ZEF004640916

VARICAM®

Electronic Rotary Cam Switch

VS-5F Series

(For SP1)

Specifications and Instruction Manual

VARICAM

VS-5F	VS-5F-1
VS-5FD	VS-5FD-1
VS-5FX	VS-5FX-1

Applicable sensor:

VRE-P062
VRE-P028

CONTENTS

CONTENTS

OPERATION

The operation is divided into a basic and applied function, and explains about usage.

CONTENTS

MAINTENANCE — Describes about daily inspections and countermeasures for errors.

APPENDIX — Attaches the following contents

INTRODUCTION

Thank you very much for purchasing our product.
Before operating this product, be sure to carefully read this manual so that you may fully understand the product, safety instructions and precautions.
- Please submit this manual to the operators actually involved in operation.
- Please keep this manual in a handy place.

HOW TO READ THIS MANUAL

This manual is composed as follows by each purpose.

SUMMARY : Describes about summary and model selection.
SPECIFICATION : Describes about specifications and outer dimensions.
INTRODUCTORY: Describes about packing contents, mounting methods, and wiring methods.
OPERATION : The operation is divided into a basic and applied function, and explains about usage.
MAINTENANCE : Describes about daily inspections and countermeasures for errors.
APPENDIX : Attaches contents that are descriptions of the password function*1, comply with both UL (UL508) and CE (EMC Directive) standards, and the data sheet.

*1: The password function is only available for “SP1”.

COPYRIGHT

GENERAL SAFETY RULES

●Application Limitation

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

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

● Signal Words

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

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

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

● Graphic Symbols

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

1. Handling Precautions

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

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

2. Storage

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

3. Transport

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

4. Installation

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

5. Wiring

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

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

6. Operation

⚠ CAUTION	
⊘	- Do not change the VARICAM's function switch settings during the operation; otherwise, it will cause injury. - Do not approach the machine after instantaneous power failure has been recovered. Doing so may result in injury if the machine starts abruptly
❗	- Be sure to check that the power supply specifications are correct; otherwise, it may cause VARICAM failure. - Be sure to provide an external emergency stop circuit so that operation can be stopped with power supply terminated immediately. - Be sure to conduct independent trial runs for VARICAM before mounting ABSOCODER sensor to the machine; otherwise, it may cause injury. - When an error occurs, be sure to eliminate the cause, ensure safety, and reset the error before restarting operation; otherwise, it may cause injury.

7. Maintenance and Inspection

⚠ CAUTION	
⊘	- Do not disassemble, remodel, or repair the unit; otherwise, it will cause electric shock, fire, and unit malfunction.
❗	- The capacitor of the power line deteriorates through prolonged use. We recommended that the capacitor be replaced every five years to prevent secondary damage.

8. Disposal

⚠ CAUTION	
⊘	- Be sure to handle VARICAM and ABSOCODER sensor as industrial waste while disposing of it.

REVISION HISTORY

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

Document No.	Date	Revision Description
ZEF004640900	29, Feb., 2008	1st Edition Japanese document: ZEF004640201
ZEF004640901	7, Jul., 2008	2nd Edition Japanese document: ZEF004640202
ZEF004640902	22, May, 2009	3rd Edition Japanese document: ZEF004640203
ZEF004640903	8, Jan., 2010	4th Edition Japanese document: ZEF004640204
ZEF004640904	23, Aug., 2010	5th Edition Japanese document: ZEF004640205
ZEF004640905	14, May, 2010	6th Edition Japanese document: ZEF004640206
ZEF004640906	4, Feb., 2013	7th Edition Japanese document: ZEF004640207
ZEF004640907	11, Mar., 2013	8th Edition Japanese document: ZEF004640208
ZEF004640908	9, Sep., 2013	9th Edition Japanese document: ZEF004640209
ZEF004640909	4, Apr., 2014	10th Edition Japanese document: ZEF004640210
ZEF004640910	22, Jul., 2014	11th Edition Japanese document: ZEF004640211
ZEF004640911	16, Oct., 2014	12th Edition Japanese document: ZEF004640212
ZEF004640912	24, Mar., 2016	13th Edition Japanese document: ZEF004640213
ZEF004640913	1, Feb., 2018	14th Edition Japanese document: ZEF004640214
ZEF004640914	16, Jan., 2019	15th Edition Japanese document: ZEF004640215
ZEF004640915	27, May, 2022	16th Edition Japanese document: ZEF004640216
ZEF004640916	14, Mar, 2024	17th Edition Japanese document: ZEF004640217

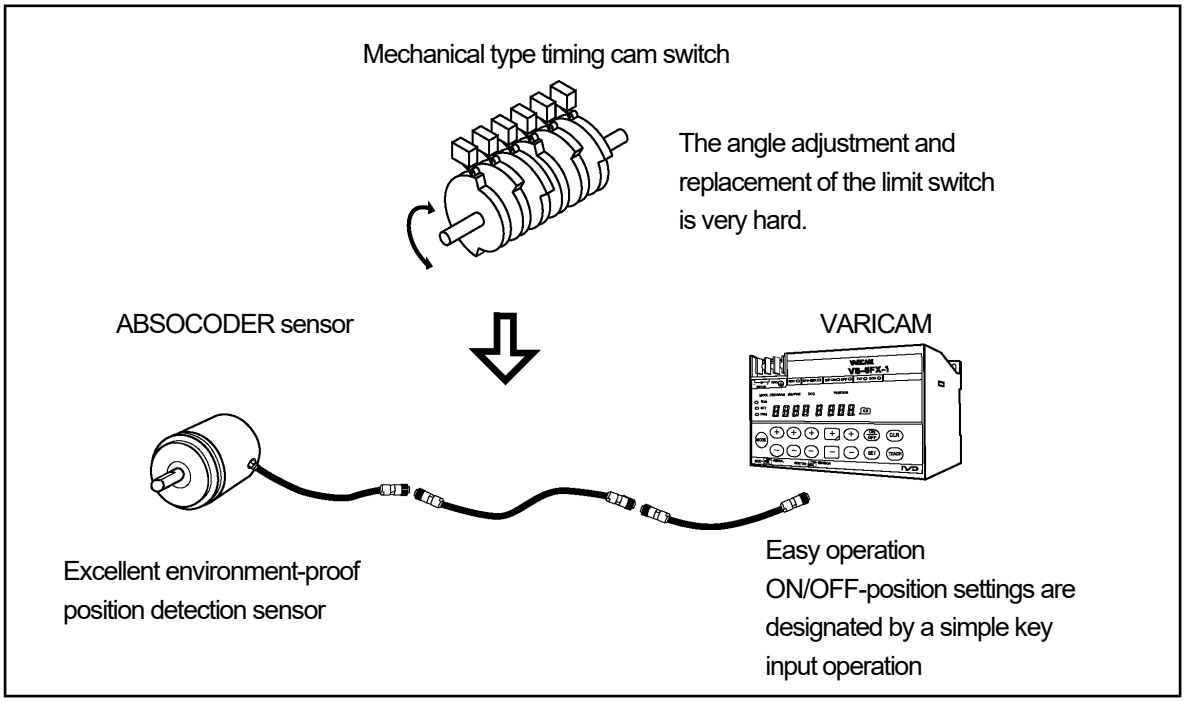
SUMMARY

Describes about summary and model selection.

1. SUMMARY

1-1. Summary

A mechanical type cam switch has been used in order to detect a rotation angle in automatic machinery such as packing, printing, press, and assembly machines. However, difficult angular adjustment and switch replacement procedures have long been onerous tasks.
VS-5F Series is an electronic type cam switch which is substituted for a mechanical type cam switch.
VARICAM is used in combination with a position detection sensor “ABSOCODER sensor” which has excellent environment-proof.
ABSOCODER sensor is mounted on the rotational axis, so the ON and OFF angle can be easily designated to VARICAM that obtain cam outputs which correspond to the rotational angle.



●New function
VARICAM “VS-5F Series” keeps existing functions of VS-5E Series; moreover, it is added more new functions.

-Motion detection switch function
- Hysteresis function
- Switch output enabling function
- External error cancel input function
- Arbitrarily pulse output
- Serial communication function
- Speed output function
- Password function (only for SP1)

For new function details, refer to “1-4. Function”.

1-2. Features

(1) High reliability

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

(2) Superior durability

ABSOCODER sensor is not used electronic parts except coils and resistance, and it features a no-contact construction excepting bearing. This sensor offers problem-free operation, even in environments where it is exposed to vibration, impact shocks, extreme temperatures, oil, and dust.

(3) ABSOCODER sensor outer dimensions(ϕ28, ϕ62)

The appropriate sized sensor for your specific needs can be selected. (ϕ28 small size, ϕ62 standard size)

(4) Cable extends max. 100 meters

The connection between ABSOCODER sensor and VARICAM is able to extend max 100 meters by using the special extension cable.

(5) Compact design

The unit's outside dimensions 130(W) × 81(H) × 99(D) were miniaturized, DIN rail mounting is also possible.

(6) Easy setting procedure with no cam adjustments

ON/OFF-position settings are designated by a simple key input operation. Settings can also be designated using the THEACH function.

(7) Automated setup changes

VS-5F Series can be registered the program by each product in advance.
The setup changes are easy by selection the program No..
Applicable model: VS-5FD(-1), VS-5FX(-1)

(8) Speeding up the production

VS-5F Series is able to response 900r/min of high-speed rotation when ON/OFF range of the switch output is one degree; therefore, the production rate is improved.

(9) Compliance with UL and CE standards

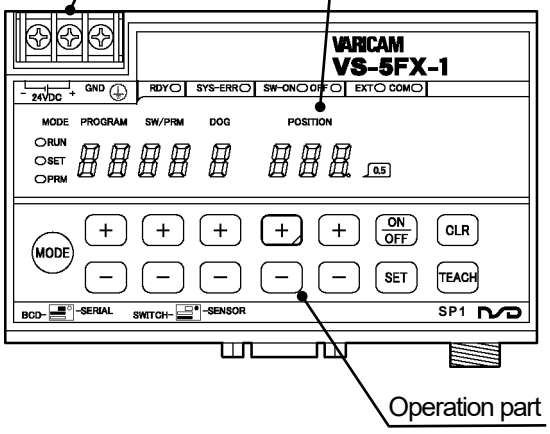
24VDC model of VARICAM complies with both UL (UL508) and CE (EMC Directive) standards.
Applicable models: VS-5F-1, VS-5FD-1, VS-5FX-1

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

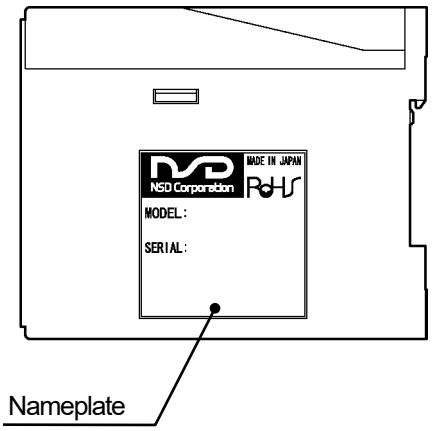
The 24DCV model of VARICAM complies with KC mark. (It is only certified under the Radio Waves Act of South Korea.)
KC mark is the same directives as CE marking. For more details, refer to "APPENDIX 2. CE MARKING".
Applicable models: VS-5F-1, VS-5FD-1, VS-5FX-1

1-3. Nomenclature

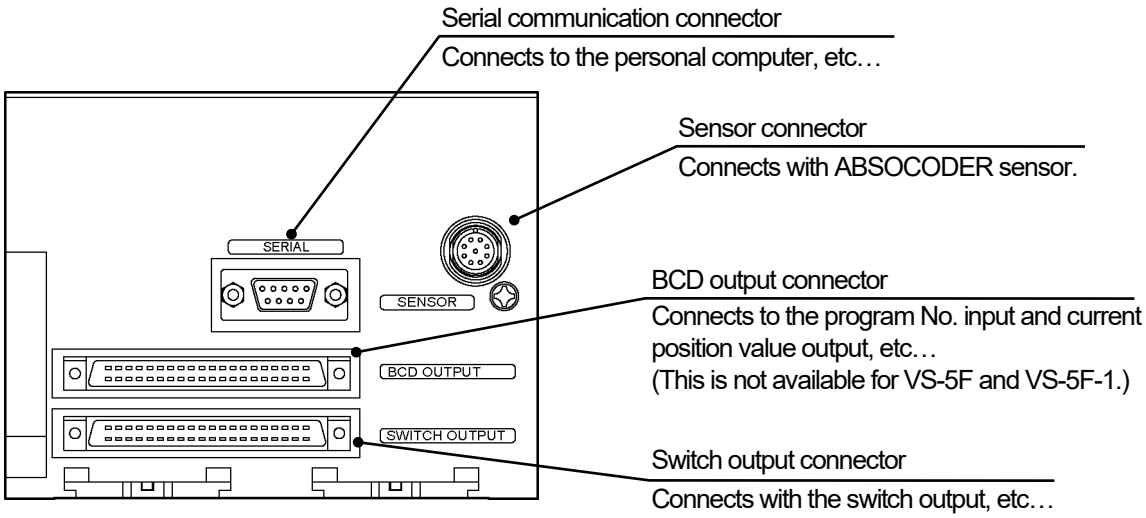
●Front side



●Right side

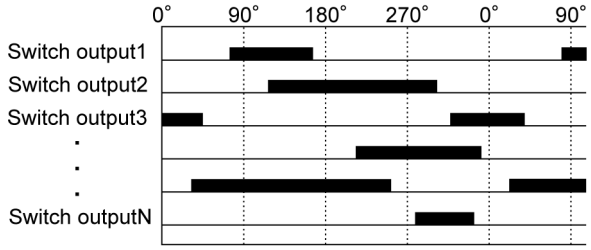


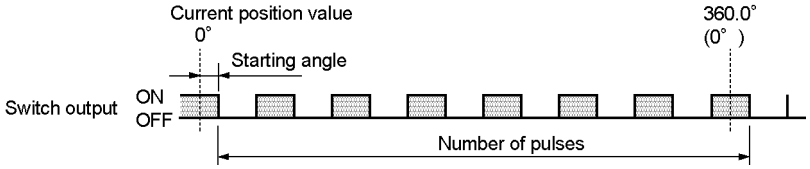
●Bottom side



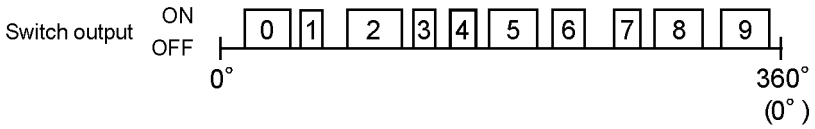
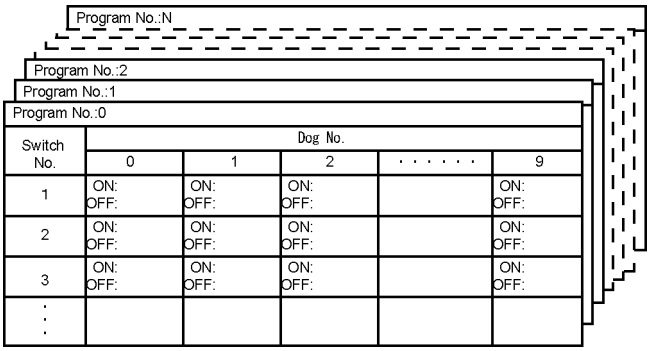
1-4. Function

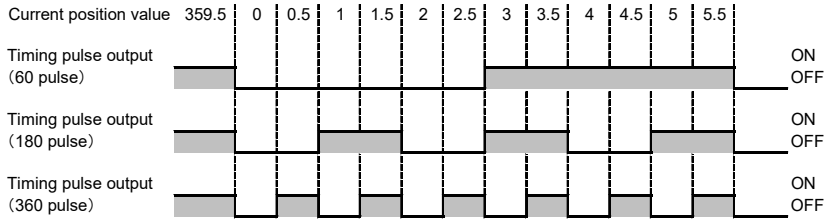
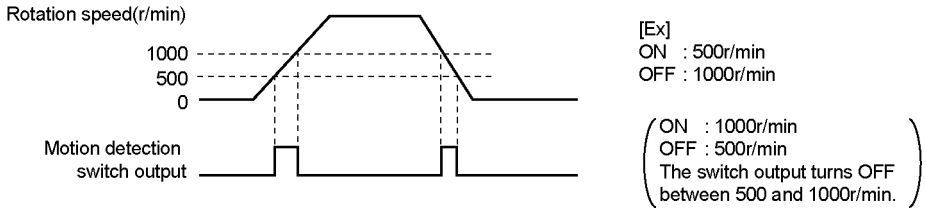
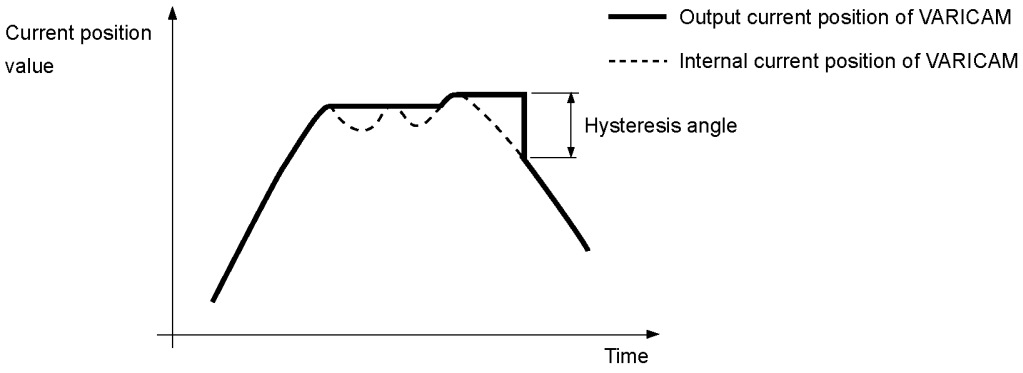
Describes about VS-5F Series functions.

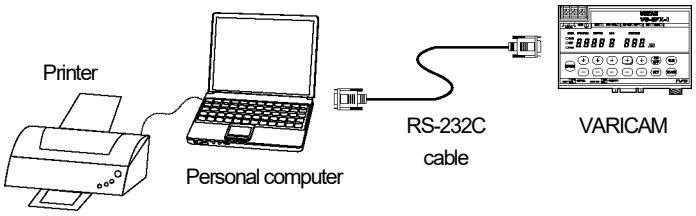
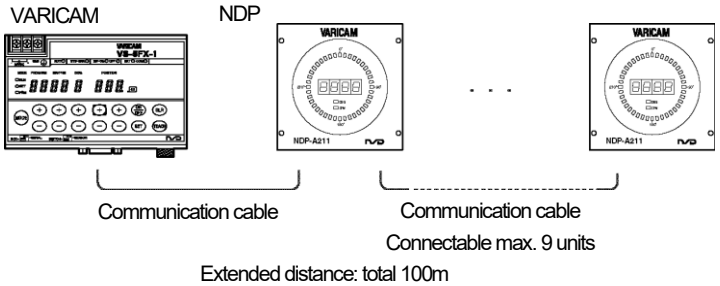
<table>
<tr><th>Function</th><th>Description</th></tr>
<tr><td>Switch output</td><td>
The switch output works the same function as the mechanical format cam switch that is configured with a cam disk and limit switch.
ON/OFF settings are designated at the VARICAM, and switch output ON/OFF operations occur according to the rotation angle of ABSOCODER sensor.
<table>
<tr><th><Setting example></th><th>ON Angle</th><th>OFF Angle</th></tr>
<tr><td>Switch output1</td><td>75˚</td><td>165˚</td></tr>
<tr><td>Switch output2</td><td>120˚</td><td>300˚</td></tr>
<tr><td>Switch output3</td><td>320˚</td><td>45˚</td></tr>
<tr><td>:</td><td>210˚</td><td>350˚</td></tr>
<tr><td>:</td><td>30˚</td><td>250˚</td></tr>
<tr><td>Switch output N</td><td>280˚</td><td>340˚</td></tr>
</table>
● Describes relationship between setting value and output
- Switch output 1 in the setting example is designated following;
ON angle = 75˚ , OFF angle = 165˚
Output is ON in the range “75˚ ≦current position＜165˚ ”.
- Switch output 3 in the setting example is designated following;
ON angle = 320˚ , OFF angle = 45˚ (The switch output 3 is set to pass 0 degree.)
The output turns ON in the following range.
”320˚ ≦ Current position and Current position ＜ 45˚


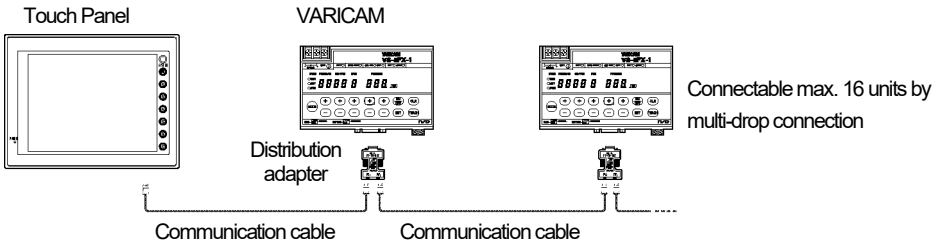
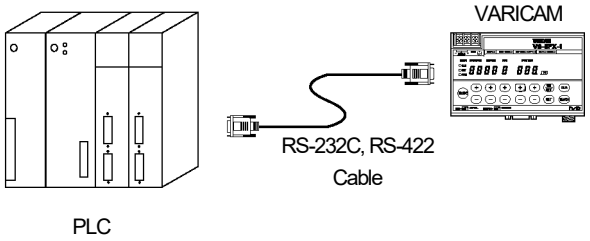
</td></tr>
<tr><td>Arbitrary pulse output</td><td>
This function is outputting pulse signal from the switch output. Outputs the pulse signal which is equally divided single rotation of ABSOCODER sensor by changing the switch settings.
It is possible that several pulse patterns are output by shifting phases, because number of pulses and pulse starting angles can be set in each switch. The number of pulses is selected from 1 to 360, and the pulse starting angles is set by each 0.5 degrees.


For more setting details, refer to “9-3. Sets the Arbitrary Pulse Output”.
</td></tr>
<tr><td>Switch output enabling</td><td>
The switch output which is set by the parameter is forcibly turned OFF by turning ON/OFF the switch output enabling function of the input signal. This function is very convenient to turn off the switch output when there is no workpiece.
For more setting details, refer to “8-8. Switch Output Enabling Function”.
</td></tr>
</table>

Function	Description
Protected switch	The primary feature of VARICAM can set and change the switch output easily. However, there are switch outputs which are not wanted to set and change easily. The protected switch function can solve these kinds of problems. The protected switch function can be used for switch Nos. 1-10. The function is used in such cases to prevent the setting from being changed in the usual manner. To change or delete a protected switch, the protected switch function must be canceled first. For more setting details, refer to “8-3. Protected Switch Function”.
Multi-dog	ON/OFF angle setting (dog) is designated ten times each switch output. Dog number is 0 to 9.  For more setting details, refer to “9-2. Sets the Multi-Dog”.
Program	This function is registering one switch output pattern as a program. The setup change is easy by switching this program. (This function is available to VS-5FD(-1) and VS-5FX(-1).) Ex. VS-5FX can designate the switch output maximum 40-point at each 16-program. 
TEACH setting	TEACH setting is able to set ON/OFF position of each switch by actually moving the machine. For more setting details, refer to “9-1. Sets by Teaching”.
Output HOLD	This function keeps the state of the switch output when the mode changes from “RUN” to another mode. For more setting details, refer to “8-6. Output HOLD Function”.
External origin set	Origin-point (zero-point) setting is executed by an external signal input. For more setting details, refer to “8-9. External Origin Set Function”. If this function is using, “Current position HOLD function” will not be able to use because these two functions are sharing an input pin. (This function available to VS-5FX(-1)).

Function	Description
Timing pulse output	Outputs the pulse signal which is equally divided single rotation of the machine (ABSOCODER sensor). This function is used when connecting the parallel type external display unit (NDP). The pulse number is selectable from 60, 180, or 360 per rotation by the parameter. If this function is using, “Motion detection switch output function” will not be able to use because these two functions are sharing an output pin. ●Current position value and pulse output  For more setting details, refer to “8-4. Timing Pulse Function”.
Motion detection switch output	This switch output turns ON or OFF when the rotation speed of the machine (ABSCODER) achieves the setting speed. This function is very useful when confirming a stop or detecting an error by detecting the machine's movement. If this function is using, “Timing pulse output function” will not be able to use because these two functions are sharing an output pin.  For more setting details, refer to “8-5. Motion Detection Switch Function”.
Hysteresis	When the direction of ABSOCODER sensor shaft rotation reverses, this function keeps the current position value before reversing until the value exceeds the setting one. Uses this function when the current position value is unstable. If the switch output repeatedly turns ON or OFF, this function can stabilize the switch output.  For more setting details, refer to “8-7. Hysteresis Function”.

Function	Description
Current position output / Speed output Current position HOLD	The current position value output function outputs rotation positions (angles) of the machine by BCD codes or gray code (720-division). The speed output function outputs rotation speeds of the machine by binary codes. The current position value output and speed output function are sharing an output pin, so it is necessary to choose either one. For more setting details, refer to “8-11. Selecting Function of the Output Contents ”. Updating of the current position value (speed) output can be stopped by the current position HOLD function. If the scan time of the programmable controller (PLC) and updating cycle of the current position value (speed) output are different, PLC might read an erroneous value. In the case of reading the accurate value, updating the current position value (speed) output is stopped by turning ON the current position HOLD. If “current position HOLD” is using, “External origin set function” will not be able to use because these two functions are sharing an input pin. For more setting details, refer to “8-10. Current Position Value (Speed) Output Function”. (This function is available to VS-5FD(-1) and VS-5FX(-1).)
External error cancel input	Cancels an error by inputting the external signal.
Serial communication	Following connections are available since the serial communication connector is equipped. (1) Setting and editing software (VS-5F-EDW2) This software makes a computer enable to read, edit, write, and print of the VARICAM setting data.  (2) Connectable with a serial type external display unit Angles and rotation speeds can be monitored by using this unit. VARICAM can connect the maximum 9 units of external display units. 

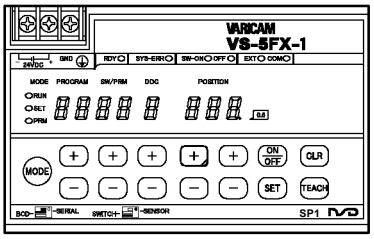
Function	Description
Serial communication	(3) Connectable with Touch Panel (VARIMONI) VARICAM setting data is able to read, edit, write, and print by using the TouchPanel. Touch Panel can control centrally maximum 16 units of VARICAM.  (4) Connectable with programmable controllers (PLC) which are made by Mitsubishi Electric Co. or OMRON Corporation.  (5) RS-232C communication Connecting with a personal computer or programmable controller (PLC), data is able to read, edit, write, and print by a communication program that is made by the customer. VS-5F Series supports existing communication protocol of VS-5E Series. For more details regarding the serial communication, please contact your NSD representative.
Password	This function is applied to all models that are written "SP1" in the lower right portion of the front panel. This is the function to ask inputting the password when the mode of VARICAM changes form the operation (RUN) mode. Customers can pick and set the password which consists of 3 digits of numeric values. The mode cannot be changed without the password after setting numbers; therefore, the value of “switch setting” and “parameter setting” can be protected. It can also be protected from changing the program No. from panel side. If the password is not set, the mode could be changed by conventional operation. Refer to “APPENDIX-1. PASSWORD FUNCTION” for the setting.

2. MODEL SELECTION WHEN ORDERING

Following figure is indicated connecttion configuration of VARICAM “VS-5F Series”.
Before ordering, please refer to the connection configuration and model list.
Please prepare equipments by the customer except from ① to ⑪ in the connection configuration.

●Connection configuration

① VARICAM
VS-5F(-1)
VS-5FD(-1)
VS-5FX(-1)

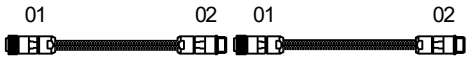


Accessory
Instruction manual
Connector
(VS-5F(-1) : 1 piece)

Crimping terminal
(100VAC model only)

③ Extension sensor cable

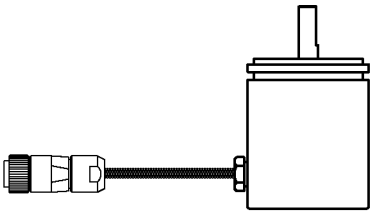
3P-S-0102-[L]
3P-RBT-0102-[L]



3P-S-0102-[L]
3P-RBT-0102-[L]

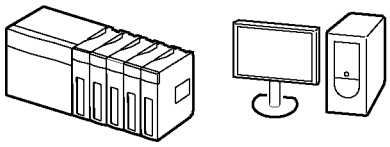
3P-S-0102-[L]
3P-RBT-0102-[L]

② ABSOCODER sensor
VRE-P062
VRE-P028

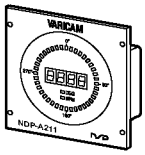


Accessory
Servo-mounting fixture

Please prepares by the customer.
PLC Computer



④ External display unit
NDP-A211** (150 X 150 size)
NDP-A221** (110 X 110 size)



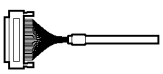
For more details, refer to the external display unit specifications and instruction manual.

⑤ Setting and editing software
VS-5F-EDW2

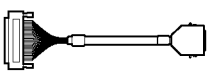
Accessory
RS-232C cable 2 m

VARICAM option

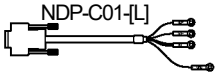
⑥ I/O cable
VS-C05-[L]



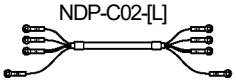
⑦ Cable for external display unit
VS-C05-Z01-2



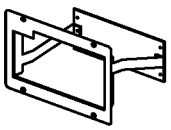
NDP-C01-[L]



NDP-C02-[L]



⑧ Panel-mount fixture
VS-K-F



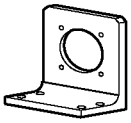
⑨ Clamp filter
ZCAT2032-0930

For more details, refer to the external display unit specifications and instruction manual.

ABSOCODER sensor option

⑩ Reinforced servo-mount fixture
SH-01

⑪ L type flange-mount fixture
RB-01



●Model list

◆VARICAM

No.	Model	Description	
①	VS-5F	100VAC model	1 program, 24 points output
	VS-5FD		8 programs, 24 points output
	VS-5FX		16 programs, 40 points output or 32 programs, 24 points output
	VS-5F-1	24VDC model	1 program, 24 points output
	VS-5FD-1		8 programs, 24 points output
	VS-5FX-1		16 programs, 40 points output or 32 programs, 24 points output

◆ABSOCODER sensor

No.	Model	Description
②	VRE-P062SAC	Diameter: ϕ62, Shaft shape: flat, servo-mount type
	VRE-P062SBC	Diameter: ϕ62, Shaft shape: key way, servo-mount type
	VRE-P062FAC	Diameter: ϕ62, Shaft shape: flat, flange-mount type
	VRE-P062FBC	Diameter: ϕ62, Shaft shape: key way, flange-mount type
	VRE-P028SAC	Diameter: ϕ28, Shaft shape: flat, servo-mount type

◆Extension sensor cable

No.	Model	Description
③	3P-S-0102-[L] (Standard cable)	Uses this cable when ABSOCODER sensor and VARICAM installation site are far. The cable is able to extended maximum 100 meters. [L]: Cable length [m] 2,3,5,8,10,15,20,25,30,35,40,45,50……100m (If a cable length is 50m or more, it can be selected by each 10m.)
	3P-RBT-0102-[L] (Robotic cable)	

◆Option

No.	Name	Model	Description
④	External display unit	NDP-A211 [*] 1	Angles and rotation speeds are able to monitor. NDP-A211: 150 x 150 size NDP-A221: 110 x 110 size [*]: Connection method *2 A: Parallel type B: Serial type The serial connection type can connect max. 9 units of NDP to VARICAM.
		NDP-A221 [*] 1	
⑤	Setting and editing software *1	VS-5F-EDW2	Data setting and editing are available by using a computer. OS: Microsoft Windows/XP/Vista/7/8/10
⑥	I/O cable	VS-C05-[L] (without shield)	Uses this cable at the switch output connector and BCD output connector. [L]: Cable length 1, 2, 3, 5, 7, 10m
⑦	Cable for external display unit	VS-C05-Z01-2 (with shield)	Uses this cable when connecting with the parallel type external display unit. Cable length: 2m
		NDP-C01-[L] (with shield)	Uses this cable when connecting with the serial type external display unit. [L]: Cable length [m] *3
		NDP-C02-[L] (with shield)	Uses this cable when connecting the NDP more than two units. [L]: Cable length [m] *3
⑧	Panel-mount fixture for VS-5F series	VS-K-F	Uses this fixture for panel mounting VARICAM on the control panel.
⑨	Clamp filter	ZCAT2032-0930	This is option parts for corresponding to CE marking. Inner dimensions: ϕ9 (Manufacturer: TDK Corporation)
⑩	Reinforced servo-mount fixture	SH-01	This fixture is able to use with VRE-P062SAC and VRE-P062SBC.
⑪	L type flange-mount fixture	RB-01	This fixture is able to use with VRE-P062SAC, VRE-P062SBC, VRE-P062FAC, and VRE-P062FBC. In the case of using VRE-P062SAC or VRE-P062SBC, the reinforced servo-mount fixture (SH-01) must be used.

*1: Please prepare the USB-RS-232C adapter when your computer doesn't have a RS-232C port.

*2: In the case of using VS-5F or VS-5F-1, select the serial type external display unit.

*3: The total cable length of the NDP-C01-[L] and NDP-C02-[L] is maximum 100 meters.

-MEMO-

SPECIFICATION

Describes about specifications and outer dimensions.

3. SPECIFICATIONS

3-1. VARICAM Specifications

3-1-1. General Specification

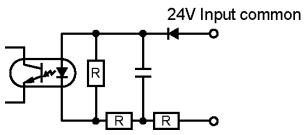
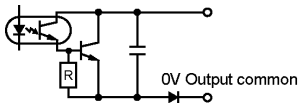
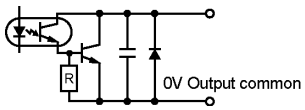
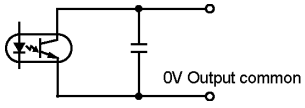
Items	Specifications	
Model	VS-5F, VS-5FD, VS-5FX	VS-5F-1, VS-5FD-1, VS-5FX-1
Power supply voltage	100VAC 50/60Hz	24VDC
Permissible power voltage range	85 to 132VAC	21.6 to 30VDC
Power consumption	20VA or less	10W or less
Insulation resistance	20 MΩ or more between external AC power terminals and ground (by 500 VDC insulation resistance tester)	20 MΩ or more between external DC power terminals and ground (by 500 VDC insulation resistance tester)
Withstand voltage	1500 VAC, 60Hz for 1 minute between external AC power terminals and ground	500 VAC, 60Hz for 1 minute between external DC power terminals and ground
Vibration resistance	20m/s^2 10 to 500Hz, 10cycles of 5 minutes in 3 directions, conforms to JIS C 0040 standard	
Ambient operating temperature	0 to +55°C (No freezing)	
Ambient operating humidity	20 to 90 %RH (No condensation)	
Ambient operating environment	Free from corrosive gases and excessive dust	
Ambient storage temperature	-10 to +70°C	
Grounding	Must be securely grounded (ground resistance of 100 Ω or less)	
Construction	Inside control panel	
Mounting	- Two-point screws mounting - DIN rail mounting - It is possible to mount on the panel when using a panel mounting fixture “VS-K-F” Choose the method either one.	
Outside dimension (mm)	130(W) x 81(H) x 99(D) [Refer to dimensions for details.]	
Mass	Approx. 0.7kg	

3-1-2. Performance Specification

Items	Specifications			
Model	VS-5F, VS-5F-1	VS-5FD, VS-5FD-1	VS-5FX, VS-5FX-1	
Number of programs	1	8 (0 to 7)	16 (0 to 15)	32 (0 to 31)
Number of switches	24	24	40	24
Number of Multi-dogs	10 times for each switch output (0 to 9)			
Position detection format	Absolute position detection			
Number of detection axes	1			
Output signal updating cycle	Switch output signal: 0.176ms Current position value output (BCD): 0.352ms to 140.6ms Current position value output (gray code (720-division)): 0.176ms, 0.352ms to 140.6ms Speed output (binary code): 0.352ms to 140.6ms Internal position data reading cycle: 0.176ms			
Switch output setting method	Numeric setting with keys, or teaching setting by manual machine operation			
Minimum setting unit	0.5°			
Position data valid digit numbers	3 digits + 0.5° (Decimal point display) (0 to 359.5)			
Response rotation speed	900r/min (When ON / OFF zone is 1 degree.)			
Setting value memory	Non-volatile memories (FRAM)			
Display description on the panel	- Number display [7 segments LED: 5digits (VS-5F, VS-5F-1 is 3 digits)] Parameter No., switch No., dog No., program No. - Data display [7 segments LED: 3 digits + 0.5° (Decimal point display)] Setting value, current position value, rotation speed, ON/ OFF state of the switch output - Operation state indicator System ready, program selecting method, system error, mode selection, ON/OFF selection when setting the switch, communication state - Error code when occurring an error			
Input description from panel side	- Program No., switch No., dog No. - Parameter, switch data - Error cancel - TEACH input - Mode selection			
Auxiliary functions	- External origin set function (VS-5FX, VS-5FX-1) -Timing pulse function - Motion detection switch output function - Hysteresis function - Protected switch function - Switch output enabling function - External error cancel input - Arbitrary pulse output - Current position value output (BCD, gray code (720-division)) / Speed output (binary code) (VS-5FD, VS-5FD-1, VS-5FX, VS-5FX-1) - Password function (only for SP1)			
Communication functions	- RS-232 communication (The setting value can be saved, loaded monitored. Moreover, RUN operation is available.) - Connectable with the Touch Panel (VARIMONI) - Connectable with the external display unit (NDP) - Connects with MELSEC (MC protocol) or MELSEC-A (Bidirectional protocol) - Connects with OMRON protocol			
Applicable standard	Applicable VS-5F-1, VS-5FD-1, VS-5FX-1 UL508 CSA C22.2 No.142 (Compliance with c-UL standard) CE Marking (EMC directive) KC mark (Korea Certification Mark)			

3-1-3. I/O Specification

Items	Specifications			
Model	VS-5F, VS-5F-1	VS-5FD, VS-5FD-1	VS-5FX, VS-5FX-1	
Input signals	-Error cancel 1 point -Switch output enabling 1 point	-Program No. 3 points -Current position HOLD 1 point -Error cancel 1 point -Switch output enabling 1 point	-Program No. 4 points -Current position HOLD 1 point or External origin set -Error cancel 1 point -Switch output enabling 1 point	-Program No. 5 points -Current position HOLD 1 point or External origin set -Error cancel 1 point -Switch output enabling 1 point
Output signals	-Switch output 24 points -Timing pulse 1 point or Motion detection switch -System ready 1 point	-Switch output 24 points -Timing pulse 2 points or Motion detection switch -System ready 1 point - Program No. 3 points -Current position value (BCD, gray code (720-division) or speed output (binary code) 11 points -Latch pulse (LP) 1 point	-Switch output 40 points -Timing pulse 1 point or Motion detection switch -System ready 1 point - Program No. 4 points -Current position value (BCD, gray code (720-division) or speed output (binary code) 11 points -Latch pulse (LP) 1 point	-Switch output 24 points -Timing pulse 1 point or Motion detection switch -System ready 1 point - Program No. 5 points -Current position value (BCD, gray code (720-division) or speed output (binary code) 11 points -Latch pulse (LP) 1 point

Items			Specifications	Circuit Diagram
Input circuit	-Program No. -Current position HOLD or External origin set -Error cancel -Switch output enabling	Input format	DC input	
		Input logic	Negative logic	
		Rated input voltage	24VDC	
		Rated input current	10mA TYP (24VDC)	
		Isolation format	Photo-coupler isolation	
Output circuit	-Switch output -Program No. -System ready	Output format	Transistor open collector	
		Output logic	Negative logic	
		Rated load voltage	24VDC (30Vmax)	
		Max. load current	100mA	
		Max. voltage drop when ON	2.0V (100mA)	
		Isolation format	Photo-coupler isolation	
	-Timing pulse or Motion detection switch	Output format	Transistor open collector	
		Output logic	Negative logic	
		Rated load voltage	24VDC (30Vmax)	
		Max. load current	100mA	
		Max. voltage drop when ON	1.5V (100mA)	
		Isolation format	Photo-coupler isolation	
	-Current position value (BCD, gray code (720-division)) or speed output (binary code) -Latch pulse (LP)	Output format	Photo-coupler open collector	
		Output logic	Current position value (BCD, gray code (720-division)) or speed output (binary code) : Switches by the parameter No. 78 Latch pulse: positive logic	
		Rated load voltage	24VDC (30Vmax)	
		Max. load current	10mA	
		Max. voltage drop when ON	0.7V (10mA)	
		Isolation format	Photo-coupler isolation	

3-1-4. Communication Interface Specification

Item	Specification	
Interface	RS-232C	RS-485
Communication format	Full duplex, start stop synchronization	Half duplex, start stop synchronization
Transmission speed	2400,4800,9600,19200,38400,57600 bps	
Communication signal	TXD, RXD, RTS, CTS, SG	DATA+, DATA-, SG
Connector format	9-pin connector (D-sub male)	

For more details about the serial communication, please contact your NSD representative.

3-2. ABSOCODER Sensor Specification

Items		Specifications	
Sensor model		VRE-P028	VRE-P062
Total number of turns		1	
Mass		0.25 kg	1.3 kg
Linearity error		1.5° Max.	1° Max.
Moment of inertia $GD^2/4(J)$		9.3×10^{-8} kg·m^2 (9.5×10^{-7} kgf·cm·s^2)	6.4×10^{-6} kg·m^2 (6.5×10^{-5} kgf·cm·s^2)
Starting torque		1.5×10^{-3} N·m or less (0.015 kgf·cm or less)	4.9×10^{-2} N·m or less (0.5 kgf·cm or less)
Permissible shaft load	Radial	15 N (1.5 kgf)	98 N (10 kgf)
	Thrust	9.8 N (1.0 kgf)	49 N (5 kgf)
Permissible mechanical speed		6000 r/min	3600 r/min
Bearing life		8×10^4 h (at 6000 r/min)	5.5×10^4 h (at3600 r/min)
Ambient temperature	Operating	-20 to +60°C	
	Storage	-30 to +90°C	
Vibration resistance		2.0 x 10^2 m/s^2 (20G) 2000Hz, up/down 4h, forward/back 2h, conforms to JIS D 1601 standard	
Shock resistance		4.9 x 10^3 m/s^2 (500G) 0.5 ms, up/down/forward/back x 3 times each, conforms to JIS C 5026 standard	
Protection rating		IP40, conforms to JEM 1030 standard	IP52f, conforms to JEM 1030 standard
Max. sensor cable length	Standard cable	100m (3P-S)	
	Robituc cable	100m (3P-RBT)	
Interconnecting sensor cable		2m	

3-3. Sensor Cable Specification

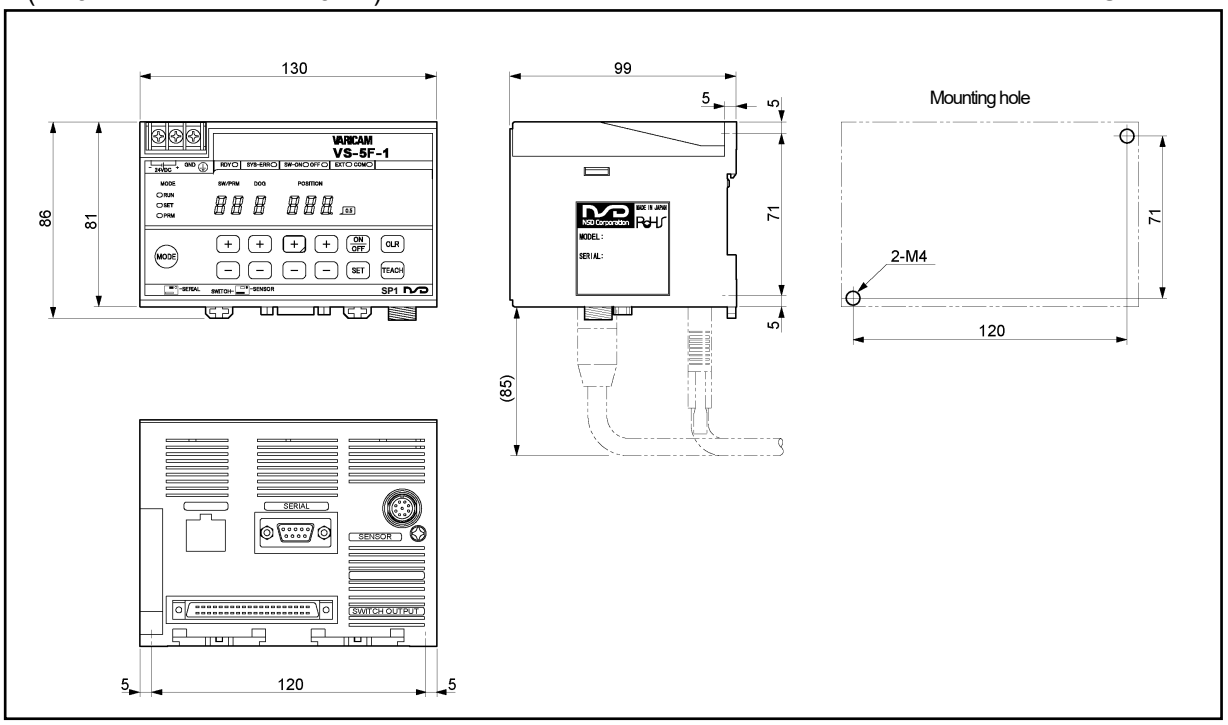
Items		Specifications	
Model code		3P-S	3P-RBT
Cable type		Standard cable	Robotic cable
Diameter		ϕ8	
Ambient temperature	Operating	-5 to +60°C	
	Storage	-5 to +60°C	-10 to +60°C
Insulator		Irradiated, formed polyethylene	ETFE plastic
Sheath		Vinyl chloride mixture	
Color of sheath		Gray	Black
Advantage		—	Usable with moving machine menber thanks to excellent flexibility

4. OUTER DIMENSIONS

4-1. VARICAM Outer Dimensions

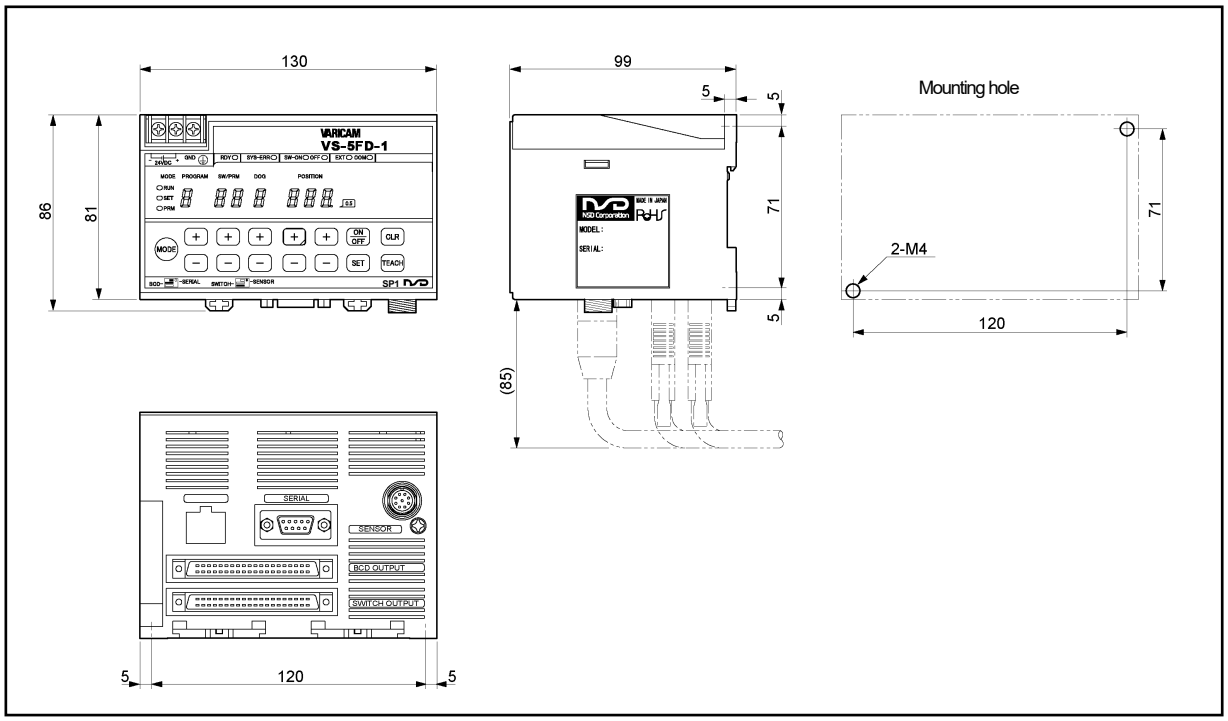
●VS-5F-1

(VS-5F is same size as VS-5F-1.) Units: mm



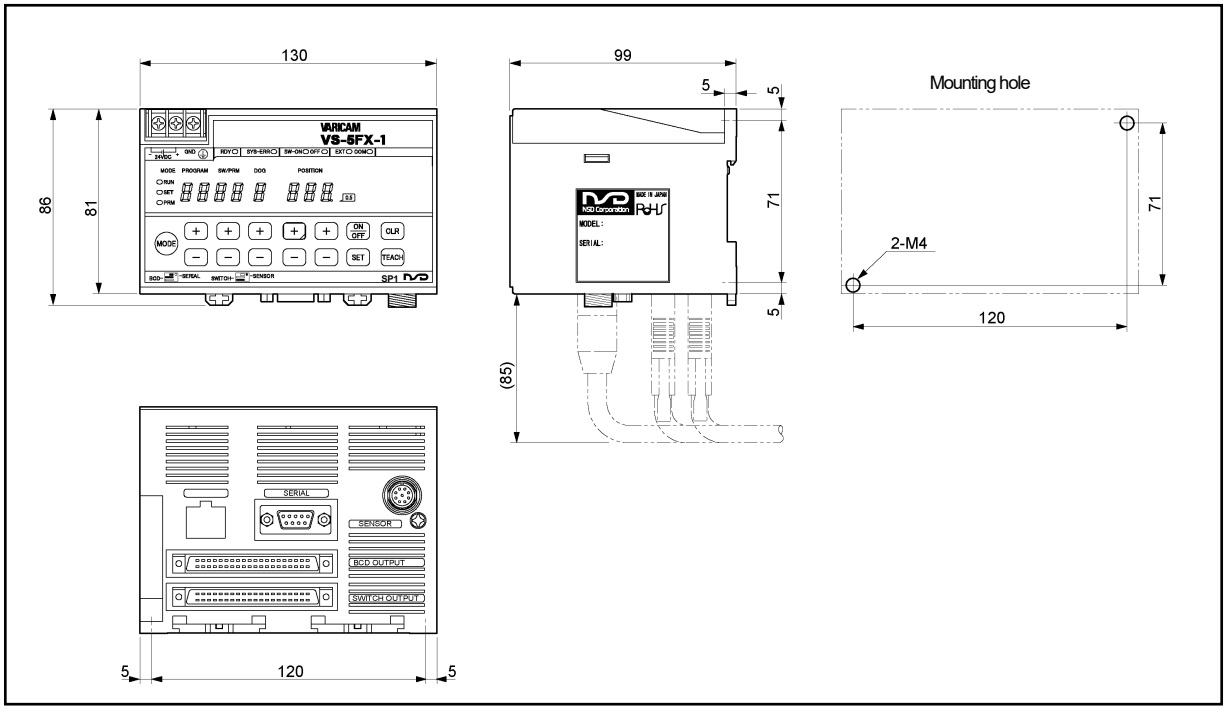
●VS-5FD-1

(VS-5FD is same size as VS-5FD-1.) Units: mm



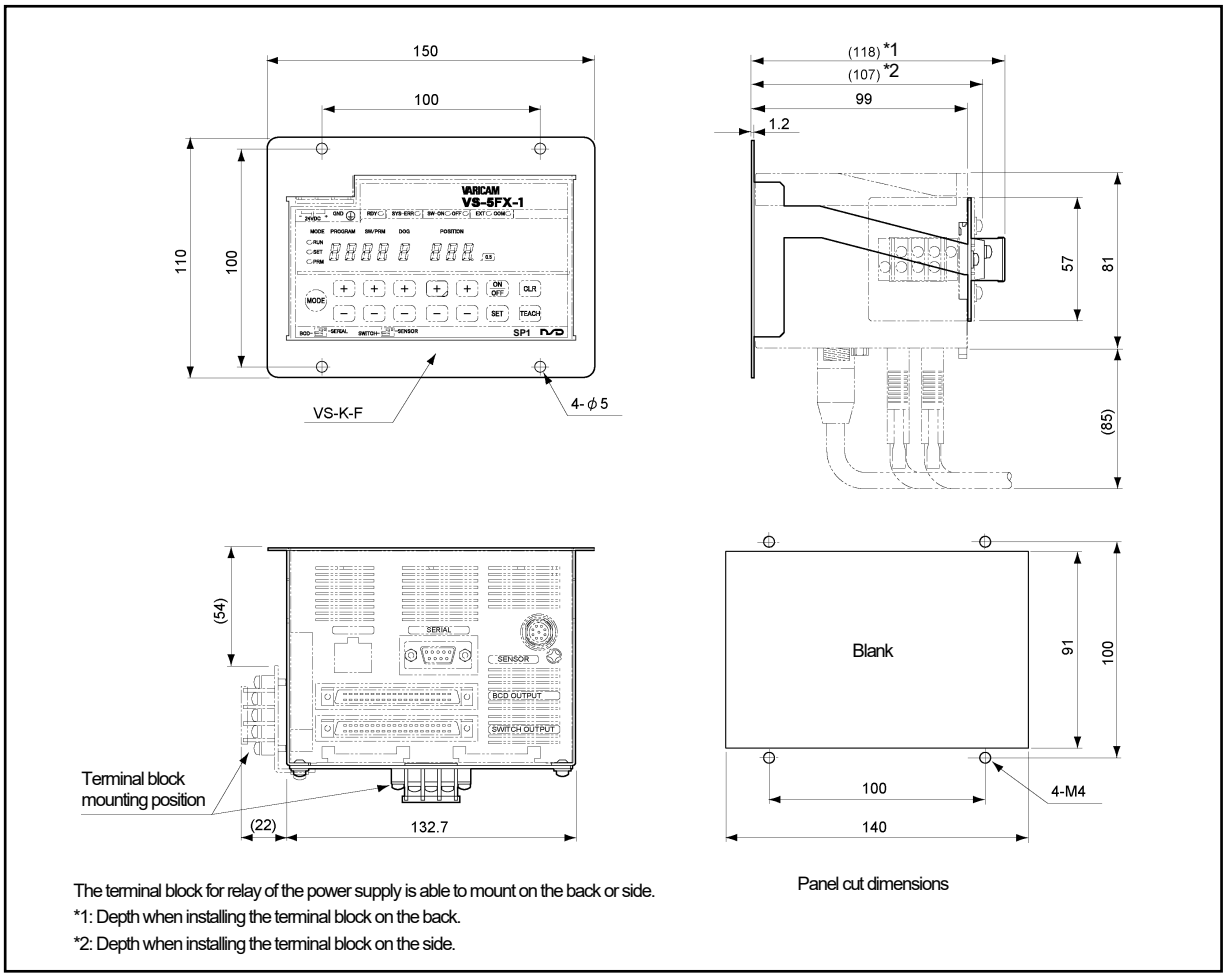
●VS-5FX-1

(VS-5FX is same size as VS-5FX-1.) Units: mm



●VS-K-F (Panel-mounting fixture)

VS-K-F can be used with all VS-5F series.



Panel cut dimensions

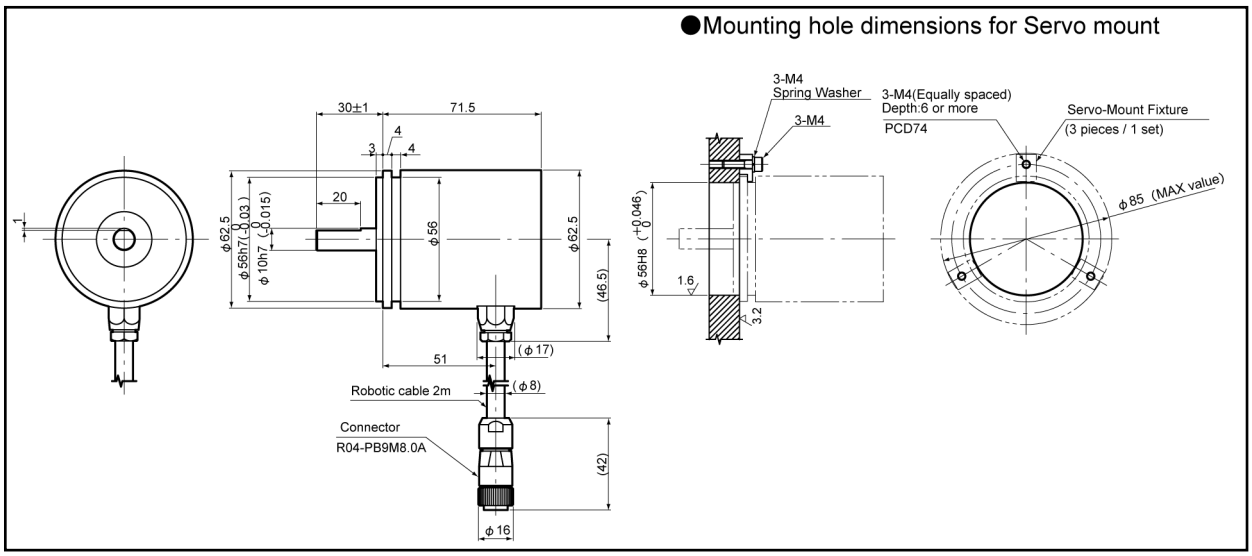
The terminal block for relay of the power supply is able to mount on the back or side.

*1: Depth when installing the terminal block on the back.

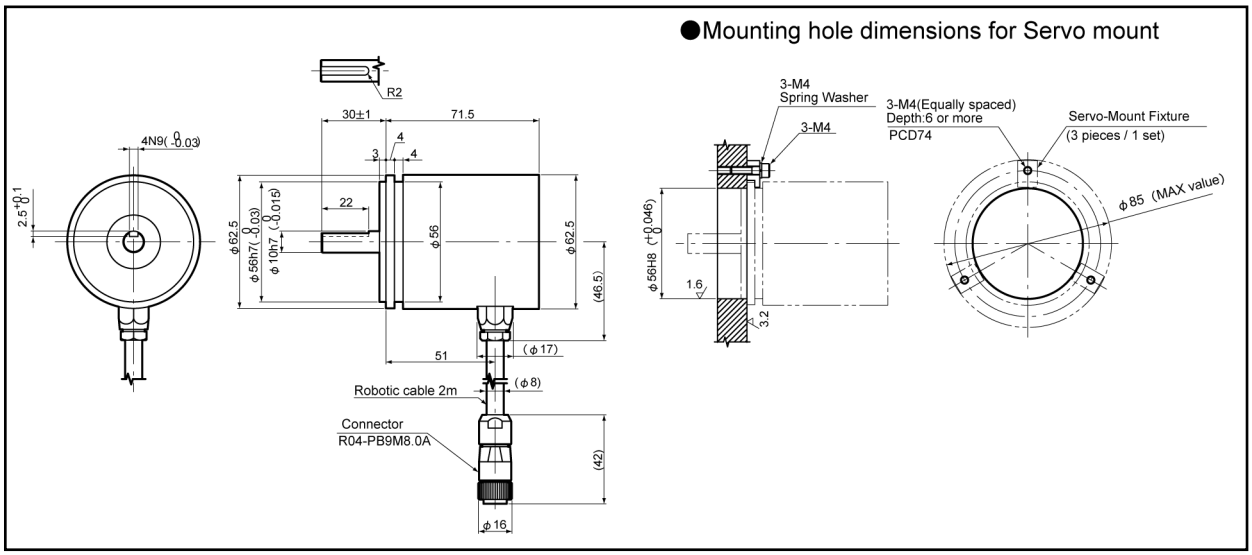
*2: Depth when installing the terminal block on the side.

4-2. ABSOCODER Sensor Outer Dimensions

●VRE-P062SAC Units: mm

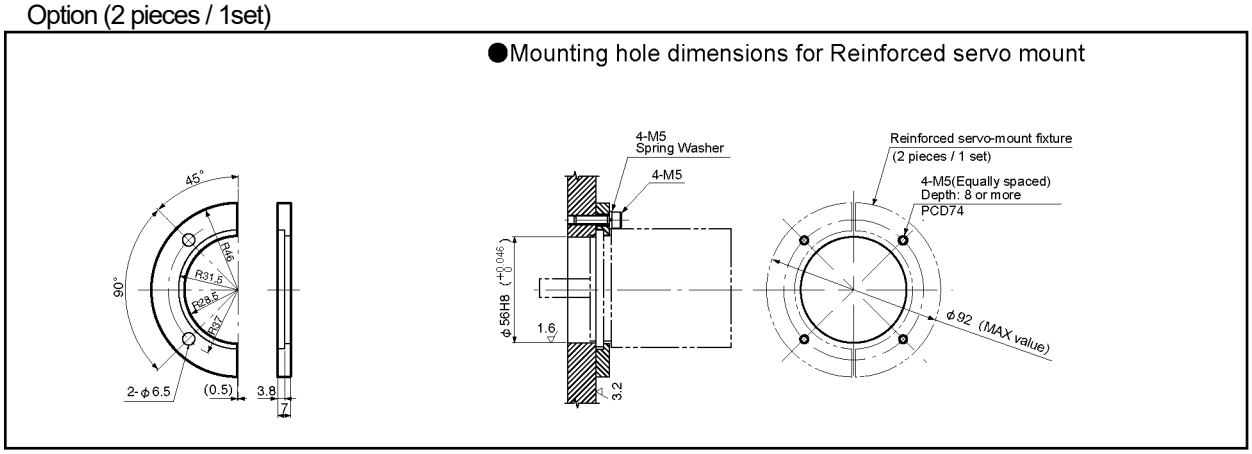


●VRE-P062SBC

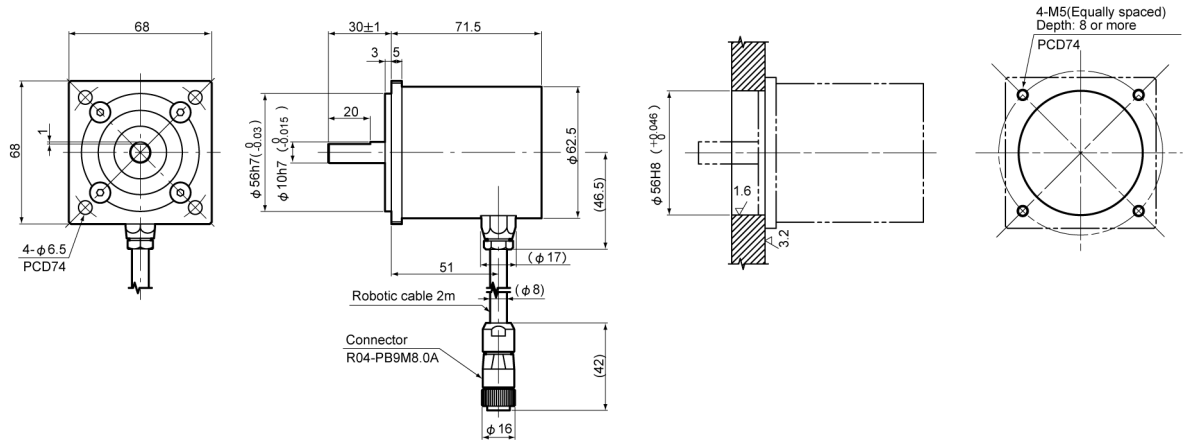


●SH-01 (Reinforced servo-mount fixture for VRE-P062SAC / SBC)

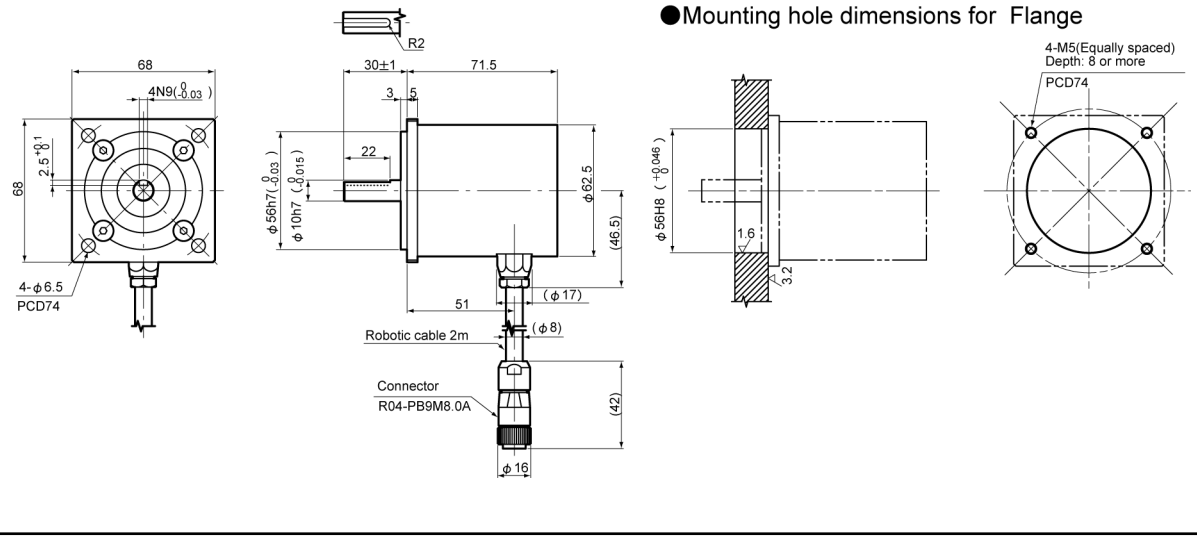
Option (2 pieces / 1set)



●VRE-P062FAC Units: mm

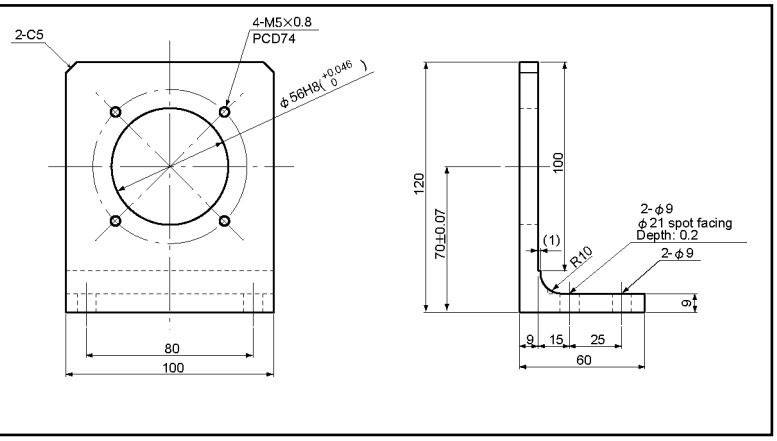


●VRE-P062FBC



●RB-01 (L type flange-mount fixture)

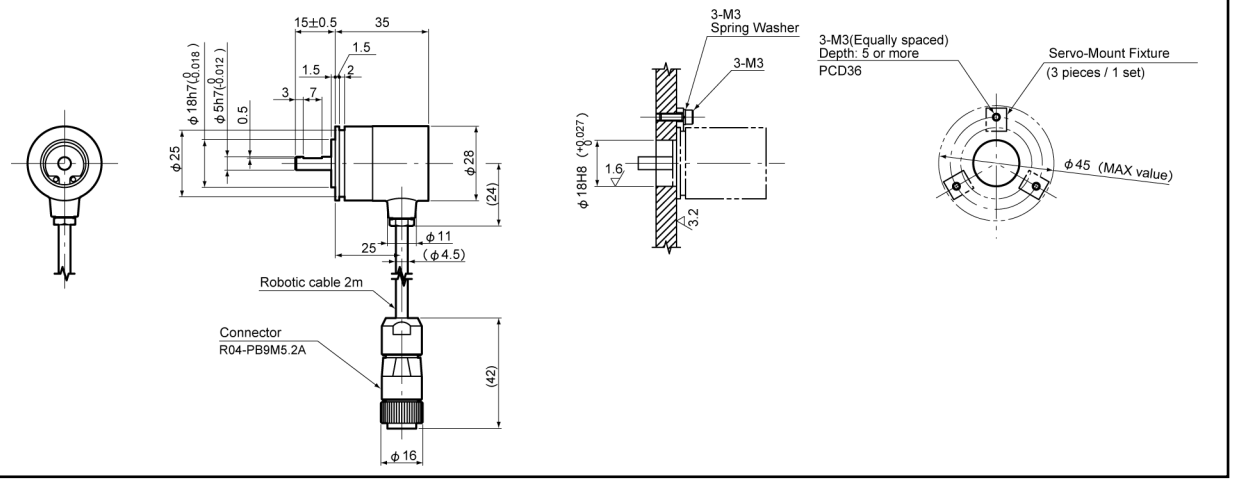
Option



L type flange-mount fixture is for VRE-P062.
Following combinations are able to use with.
- VRE-P062SAC/SBC + SH-01
- VRE-P062FAC/FBC

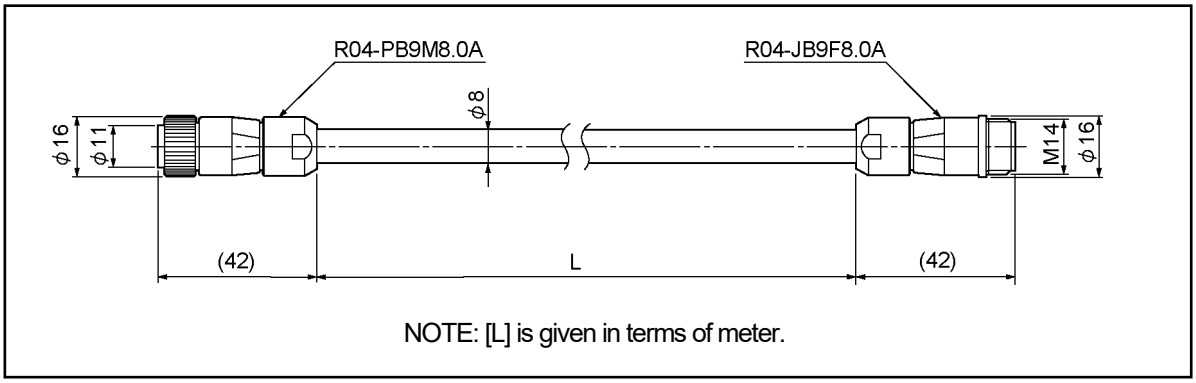
●VRE-P028SAC Units: mm

●Mounting hole dimensions for Servo mount



4-3. Extension Sensor Cable Outer Dimensions

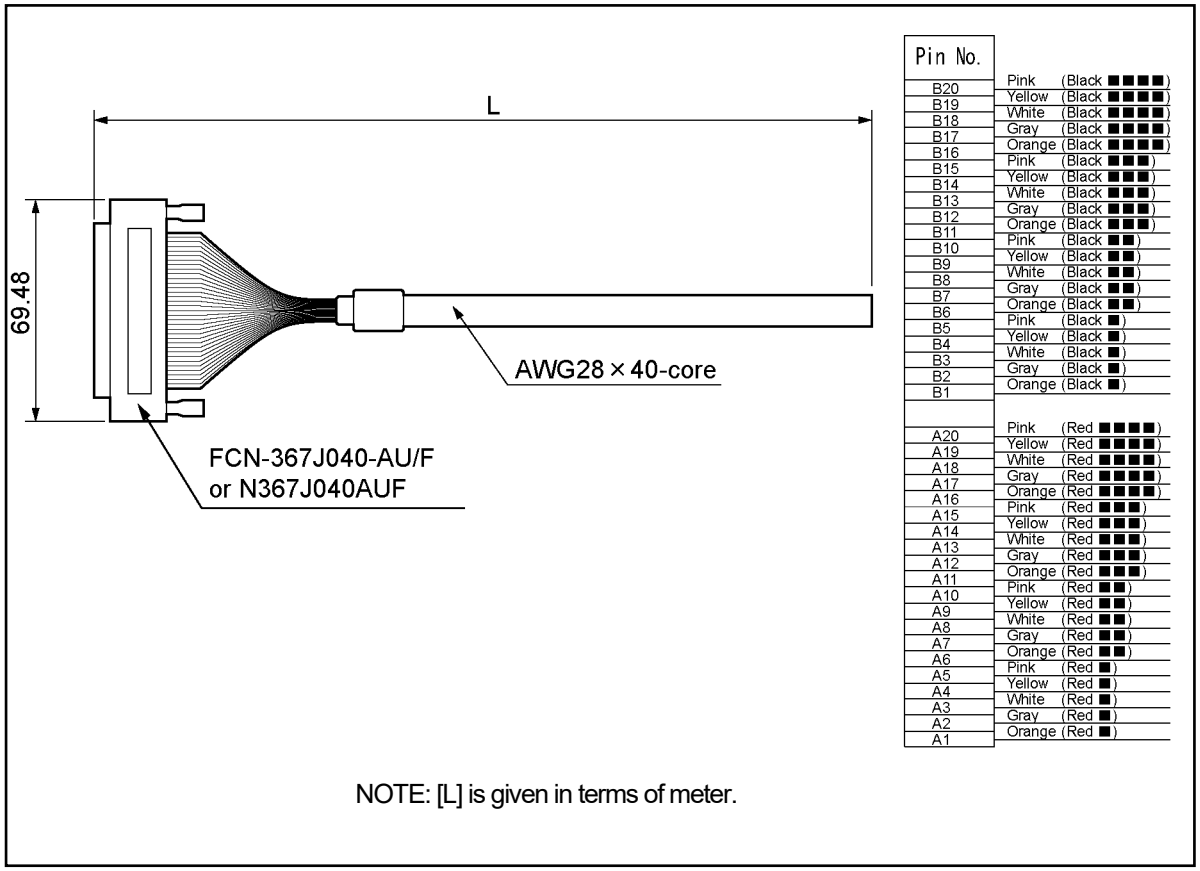
●3P-S-0102-[L] or 3P-RBT-0102-[L] Units: mm



NOTE: [L] is given in terms of meter.

4-4. External Cable Outer Dimensions

●VS-C05-[L] Units: mm



Pin No.	
B20	Pink (Black ■■■■)
B19	Yellow (Black ■■■■)
B18	White (Black ■■■■)
B17	Gray (Black ■■■■)
B16	Orange (Black ■■■■)
B15	Pink (Black ■■■)
B14	Yellow (Black ■■■)
B13	White (Black ■■■)
B12	Gray (Black ■■■)
B11	Orange (Black ■■■)
B10	Pink (Black ■■)
B9	Yellow (Black ■■)
B8	White (Black ■■)
B7	Gray (Black ■■)
B6	Orange (Black ■■)
B5	Pink (Black ■)
B4	Yellow (Black ■)
B3	White (Black ■)
B2	Gray (Black ■)
B1	Orange (Black ■)
A20	Pink (Red ■■■■)
A19	Yellow (Red ■■■■)
A18	White (Red ■■■■)
A17	Gray (Red ■■■■)
A16	Orange (Red ■■■■)
A15	Pink (Red ■■■)
A14	Yellow (Red ■■■)
A13	White (Red ■■■)
A12	Gray (Red ■■■)
A11	Orange (Red ■■■)
A10	Pink (Red ■■)
A9	Yellow (Red ■■)
A8	White (Red ■■)
A7	Gray (Red ■■)
A6	Orange (Red ■■)
A5	Pink (Red ■)
A4	Yellow (Red ■)
A3	White (Red ■)
A2	Gray (Red ■)
A1	Orange (Red ■)

NOTE: [L] is given in terms of meter.

INTRODUCTORY

Describes about packing contents, mounting methods, and wiring methods.

5. INSTALLATION
6. WIRING and CONNECTION

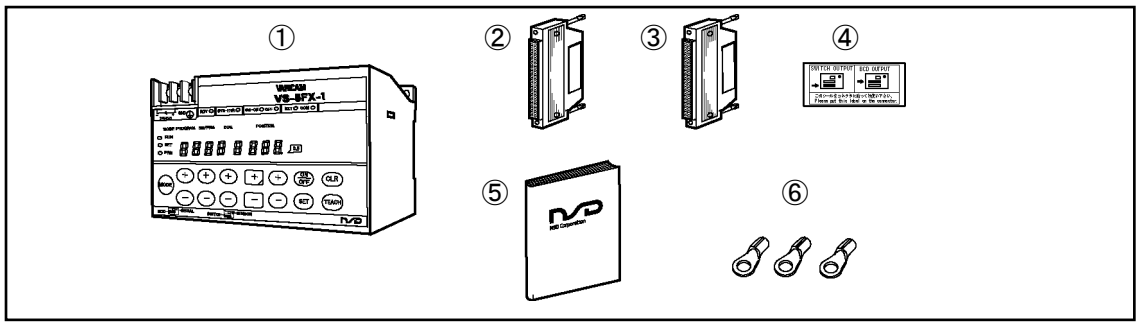
5. INSTALLATION

The handling procedures from the point of delivery to system installation are described in this chapter.

5-1. Checking the Contents of the Shipping Case

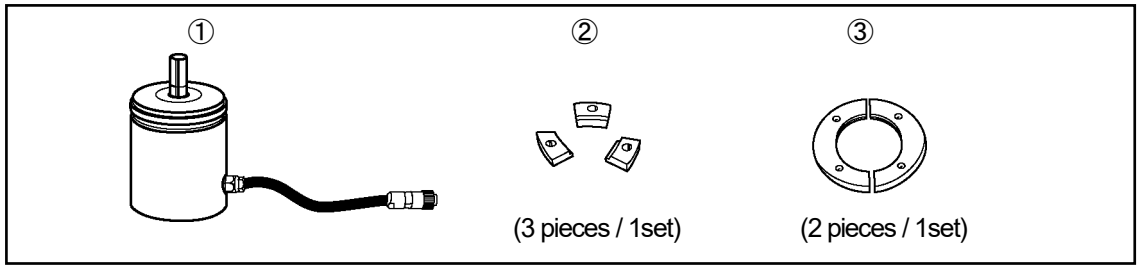
Open the packing case, and verify that all items are present.

(1) VARICAM



① VARICAM unit	1 unit	
② Switch output connector	1 piece	Connector: FCN-361J040-AU / N361J040AU Cover: FCN-360C040-E / N360C040E Manufacturer: FUJITSU COMPONENT LIMITED / OTAX CO.,LTD.
③ BCD connector (Accessory for VS-5FD(-1) and VS-5FX(-1).)	1 piece	Connector: FCN-361J040-AU / N361J040AU Cover: FCN-360C040-E / N360C040E Manufacturer: FUJITSU COMPONENT LIMITED / OTAX CO.,LTD.
④ Connector identifying seal (Accessory for VS-5FD(-1) and VS-5FX(-1).)	1 sheet	It is a seal for identifying a switch output connector and a BCD connector of VS-5FD(-1) and VS-5FX(-1). Puts a seal on the connector.
⑤ Instruction manual	1 piece	
⑥ Crimping terminal 1.25-3 (Accessory for VS-5F, VS-5FD, and VS-5FX.)	3 pieces	Manufacturer: NICHIFU Co.Ltd.

(2) ABSOCODER sensor



① ABSOCODER sensor	1 unit
② Servo-mount fixture (Accessory for Servo-mount type)	1 set (Accessory)
③ Reinforced servo-mounting fixture	1 set (Sells separately)

Note

When an extension sensor cable and panel-mount fixture (VS-K-F) are ordered, they are packed separately.
The flange-mount type of ABSOCODER sensor does not attach the servo-mounting fixture.

5-2. Installation Conditions and Precautions

The VARICAM and ABSOCODER sensor installation procedures and precautions are described.
Refer to “4. OUTER DIMENSIONS” for mounting dimensions.

5-2-1. VARICAM Installation Conditions and Precautions

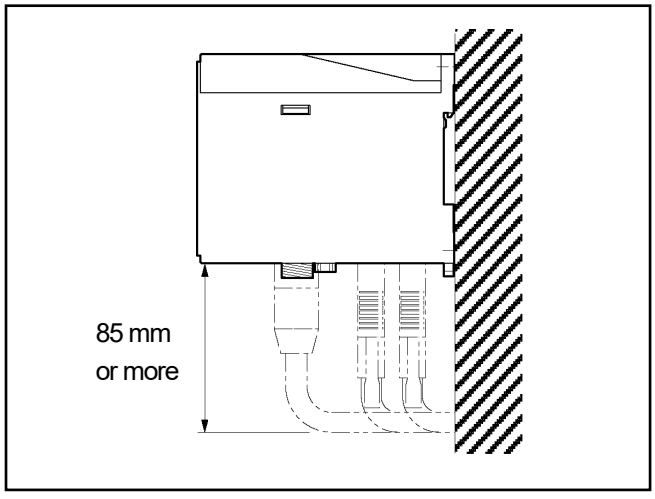
When installing VARICAM, the following conditions and precautions should be observed.

- Installation site

(1) Avoid sites where the unit is exposed to direct sunlight.
(2) The ambient temperature should never exceed a 0 to 55°C range.
(3) The ambient humidity should never exceed a 20 to 90% RH range.
(4) Do not install the unit in areas where condensation is likely to occur (high humidity with extreme temperature changes).
(5) Avoid sites where dust is excessive.
(6) Do not install in areas with an excessive amount of salt and/or metal chips.
(7) Do not install in areas where flammable and/or corrosive gases are present.
(8) Avoid areas where splashing water, oil or chemicals are likely to occur.
(9) Avoid areas where vibration and shocks are excessive.

- Installation cautions

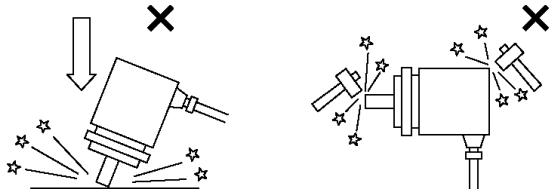
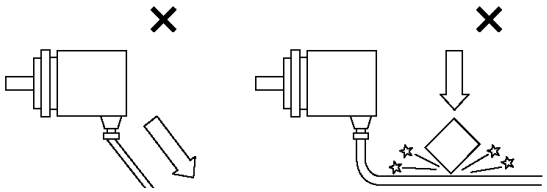
(1) Secure tightly with 2-M4 screws.
(2) If the VARICAM is mounted on the DIN rail, secure tight on the rail.
Recommended DIN rail: PFP-50N, PFP-100N, PFP-100N2 [Omron Corporation]
Recommended end plate: PFP-M [Omron Corporation]
(3) In order to improve noise resistance, install as far away as possible from high-voltage and power cables.
(4) Allow 85mm or more space at the VARICAM’s bottom side for plugging in and unplugging the connectors.
(5) Install inside the control cabinet.



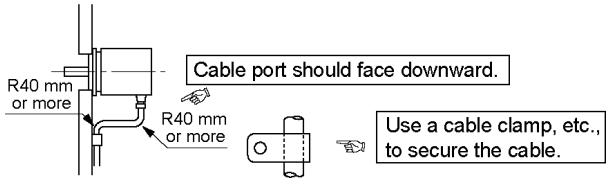
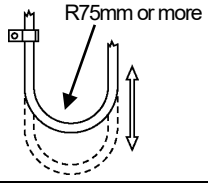
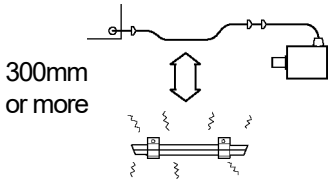
5-2-2. ABSOCODER Sensor Installation Conditions and Precautions

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

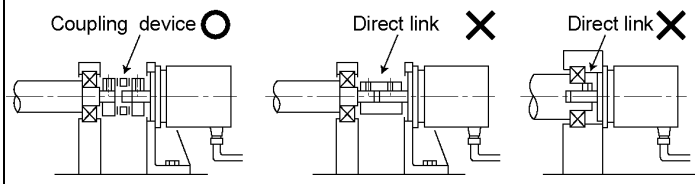
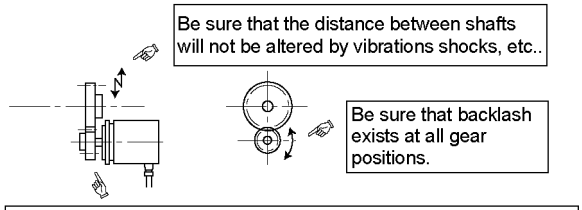
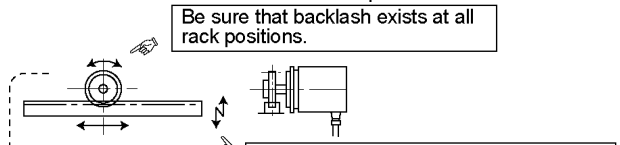
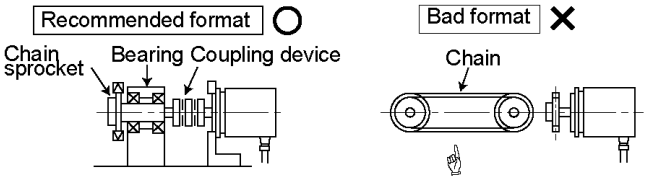
- Handling of Turn-type ABSOCODER sensor

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

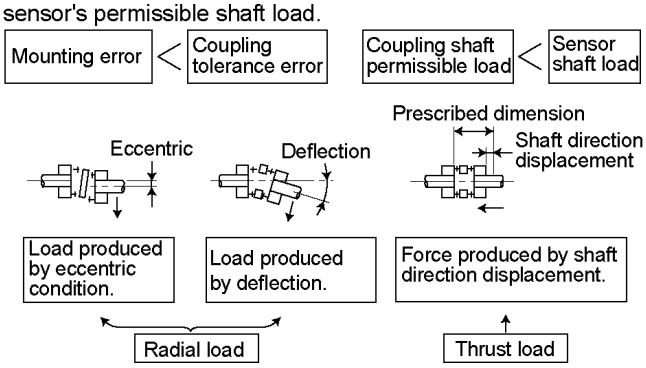
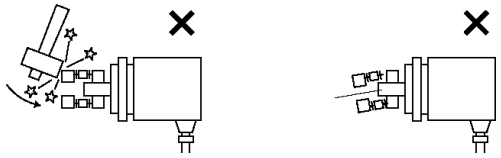
- Mounting of Turn-type ABSOCODER sensor

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

- Mounting of Turn-type ABSOCODER sensor

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

- Coupling of Turn-type ABSOCODER sensor

<table>
<tr><th>Item</th><th>Explanation</th><th>Precaution</th></tr>
<tr><td rowspan="3">1) Coupling device selection precaution</td><td>1. When selecting a coupling, consider factors such as the design mounting error, the coupling tolerance error, and the sensor's permissible shaft load.
 
</td><td rowspan="3">The selection of a larger coupling than necessary will increase the shaft load which is caused by the mounting error amount. Excessive force applied to the shaft can deform the coupling and reduce durability.</td></tr>
<tr><td>2. If the selected coupling device is larger than necessary (when used in high vibration/shock environments), the load which is applied to the shaft by the vibrations/shocks will be increased by the weight of the coupling device.</td></tr>
<tr><td>3. Be sure to select a coupling device with an adequate transmission torque surplus relative to the sensor shaft's torque.</td></tr>
<tr><td>2) Coupling device installation precaution</td><td>Avoid bending or damaging the coupling.
  </td></tr>
</table>

6. WIRING and CONNECTION

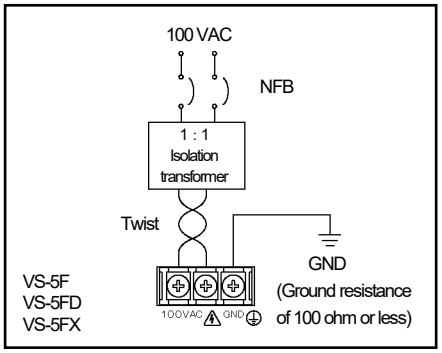
6-1. Power Supply Connection

Describes about the power supply connection.

(1) Isolation transformer

In the case of using VARICAM with 100VAC model (VS-5F, VS-5FD, VS-5FX)

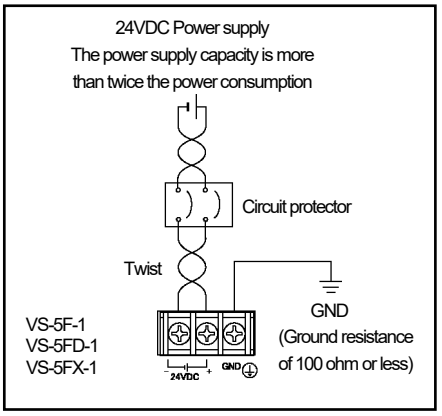
Connect the isolation transformer if the noise influences VARICAM.



(2) Power supply

In the case of using VARICAM with 24VDC model (VS-5F-1, VS-5FD-1, VS-5FX-1)

- The power supply should be isolated from the commercial power supply.
- Choose the power supply capacity which is more than twice the power consumption of VARICAM.
  The power consumption of the VARICAM is 10W or less.



(3) Wiring

- Twist the power cable for preventing noises.
- The power cable should be as thick as possible to minimize voltage drops.

(4) Crimping terminal

Use the crimping terminal as following:

- Use M3 size crimp lug terminal (ring type) of accessory when using VARICAM with 100VAC model.
- Use M3 size crimping lug terminal when using VARICAM with 24VDC model.
- The terminal block tightening torque is 0.6N·m (5.1Lb·In).

(5) Ground

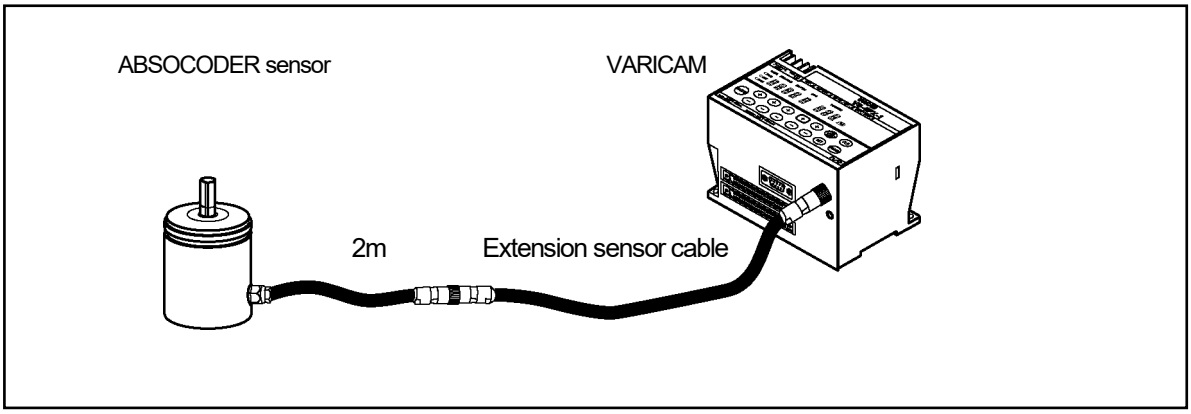
- VARICAM should be grounded (ground resistance of 100ohm or less) to prevent electrical shocks.

6-2. Connection between VARICAM and ABSOCODER Sensor

Describes about the connection of VARICAM and ABSOCODER sensor.

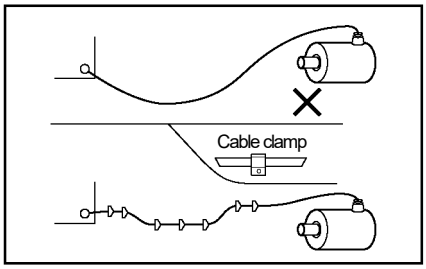
●Cable connection

ABSOCODER sensor is equipped with a 2-meter cable. If a length is required, the dedicated extension sensor cable of special must be used. The maximum extensible length is 100m.

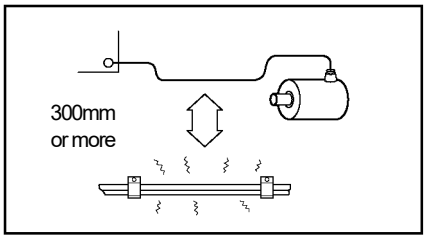


●Wiring precautions

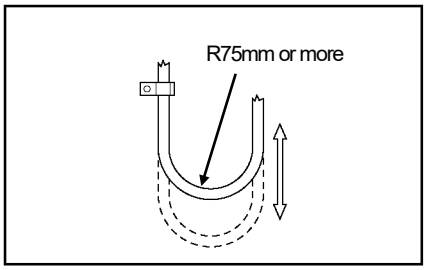
(1) The sensor cable should be clamped as shown in the right figure to prevent excessive tension from being applied to the cable connectors.



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



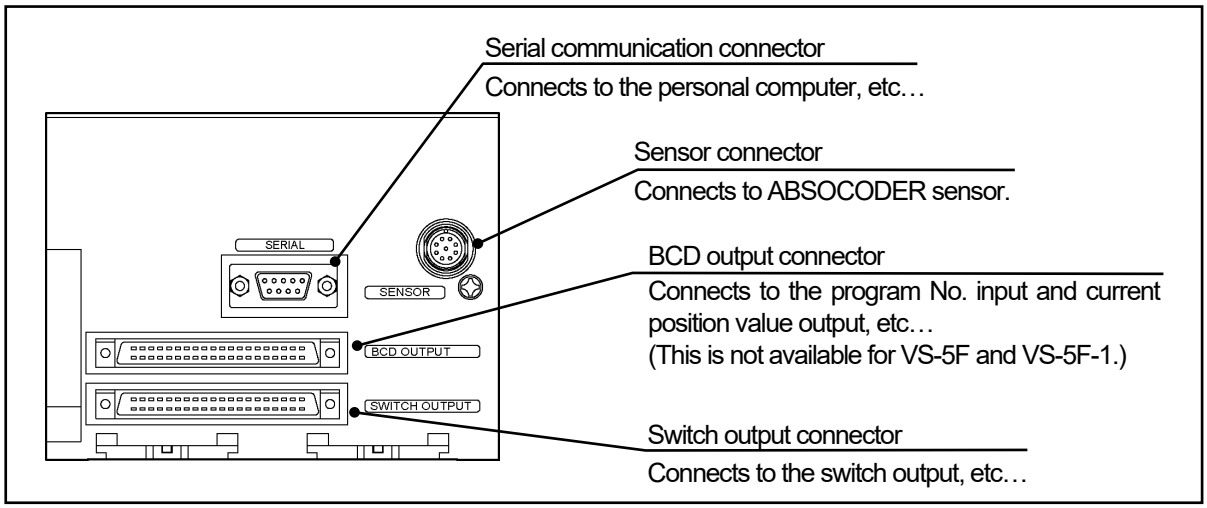
(3) If the cable is moved under the state of bending like a horseshoe, a robotic cable should be used. The bend radius should never be less than 75 mm.



6-3. Connector Connections

Describes about the connector connection.

6-3-1. Connector Names and Functions



6-3-2. Signal Names and Descriptions

Name		Description	Applicable model		
			VS-5F	VS-5FD	VS-5FX
Output	Switch outputs	Outputs ON/OFF signal outputs according to the switch output setting values.	○ or ○	○ or ○	○ or ○
	Arbitrary pulse	Outputs the pulse signal which is equally divided single rotation when setting the pulse number at the arbitrary pulse selection.			
	System ready	If VARICAM and ABSOCODER sensor operate normally during selecting RUN mode, the system ready signal is output. Use this signal as the interlock signal.	○	○	○
	Timing pulse	Outputs a pulse signal which is equally divided single rotation of the machine (ABSOCODER sensor). The pulse number is selectable from 60, 180, or 360 per revolution.	○ or ○	○ or ○	○ or ○
	Motion detection switch	Outputs ON/OFF signal according to rotation speed setting values.			
	Current position value(BCD)	The current position value for the display is output by BCD 3-digit + 0.5 degree signal.		○ or ○ or ○	○ or ○ or ○
	Current position value(gray code (720-division))	The current position value for the display is output by gray codes which are divided by 720.			
	Speed	Outputs the shaft rotation speed of ABSOCODER sensor by binary codes.			
	Latch pulse	This is updating timing signal of the current position value outputs.		○	○
	Program No.	The currently selected program No. is output.		○	○
Input	Switch output enabling	The switch output will operate when this input is turned ON.	○	○	○
	Error cancel	Cancels an error when this input is turned ON.	○	○	○
	Program No.	Inputs the program No. by binary codes.		○	○
	Current position HOLD	Uses this function when the current position value (speed) output is read by the programmable controller. Stops updating the current position value (speed) output when this signal is turned ON.		○	○ or ○
	External origin set	Sets the origin when this input is turned ON.			

6-3-3. I/O Signal Condition in the Each Mode

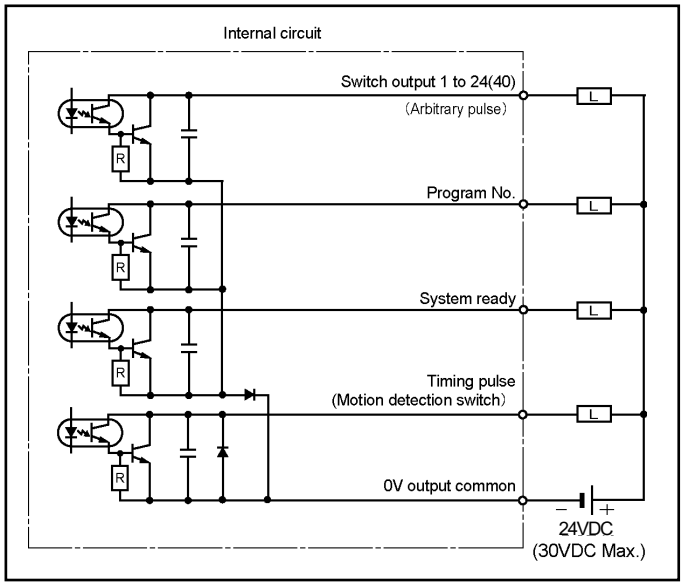
Indicates connector's I/O signal condition in each mode.

Signal name \ Mode		RUN mode (RUN)	Switch setting mode (SET)	Parameter setting mode (PRM)
Output	Switch	Valid	Depending on the parameter No. 94 setting, determines whether output is OFF or HOLD. For more details, refer to "8-6. Output HOLD function".	
	Arbitrary pulse			
	System ready	Valid (output ON)	Valid (output OFF)	
	Timing pulse	Valid	Valid（It is same as RUN mode.）	
	Motion detection switch			
	Current position value	Valid	Valid（It is same as RUN mode.）	
	Speed			
	Latch pulse	Valid	Valid（It is same as RUN mode.）	
	Program No.	Valid	Valid（It is same as RUN mode.）	
Input	Switch output enabling	Valid	Invalid	
	Error cancel	Valid	Valid	
	Program No.	Valid	Invalid	
	Current position HOLD	Valid	Valid	
	External origin set			

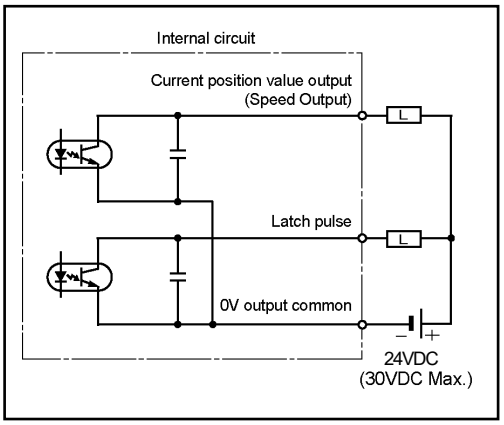
6-3-4. I/O Circuit

(1) Output circuit

① Switch output (Arbitrary pulse), program No., system ready, timing pulse (Motion detection switch)

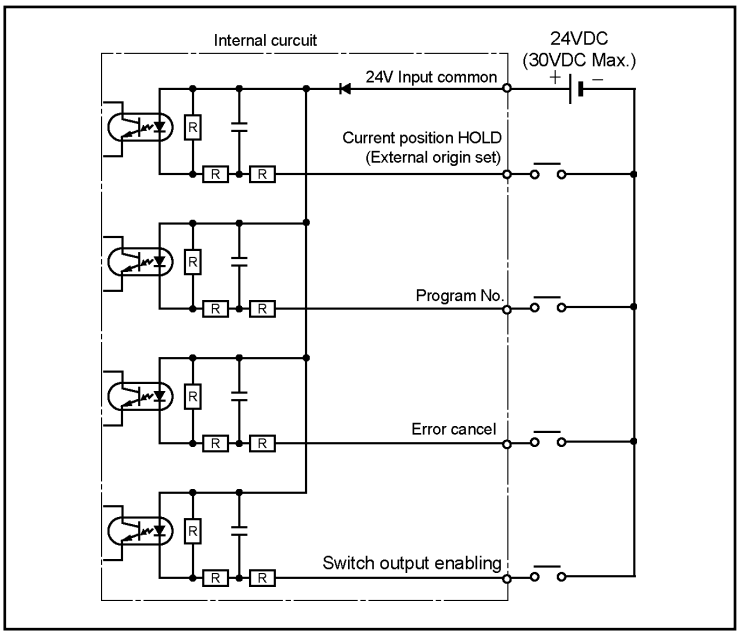


② Current position value (speed), latch pulse (LP)



(2) Input circuit

Program No., current position HOLD (external origin set), error cancel, switch output enabling



6-3-5. I/O Connector Pin Arrangement

(1) VS-5F, VS-5FD, VS-5F-1, VS-5FD-1

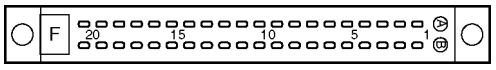
① Switch output connector (SWITCH OUTPUT)

The pin arrangements of switch output connectors are the same both VS-5F(-1) and VS-5FD(-1).

[Connector model: FCN-361J040-AU / FCN-360C040-E (FUJITSU COMPONENT LIMITED)
or N361J040AU / N360C040E (OTAX CO.,LTD.)]

Pin No.	Signal name	Pin No.	Signal name
B20 *1	Switch output 1	A20 *1	Switch output 17
B19 *1	Switch output 2	A19 *1	Switch output 18
B18 *1	Switch output 3	A18 *1	Switch output 19
B17 *1	Switch output 4	A17 *1	Switch output 20
B16 *1	Switch output 5	A16 *1	Switch output 21
B15 *1	Switch output 6	A15 *1	Switch output 22
B14 *1	Switch output 7	A14 *1	Switch output 23
B13 *1	Switch output 8	A13 *1	Switch output 24
B12 *1	Switch output 9	A12	
B11 *1	Switch output 10	A11	
B10 *1	Switch output 11	A10	
B9 *1	Switch output 12	A9	
B8 *1	Switch output 13	A8	
B7 *1	Switch output 14	A7	
B6 *1	Switch output 15	A6	System ready output
B5 *1	Switch output 16	A5 *2	Timing pulse / Motion detection switch output
B4	Switch output enabling input	A4	0V output common
B3	Error cancel input	A3	
B2	+24V input common	A2	
B1		A1	

Shows the pin arrangement as viewed from the soldering terminals side.



● External cable (VS-C05)

Indicates external cable wire colors and markings.
It can be used at either the switch output connector or the BCD connector.

Pin No.	Wire colors & markings	Pin No.	Wire colors & markings
B20	Pink (Black■■■■)	A20	Pink (Red■■■■)
B19	Yellow (Black■■■■)	A19	Yellow (Red■■■■)
B18	White (Black■■■■)	A18	White (Red■■■■)
B17	Gray (Black■■■■)	A17	Gray (Red■■■■)
B16	Orange (Black■■■■)	A16	Orange (Red■■■■)
B15	Pink (Black■■■)	A15	Pink (Red■■■)
B14	Yellow (Black■■■)	A14	Yellow (Red■■■)
B13	White (Black■■■)	A13	White (Red■■■)
B12	Gray (Black■■■)	A12	Gray (Red■■■)
B11	Orange (Black■■■)	A11	Orange (Red■■■)
B10	Pink (Black■■)	A10	Pink (Red■■)
B9	Yellow (Black■■)	A9	Yellow (Red■■)
B8	White (Black■■)	A8	White (Red■■)
B7	Gray (Black■■)	A7	Gray (Red■■)
B6	Orange (Black■■)	A6	Orange (Red■■)
B5	Pink (Black■)	A5	Pink (Red■)
B4	Yellow (Black■)	A4	Yellow (Red■)
B3	White (Black■)	A3	White (Red■)
B2	Gray (Black■)	A2	Gray (Red■)
B1	Orange (Black■)	A1	Orange (Red■)

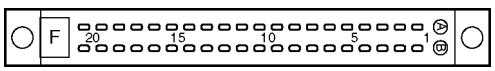
② BCD output connector (BCD OUTPUT)

VS-5FD(-1) is equipped with this connector. VS-5F(-1) is not.

[Connector model: FCN-361J040-AU / FCN-360C040-E (FUJITSU COMPONENT LIMITED)
or N361J040AU / N360C040E (OTAX CO.,LTD.)]

Pin No.	Signal name	Pin No.	Signal name			
B20		A20 *3	Current position value output (BCD) 0.5	Current position value output (gray code (720-division)) 2^0	Speed output 1	Speed output 2
B19		A19 *3	Current position value output (BCD) 1	Current position value output (gray code (720-division)) 2^1	Speed output 2	Speed output 4
B18		A18 *3	Current position value output (BCD) 2	Current position value output (gray code (720-division)) 2^2	Speed output 4	Speed output 8
B17		A17 *3	Current position value output (BCD) 4	Current position value output (gray code (720-division)) 2^3	Speed output 8	Speed output 16
B16		A16 *3	Current position value output (BCD) 8	Current position value output (gray code (720-division)) 2^4	Speed output 16	Speed output 32
B15		A15 *3	Current position value output (BCD) 10	Current position value output (gray code (720-division)) 2^5	Speed output 32	Speed output 64
B14		A14 *3	Current position value output (BCD) 20	Current position value output (gray code (720-division)) 2^6	Speed output 64	Speed output 128
B13		A13 *3	Current position value output (BCD) 40	Current position value output (gray code (720-division)) 2^7	Speed output 128	Speed output 256
B12		A12 *3	Current position value output (BCD) 80	Current position value output (gray code (720-division)) 2^8	Speed output 256	Speed output 512
B11 *2	Timing pulse / Motion detection switch output	A11 *3	Current position value output (BCD) 100	Current position value output (gray code (720-division)) 2^9	Speed output 512	Speed output 1024
B10		A10 *3	Current position value output (BCD) 200		Speed output 1024	Speed output 2048
B9	Current position HOLD input	A9	Latch pulse output (LP)			
B8	Program No. input 1	A8	Program No. output 1			
B7	Program No. input 2	A7	Program No. output 2			
B6	Program No. input 4	A6	Program No. output 4			
B5		A5				
B4		A4				
B3		A3				
B2	+24V input common	A2	0V output common			
B1		A1				

Shows the pin arrangement as viewed from the soldering terminals side.



(2) VS-5FX, VS-5FX-1

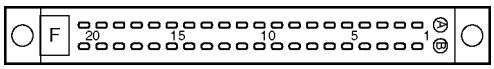
●When using a 16-program, 40-switch output format

① Switch output connector (SWITCH OUTPUT)

[Connector model: FCN-361J040-AU / FCN-360C040-E (FUJITSU COMPONENT LIMITED)
or N361J040AU / N360C040E (OTAX CO.,LTD.)]

Pin No.	Signal name	Pin No.	Signal name
B20 *1	Switch output 1	A20 *1	Switch output 17
B19 *1	Switch output 2	A19 *1	Switch output 18
B18 *1	Switch output 3	A18 *1	Switch output 19
B17 *1	Switch output 4	A17 *1	Switch output 20
B16 *1	Switch output 5	A16 *1	Switch output 21
B15 *1	Switch output 6	A15 *1	Switch output 22
B14 *1	Switch output 7	A14 *1	Switch output 23
B13 *1	Switch output 8	A13 *1	Switch output 24
B12 *1	Switch output 9	A12 *1	Switch output 25
B11 *1	Switch output 10	A11 *1	Switch output 26
B10 *1	Switch output 11	A10 *1	Switch output 27
B9 *1	Switch output 12	A9 *1	Switch output 28
B8 *1	Switch output 13	A8 *1	Switch output 29
B7 *1	Switch output 14	A7 *1	Switch output 30
B6 *1	Switch output 15	A6 *1	Switch output 31
B5 *1	Switch output 16	A5 *1	Switch output 32
B4	Switch output enabling input	A4	0V output common
B3	Error cancel input	A3	
B2	+24V input common	A2	
B1		A1	

Shows the pin arrangement as viewed from the soldering terminals side.

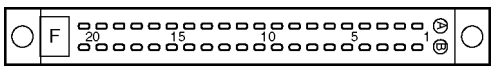


② BCD output connector (BCD OUTPUT)

[Connector model: FCN-361J040-AU / FCN-360C040-E (FUJITSU COMPONENT LIMITED)
or N361J040AU / N360C040E (OTAX CO.,LTD.)]

Pin No.	Signal name	Pin No.	Signal name			
B20 *1	Switch output 33	A20 *3	Current position value output (BCD) 0.5	Current position value output (gray code (720-division))2^0	Speed output 1	Speed output 2
B19 *1	Switch output 34	A19 *3	Current position value output (BCD) 1	Current position value output (gray code (720-division)) 2^1	Speed output 2	Speed output 4
B18 *1	Switch output 35	A18 *3	Current position value output (BCD) 2	Current position value output (gray code (720-division)) 2^2	Speed output 4	Speed output 8
B17 *1	Switch output 36	A17 *3	Current position value output (BCD) 4	Current position value output (gray code (720-division)) 2^3	Speed output 8	Speed output 16
B16 *1	Switch output 37	A16 *3	Current position value output (BCD) 8	Current position value output (gray code (720-division)) 2^4	Speed output 16	Speed output 32
B15 *1	Switch output 38	A15 *3	Current position value output (BCD) 10	Current position value output (gray code (720-division)) 2^5	Speed output 32	Speed output 64
B14 *1	Switch output 39	A14 *3	Current position value output (BCD) 20	Current position value output (gray code (720-division)) 2^6	Speed output 64	Speed output 128
B13 *1	Switch output 40	A13 *3	Current position value output (BCD) 40	Current position value output (gray code (720-division)) 2^7	Speed output 128	Speed output 256
B12	System ready output	A12 *3	Current position value output (BCD) 80	Current position value output (gray code (720-division)) 2^8	Speed output 256	Speed output 512
B11 *2	Timing pulse / Motion detection switch output	A11 *3	Current position value output (BCD) 100	Current position value output (gray code (720-division)) 2^9	Speed output 512	Speed output 1024
B10		A10 *3	Current position value output (BCD) 200		Speed output 1024	Speed output 2048
B9 *4	Current position HOLD / External origin set input	A9	Latch pulse output (LP)			
B8	Program No. input 1	A8	Program No. output 1			
B7	Program No. input 2	A7	Program No. output 2			
B6	Program No. input 4	A6	Program No. output 4			
B5	Program No. input 8	A5	Program No. output 8			
B4		A4				
B3		A3				
B2	+24V input common	A2	0V output common			
B1		A1				

Shows the pin arrangement as viewed from the soldering terminals side.



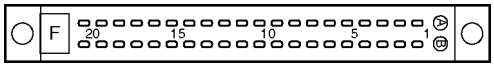
●When using a 32-program, 24-switch output format

① Switch output connector (SWITCH OUTPUT)

[Connector model: FCN-361J040-AU / FCN-360C040-E (FUJITSU COMPONENT LIMITED)
or N361J040AU / N360C040E (OTAX CO.,LTD.)]

Pin No.	Signal name	Pin No.	Signal name
B20 *1	Switch output 1	A20 *1	Switch output 17
B19 *1	Switch output 2	A19 *1	Switch output 18
B18 *1	Switch output 3	A18 *1	Switch output 19
B17 *1	Switch output 4	A17 *1	Switch output 20
B16 *1	Switch output 5	A16 *1	Switch output 21
B15 *1	Switch output 6	A15 *1	Switch output 22
B14 *1	Switch output 7	A14 *1	Switch output 23
B13 *1	Switch output 8	A13 *1	Switch output 24
B12 *1	Switch output 9	A12	
B11 *1	Switch output 10	A11	
B10 *1	Switch output 11	A10	
B9 *1	Switch output 12	A9	
B8 *1	Switch output 13	A8	
B7 *1	Switch output 14	A7	
B6 *1	Switch output 15	A6	
B5 *1	Switch output 16	A5	
B4	Switch output enabling input	A4	0V output common
B3	Error cancel input	A3	
B2	+24V input common	A2	
B1		A1	

Shows the pin arrangement as viewed from the soldering terminals side.

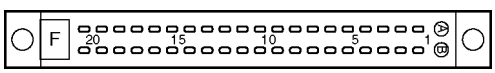


② BCD output connector (BCD OUTPUT)

[Connector model: FCN-361J040-AU / FCN-360C040-E (FUJITSU COMPONENT LIMITED)
or N361J040AU / N360C040E (OTAX CO.,LTD.)]

Pin No.	Signal name	Pin No.	Signal name			
B20		A20 *3	Current position value output (BCD) 0.5	Current position value output (gray code (720-division)) 2^0	Speed output 1	Speed output 2
B19		A19 *3	Current position value output (BCD) 1	Current position value output (gray code (720-division)) 2^1	Speed output 2	Speed output 4
B18		A18 *3	Current position value output (BCD) 2	Current position value output gray code (720-division)) 2^2	Speed output 4	Speed output 8
B17		A17 *3	Current position value output (BCD) 4	Current position value output (gray code (720-division)) 2^3	Speed output 8	Speed output 16
B16		A16 *3	Current position value output (BCD) 8	Current position value output (gray code (720-division)) 2^4	Speed output 16	Speed output 32
B15		A15 *3	Current position value output (BCD) 10	Current position value output (gray code (720-division)) 2^5	Speed output 32	Speed output 64
B14		A14 *3	Current position value output (BCD) 20	Current position value output (gray code (720-division)) 2^6	Speed output 64	Speed output 128
B13		A13 *3	Current position value output (BCD) 40	Current position value output (gray code (720-division)) 2^7	Speed output 128	Speed output 256
B12	System ready output	A12 *3	Current position value output (BCD) 80	Current position value output (gray code (720-division)) 2^8	Speed output 256	Speed output 512
B11 *2	Timing pulse / Motion detection switch output	A11 *3	Current position value output (BCD) 100	Current position value output (gray code (720-division)) 2^9	Speed output 512	Speed output 1024
B10		A10 *3	Current position value output (BCD) 200		Speed output 1024	Speed output 2048
B9 *4	Current position HOLD / External origin set input	A9	Latch pulse output (LP)			
B8	Program No. input 1	A8	Program No. output 1			
B7	Program No. input 2	A7	Program No. output 2			
B6	Program No. input 4	A6	Program No. output 4			
B5	Program No. input 8	A5	Program No. output 8			
B4	Program No. input 16	A4	Program No. output 16			
B3		A3				
B2	+24V input common	A2	0V output common			
B1		A1				

Shows the pin arrangement as viewed from the soldering terminals side.



6-3-6. Communication Connector Pin Arrangement

Uses the serial communication connector when connecting the PLC, computer, or peripheral device.

◎Serial connector (SERIAL)

[Connector: D-Sub 9-pin]

Pin No.	Signal name	Description	Notes
1	DATA-	—	
2	RXD	Receive Data	
3	TXD	Send Data	
4	DTR	Data Terminal Ready	
5	SG	Signal Ground	
6	DSR	Data Set Ready	
7	RTS	Request To Send	
8	CTS	Clear To Send	
9	DATA+	—	
Mounting screw	SHIELD	Cable shield	Shield must be connected.

Connector on the VARICAM side

Model : DELC-J9PAF-13L6E (9-pin male)

Manufacturer : Japan Aviation Electronics Industry, Ltd.

For more details about the serial communication, please contact your NSD representative.

-MEMO-

OPERATION

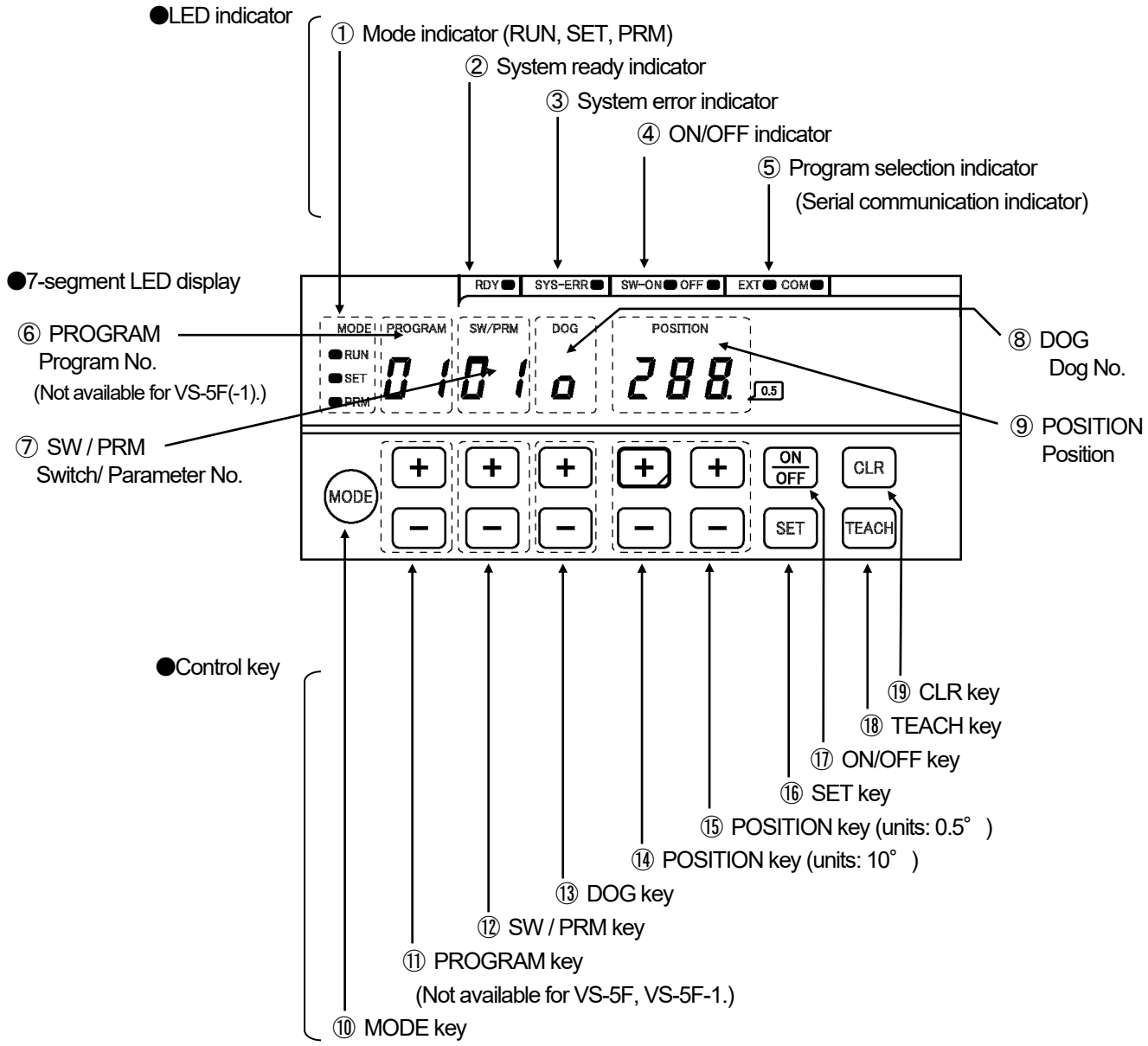
The operation is divided into a basic and applied function, and explains about usage.

7. HOW TO USE BASIC FUNCTION

VARICAM can operate easily with operation instruction of this chapter.

7-1. Nomenclature and Function of the Panel Side

Describes nomenclatures and functions of the panel side



●Indicators

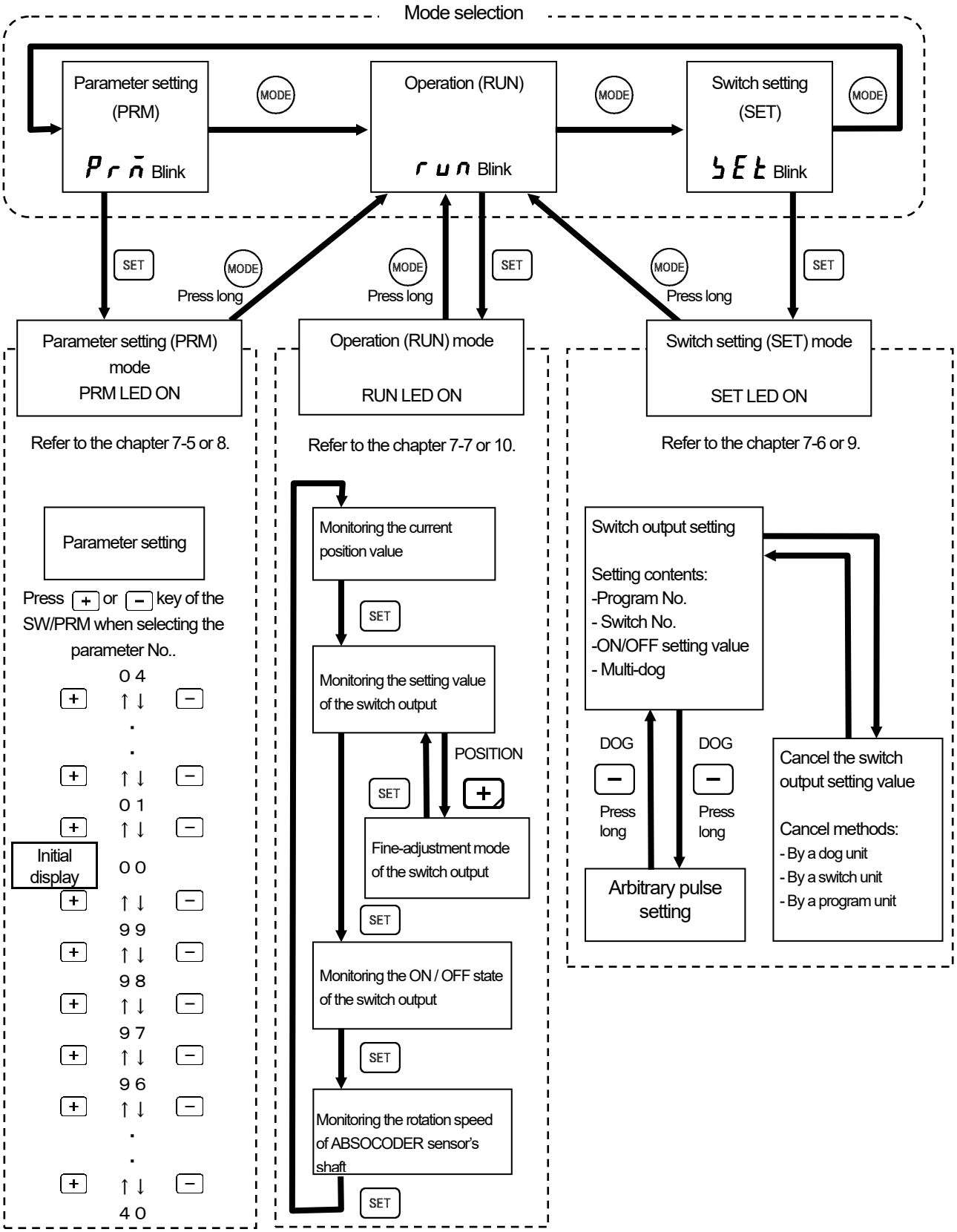
No.	Name	Descriptions
①	Mode indicator RUN, SET, PRM	Indicates selecting mode. RUN LED is ON: The operation (RUN) mode is selected. SET LED is ON: The switch setting (SET) mode is selected. PRM LED is ON: The parameter setting (PRM) mode is selected.
②	System ready indicator RDY	RDY LED is ON: Indicates that there is no error during selecting the operation (RUN) mode. This indicator is same condition as “System ready output signal” of the output connector.
③	System error indicator SYS-ERR	SYS-ERR LED is ON: Indicates that VARICAM hardware has a malfunction.
④	ON / OFF indicator SW-ON, OFF	SW-ON LED is ON: Displays ON setting value of the switch output on the display area ⑨ "POSITION" OFF LED is ON: Displays OFF setting value of the switch output on the display area ⑨ "POSITION"
⑤	Program selection indicator (Serial communication indicator) EXT, COM	(1) Indicates the program No. input method. Both EXT LED and COM LED are OFF: Selecting key input on the panel EXT LED is ON: Selecting the input from BCD connector COM LED is ON: Selecting following contents: - Inputs by the serial communication - Sets “2” or “3” at the parameter No.85 (protocol) (2) Monitors the serial communication EXT LED is blinking: Sending the data COM LED is blinking: Receiving the data
⑥	Program No. display PROGRAM	Displays selecting program No..(This function is not available to VS-5F and VS-5F-1)
⑦	Switch No. / parameter No. display SW / PRM	A switch No. is displayed when selecting the switch setting (SET) mode or operation (RUN) mode. A parameter No. is displayed when selecting the parameter setting (PRM) mode.
⑧	Dog No. display DOG	A dog No. of the switch output is displayed.
⑨	Position display POSITION （Displays by 0.5° unit）	A setting value is displayed when selecting the switch setting (SET) mode or parameter setting (PRM) mode. A current position value or an error code is displayed when selecting the operation (RUN) mode. The decimal point expresses "0.5 degree". Decimal point is ON: 0.5 degree, Decimal point is OFF: 0.0 degree

● Control keys

No.	Name	Descriptions
⑩	MODE key	Selects the mode from the operation (RUN), switch setting (SET), and parameter setting (PRM) mode.
⑪	PROGRAM key	Selects the program No.. (This key is not available to VS-5F and VS-5F-1.)
⑫	SW / PRM key	Selects the switch No. in the switch setting (SET) mode or operation (RUN) mode. Selects the parameter No. in the parameter setting (PRM) mode.
⑬	DOG key	Selects the dog No. of the switch output.
⑭	POSITION key (Units: 10°)	Increases or decreases the setting value that is displayed at ⑨ "POSITION". (The value can be changed every 10 degrees.) Changes to the fine-adjustment mode of the switch output when pressing [+] key at operation (RUN) mode.
⑮	POSITION key (Units: 0.5°)	Increases or decreases the setting value that is displayed at ⑨ "POSITION". (The value can be changed every 0.5 degrees.)
⑯	SET key	Enters the mode by pressing this key when selecting a mode. Enters the setting value by pressing this key when selecting the switch setting (SET) mode or parameter setting (PRM) mode. Changes the monitor contents by pressing this key when selecting the operation (RUN) mode.
⑰	ON/OFF key	Changes either ON or OFF setting value of the switch output. Changes ④ "ON / OFF indicator" when pressing this key.
⑱	TEACH key	Uses this key when setting the switch output by the teaching. Reads the machine’s current position by pressing this key when selecting the switch setting (SET) mode.
⑲	CLR key	Use this key following case: - Cancels the setting value when designating the switch output or parameter. - Cancels the error.

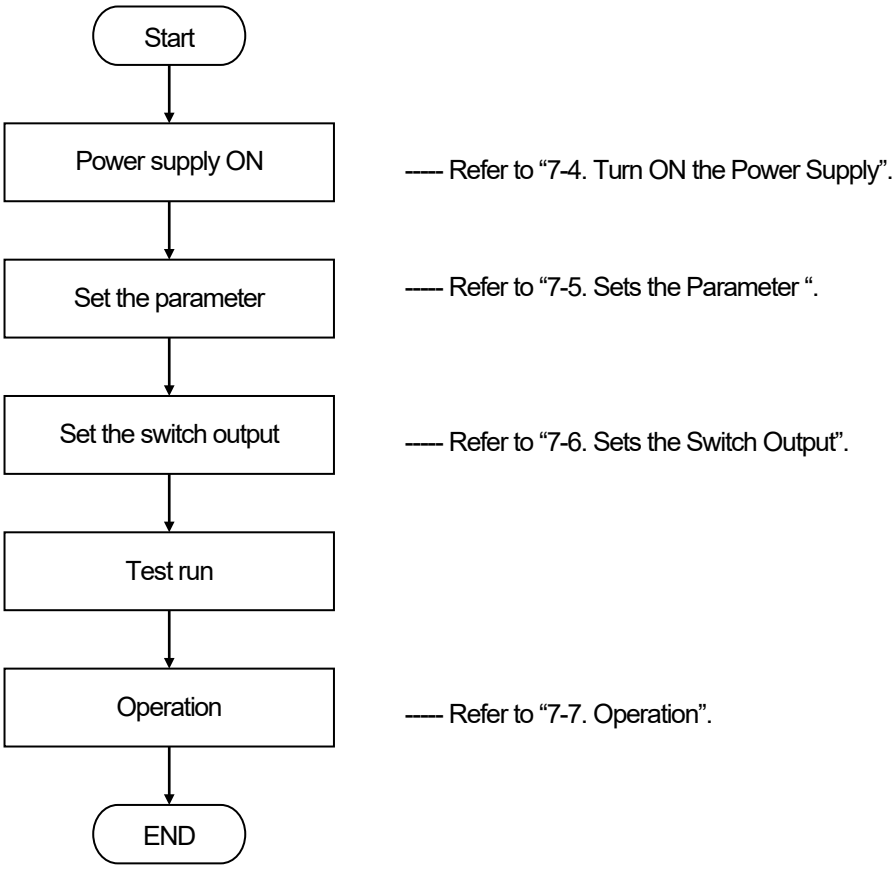
7-2. Operation Flow

An operation flowchart is shown below.



7-3. Procedure before the Operation

Describes the procedure until operation.

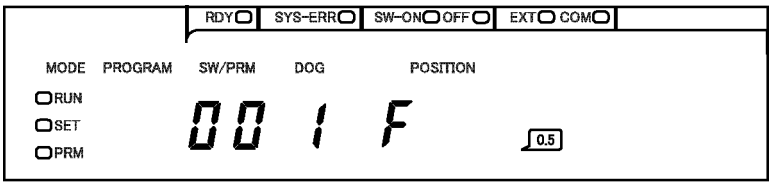


7-4. Turns ON the Power Supply

The VS-5F Series doesn't have any power supply switch; therefore, use external switch for turning ON / OFF the power supply.
Before turning ON the power supply, be sure that the wiring is correct and the screws of terminal block are securely tightened.

The screen displays as below figure when turning ON the power supply for the first time after delivery.

After turning ON the power supply, the screen displays one second.



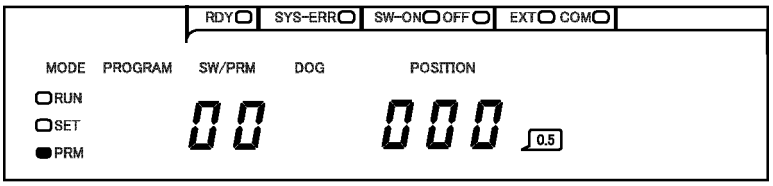
LED ON/OFF state
● : ON
○ : OFF

(1) (2) (3)

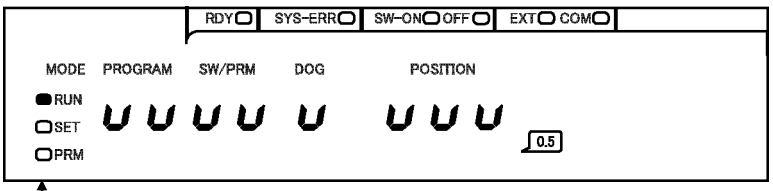
(1): Software specification (Displays 00.)
(2): Software version
(3): VARICAM model

F : VS-5F(-1) Fd : VS-5FD(-1) FU : VS-5FX(-1)

Changes the parameter setting (PRM) mode automatically.



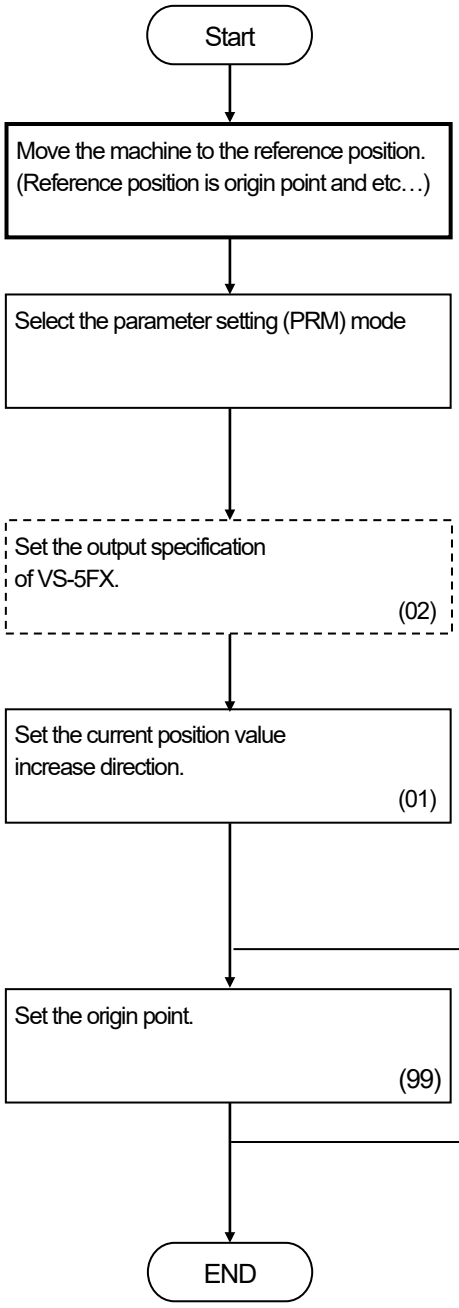
The screen displays below figure when changing mode to the operation (RUN) mode or switch setting (SET) mode.
In the case of restarting the power supply, keeps the mode just before turning OFF.



Operation (RUN) mode : RUN LED is ON
Switch setting (SET) mode : SET LED is ON

7-5. Sets the Parameter

VARICAM can operate easily only setting next parameter.



The numeric value "( )" indicates the parameter number.
For more parameter details, refer to the parameter list on next page.

Move the machine to the reference position.

The screen displays the parameter setting (PRM) mode when turning ON the power supply for the first time after delivery, so this operation doesn't need.
In the case of changing to another mode, do this procedure.
For the setting method, refer to "7-5-1. Selects the Parameter Setting (PRM) Mode".

In the case of using VS-5FX(-1), designates the output specification.
For the setting method, refer to "7-5-2. Sets the Output Specifications of VS-5FX".

Designates the rotation direction of ABSOCODER sensor's shaft in which the current position value increase.
For the setting method, refer to "7-5-3. Sets the Rotation Direction of ABSOCODER sensor".

Matches the machine's position and current position value on the VARICAM's display by designating the parameter No. 98 or 99.
For the setting method, refer to "7-5-4. Sets the Origin point or 7-5-5. Sets the Current Position Value".

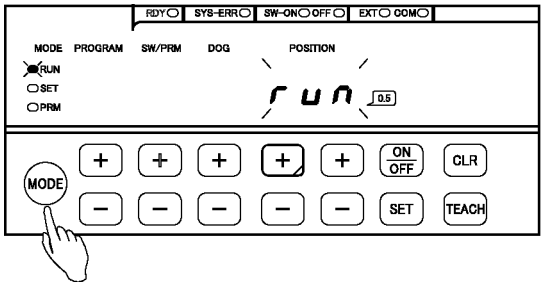
●Parameter List

No.	Name	Description	Setting range	Initial value
00	Initial display	Displays “00” at first when selecting the parameter setting (PRM) mode.		
02	VS-5FX output specifications	This function must be designated at first when using VS-5FX(-1) after delivery. Designates the combination of program and switch output numbers.	0: 16-program, 40-switch 1: 32-program, 24-switch	0
01	ABSOCODER sensor rotation direction	Designates the rotation direction of ABSOCODER sensor’s shaft in which the current position value increase. 0: Increases the current position value by rotating CW direction. 1: Increases the current position value by rotating CCW direction.	0: CW direction  Display: cu 1: CCW direction  Display: ccu	0
99	Origin point setting	Designates the machine’s origin point (000) to VARICAM.		0
98	Current position setting	Designates the machine's current position value to VARICAM by the key input. Setting unit is 0.5° .	0 to 359.5°	0

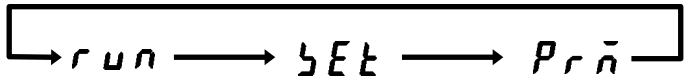
7-5-1. Selects the Parameter Setting (PRM) Mode

LED ON/OFF state
● : ON
○ : OFF
✳ : BLINK

Keeps pressing [MODE] key more than 1 second.
POSITION and MODE display areas are blinking, and changes to mode selection screen.



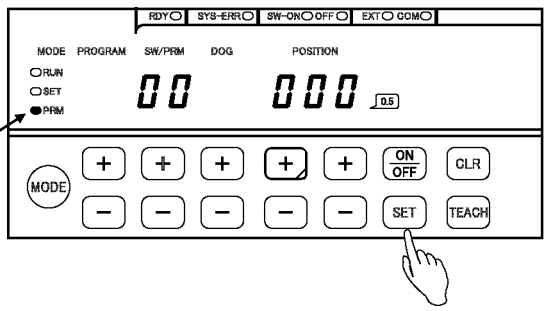
Repeatedly presses [MODE] key, and selects the parameter setting (PRM) mode.



Operation (RUN) mode　Switch setting (SET)mode　Parametr setting (PRM) mode

MODE	MODE	MODE
✳ RUN	○ RUN	○ RUN
○ SET	✳ SET	○ SET
○ PRM	○ PRM	✳ PRM

Presses [SET] key.
Changes to the parameter setting (PRM) mode.



PRM LED is ON

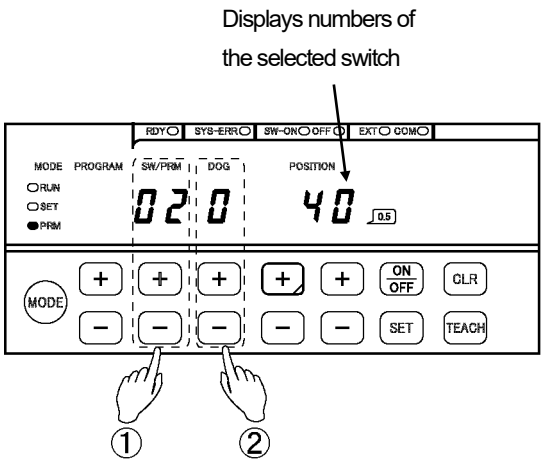
POINT
The password would be already set if "PAS" is displayed. Refer to “ APPENDIX 1”.

7-5-2. Sets the Output Specifications of VS-5FX

This setting is only for using VS-5FX-1.
Designates the combination of program and switch output numbers.

- Sets the parameter by the following procedures.

① Selects parameter No.02.
Selects "02" by pressing [+] or [-] of the SW / PRM.



② Designates the output specification. *1
Selects the output specification
by pressing [+] or [-] key of DOG.
DOG and POSITION display areas are blinking.

If [CLR] key is pressed in this timing, the setting will be canceled.

Selecting range
0: 16-program, 40-switch
1: 32-program, 24-switch

③ Confirms the setting value.
Presses [SET] key.
DOG and POSITION display areas are blinking faster.
Reconfirm the selected setting value.

If [CLR] key is pressed in this timing, the setting will be canceled.

④ Enters the setting value.
Presses [SET] key again.
DOG and POSITION display areas turns ON.
Enters selected setting value.

POINT
*1: It is also able to select by pressing [ON/OFF] key.

7-5-3. Sets the Rotation Direction of ABSOCODER Sensor

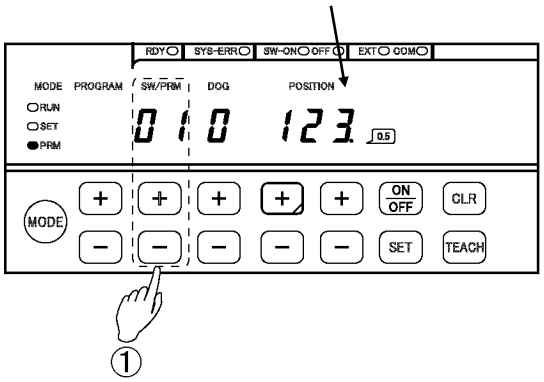
This setting is designated the rotation direction of ABSOCODER sensor's shaft in which the current position value increase.

- Sets the parameter by the following procedures.

① Selects the parameter No. 01.

Selects "01" by pressing [+] or [-] of the SW / PRM.

Checking the number that is displayed here is not necessary.

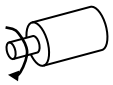


② Selects the increase direction of the current position value. *1

Selects the increase direction of the current position value by pressing [+] or [-] key of DOG.

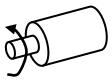
Select range

0: Increases the current position value by rotating CW direction.



ABSOCODER sensor

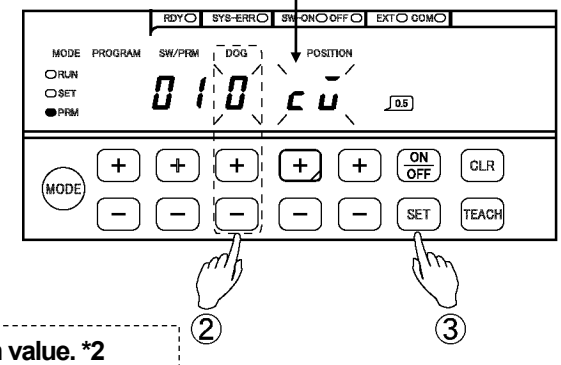
1: Increases the current position value by rotating CCW direction.



ABSOCODER sensor

*2 0: CW display blinks.

1: CCW display blinks.



③ Enters the increase direction of the current position value. *2

DOG and POSITION display areas are blinking.

If [CLR] key is pressed in this timing, the selecting value will be canceled.

Presses [SET] key, and then DOG and POSITION display areas turn ON.

The setting is completed.

POINT

*1: It is also able to select by pressing [ON/OFF] key.

*2: These operations and displays are applied to a product that is written "SP1" in the lower right portion of the front panel.

⚠ CAUTION

The "origin point setting" or "current position setting" must be designated when resetting the parameter No.01. The machine position and current position value on VARICAM's display don't match.

-For the origin point setting, refer to "7-5-4. Sets the Origin Point".

-For the current value setting, refer to "7-5-5. Sets the Current Position Value".

7-5-4. Sets the Origin Point

This setting is for matching the values of the machine position and current position on VARICAM's display when the machine position is on the origin point (0 degree).
Sets the “origin point setting” according to the following procedures.

[1] Moves the machine to the origin point position.

[2] Checks that VARICAM and ABSOCODER sensor are connected.

If VARICAM and ABSOCODER sensor are not connected, VARICAM will detect the sensor error (u08). Therefore, the origin point is impossible to set.

[3] Sets the parameter by the following procedures.

① Selects the parameter No. 99.

Selects “99” by pressing [+] or [-] key of SW / PRM.

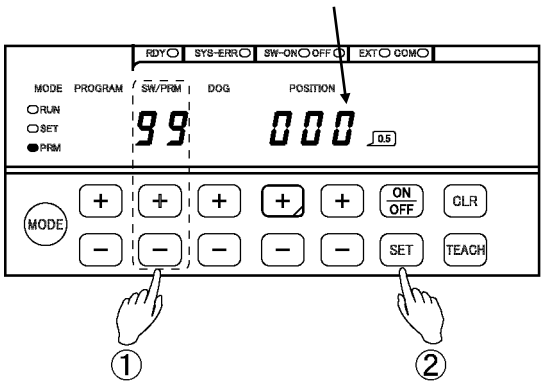
② Designates the origin point.

Presses [SET] key, and then “000” blinks on the POSITION display area for the confirmation.

If [CLR] key is pressed in this timing, the “origin point setting” will be canceled.

Presses [SET] key again, and then “000” turns ON. The “origin point setting” is completed.

Presses [SET] key once, the numeric value blinks.
Presses it again, the numeric value turns ON.



7-5-5. Sets the Current Position Value

If the machine cannot move to origin point position, this setting will be used.
The machine position value should be input by the key. Match the current position value on VARICAM's display and the machine position.
Minimum setting unit is 0.5° .

Sets the current position value according to the following procedures.

[1] Checks VARICAM and ABSOCODER sensor are connected.

If VARICAM and ABSOCODER sensor are not connected, VARICAM will detect the sensor error (u08). Therefore, the origin point is impossible to set.

[2] Sets the parameter by the following procedures.

① Selects the parameter No. 98.

Selects "98" by pressing [+] or [-] key of SW / PRM.

② Inputs the machine's current position value.

Inputs the value by pressing [+] or [-] key of POSITION.
Inputting value blinks on the POSITION display area.

Setting range: 0 to 359.5°

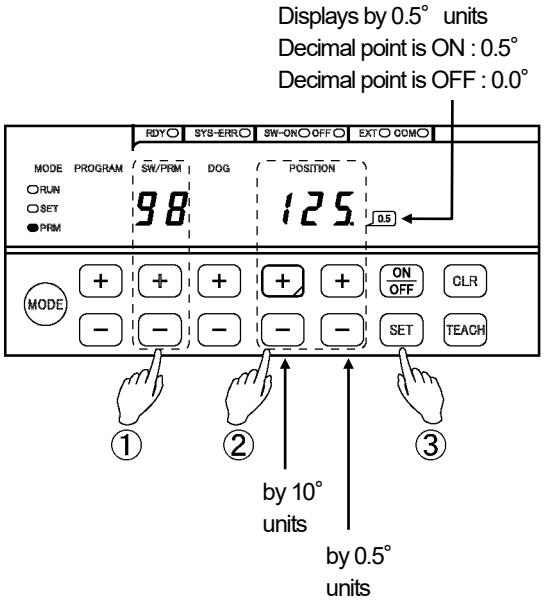
If [CLR] key is pressed in this timing, the inputting value will be canceled.

③ Enters the current position value.

Presses [SET] key, and then POSITION display area turns ON.
The current position value setting is completed.

Setting example

Below figure is an case that is input "125.5° "



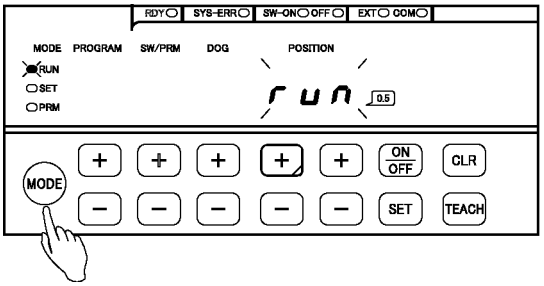
POINT

The value can fast-forward when [+] or [-] key of POSITION is kept pressing.

7-6. Sets the Switch Outputs

7-6-1. Selects the Switch Setting (SET) Mode

LED ON/OFF state
: ON
: OFF
: BLINK



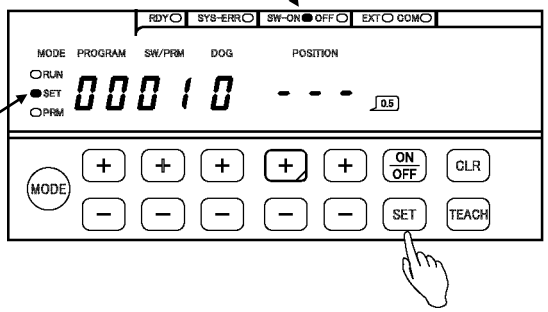
Keeps to press [MODE] key more than 1 second.
POSITION and MODE display areas are blinking, and changes to mode selection screen.

Repeats press [MODE] key, and selects the switch setting (SET) mode.

Operation (RUN) mode — Switch setting (SET)mode — Parametr setting (PRM) mode

Operation (RUN) mode	Switch setting (SET)mode	Parametr setting (PRM) mode
MODE	MODE	MODE
RUN	RUN	RUN
SET	SET	SET
PRM	PRM	PRM

SW-ON LED is ON



SET LED is ON

Presses [SET] key.
Changes to the switch setting (SET) mode.

POINT
The password would be already set if "PAS" is displayed. Refer to " APPENDIX 1".

POINT
"- - -" is displayed on the POSITION display area when data is not designated.

7-6-2. Sets the Switch Outputs

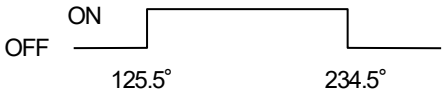
Explains the switch output setting procedure below, and it explains using contents of the setting example.

Setting example

Program No. : 1

Switch No. : 1

ON angle	125.5°
OFF angle	234.5°



Sets the switch output according to the following procedures.

① Selects the program number.

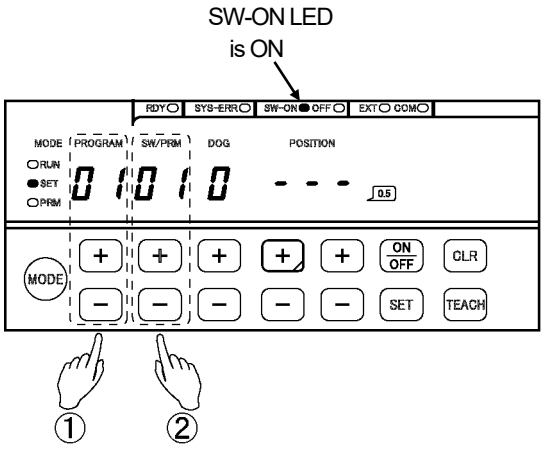
Selects the program number by pressing [+] or [-] key of PROGRAM.

Program number selection range

VS-5F(-1) : There is not program function.

VS-5FD(-1) : 0 to 7

VS-5FX(-1) : 00 to 15 or 00 to 31



② Selects the switch number.

Selects the switch number by pressing [+] or [-] key of SW / PRM.

Switch number selection range

VS-5F(-1) : 01 to 24

VS-5FD(-1) : 01 to 24

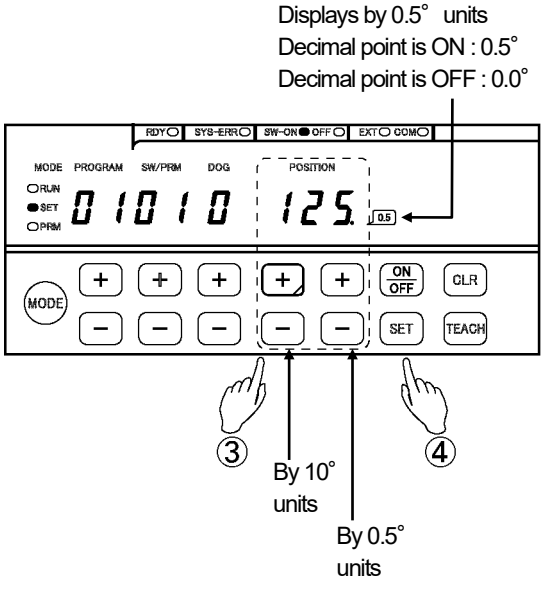
VS-5FX(-1) : 01 to 40 or 01 to 24

③ Inputs the ON angle value.

Inputs the ON angle value by pressing [+] or [-] key of POSITION, and then the value blinks in the POSITION display area.

Setting range: 0 to 359.5°

If [CLR] key is pressed in this timing, the inputting value will be canceled.



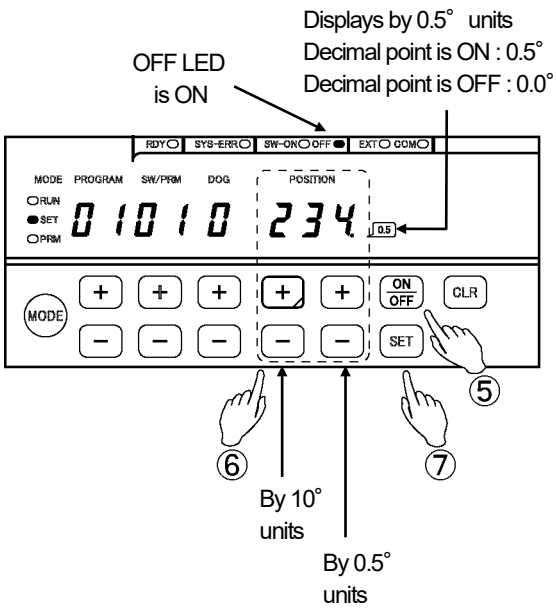
④ Enters the ON angle value.

Presses [SET] key, and then POSITION display area turns ON.

The ON angle value is entered.

⑤ Turns ON the OFF LED. *1

Presses [ON / OFF] key in order to designate the OFF angle. The OFF LED turns ON.



⑥ Inputs the OFF angle value.

Inputs the OFF angle value by pressing [+] or [-] key of POSITION, and then the value blinks in the POSITION display area.

Setting range: 0 to 359.5°

If [CLR] key is pressed in this timing, the inputting value will be canceled.

⑦ Enters the OFF angle value. *2

Presses [SET] key, and then POSITION display area turns ON.
The OFF angle value is entered.

⑧ Repeats below procedure.

Repeats procedure ② to ⑦ until number of switch outputs which you need.
Operates from procedure ① when setting the switch output to different program.

POINT

*1: SW-ON LED and OFF LED switch when [ON / OFF] key is pressed every time.
Turns ON the SW-ON LED when setting the ON angle.
Turns ON the OFF LED when setting the OFF angle.

*2: ON and OFF angle must be set together.
In the case of setting only ON angle and go to different operation, the screen displays “u17 (‘No setting’ error)”.

7-7. Operation

The operation procedure is following:

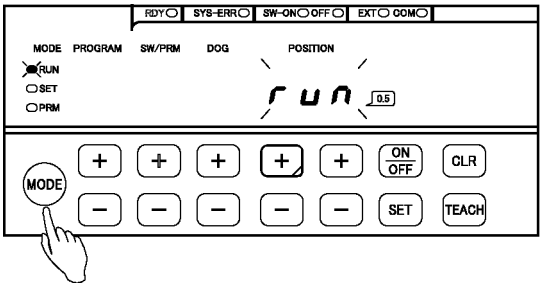
[1] Selects the switch setting (SET) mode.
[2] Selects the program number to be operated.
[3] Selects the operation (RUN) mode.
[4] Operation (RUN)

VS-5F(-1) doesn't have any program function, so procedure [1] and [2] is not available.

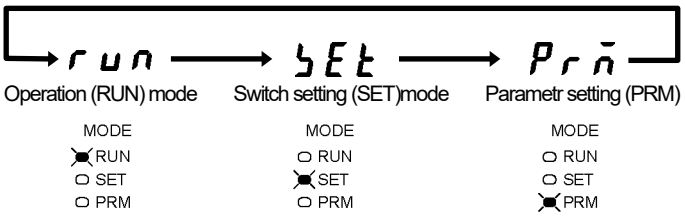
LED ON/OFF state
● : ON
○ : OFF
◐ : BLINK

[1] Selects the Switch Setting (SET) Mode

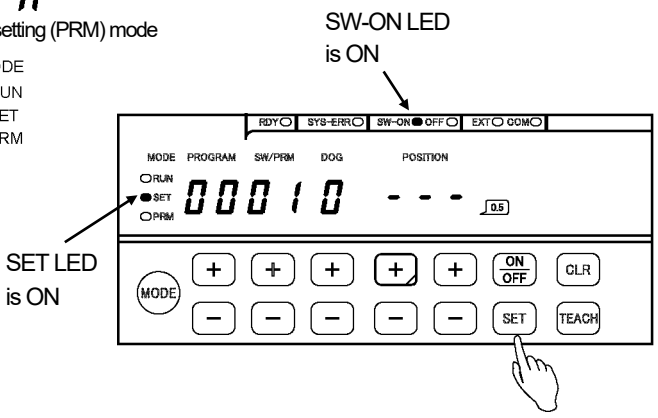
① Keeps pressing [MODE] key more than 1 second.
POSITION and MODE display areas are blinking, and changes to mode selection screen.



② Repeatedly presses [MODE] key, and selects the switch setting (SET) mode.

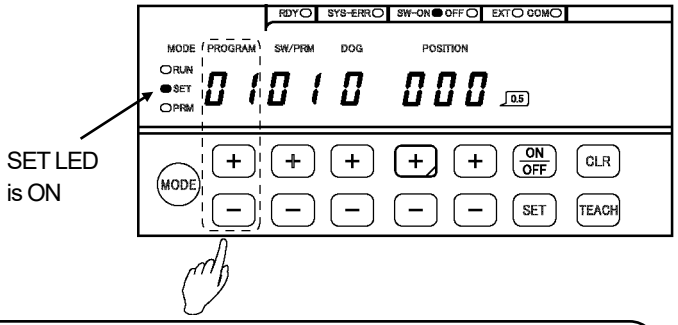


③ Presses [SET] key.
Changes to the switch setting (SET) mode.



POINT
The password would be already set if "PAS" is displayed. Refer to " APPENDIX 1".

[2] Selects the program number to be operated.
Designates the program number by pressing [+] or [-] key of PROGRAM.



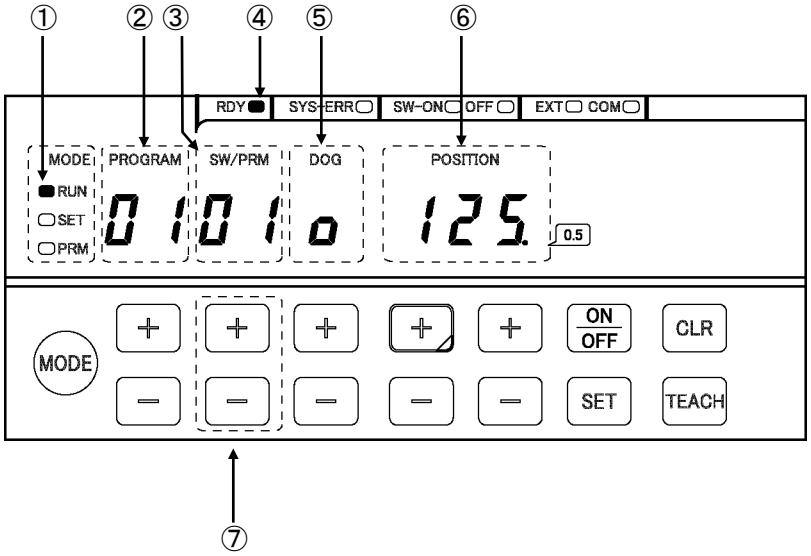
POINT
In the case of selecting the program number from I/O, refer to "8-2. Selection of the Program No. Input Method".

[3] Selects the Operation (RUN) Mode

Selects the operation (RUN) mode, refer to the procedure [1].

[4] Operation (RUN)

The switch output turns ON or OFF according to the setting value during the operation.
Indicates the monitor contents during the operation.



Name	Descriptions
① MODE indicator	RUN LED is ON: Indicates the operation (RUN) mode.
② PROGRAM display	Displays selecting the program number. (VS-5F and VS-5F-1 are not available this function.)
③ SW / PRM display	Displays the switch number which is selected by SW /PRM key.
④ RDY indicator	If there is no error, this indicator will turn ON when selecting operation (RUN) mode. This indicator is same condition as “System ready output signal” of the output connector.
⑤ DOG display	Monitors the switch number output state that is selected by SW / PRM key. ON : DOG o OFF : DOG
⑥ POSITION display	Displays the current position value.
⑦ SW / PRM key	Selects the switch number that is monitored on DOG display area.

8. HOW TO USE APPLIED FUNCTIONS (PARAMETER)

In this chapter, explains applied function that is set by the parameter.
Please use this chapter when needed.

8-1. Parameter Basic Setting Procedure

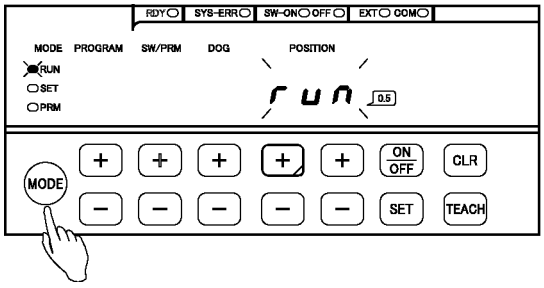
The parameter is designated by either method after selecting the mode.

(1) Selecting Methods of Numeric Value
This method is applicable with parameters below.
Parameter No.: 03, 04, 77, 78, 81, 82, 84, 85, 89, 91, 92, 93, 94, 95, 97
Refer to “8-1-2. Selecting Methods of Numeric Value” for the operation method.

(2) Inputting the numeric value method
This method is applicable with parameters below.
Parameter No.: 40, 74, 75, 76, 80, 83, 86, 90, 98
Refer to “8-1-3. Inputting the numeric value method” for the operation method.

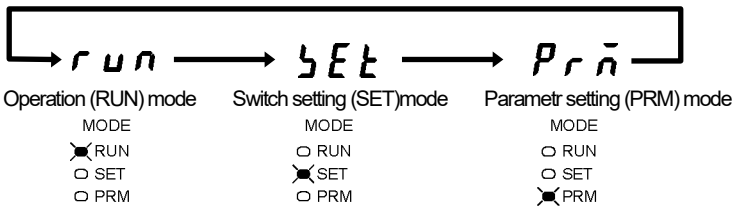
8-1-1. Selects the Parameter Setting (PRM) Mode

LED ON/OFF state
: ON
: OFF
: BLINK

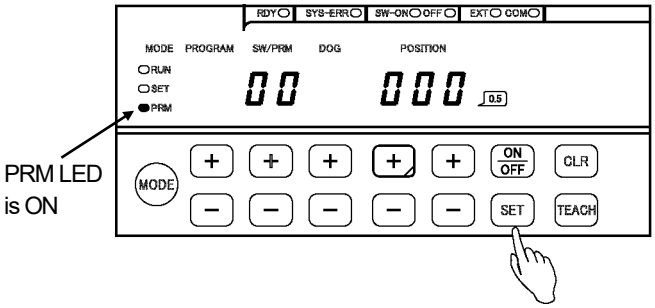


Keeps pressing [MODE] key more than 1 second.
POSITION and MODE display areas are blinking, and changes to mode selection screen.

Repeatedly presses [MODE] key, and selects the parameter setting (PRM) mode.



Presses [SET] key.
Changes to the parameter setting (PRM) mode.



POINT
The password would be already set if "PAS" is displayed. Refer to “ APPENDIX 1”.

8-1-2. Selecting Methods of Numeric Value

Sets the parameter by the following procedures.

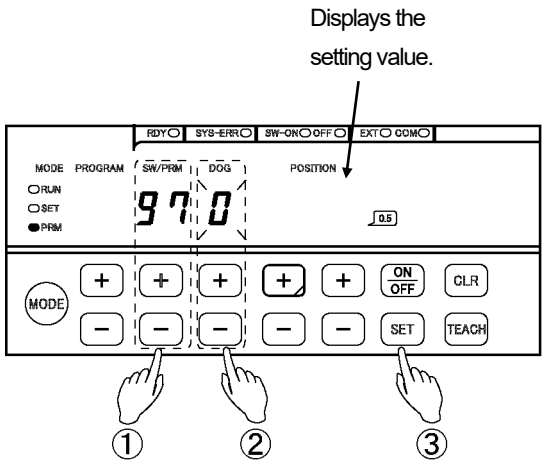
① Selects the parameter number.
Selects the parameter number by pressing [+] or [-] key of SW / PRM.

② Selects the setting value. *1
Selects the setting value by pressing [+] or [-] key of DOG.

Some parameters display the setting value at POSITION display area.
Refer to the pertinent parameter list for the display contents.

③ Enter the setting value. *2
Selecting numeric value blinks.
If [CLR] key is pressed in this timing, the selecting value will be canceled.

Presses [SET] key, and then DOG display area turns ON.
The setting is completed.



POINT
*1: The setting value can be also selected by pressing [ON / OFF] key.
*2: These operations and displays are applied to a product that is written "SP1" in the lower right portion of the front panel.

8-1-3. Inputting the Numeric Value Method

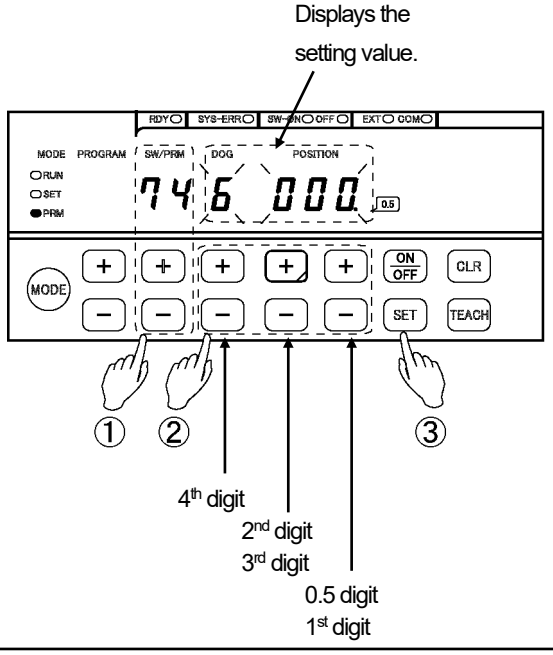
Sets the parameter by the following procedures.

① Selects the parameter number.
Selects the parameter number by pressing [+] or [-] key of SW / PRM.

② Inputs the setting value. *3
Inputs the setting value by pressing [+] or [-] key of DOG and POSITION.

③ Enter the setting value.
Inputting numeric value blinks.
If [CLR] key is pressed in this timing, the inputting value will be canceled.

Presses [SET] key, and then DOG and POSITION display areas turn ON.
The setting is completed.



POINT
*3: The value can fast-forward when [+] or [-] key of POSITION and DOG is kept pressing.

8-1-4. Parameter List

This is a parameter list, and refers to the each chapter for parameter details.
Default values (the factory setting values) are shown in [ ].

● Initial parameter (1/4)

No.	Name	Description and setting range	Applicable model			Reference (Chapter No.)
			VS-5F	VS-5FD	VS-5FX	
00	Initial display	Displays "00" at first when selecting the parameter setting (PRM) mode.	○	○	○	
02	VS-5FX output specifications	This function must be designated at first when using VS-5FX(-1) after delivery. Designates the combination of program and switch output numbers. [0: 16-program, 40-switch] 1: 32-program, 24-switch			○	7-5-2
01	ABSOCODER sensor rotation direction	Designates the rotation direction of ABSOCODER sensor's shaft in which the current position value increase. [0: CW direction] Display: C U  1: CCW direction Display: C C U 	○	○	○	7-5-3
99	Origin point setting	Designates the machine's origin point (000) to VARICAM.	○	○	○	7-5-4
98	Current position setting	Designates the machine's current position value to VARICAM by the key input. Setting unit is 0.5°. Setting range:0 to 359.5° [0°]	○	○	○	7-5-5

● Switch output parameter (2/4)

No.	Name	Description and setting range	Applicable model			Reference (Chapter No.)
			VS-5F	VS-5FD	VS-5FX	
97	Program No. input format	Selects the input format of the program No. to be operated. 0: By panel key input 1: By external connector input 2: By serial communication		○	○	8-2
96	Protected switch	Selects whether or not the protected switch function is to be used. The switch Nos. 1 to 10 is set as the protected switch when selecting "1:VALID". 0: INVALID 1: VALID	○	○	○	8-3
95	Protected switch cancel	Uses this function when selecting the protected switch by the parameter No. 96 (protected switch). The protected switch setting value can be changed by selecting "1:cancel". 0: Do not cancel 1: Cancel	○	○	○	8-3
94	Output status in SET mode	Selects the switch output status when changing the switch setting (SET) mode or parameter setting (PRM) mode from operation (RUN) mode. 0: Output OFF 1: Output HOLD	○	○	○	8-6
93	Timing pulse	VS-5F(-1) : Switch output connector A5-pin VS-5FD(-1) : Switch output connector A5-pin and BCD output connector B11-pin VS-5FX(-1) : BCD output connector B11-pin Changes the timing pulse and motion detection switch function. Timing pulse function is selecting number of output pulses per revolution. 0: 360 pulses Display: 360 1: 180 pulses Display: 180 2: 60 pulses Display: 60 3: Motion detection switch Display: Spd	○	○	○	8-4 8-5
92	Setting change during operation	Designates the function when fine-adjusting the switch output during the operation. 0: Change disable 1: Change enable	○	○	○	10-3
90	Switch output enabling range	Switch output connector B4-pin Designates controlling numbers of switch output by the switch output enabling signal. VS-5F(-1) : 0 to 24 VS-5FD(-1) : 0 to 24 VS-5FX(-1) : 0 to 40 0	○	○	○	8-8
75	Motion detection switch OFF	Designates a value that the motion detection switch output turns OFF. "3: Motion detection switch" needs to be selected at the parameter No. 93 (timing pulse). Setting range: 0 to 6000 r/min 0 r/min	○	○	○	8-5
74	Motion detection switch ON	Designates a value that the motion detection switch output turns ON. "3: Motion detection switch" needs to be selected at the parameter No. 93 (timing pulse). Setting range: 0 to 6000 r/min 0 r/min	○	○	○	8-5
40	Hysteresis angle	Designates a hysteresis angle when controlling flickers of the current position value. Setting unit is 0.5°. Setting range: 0.0 to 10.0° 0.0°	○	○	○	8-7

● Current position value (speed) output parameter (3/4)

No.	Name	Description and setting range	Applicable model			Reference (Chapter No.)
			VS-5F	VS-5FD	VS-5FX	
04	Contents of BCD output connector	Selects the output contents of BCD output connector A10-pin to A20-pin. Current position value output (BCD, gray code (720-division)), Speed output (binary code) The speed output can select the output resolution. 0: Current position value BCD 1: Speed binary code 0 to 7FF Hex (0 to 2047 r/min) Unit: 1 r/min 2: Speed binary code 0 to 7FF Hex (0 to 4094 r/min) Unit: 2 r/min 3: Gray code (720-division) of the current position value Updating cycle: 0.352 to 140.6ms Latch pulse output: enable HOLD input: enable 4: Gray code (720-division) of the current position value (High speed) Updating cycle: 0.176ms Latch pulse output: disable HOLD input: disable		○	○	8-11
03	Current position HOLD / External origin set selection	BCD output connector B9-pin This function changes the current position HOLD and external origin set functions. 0: Current position HOLD 1: External origin set			○	8-9
91	Latch pulse cycle	Designates the timing and update cycle which make the current position value output (speed) be stable condition when reading the current position value by using the latch pulse signal. "0: Transparent format" needs to be selected at the parameter No.77 (HOLD selection). Edge timing 0: 0.352 ms Display: 0.35 1: 17.58 ms Display: 17.6 2: 35.16 ms Display: 35.2 Level timing 3: 1.406 ms Display: 1.41 4: 4.219 ms Display: 4.22 5: 8.438 ms Display: 8.44 6: 17.58 ms Display: 17.6 7: 35.16 ms Display: 35.2 8: 70.32 ms Display: 70.3 9: 140.6 ms Display: 141		○	○	8-10
78	Logic of BCD output connector	BCD output connector A10 to A20 pin Selects the logic of current position value output (BCD, gray code (720-division) of the current position value) and speed output (binary code). 0: Positive logic 1: Negative logic		○	○	8-12
77	HOLD selection	By using the HOLD signal, selects the format which makes the current position value updating stop, and read it. 0: Transparent format 1: PC synchronization format		○	○	8-10
76	PC synchronization delay value	Designates the HOLD delay time of PC synchronization format. "1: PC synchronization format" needs to be selected at the parameter No.77 (HOLD selection). Setting range: 0 to 99 ms 0 ms		○	○	8-10

● Serial communication parameter (4/4)

No.	Name	Description and setting range	Applicable model			Reference (Chapter No.)
			VS-5F	VS-5FD	VS-5FX	
89	Communication setting	Designates this function when writing data to VARICAM by communication. 0: Setting disabled 1: Setting enabled	○	○	○	8-13
86	Node number	Designates this function when "9 (VARIMONI)" is selected at the parameter No. 85. Designates the node number to VARICAM. Setting range: 0 to 15 1	○	○	○	8-13
85	Protocol	Selects the communication protocol. 0: NSD 1: MELSEC-A (Bidirectional protocol) 2: MELSEC (MC protocol) 3: OMRON 8: NDP (external display unit) 9: VARIMONI	○	○	○	8-13
84	Device selection	Designates this function when "2: MELSEC (MC protocol) is selected at the parameter No. 85. Selects the device of programmable controller. 0: D (Data register) 1: R (File register)	○	○	○	8-13
83	Device No.	Designates this function when the next protocol is selected at the parameter No. 85. - 2: MELSEC (MC protocol) - 3: OMRON Designates the first number of selected device. Setting range: 0 to 9000 0	○	○	○	8-13
82	Communication dog No.	Designates this function when the next protocol is selected at the parameter No. 85. - 2: MELSEC (MC protocol) - 3: OMRON Designates the last dog No. of switch output data which reading by the programmable controller. Setting range: 0 to 9 0	○	○	○	8-13
81	Baud rate	Selects the communication baud rate. 0: 2400bps Display: 2.4 1: 4800bps Display: 4.8 2: 9600bps Display: 9.6 3: 19200bps Display: 19.2 4: 38400bps Display: 38.4 5: 57600bps Display: 57.6	○	○	○	8-13
80	Permissible angle for setting change during operation	During the operation, the permissible angle is designated when changing the setting value of the switch output by communication. Set "1" at the parameter No.92, and select one of following protocol at the parameter No.85. 0: NSD 1: MELSEC-A (Bidirectional protocol) 2: MELSEC (MC protocol) 3: OMRON Setting range: 0.5 to 180.0° 0.5°	○	○	○	8-13

8-2. Selection of the Program No. Input Method

This method is available for VS-5FD, VS-5FD-1, VS-5FX, and VS-5FX-1.

Selects the input format of the program number to be operated.

● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
97	Program No. input format	Selects the input format of the program number to be operated.	0: By panel key input 1: By external connector input 2: By serial communication	0	8-1-1 8-1-2

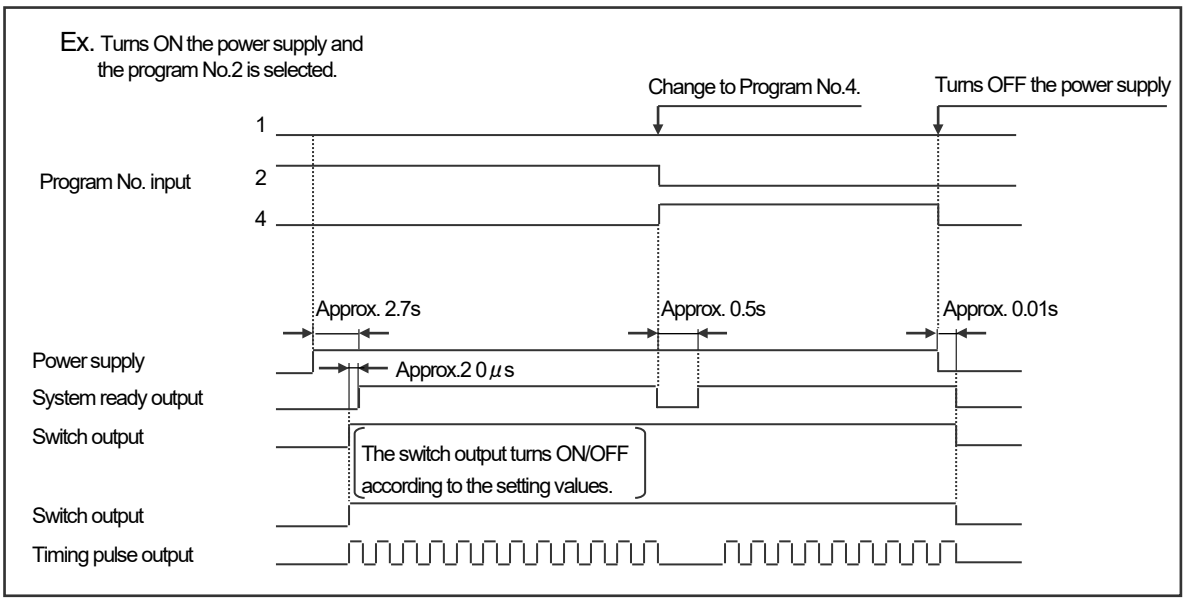
POINT

In the case of selecting "0: By panel key input" and setting the password, the password must be input when changing the program No.. Refer to " APPENDIX 1" for the password.

⚠ CAUTION

When "2" or "3" is selected at the parameter No. 85 (Protocol), parameter No. 97 (Program No. input format) is disabled and the selecting program No. is fixed to "0"

When the Program No. is changed by an external (BCD output connector), the timing will be as shown below.



⚠ CAUTION

When the program No. is changed, the system ready signal turns OFF approximately 0.5 seconds. The switch output (Arbitrary pulse output) and timing pulse are "HOLD" status during the time. Use care when changing the program No..

8-3. Protected Switch Function

This function is applicable with all VS-5F Series.

Switch No. 1 to 10 is able to use as the protected switch by setting the parameter No.96.
After the parameter No. 95 (protected switch cancel) is set, changes the setting value of the switch output which is set as a protected switch.

● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
96	Protected switch	Selects whether or not the protected switch function is to be used. The switch Nos. 1 to 10 is set as the protected switch when selecting "1:VALID".	0: INVALID 1: VALID	0	8-1-1 8-3-1
95	Protected switch cancel	The protected switch setting value can be changed by selecting "1:cancel". After selecting "1: Cancel", change the setting value by selecting the switch setting (SET) mode. If the operation (RUN) mode is selected, canceling will be disabled.	0: Do not cancel 1: Cancel	0	8-1-1 8-1-2

8-3-1. Protected Switch Setting Procedure

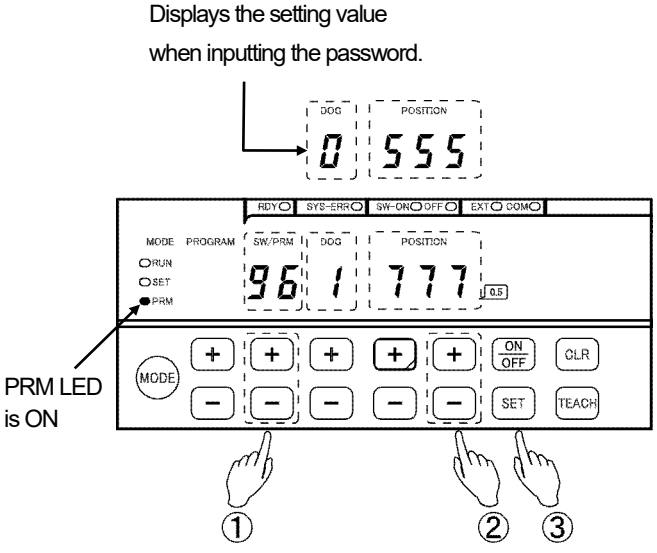
The protected switch is set in the parameter setting (PRM) mode.
For mode selection methods, refer to the "8-1-1. Selects the Parameter Setting (PRM) Mode".

① Select the parameter No. 96.
Selects "96" by pressing [+] or [-] key of SW / PRM.

② Inputs the pass word.
Inputs the password by pressing [+] or [-] key of POSITION, and then POSITION display area will be blinking.

Password
777: Use the protected switch
555: Not use the protected switch

③ Enters the protected switch.
Presses [SET] key, and then POSITION display area turns ON.
The protected switch setting is completed.



POINT
The password of protected switch is different from the password of "MODE" change.
Input the password of protected switch.

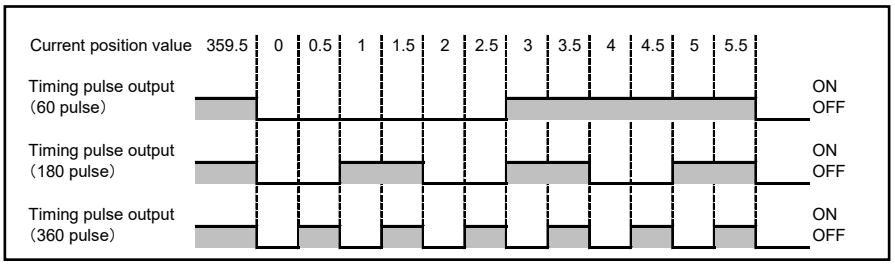
8-4. Timing Pulse Function

This function is applicable with all VS-5F Series.

The timing pulse function is used for detecting the rotation speed. Outputs a pulse which is equally divided single rotation of the machine (ABSOCODER sensor).
ON / OFF signal that is equally divided single rotation outputs to connector below.

VS-5F(-1) : A5 pin of the switch output connector
VS-5FD(-1) : A5 pin of the switch output connector, B11 pin of the BCD output connector
VS-5FX(-1) : B11 pin of the BCD output connector

The pulse number can be selected from 60, 180, and 360 per revolution by the parameter 93 (Timing pulse).



● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
93	Timing pulse	Changes the timing pulse and motion detection switch function. Timing pulse function is selecting number of output pulses per revolution.	0: 360 pulses Display: 360 1: 180 pulses Display: 180 2: 60 pulses Display: 60 3: Motion detection switch Display: Spd	0	8-1-1 8-1-2

⚠ CAUTION

If “timing pulse” is selected by the parameter No. 93 (Timing pulse), “motion detection switch” function cannot be used.

8-5. Motion Detection Switch Function

This function is applicable with all VS-5F Series.

This switch output turns ON or OFF when rotation speed of the machine (ABSOCODER sensor) achieves the setting speed.

According to the setting value of the rotation speed, this function outputs the ON/OFF signals to following connectors.

VS-5F(-1) : A5 pin of the switch output connector

VS-5FD(-1) : A5 pin of the switch output connector, B11 pin of the BCD output connector

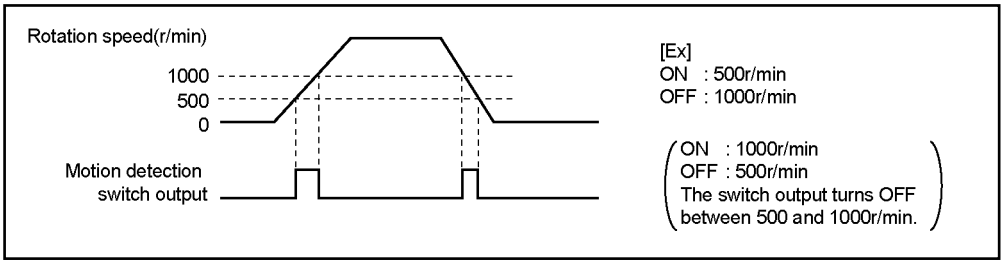
VS-5FX(-1) : B11 pin of the BCD output connector

This function is that selects"3: Motion detection switch" by the parameter No. 93 (Timing pulse).

The setting range of the rotation speed is 0 to 6000r/min, and it is set by the following parameters.

ON setting: Parameter No. 74 (Motion detection switch ON)

OFF setting: Parameter No. 75 (Motion detection switch OFF)



● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
93	Timing pulse	Changes the timing pulse and motion detection switch function. Timing pulse function is selecting number of output pulses per revolution.	0: 360 pulses Display: 360 1: 180 pulses Display: 180 2: 60 pulses Display: 60 3: Motion detection switch Display: Spd	0	8-1-1 8-1-2
75	Motion detection switch OFF	Designates a value that the motion detection switch output turns OFF.	0 to 6000 r/min	0	8-1-1 8-1-3
74	Motion detection switch ON	Designates a value that the motion detection switch output turns ON.	0 to 6000 r/min	0	8-1-1 8-1-3

⚠ CAUTION

If "motion detection switch" is selected by the parameter No. 93 (Timing pulse), "timing pulse" function cannot be used.

8-6. Output HOLD Function

This function is applicable with all VS-5F Series.

This function keeps the state of the switch output when the mode changes from the operation (RUN) mode to switch setting (SET) mode or parameter setting (PRM) mode.

This function sets by the parameter No. 94 (Output state in SET mode).

● Parameter list

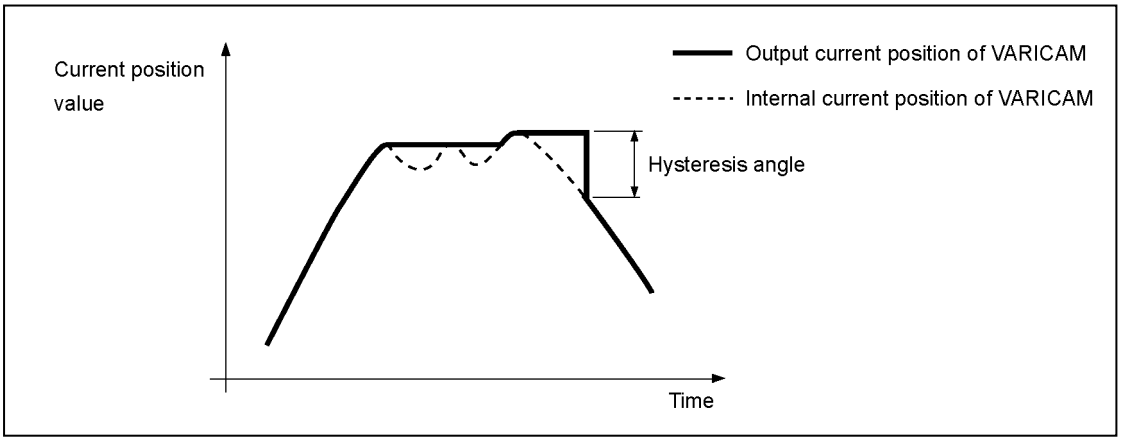
No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
94	Output status in SET mode	Selects the switch output status when changing the switch setting (SET) mode or parameter setting (PRM) mode from operation (RUN) mode. Keeps the state of switch output of operation (RUN) mode when selecting "1: Output HOLD".	0: Output OFF 1: Output HOLD	0	8-1-1 8-1-2

8-7. Hysteresis Function

This function is applicable with all VS-5F Series.

When the rotation direction of ABSOCODER sensor's shaft reverses, this function keeps the current position value before reversing until the value exceeds the setting value.
This function is used when flicking the current position value even though machine is stopped.
If the switch output repeatedly turns ON or OFF, this function can stabilize the switch output.

This function sets by the parameter No. 40 (Hysteresis angle).



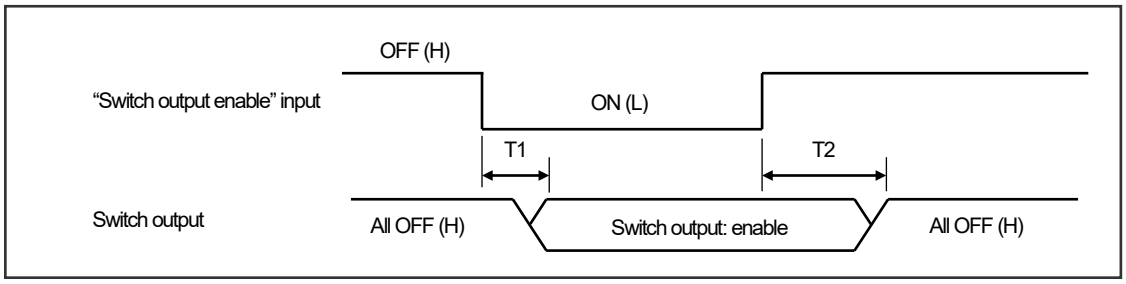
● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
40	Hysteresis angle	Designates a hysteresis angle when controlling flickers of the current position value. Setting unit is 0.5°.	0.0 to 10.0°	0	8-1-1 8-1-3

8-8. Switch Output Enabling Function

This function is applicable with all VS-5F Series.

This is a function that controls whether permit switch output or not by inputting the signals to B4 pin of the switch output connector. This function is very convenient to turn off the switch output when there is no workpiece. The numbers of switch output which is controlled at this function sets by the parameter No. 90 (Switch output enabling range).



T1: Time from turning ON the "switch output enabling input" to enabling the switch output
T1≦3ms

T2: Time from turning OFF the "switch output enabling input" to disabling the switch output
T2≦3ms

● Parameter list

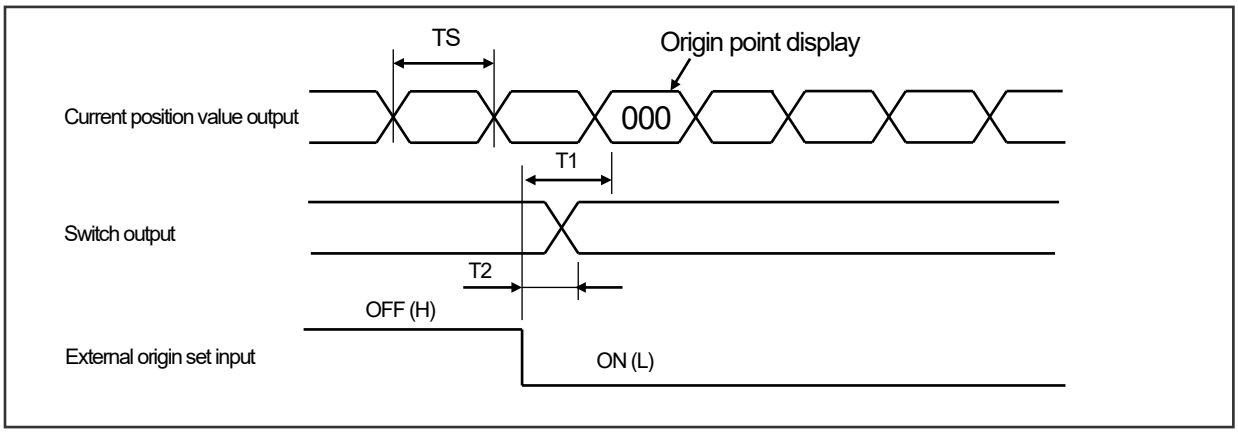
No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
90	Switch output enabling range	Designates controlling numbers of switch output by the switch output enabling signal. The number of switch is enabling from 1 to the setting value. If 0 is set, this function would be disabled, and the "switch output" would be output according to the setting value.	VS-5F(-1): 0 to 24 VS-5FD(-1): 0 to 24 VS-5FX(-1): 0 to 40	0	8-1-1 8-1-3

8-9. External Origin Set Function

This function is only applicable with VS-5FX(-1).

This function sets the origin (origin setting /zero point setting) by inputting the signal B9 pin of BCD output connector.

In the case of using this function, selects “1” for the setting value of parameter No.03 (Current position HOLD / External origin set selection). B9 pin content of BCD output connector is changed to “external origin set input”. The current position value output and current position value display are changed to the origin (000) when inputting “external origin set”.



T1: Time from inputting “external origin set” to switching the current position value as “000”
T1≦Ts+5ms

TS: Updating cycle of the current position value output
TS might be changed to below values when “edge timing” or “level timing “ is used in “8-10. Current Position Value (Speed) Output Function”
Check the setting value of parameter No.91 (Latch pulse cycle).
0: 0.352ms, 1: 17.58ms, 2: 35.16ms, 3: 1.406ms, 4: 4.219ms
5: 8.438ms, 6: 17.58ms, 7: 35.16ms, 8: 70.32ms, 9: 140.6ms

T2: Time from inputting “external origin set” to changing to the switch output of the current position value “000”
T2≦5ms

● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
03	Current position HOLD / External origin set selection	This function changes the current position HOLD and external origin set functions.	0: Current position HOLD 1: External origin set	0	8-1-1 8-1-2

⚠ CAUTION

The current position HOLD input signal is not available when the parameter No.03 (Current position HOLD / External origin set selection) is selected “external origin set”.
Therefore, the transparent and PC synchronization format in “8-10. Current Position Value (speed) Output Function” is not used.

8-10. Current Position Value (Speed) Output Function

This function is only applicable with VS-5FD(-1) and VS-5FX(-1).

There are 5 reading methods available when the host controller reads the current position value (speed) of BCD output connector.

(1) Reading by the edge timing of the latch pulse
(2) Reading by the level timing of the latch pulse
(3) Reading by "transparent format" using the current position HOLD signal
(4) Reading by "PC synchronization format" using the current position HOLD signal
(5) Reading by gray code (720-division) of the current position value

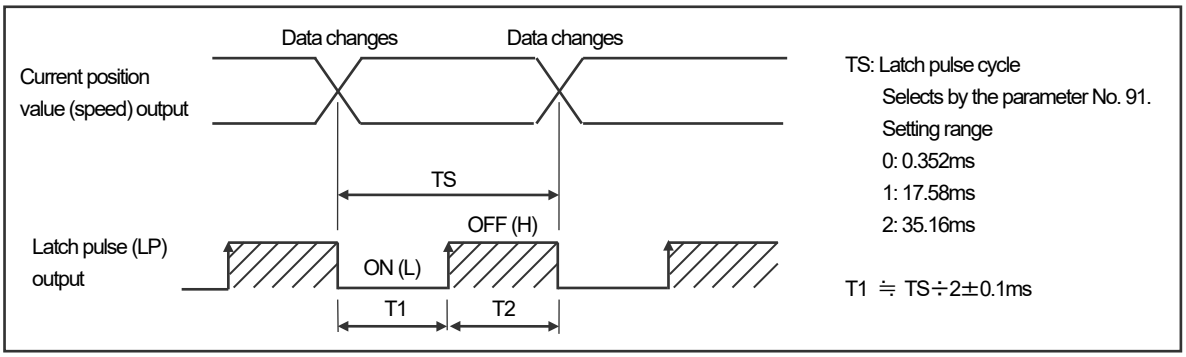
● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
91	Latch pulse cycle	Designates the timing and update cycle which make the current position value output (speed) be stable condition when reading the current position value by using the latch pulse signal. "0: Transparent format" needs to be selected at the parameter No.77 (HOLD selection).	Edge timing 0: 0.352 ms Display: 0.35 1: 17.58 ms Display: 17.6 2: 35.16 ms Display: 35.2 Level timing 3: 1.406 ms Display: 1.41 4: 4.219 ms Display: 4.22 5: 8.438 ms Display: 8.44 6: 17.58 ms Display: 17.6 7: 35.16 ms Display: 35.2 8: 70.32 ms Display: 70.3 9: 140.6 ms Display: 141	0	8-1-1 8-1-2
77	HOLD selection	By using the HOLD signal, selects the format which makes the current position value updating stop, and read it.	0: Transparent format 1: PC synchronization format	0	8-1-1 8-1-2
76	PC synchronization delay value	Designates the HOLD delay time of PC synchronization format. "1: PC synchronization format" needs to be selected at the parameter No.77 (HOLD selection).	0 to 99 ms	0	8-1-1 8-1-3

(1) Edge timing

Designating the reading method by the edge timing is as follows:
- Designates the parameter No. 77(HOLD selection) as "0" in advance.
- The setting of the edge timing and updating cycle should be selected between 0 and 2 by the parameter No.91 (Latch pulse cycle).

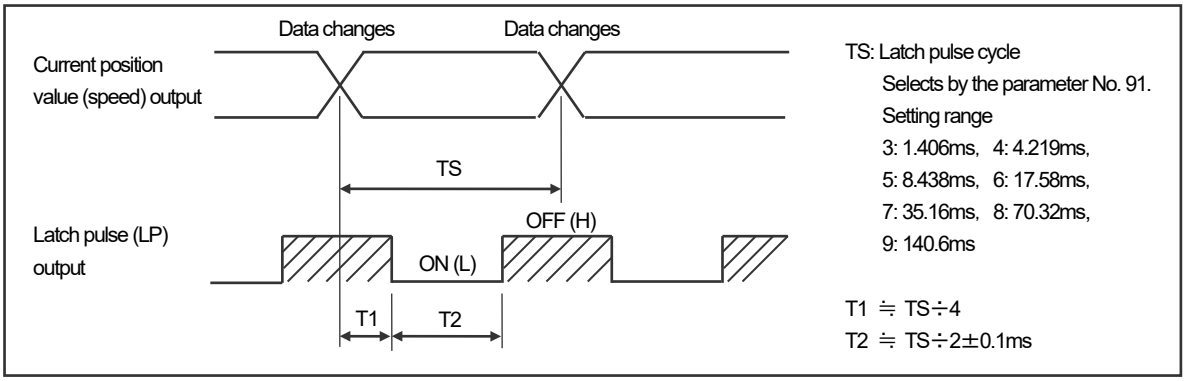
The current position value (speed) output stabilizes at the leading edge of the latch pulse output signal. The current position value (speed) output should be read at that time.



(2) Level timing

Designating the reading method by the level timing is as follows:
- Designates the parameter No. 77(HOLD selection) as "0" in advance.
- The setting of the level timing and updating cycle should be selected between 3 and 9 by the parameter No.91 (Latch pulse cycle).

The current position value (speed) output stabilizes when the latch pulse output signal is ON (LOW level).
The current position value (speed) output should be read at that time.



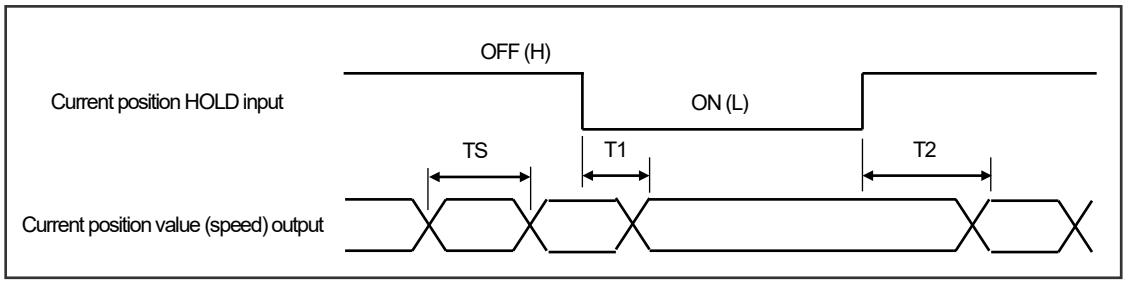
⚠CAUTION Cautions of the edge timing and level timing

1. The response time lag is approximately 0.1ms when the maximum load current is 10mA.
   Design the external circuit with taking the margin for time.
2. The logic of latch pulses is not changed even if the parameter No.78 (BCD output logic) is switched.

(3) Transparent format

Reading method by the transparent format is designated the parameter No. 77(HOLD selection) as “0”.

Updating of the current position value (speed) is stopped while the current position HOLD signal is input (ON). The current position value (speed) should be read at that time.



TS: Updating cycle of the current position value (speed) output
TS is able to change by the parameter No. 91 (Latch pulse cycle).
0: 0.352ms, 1: 17.58ms, 2: 35.16ms, 3: 1.406ms, 4: 4.219ms
5: 8.438ms, 6: 17.58ms, 7: 35.16ms, 8: 70.32ms, 9: 140.6ms

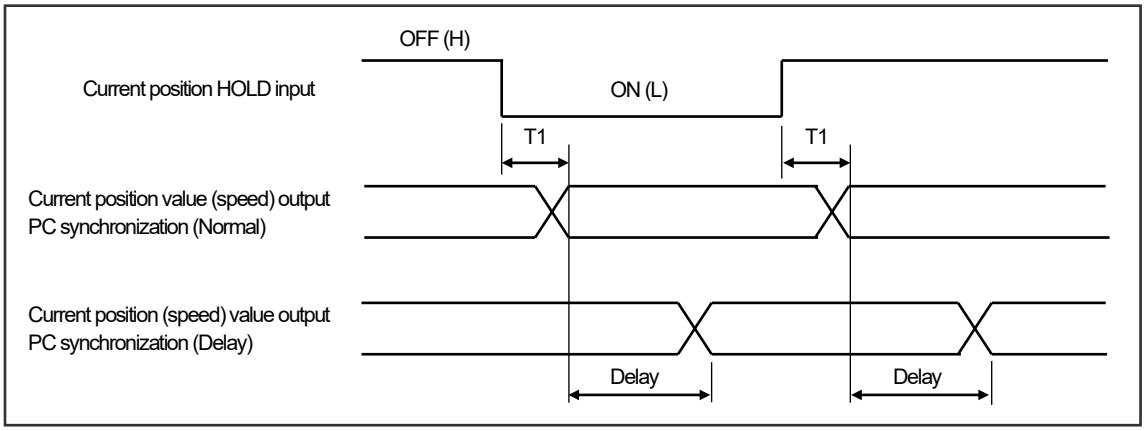
T1: Time from turning ON the current position HOLD input to stopping to update the current position value output.
T1≦4ms

T2: Time from turning OFF the current position HOLD input to starting to update the current position value output.
T2≦TS+4ms

(4) PC synchronization format

Reading method by the PC synchronization format is designated the parameter No. 77(HOLD selection) as “1”.

The current position value (speed) output updating occurs when the current position HOLD signal status changes (leading edge or trailing edge). The host controller reads the current position value (speed) output after being changed the current position HOLD signal.



T1: Time from changing the current position HOLD signal to stopping to update the current position value output.
T1≦4ms

Delay: Delay time from inputting the current position HOLD signal to completing to update the current position value.
The time is set by the parameter No.76 (PC synchronization delay value).
Setting range: 0 to 99ms

⚠ CAUTION Cautions for VS-5FX and VS-5FX-1

The “external origin set function (chapter No.8-9)” cannot be used when using the transparent or PC synchronization format.

(5) Gray code (720-division)

a) In the case of the update cycle of the current position output is 0.352ms or more

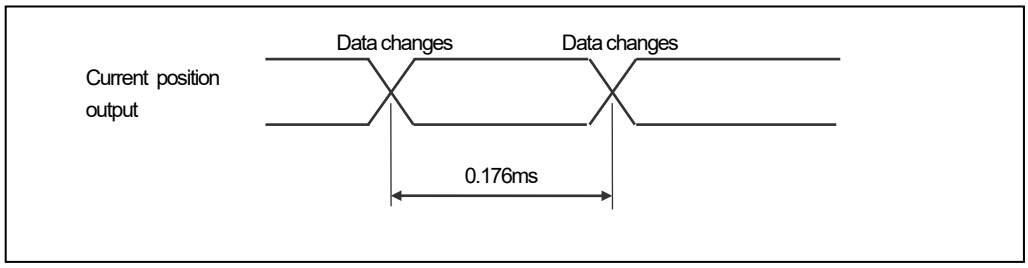
Set the parameter No. 04 (Contents of BCD output connector) to "3: gray code (720-division) of the current position value". (For more details of the parameter No.04, refer to "8-11".)

The current position output can be read by using the current position HOLD input or latch pulse output.

b) In the case of the update cycle of the current position output is 0.176ms

Set the parameter No. 04 (Contents of BCD output connector) to "4: gray code (720-division) of the current position value (high-speed)". (For more details of the parameter No.04, refer to "8-11".)

The parameter No. 91, 76, and 77 are invalid because the latch pulse output or current position HOLD input cannot be used. Read the current position output at your desirable timing.



CAUTION The rotation speed and bit changes of gray code

The gray code has a character that can be changed to only 1 bit when changing from a value to nearby value.

However, the current position value is changed more than 2-bit at a time when increasing the rotation speed.

In this case, the character of the gray code cannot be used.

The maximum rotation speed that changes the current position value to 1-bit only is approximately 450 r/min (update cycle: 0.176ms).

8-11. Selecting Function of the Output Contents (Current Position Value / Speed)

This method is available for VS-5FD, VS-5FD-1, VS-5FX, and VS-5FX-1.

The output contents of the BCD output connector (A10 to A20 pin) is selectable either current position value output or speed output.

The machine's rotation position (angle) will output by BCD code or gray code (720-division), if the current position value output is selected.
The machine's rotation speed will output by the binary code, if the speed output will be selected.
This function sets by the parameter No. 04 (Contents of BCD output connector).

● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
04	Contents of BCD output connector	Selects the output contents. - Current position value output (BCD, gray code (720-division)) - Speed output (binary code) The speed output can select the output resolution.	0: Current position value BCD 1: Speed binary 0 to 7FF Hex (0 to 2047 r/min) Unit: 1 r/min 2: Speed binary 0 to 7FF Hex (0 to 4094 r/min) Unit: 2 r/min 3: Gray code (720-division) of the current position value Updating cycle: 0.352 to 140.6ms Latch pulse output: enable HOLD input: enable 4: Gray code (720-division) of the current position value (High speed) Updating cycle: 0.176ms Latch pulse output: disable HOLD input disable	0	8-1-1 8-1-2

POINT

The relation between the current position value(decimal notation) and gray code (720-division) is indicated below.

Current position value(decimal notation)	Gray code (720-division)	Binary code for gray code (720-division) ( ): decimal notation
0	00 1101 0100	00 1001 1000 (152)
1	00 1101 0101	00 1001 1001 (153)
2	00 1101 0111	00 1001 1010 (154)
· ·	· ·	· ·
717	10 1101 0111	11 0110 0101 (869)
718	10 1101 0101	11 0110 0110 (870)
719	10 1101 0100	11 0110 0111 (871)

The procedure of the conversion from the gray code (720-division) to the current position value (decimal notation) is indicated below.

① Convert the gray code (720-division) into the binary code.
② Convert the binary code in procedure ① into the decimal notation.
③ Subtract 152 (surplus) from decimal notation in procedure ②.

8-12. Selecting Function of the Output Logic (Current Position Value / Speed)

This method is available for VS-5FD, VS-5FD-1, VS-5FX, and VS-5FX-1.

This function inverts the logic of the current position value output (BCD, gray code (720-division) or speed output.
It is selectable that the host controller or display unit connects to VARICAM.
Positive logic: truth-value is “1” when BCD output connector (A10 to A20 pin) output is OFF (High level).
Negative logic: truth-value is “1” when BCD output connector (A10 to A20 pin) output is ON (Low level).

This function sets by the parameter No. 78 (Logic of BCD output connector).

● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
78	Logic of BCD output connector	Selects the logic of current position value output (BCD, gray code (720-division) and speed output (binary code).	0: Positive logic 1: Negative logic	0	8-1-1 8-1-2

8-13. Serial Communication Function

This function is applicable with all VS-5F Series.

VARICAM is equipped the serial communication connector, so following functions are available:

- Data can read and write by communicating with the host controller.
- Connectable with the touch panel
- Connectable with the external display unit (NDP)
- VARICAM can use the setting and editing software "VS-5F-EDW2", so the data can be read, edited, written, and printed by the personal computer.

For more details regarding the serial communication, please contact your NSD representative.

● Parameter list (1/2)

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
89	Communication setting	Designates this function when writing data to VARICAM by communication. Writing is available when selecting "1: Setting enabled". - The setting values of all switch output and parameter can be writable. - This setting is invalid when changing the mode from parameter setting (PRM) to others.	0: Setting disabled 1: Setting enabled	0	8-1-1 8-1-2
86	Node number	Designates this function when "9 (VARIMONI)" is selected at the parameter No. 85. Designates the node number to VARICAM.	0 to 15	1	8-1-1 8-1-3
85	Protocol	Selects the communication protocol.	0: NSD 1: MELSEC-A (Bidirectional protocol) 2: MELSEC (MC protocol) 3: OMRON 8: NDP (external display unit) 9: VARIMONI	0	8-1-1 8-1-2
84	Device selection	Designates this function when "2: MELSEC (MC protocol)" is selected at the parameter No. 85. Selects the device of programmable controller.	0: D (Data register) 1: R (File register)	0	8-1-1 8-1-2

⚠ CAUTION

When "2" or "3" is selected at the parameter No. 85 (Protocol), parameter No. 97 (Program No. input format) is disabled and the selecting program No. is fixed to "0"

● Parameter list (2/2)

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
83	Device No.	Designates this function when the next protocol is selected at the parameter No. 85. - 2: MELSEC (MC protocol) - 3: OMRON Designates the first number of selected device.	0 to 9000	0	8-1-1 8-1-3
82	Communication dog No.	Designates this function when the next protocol is selected at the parameter No. 85. - 2: MELSEC (MC protocol) - 3: OMRON Designates the last dog No. of switch output data which reading by the programmable controller.	0 to 9	0	8-1-1 8-1-2
81	Baud rate	Selects the communication baud rate.	0: 2400bps Display: 2.4 1: 4800bps Display: 4.8 2: 9600bps Display: 9.6 3: 19200bps Display: 19.2 4: 38400bps Display: 38.4 5: 57600bps Display: 57.6	2	8-1-1 8-1-2
80	Permissible angle for setting change during operation	During the operation, the permissible angle is designated when changing the setting value of the switch output by communication. Set "1" at the parameter No.92, and select one of following protocol at the parameter No.85. - 0: NSD - 1: MELSEC-A (Bidirectional protocol) - 2: MELSEC (MC protocol) - 3: OMRON	0.5 to 180.0°	0.5	8-1-1 8-1-3

*1: Protocol summary

NSD protocol
Selects when using the setting and editing software “VS-5F-EDW2”.

NDP protocol
Selects when connecting the serial connection type external display unit (NDP).

VARIMONI protocol
Selects when connecting the touch panel.

MELSEC-A protocol (Bidirectional protocol)
Selects when connecting the computer link module of the programmable controller which is made by Mitsubishi Electric Co.

MELSEC protocol (MC protocol)
Selects when connecting the computer link module of the programmable controller (MELSEC-A Series and MELSEC-Q Series) which is made by Mitsubishi Electric Co.

OMRON protocol
Selects when connecting the link unit of the programmable controller which is made by Omron Corporation.

9. HOW TO USE APPLIED FUNCTIONS (SWITCH OUTPUT)

Applied functions of the switch output are explained in this chapter.
Please use this chapter when needed.

9-1. Sets by Teaching

This function is applicable with all VS-5F Series.

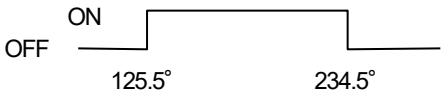
Designates the teaching setting of the switch output according to the following procedures.

Teaching contents of the setting example

Setting example

Program No. : 1
Switch No. : 1

ON angle	125.5°
OFF angle	234.5°



Teaching setting of the switch output is designated in switch setting (SET) mode.
For mode selection methods, refer to the “7-6-1. Selects the Switch Setting (SET) Mode”.

① Selects the program number.

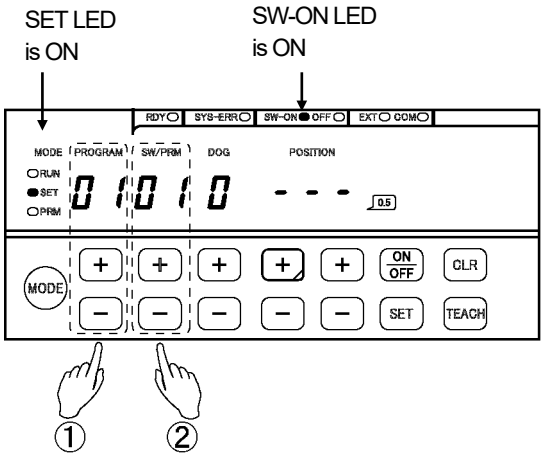
Selects the program number by pressing [+] or [-] key of PROGRAM.

Program number selection range
VS-5F(-1) : There is not any program function.
VS-5FD(-1) : 0 to 7
VS-5FX(-1) : 00 to 15 or 00 to 31

② Selects the switch number.

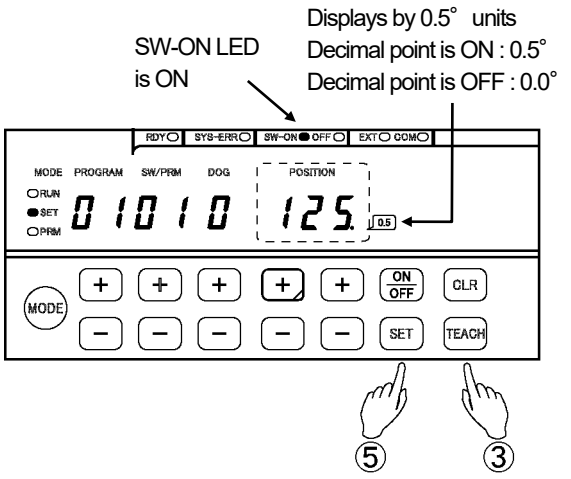
Selects the switch number by pressing [+] or [-] key of SW / PRM.

Switch number selection range
VS-5F(-1) : 01 to 24
VS-5FD(-1) : 01 to 24
VS-5FX(-1) : 01 to 40 or 01 to 24



③ Changes the teaching mode.

Presses [TEACH] key.
The current position value is displayed at POSITION display area, and it's blinking in high-speed.



④ Moves the machine to ON angle.

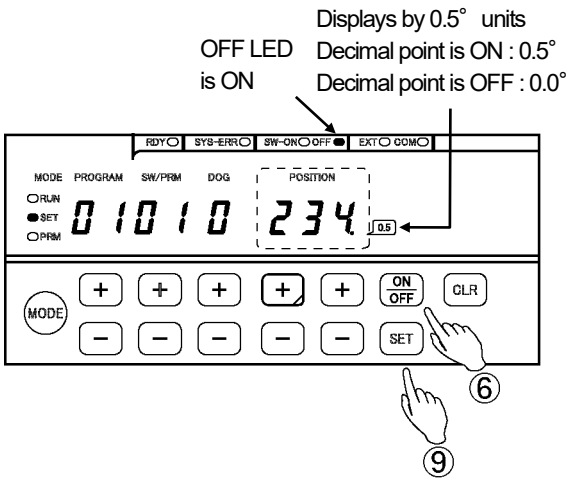
Moves the machine to the desired ON angle.

⑤ Enters the ON angle value.

Presses [SET] key, and then POSITION display area turns ON.
The ON angle value is entered.

⑥ Turns ON the OFF LED. *1

Presses [ON / OFF] key in order to designate the OFF angle. The OFF LED turns ON.



⑦ Do the ③ operation, and change the teaching mode again.

⑧ Moves the machine to OFF angle.

Moves the machine to the desired OFF angle.

⑨ Enters the OFF angle value.

Presses [SET] key, and then POSITION display area turns ON.
The OFF angle value is entered.

⑩ Repeats below procedure.

Repeats procedure ② to ⑨ until number of switches which you need.
Repeats procedure ③ to ⑨ after selecting dog No. when setting the multi-dog.
Operates from procedure ① when setting the switch output to different program.

POINT

*1: SW-ON LED and OFF LED switch when [ON / OFF] key is pressed every time.
Turns ON the SW-ON LED when setting the ON angle.
Turns ON the OFF LED when setting the OFF angle.

9-2. Sets the Multi-Dog

This function is applicable with all VS-5F Series.

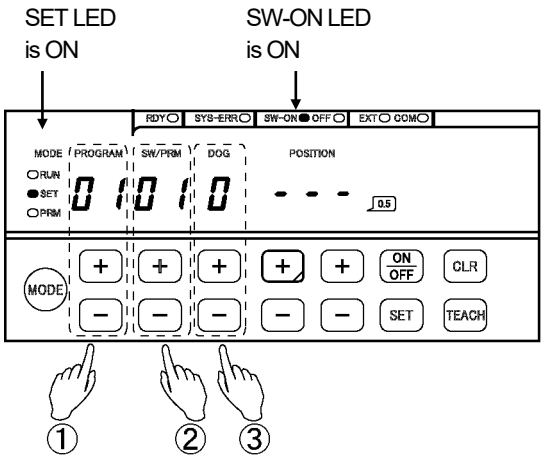
Designates the multi-dog by the following procedures.

The multi-dog setting of the switch output is set in the switch setting (SET) mode.
For mode selection methods, refer to the "7-6-1. Selects the Switch Setting (SET) Mode".

① Selects the program number.

Selects the program number by pressing [+] or [-] key of PROGRAM.

Program number selection range
VS-5F(-1) : There is not any program function.
VS-5FD(-1) : 0 to 7
VS-5FX(-1) : 00 to 15 or 00 to 31



② Selects the switch number.

Selects the switch number by pressing [+] or [-] key of SW / PRM.

Switch number selection range
VS-5F(-1) : 01 to 24
VS-5FD(-1) : 01 to 24
VS-5FX(-1) : 01 to 40 or 01 to 24

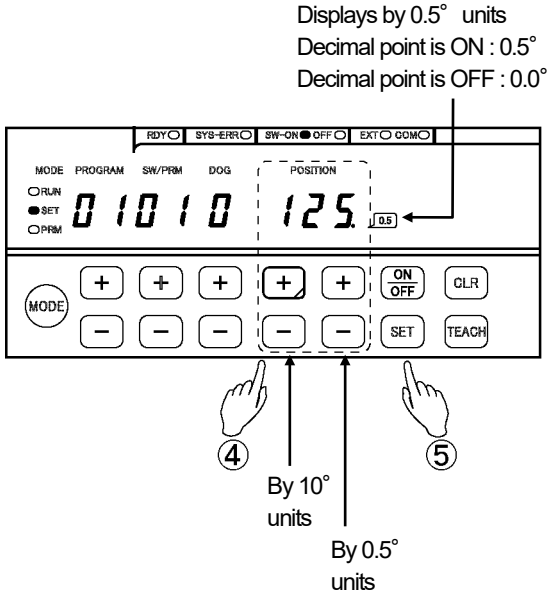
③ Selects the dog number.

Selects the dog number by pressing [+] key of the DOG.
DOG number selection range: 0 to 9

④ Inputs the ON angle value.

Inputs the ON angle value by pressing [+] or [-] key of POSITION, and then the value blinks in the POSITION display area.
Setting range: 0 to 359.5˚

If [CLR] key is pressed in this timing, the inputting value will be canceled.

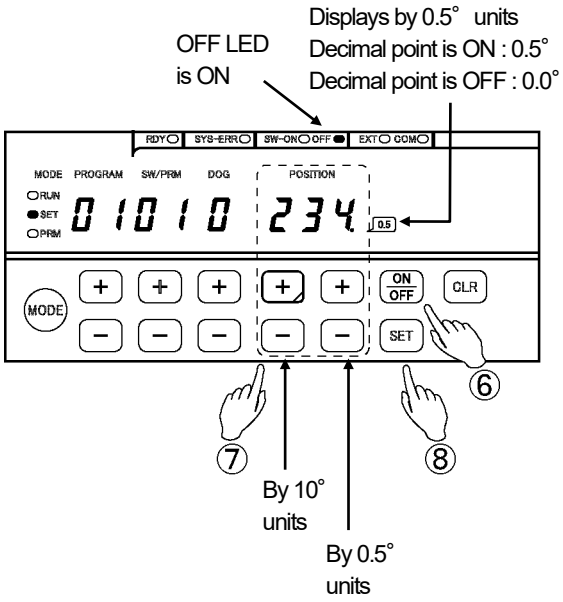


⑤ Enters the ON angle value.

Presses [SET] key, and then POSITION display area turns ON.
The ON angle value is entered.

⑥ Turns ON the OFF LED.

Presses [ON / OFF] key in order to designate the OFF angle. The OFF LED turns ON.



⑦ Inputs the OFF angle value.

Inputs the OFF angle value by pressing [+] or [-] key of POSITION, and then the value blinks in the POSITION display area.
Setting range: 0 to 359.5°

If [CLR] key is pressed in this timing, the inputting value will be canceled.

⑧ Enters the OFF angle value.

Presses [SET] key, and then POSITION display area turns ON.
The OFF angle value is entered.

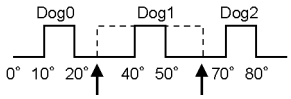
⑨ Repeats below procedure.

Repeats procedure ③ to ⑧ until number of dogs which you need.

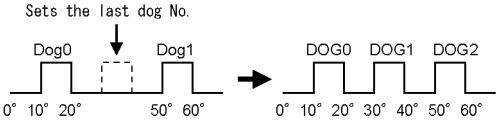
POINT

1. Switching the ON angle and OFF angle setting
   SW-ON LED and OFF LED switch when [ON / OFF] key is pressed every time.
   Turns ON the SW-ON LED when setting the ON angle.
   Turns ON the OFF LED when setting the OFF angle.

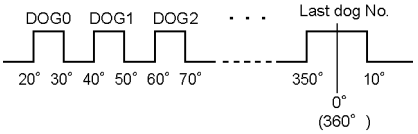
2. Modifying the dog after setting
   The dog can be modified in the range that prevents having overlaps to the next dogs.
   Ex. Modifies DOG1



3. Inserting a dog
   The dog can be inserted between dogs that are already set, and inserting dog should be set last dog number. After the setting value is entered, dogs are rearranged in ascending order.
   Ex. Inserting a dog which is turning ON at 30°and turning OFF at 40°



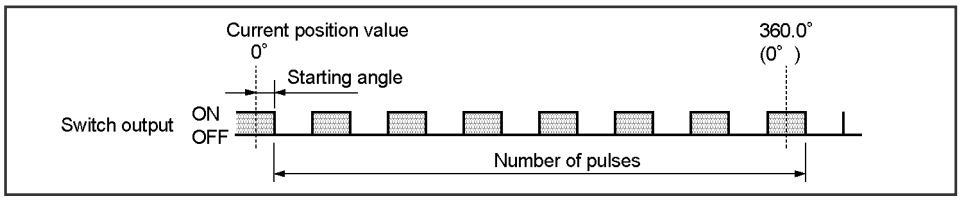
4. The dog number of setting value which passes 0°
   The dog number is set last dog number.



9-3. Sets the Arbitrary Pulse Output

This function is applicable with all VS-5F Series.

Outputs the pulse (arbitrary pulse) signal which is equally divided single rotation of the machine (ABSOCODER sensor) by changing the switch settings.
The number of pulses and pulse starting angle can be set.
The number of pulses can be selected any number from 1 to 360, and the pulse start angles can be set by each 0.5 degree.



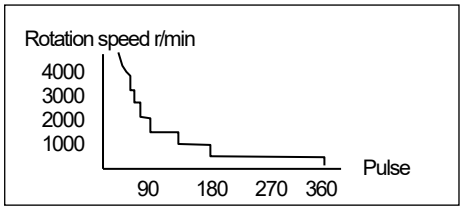
⚠ CAUTION

1. Setting of the arbitrary pulse output
   If the switch output already has been set, the arbitrary pulse output cannot be set.
   The arbitrary pulse output should be set after the switch output setting value is deleted.

2. Response rotation speed
   The response rotation speed of the arbitrary pulse output is same as the switch output one.
   When the response rotation speed is set 180 pulses (ON / OFF zone is 1 degree), it follows until 900 r/min.
   If the rotation speed exceeds the response rotation speed, the output pulse will be less than the setting number of pulses.

   Indicates a relationship between setting pulse and response rotation speed

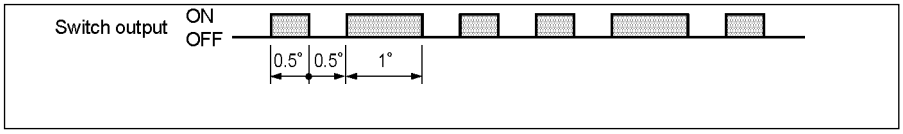
Setting pulse numbers	Response rotation speed
Less than 45 pulses	3600 r/min
Less than 90 pulses	1800 r/min
Less than 120 pulses	1200 r/min
Less than 180 pulses	900 r/min
Less than 360 pulses	450 r/min



3. Pulse width
   The pulse width is formed per 0.5° units (720 divisions / rotations).
   When 720 is not divided by the pulse number which is set, the pulse width does not uniform.

   Ex. In the case of setting at 260 pulses,

$$\frac{720 \text{ divisions}}{260 \text{ pulses}} = 2.7692 \cdots \leftarrow \text{Cannot be divided.}$$



Sets the arbitrary pulse output according to the following procedures.

The arbitrary pulse output setting is set in the switch setting (SET) mode.
For mode selection methods, refer to the “7-6-1. Selects the Switch Setting (SET) Mode”.

① Selects the program number.

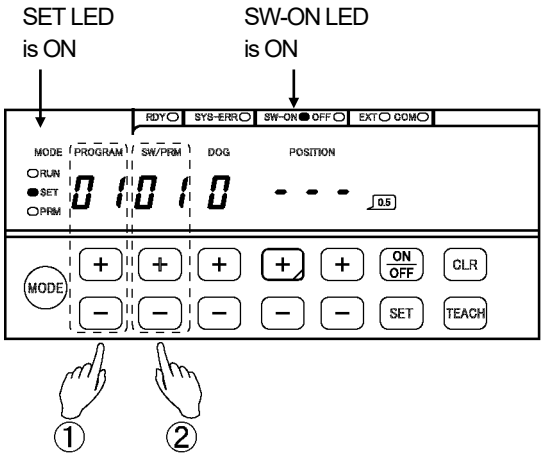
Selects the program number by pressing [+] or [-] key of PROGRAM.

Program number selection range
VS-5F(-1) : There is not any program function.
VS-5FD(-1) : 0 to 7
VS-5FX(-1) : 00 to 15 or 00 to 31

② Selects the switch number.

Selects the switch number by pressing [+] or [-] key of SW / PRM.

Switch number selection range
VS-5F(-1) : 01 to 24
VS-5FD(-1) : 01 to 24
VS-5FX(-1) : 01 to 40 or 01 to 24



③ Changes the arbitrary pulse mode.

Keeps pressing [-] key of the DOG.
“P” is displayed at the DOG display area, and it's blinking.

If [CLR] key is pressed in this timing, the arbitrary pulse mode will be canceled.

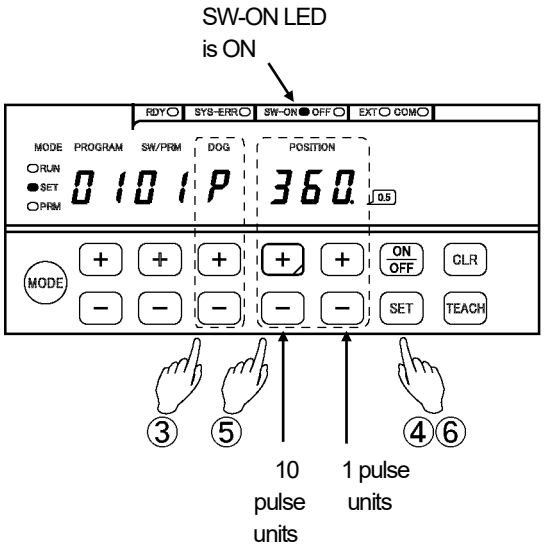
④ Enters the arbitrary pulse mode. *1

Presses [SET] key, and then changes arbitrary pulse mode.

⑤ Inputs the number of pulse.

Inputs the number of pulse by pressing [+] or [-] key of POSITION, and then the value blinks in the POSITION display area.
Setting range: 1 to 360 pulses

If [CLR] key is pressed in this timing, the inputting value will be canceled.



⑥ Enters the number of pulse.

Presses [SET] key, and then POSITION display area turns ON.
The number of pulse is entered.

⑦ Turns ON the OFF LED. *2

Presses [ON / OFF] key in order to designate the pulse starting angle. The OFF LED turns ON.

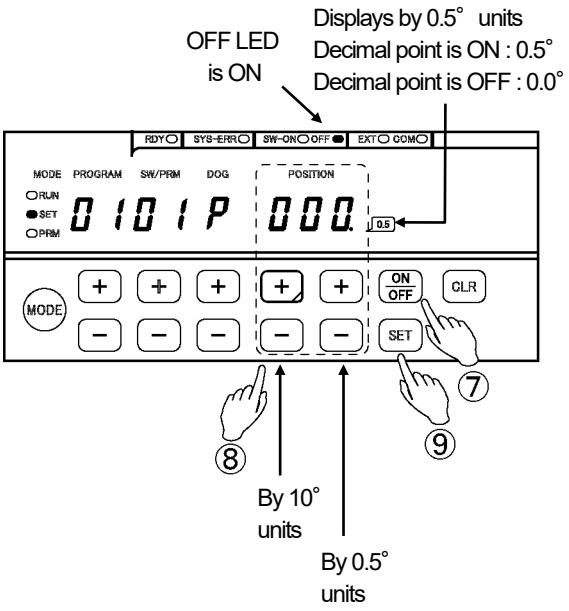
⑧ Inputs the pulse starting angle.

Inputs the pulse starting angle by pressing [+] or [-] key of POSITION, and then the value blinks in the POSITION display area.
Setting range: 0 to 359.5˚

If [CLR] key is pressed in this timing, the inputting value will be canceled.

⑨ Enters the pulse starting angle.

Presses [SET] key, and then POSITION display area turns ON.
The pulse starting angle is entered.



POINT

*1: Repeats procedure ③ and ④ again when returning form the arbitrary pulse mode to the switch setting (SET) mode.

*2: SW-ON LED and OFF LED switch when [ON / OFF] key is pressed every time.
Turns ON the SW-ON LED when setting the number of pulses.
Turns ON the OFF LED when setting the pulse starting angles.

9-4. Deletes the Switch Output Setting Value

This function is applicable with all VS-5F Series.

The deletion method of the setting value is following:

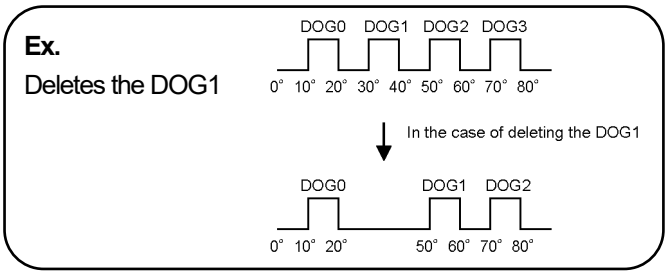
(1) Deletes the dog unit
(2) Deletes the switch unit
(3) Deletes the program unit *1

*1: The deletion function of the program unit is not available for VS-5F and VS-5F-1.
Refer to the next page for each deletion procedure.

9-4-1. Deletes by the Dog Units

The deletion method by the dog unit is following:

1. Selects intended dog.
2. Set the same value to ON and OFF angles.



The following procedures perform deletion.

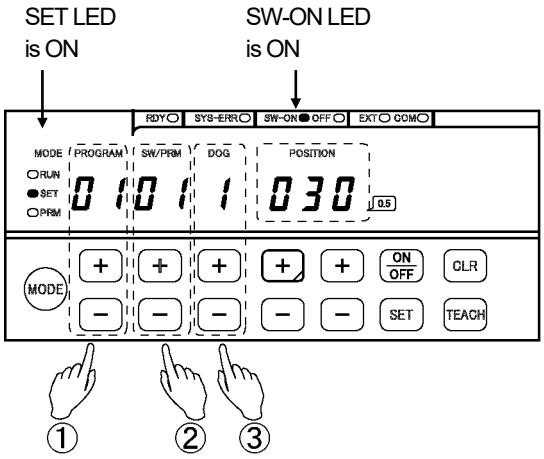
The deletion is set in the switch setting (SET) mode.
For mode selection methods, refer to the "7-6-1. Selects the Switch Setting (SET) Mode".

① Selects the program number.
Selects the program number by pressing [+] or [-] key of PROGRAM.

VS-5F and VS-5F-1 don't have any program function. Starts the operation from ②.

② Selects the switch number.
Selects the switch number by pressing [+] or [-] key of SW / PRM.

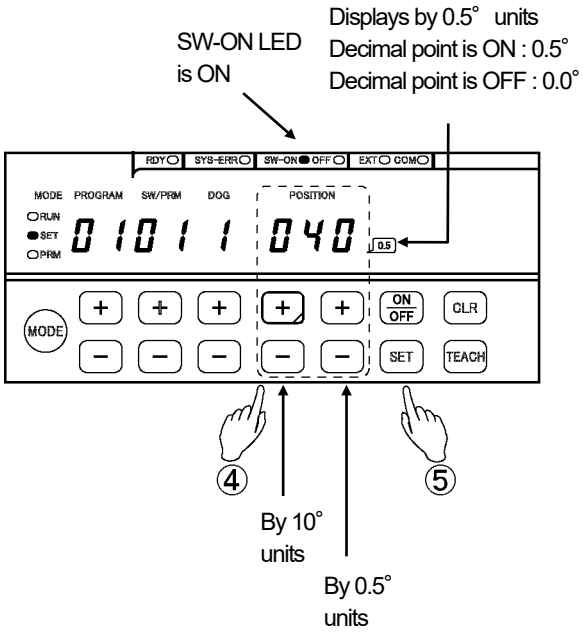
③ Selects the dog number.
Selects the dog number by pressing [+] or [-] key of the dog.



④ Inputs the same value for ON angle and OFF angle.
Inputs to ON angle which is same value as OFF angle by pressing [+] or [-] key of POSITION, and then the value blinks in the POSITION display area.

If [CLR] key is pressed in this timing, the deletion by the dog unit will be canceled.

⑤ Deletes the dog.
Presses [SET] key, and then POSITION display area turns ON.
The dog is deleted.



9-4-2. Deletes by the Switch Units

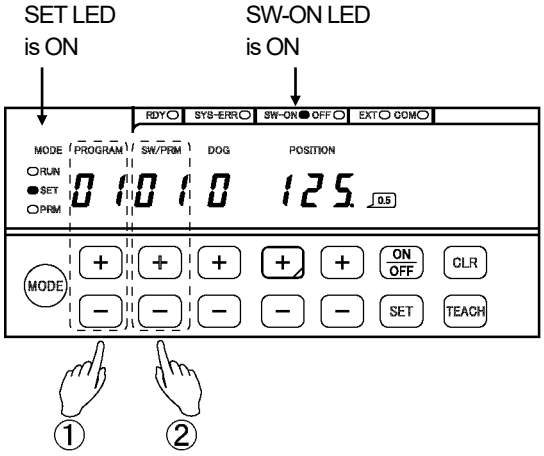
The deletion method by the switch unit that the all dog setting values in selected switch No. is deleted.

The following procedures perform deletion.

The deletion is set in the switch setting (SET) mode.
For mode selection methods, refer to the "7-6-1. Selects the Switch Setting (SET) Mode".

① Selects the program number.
Selects the program number by pressing [+] or [-] key of PROGRAM.

VS-5F and VS-5F-1 don't have any program function. Starts the operation from ②.

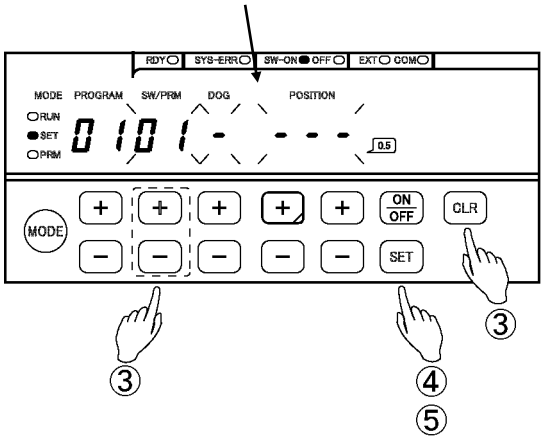


② Selects the switch number.
Selects the switch number by pressing [+] or [-] key of SW / PRM.

③ Changes the deletion mode.
Hold down [CLR] key and press [+] or [-] key of the SW/ PRM.
SW / PRM, DOG, and POSITION display areas are blinking.

If [CLR] key is pressed in this timing, a deletion by the switch unit will be canceled.

The display area blinks by ③ operation.
The display area blinks fast by ④ operation.



④ Confirms the deletion.
Presses [SET] key.
SW / PRM, DOG, and POSITION display areas are blinking faster.

Reconfirm the setting value of selected switch numbers should be deleted.

If [CLR] key is pressed in this timing, a deletion by the switch unit will be canceled.

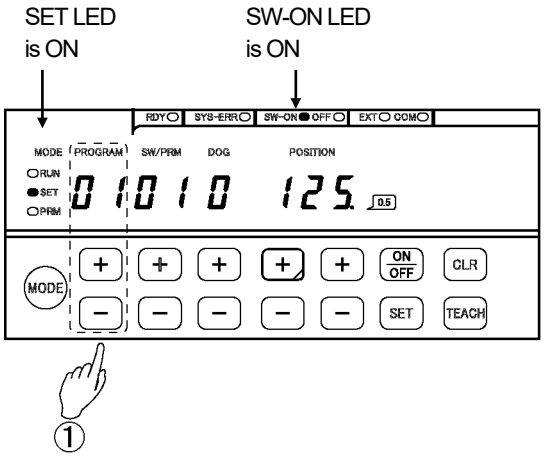
⑤ Deletion
Presses [SET] key again.
SW / PRM, DOG, and POSITION display areas turn ON.
The setting value of selected switch number is deleted.

9-4-3. Deletes by the Program Units

The deletion method by the program unit that the setting values of the switch output are registered programs is deleted. The deletion function by program unit is not available with VS-5F and VS-5F-1.

The following procedures perform deletion.

The deletion is set in the switch setting (SET) mode.
For mode selection methods, refer to the "7-6-1. Selects the Switch Setting (SET) Mode".



① Selects the program number.
Selects the program number by pressing [+] or [-] key of PROGRAM.

② Changes the deletion mode.
Hold down [CLR] key and press [+] or [-] key of the PROGRAM.
PROGRAM, SW / PRM, DOG, and POSITION display areas are blinking.

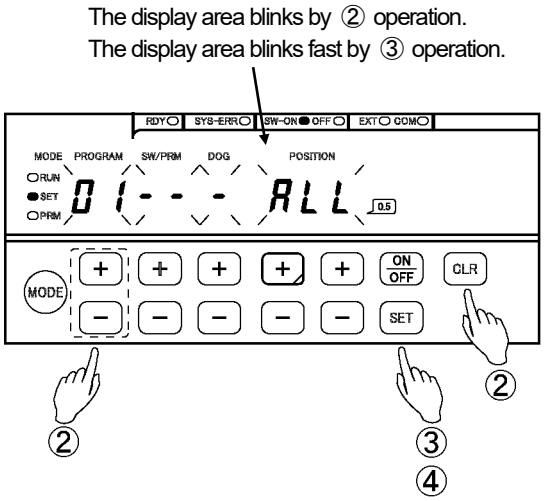
If [CLR] key is pressed in this timing, a deletion by the program unit will be canceled.

③ Confirms the deletion.
Presses [SET] key.
PROGRAM, SW / PRM, DOG, and POSITION display areas are blinking faster.

Reconfirm the setting value of selected program numbers should be deleted.

If [CLR] key is pressed in this timing, a deletion by the program unit will be canceled.

④ Deletion
Presses [SET] key again.
PROGRAM, SW / PRM, DOG, and POSITION display areas turn ON.
All setting value of the switch output which is registered program is deleted.



10. HOW TO USE APPLIED FUNCTIONS (OPERATION MODE)

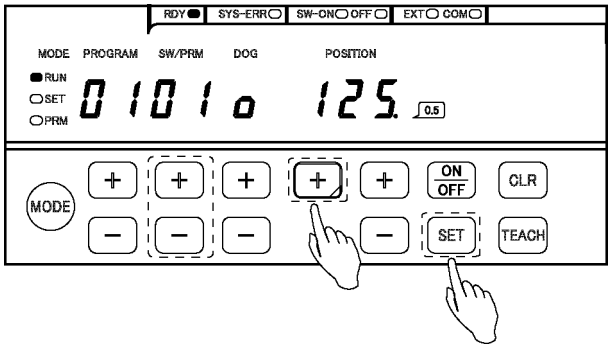
Applied functions of the operation (RUN) mode are explained in this chapter.
Please use this chapter when needed.

The operation (RUN) mode can monitor following (1) to (4) contents.
Also, the switch output can be fine-adjusted during the operation.

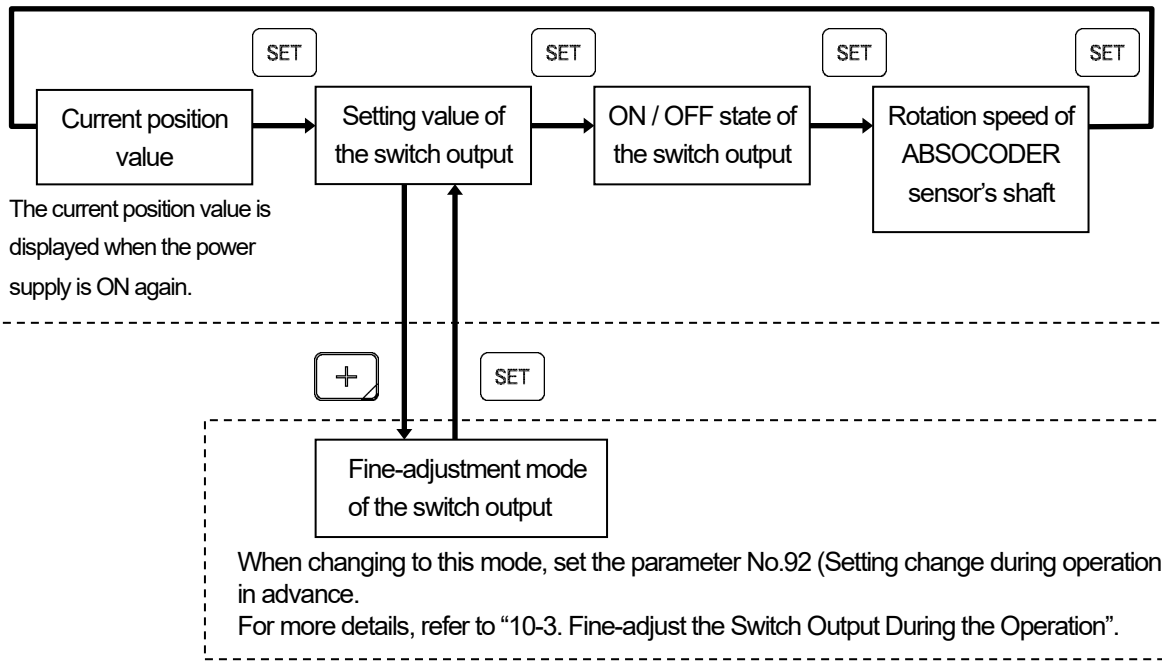
(1) Monitoring the current position value
(2) Monitoring the setting value of the switch output
(3) Monitoring the ON / OFF state of the switch output
(4) Monitoring the rotation speed of ABSOCODER sensor's shaft
(5) Fine-adjustment mode of the switch output

10-1. Changes the Monitor Contents

The contents of the monitor can be changed by pressing [SET] key.
Monitors the setting value of the switch output and presses [+] key when the mode is changed the fine-adjustment mode of the switch output.



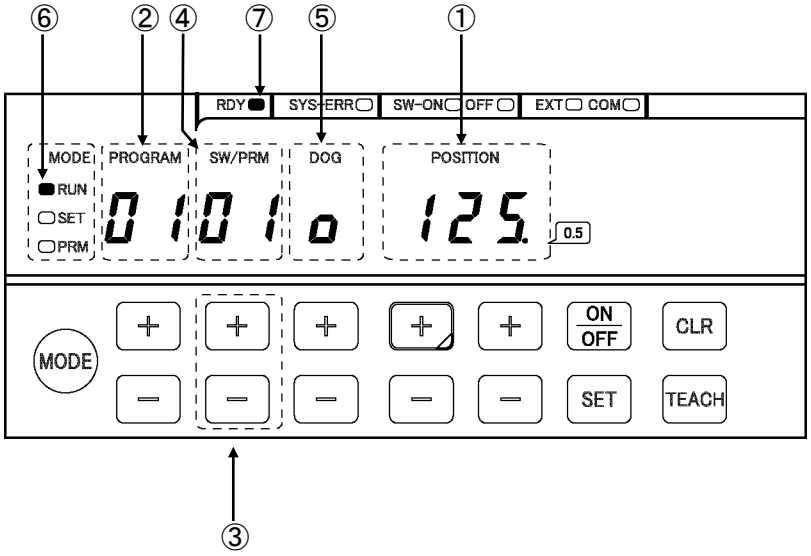
For more monitor contents details, refer to "10-2. Monitor Contents".



10-2. Monitor Contents

(1) Monitoring the current position value

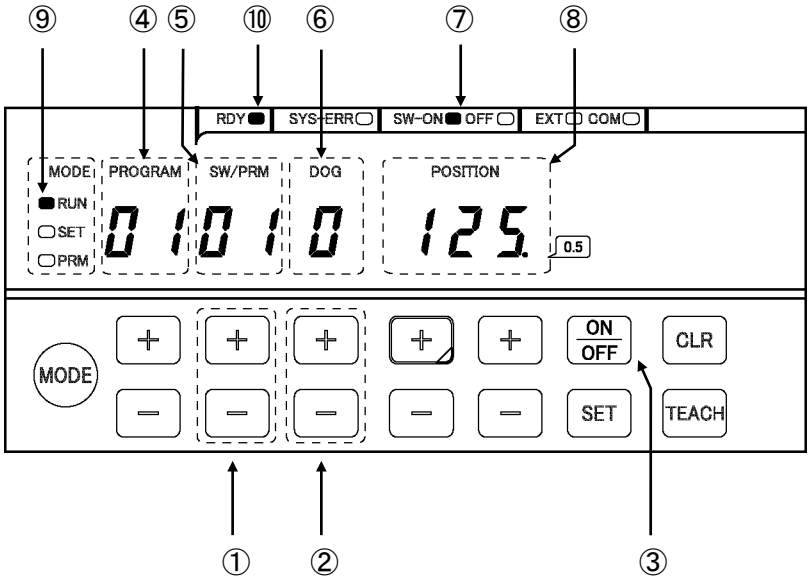
The current position value and ON / OFF state of the switch output can be check during the operation.



Name	Descriptions
① POSITION display	Displays the current position value.
② PROGRAM display	Displays selecting the program number. (VS-5F and VS-5F-1 are not available this function.)
③ SW / PRM key	Selects the switch number that is monitored on DOG display area.
④ SW / PRM display	Displays the switch number which is selected by SW /PRM key.
⑤ DOG display	Monitors the output state of the switch number which is selected by SW / PRM key. ON : DOG o OFF : DOG
⑥ MODE indicator	RUN LED is ON: Indicates the operation (RUN) mode.
⑦ RDY indicator	If there is no error, this indicator will turn ON when selecting the operation (RUN) mode. This indicator is same condition as “System ready output signal” of the output connector.

(2) Monitoring the setting value of the switch output

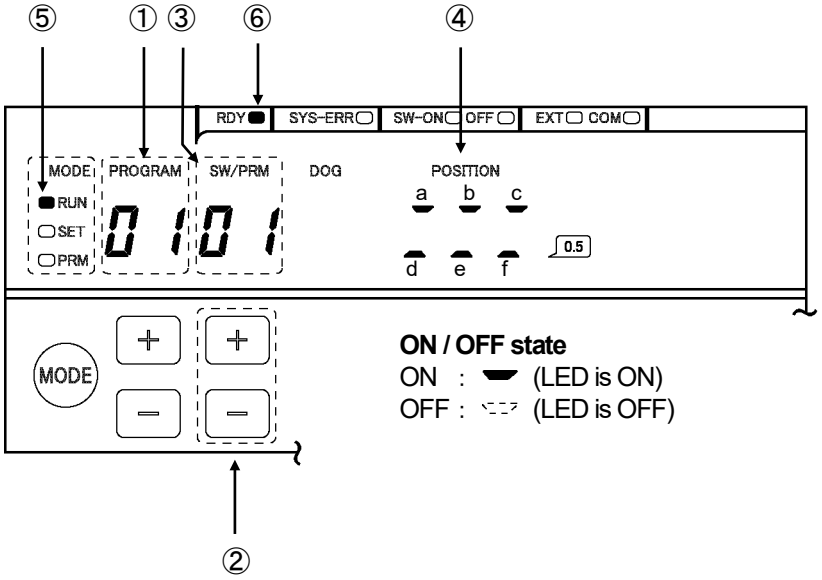
Setting values of the switch outputs which are registered programs during the operation can be checked.



Name	Descriptions
① SW/ PRM key	Selects the switch number of the setting value which needs to check.
② DOG key	Selects the dog number of the setting value which needs to check.
③ ON / OFF key	Switches the ON and OFF setting value displays.
④ PROGRAM display	Displays selecting the program number. (VS-5F and VS-5F-1 are not available this function.)
⑤ SW / PRM display	Displays the switch number.
⑥ DOG display	Displays the dog number. If the arbitrary pulse is used, "P" might be displayed.
⑦ ON / OFF indicator	When the SW outputs, the contents of POSITION display would be as follows; SW-ON LED is ON: Displays the ON setting value. OFF LED is ON: Displays the OFF setting value. When the arbitrary pulse outputs, the contents of POSITION display would be as follows; SW-ON LED is ON: Displays the number of pulses. OFF LED is ON: Displays the start angle.
⑧ POSITION display	Displays the ON or OFF setting value.
⑨ MODE indicator	RUN LED is ON: Indicates the operation (RUN) mode.
⑩ RDY indicator	If there is no error, this indicator will turn ON when selecting the operation (RUN) mode. This indicator is same condition as “System ready output signal” of the output connector.

(3) Monitoring the ON / OFF state of the switch output

The ON / OFF state of the switch outputs and arbitrary pulses which are registered programs during the operation can be checked.

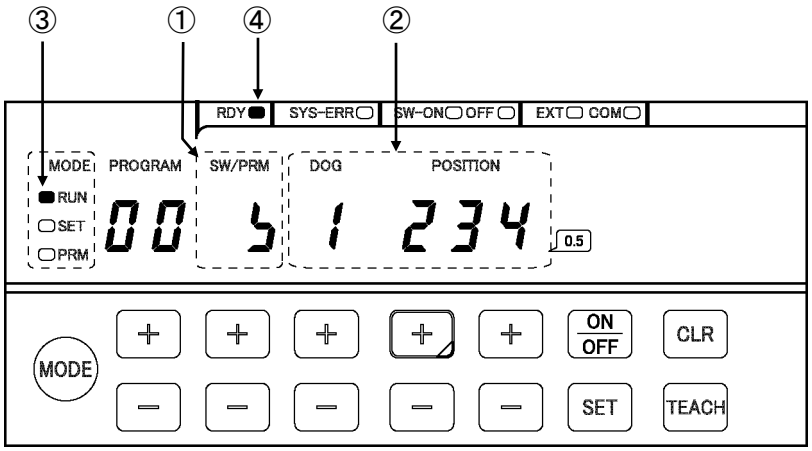


Name	Descriptions
① PROGRAM display	Displays selecting the program number. (VS-5F and VS-5F-1 are not available this function.)
② SW / PRM key	ON / OFF state is displayed per six switches, and selects first switch number. First switch No.: 01, 07, 13, 19, 25, 31, 37
③ SW / PRM display	Displays the switch number.
④ POSITION display	Indicates the ON / OFF state of the switch output and arbitrary pulse. ON / OFF state is displayed per six switches.
⑤ MODE indicator	RUN LED is ON: Indicates the operation (RUN) mode.
⑥ RDY indicator	If there is no error, this indicator will turn ON when selecting the operation (RUN) mode. This indicator is same condition as “System ready output signal” of the output connector.

	Display of 7segment LED					
	a	b	c	d	e	f
Applicable switch No.	SW1	SW2	SW3	SW4	SW5	SW6
	SW7	SW8	SW9	SW10	SW11	SW12
	SW13	SW14	SW15	SW16	SW17	SW18
	SW19	SW20	SW21	SW22	SW23	SW24
	SW25	SW26	SW27	SW28	SW29	SW30
	SW31	SW32	SW33	SW34	SW35	SW36
	SW37	SW38	SW39	SW40	—	—

(4) Monitoring the rotation speed of ABSOCODER sensor's shaft

The rotation speed of ABSOCODER sensor's shaft can be check during the operation.



Name	Descriptions
① SW / PRM display	When the rotation speed is displayed, the following figure is indicated. 5
② DOG, PROGRAM display	Displays the rotation speed. The display unit is 1 r/min. Indicates "1234 r/min" in the above display example.
③ MODE indicator	RUN LED is ON: Indicates the operation (RUN) mode.
④ RDY indicator	If there is no error, this indicator will turn ON when selecting the operation (RUN) mode. This indicator is same condition as "System ready output signal" of the output connector.

10-3. Fine-adjust the Switch Output During the Operation

This function is applicable with all VS-5F Series.

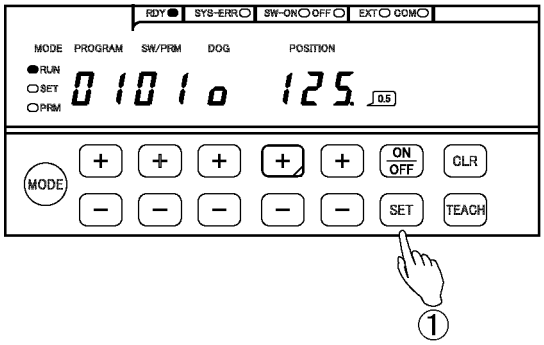
Uses this function when the switch output needs to fine-adjust during the operation.
The fine-adjustment unit is 0.5 degree.
This function changes in the operation (RUN) mode after setting the parameter No.92 (setting change during operation).

● Parameter list

No.	Name	Description	Setting range	Initial value	Reference for setting procedure (Chapter No.)
92	Setting change during operation	Designates the function when fine-adjusting the switch output during the operation.	0: Change disable 1: Change enable	0	8-1-1 8-1-2

Fine-adjusts the switch output according to the following procedures.

① Monitors the setting value of the switch output.
Presses [SET] key, and monitors the setting value of the switch output.

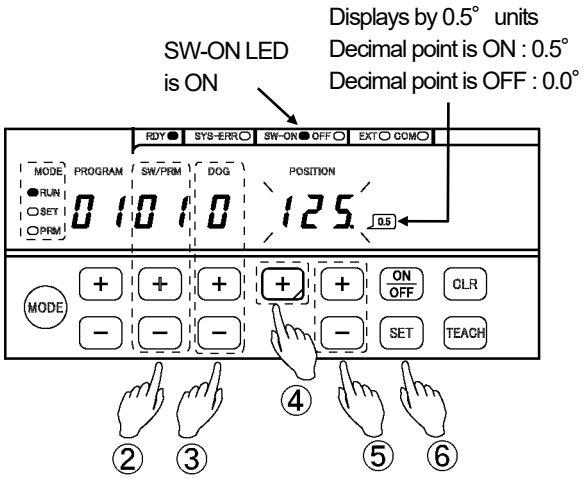


② Selects the switch number.
Selects the switch number by pressing [+] or [-] key of SW / PRM.

③ Selects the dog number.
Selects the dog number by pressing [+] or [-] key of the dog.

④ Changes the fine-adjust mode. *1
Presses [+] key of POSITION, and then the value blinks in the POSITION display area.

⑤ Fine-adjusts the ON angle value. *4
Fine-adjusts the ON angle value by pressing [+] or [-] key of POSITION.
The value which is fine-adjusted is reflected the switch output.



⑥ Changes the setting value monitoring mode of the switch output. *2
Presses [SET], and changes the setting value monitoring mode of the switch output.

⑦ Turns ON the OFF LED. *3

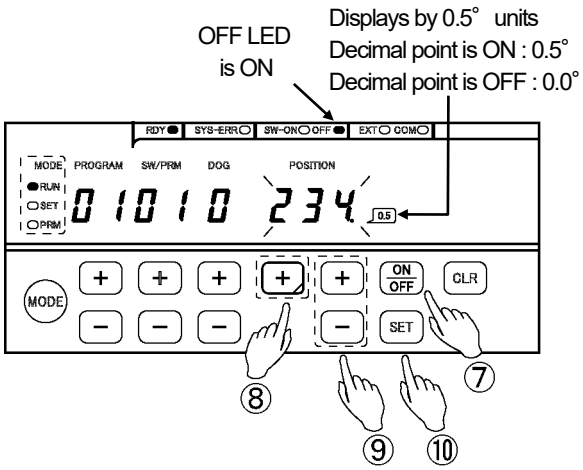
Presses [ON / OFF] key in order to fine-adjust the OFF angle.
Turns ON the OFF LED.

⑧ Changes the fine-adjust mode.

Presses [+] key of POSITION, and then the value blinks in the POSITION display area.

⑨ Fine-adjust the OFF angle value. *4

Fine-adjusts the OFF angle value by pressing [+] or [-] key of POSITION.
The value which is fine-adjusted is reflected the switch output.



⑩ Changes the setting value monitoring mode of the switch output. *2

Presses [SET], and changes the setting value monitoring mode of the switch output.

POINT

*1: In the case of fine-adjusting the ON angle only, the operation after procedure ⑦ is not needed.
In the case of fine-adjusting the OFF angle only, the procedure ④, ⑤, and ⑥ are not needed.

*2: Even if pressing POSITION [+] key or [CLR] key, changes the setting value monitoring mode of the switch output.

*3: SW-ON LED and OFF LED switch when [ON / OFF] key is pressed every time.
Turns ON the SW-ON LED when fine-adjusting the ON angle.
Turns ON the OFF LED when fine-adjusting the OFF angle.

*4: The ON angle cannot be adjusted more than the OFF angle. Similarly, the OFF angle cannot be adjusted more than ON angle. Moreover, it cannot adjust in the range that prevents having overlaps to anteroposterior dogs.

-MEMO-

MAINTENANCE

Describes about daily inspections and countermeasures for errors.

11. INSPECTIONS

The inspection should be conducted once every 6 months to a year.
Inspected items which do not satisfy the criteria shown below should be repaired.

Inspection item	Inspection description	Criteria	Remark
Power supply	Measure the voltage fluctuation at the power supply terminal block of VARICAM to determine if it is within the prescribed range.	100 VAC model: 82 to 132VAC 24 VDC model: 21.6 to 30.0VDC	Tester
Ambient conditions	Check the ambient temperature.	ABSOCODER sensor : -20 to +60°C VARICAM: 0 to +55°C	Thermometer
	There should be no accumulation of dust.	None	Visual inspection
Mount condition	Verify that the ABSOCODER sensor is securely mounted.	There should be no looseness.	
	Verify that the ABSOCODER sensor shaft is securely coupled to the machine shaft.	There should be no looseness.	
	Check for severed cables.	Cable should appear normal.	
	Verify that the sensor cable connector is plugged in all the way.	There should be no looseness.	
	Verify that the I/O connector is plugged in all the way.	There should be no looseness.	

12. TROUBLE SHOOTING

Error causes and countermeasures are described below.

12-1. Error Displays and Countermeasures

Displays the error on VARICAM when VARICAM or ABSOCODER sensor has an error.
Refer to the following list and implement appropriate countermeasures.

● Lists of the error displays, probable causes, and error cancel procedures

Error display	Name	Output state	Probable cause	Error cancel procedure
U05 blinks RDY.LED is OFF	Sensor power supply error	All output is OFF.	The power supply inside of VARICAM for sensor breaks down.	Replace VARICAM. For more details, refer to the chapter 12-2.
U08 blinks RDY.LED is OFF	Sensor error	All output is OFF.	Sensor connector is disconnected and loose.	After removing the error causes, cancels the error following methods: - Presses [CLR] or [ON / OFF] key. - Inputs the error cancel signal from external.
			Sensor cable is severed.	Replace the sensor cable. For more details, refer to the chapter 12-2.
			Failure of ABSOCODER sensor	Replace ABSOCODER sensor. For more details, refer to the chapter 12-2.
			Failure of VARICAM	Replace VARICAM. For more details, refer to the chapter 12-2.
U09 blinks RDY.LED is OFF	Memory error	All output is OFF.	Memory data has been changed due to external noise, etc.	Do the initialization operation. For the operation method, refer to the chapter 12-3. NOTE Data needs to reset up because the parameter and switch output setting values are initialized.
U17 blinks	"No setting" error	—	Only ON angle was set up when setting a switch output. (OFF angle is not set.)	Cancel the error by pressing [CLR] or [ON / OFF] key. OFF angle also needs to set after resetting the ON angle.
U18 blinks	Setting error	—	The ON angle is set overlapped values when setting a multi-dog.	Cancel the error by pressing [CLR] or [ON / OFF] key. Sets the correct value at ON angle.
SYS-ERR LED is ON	System error	All output is OFF.	The power supply voltage is low.	Replace the power supply.
			Failure of VARICAM	Replace VARICAM. For more details, refer to the chapter 12-2.
UUUU U UUU is ON RDY.LED is OFF	Origin point unset error	The output is undefined both switch and BCD signals.	The origin point is not set.	Set the parameter No.98 or 99. For more details, refer to the chapter 7-5-4 or 7-5-5.

12-2. Procedure Contents after Replacing

Implement the following measures after replacing VARICAM, ABSOCODER sensor, and sensor cable.

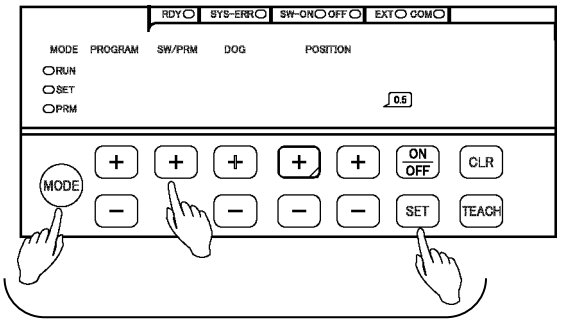
Replacing contents	Measures
In the case of replacing ABSOCODER sensor	Implements the following measures after the replacement. 1. Cancels an error either one of the following methods. - Presses [CLR] or [ON / OFF] key. - Inputs the error cancel signal from external. 2. Sets the origin point or current position values.
In the case of replacing the sensor cable	Implements the following measures after the replacement. 1. Cancels an error either one of the following methods. - Presses [CLR] or [ON / OFF] key. - Inputs the error cancel signal from external. 2. Sets the origin point or current position values.
In the case of replacing VARICAM	Sets all the parameter and switch output after the replacement.

12-3. Initialization Operation

All the VARICAM setting contents are deleted after the initialization operation, and the setting is initialized as the factory setting value.

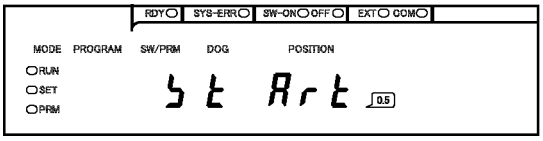
Initializes the setting by the following procedures.

① Turns ON the power supply with holding 3 keys ([MODE], [+] of SW/PRM, and [SET]) at same time.
Holds 3 key more than 1 second, and the initialization will start.

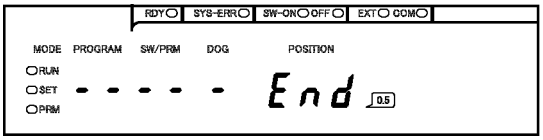


Presses 3 keys at same time.

② The display is following figure when the initialization starts.



The display is following figure when the initialization finishes.



③ Turns ON the power supply again.
This is the end of the initialization operation.

⚠ CAUTION

The parameter setting contents, switch output setting value, and password are deleted after the initialization operation.
Before the initialization, check the machine's origin point and setting contents and write it on data sheet which is attached with this manual.

-MEMO-

APPENDIX

Attaches the following contents:

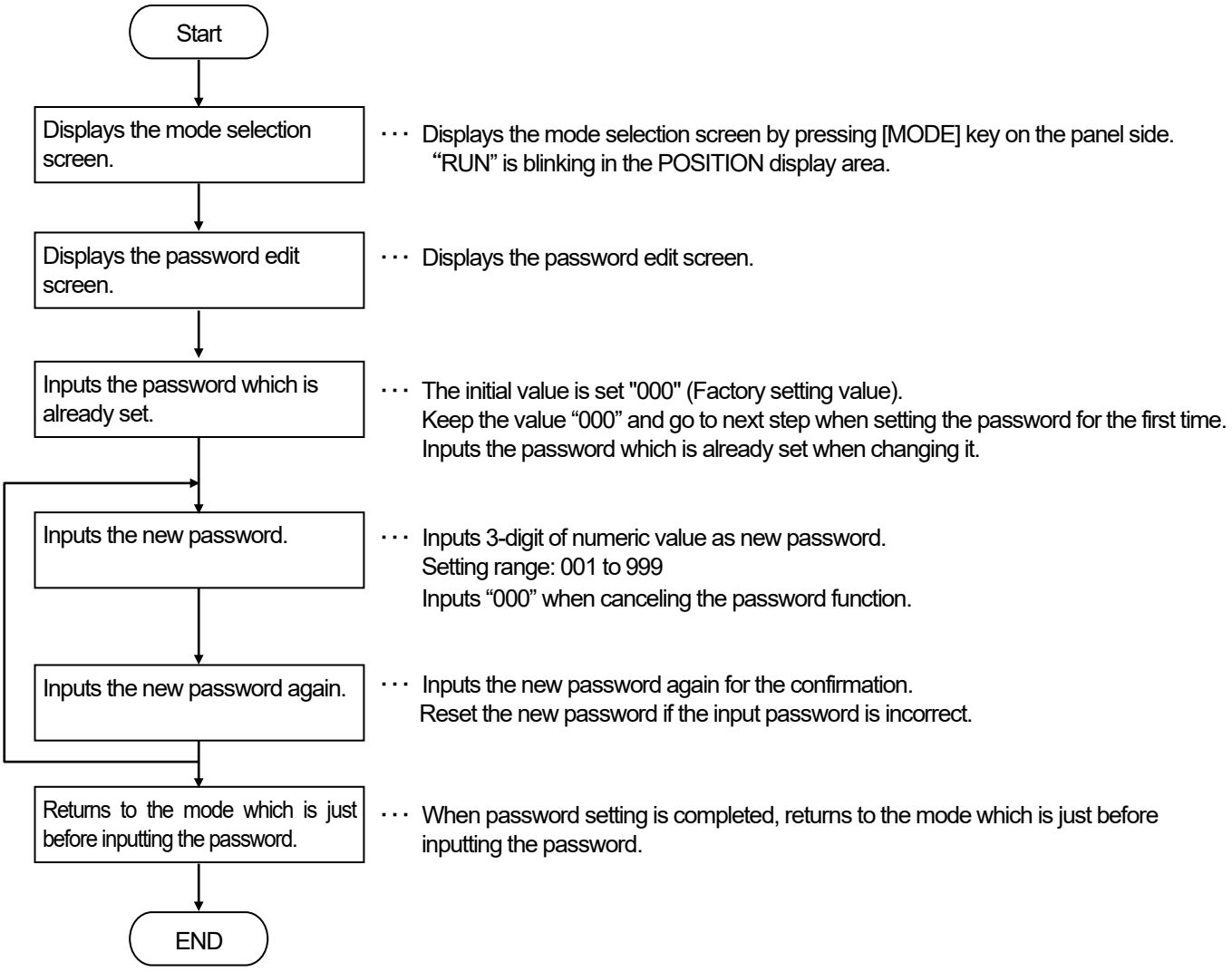
APPENDIX 1. PASSWORD FUNCTION

This function is applied to all models that are written "SP1" in the lower right portion of the front panel.
This is the function to ask inputting the password when the mode of VARICAM changes from the operation (RUN) mode.
Customers can pick and set the password which consists of 3 digits of numeric values.
The mode cannot be changed without the password after setting numbers; therefore, the value of “switch setting” and “parameter setting” can be protected. It can also be protected from changing the program No. from panel side.

If the password is not set, the mode could be changed by conventional operation.

APPENDIX 1-1. Password Setting Flow

The flowchart of setting the password is shown below.
A change or deletion of the password is the same as the following operation.
For more details regarding the setting procedure, refer to “APPENDIX 1-3. Password Setting Procedures”.



APPENDIX 1-2. Cautions when Setting the Password

● Important

Keep the password in a safe place.
The mode of VARICAM couldn't be changed if you forgot the password. As the result, setting values of the parameter and the switch output cannot be change or read by the panel side operation of VARICAM.
When using the setting and editing software "VS-5F-EDW2", setting values of the parameter and the switch output are able to read, but not able to write. (*1)
The password can be neither read nor written. (*2)
In this case, the initialization operation should be done. However, setting values of the parameter and the switch output are deleted after the initialization operation. (*3)
*1: It is available when selecting "0" at the parameter No.85 (protocol).
*2: If the parameter No.85 is selected a number except "0", setting values can be read and written by communication regardless of whether the password is set or not. Restrict to prevent reading and writing setting values by the host controller.
*3: Refer to the "12-3. Initialization Operation".

● Password memo

VARICAM users and machinery manufacturers who set the password must notate it for remembrance' sake.

Password memo

Check

☐ Ask _____ the password
Person's name

☐ Ask machinery manufacturer the password
Manufacturer : _____
Name : _____
Contact : _____

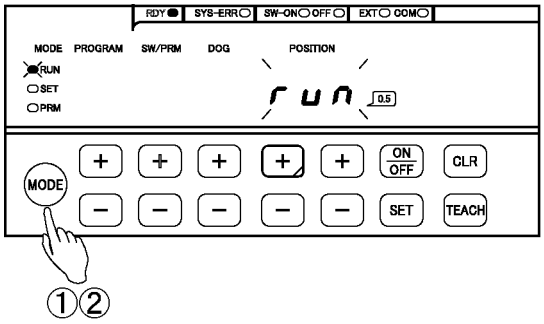
APPENDIX 1-3. Password Setting Procedures

Sets the password by the following procedures.

LED ON/OFF state
● : ON
○ : OFF
⁜ : BLINK

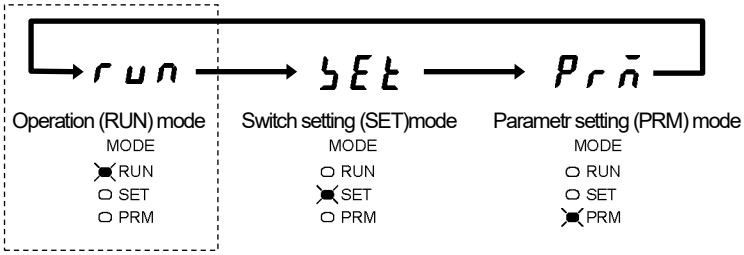
① Displays the mode selection screen.

Keeps pressing [MODE] key more than 1 second.
POSITION and MODE display areas are blinking, and changes to mode selection screen.



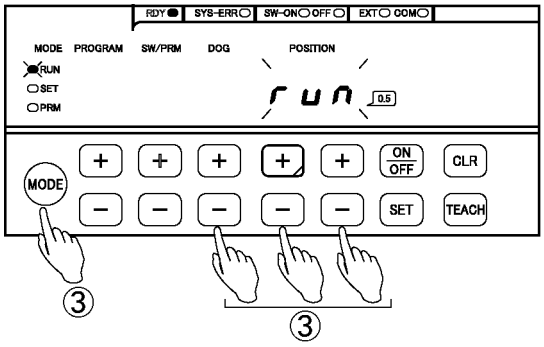
② Changes the mode.

Repeatedly presses [MODE] key, and selects the operation (RUN) mode.



③ Displays the password edit screen.

Hold down [-] keys of DOG and POSITION, and then presses [MODE] key.
"En" and "PAS" are alternately blinking in the POSITION display area.

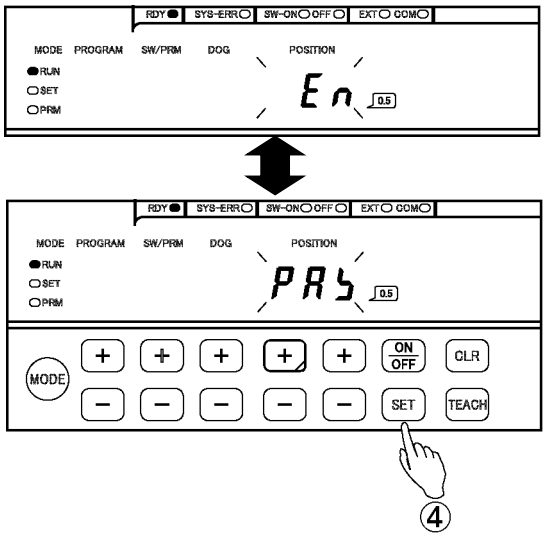


Press three keys at a time.

④ Displays the current password input screen.

Presses [SET] key.
"OLD" turns ON in the POSITION display area.

Password edit screen



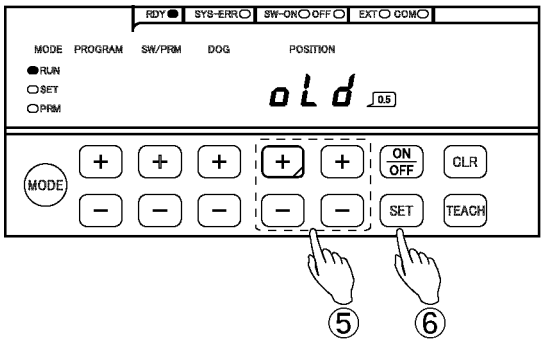
⑤ Inputs the current password.

Presses [+] or [-] key of POSITION once,
"000" is blinking in the POSITION display area.

Go to the procedure ⑥ after the above-procedure when setting the password for the first time.

In the case of changing the password, input the password which is already set by pressing [+] or [-] key of POSITION again.

If [CLR] key is pressed in this timing, returns to the mode which is just before inputting the password.



⑥ Enters the current password.

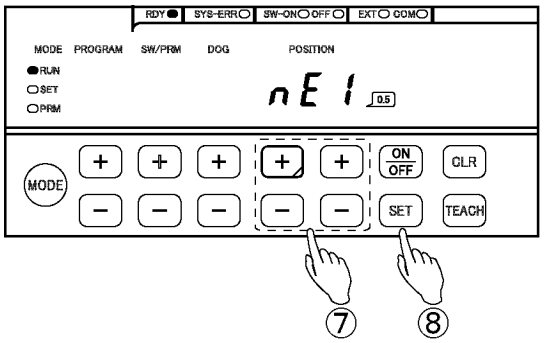
Presses [SET] key.
Displays the new password input screen.

New password input screen

⑦ Inputs the new password.(1st)*1*2

Inputs the new password by pressing [+] or [-] key of POSITION.

If [CLR] key is pressed in this timing, returns to the mode which is just before inputting the password.



⑧ Enters the new password.

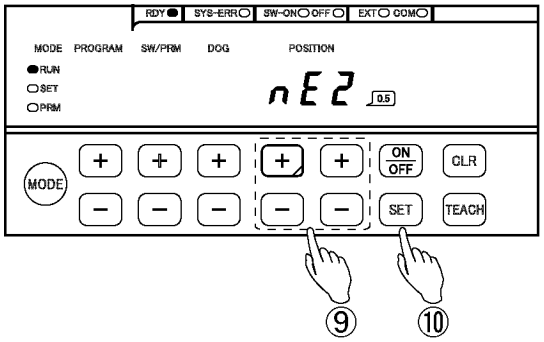
Presses [SET] key.
Displays the password input screen for the confirmation.

Password input screen for a confirmation

⑨ Inputs the password for the confirmation. (2nd)*1*2

Inputs the new password by pressing [+] or [-] key of POSITION again.

If [CLR] key is pressed in this timing, returns to the mode which is just before inputting the password.



⑩ Enters the password for the confirmation.

Presses [SET] key.

- The operation tone beeps when the password is completely set. The mode returns just before setting the password.
- If the password is different between (1st) and (2nd), the operation tone would beep out three times. In this case, the new password input screen is displayed, so operate from the procedure ⑦ again.

POINT

*1: The password setting range is "001" to "999".
*2: Input the "000" in the procedure ⑦ and ⑨ if the password function is cancelled.

APPENDIX 1-4. Mode Selection Procedure after Setting the Password

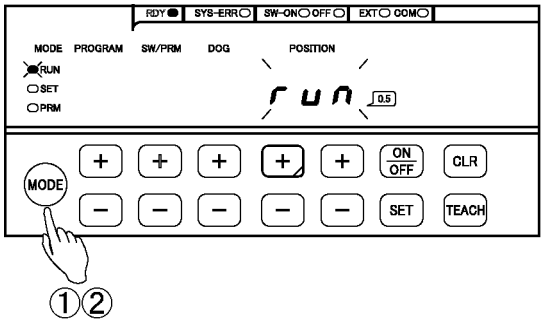
Explains the operation procedure of mode selection after setting the password.

The password must be input when changing the mode from operation (RUN) to parameter (PRM) or switch setting (SET).

① Displays the mode selection screen.

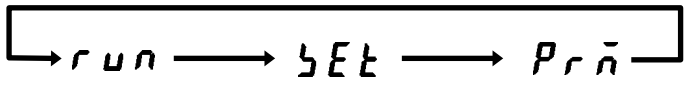
Keeps pressing [MODE] key more than 1 second.
POSITION and MODE display areas are blinking, and changes to mode selection screen.

LED ON/OFF state
: ON
: OFF
: BLINK



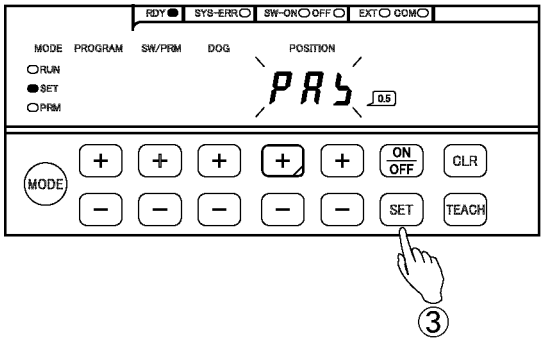
② Changes the mode.

Repeatedly presses [MODE] key, and selects the parameter setting (PRM) or switch setting (SET) mode.



Operation (RUN) mode	Switch setting (SET)mode	Parametr setting (PRM) mode
MODE	MODE	MODE
RUN	RUN	RUN
SET	SET	SET
PRM	PRM	PRM

Password input screen



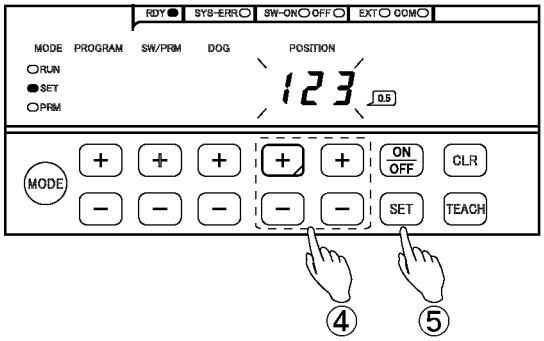
③ Displays the password input screen.

Presses [SET] key.
"PAS" is blinking in the POSITION display area.

④ Inputs the password.

Inputs the password by pressing [+] or [-] key of POSITION.

If [CLR] key is pressed in this timing, returns the operation (RUN) mode.



⑤ Enter the password.

Presses [SET] key.

- Returns to the mode which is selected in procedure ② when the password is correct.
- Returns to the operation (RUN) mode if the password is incorrect.

-MEMO-

APPENDIX 2. CE MARKING

24VDC model of VARICAM (VS-5F-1, VS-5FD-1, and VS-5FX-1) conforms to EMC directive.

APPENDIX 2-1. EMC Directives

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

APPENDIX 2-2. EMC Directive and Standards

EMC Directive consists of immunity and emission items.
It conforms to Table 01(see below) of EMC standards and Testing.

Table 01 EMC Standard and Testing

Class	Standard No.	Name
EMI (Emission)	EN61000-6-4	Generic standards. Emission standard for industrial environments
	EN55011 Class A	Electromagnetic Radiation Disturbance
EMS (Immunity)	EN61000-6-2	Generic standards. Immunity standard for industrial environments
	EN61000-4-2	Electrostatic Discharge
	EN61000-4-3	Radiated, Radio frequency, Electromagnetic Field
	EN61000-4-4	Electrical Fast Transient / Burst
	EN61000-4-5	Surge Immunity
	EN61000-4-6	Conducted Disturbances, Induced by Radio-Frequency Fields
	EN61000-4-8	Power Frequency Magnetic Field

APPENDIX 2-3. Low Voltage Directive

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

APPENDIX 2-4. Measures for EMC Compliance and Restriction

Describes measures for EMC compliance and restriction when testing the compatibility verification.

(1) Sensor cable

Mounts the clamp filter on the sensor cable.

Mounts the clamp filter within 200mm from VARICAM. (① in the figure)

(2) I/O cable

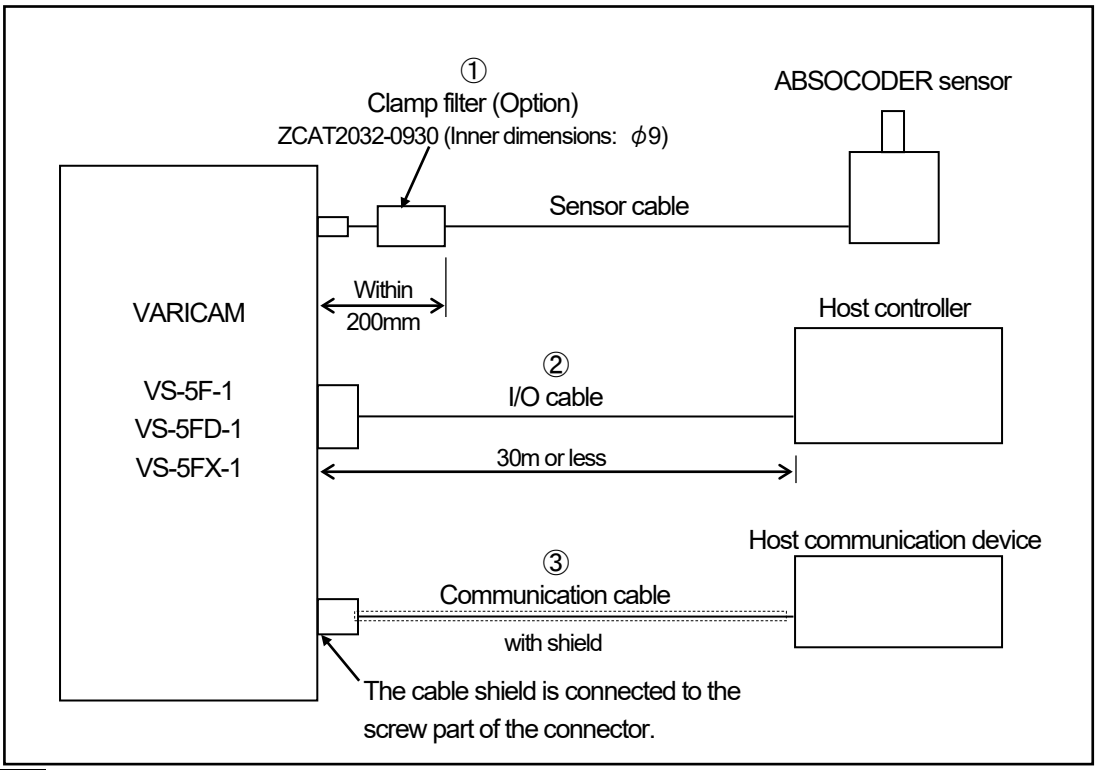
I / O cable which connects to the switch output connector and BCD output connector is under 30m.

(② in the figure)

(3) Communication cable

A cable which connects to the communication connector must use with a shield, and the shield is connected to mounting screw.

The cable is used metallic shell connectors when NSD tested, and the cable shield is connected to the screw part of the connector. (③ in the figure)



Reference

It may be improved when clamp filter is added to the power supply cable, and I/O cable.

- In the case of it operates faultily by the influence from the peripheral device
- In the case of it is effect to reduce the conduction and radiation noise

Recommendation Clamp Filter

	Mounting location	Clamp Filter model	Manufacturer
1	I / O cable	ZCAT3035-1330 (Inner dimensions: φ13)	TDK
2	Power supply cable	ZCAT2032-0930 (Inner dimensions: φ9)	

APPENDIX 3. UL STANDARD

24VDC model of VARICAM (VS-5F-1, VS-5FD-1, and VS-5FX-1) corresponds to the UL standard.
Read this page carefully and use VARICAM by following the described items.

APPENDIX 3-1. Installation

- Install inside the control cabinet.
- For use in pollution degree 2 environment
- Surrounding air temperature rating of 55℃ maximum

APPENDIX 3-2. External Power Supply

Use a “Class 2” power supply.

APPENDIX 3-3. Wiring to the Power Supply and Ground

- Use field installed conductors with a temperature rating of 75°C or higher.
- Use electrical wires of copper “AWG18”or copper strand “AWG18”.
- The terminal block tightening torque is 0.6 N·m (5.1 lb·in).

APPENDIX 4. DATA SHEET

APPENDIX 4-1. Parameter

(1/3)

No.	Name	Setting range	Applicable model			Initial value	Setting value
			VS-5F	VS-5FD	VS-5FX		
04	Contents of BCD output connector	0: Current position value BCD 1: Speed binary code 0 to 7FF Hex (0 to 2047 r/min) Units: 1 r/min 2: Speed binary code 0 to 7FF Hex (0 to 4094 r/min) Units: 2 r/min 3: Gray code (720-division) of the current position value Updating cycle: 0.352 to 140.6ms Latch pulse output: enable HOLD input: enable 4: Gray code (720-division) of the current position value (High speed) Updating cycle: 0.176ms Latch pulse output: disable HOLD input: disable		○	○	0	
03	Current position HOLD / External origin set selection	0: Current position HOLD 1: External origin set			○	0	
02	VS-5FX output specifications	0: 16-program, 40-switch 1: 32-program, 24-switch			○	0	
01	ABSOCODER sensor rotation direction	0: CW direction Display:  1: CCW direction Display: 	○	○	○	0	
00	Initial display	Displays “00” at first when selecting the parameter setting (PRM) mode.	○	○	○	—	—
99	Origin point setting	0	○	○	○	0	—
98	Current position setting	0 to 359.5°	○	○	○	0	
97	Program No. input format	0: By panel key input 1: By external connector input 2: By serial communication		○	○	0	
96	Protected switch	0: INVALID 1: VALID	○	○	○	0	
95	Protected switch cancel	0: Do not cancel 1: Cancel	○	○	○	0	
94	Output status in SET mode	0: Output OFF 1: Output HOLD	○	○	○	0	

(2/3)

No.	Name	Setting range	Applicable model			Initial value	Setting value
			VS-5F	VS-5FD	VS-5FX		
93	Timing pulse	0: 360 pulses Display: 360 1: 180 pulses Display: 180 2: 60 pulses Display: 60 3: Motion detection switch Display: Spd	○	○	○	0	
92	Setting change during operation	0: Change disable 1: Change enable	○	○	○	0	
91	Latch pulse cycle	Edge timing 0: 0.352 ms Display: 0.35 1: 17.58 ms Display: 17.6 2: 35.16 ms Display: 35.2 Level timing 3: 1.406 ms Display: 1.41 4: 4.219 ms Display: 4.22 5: 8.438 ms Display: 8.44 6: 17.58 ms Display: 17.6 7: 35.16 ms Display: 35.2 8: 70.32 ms Display: 70.3 9: 140.6 ms Display: 141		○	○	0	
90	Switch output enabling range	VS-5F(-1) : 0 to 24 VS-5FD(-1) : 0 to 24 VS-5FX(-1) : 0 to 40	○	○	○	0	
89	Communication setting	0: Setting disabled 1: Setting enabled	○	○	○	0	
86	Node number	0 to 15	○	○	○	1	
85	Protocol	0: NSD 1: MELSEC-A (Bidirectional protocol) 2: MELSEC (MC protocol) 3: OMRON 8: NDP (external display unit) 9: VARIMONI	○	○	○	0	

(3/3)

No.	Name	Setting range	Applicable model			Initial value	Setting value
			VS-5F	VS-5FD	VS-5FX		
84	Device selection	0: D (Data register) 1: R (File register)	○	○	○	0	
83	Device No.	0 to 9000	○	○	○	0	
82	Communication dog No.	0 to 9	○	○	○	0	
81	Baud rate	0: 2400bps Display: 2.4 1: 4800bps Display: 4.8 2: 9600bps Display: 9.6 3: 19200bps Display: 19.2 4: 38400bps Display: 38.4 5: 57600bps Display: 57.6	○	○	○	2	
80	Permissible angle for setting change during operation	0.5 to 180.0°	○	○	○	0.5	
78	Logic of BCD output connector	0: Positive logic 1: Negative logic		○	○	0	
77	HOLD selection	0: Transparent format 1: PC synchronization format		○	○	0	
76	PC synchronization delay value	0 to 99 ms		○	○	0	
75	Motion detection switch OFF	0 to 6000 r/min	○	○	○	0	
74	Motion detection switch ON	0 to 6000 r/min	○	○	○	0	
40	Hysteresis angle	0.0 to 10.0°	○	○	○	0	

APPENDIX 4-2. Switch Output

Please copy required number of this data sheets.

Program No. :		Program name :									
Switch No.	Switch name	Multi-dog No.									Arbitrary pulse
		0	1	2	3	4	5	6	7	8	9	
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:
		ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	ON: OFF:	Pulse No. : Starting angle:

NSD Group

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

Distributor
NSD Trading Corporation 3-31-23, OSU, NAKA-KU, NAGOYA, JAPAN 460-8302
Phone: +81-52-261-2352 Facsimile: +81-52-252-0522
URL: www.nsdcorp.com E-mail: foreign@nsdcorp.com