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You can read the recommendations in the user guide, the technical guide or the installation guide for OMRON R7D-AP. You'll find the answers to all your questions on the OMRON R7D-AP in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

User manual OMRON R7D-AP
User guide OMRON R7D-AP
Operating instructions OMRON R7D-AP
Instructions for use OMRON R7D-AP
Instruction manual OMRON R7D-AP

Cat. No. I533-E1-04

SMARTSTEP A SERIES
R7M-A□ (Servomotors)
R7D-AP□ (Servo Drivers)

Servomotors/Servo Drivers

USER'S MANUAL

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Manual abstract:

No. @@@@Please keep this manual handy for reference after reading it. 1. @No. I533-E1) to gain sufficient knowledge of the devices, safety information, and precautions before actual use. 2. The products are illustrated without covers and shieldings for closer look in this USER'S MANUAL. For actual use of the products, make sure to use the covers and shieldings as specified. 3. This USER'S MANUAL and other related user's manuals are to be delivered to the actual end users of the products.

4. Please keep this manual close at hand for future reference. 5. If the product has been left unused for a long time, please inquire at our sales representative. NOTICE 1.

This manual describes information about installation, wiring, switch setting, and troubleshooting of the SMARTSTEP A-series Servomotors and Servo Drivers. For information about actual operating procedures using a Parameter Unit, refer to the SMARTSTEP A Series Operation Manual (I534). 2. Be sure that this manual accompanies the product to its final user. 3.

Although care has been given in documenting the product, please contact your OMRON representative if you have any suggestions on improving this manual. 4. Assume that anything not specifically described in this manual is not possible. 5. Do not allow the Servomotor or Servo Driver to be wired, set, or operated (from a Parameter Unit) by anyone that is not a profession electrical engineer or the equivalent. 6. We recommend that you add the following precautions to any instruction manuals you prepare for the system into which the product is being installed. · Precautions on the dangers of high-voltage equipment. · Precautions on touching the terminals of the product even after power has been turned OFF. (These terminals are live even with the power turned OFF.

) 7. Specifications and functions may be changed without notice in order to improve product performance. 8. Positive and negative rotation of AC Servomotors described in this manual are defined as looking at the end of the output shaft of the motor as follows: Counterclockwise rotation is positive and clockwise rotation is negative. 9. Do not perform withstand-voltage or other megameter tests on the product. Doing so may damage internal components. 10. Servomotors and Servo Drivers have a finite service life. Be sure to keep replacement products on hand and to consider the operating environment and other conditions affecting the service life.

11. Do not set values for any parameters not described in this manual. Operating errors may result. Consult your OMRON representative if you have questions. 12.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative. Items to Check Before Unpacking 1. Check the following items before removing the product from the package: · Has the correct product been delivered (i.e., the correct model number and specifications)? · Has the product been damaged in shipping? 2.

Check that the following accessories have been delivered. · Safety Precautions No connectors or mounting screws are provided. Obtain these separately.

USER'S MANUAL SMARTSTEP A SERIES MODELS R7M-A@ (Servomotors) R7D-AP@ (Servo Drivers) Servomotors/Servo Drivers Notice: OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual. The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property. !DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage. Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Additionally, there may be severe property damage. Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage. !WARNING !Caution OMRON Product References All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product. The abbreviation "Ch," which appears in some displays and on some OMRON products, often means "word" and is abbreviated "Wd" in documentation in this sense. The abbreviation "PC" means Programmable Controller and is not used as an abbreviation for anything else. Visual Aids The following headings appear in the left column of the manual to help you locate different types of information. Note Indicates information of particular interest for efficient and convenient operation of the product. OMRON, 2001 All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of OMRON.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

General Warnings Observe the following warnings when using the SMARTSTEP Servomotor and Servo Driver and all connected or peripheral devices. This manual may include illustrations of the product with protective covers removed in order to describe the components of the product in detail. Make sure that these protective covers are on the product before use. Consult your OMRON representative when using the product after a long period of storage.

!WARNING Always connect the frame ground terminals of the Servo Driver and the Servomotor to a class-3 ground (to 100 or less).

Not connecting to a class-3 ground may result in electric shock. Do not touch the inside of the Servo Driver. Doing so may result in electric shock. Do not remove the front cover, terminal covers, cables, or optional items while the power is being supplied. Doing so may result in electric shock. Installation, operation, maintenance, or inspection must be performed by authorized personnel. Not doing so may result in electric shock or injury. Wiring or inspection must not be performed for at least five minutes after turning OFF the power supply.



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Doing so may result in electric shock. Do not damage, press, or put excessive stress or heavy objects on the cables.

Doing so may result in electric shock. Do not touch the rotating parts of the Servomotor in operation. Doing so may result in injury. Do not modify the product. Doing so may result in injury or damage to the product. Provide a stopping mechanism on the machine to ensure safety. The holding brake is not designed as a stopping mechanism for safety purposes. Provide an external emergency stopping mechanism that can stop operation and shutting off the power supply immediately. Not doing so may result in injury. Do not come close to the machine immediately after resetting momentary power interruption to avoid an unexpected restart.

(Take appropriate measures to secure safety against an unexpected restart.) Doing so may result in injury. Use the Servomotors and Servo Drivers in a specified combination. Using them incorrectly may result in fire or damage to the products. !WARNING !WARNING !WARNING !WARNING !WARNING !WARNING !WARNING !WARNING !WARNING !WARNING !Caution !Caution Do not store or install the product in the following places.

Doing so may result in fire, electric shock, or damage to the product. · Locations subject to direct sunlight. · Locations subject to temperatures or humidity outside the range specified in the specifications. · Locations subject to condensation as the result of severe changes in temperature. · Locations subject to corrosive or flammable gases.

· Locations subject to dust (especially iron dust) or salts. · Locations subject to shock or vibration. · Locations subject to exposure to water, oil, or chemicals. !Caution Do not touch the Servo Driver radiator, Servo Driver regeneration resistor, or Servomotor while the power is being supplied or soon after the power is turned OFF. Doing so may result in a skin burn due to the hot surface. Storage and Transportation Precautions !Caution Do not hold the product by the cables or motor shaft while transporting it. Doing so may result in injury or malfunction. Do not place any load exceeding the figure indicated on the product. Doing so may result in injury or malfunction. !Caution Installation and Wiring Precautions !Caution Do not step on or place a heavy object on the product.

Doing so may result in injury. Do not cover the inlet or outlet ports and prevent any foreign objects from entering the product. Doing so may result in fire. Be sure to install the product in the correct direction. Not doing so may result in malfunction. Provide the specified clearances between the Servo Driver and the control panel or with other devices. Not doing so may result in fire or malfunction. Do not apply any strong impact. Doing so may result in malfunction. Be sure to wire correctly and securely.

Not doing so may result in motor runaway, injury, or malfunction. !Caution !Caution !Caution !Caution !Caution !Caution Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction. Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals.

Connection of bare stranded wires may result in burning. Always use the power supply voltage specified in the User's Manual. An incorrect voltage may result in malfunction or burning. Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable.

An incorrect power supply may result in malfunction. Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning. Take appropriate and sufficient countermeasures when installing systems in the following locations. Failure to do so may result in damage to the product. · Locations subject to static electricity or other forms of noise. · Locations subject to strong electromagnetic fields and magnetic fields. · Locations subject to possible exposure to radioactivity. · Locations close to power supplies. !Caution !Caution !Caution !Caution Operation and Adjustment Precautions !Caution Confirm that no adverse effects will occur in the system before performing the test operation.

Not doing so may result in equipment damage. Check the newly set parameters and switches for proper execution before actually running them. Not doing so may result in equipment damage. Do not make any extreme adjustments or setting changes. Doing so may result in unstable operation and injury. Separate the Servomotor from the machine, check for proper operation, and then connect to the machine. Not doing so may cause injury. When an alarm occurs, remove the cause, reset the alarm after confirming safety, and then resume operation. Not doing so may result in injury. Do not use the built-in brake of the Servomotor for ordinary braking.

Doing so may result in malfunction. !Caution !Caution !Caution !Caution !Caution Maintenance and Inspection on improvements and other reasons. It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request.

Please consult with your OMRON representative at any time to confirm actual specifications of purchased products. DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown. PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions. Table of Contents Chapter 1. Introduction.

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Introduction 1-1 Features Chapter 1 The SMARTSTEP A-series Servomotors and Servo Drivers have been developed as pulse string input-type Position
Controllers to replace stepping motors in simple positioning systems. The SMARTSTEP A-series Servomotors and Servo Drivers combine the stepping motor's
ease of use with faster positioning resulting from high speed and high torque, higher reliability with no loss of positioning accuracy even during sudden load
changes, and other advanced features. Faster Response and Rotation Speed SMARTSTEP A-series Servomotors and Servo Drivers incorporate the same high-
speed and hightorque features, unachievable with stepping motors, as the OMNUC W Series. The SMARTSTEP Aseries Servomotors provide faster rotation
speeds of up to 4,500 r/min, with constant operation possible at this speed. Faster output torque of up to 1 s can output up to approximately 300% of the rated
torque, providing even faster middle- and long-stroke positioning. Constant Accuracy The A-series product line's higher encoder resolution of 2,000
pulses/rotation provides feedback control enabling continuous operation without loss of positioning accuracy, even with sudden load changes or sudden
acceleration or deceleration. Minimal Setting with Servo Driver Front Panel Switches The SMARTSTEP A Series can be operated immediately without time-

consuming parameter setting. The A-series Servo Drivers' front panel switches enable easier alteration of function or positioning resolution settings. Resolution Settings SMARTSTEP A-series Servomotor resolution can be selected from the following four levels: 500 pulses/rotation (0.72°/step); 1,000 pulses/rotation (0.36°/step) (default setting); 5,000 pulses/rotation (0.072°/step); or 10,000 pulses/rotation (0.036°/step) Command Pulse Input Setting SMARTSTEP A-series command pulse input setting can be switched between CW/CCW (2-pulse) and SIGN/PULS (single-pulse) methods to easily adapt to Position Controller output specifications. Dynamic Brake Setting SMARTSTEP A-series Servomotors can be forcibly decelerated to a stop at RUN OFF or when an alarm occurs. Gain Setting A special rotary switch on SMARTSTEP A-series Servo Drivers enables easy gain setting. Online autotuning can also be activated with the flick of a switch, and responsiveness can be easily matched to the machinery to be used. 1-2 Introduction Chapter 1 Note Using a Parameter Unit or personal computer enables operation with parameter settings. Cylinder-style and Flat-style Servomotors The SMARTSTEP A Series offers Flanged Cylinder-style Servomotors, with a smaller mounting area, and Flat-style Servomotors, with a shorter overall length. The Flat Servomotor depth dimensions are approximately the same as those of stepping motors of the same output capacity. Servomotors can be selected by size, thereby making equipment more compact.

A Wider Selection of Programming Devices Special SMARTSTEP A-series Parameter Units and personal computer monitoring software are available. The special monitoring software enables performing parameter setting, speed and current monitoring, speed and current waveform displays, I/O monitoring, autotuning, jogging, and other operations from a computer. It is also possible to perform multiple-axis communications that set the parameters and monitor operations for multiple Servo Drivers. For details, refer to the Servo Driver Personal Computer Monitor Software (CD-ROM) for Windows 95/98, Version 2.0 (WMON Win Ver.

2.0) (Catalog No.: SBCE-011). 1-3 Introduction 1-2 System Configuration SYSMAC + Position Control Unit with pulse string output B.B INP VCMP TGON REF POWER Chapter 1 NC413 RUN ERROR SENS DATA X Y Z U MACHINE No.

CN1 CN2 B24 A24 R7APR02A PARAMETER UNIT SCROLL MODE/SET B1 A1 RESET SYSMAC CJ/CS/C/CV Programmable Controller Position Control Units CJIW-NC113/213/413 CJIW-NC133/233/433 CSIW-NC113/213/413 CSIW-NC133/233/433 C200HW-NC113/213/413 C500-NC113/211 Pulse String JOG RUN RUN DATA READ DRIVER PR PR WRITE DRIVER R7A-PR02A Parameter Unit (Hand-held) SYSMAC Programmable Controllers with pulse outputs SYSMAC CPM2A SYSMAC CPM2C PA203 POWER / SMARTSTEP A-series R7D-AP@ Servo Driver SYSMAC CQM1H Single-shaft Positioner with pulse string output MS NS M0 M1 M2 901 OPEN No.



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OPEN LINE CCW M2 3F88M1 AXIS LINE CW M ALAR LS IT LIM SOFT H NG SR M ORG DER AL ENCO OP ST ALM IVER R DR HE OT T141
POSITIO NER DR 23 456 456 NA ×10 ×1 DR0 DR1 L/R M0 M1 901 23 78 3F88M-DRT141 Single-shaft Positioner for DeviceNet 1-4 78 123 ON (RED N)
ATIO : UNIC D COMM EE s SP bp H ITC 125kbps SW 1 DIP DR 250kbps F DR0 OFF 500k - OTE OFF OF EM ON L/R ON DE F ON LOCA OF MO H TE
DE ON SWITC REMO L MO DIP LOCA L/R F OF ON I/O SMARTSTEP A-series R7M-A@ Servomotor Introduction 1-3 Servo Driver Nomenclature
Chapter 1 Rotary switch for unit No. selection Rotary switch for gain adjustment Function selection switches: Switch/parameter setting enable switch
Resolution setting Command pulse input setting Dynamic braking setting Online autotuning switch Main-circuit power supply indicator Main-circuit power
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EC Directives Applicable standards EN50178 Remarks Safety requirements for electrical devices for measurement, control, and research facilities Rotating
electrical equipment Wireless interference and measurement methods for radio-frequency devices for industry, science, and medical application
Electromagnetic compatibility and immunity standards for industrial environments EC Directives Product Low Voltage AC Servo Drivers Directive AC
Servomotors EMC Directives AC Servo Drivers and AC Servomotors IEC60034-1, -5, -8, -9 EN60034-1, -9 EN55011 class A group 1 EN61000-6-2 Note
Installation under the conditions stipulated in 3-2-5 EMC-compatible Wiring must be met to ensure conformance to EMC Directives. UL and cUL Standards
Product AC Servo Drivers AC Servomotors AC Servo Drivers AC Servomotors Applicable standards UL508C UL1004 cUL C22.2 No. 14 cUL C22.2 No. 100
File No. E179149 E179189 E179149 E179189 Remarks Power conversion devices Electric motors Industrial control devices Motors and generators
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Fuse B1 B2 AC Servomotor P2 CHARGE L1 L2 R T N1 Relay drive Voltage detection + - (See note.) U V W U V W M N2 Voltage detection Gate drive Gate
drive overcurrent protection CN2 E Interface L1C L2C + - - DC/DC conversion ±5 V +16.

5 V +5 V ±15 V +5 V POWER PWM generation ASIC Current detection Digital current amp Encoder signal processing Command pulse processing CNI
Command pulse input 0V Alarm code display Analog voltage conversion Current command processing Position control Speed control Serial port CPU I/O
Control I/O RS-422 CN4 Analog monitor output CN3 Parameter Unit/computer Note Only on R7D-AP04H/AP04L. 1-7 Introduction Chapter 1 200 V AC:
R7D-APA3H/-APA5H/-AP01H/-AP02H/-AP04H AC Servo Driver 1 2 Fuse B1 B2 AC Servomotor P1 R T N1 Relay drive Voltage detection Voltage detection
Gate drive CHARGE P2 + - (See note.) L1 L2 U V W U V W M N2 Gate drive overcurrent protection CN2 E Interface L1C L2C + - - DC/DC conversion
±5 V +16.5 V +5 V ±15 V +5 V POWER PWM generation Encoder signal processing ASIC Current detection Digital current amp CNI Command pulse
processing Command pulse input 0V Alarm code display Analog voltage conversion Current command processing Position control Speed control Serial port
CPU I/O Control I/O RS-422 CN4 Analog monitor output CN3 Parameter Unit/computer Note Only on R7D-AP04H/AP04L. 200 V AC: R7D-AP08H 1 2 P I
L2 L3 R S T N Relay drive Voltage detection Voltage detection Gate drive Fuse + - CHARGE AC Servo Driver B1 B2 B3 FAN ±12 V AC Servomotor P U V
W U V W M N Gate drive overcurrent protection Thermistor Interface CN2 E L1C L2C + - - DC/DC conversion ±5 V +16.5 V +5 V ±15 V +5 V POWER
PWM generation Digital current amp Encoder signal processing ASIC Current detection CNI Command pulse processing Command pulse input 0V Alarm
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W 100 W 200 W 400 W 750 W With brake Straight shaft without key 30 W 50 W 100 W 200 W 400 W 750 W Straight shaft with key 30 W 50 W 100 W 200 W
400 W 750 W 3,000-r/min Flat-style Servomotors Specifications Model 100 W 200 W 400 W 750 W Straight shaft with key 100 W 200 W 400 W 750 W R7M-
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) Model For Cylinder-style Servomotors (Backlash = 45 Max.) Model Specifications Servomotor Reduction gears capacity (deceleration ratio) 50 W 1/5 1/9 1/15 1/25 100 W 1/5 1/9 1/15 1/25 200 W 1/5 1/9 1/15 1/25 400 W 1/5 1/9 1/15 1/25 750 W 1/5 1/9 1/15 1/25 R7G-VRSFPB05B50 R7G-VRSFPB09B50 R7G-VRSFPB15B50 R7G-VRSFPB25B50 R7G-VRSFPB05B100 R7G-VRSFPB09B100 R7G-VRSFPB15B100 R7G-VRSFPB25B100 R7G-VRSFPB05B200 R7G-VRSFPB09C400 R7G-VRSFPB15C400 R7G-VRSFPB25C200 R7G-VRSFPB05C400 R7G-VRSFPB09C400 R7G-VRSFPB15C400 R7G-VRSFPB25D400 R7G-VRSFPB05C750 R7G-VRSFPB09D750 R7G-VRSFPB15D750 R7G-VRSFPB25E750 Specifications Servomotor Reduction gears capacity (deceleration ratio) 50 W 1/5 1/9 1/15 1/25 100 W 1/5 1/9 1/15 1/25 200 W 1/5 1/9 1/15 1/25 400 W 1/5 1/9 1/15 1/25 750 W 1/5 1/9 1/15 1/25 R7G-RGSF05B50 R7G-RGSF09B50 R7G-RGSF15B50 R7G-RGSF25B50 R7G-RGSF05B100 R7G-RGSF09B100 R7G-RGSF15B100 R7G-RGSF25B100 R7G-RGSF05B200 R7G-RGSF09C400 R7G-RGSF15C400 R7G-RGSF25C400 R7G-RGSF05C400 R7G-RGSF09C400 R7G-RGSF15C400 R7G-RGSF25C400 R7G-RGSF05C750 R7G-RGSF09C750 R7G-RGSF15C750 R7G-RGSF25C750 Note There are no reduction gears for 30-W Servomotors. Note There are no reduction gears for 30-W Servomotors. For Flat-style Servomotors (Backlash = 3 Max.)

) Model For Flat-style Servomotors (Backlash = 45 Max.) Model Specifications Servomotor Reduction gears capacity (deceleration ratio) 100 W 1/5 1/9 1/15 1/25 200 W 1/5 1/9 1/15 1/25 400 W 1/5 1/9 1/15 1/25 750 W 1/5 1/9 1/15 1/25 R7G-VRSFPB05B100P R7G-VRSFPB09B100P R7G-VRSFPB15B100P R7G-VRSFPB25C100P R7G-VRSFPB05B200P R7G-VRSFPB09C400P R7G-VRSFPB15C400P R7G-VRSFPB25C200P R7G-VRSFPB05C400P R7G-VRSFPB09C400P R7G-VRSFPB15C400P R7G-VRSFPB25D400P R7G-VRSFPB05C750P R7G-VRSFPB09D750P R7G-VRSFPB15D750P R7G-VRSFPB25E750P Specifications Servomotor Reduction gears capacity (deceleration ratio) 100 W 1/5 1/9 1/15 1/25 200 W 1/5 1/9 1/15 1/25 400 W 1/5 1/9 1/15 1/25 750 W 1/5 1/9 1/15 1/25 R7G-RGSF05B100P R7G-RGSF09B100P R7G-RGSF15B100P R7G-RGSF25B100P R7G-RGSF05B200P R7G-RGSF09C400P R7G-RGSF15C400P R7G-RGSF25C400P R7G-RGSF05C400P R7G-RGSF09C400P R7G-RGSF15C400P R7G-RGSF25C400P R7G-RGSF05C750P R7G-RGSF09C750P R7G-RGSF15C750P R7G-RGSF25C750P 2-3 Standard Models and Specifications Chapter 2 Position Control Unit Cable Specifications For CJ1M-CPU21/ CPU22/CPU23 For FQM1-MMP21 for general-purpose I/O For CSIW-HCP22-V1 for general-purpose I/O 1m 0.5 m 1m 0.5 m 1m 0.5 m 1m 0.

5 m 1m Model XW2Z-100J-A26 XW2Z-050J-A28 XW2Z-100J-A28 XW2Z-050J-A29 XW2Z-100J-A29 XW2Z-050J-A30 XW2Z-100J-A30 XW2Z-050J-A32 XW2Z-100J-A32 Servo Relay Units for CNI Specifications For CSIW-NC113/133 CJ1W-NC113/133 C200HW-NC113 C200H-NC112 3F88M-DRT141 (No communications supported.) For CSIW-NC213/233/413/433 CJ1W-NC213/233/413/433 C200HW-NC213/413 C500-NC113/211 C200H-NC211 (No communications supported.) For CSIW-HCP22 CQM1H-PLB21 CQM1-CPU43-V1 (No communications supported.) For CSIW-NC213/233/413/433 CJ1W-NC213/233/413/433 (Communications supported.) For CJ1M-CPU21/CPU22/ CPU23 For CSIW-HCP22-V1 and FQM1-MMP21 No communications 1m supported.

2m Communications supported. 2m For FQM1-MMP21 1m 2m For CSIW-HCP22-V1 1m 2m For CQM1H-PLB21, 0.5 m CQM1-CPU43-V1 1m For C200H-NC112 0.5 m 1m For C200H-NC211, 0.5 m C500-NC113/211 1m For CSIW-NC113, 0.5 m C200HW-NC113 1m For CSIW-NC213/413, 0.5 m C200HW-NC213/413 1m For CSIW-NC133 0.5 m 1m For CSIW-NC233/433 0.5 m 1m For CJ1W-NC113 0.5 m 1m For CJ1W-NC213/413 0.

5 m 1m For CJ1W-NC133 0.5 m 1m For CJ1W-NC233/433 0.5 m 1m For CSIW-HCP22 0.5 m (1 axis) 1m For CSIW-HCP22 0.5 m (2 axes) 1m For 3F88M-DRT141 0.5 m 1m Model XW2B-20J6-1B Servo Relay Unit XW2B-40J6-2B For FQM1-MMP21 for special I/O For CSIW-HCP22-V1 for special I/O XW2B-20J6-3B Control Cables for CNI Model R88A-CPU001S R88A-CPU002S R88A-CTU001N R88A-CTU002N XW2B-40F5-P Specifications General-purpose Control Cable (with Connector on one end) XW2B-40J6-4A XW2B-20J6-8A XW2B-40J6-9A XW2B-80J7-1A XW2Z-100J-B5 XW2Z-200J-B5 XW2Z-100J-B7 XW2Z-200J-B7 XW2Z-100J-B10 XW2Z-200J-B10 XW2Z-100J-B12 XW2Z-200J-B12 XW2Z-050J-A3 XW2Z-100J-A3 XW2Z-050J-A4 XW2Z-100J-A4 XW2Z-050J-A5 XW2Z-100J-A5 XW2Z-050J-A8 XW2Z-100J-A8 XW2Z-050J-A9 XW2Z-100J-A9 XW2Z-050J-A12 XW2Z-100J-A12 XW2Z-050J-A13 XW2Z-100J-A13 XW2Z-050J-A16 XW2Z-100J-A16 XW2Z-050J-A17 XW2Z-100J-A17 XW2Z-050J-A20 XW2Z-100J-A20 XW2Z-050J-A21 XW2Z-100J-A21 XW2Z-050J-A22 XW2Z-100J-A22 XW2Z-050J-A23 XW2Z-100J-A23 XW2Z-050J-A25 XW2Z-100J-A25 1m 2m Connector Terminal Block Cable 1 m 2m Connector Terminal Blocks Integrated Servomotor Cables Model R7A-CEA003S R7A-CEA005S R7A-CEA010S R7A-CEA015S R7A-CEA020S R7A-CEA003B R7A-CEA005B R7A-CEA010B R7A-CEA015B R7A-CEA020B Servo Driver Cable Position Control Unit Cable Specifications For Servomotors without 3m brakes (both Cylinder- and 5 m Flat-style) 10 m 15 m 20 m For Servomotors with 3m brakes (both Cylinder- and 5 m Flat-style) 10 m 15 m 20 m Separate Servomotor Cables Power Cables Specifications 3m 5m 10 m 15 m 20 m 3m 5m 10 m 15 m 20 m Standard cable model R88A-CAWA003S R88A-CAWA005S R88A-CAWA010S R88A-CAWA015S R88A-CAWA020S R88A-CAWA003B R88A-CAWA005B R88A-CAWA010B R88A-CAWA015B R88A-CAWA020B Robot cable model R88A-CAWA003SR R88A-CAWA005SR R88A-CAWA010SR R88A-CAWA015SR R88A-CAWA020SR R88A-CAWA003BR R88A-CAWA005BR R88A-CAWA010BR R88A-CAWA015BR R88A-CAWA020BR For Servomotors without brakes (both Cylinder- and Flat-style) For Servomotors with brakes (both Cylinder and Flatstyle) Encoder Cables Specifications Standard cable model R7A-CRA003C R7A-CRA005C R7A-CRA010C R7A-CRA015C R7A-CRA020C Robot cable model R7A-CRA003CR R7A-CRA005CR R7A-CRA010CR R7A-CRA015CR R7A-CRA020CR 3m For Servomotors (Cylinder-style or 5 m Flat-style) 10 m 15 m 20 m Note Use a robot cable if cable flexibility is required. 2-4 Standard Models and Specifications Chapter 2 Peripheral Cable Connectors Model 1 m R88A-CMW001S 2 m R7A-CCA002P2 2 m R7A-CCA002P3 R88A-CNU01C R7A-CNA01R R7A-CNA02R 1 m XW2Z-100J-C1 2 m XW2Z-200J-C1 Specifications Analog Monitor Cable (CN4) Computer Monitor Cable (CN3) DOS PC98 Control I/O Connector (CNI) Encoder Connector (CN2) Encoder Connector (Servomotor end) Communications Cable Parameter Units Model R7A-PR02A Specifications Hand-held (with 1-m cable) External Regeneration Resistors Specifications 220 W 47 Model R88A-RR22047S Resistor DC Reactors Model R88A-PX5063 R88A-PX5062 R88A-PX5061 R88A-PX5071 R88A-PX5070 R88A-PX5069 R88A-PX5061 Specifications For R7D-APA3L/APA5L/APA01L For R7D-AP02L For R7D-AP04L For R7D-APA3H/APA5H/AP01H For R7D-AP02H For R7D-AP04H For R7D-AP08H Front-panel Brackets Model R88A-TK01W Specifications For the SMARTSTEP A Series 2-5 Standard Models and Specifications 2-2 External and Mounted Dimensions Chapter 2 2-2-1 Servo Drivers Single-phase 100 V AC: R7D-APA3L/APA5L/AP01L/AP02L (30 W to 200 W) Single-phase 200 V AC: R7D-APA3H/APA5H/AP01H/AP02H (30 W to 200 W) Wall Mounting External dimensions Mounted dimensions 5.



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resistance Impact resistance Insulation resistance Dielectric strength Protective structure Specifications 0 to 55°C 90% max.



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(with no condensation) 20 to 85°C 90% max. (with no condensation) No corrosive gasses. 10 to 55 Hz in X, Y, and Z directions with 0.1-mm double amplitude; acceleration: 4.9 m/s² max.

Acceleration 19.6 m/s² max., in X, Y, and Z directions, three times Between power line terminals and case: 0.5 M min. (at 500 V DC) Between power line terminals and case: 1,500 V AC for 1 min at 50/60 Hz Between each control signal terminal and case: 500 V AC for 1 min Built into panel (IP10).

Note 1. The above items reflect individual evaluation testing. The results may differ under compound conditions. Note 2. Absolutely do not conduct a withstand voltage test with a Megger tester on the Servo Driver. If such tests are conducted, internal elements may be damaged. Note 3. Depending on the operating conditions, some Servo Driver parts will require maintenance. Refer to 5-5 Periodic Maintenance for details. Note 4.

The service life of the Servo Driver is 50,000 hours at an average ambient temperature of 40°C at 80% of the rated torque. 2-17 Standard Models and Specifications 2-3-2 Performance Specifications Chapter 2 Control Specifications 100-V AC Input Type R7D-APA3L 0.42 A 1.3 A R7D-APA5L 0.6 A 1.9 A R7D-AP01L 0.89 A 2.8 A R7D-AP02L 2.0 A 6.0 A R7D-AP04L 2.

6 A 8.0 A Item Continuous output current (rms) Momentary maximum output current (rms) Input power Main circuit Control circuits Heating value Main circuits Control circuits Control method Speed feedback Inverter method PWM frequency Maximum applicable frequency (command pulse application) Weight Applicable Servomotor wattage Applicable Cylinder Servomotor style (R7M-) Flat-style Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz (double voltage method) Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz 3.1 W 13 W 4.6 W 13 W 6.7 W 13 W 13.

3 W 13 W 20.0 W 13 W All-digital servo 2,000 pulses/revolution, incremental encoder PWM method based on IGBT 11.7 kHz 250 kpps Approx. 0.8 kg Approx.

0.8 kg Approx. 0.8 kg Approx. 0.8 kg Approx. 1.1 kg 30 W 50 W 100 W 200 W 400 W A03030 A05030 A10030 AP10030 A20030 AP20030 A40030 AP40030 200-V AC Input Type (Single-phase Input) Item R7DR7DR7DR7DR7DR7DAPA3H APA5H AP01H AP02H AP04H AP08H Continuous output cur- 0.42 A 0.6 A 0.

89 A 2.0 A 2.6 A 4.4 A Item Momentary maximum 1.3 A 1.9 A 2.8 A 6.0 A 8.0 A 13.9 A output current (rms) Input power Main circuit Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz (for R7DAP08H only, three supply phase input possible) Control Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz circuits Heating Main circuit- 3.

1 W 4.6 W 6.7 W 13.3 W 20 W 47 W value circuits Control 20 W 20 W 20 W 20 W 20 W 20 W circuits Control method All-digital servo 2-18 Standard Models and Specifications Item Speed feedback Inverter method PWM frequency Maximum applicable frequency (command pulse application) Weight R7DR7DR7DR7DAPA3H APA5H AP01H AP02H 2,000 pulses/revolution, incremental encoder PWM method based on IGBT 11.7 kHz 250 kpps R7DAP04H Chapter 2 R7DAP08H Approx.

0.8 kg Applicable Servomotor 30 W wattage Applicable Cylinder- A03030 Servomotor type (R7M-) Flat-type Approx. 0.8 kg 50 W A05030 Approx. 0.8 kg 100 W A10030 AP10030 Approx. 0.8 kg 200 W A20030 AP20030 Approx. 1.1 kg 400 W A40030 AP40030 Approx. 1.7 kg 750 W A75030 AP75030 2-3-3 Terminal Block Specifications Signal L1 L2 L3 +1 +2 L1C L2C B1 B2 B3 Function Condition Main circuits power R7DAP@H: Single-phase 200/230 V AC (170 to 253 V AC) 50/60 Hz supply input R7DAP@L: Single-phase 100/115 V AC (85 to 127 V AC) 50/60 Hz Note: Only the R7DAP08H (750 W) has an L3 terminal, enabling three-phase input: Three-phase 200/230 V AC (170 to 253 V AC) 50/60 Hz DC Reactor terminal- Normally short-circuit between +1 and +2. Terminal for power supply- If harmonic control measures are required, connect a DC Reactor between +1 phase harmonic and +2. control Main circuit DC out- Do not connect anything. put (Reverse) Control circuits R7D-AP@H: Single-phase 200/230 V AC (170 to 253 V AC) 50/60 Hz power supply input R7D-AP@L: Single-phase 100/115 V AC (85 to 127 V AC) 50/60 Hz External regeneration- 30 to 200 W: No External Regeneration Resistor can be connected.

tion resistance con- 400 W: This terminal does not normally need to be connected. If regenerative section terminals energy is high, connect an External Regeneration Resistor between B1 and B2. 750 W: Normally shorted between B2 and B3. If there is high regenerative energy, remove the short bar between B2 and B3 and connect an External Regeneration Resistor between B1 and B2. Servomotor connection These are the terminals for outputs to the Servomotor. Be sure to connect terminals White wire these terminals correctly. Blue Green/ Yellow Frame ground This is the ground terminal. Ground to a minimum of 100 (class D, class 3). U V W 2-19 Standard Models and Specifications 2-3-4 Control I/O Specifications (CN1) Chapter 2 Control I/O and External Signals for Position Control Reverse pulse +CW 1 -CW 2 200 8 INP Positioning completed output (See note 2.) Forward pulse +CCW 3 -CCW 4 200 7 BKIR Brake interlock 10 OGND Deviation counter reset +ECRST 5 -ECRST 6 200 (See note 2.)

) 32 Z Maximum operating voltage: 30 V DC Maximum Output Current: Phase Z: 20 mA DC Other than Phase Z: 50 mA DC Phase Z 33 ZCOM (See note 2.) 34 ALM Alarm output 35 ALMCOM (See note 2.) 24 V DC +24VIN 13 22 TXD+ Transmission data 23 TXD- (See note 1.) RUN command RUN 14 3.3 k Alarm reset 20 RXD+ Reception data RESET 18 3.

3 k 21 RXD- 24 RT Terminating resistance terminal Shell FG Frame ground Note 1. Interface for RS-422: · Applicable line driver: T.I. SN75174, MC3487 or equivalent · Applicable line receiver: T.I.

SN75175, MC3486 or equivalent Note 2. Automatic-reset fuses are used for output protection. If overcurrent causes the fuse to operate, current will not flow, and after a fixed period of time it will automatically reset. 2-20 Standard Models and Specifications Chapter 2 Control I/O Signals CN1 Control Inputs Function Contents Pulse string input terminals for position commands. Line-driver input: 7 mA at 3 V Maximum response frequency: 250 kpps Open-collector input: 7 to 15 mA Maximum response frequency: 250 kpps Any of the following can be selected by means of a Pn200.0 setting: feed pulses or direction signals (PULS/SIGN); forward or reverse pulses (CW/CCW); 90° phase difference (phase A/B) signals (A/B). Line-driver input: 7 mA at 3 V Open-collector input: 7 to 15 mA ON: Pulse commands prohibited and deviation counter cleared. Note Input for at least 20 µs. Power supply input terminal (+24 V DC) for sequence inputs (pins 14 and 18). ON: Servo ON (Starts power to Servomotor).

) ON: Servo alarm status is reset. Pin Signal name No. 1 +PULS/CW/A 2 PULS/CW/B 3 4 Feed pulses, reverse pulses, or 90° phase difference pulses (phase A) +SIGN/CCW/B Direction signal, for SIGN/CCW/B forward pulses, or 90° phase difference pulses (phase B) +ECRST ECRST Deviation counter reset 5 6 13 14 18 +24VIN RUN RESET +24-V power supply input for control DC RUN command input Alarm reset input CN1 Control Outputs Function Phase Z output Contents Pin Signal No.



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name 32 Z 33 ZCOM 34 35 7 8 10 Outputs the Encoder's phase Z. (1 pulse/revolution) Open collector output (maximum output voltage: 30 V DC max; maximum output current: 20 mA) Alarm output When the Servo Driver generates an alarm, the output turns ALM OFF. Open collector output (maximum operating voltage: 30 V ALMCOM DC; maximum output current: 50 mA) BKIR Brake interlock output Outputs the holding brake timing signals. INP Positioning completed ON when the position error is within the positioning completed output range (Pn500). Output ground common Ground common for sequence outputs (pins 7 and 8). OGND Note An open-collector output interface is used for pin-7 and -8 sequence outputs. (Maximum operating voltage: 30 V DC; maximum output current: 50 mA) 2-21 Standard Models and Specifications Chapter 2 Contents Interface for RS-422A transmission and reception. Interface for RS-422 Signal name RXD+ RXD- TXD+ TXD- RT GND Function Reception data Transmission data Terminating resistance terminal RS-422A ground Connect to pin 21 (RXD) on the end Unit. Ground for RS-422A. Pin No. 20 21 22 23 24 19 CNI: Pin Arrangement 1 2 - feed pulse, -PULS - reverse pulse, -/CW/-A - phase A -SIGN -/CCW/-B + feed pulse, +PULS /+CW/+A + reverse pulse, + phase A 19 Reception data + 21 Transmission data + Terminating resistance terminal 23 TXD- Transmission data - RXD- Reception data - GND Ground for RS-422A 4 20 RXD+ + direction signal, +SIGN 3 - direction /+CCW/+B + forward pulse, + phase B signal, - forward pulse, 22 TXD+ - phase B + deviation 5 +ECRST counter reset Deviation counter reset 7 BKIR Positioning completed output 9 Output ground common 11 Brake interlock output 26 24 RT 6 -ECRST 25 8 INP 27 28 29 30 10 OGND 12 13 14 RUN RUN command input 15 16 17 18 RESET Alarm reset input +24VIN Control DC +24-V input 31 32 Z Encoder phase-Z output 33 34 ALM Alarm output Alarm output 35 ALMCOM ground 36 ZCOM Phase-Z output ground Note Do not wire the empty pins. CNI Connectors (36P) 10236-52A2JL (Sumitomo 3M) 10136-3000VE (Sumitomo 3M) 10336-52A0-008 (Sumitomo 3M) Servo Driver receptacle Cable solder plug Cable case 2-22 Standard Models and Specifications Chapter 2 Control Input Circuits Position Command Pulse Inputs and Deviation Counter Reset Inputs Line Driver Input Controller + - + - Servo Driver 200 Input current: 7 mA, 3 V Applicable line driver: AM26LS31A or equivalent Open Collector Input Using External Power Supply Controller Vcc R 200 Servo Driver + - Input current: 7 to 15 mA Note Select a value for resistance R so that the input current will be from 7 to 15 mA. Vcc 24 V 12 V 5V R 1.6 to 2.4 k 750 to 1.1 k None Sequence Inputs Servo Driver +24VIN 13 External power supply: 24 V + 1 V DC Power supply capacity: 50 mA min. (per Unit) Minimum ON time: 2 ms To other input circuit GNDs 14 3.

3 k Photocoupler input: 24 V DC, 7 mA To other input circuits Signal Levels ON level: Minimum (+24VIN-1) V OFF level: Maximum (+24VIN-1) V 2-23 Standard Models and Specifications Chapter 2 Control Output Circuits Sequence and Alarm Outputs Servo Driver To other output circuits + X Di - (See note.) External power supply 24 V DC ± 1 V Maximum operating voltage: 30 V DC Maximum output current: 50 mA Di: Diode for preventing surge voltage (Use speed diodes.) Note Automatic-reset fuses are used for output protection. If overcurrent causes the fuse to operate, current will not flow, and after a fixed period of time it will automatically reset. Phase-Z Output Servo Driver Controller 32 Z 33 ZCOM (See note.) FG Maximum operating voltage: 30 V DC Maximum output current: 20 mA Note Automatic-reset fuses are used for output protection. If overcurrent causes the fuse to operate, current will not flow, and after a fixed period of time it will automatically reset. 2-24 Standard Models and Specifications Chapter 2 Control Input Details Feed Pulse/Direction Signal, Reverse Pulse/Forward Pulse, +90° Phase Difference Signals (Phase A) (+A) CNI Pin Numbers CNI pin 1: +Feed Pulse (+PULS), +Reverse Pulse (+CW), +90° Phase Difference Signals (Phase A) (+A) CNI pin 2: Feed Pulse (PULS), Reverse Pulse (CW), 90° Phase Difference Signals (Phase A) (-A) CNI pin 3: +Direction Signal (+SIGN), +Forward Pulse (+CCW), +90° Phase Difference Signals (Phase B) (+B) CNI pin 4: Direction Signal (SIGN), -Forward Pulse (CCW), 90° Phase Difference Signals (Phase B) (B) Functions The function of these signals depends on the setting of Pn200.0 (command pulse mode: position control setting 1). Logic Pn200.

0 Command pulse Input pins setting mode 0 Feed pulse and 1: +PULS direction signal 2: PULS 3: +SIGN 4: SIGN 1 Reverse pulse and forward pulse 1: +CW 2: CW 3: +CCW 4: CCW 1: +A 2: A 3: +B 4: B Servomotor forward command Servomotor reverse command H L Positive L L 2 3 4 90° phase difference signals ($\times 1$) 90° phase difference signals ($\times 2$) 90° phase difference signals ($\times 4$) 2-25 Standard Models and Specifications Logic Pn200.0 Command pulse Input pins setting mode 5 Feed pulse and 1: +PULS direction signal 2: PULS 3: +SIGN 4: SIGN 6 Reverse pulse and forward pulse 1: +CW 2: CW 3: +CCW 4: CCW 1: +A 2: A 3: +B 4: B Servomotor forward command Chapter 2 Servomotor reverse command L H H Negative H 7 8 9 90° phase difference signals ($\times 1$) 90° phase difference signals ($\times 2$) 90° phase difference signals ($\times 4$) 2-26 Standard Models and Specifications Command Pulse Timing Chapter 2 The following wave forms are for positive logic. Conditions are the same for negative logic. Command pulse mode Feed pulse and direction signal Maximum input frequency: 250 kpps Timing Forward rotation command Reverse rotation command Direction signals t1 t2 t1 t2 Feed pulses t1 t1 T t1 0.1 μ s t2 > 3.0 μ s 2.0 μ s T 4.0 μ s (T) $\times 100$ 50 (%) Reverse pulse and forward pulse Maximum input frequency: 250 kpps Forward rotation command Reverse rotation command Reverse pulses t2 Forward pulses t1 t1 T t1 0.1 μ s t2 > 3.0 μ s 2.

0 μ s T 4.0 μ s (T) $\times 100$ 50 (%) Reverse rotation command 90° phase difference signals Maximum input frequency: $\times 1$: Line driver: 250 kpps $\times 2$: Line driver: 250 kpps $\times 4$: Line driver: 187.5 kpps Forward rotation command Phase A pulses t1 t1 Phase B pulses T t1 0.1 ms 2.0 ms T 4.0 ms (T) $\times 100$ 50 (%) 2-27 Standard Models and Specifications Chapter 2 + Deviation Counter Reset (5: +ECRST) Deviation Counter Reset (6: ECRST) The content of the deviation counter will be reset when the deviation counter reset signal turns ON and the position loop will be disabled.



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