Button" was pressed and the wireless axis was searched again in the Select Wireless Axis window or Selected Axis Fixing Warning window
	Normal Sound (Pip)	• Button was pressed for other reasons apart from above

Refer to [4.1.3 Operation Volume Tuning] for how to change volume of buzzer.

3.5.2 Power-Off Feature

DIGITAL SPEED CONTROLLER should turn off the screen after 2 minutes has passed with no operation in the initial menu window (straight after startup) or in "Normal mode". While the screen is turned off, a small dot mark should turn on and off in 2-second pitch on the right top of the screen.
When any button is pressed while the power is turned off, the screen should come back on. The operation of a button when it is pressed this time would not affect any operation such as window transition, but it just turns on the screen.
Note that the screen would not turn off during "Test Operation mode", "Other Tool Connecting" or "Alarm Generated". Also, when REMOTE DIGITAL SPEED CONTROLLER is started up in "Setting Change mode", the screen would not be turned off in the Environment Setting window while an axis is not selected or in the Password Setting window.



3.5.3 Operation Lock Feature

There is the operation lock feature equipped in order to make the following two points possible.

- To avoid wrong operation with a touch of a button unexpectedly on DIGITAL SPEED CONTROLLER.
- To make it accessible and available to edit data only for person in charge.

While in the Simple Velocity Setting window or AVD Setting window in the normal mode, press and hold "Enter Button" , "Right Button" and "Down Button" for approximately 2 seconds together, and the mode switches to the operation lock / operation lock release.
While the operation lock is activated, an icon shows up on the right top of the panel.
When a button is pressed during the operation lock, a window to show that it is in the operation lock and it turns back to the previous window in 3 seconds.
Also, the status of operation lock should be retained to the next startup even if the power is turned off.

Display while Operation Locked　　Operation Locked

DIGITAL SPEED CONTROLLER

Chapter 4

Environment Setting

4.1 Environment Setting ····· 4-1
4.1.1 Display of Environment Setting Mode ····· 4-1
4.1.2 Language Setting, Brightness Setting ····· 4-2
4.1.3 Operation Volume Tuning ····· 4-5
4.1.4 Connected Axis Fixing / Axis Fixing Release ····· 4-6
4.1.5 Selecting Simple Velocity Setup ····· 4-8
4.1.6 Password Setting / Release ····· 4-9
4.1.7 How to Input Password ····· 4-12

4.1 Environment Setting

4.1.1 Display of Environment Setting Mode

The operation sounds, displayed language and password settings on DIGITAL SPEED CONTROLLER can be performed. The process to display the Environment Setting mode and the setting items are as shown below.

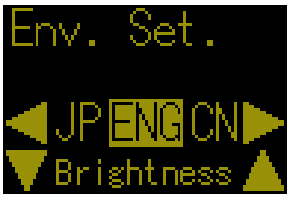
Item	Operation / Window Display
Start Setting mode	Press  while the power to DIGITAL SPEED CONTROLLER is off and press and hold  before [IAI] is displayed.
Language Switchover, Luminance Tuning	
Operation Volume Tuning	
Operation Sound Tuning Connected Axis Fixing / Axis Fixing Release (Dedicated for REMOTE DIGITAL SPEED CONTROLLER)	 When Connected to ELECYLINDER  When Not Connected to ELECYLINDER
Selecting Simple Velocity Setup	
Password setting	When Password Set    When Password not Set 
Finish Setting Mode	Press and hold  to turn off the power to DIGITAL SPEED CONTROLLER and press  again to turn on the power to DIGITAL SPEED CONTROLLER.

4.1.2 Language Setting, Brightness Setting

It is an operation to switch the language between Japanese, English and Chinese, and to adjust the brightness.

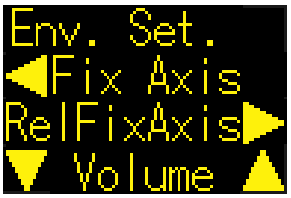
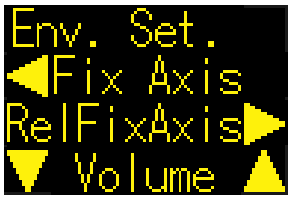
Step	Operation	Window Display
1	Start up the environment setting mode of DIGITAL SPEED CONTROLLER.	
[Switching to Japanese]		
2	Press ◀ and select “JP”. The display will be switched to the Japanese language window. 	
3	Long-press ⏻ to turn OFF the power to the DIGITAL SPEED CONTROLLER. Press ⏻ again to turn the power back ON to the DIGITAL SPEED CONTROLLER and the language switches to Japanese. 	

Step	Operation	Window Display
[Switching to English]		
2	Press ◀ or ▶ and select “ENG”. The display will be switched to the English language window. 	
3	Long-press ⏻ to turn OFF the power to the DIGITAL SPEED CONTROLLER. Press ⏻ again to turn the power back ON to the DIGITAL SPEED CONTROLLER and the language switches to English. 	
[Switching to Chinese]		
2	Press ▶ and select “CN”. The display will be switched to the Chinese language window. 	
3	Long-press ⏻ to turn OFF the power to the DIGITAL SPEED CONTROLLER. Press ⏻ again to turn the power back ON to the DIGITAL SPEED CONTROLLER and the language switches to Chinese. 	

Step	Operation	Window Display
[Brightness Setting]		
2	Press either (Brightness up) or (Brightness down) to adjust the brightness. 	
3	Long-press to turn OFF the power to the DIGITAL SPEED CONTROLLER. Press again to turn the power back ON to the DIGITAL SPEED CONTROLLER and the brightness should be set to the adjusted. 	

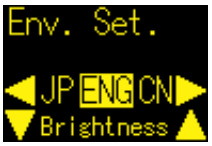
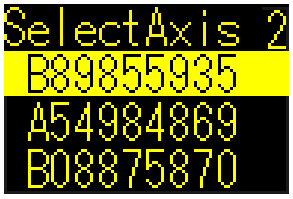
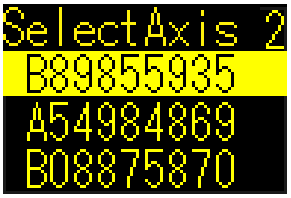
4.1.3 Operation Volume Tuning

Volume when operating DIGITAL SPEED CONTROLLER should be set up. The volume can be selected from four levels, mute, small, medium and large.

Step	Operation	Window Display
1	Start up the environment setting mode of DIGITAL SPEED CONTROLLER	
2	Press  to switch window. 	
[Operation Volume Tuning]		
3	Press  or  . Volume changes. 	
4	Long-press  to turn OFF the power to the DIGITAL SPEED CONTROLLER. Press  again to turn the power back ON to the DIGITAL SPEED CONTROLLER and the volume should be set to the adjusted. 	

4.1.4 Connected Axis Fixing / Axis Fixing Release

It is a setting to connect only to a specific axis in REMOTE DIGITAL SPEED CONTROLLER. While an axis is fixed, the Select Wireless Axis window should not be displayed at startup. Also the connected axis cannot be changed in the Change Connected Axis window.

Step	Operation	Window Display
1	Start up the environment setting mode of DIGITAL SPEED CONTROLLER	
[How to Fix Connected Axis]		
2	Press  to display the Select Wireless Axis window. 	
3	Select ELECYLINDER to connect with  or  and press  .	
4	Press  to display the Environment Setting window.	
5	Press and hold  to fix the connected axis. 	

Step	Operation	Window Display
[How to Release Axis Fixing]		
2	Press to display the Select Wireless Axis window. 	 (Note) When an axis in the connected axis fixing is off, "◀ Connected Axis Fixing" should not be displayed.
3	Press and hold to release the axis fixing. 	

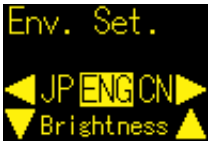
4.1.5 Selecting Simple Velocity Setup

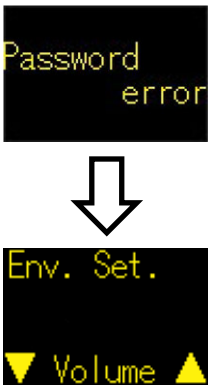
It is an operation to set up the operating conditions (Velocity) of ELECYLINDER. Selection is available from "Cycle Time Split Mode" and "Velocity Split Mode".
(∗Applicable Version　Digital Speed Controller Teaching, EC Equipped Digital Speed Controller: V1.60 and later, Remote Speed Controller: V1.20 and later)
"Cycle Time Split Mode" is set on delivery.

Step	Operation	Window Display
1	Start up the environment setting mode of DIGITAL SPEED CONTROLLER.	
[How to Select Mode]		
2	Press to display Selecting Simple Velocity Setup Window. 	
3	Select a mode to use with and . An arrow on the selected mode should flash.	
4	Long-press to turn OFF the power to the DIGITAL SPEED CONTROLLER. Press again to turn on the power to the digital speed controller, and the mode should be changed to that selected in the simple velocity setup. 	

4.1.6 Password Setting / Release

It is operation to set up and release the password. It should be set undefined (0000) on delivery.

Step	Operation	Window Display
1	Start up the environment setting mode of DIGITAL SPEED CONTROLLER.	
[When Password Undefined (0000)]		
2	Press  to display Password Setting Window. 	
3	Have [Digit Setting] and [Number Setting] conducted to set up the password. **[Digit Setting]** Press  or  to select a digit. **[Number Setting]** Press  (Number up) or  (Number down) to set a number to the selected digit. 	
4	Press  and the password should be set and the Initial Menu window should be displayed. 	 (Note) The environment setting window should be displayed in REMOTE DIGITAL SPEED CONTROLLER when it is not connected to ELECYLINDER.

Step	Operation	Window Display
[When Password Set (Other than 0000)]		
2	If there is a password set, the password input window should show up. Refer to [4.1.7 How to Input Password] for how to input a password.	
When Password is Incorrect		
3	An error should be displayed and the screen goes back to the Environment Setting window.	
When Password is Correct		
3	Password Setting window appears.	

Step	Operation	Window Display
4	Have [Digit Setting] and [Number Setting] conducted to set up the password. **[Digit Setting]** Press ◀ or ▶ to select a digit. **[Number Setting]** Press ▲ (Number down) or ▼ (Number up) to set a number to the selected digit.  Input "0000" when a password is not to be set.	
5	Press ↵ and the password should be set and the Initial Menu window should be displayed. 	 (Note) The environment setting window should be displayed in REMOTE DIGITAL SPEED CONTROLLER when it is not connected to ELECYLINDER.

4.1.7 How to Input Password

When it is necessary to set up ELECYLINDER while the password is set (other than 0000), it is necessary to input the password.

Step	Operation	Window Display
1	When it is necessary to change the setting while the password is set, the Password Input window is to be displayed.	
2	Have [Digit Setting] and [Number Setting] conducted, and press to enter the password. **[Digit Setting]** Press or to select a digit. **[Number Setting]** Press (Number down) or (Number up) to set a number to the selected digit. 	

DIGITAL SPEED CONTROLLER

Chapter 5

Troubleshooting

5.1 Troubleshooting Confirmations ····· 5-1
5.1.1 Communication Error between Panel and Controller ····· 5-1
5.1.2 Wireless Communication Error ····· 5-1
5.1.3 Connected to Other Tool ····· 5-2
5.1.4 Error Display ····· 5-2
5.1.5 Error Display List ····· 5-3
5.1.6 ROBO PUMP Alarm ····· 5-4

5.1 Troubleshooting Confirmations

5.1.1 Communication Error between Panel and Controller

It should be displayed when a communication error is occurred between DIGITAL SPEED CONTROLLER and ELECYLINDER.

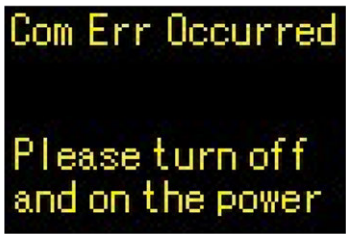
Cause of Occurrence

- Communication has failed including retries due to impact of such as noise.
- A connector is not connected appropriately.
- A signal line is broken.

When this alarm is being occurred, transition to another window will not be available as the communication with ELECYLINDER should be cut off and acquirement of data is unavailable. When this error has occurred, press and hold "Power / Display Switchover Button" to turn off the power to DIGITAL SPEED CONTROLLER once, and reboot DIGITAL SPEED CONTROLLER.

5.1.2 Wireless Communication Error

It should be displayed when a wireless communication error has occurred between REMOTE DIGITAL SPEED CONTROLLER and ELECYLINDER.
Reboot the power to REMOTE DIGITAL SPEED CONTROLLER when this error has occurred.

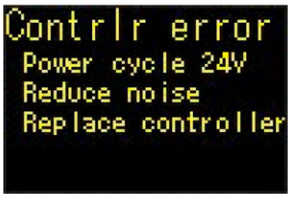


5.1.3 Connected to Other Tool

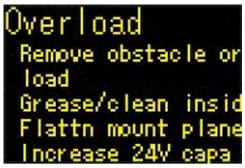
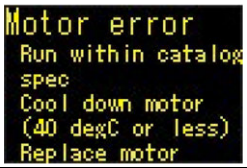
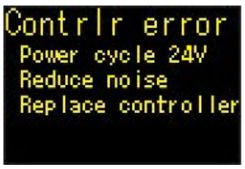
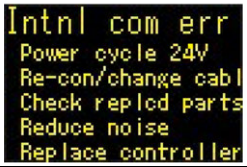
There should be an error window appeared when a tool in higher priority is connected during operation on such as EC-equipped DIGITAL SPEED CONTROLLER and REMOTE DIGITAL SPEED CONTROLLER. Once the connection of another tool is disconnected, EC-equipped DIGITAL SPEED CONTROLLER should get into the normal operation through the initializing process, and should transit to the initial menu window automatically.
For REMOTE DIGITAL SPEED CONTROLLER, press either of "Power / Display Switchover Button" or "Enter Button" to reboot, and the screen should transit to the Select Wireless Axis window automatically.
Refer to [3.1.1 Priority in Connection] for the priority in communication.

5.1.4 Error Display

Once an alarm is generated in ELECYLINDER, the content of the alarm should be displayed in the screen of DIGITAL SPEED CONTROLLER. Refer to [ELECYLINDER Electricity Section Instruction Manual] for details of the alarm levels and alarm codes.

Step	Operation	Window Display
1	If it is an alarm in the operation release level, press and hold and the alarm should be released. 	Alarm Display 
2	Press any of , , or and the alarm code should be displayed. 	 * Press any of , , or and it returns to the alarm display window.

5.1.5 Error Display List

Error Display	Window Display
Alarm group A: Overload	
Alarm group B: Motor abnormality	
Alarm group C: Controller abnormality	
Alarm group D: Internal communication abnormality	
Alarm group E: Power supply voltage abnormality	
Alarm group Other	
Alarm group warning: Overload warning	
Alarm group warning: Total travel count	
Alarm group warning: Total travel distance	

5.1.6 ROBO PUMP Alarm

Only the alarm detail window should be displayed when there is an alarm of ROBO PUMP generated. For the details of alarm code, refer to [ROBO PUMP Instruction manual (ME3827)]. For an alarm in the operation release level, the alarm can be reset by pressing and holding the "enter button"  .

DIGITAL SPEED CONTROLLER

Chapter 6

Warranty

6.1 Warranty Period ·····6-1
6.2 Scope of the Warranty ·····6-1
6.3 Honoring the Warranty·····6-1
6.4 Limited Liability ·····6-2
6.5 Conformance with Applicable Standards/Regulations, etc., and Application Conditions ·····6-2
6.6 Other Items Excluded from Warranty ·····6-2

6.1 Warranty Period

Whichever of the following periods is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to a specified location
- 2,500 operational hours

6.2 Scope of the Warranty

Our products are covered by warranty when all of the following conditions are met.
Faulty products covered by warranty will be replaced or repaired free of charge:

(1) The breakdown or malfunction in question pertains to our product as delivered by IAI or our authorized dealer.
(2) The breakdown or malfunction in question occurred during the warranty period.
(3) The breakdown or malfunction in question occurred while the product was in use for an appropriate purpose under the operating conditions and operating environment specified in the instruction manual and catalog.
(4) The breakdown or malfunction in question was caused by a specification defect, malfunction, or poor product quality.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

- Anything other than our product
- Modification or repair performed by a party other than IAI (unless approved by IAI)
- Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
- Natural disaster, unnatural disaster, incident or accident for which we are not liable
- Natural fading of paint or other symptoms of aging
- Wear, depletion or other expected results of use
- Operation noise, vibration or other subjective sensations not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

6.3 Honoring the Warranty

As a rule, the product must be consigned to IAI for repair under warranty.

6.4 Limited Liability

(1) We assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
(2) We assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

6.5 Conformance with Applicable Standards/Regulations, etc., and Application Conditions

(1) If our product is combined with another product or any system, equipment, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules.
The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc.
In such a case we assume no liability for the conformance of our product with the applicable standards, etc.
(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications.
Contact IAI if you must use our product for any of these applications:
- Medical equipment used to maintain, control or otherwise affect human life or physical health
- Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
- Machinery components essential for safety (safety devices etc.)
- Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

6.6 Other Items Excluded from Warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- Guidance for mounting/adjustment and witnessing of test operation
- Maintenance and inspection
- Technical guidance and education on operating/wiring methods, etc.
- Technical guidance and education on programming and other items related to programs

DIGITAL SPEED CONTROLLER

Chapter 7

EU Declaration of Conformity

7.1 EU Declaration of Conformity ····· 7-1

7.1 EU Declaration of Conformity

Here attaches a document for EU Declaration of Conformity of this product.

IAI Quality and Innovation

IAI CORPORATION
577-1 Obane, Shimizu-Ku, Shizuoka City, Shizuoka 424-0103 Japan

EU DECLARATION OF CONFORMITY

Manufacturer:

IAI CORPORATION
577-1 Obane, Shimizu-Ku, Shizuoka City, Shizuoka 424-0103 Japan

Authorized representative within the Community:

IAI Industrieroboter GmbH
Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany

We make this declaration under the responsibility of the manufacturer.
Hereby declares that the equipment described below:

Equipment:

RADIO EQUIPMENT SYSTEM

TB-03 series
IABL series

Complies with the provisions of the RED 2014/53/EU, European Directives and the following harmonized standards:

EN 55032: 2015
ETSI EN 300 328 V2.2.2

And also complies with the provisions of the RoHS Directive 2011/65/EU+(EU)2015/863, based on the following specifications applied:

EN IEC 63000: 2018

Done at Shizuoka, Japan,

On July 30 , 2021

President Toru Ishida

CE

ORIGINAL

Revision History

Revision date	Revised content
2019.02	First Edition
2022.09	Edition 1B 2.1 System Construction when Using RCON Connection Unit DIGITAL SPEED CONTROLLER TEACHING deleted 3.1 Connection of DIGITAL SPEED CONTROLLER and R-unit caution note added Others correction made
2023.03	Edition 1C Precautions for Handling Caution note added regarding setup of ELECYLINDER with automatic servo-off function enabled Others correction made
2023.12	Edition 1D 3.2.1, 4.1.5 Velocity Split Mode added in simple velocity setup
2024.10	Edition 1E Applicable for ROBO PUMP connection

Manual No.: ME3818-1E (October 2024)

IAI
Quality and Innovation

IAI Corporation

Head Office: 1210 Ihara Shimizu-KU Shizuoka City Shizuoka 424-0114, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL +1-310-891-6015 FAX +1-310-891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL +1-847-908-1400 FAX +1-847-908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL +1-678-354-9470 FAX +1-678-354-9471
website: www.intelligentactuator.com

Technical Support available in Europe

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL +49(0)6196-88950 FAX +49(0)6196-889524
website:www.iai-automation.com

Technical Support available in Great Britain

LC Automation
control & safety

Duttons Way, Shadsworth Business Park, Blackburn, Lancashire, BB1 2QR, United Kingdom
TEL +44(0)1254-685900
website: www.lcautomation.com

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL+86-21-6448-4753 FAX +86-21-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825 PhairojKijja Tower 7th Floor, Debaratana RD., Bangna-Nuea, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456
website:www.iai-robot.co.th

24.10.000